VALDONĖ DARŠKUVIENĖ

Vytautas Magnus University

Financial Markets

Leonardo da Vinci programme project

**„Development and Approbation of Applied Courses
Based on the Transfer of Teaching Innovations
in Finance and Management for Further Education
of Entrepreneurs and Specialists in Latvia, Lithuania and Bulgaria"**

2010

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INTRODUCTION

Motivation for developing the course

Research by the members of the project consortium Employers' Confederation of Latvia and Bulgarian Chamber of Commerce and Industry indicated the need for further education courses in the field of finance and managerial decision making.

Innovative content of the course

The course has been developed to include the following innovative content:
- Key concepts of financial markets, which are explained from an applied perspective, including with examples and problems from current financial markets practices from EU integration and development perspective;
- Analytical techniques to be applied in financial markets provide with understanding and tools to decision makers in the firm;
- Applied exercises, which cover topics such as money market, debt market, equity market instruments, as well as decision making rules in the financial markets;
- Summaries are provided at the end of every chapter, which aid revision and control of knowledge acquisition during self-study;

Innovative teaching methods of the course

The course is developed to utilise the following innovative teaching methods:
- Availability on the electronic platform with interactive learning and interactive evaluation methods;
- Active use of case studies and participant centred learning;
- Availability in modular form;
- Utilising two forms of learning - self-study and tutorial consultations;
- Availability in several languages simultaneously.

Target audience for the course

The target audience are: entrepreneurs, finance and management specialists from Latvia, Lithuania and Bulgaria and, in the longer term, similar groups in any other European country.
The course assumes little prior applied knowledge in the area of financial and operation analysis.
The course is intended for 32 academic hours (2 credit points).

Course objective

The objective of the course is to provide entrepreneurs with the knowledge in the area of financial markets, specific financial market instruments, behavior in order to enable them to understand the financial markets processes and their factors, and to make successfully financial decisions on the individual as well as company level.

1. FINANCIAL MARKETS: STRUCTURE AND ROLE IN THE FINANCIAL SYSTEM

Mini contents	• The structure of a financial system
	• Functions of a financial system
	• The structure and key features of financial markets
	• The key features of financial intermediaries
	• Major financial market participants

1.1. Financial system structure and functions

The **financial system** plays the key role in the economy by stimulating economic growth, influencing economic performance of the actors, affecting economic welfare. This is achieved by financial infrastructure, in which entities with funds allocate those funds to those who have potentially more productive ways to invest those funds. A financial system makes it possible a more efficient transfer of funds. As one party of the transaction may possess superior information than the other party, it can lead to the information asymmetry problem and inefficient allocation of financial resources. By overcoming the information asymmetry problem the financial system facilitates balance between those with funds to invest and those needing funds.

According to the **structural approach,** the financial system of an economy consists of three main components:

1) financial markets;

2) financial intermediaries (institutions);

3) financial regulators.

Each of the components plays a specific role in the economy.

According to the **functional approach, financial markets** facilitate the flow of funds in order to finance investments by corporations, governments and individuals. **Financial institutions** are the key players in the financial markets as they perform the function of intermediation and thus determine the flow of funds. The **financial regulators** perform the role of monitoring and regulating the participants in the financial system.
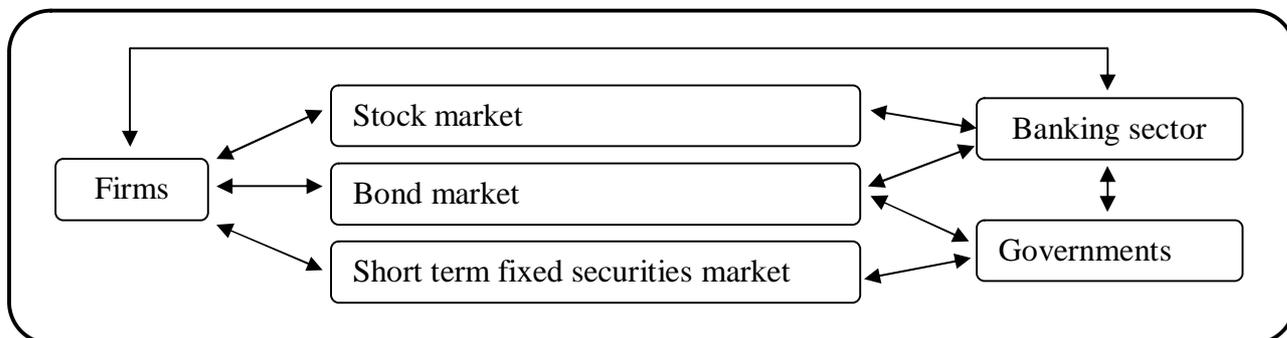
Figure 1. The structure of financial system

Financial markets studies, based on capital market theory, focus on the financial system, the structure of interest rates, and the pricing of financial assets.

An **asset** is any resource that is expected to provide future benefits, and thus possesses economic value. Assets are divided into two categories: tangible assets with physical properties and intangible assets. An *intangible asset* represents a legal claim to some future economic benefits. The value of an intangible asset bears no relation to the form, physical or otherwise, in which the claims are recorded.

Financial assets*,* often called **financial instruments***,* are intangible assets, which are expected to provide future benefits in the form of a claim to future cash. Some financial instruments are called *securities* and generally include stocks and bonds.

Any transaction related to financial instrument includes at least two parties:

1) the party that has agreed to make future cash payments and is called the *issuer*;

2) the party that owns the financial instrument, and therefore the right to receive the payments made by the issuer, is called the *investor*.

Financial assets provide the following key economic **functions**.

- they allow the transfer of funds from those entities, who have surplus funds to invest to those who need funds to invest in tangible assets;

- they redistribute the unavoidable risk related to cash generation among deficit and surplus economic units.

The claims held by the final wealth holders generally differ from the liabilities issued by those entities who demand those funds. They role is performed by the specific entities operating in financial systems, called **financial intermediaries**. The latter ones transform the final liabilities into different financial assets preferred by the public.

1.2. Financial markets and their economic functions

A financial market is a market where financial instruments are exchanged or traded. Financial markets provide the following three major **economic functions**:

1) Price discovery

2) Liquidity

3) Reduction of transaction costs

1) **Price discovery** function means that transactions between buyers and sellers of financial instruments in a financial market determine the price of the traded asset. At the same time the required return from the investment of funds is determined by the participants in a financial market. The motivation for those seeking funds (deficit units) depends on the required return that investors demand. It is these functions of financial markets that signal how the funds available from those who want to lend or invest funds will be allocated among those needing funds and raise those funds by issuing financial instruments.

2) **Liquidity** function provides an opportunity for investors to sell a financial instrument, since it is referred to as a measure of the ability to sell an asset at its fair market value at any time. Without liquidity, an investor would be forced to hold a financial instrument until conditions arise to sell it or the issuer is contractually obligated to pay it off. Debt instrument is liquidated when it matures, and equity instrument is until the company is

either voluntarily or involuntarily liquidated. All financial markets provide some form of liquidity. However, different financial markets are characterized by the degree of liquidity.

3) The function of **reduction of transaction costs** is performed, when financial market participants are charged and/or bear the costs of trading a financial instrument. In market economies the economic rationale for the existence of institutions and instruments is related to transaction costs, thus the surviving institutions and instruments are those that have the lowest transaction costs.

The key attributes determining transaction costs are

- **asset specificity,**

- **uncertainty,**

- **frequency of occurrence.**

Asset specificity is related to the way transaction is organized and executed. It is lower when an asset can be easily put to alternative use, can be deployed for different tasks without significant costs.

Transactions are also related to *uncertainty*, which has (1) external sources (when events change beyond control of the contracting parties), and (2) depends on opportunistic behavior of the contracting parties. If changes in external events are readily verifiable, then it is possible to make adaptations to original contracts, taking into account problems caused by external uncertainty. In this case there is a possibility to control transaction costs. However, when circumstances are not easily observable, opportunism creates incentives for contracting parties to review the initial contract and creates moral hazard problems. The higher the uncertainty, the more opportunistic behavior may be observed, and the higher transaction costs may be born.

Frequency of occurrence plays an important role in determining if a transaction should take place within the market or within the firm. A one-time transaction may reduce costs when it is executed in the market. Conversely, frequent transactions require detailed contracting and should take place within a firm in order to reduce the costs.

When assets are specific, transactions are frequent, and there are significant uncertainties intra-firm transactions may be the least costly. And, vice versa, if assets are non-specific, transactions are infrequent, and there are no significant uncertainties least costly may be market transactions.

The mentioned attributes of transactions and the underlying incentive problems are related to behavioural assumptions about the transacting parties. The economists (Coase (1932, 1960, 1988), Williamson (1975, 1985), Akerlof (1971) and others) have contributed to transactions costs economics by analyzing behaviour of the human beings, assumed generally self-serving and rational in their conduct, and also behaving opportunistically. Opportunistic behaviour was understood as involving actions with incomplete and distorted information that may intentionally mislead the other party. This type of behavior requires efforts of ex ante screening of transaction parties, and ex post safeguards as well as mutual restraint among the parties, which leads to specific transaction costs.

Transaction costs are classified into:

1) costs of search and information,

2) costs of contracting and monitoring,

3) costs of incentive problems between buyers and sellers of financial assets.

1) **Costs of search and information** are defined in the following way:

- *search* costs fall into categories of explicit costs and implicit costs.

Explicit costs include expenses that may be needed to advertise one's intention to sell or purchase a financial instrument. *Implicit costs* include the value of time spent in locating counterparty to the transaction. The presence of an organized financial market reduces search costs.

- *information* costs are associated with assessing a financial instrument's investment attributes. In a price efficient market, prices reflect the aggregate information collected by all market participants.

2) **Costs of contracting and monitoring** are related to the costs necessary to resolve information asymmetry problems, when the two parties entering into the transaction possess limited information on each other and seek to ensure that the transaction obligations are fulfilled.

3) **Costs of incentive problems** between buyers and sellers arise, when there are conflicts of interest between the two parties, having different incentives for the transactions involving financial assets.

The functions of a market are performed by its diverse participants. The participants in financial markets can be also classified into various groups, according to their motive for trading:

- Public investors, who ultimately own the securities and who are motivated by the returns from holding the securities. Public investors include private individuals and institutional investors, such as pension funds and mutual funds.

- Brokers, who act as agents for public investors and who are motivated by the remuneration received (typically in the form of commission fees) for the services they provide. Brokers thus trade for others and not on their own account.

- Dealers, who do trade on their own account but whose primary motive is to profit from trading rather than from holding securities. Typically, dealers obtain their return from the differences between the prices at which they buy and sell the security over short intervals of time.

- Credit rating agencies (CRAs) that assess the credit risk of borrowers.

In reality three groups are not mutually exclusive. Some public investors may occasionally act on behalf of others; brokers may act as dealers and hold securities on their own, while dealers often hold securities in excess of the inventories needed to facilitate their trading activities. The role of these three groups differs according to the trading mechanism adopted by a financial market.

1.3. Financial intermediaries and their functions

Financial intermediary is a special financial entity, which performs the role of efficient allocation of funds, when there are conditions that make it difficult for lenders or investors of funds to deal directly with borrowers of funds in financial markets. Financial intermediaries include depository institutions, insurance companies, regulated investment companies, investment banks, pension funds.

The role of financial intermediaries is to create more favourable transaction terms than could be realized by lenders/investors and borrowers dealing directly with each other in the financial market.

The financial intermediaries are engaged in:

- obtaining funds from lenders or investors and

- lending or investing the funds that they borrow to those who need funds.

The funds that a financial intermediary acquires become, depending on the financial claim, either the liability of the financial intermediary or equity participants of the financial intermediary. The funds that a financial intermediary lends or invests become the asset of the financial intermediary.

Financial intermediaries are engaged in transformation of financial assets, which are less desirable for a large part of the investing public into other financial assets—their own liabilities—which are more widely preferred by the public.

Asset transformation provides at least one of three economic functions:

- Maturity intermediation.

- Risk reduction via diversification.

- Cost reduction for contracting and information processing.
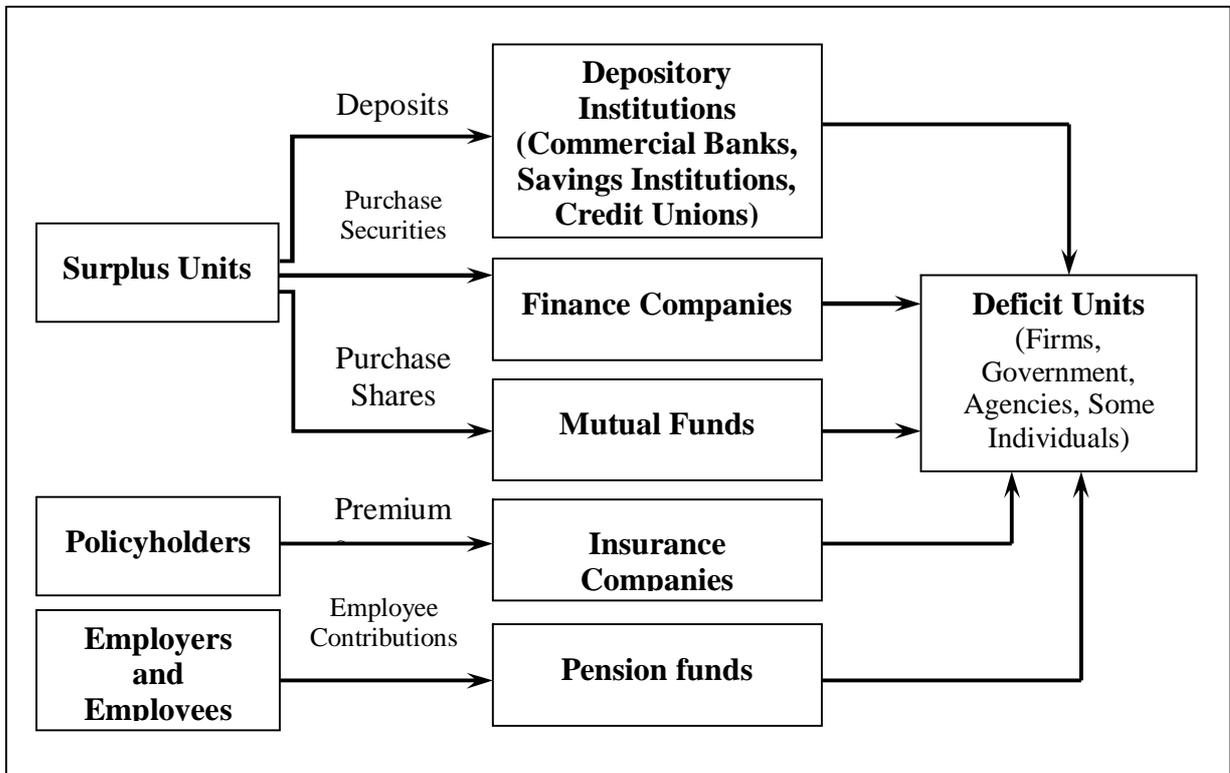
Figure 2. Comparison of roles among financial institutions

Source: Madura J. (2008). Financial Institutions and Markets, Eight Edition

These economic functions are performed by financial market participants while providing the special financial services (e.g. the first and second functions can be performed by brokers, dealers and market makers. The third function is related to the service of underwriting of securities).

Other services that can be provided by financial intermediaries include:

- Facilitating the trading of financial assets for the financial intermediary's customers through brokering arrangements.

- Facilitating the trading of financial assets by using its own capital to take a position in a financial asset the financial intermediary's customer want to transact in.

- Assisting in the creation of financial assets for its customers and then either distributing those financial assets to other market participants.

- Providing investment advice to customers.

- Manage the financial assets of customers.

- Providing a payment mechanism.

1.4. Financial markets structure

1.4.1. Financial instruments

There is a great variety of financial instrument in the financial marketplace. The use of these instruments by major market participants depends upon their offered risk and return characteristics, as well as availability in retail or wholesale markets. The general view on the financial instrument categories is provided in Table 1.

Table 1. Financial instrument categories

Category	Risk determinants	Expected returns	Main participants
Non-tradables and non-transferables	In wholesale money markets: transaction volumes	In wholesale money markets: low	In wholesale money markets: banks
	In retail markets: low transparency, lack of standardisation, low creditworthiness	In credit markets: low	In retail markets: banks and non-bank firms and households
	In foreign exchange markets: high volatility, change of currency	In foreign exchange markets: high	In foreign exchange markets: financial institutions, companies
Securities	Market volatility, individual risks and failures	Comparably high	Banks and non-bank firms, individuals
Derivatives	Market volatility, leverage	Very high	Banks and non-bank firms, individuals

Source: Reszat B. (2008). European Financial Systems in the Global Economy

A **financial instrument** can be classified by the type of claims that the investor has on the issuer. A financial instrument in which the issuer agrees to pay the investor interest plus repay the amount borrowed is a **debt instrument**. A debt instrument also referred to as an *instrument of indebtedness*, can be in the form of a note, bond, or loan. The interest payments that must be made by the issuer are fixed contractually. For example, in the case of a debt instrument that is required to make payments in Euros, the amount can be a fixed Euro amount or it can vary depending upon some benchmark. The investor in a debt instrument can realize no more than the contractual amount. For this reason, debt instruments are often called **fixed income instruments**.

Fixed income instruments forma a wide and diversified fixed income market. The key characteristics of it is provided in Table 2.

Table 2.Fixed-income market

	Market	Features	Issuers
Long term	Bonds	Long-term obligations to make a series of fixed payments	Governments, firms
	Convertibles	Bonds that can be swapped for equity at pre-specified conditions	Firms
	Asset-backed securities	Securitised "receivables" presenting future streams of payments	Financial institutions, firms
	Preferred stock, subordinated debt	Debt and equity hybrids	Firms
Medium term	Notes	Medium-term obligations	Governments
	Floating-rate notes	Medium-term instruments with interest rates based on LIBOR or another index	Firms
Short term	Bills	Short-term obligations	Governments
	Commercial paper	Short-term debt instruments	Firms
	Certificates of deposit	Short-term debt instruments	Banks

Source: Reszat B. (2008). European Financial Systems in the Global Economy

In contrast to a debt obligation, an **equity instrument** specifies that the issuer pays the investor an amount based on earnings, if any, after the obligations that the issuer is required to make to investors of the firm's debt instruments have been paid.

Common stock is an example of equity instruments. Some financial instruments due to their characteristics can be viewed as a mix of debt and equity.

Preferred stock is a financial instrument, which has the attribute of a debt because typically the investor is only entitled to receive a fixed contractual amount. However, it is similar to an equity instrument because the payment is only made after payments to the investors in the firm's debt instruments are satisfied.

Another "combination" instrument is a **convertible bond**, which allows the investor to convert debt into equity under certain circumstances. Because preferred stockholders typically are entitled to a fixed contractual amount, preferred stock is referred to as a **fixed income instrument**.

Hence, fixed income instruments include debt instruments and preferred stock.

The features of debt and equity instruments are contrasted in Table 3.

The classification of debt and equity is especially important for two legal reasons. First, in the case of a bankruptcy of the issuer, investor in debt instruments has a priority on the

claim on the issuer's assets over equity investors. Second, the tax treatment of the payments by the issuer can differ depending on the type of financial instrument class.

Table 3. Debt versus equity

	Debt	Equity
Characteristic	Borrower-lender relation, fixed maturities	Ownership, no time limit
Advantages:		
✓ **for the firm**	Predictability, independence from shareholders' influence	Flexibility, low cost of finance, reputation
✓ **for the investor**	Low risk	High expected return
Disadvantages:		
✓ **for the firm**	Debt servicing obligation	Shareholder dependence, short-sightedness, market volatility influencing management decisions
✓ **for the investor**	Low returns	High risk

Source: Reszat B. (2008). European Financial Systems in the Global Economy

1.4.2. Classification of financial markets

There different ways to classify financial markets. They are classified according to the financial instruments they are trading, features of services they provide, trading procedures, key market participants, as well as the origin of the markets.

The generalized financial market classification is given in Table 4.

Table 4. Financial market classification

Criterion	Features	Examples
Products	Tradability, transferability, ownership, maturity, denomination, substance	Equity, debt instruments, derivatives
Services	Technical, advisory, information and knowledge-based, administrative	IT support, research and analysis, custody
Ways of trading	Physical, electronic, virtual	Over the counter, exchange, internet
Participants	Professionals, non-professionals, institutions, officials	Banks, central banks, non-bank financial companies, institutional investors, business firms, households
Origin	Domestic, cross-border, regional, international	National markets, regionally integrated markets, Euromarkets, domestic/foreign currency markets, onshore/offshore markets

Source: Reszat B. (2008). European Financial Systems in the Global Economy.

From the perspective of country origin, its financial market can be broken down into an internal market and an external market.

The **internal market**, also called the **national market**, consists of two parts: the domestic market and the foreign market. The **domestic market** is where issuers domiciled in the country issue securities and where those securities are subsequently traded.

The **foreign market** is where securities are sold and traded outside the country of issuers.

External market is the market where securities with the following two distinguishing features are trading: 1) at issuance they are offered simultaneously to investors in a number of countries; and 2) they are issued outside the jurisdiction of any single country. The external market is also referred to as the **international market, offshore market**, and the **Euromarket** (despite the fact that this market is not limited to Europe).

Money market is the sector of the financial market that includes financial instruments that have a maturity or redemption date that is one year or less at the time of issuance. These are mainly **wholesale markets**.

The **capital market** is the sector of the financial market where long-term financial instruments issued by corporations and governments trade. Here "long-term" refers to a financial instrument with an original maturity greater than one year and perpetual securities (those with no maturity). There are two types of capital market securities: those that represent shares of ownership interest, also called **equity,** issued by corporations, and those that represent indebtedness, or **debt** issued by corporations and by the state and local governments.

Financial markets can be classified in terms of **cash market** and **derivative markets**.

The **cash market**, also referred to as the **spot market**, is the market for the immediate purchase and sale of a financial instrument.

In contrast, some financial instruments are contracts that specify that the contract holder has either the obligation or the choice to buy or sell another something at or by some future date. The "something" that is the subject of the contract is called the *underlying (asset)*. The underlying asset is a stock, a bond, a financial index, an interest rate, a currency, or a commodity. Because the price of such contracts derive their value from the value of the underlying assets, these contracts are called **derivative instruments** and the market where they are traded is called the **derivatives market**.

When a financial instrument is first issued, it is sold in the **primary market**. A **secondary market** is such in which financial instruments are resold among investors. No new capital is raised by the issuer of the security. Trading takes place among investors.

Secondary markets are also classified in terms of organized stock exchanges and over-the-counter (OTC) markets.

Stock exchanges are central trading locations where financial instruments are traded. In contrast, an **OTC market** is generally where unlisted financial instruments are traded.

1.5. Financial market regulation

In general, financial market regulation is aimed to ensure the fair treatment of participants. Many regulations have been enacted in response to fraudulent practices. One of the key aims of regulation is to ensure business disclosure of accurate information for investment decision making. When information is disclosed only to limited set of investors, those have major advantages over other groups of investors. Thus regulatory framework has to provide the equal access to disclosures by companies. The recent regulations were passed

in response to large bankruptcies, overhauled corporate governance, in order to strengthen the role of auditors in overseeing accounting procedures. The Sorbanes-Oxley Act of 2002 in US was designed particularly to tighten companies' governance after dotcom bust and Enron's Bankruptcy. It had direct consequences internationally, first of all through global companies. The US Wall Street Reform and Consumer Protection Act (Dodd-Frank) of 2010 aims at imposing tighter financial regulation for the financial markets and financial intermediaries in US, in order to ensure consumer protection. This is in tune with major financial regulation system development in EU and other parts of the world.

1.6. Summary

The financial system of an economy consists of three components: (1) Financial markets; (2) financial intermediaries; and (3) financial regulators.

The main function of the system is to channel funds between the two groups of end users of the system: from lenders ('surplus units') to borrowers ('deficit units'). Besides, a financial system provides payments facilities, a variety of services such as insurance, pensions and foreign exchange, together with facilities which allow people to adjust their existing wealth portfolios.

Apart from direct borrowing and lending between end-users, borrowing and lending through intermediaries and organized markets have important advantages. These include transforming the maturity of short-term savings into longer-term loans, reduction of risk and controlling transaction costs.

The field of financial markets and its theoretical foundations is based on the study of the financial system, the structure of interest rates, and the pricing of risky assets.

The major market players are households, governments, nonfinancial corporations, depository institutions, insurance companies, asset management firms, investment banks, nonprofit organizations, and foreign investors.

Financial markets are classified into internal versus external markets, capital markets versus money markets, cash versus derivative markets, primary versus secondary markets, private placement versus public markets, exchange-traded versus over-the-counter markets.

The financial markets and intermediaries are subject to financial regulators. The recent changes in the regulatory system are happening in response to the problems in the credit markets and financial crisis that struck 2008.

Key terms

- Financial system
- Financial markets
- Money markets
- Capital markets
- Debt markets
- Derivative markets

Further readings

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Review questions and problems

1. What are the functions of a financial system?

2. Distinguish the difference between deficit and surplus units.

3. What is the difference between 'saving' and a 'financial surplus'?

4. Discuss the advantages to deficit and surplus units of using organized financial markets and financial intermediaries.

5. How are financial intermediaries able to engage in maturity transformation?

6. Explain briefly the difference between deposit-taking and non-deposit-taking intermediaries.

7. Why do people simultaneously hold financial assets and liabilities?

8. Why is the average size of broker/ dealer operations in general smaller than that of asset transformers?

2. INTEREST RATES DETERMINATION AND STRUCTURE

Mini contents	• Interest rate determination
	• Loanable funds theory
	• Liquidity preference theory
	• Level of interest rates in the economy
	• Understanding of the term structure of interest rates
	• Theories of term structure of interest rates
	• Spot rates and forwards rates
	• Yield curves

For financing and investing decision making in a dynamic financial environment of market participants, it is crucial to understand interest rates as one of the key aspects of the financial environment. Several economic theories explain determinants of the level of interest rates. Another group of theories explain the variety of interest rates and their term structure, i.e. relationship between interest rates and the maturity of debt instruments.

2.1. Interest rate determination

2.1.1. The rate of interest

Interest rate is a rate of return paid by a borrower of funds to a lender of them, or a price paid by a borrower for a service, the right to make use of funds for a specified period. Thus it is one form of yield on financial instruments. Two questions are being raised by market participants:

- What determines the average rate of interest in an economy?

- Why do interest rates differ on different types and lengths of loans and debt instruments?

Interest rates vary depending on borrowing or lending decision. There is interest rate at which banks are lending (the offer rate) and interest rate they are paying for deposits (the bid rate). The difference between them is called a **spread**. Such a spread also exists between selling and buying rates in local and international money and capital markets. The spread between offer and bid rates provides a cover for administrative costs of the financial intermediaries and includes their profit. The spread is influenced by the degree of competition among financial institutions. In the short-term international money markets the spread is lower if there is considerable competition. Conversely, the spread between banks borrowing and lending rates to their retail customers is larger in general due to considerably larger degree of loan default risk. Thus the lending rate (offer or ask rate) always includes a **risk premium**.

Concept	**Risk premium** is **an** addition to the interest rate demanded by a lender to take into account the risk that the borrower might default on the loan entirely or may not repay on time (default risk).

There are several factors that determine the risk premium for a non- Government security, as compared with the Government security of the same maturity. These are (1) the perceived creditworthiness of the issuer, (2) provisions of securities such as conversion provision, call provision, put provision, (3) interest taxes, and (4) expected liquidity of a security's issue.

In order to explain the determinants of interest rates in general, the economic theory assumes there is some particular interest rate, as a representative of all interest rates in an economy. Such an interest rate usually depends upon the topic considered, and can represented by e.g. interest rate on government short-term or long-term debt, or the base interest rate of the commercial banks, or a short-term money market rate (EURIBOR). In such a case it is assumed that the interest rate structure is stable and that all interest rates in the economy are likely to move in the same direction.

Concept	**Interest rate structure** is the relationships between the various rates of interest in an economy on financial instruments of different lengths (terms) or of different degrees of risk.

The rates of interest quoted by financial institutions are nominal rates, and are used to calculate interest payments to borrowers and lenders. However, the loan repayments remain the same in money terms and make up a smaller and smaller proportion of the borrower's income. The real cost of the interest payments declines over time. Therefore there is a real interest rate, i.e. the rate of interest adjusted to take into account the rate of inflation. Since the real rate of return to the lender can be also falling over time, the lender determines interest rates to take into account the expected rate of inflation over the period of a loan. When there is uncertainty about the real rate of return to be received by the lender, he will be inclined to lend at fixed interest rates for short-term.

The loan can be 'rolled over' at a newly set rate of interest to reflect changes in the expected rate of inflation. On the other hand, lenders can set a floating interest rate, which is adjusted to the inflation rate changes.

Concept	**Real interest rate** is the difference between the nominal rate of interest and the expected rate of inflation. It is a measure of the anticipated opportunity cost of borrowing in terms of goods and services forgone.

The dependence between the real and nominal interest rates is expressed using the following equation:

$i = (1+ r)(1 + i^e) - 1$

where i is the nominal rate of interest, r is the real rate of interest and i^e e is the expected rate of inflation.

Example	Assume that a bank is providing a company with a loan of 1000 thous. Euro for one year at a real rate of interest of 3 per cent. At the end of the year it expects to receive back 1030 thous. Euro of purchasing power at current prices. However, if the bank expects a 10 per cent rate of inflation over the next year, it will want 1133 thous. Euro back (10 per cent above 1030 thous. Euro). The interest rate required by the bank would be 13.3 per cent
	$i = (1+ 0,03)(1 + 0,1) - 1 = (1,03)(1,1) - 1 = 1,133 - 1 = 0,133$ or 13,3 per cent

When simplified, the equation becomes: $i = r + i^e$

In the example, this would give 3 per cent plus 10 per cent = 13 per cent.

The real rate of return is thus: $r = i - i^e$

When assumption is made that r is stable over time, the equation provides the Fisher effect. It suggests that changes in short-term interest rates occur because of changes in the expected rate of inflation. If a further assumption is made that expectations about the rate of inflation of market participants are correct, then the key reason for changes in interest rates is the changes in the current rate of inflation.

Borrowers and lenders think mostly in terms of real interest rates. There are two economic theories explaining the level of real interest rates in an economy:

- The loanable funds theory
- Liquidity preference theory

2.1.2. Interest rate theories: loanable funds theory

In an economy, there is a supply loanable funds (i.e., credit) in the capital market by households, business, and governments. The higher the level of interest rates, the more such entities are willing to supply loan funds; the lower the level of interest, the less they are willing to supply. These same entities demand loanable funds, demanding more when the level of interest rates is low and less when interest rates are higher.

The extent to which people are willing to postpone consumption depends upon their **time preference.**

Concept	**Time preference** describes the extent to which a person is willing to give up the satisfaction obtained from present consumption in return for increased consumption in the future.

The term 'loanable funds' simply refers to the sums of money offered for lending and demanded by consumers and investors during a given period. The interest rate in the model is determined by the interaction between potential borrowers and potential savers.

Concept	**Loanable funds** are funds borrowed and lent in an economy during a specified period of time – the flow of money from surplus to deficit units in the economy.

The loanable funds theory was formulated by the Swedish economist Knut Wicksell in the 1900s. According to him, the level of interest rates is determined by the supply and demand of loanable funds available in an economy's credit market (i.e., the sector of the capital markets for long-term debt instruments). This theory suggests that investment and savings in the economy determine the level of long-term interest rates. Short-term interest rates, however, are determined by an economy's financial and monetary conditions.

According to the loanable funds theory for the economy as a whole:

Demand for loanable funds = net investment + net additions to liquid reserves

Supply of loanable funds = net savings + increase in the money supply

Given the importance of loanable funds and that the major suppliers of loanable funds are commercial banks, the key role of this financial intermediary in the determination of

interest rates is vivid. The central bank is implementing specific monetary policy, therefore it influences the supply of loanable funds from commercial banks and thereby changes the level of interest rates. As central bank increases (decreases) the supply of credit available from commercial banks, it decreases (increases) the level of interest rates.

2.1.3. Interest rate theories: liquidity preference theory

Saving and investment of market participants under economic uncertainty may be much more influenced by expectations and by exogenous shocks than by underlying real forces. A possible response of risk-averse savers is to vary the form in which they hold their financial wealth depending on their expectations about asset prices. Since they are concerned about the risk of loss in the value of assets, they are likely to vary the average liquidity of their portfolios.

Concept	**A liquid asset** is the one that can be turned into money quickly, cheaply and for a known monetary value.

Liquidity preference theory is another one aimed at explaining interest rates. J. M. Keynes has proposed (back in 1936) a simple model, which explains how interest rates are determined based on the preferences of households to hold money balances rather than spending or investing those funds.

Money balances can be held in the form of currency or checking accounts, however it does earn a very low interest rate or no interest at all. A key element in the theory is the motivation for individuals to hold money balance despite the loss of interest income. Money is the most liquid of all financial assets and, of course, can easily be utilized to consume or to invest. The quantity of money held by individuals depends on their level of income and, consequently, for an economy the demand for money is directly related to an economy's income. There is a trade-off between holding money balance for purposes of maintaining liquidity and investing or lending funds in less liquid debt instruments in order to earn a competitive market interest rate. The difference in the interest rate that can be earned by investing in interest-bearing debt instruments and money balances represents an opportunity cost for maintaining liquidity. The lower the opportunity cost, the greater the demand for money balances; the higher the opportunity cost, the lower the demand for money balance.

Concept	**Liquidity preference** is preference for holding financial wealth in the form of short-term, highly liquid assets rather than long-term illiquid assets, based principally on the fear that long-term assets will lose capital value over time.

According to the liquidity preference theory, the level of interest rates is determined by the supply and demand for money balances. The money supply is controlled by the policy tools available to the country's Central Bank. Conversely, in the loan funds theory the level of interest rates is determined by supply and demand, however it is in the credit market.

2.2. The structure of interest rates

The variety of interest rates that exist in the economy and the structure of interest rates is subject to considerable change due to different factors. Such changes are important to the operation of monetary policy. Interest rates vary because of differences in the time period,

the degree of risk, and the transactions costs associated with different financial instruments. Figure 3 provides an overview of the factors influencing interest rates and
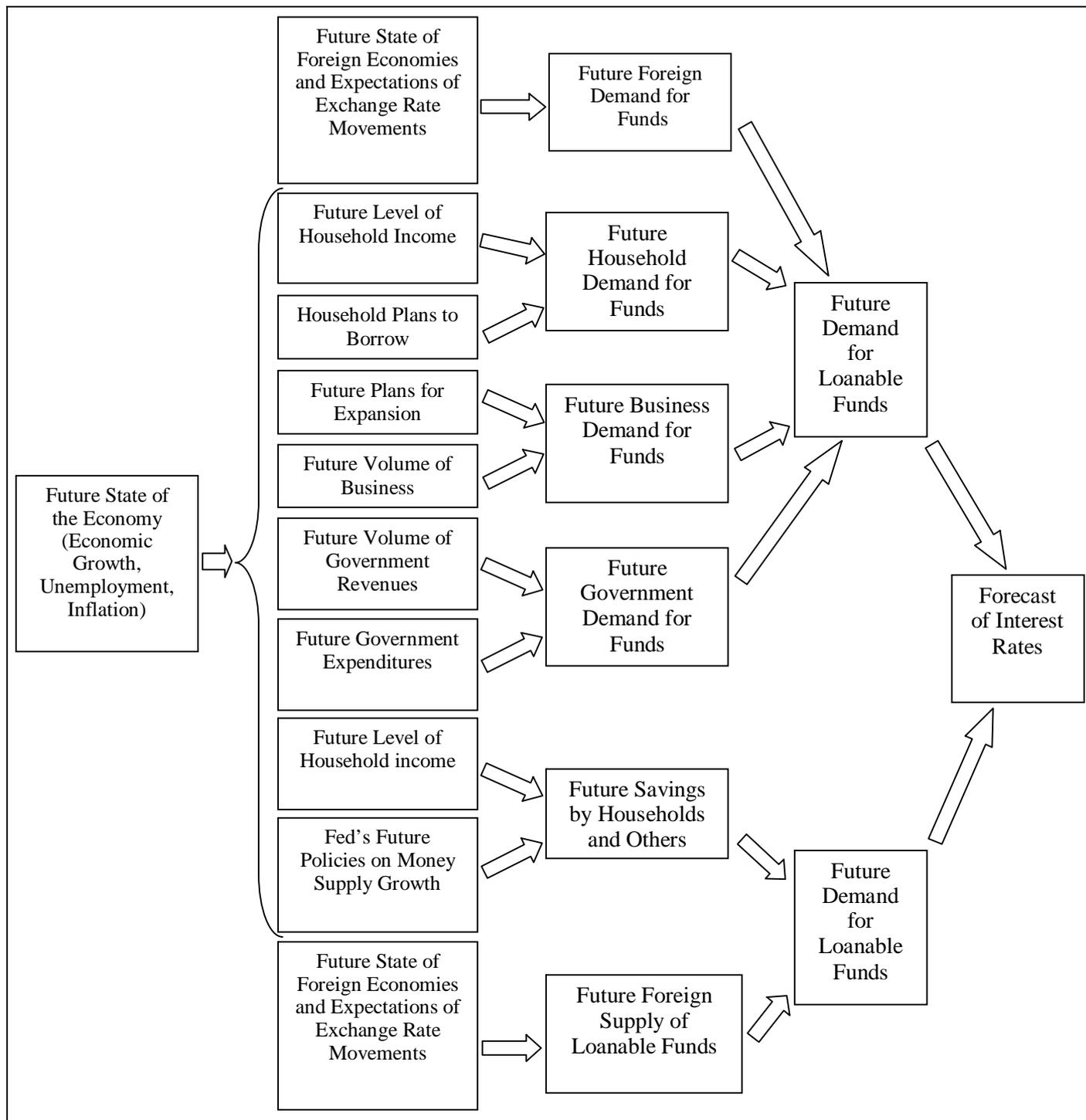
Figure 3. Framework for Forecasting Interest Rates
Source: Madura J. (2008). Financial Institutions and Markets.
thus the general framework for forecasting them.

The greater the risk of default associated with an asset, the higher must be the interest rate paid upon it as compensation for the risk. This explains why some borrowers pay higher rates of interest than others.

The degree of risk associated with a request for a loan may be determined upon a company's size, profitability or past performance; or, it may be determined more formally by credit rating agencies. Borrowers with high credit ratings will be able to have commercial bills accepted by banks, find willing takers for their commercial paper or borrow directly from banks at lower rates of interest. Such borrowers are often referred to as prime borrowers. Those less favored may have to borrow from other sources at higher rates.

The same principle applies to the comparison between interest rates on sound risk-free loans (such as government bonds) and expected yields on equities. The more risky a company is thought to be, the lower will be its share price in relation to its expected average dividend payment – that is, the higher will be its dividend yield and the more expensive it will be for the company to raise equity capital.

2.3. Term structure of interest rates

The relationship between the yields on comparable securities but different maturities is called the **term structure of interest rates**. The primary focus here is the Treasury market. The graphic that depicts the relationship between the yield on Treasury securities with different maturities is known as the **yield curve** and, therefore, the maturity spread is also referred to as the **yield curve spread**.

Concept	**Yield curve:** Shows the relationships between the interest rates payable on bonds with different lengths of time to maturity. That is, it shows the term structure of interest rates.

The focus on the Treasury yield curve functions is due mainly because of its role as a benchmark for setting yields in many other sectors of the debt market. However, a Treasury yield curve based on observed yields on the Treasury market is an unsatisfactory measure of the relation between required yield and maturity. The key reason is that securities with the same maturity may actually provide different yields.

Hence, it is necessary to develop more accurate and reliable estimates of the Treasury yield curve. It is important to estimate the theoretical interest rate that the Treasury would have to pay assuming that the security it issued is a zero-coupon security.

If the term structure is plotted at a given point in time, based on the yield to maturity, or the spot rate, at successive maturities against maturity, one of the three shapes of the yield curve would be observed. The type of yield curve, when the yield increases with maturity, is referred to as an **upward-sloping yield curve** or a **positively sloped yield curve**. A distinction is made for upward sloping yield curves based on the steepness of the yield curve. The steepness of the yield curve is typically measured in terms of the maturity spread between the long-term and short-term yields.

A **downward-sloping** or **inverted yield curve** is the one, where yields in general decline as maturity increases.

A variant of the **flat yield** is the one in which the yield on short-term and long-term Treasuries are similar but the yield on intermediate-term Treasuries are much lower than, for example, the six-month and 30-year yields. Such a yield curve is referred to as a **humped yield curve**.

2.4. Theories of term structure of interest rates

There are several major economic theories that explain the observed shapes of the yield curve:

- **Expectations theory**

- **Liquidity premium theory**

- **Market segmentation theory**

- **Preferred habitat theory**

2.4.1. Expectations theory

The pure expectations theory assumes that investors are indifferent between investing for a long period on the one hand and investing for a shorter period with a view to reinvesting the principal plus interest on the other hand. For example an investor would have no preference between making a 12-month deposit and making a 6-month deposit with a view to reinvesting the proceeds for a further six months so long as the expected interest receipts are the same. This is equivalent to saying that the pure expectations theory assumes that investors treat alternative maturities as perfect substitutes for one another.

The pure expectations theory assumes that investors are risk-neutral. A risk-neutral investor is not concerned about the possibility that interest rate expectations will prove to be incorrect, so long as potential favourable deviations from expectations are as likely as unfavourable ones. Risk is not regarded negatively.

However, most investors are risk-averse, i.e. they are prepared to forgo some investment return in order to achieve greater certainty about return and value of their investments. As a result of risk-aversion, investors may not be indifferent between alternative maturities. Attitudes to risk may generate preferences for either short or long maturities. If such is the case, the term structure of interest rates (the yield curve) would reflect risk premiums.

Question	How a yield curve would shift in response to sudden expectations of rising interest rates according to pure expectations theory?

If an investment is close to maturity, there is little risk of capital loss arising from interest rate changes. A bond with a distant maturity (long duration) would suffer considerable capital loss in the event of a large rise in interest rates. The risk of such losses is known as **capital risk**.

To compensate for the risk that capital loss might be realised on long-term investments, investors may require a risk premium on such investments. A risk premium is an addition to the interest or yield to compensate investors for accepting risk. This results in an upward slope to a yield curve. This tendency towards an upward slope is likely to be reinforced by the preference of many borrowers to borrow for long periods (rather than borrowing for a succession of short periods).

Some investors may prefer long maturity investments because they provide greater certainty of income flows. This uncertainty is **income risk**. If investors have a preference for predictability of interest receipts, they may require a higher rate of interest on short-term investments to compensate for income risk. This would tend to cause the yield curve to be inverted (downward sloping).

The effects on the slope of the yield curve from factors such as capital risk and income risk are in addition to the effect of expectations of future short-term interest rates. If money market participants expect short-term interest rates to rise, the yield curve would tend to be upward sloping. If the effect of capital risk were greater than the effect of income risk, the upward slope would be steeper. If market expectations were that short-term interest rates would fall in the future, the yield curve would tend to be downward sloping. A dominance

of capital-risk aversion over income-risk aversion would render the downward slope less steep (or possibly turn a downward slope into an upward slope).

Panel A: Impact of a Sudden Expectation of Higher Interest Rates

Market for 3-Month (Short term) Risk-free Debt	**Market for 3-Month (Short term) Risk-free Debt**	**Market for 3-Month (Short term) Risk-free Debt**
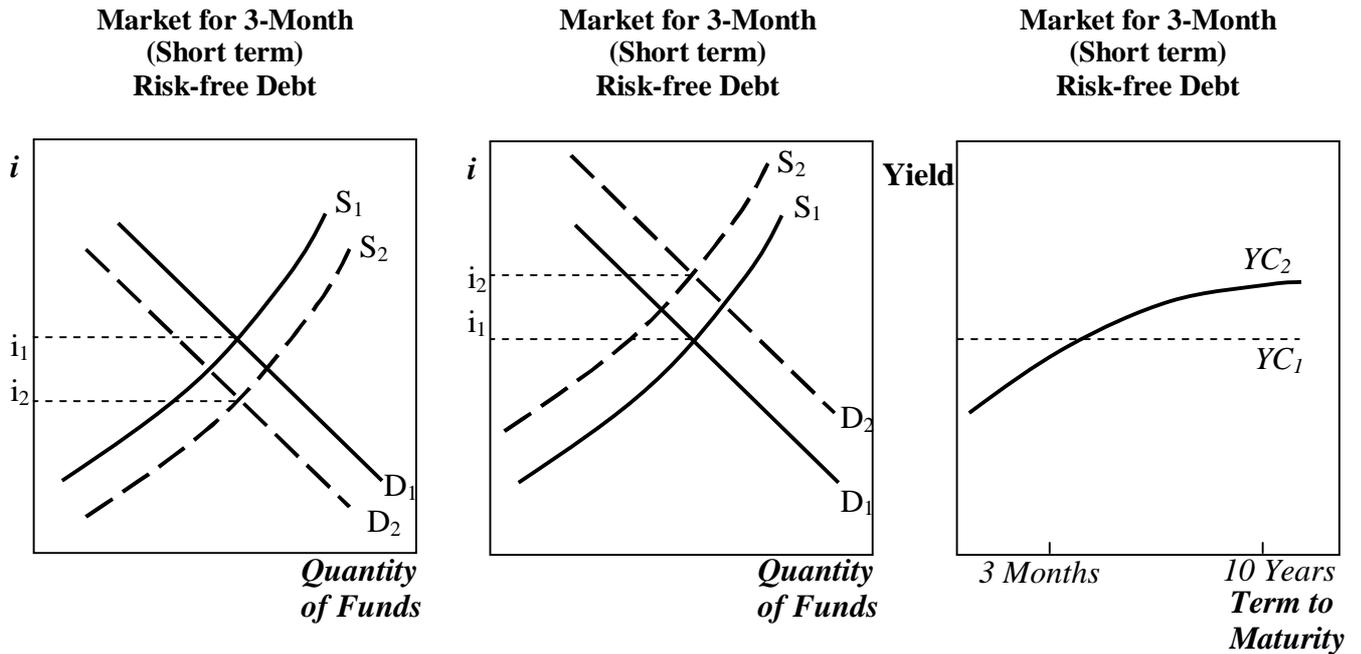
E($\uparrow i$) → Supply of funds provided by investors $\uparrow$ in short-term (such as 3-month) markets, and $\downarrow$ in long-term (such as 10-year) markets. Demand for funds by borrowers $\uparrow$ in long-term markets and $\downarrow$ in short-term markets. Therefore, the yield curve becomes upward sloping as shown here.

Panel B: Impact of a Sudden Expectation of Lower Interest Rates
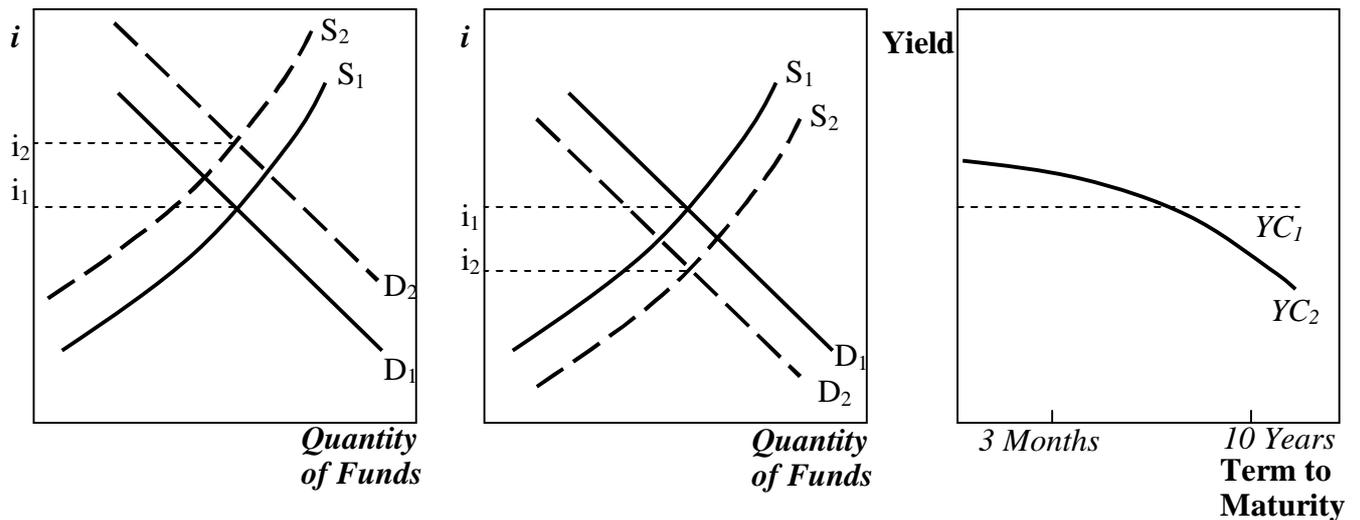
E($\downarrow i$) → Supply of funds provided by investors $\uparrow$ in long-term (such as 10-year) markets, and $\downarrow$ in short-term (such as 3-month) markets. Demand for funds by borrowers $\uparrow$ in short-term markets and $\downarrow$ in long-term markets. Therefore, the yield curve becomes downward sloping as shown here.

Figure 4. How Interest Rate Expectations Affect the Yield Curve

Source: Madura J. (2008). Financial Institutions and Markets

The Figure 4 provides a graphical explanation, how interest rate expectations affect the yield curve.

Question	Why interest rates tend to decrease during recessionary periods?

Question	What is the relationship between yield and liquidity of the securities?

2.4.2. Liquidity premium theory

Some investors may prefer to own shorter rather than longer term securities because a shorter maturity represents greater liquidity. In such case they will be willing to hold long term securities only if compensated with a premium for the lower degree of liquidity. Though long-term securities may be liquidated prior to maturity, their prices are more sensitive to interest rate movements. Short-term securities are usually considered to be more liquid because they are more likely to be converted to cash without a loss in value. Thus there is a liquidity premium for less liquid securities which changes over time. The impact of liquidity premium on interest rates is explained by liquidity premium theory.
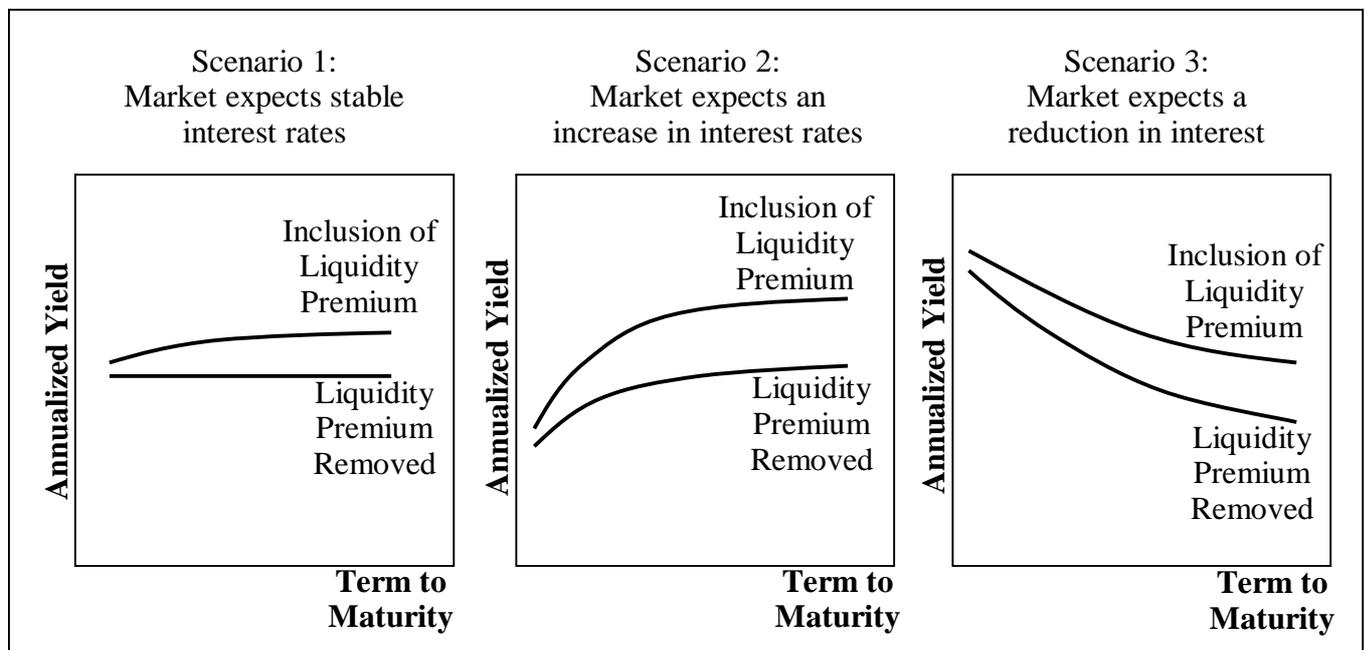
Figure 5. **Impact of liquidity premium on the yield curve under three scenarios**
Source: Madura J. (2008). Financial Institutions and Markets.

Figure 5 provides a graphical explanation of impact of liquidity premium on interest rates and yield curve.

2.4.3. Market segmentation theory

According to the market segmentation theory, interest rates for different maturities are determined independently of one another. The interest rate for short maturities is determined by the supply of and demand for short-term funds. Long-term interest rates are those that equate the sums that investors wish to lend long term with the amounts that borrowers are seeking on a long-term basis.

According to market segmentation theory, investors and borrowers do not consider their short-term investments or borrowings as substitutes for long-term ones. This lack of substitutability keeps interest rates of differing maturities independent of one another. If investors or borrowers considered alternative maturities as substitutes, they may switch between maturities. However, if investors and borrowers switch between maturities in response to interest rate changes, interest rates for different maturities would no longer be independent of each other. An interest rate change for one maturity would affect demand andsupply, and hence interest rates, for other maturities.

2.4.4. The preferred habitat theory

Preferred habitat theory is a variation on the market segmentation theory. The preferred habitat theory allows for some substitutability between maturities. However the preferred habitat theory views that interest premiums are needed to entice investors from their preferred maturities to other maturities.

According to the market segmentation and preferred habitat explanations, government can have a direct impact on the yield curve. Governments borrow by selling bills and bonds of various maturities. If government borrows by selling long-term bonds, it will push up long-term interest rates (by pushing down long-term bond prices) and cause the yield curve to be more upward sloping (or less downward sloping). If the borrowing were at the short maturity end, short-term interest rates would be pushed up.

Question   What factors influence the shape of the yield curve?

2.5. Forward interest rates and yield curve

The expectations that are relevant to investment decisions are expectations relative to market expectations. An active portfolio manager bases investment decisions on attempts to forecast interest rates more accurately than the average participant in the money market. For this reason the manager of an actively managed bond portfolio needs to be able to ascertain the market consensus forecast. Such market expectations can be deduced from forward interest rates.

Forward interest rates are rates for periods commencing at points of time in the future. They are implied by current rates for differing maturities. For example, the current 3-month interest rate and the current 6-month interest rate between them imply a rate for a 3-month period which runs from a point in time three months from the present until a point in time six months hence.

The forward 3-month rate for a period commencing three months from the present is the rate which, when compounded on the current 3-month rate, would yield the same return as the current 6-month rate. For example if the 3-month rate is 9% p.a. and the 6-month rate is 10% p.a., the forward rate is shown as x in equation:

$(1,0225)(1 + x) = 1,05$

The forward rate is calculated as:

$x = (1,05/1.0225) - 1 = 0,0269$

which is 2.69% over three months and hence 10.76% p.a.

The forward rate can be interpreted as the market expectation of the future interest rate under the assumptions that: the expectations theory of the yield curve is correct and there is no risk premium. If the expectations theory is seen as a good model, but there is a risk premium, an adjustment is required to remove the effects of the risk premium before the result can be interpreted as the market forecast of the future interest rate.

Question	What is the meaning of the forward rate in the context of the term structure of interest rates?

The **yield curve** based on zero coupon bonds is known as the **spot yield curve**. It is regarded as more informative than a yield curve that relates redemption yields to maturities of coupon bearing bonds. The redemption date is not the only maturity date.

Example	The one-year interest rate is 6,5% p.a. and the six-month interest rate is 6% p.a. What is the forward six-month interest rate for the period between six months and one year from now? Can this forward interest rate be taken to be the interest rate expected by money market participants?
	Let x be the forward interest rate p.a. (so that the rate for six months is $x/2$).
	$(1,03)(1 + x/2) = 1,065$
	$1 + x/2 = (1,065)/(1,03)$
	$x/2 = [(1,065)/(1,03)] - 1$
	$x = 2\{ [(1,065)/(1,03)] - 1\}$
	Therefore $x = 0,068$, i.e. 6,8% p.a.
	The forward interest rate of 6,8% p.a. can be taken to be the market expectation if the expectations theory of the yield curve is correct and there is no risk premium. If the expectations theory is correct but there is a risk premium, the risk premium must be removed before carrying out the calculation. Suppose that the six-month rate contains no risk premium, but the one-year rate contains a risk premium of 0,1% p.a. The one-year interest rate, net of the risk premium, is 6,4% p.a. The new calculation would be as follows:
	$(1,03)(1 + x/2) = (1,064)$
	$x = 2\{[(1,064)/(1,03)] - 1\}$
	Therefore $x = 0,066$, i.e. 6,6% p.a.

Coupon-bearing bonds may have differing redemption yields, despite having common redemption dates, because of differences in the coupon payments. Yield curves based on coupon-bearing bonds may not provide a single redemption yield corresponding to a redemption (final maturity) date.

The **forward yield curve** relates forward interest rates to the points of time to which they relate. For example, rates of return on five-year bonds and rates on four-year bonds imply rates on one year instruments to be entered into four years from the present. The implied forward rate can be calculated by means of the formula:

$$(1 + {}_4r_1) = (1 + {}_0r_5)^5 / (1 + {}_0r_4)^4$$

where r_5 is the five-year interest rate, r_4 is the four-year interest rate, and ${}_4r_1$ is the one-year rate expected in four years' time.

This formula arises from the relation:

$$(1 + {}_0r_5)^5 = (1 + {}_0r_4)^4 (1 + {}_4r_1)$$

which states that a five-year investment at the five-year interest rate should yield the same final sum as a four-year investment at the four-year rate with the proceeds reinvested for one year at the one-year rate expected to be available four years hence. The value of ${}_4r_1$ would be related to the point in time, of four years, on the yield curve. Carrying out such a calculation for a succession of future periods produces a series of forward interest rates.

When plotted against their respective dates, the series of forward rates produces a forward yield curve. The forward yield curve requires the use of zero coupon bonds for the calculations.

This forms also the basis for calculation of short-term interest rate futures. Short-term interest rate futures, which frequently take the form of three-month interest rate futures, are instruments suitable for the reduction of the risks of interest rate changes. Three-month interest rate futures are notional commitments to borrow or deposit for a three-month period that commences on the futures maturity date. They provide means whereby

borrowers or investors can (at least approximately) predetermine interest rates for future periods.

Example	Assume that the three-month interest rate is 4.5% p.a. and the six-month interest rate is 5% p.a. What is the forward interest rate for the three-month period commencing three months from now? 5% p.a. is 2,5% over six months, and 4,5% p.a. is 1,125% over three months. (1,025)/(1,01125) = 1,013597 1.013597 - 1 = 0.013597, i.e. 1.3597% for three months or 5.44% p.a. (to two decimal places). The forward interest rate is 5,44% p.a.

2.6. Summary

Level of interest rates in an economy is explained by two key economic theories: the loanable funds theory and the liquidity preference theory. The loanable funds theory states that the level of interest rates is determined by the supply of and demand for loanable funds. According to the liquidity preference theory, the level of interest rates is determined by the supply of and demand for money balances.

Interest rates in the economy are determined by the base rate (rate on a Government security) plus a risk premium (or a spread). There are several factors that determine the risk premium for a non- Government security, as compared with the Government security of the same maturity. These are (1) the perceived creditworthiness of the issuer, (2) provisions of securities such as conversion provision, call provision, put provision, (3) interest taxes, and (4) expected liquidity of a security's issue.

The term structure of interest rates shows the relationship between the yield on a bond and its maturity. The yield curve describes the relationship between the yield on bonds of the same credit quality but different maturities in a graphical way. Apart from spot rates, forward rates provide additional information for issuers and investors. The major theories explain the observed shapes of the yield curve are the expectations theory, liquidity premium, market segmentation theory and preferred habit theory.

Key terms

- Interest rates
- Loanable funds
- Spot rate
- Forward rate
- Term structure of interest rates
- Yield curve
- Expectations
- Biased expectations
- Liquidity
- Segmented markets

- Preferred habitat

Further readings

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Relevant websites

- http://www.bloomberg.com

- http://www.federalreserve.gov

- http://www.ft.com

- http://www.ecb.int/stats/money/yc/html/index.en.html

- http://www.treas.gov/offices/domestic-finance/debt-management/interest-rate/yield.shtml

- http://www.newyorkfed.org/research/capital_markets/ycfaq.html

- http://demonstrations.wolfram.com/PriceYieldCurve/

Review questions and problems

- How would you expect an increase in the propensity to save to affect the general level of interest rates in an economy?

6. Explain how an increase in the rate of inflation might affect (a) real interest rates and (b) nominal interest rates.

7. Why are some lenders capital risk averse and others income risk averse? What slope will the yield curve have when the market is dominated by capital risk aversion?

8. Why might interest rates payable on long-term, 'risk-free' government bonds include a term premium?

9. Look at the most recent interest rate change by European Central bank, US FED, Bank of England, Central Bank of Lithuanian, Central Bank of Latvia and Central Bank of Estonia. Compare them. What conclusions can be drawn?

10. What conclusion might you draw about possible future interest rates if a positive term premium were to increase?

11. Why might interest rate movements of various developed countries be more highly correlated in recent years than in earlier years?

12. Consider the prevailing conditions for inflation (including oil prices), the economy, and the budget deficit, the central bank of your country and EU central bank monetary policy that could affect interest rates. Based on the prevailing conditions, do you think interest rates will likely increase during the following half a year? Provide arguments for your answer. Which factor do you think will have the largest impact on interest rates?

13. Assume that a) investors and borrowers expect that the economy will weaken and that inflation will decline; b) investors require a low liquidity premium; c) markets are partially segmented and the Government prefers to borrow in the short-term markets. Explain how each of the three factors would affect the term structure of interest rates, holding all other factors constant. Then explain the overall effect on the term structure.

14. Assume that the yield curves in the US, Germany and Japan are flat. If the yield curve in the US suddenly becomes positively sloped, do you think the yield curves in Germany and Japan would be affected? If yes, how?

15. A company X has funded its operations by bank loans extensively. The interest rate on the loans is tied to the market interest rates and is adjusted every six months. Thus the cost of funds is sensitive to interest rate movements. Because of expectations that EU economy would strengthen during the next year, the company plans further growth through investments. The company expects that it will need substantial long-term financing to finance its growth and plans to borrow additional funds in the debt market.

    a) What can be the company's expectations about the change in interest rates in the future? Why?

    b) How would these expectations affect the company's cost of borrowing on its existing loans and on future debt?

    c) How these expectations would affect the company's decision when to borrow funds and whether to issue floating-rate or fixed rate debt?

16. Assume that the interest rate for one year securities is expected to be 4 percent today, 5 percent one year from now and 7 percent two years from now. Using only the pure expectations theory find what are the current (spot) interest rates on two and three year securities.

17. Assume that the spot (annualized) interest rate on a three year security is 8 percent, while the spot (annualized) interest rate on a two year security is 5 percent. Use only this information to estimate the one year forward rate two years from now.

18. Assume that the spot (annualized) interest rate on a two year security is 7 percent, while the spot (annualized) interest rate on a one year security is 6 percent.

    a) Using only this information estimate the one year forward rate.

    b) Assume that the liquidity premium on a two year security is 0,4 percent. Use this information to re-estimate the one year forward rate

19. Assess the shape of the yield curve using the website http://www.ecb.int/stats/money/yc/html/index.en.html. Based on various theories attempting to explain the shape of the yield curve, provide your explanations of the difference between the 1 year and the 30 year government securities. Which theory according to your opinion is the most reasonable? Why?

20. Consider how quickly other interest rates in the economy changed thereafter. Why does the MPC change interest rates each time it acts by only 1/4 or, at most, 1/2 a per cent?

21. Could the MPC of the Bank of England raise interest rates when everyone was expecting them to fall? Look at the financial press and find the current interest spread between five-year and ten-year government bonds. Is there a positive term premium?

22. What conclusion might you draw about possible future interest rates if a positive term premium were to increase? How is money actually transferred from an account in one country to an account in another?

23. Has the growth of the Euromarkets been, on balance, a positive development for the world economy?

24. How many reasons can you think up for preferring fixed to floating rate loans and vice versa?

25. Find out as much as you can about:

a) the activities of the international credit rating agencies;

b) the role of the international banks in the international debt crisis of the developing countries.

26. What is:

a) EURIBOR?

b) a euroeuro?

c) a swaption?

d) a plain vanilla swap?

27. Look in the financial press and find examples of variations on plain vanilla swaps that re not mentioned in the text.

28. If you swapped a floating rate payment for a fixed rate payment, would you gain or lose if interest rates unexpectedly rose? Why?

3. MONEY MARKETS

Mini contents	• The purpose of money markets
	• Money markets segments and participants
	• Money market instruments
	• Money market rates and yields

3.1. Money market purpose and structure

3.1.1. The role of money markets

The purpose of money markets is facilitate the transfer of short-term funds from agents with excess funds (corporations, financial institutions, individuals, government) to those market participants who lack funds for short-term needs.

They play central role in the country's financial system, by influencing it through the country's monetary authority.

For financial institutions and to some extent to other non-financial companies money markets allow for executing such functions as:

- Fund raising;

- Cash management;

- Risk management;

- Speculation or position financing;

- Signalling;

- Providing access to information on prices.

Money markets are **wholesale markets** with very large amounts of transactions, e.g. with transactions from 500 million Euro to 1 billion Euro or even larger ones. This is the most active financial market in terms of volumes of trading.

From the start of emergence the traditional money markets performed the **role of monetary policy**. In order to influence the supply side, governments have employed methods of direct regulation and control of the savings and investment behaviour of individuals and companies. However due to fast technological advances, internationalization and liberalization of financial markets, possibilities to carry out policy objectives through such measures have diminished. Current policy through market-oriented measures is aimed primarily at demand side. Thus money markets serve the interface between execution of monetary policy and the national economies

Another role of domestic money markets is to serve public policy objectives, i.e. financing public sector deficits and managing the accumulated government deficits. Government public debt policy is an important determinant of the money markets operations, since government debt typically forms a key part of the country's money markets (as well as debt markets). The scope and measures of monetary policy are also linked to the government's budget and fiscal policies. Thus the country's money market

shifts are dependant upon the goals of national public policy and tools used to reach these goals.

Changes in the role and structure of money markets were also influenced by financial deregulation, which evolved as a result of recognition that excessive controls are not compatible with efficient resource allocation, with solid and balanced growth of economies. Money markets went through passive adaptation as well as through active influence from the side of governments and monetary authorities.

Finally, money markets were influenced by such international dimensions as increasing capital mobility, changing exchange rate arrangements, diminishing monetary policy autonomy. The shifts in European domestic money markets were made by the European integration process, emergence and development of European monetary union.

3.1.2. Money market segments

In a broad sense, **money market** consists of the market for short-term funds, usually with maturity up to one year. It can be divided into several major segments:

Interbank market, where banks and non-deposit financial institutions settle contracts with each other and with central bank, involving temporary liquidity surpluses and deficits.

Primary market, which is absorbing the issues and enabling borrowers to raise new funds.

Secondary market for different short-term securities, which redistributes the ownership, ensures liquidity, and as a result, increases the supply of lending and reduces its price.

Derivatives market – market for financial contracts whose values are derived from the underlying money market instruments.

Interbank market is defined mainly in terms of participants, while other markets are defined in terms of instruments issued and traded. Therefore there is a considerable overlap between these segments. Interbank market is referred mainly as the market for very short deposits and loans, e.g. overnight or up to two weeks. Nearly all types of money market instruments can be traded in interbank market.

Key money market segments by instruments are provided in Figure 6
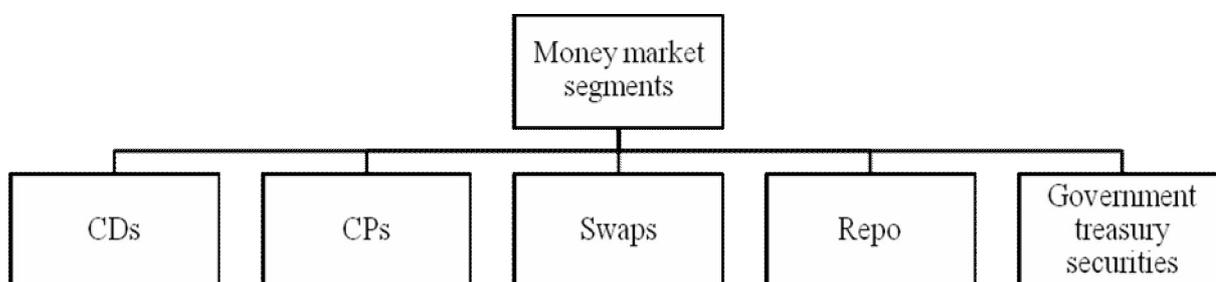
Figure 6. Key money market instruments

The **money-market instruments** are often grouped in the following way:

- Treasury bills and other short-term government securities (up to one year);

- Interbank loans, deposits and other bank liabilities;

- Repurchase agreements and similar collateralized short-term loans;

- Commercial papers, issued by non-deposit entities (non-finance companies, finance companies, local government, etc. ;

- Certificates of deposit;

- Eurocurrency instruments;

- Interest rate and currency derivative instruments.

All these instruments have slightly different characteristics, fulfilling the demand of investors and borrowers for diversification in terms of risk, rate of return, maturity and liquidity, and also diversification in terms of sources of financing and means of payment. Many investors regard individual money market instruments as close substitutes, thus changes in all money market interest rates are highly correlated.

Major **characteristics of money market instruments** are:

- short-term nature;

- low risk;

- high liquidity (in general);

- close to money.

Money markets consist of **tradable instruments** as well as **non-tradable instruments**. Traditional money markets instruments, which included mostly dealing of market participants with central bank, have decreased their importance during the recent period, followed by an increasing trend to finance short-term needs by issuing new types of securities such as REPOs, commercial papers or certificates of deposit. The arguments behind the trend are the following:

1. An observed steady shift to off-balance sheet instruments, as a reaction to introduction of capital risk management rules for internationally operating banks in the recommendations of Basel II Accord and EU Directives on banking.

2. Advantages provided to high-rated market participants, allowing to diversify borrowing sources, to cut the costs, to reduce the borrowers' dependence on banking sector lending and its limitations.

In terms of risk two specific **money-market segments** are:

- unsecured debt instruments markets (e.g. deposits with various maturities, ranging from overnight to one year);

- secured debt instruments markets (e.g. REPOs) with maturities also ranging from overnight to one year.

Differences in amount of risk are characteristic to the secured and the unsecured segments of the money markets. Credit risk is minimized by limiting access to high-quality counter-parties. When providing unsecured interbank deposits, a bank transfers funds to another bank for a specified period of time during which it assumes full counterparty credit risk. In the secured REPO markets, this counterparty credit risk is mitigated as the bank that provides liquidity receives collateral (e.g., bonds) in return.

Money markets structures differ across the countries, depending upon regulatory and legislative frameworks, factors that have supported or limited the development of such

national markets. The influence of business culture and traditions, industrial structures have played an important role also.

Economic significance of money markets is predetermined by its size, level of development of infrastructure, efficiency. Growth of government securities issues, their costs considerations, favourable taxation policies have become additional factors boosting some of the country's money markets.

3.1.3. Money market participants

Money market participants include mainly credit institutions and other financial intermediaries, governments, as well as individuals (households).

Ultimate lenders in the money markets are households and companies with a financial surplus which they want to lend, while *ultimate borrowers* are companies and government with a financial deficit which need to borrow. Ultimate lenders and borrowers usually do not participate directly in the markets. As a rule they deal through an intermediary, who performs functions of broker, dealer or investment banker.

Important role is played by *government*, which issue money market securities and use the proceeds to finance state budget deficits. The government debt is often refinanced by issuing new securities to pay off old debt, which matures. Thus it manages to finance long-term needs through money market securities with short-term maturities.

Central bank employs money markets to execute monetary policy. Through monetary intervention means and by fixing the terms at which banks are provided with money, central banks ensure economy's supply with liquidity.

Credit institutions (i.e., banks) account for the largest share of the money market. They issue money market securities to finance loans to households and corporations, thus supporting household purchases and investments of corporations. Besides, these institutions rely on the money market for the management of their short-term liquidity positions and for the fulfilment of their minimum reserve requirements.

Other important market participants are other financial intermediaries, such as *money market funds*, *investment funds* other than money-market funds, *insurance companies* and *pension funds*.

Large *non-financial corporations* issue money market securities and use the proceeds to support their current operations or to expand their activities through investments.

In general issuance of money market securities allow market participants to increase their expenditures and finance economic growth.

Money market securities are purchased mainly by corporations, financial intermediaries and government that have funds available for a short-term period. . Individuals (or households) play a limited role in the market by investing indirectly through money market funds. Apart from transactions with the central bank, money-market participants trade with each other to take positions dependant upon their short-term interest rate expectations, to finance their securities trading portfolios (bonds, shares, etc.), to hedge their longer-term positions with short-term contracts, and to reduce individual liquidity imbalances

3.2. Money market instruments

3.2.1. Treasury bills and other government securities

Treasury bills are short-term money market instruments issued by government and backed by it. Therefore market participant view these government securities as having little or even no risk. The interest rates on Treasury securities serve as benchmark default-free interest rates. A typical life to maturity of the securities is from four weeks to 12 months. As they do not have a specified coupon, they are in effect zero-coupon instruments and are issued at a discount to their par or nominal value, at which price they are redeemed. Any new issue with the same maturity date as an existing issue is regarded as a new tranche of the existing security.

Question	What are key characteristics of Treasury bills?

Treasury bills are typically issued at only certain maturities dependant upon the government budget deficit financing requirements. Budget deficits create a challenge for the government. Large volumes of Treasury securities have to be sold each year to cover annual deficit, as well as the maturing Treasury securities, that were issued in the past. The mix of Treasury offerings determines the maturity structure of the government's debt.

Primary market. The securities are issued via a regularly scheduled **auction** process. Upon the Treasury's announcement of the size of upcoming auction, tenders or sealed bids are being solicited.

Concept	**A tender** is a sealed bid.

Bidders are submitting two types of bids: competitive and non-competitive. A **competitive bidder** specifies both the amount of the security that the bidder wants to buy, as well as the price that the bidder wants to pay. The price is set in terms of yield. The price of the securities in the auction is set based on the prices offered in competitive bids, taking the average of all accepted competitive prices. Not all competitive bids that are tendered are accepted. Typically the longer the maturity, the greater would be the percentage of accepted bids. The percentage of accepted bids is determined by the size of the issue as compared to the amount of bids tendered. Competitive bidders are the largest financial institutions that generally purchase largest amounts of Treasury securities. In general 80-90% Treasury securities are sold to them.

A **non- competitive bidder** specifies only the amount of the security that the bidder wants to buy, without providing the price, and automatically pay the defined price. Non-competitive bidders are retail customers, who purchase low volumes of the issues, and are not enough sophisticated to submit a bid price. Limits on each non-competitive bid can be set. Direct purchases of Treasury securities by individuals are limited in many countries. In such cases they use the services of dealers.

The Figure 7 illustrates the results of sealed bid (tender) auction. The Treasury will accept the competitive bids with the highest price and lowest interest rates, and will reject other bids.

Depending upon the existing regulation in a specific country treasury security auctions can be organized and held at the central bank or stock exchanges.

There are two **auction forms:**

- *Uniform price auction*, when all bidders pay the same price;

- *Discriminatory price auction*, in which each bidder pays the bid price.

Price

Supply curve

Accepted bids

Rejected bids

Price of lowest accepted bid

Demand curve

Amount of bonds
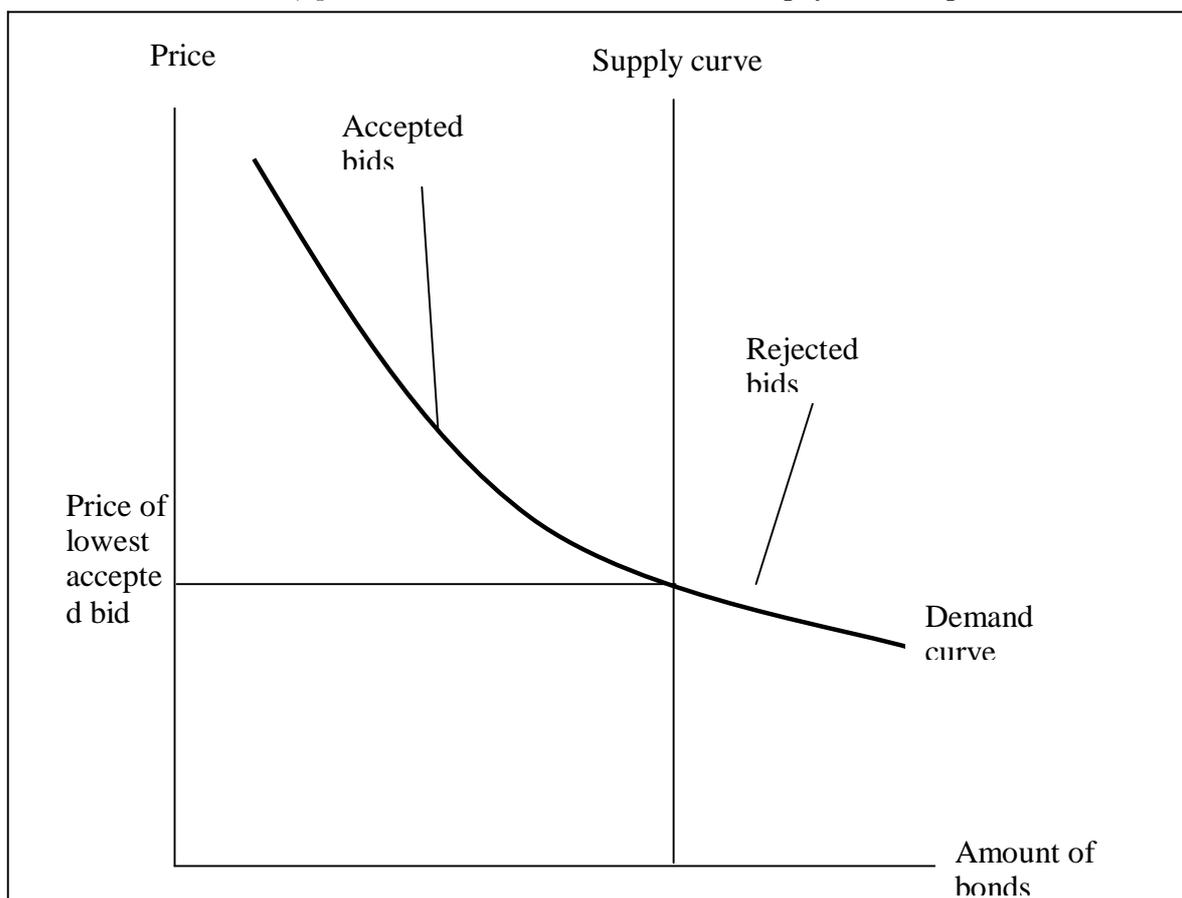
Figure 7. Prices in a sealed-bid auction

The procedure of the *discriminatory price auction* one is more sophisticated. At first, all the non-competitive bids are totaled, and their sum is subtracted from the total issue amount. This way all non-competitive bids are fulfilled. The price, which non-competitive bidders are going to pay, is determined taking into account the results of the competitive part of the auction.

| **Concept** | **Uniform price auction** is an auction, when all bidders pay the same price. |

| **Concept** | **Discriminatory price auction** is an auction, in which each bidder pays the bid price. |

Further on, all competitive tenders are ranked in order of the bid yield. In order to minimize the governments borrowing costs, the lowest competitive bid is accepted first. As a result, the highest bid prices are accepted until the issue is sold out fully. The lowest rejected bid yield (or the highest accepted bid yield) is called **stop yield**. The corresponding price is called the **stop-out price**.

During such a Treasury auction, each competitive bidder pays the price for the securities, which is determined by the yield that was bid. The **average yield** is the average of all accepted competitive bids, weighted by the amounts allocated at each yield. All non-competitive bidders pay the average yield.

The discriminatory auction is characterized by

- *a tail* – the difference between the stop yield and the average yield;

- *a cover* – the ratio between the total amount competitive and non-competitive bids tendered and the total issue (i.e. the total amount of accepted bids). .

A large cover indicates active market participation in an auction. Average cover can be evaluated in terms of a difference between maximum and minimum accepted bid yields (in basis points) A small tail shows that most competitive bidders provide similar evaluation of Treasury security issue, and thus pay nearly the same price for it. The larger the cover and the smaller the tail, the more efficient is the Treasury auction.

Concept	**Basis point** is a very fine measure of interest rates, equal to one hundredth of one percentage point.

In a discriminatory price auction the bidder's price is determined by his own tender. A low bid, i.e. low yield and high offered price, increases the bidder's chance of his bid to be accepted. However, this can lead to the possibility of the **winner's curse**. In such a case the low bidder's tender is accepted, but he pays a price that is higher than of others lower priced (or higher yield) bids. Therefore competitive bidders may be reluctant to submit low bids, because this will oblige them to pay high prices for newly issued securities. This is a problem of discriminatory price auction.

Concept	**Winner's curse** is the case, when the low bidder wins acceptance of the tender, but pays a price, which is higher than that of other lower bidders.

A uniform price auction (or a Dutch auction) does not have a problem of this kind. All the procedures of the auction except for the last one are the same as in the discriminatory price auction. Each accepted bid pays the price of the lowest accepted bid.

As a result, uniform price auction becomes more expensive to the Treasury and it receives lower revenue. Besides, the average bidder may bid a higher price, shifting demand curve to right with the possibility offsetting the negative effect to the Treasury (see Figure 8).
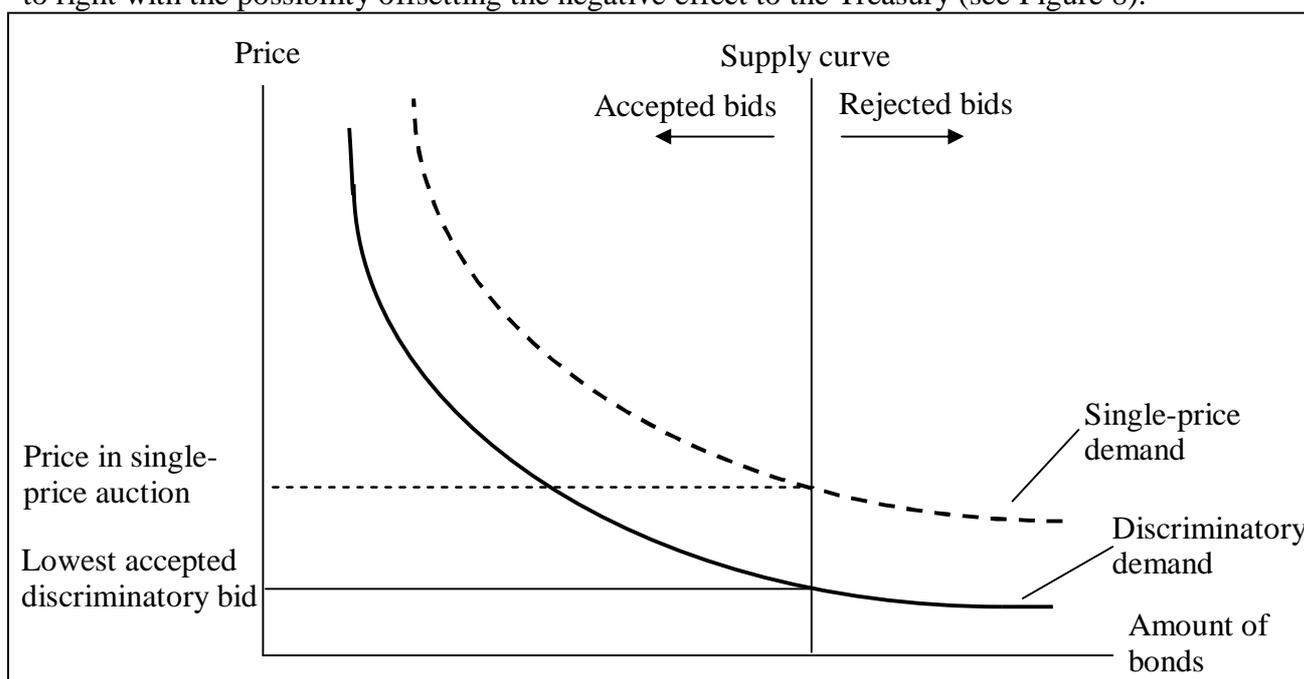
Figure 8. Impact of single-price auction upon demand curve

Uniform price auction is considered fairer because all competitive bidders pay the same price. This may encourage greater participation in the auction, and finally increase the auction's cover indicator. Competitive bidders are not afraid to submit too low bids, because they will not be paying the price they bid. Conversely, the lower they will bid, the higher likelihood is that their bid will be accepted. As a result, bidders tend to reduce their bids, thereby lowering the average yield on the entire issue. Such changes in bidder behaviour may offset the direct effect of higher issuer's interest costs in the uniform price auction.

While evaluating the effectiveness of the Treasury auction method, there is a concern, that competitive as well as non-competitive bidders can be neglected, while few large financial institutions may be favoured. This can cause decline in auction participation, undermining the Treasury's abilities to place large amounts of securities. On the other hand, since bidders do not pay their tendered prices, the uniform price auction may be more subject to manipulation or collusion by informed bidders.

| **Question** | What is the role of competitive and non-competitive bidders in the Treasury securities auction? |

Secondary market. Typically the Treasury securities have an active and liquid secondary market. The most actively traded issues, which are usually the ones sold through an auction most recently, are called **on-the-run issues**. They have narrower bid-ask spreads than older, off-the-run issues. The role of brokers and dealers is performed by financial institutions. As a rule, competitive bidders can submit more than one bid to each auction, with different prices and quantities on each tender. However, in well developed markets limitations are being placed to the amount of securities in each auction allocated to a particular single bidder. The aim of such a rule is to prevent market from influence of a single bidder, and thus squeezing other financial institutions with their own customers.

| **Question** | What is the role of competitive and non-competitive bidders in the Treasury securities auction? |

The text then can follow (starting with the style of the first paragraph). Then, we can have some readings or an example. It can be but in the same format as the Concept/Check Question.

Price of a Treasury bill is the price that an investor will pay for a particular maturity Treasury security, depending upon the investor's required return on it. The price is determined as the present value of the future cash flows to be received. Since the Treasury bill does not generate interest payments, the value of it is the present value of par value. Therefore, since the Treasury bill does not pay interest, investors will pay a price for a one-year security that will ensure that the amount they receive one year later will generate the desired return.

Example	Assume investor requires a 5 percent annualized return on a one-year Treasury bill with a 100000Euro par value. He will be willing to pay the price
	P = 100000 Euro / 1,05 = 95238 Euro
	If investor requires a return higher than 5 percent, he will discount the par value at a higher return rate. This will result in a lower price to be paid today.

In case the maturity of Treasury bill is shorter than one year, then the annualized return will be reduced by the fraction of the year, during which the investment is made. The simplified calculations are provided in the example below.

Example	Assume investor requires a 5 percent annualized return on a 6 month Treasury bill with a 100000 Euro par value. The price of the security will be
	$P = 100000$ Euro $/ (1 + 0,05 / 2) =$
	$= 100000$ Euro $/ (1 + 0,025) = 97560,9$ Euro
	If investor requires a return higher than 5 percent, he will discount the par value at a higher return rate. This will result in a lower price to be paid today.

The price of the Treasury bill calculated on discount rate basis is:

$$P = PAR \ x \ (1 - (d \ x \ n / 360))$$

where d is the yield or rate of discount, PAR is par or maturity value and n is the number of days of the investment (holding period).

Example	Assume investor requires an 8 percent annualized return on a 91-day Treasury bill with a 100000 Euro par value. The price of the security will be
	$P = 100000$ Euro $x (1 – (0,08 \ x \ 91 / 360) =$
	$= 100000$ Euro $x (1 – 0,02) = 98000$ Euro
	If investor requires a return higher than 5 percent, he will discount the par value at a higher return rate. This will result in a lower price to be paid today.

Yield of a Treasury bill is determined taking into account the difference between the selling price and the purchase price. Since Treasury bills do not offer coupon payments, the yield the investor will receive if he purchases the security and holds it until maturity will be equal to the return based on difference between par value and the purchase price. The annualized yield on Treasury bill is calculated in the following way:

$$y = (PAR - P) / P \ x \ (365/n)$$

where d is the yield, PAR – par value, P - purchase price of the Treasury bill and n is the number of days of the investment (holding period).

Example	Assume investor requires pays 98000 Euro for a 91-day Treasury bill with a 100000 Euro par value. The annualized yield of the security will be
	$y = (100000 – 98000) / 98000) \ x \ (365 / 91) =$
	$= 0,02 \ x \ 4,01 = 0,0802$ or $8,02 \%$.

If the Treasury bill is sold prior to maturity, the return is calculated on the basis of difference between the price for which the bill was sold in the secondary market and the purchase price.

The annualized yield on Treasury bill is calculated in the following way:

$$y = (SP - P) / P \ x \ (365/n)$$

where d is the yield, SP – selling price, P - purchase price of the Treasury bill and n is the number of days of the investment (holding period).

In some countries (e.g. US) Treasury bills are quoted on a discount rate (or referred to as Treasury bill rate) basis. The Treasury bill discount rate represents the percent discount of the purchase price from par value of a new issue of a Treasury bill. It is determined in the following way:

d = (PAR - P) / PAR x (360/n)

where d is the yield, PAR – par value, P - purchase price of the Treasury bill and n is the number of days of the investment (holding period).

In such a case the year is assumed having 360 days, and the number of days of the investment can be actual or an assumed convention. If a newly issued Treasury bill is held until maturity, then its yield is always greater than rate of discount. The difference is due to price or value used in denominator, since purchase price is always lower than par value. Besides, the yield is always calculated on 365 day during a year basis.

3.2.2. The interbank market loans

Interbank market is a market through which banks lend to each other.

Commercial banks are required to keep reserves on deposits within central bank. Banks with reserves in excess of required reserves can lend these funds to other banks. Traditionally this formed the basis of the interbank market operations. However, currently these operations involve lending any funds in reserve accounts at a central bank.

Concept	**Interbank market** is a market which involves bank borrowing and lending of any funds in reserve accounts at the central bank.

In US the interbank market is the **federal funds** market, which involves the borrowing and lending any funds in reserve accounts at the Federal Reserve Bank (FED).

The major **characteristics** of the interbank markets are:

- The transfer of immediately available funds;
- Short time horizons;
- Unsecured transfers.

Individual banks have a possibility to invest (lend) surplus funds and have a source of borrowing when their reserves are low, thus they manage their reserve position and fund their assets portfolio by trading at the interbank market. This is a wholesale market with deals usually in large denominations. It is used by all types of banks, involved in loans for very short periods, from overnight to fourteen days mostly. Then bank borrows in the interbank market, it is said to be a funds buyer. When bank lends immediately available reserve accounts, it is said to be a seller. Most banks simultaneously buy and sell funds all the time. By acting as dealers they make markets for funds by announcing willingness to buy or to sell at the current competitive interbank rate.

The interbank interest rates and interest rates in the traditional market are interconnected. If banks are short of liquidity they will lend less to both markets and will cause interest rates to rise. When Central bank provides funds to the discount market, less attractive terms are offered by banks. Thus they may choose other markets to invest and will cause the drop in interest rates.

Interbank rates are generally slightly higher and more volatile than interest rates in the traditional market. In periods of great shortage of liquidity, the needs of banks which do not have sufficient funds to meet the central bank requirements drive up the overnight rates significantly.

To keep up the speed of the transfer and the costs of transfer down, the interbank market transfers are unsecured, i.e. not backed by any collateral and have no protection against default by the borrowing bank.

Credit risk in the interbank market is controlled through the interbank rate, which is truly competitive, quoted market rate. It is determined entirely by the supply and demand of banks for funds. Since the market is a closed interbank system, the aggregate value of all buy orders (demand for funds) should be equal to the aggregate value of all sell orders (supply of funds). If the demand for fund purchases increases, it drives up the interbank interest rate.

Question	How is interbank interest rate determined?

Participants in the interbank market typically undertake two **types of transactions**:

- reserve management transactions;
- portfolio management transactions.

Bank reserve management transactions allow complying with contemporaneous bank reserve requirements.

Through portfolio management transactions banks use interbank market to finance their assets' portfolio. These are encouraged by the interbank market liquidity and flexibility. With time horizons as short as overnight, the transactions can be made rapidly at low transaction costs.

Unlike other instruments 'traded' in the money markets, interbank deposits are not negotiable i.e. do not have a secondary market. A lending bank which wishes to retrieve its funds simply withdraws the deposit from the bank to which it was lent. Thus, In this case, the distinction between primary and secondary markets is irrelevant.

Question	How has the interbank interest rate volatility changed over the recent years? What is the major cause of this change?

3.2.3. Commercial papers

Commercial paper (CP) is a short-term debt instrument issued only by large, well known, creditworthy companies and is typically unsecured. The aim of its issuance is to provide liquidity or finance company's investments, e.g. in inventory and accounts receivable.

The **major issuers** of commercial papers are financial institutions, such as finance companies, bank holding companies, insurance companies. Financial companies tend to use CPs as a regular source of finance. Non-financial companies tend to issue CPs on an irregular basis to meet special financing needs.

Thus commercial paper is a form of short-term borrowing. Its initial maturity is usually between seven and forty-five days. In US, the advantage of issuing CPs with maturities less than nine months is that they do not have to register with the Securities Exchange

Commission (SEC) as a public offering. This reduces the costs of registration with SEC and avoids delays related to the registration process.

CPs can be sold directly by the issuer, or may be sold to dealers who charge a placement fee (e.g. 1/8 percent). Since issues of CPs are heterogeneous in terms of issuers, amounts, maturity dates, there is no active secondary market for commercial papers. However, dealers may repurchase CPs for a fee.

Question	What is the role of financial institutions in the commercial paper market?

The price of CP is calculated in the following way:

$P = PAR \times (1 - (d \times n / 360))$

where d is the yield or rate of discount, PAR is par or maturity value and n is the number of days of the investment (holding period).

CP is sold at a discount to its maturity value, thus it is the other money market instrument whose return is expressed on a discount basis.

Example	A 30 day CP with 10 million Euro par value yields 4,75%. The price of this CP currently offering is equal to
	$P = 10,0$ million Euro $\times (1 - (0,0475 \times 30 / 360)) =$
	$= 10,0$ million Euro $\times (1 - 0,003) = 9,97$ million Euro

The yield on CP is calculated in the following way:

$d = (PAR - P) / PAR \times (360/n)$

where d is the yield or rate of discount, PAR – par value, P - initial price of the CP and n is the number of days of the investment (holding period).

Example	Investor has purchased a 30 day CP with a par value of 1 million Euro for a price of 990 000 Euro. What is the yield of this CP investment?
	$d = (1$ mil Euro $- 990\ 000$ Euro$) / 1$ mil Euro $\times (360/30) =$
	$= 0,01 \times 12 = 0,12$ or 12 %.

Commercial paper is normally **unsecured** against any specific assets and firms wishing to use the commercial paper market will usually seek a credit rating from one or other of the credit rating agencies. A high rating will mean that such paper can be issued at a smaller discount, often amounting to the equivalent of 1 per cent. Although commercial paper is unsecured, typically it is backed by a line of credit at a commercial bank.

As a source of finance, commercial paper serves a similar purpose to commercial bills (and is priced in the same way). Thus, in countries with a highly developed discount, or bills, market, the market for commercial paper is relatively small (e.g. UK). However, when the commercial bill market is less developed, the commercial paper market is very large (e.g. France and US). The main difference between commercial papers and commercial bills lies in the manner of their creation. A firm borrows via a commercial bill when it agrees to 'accept' a bill which is 'drawn' by a creditor. The bill originates with the lender. A firm borrows via commercial paper when it issues the paper itself.

Question	What are the substitutes for commercial paper?

3.2.4. Certificates of deposit

Certificate of deposit (CD) states that a deposit has been made with a bank for a fixed period of time, at the end of which it will be repaid with interest.

Thus it is, in effect, a receipt for a time deposit and explains why CDs appear in definitions of the money supply such as M4. It is not the certificate as such that is included, but the underlying deposit, which is a time deposit like other time deposits.

An institution is said to 'issue' a CD when it accepts a deposit and to 'hold' a CD when it itself makes a deposit or buys a certificate in the secondary market. From an institution's point of view, therefore, issued CDs are liabilities; held CDs are assets.

The **advantage to the depositor** is that the certificate can be tradable. Thus though the deposit is made for a fixed period, he depositor can use funds earlier by selling the certificate to a third party at a price which will reflect the period to maturity and the current level of interest rates.

The **advantage to the bank** is that it has the use of a deposit for a fixed period but, because of the flexibility given to the lender, at a slightly lower price than it would have had to pay for a normal time deposit.

The minimum denomination can be 100 000USD, although the issue can be as large as 1 million USD. The maturities of CDs usually range from two weeks to one year.

Non-financial corporations usually purchase negotiable CDs. Though negotiable CD denominations are typically too large for individual investors, they are sometimes purchased by money market funds that have pooled individual investors' funds. Thus money market funds allow individuals to be indirect investors in negotiable CDs. This way the negotiable CD market can be more active. There is also a secondary market for these securities, however its liquidity is very low.

Concept	**Negotiable certificates of deposit** are certificates that are issued by large commercial banks and other depository institutions as a short-term source of funds.

The negotiable CDs must be priced offering a premium above government securities (e.g. Treasury bills) to compensate for less liquidity and safety. The premiums are generally higher during the recessionary periods. The premiums reflect also the money market participants' understanding about the safety of the financial system.

Question	What factors lead to rise / decline in certificates of deposit market?

Negotiable CDs are priced on a **yield** basis. Institution issue negotiable CDs at a par value.

Thus the yield of the security is calculated:

$$y = (PAR - P)/ P \times (360 / n)$$

Example	A three-month CD for 100 000 Euro at 6 per cent matures in 73 days. It is currently trading at 99 000 Euro. Rate of return of this CD current offering is
	$y = (100\,000 - 99\,000)/ 99\,000 \times (360 / 73) =$
	$= 0,01 \times 4,93 = 0,0493$ or 4,93%

The market price of the CD is found by discounting the par or maturity value by the rate of interest currently available on similar assets, adjusted for the residual maturity.

The **price** of CDs is determined using the following equation:

$$P = PAR / (1 - (i \times n / 360))$$

Question	Find the price of a three-month 150,000 Euro CD, paying 4 per cent, if it has 36 days to maturity and short-term interest rates are 4 per cent.
	What will be the price of this same CD if short-term interest rates fall to 2 percent?

The annualized yield they pay is the annualized interest rate on negotiable CDs. If investors purchase and holds negotiable CDs until maturity, their annualized yield is the interest rate. However, if investors purchase or negotiable CDs in the secondary market instead of holding them from issuance to maturity, then annualized yield can differ from the annualized interest rate.

$$y = (\text{Selling Price} - \text{Purchase Price} + \text{Interest}) / \text{Purchase Price}$$

Example	An investor purchased a negotiable CD a year ago in a secondary market. He redeems it today upon maturity and receives 1 million Euro. He also receives 40000 Euro of interest. What is investor's annualized yield on this investment?

The interest rate paid on CDs is often linked to interbank rate. If LIBOR is 4,75 per cent, for example, the CD described above might be paying 5 percent because it is quoted as paying LIBOR plus 25 basis points.

Certificates of deposit are an alternative of short-term, wholesale lending and borrowing. Three- and six-month maturities are common. Some CDs are issued for one year and even for two years but the market for these is comparatively thin. This has led to the practice of banks issuing 'roll-over' CDs, i.e. six-month CDs with a guarantee of further renewal on specified terms. CDs are issued by a wide variety of banks. It is quite common for a bank both to have issued and to hold CDs, though normally of differing maturities. It will issue CDs with a maturity expected to coincide with a liquidity surplus and hold CDs expected to mature at a time of shortage.

3.2.5. Repurchase agreements

A **repurchase agreement (REPO)** is an agreement to buy any securities from a seller with the agreement that they will be repurchased at some specified date and price in the future.

Concept	**Repurchase agreement (REPO)** is a fully collateralize loan in wich the collateral consists of marketable securities.

In essence the REPO transaction represents a loan backed by securities. If the borrower defaults on the loan, the lender has a claim on the securities. Most REPO transactions use government securities, though some can involve such short-term securities as commercial papers and negotiable Certificates of Deposit.

Since the length of any repurchase agreement is short-term, a matter of months at most, it is usually assumed as a form of short-term finance and therefore, logically, an alternative to other money market transactions.

Concept	**Open REPO** is a REPO agreement with no set maturity date, but renewed each day upon agreement of both counterparties.

Concept	**Term REPO** is a REPO with a maturity of more than one day.

A **reverse REPO** transaction is a purchase of securities by one party from another with the agreement to sell them. Thus a REPO and a reverse REPO can refer to the same transaction but from different perspectives and is used to borrow securities and to lend cash.

The participants of REPO transactions are banks, money market funds, non-financial institutions. The transactions can amount 10 million in USD terms with the maturity from one to 15 days and for one, three, six months. There is no secondary market for REPOs

Since the effect of the REPO transactions influence money market prices and yields, it is normal to regard such REPOs as money market deals. In a REPO, the seller is the equivalent of the borrower and the buyer is the lender. The repurchase price is higher than the initial sale price, and the difference in price constitutes the return to the lender.

The amount of REPO loan is determined in the following way:

REPO principal = Securities market value x (1 – Haircut)

Securities market value = PAR x (1 – (d x n / 360))

where the securities market value is determined as the current market value of these securities, d is the rate of discount of the securities, n is term of the securities, PAR is the par value of the securities.

In the REPO transaction securities market value is equal to the value of collateral, against which the borrowing takes place. Since the value of the securities may be fluctuating during the term of , the amount of the loan (the principal) is less than the current market value of the securities.

The deduction from current market value of the securities collateral required to do the REPO transaction is made, which is call a **haircut** or a **margin**. The haircut is a margin stated in terms of basis points. A standard haircut can be, e.g. 25 basis points (or 0,0025%). Thus a REPO loan is overcollateralized loan meaning that the amount of the collateral exceeds the loan principal and the haircut.

Repurchase of the securities is made by repaying REPO loan and interest:

REPO principal + Interest = REPO principal (1 + (y x t / 360))

where y is the yield or rate of the REPO transaction, t is the term of the REPO transaction.

REPO principal = Securities market value x (1 – Haircut)

Securities market value is defined as present value of the par value of the securities involved in the transaction.

Concept	**Haircut** – the function of a broker/ dealer's securities portfolio, that cannot be traded, but instead must be held as capital to act as a cushion against loss.

The haircut or margin offers some protection to the lender in case the borrower goes bankrupt or defaults for some other reason. The size of the risk, and thus this haircut / margin, depends in large part upon the status of the borrower, but it also depends upon the precise nature of the contract. Some REPO deals are genuine sales. In these circumstances, the lender owns the securities and can sell them in the case of default. In some REPO contracts, however, what is created is more strictly a collateralized loan with securities acting as collateral while remaining in the legal ownership of the borrower. In the case of default, the lender has only a general claim on the lender and so the haircut / margin is likely to be greater.

Example	Consider a 90 day REPO transaction, with a REPO rate of 4,75%. 180 days government securities with a rate of discount of 5% and a par value of 10 million Euro are used as collateral. Assume that the haircut is equal to 25 basis points. What is the amount of REPO loan? What is the amount of REPO loan repayment in the transaction?

REPO deals are quoted on a **yield** basis. The rate is quoted as a simple interest yield on a 360 days basis set upon initiation of the transaction and fixed for the term of REPO.

The REPO rate or yield is calculated:

$y = (PAR – P) / P \times (360 / t)$

where P is the purchase price, PAR is the agreed repurchase price and t is the period of the transaction.

Example	Investor has purchased securities at a price of 9 980 000 Euro, with an agreement to sell them back at 10 million Euro. At the end of 15 days period. What is the yield of the transaction?

REPO transactions have two legs: 1) when cash is borrowed against collateral; 2) when REPO transaction takes place, i.e. securities are repurchased by repaying REPO loan plus interest.

The repurchase of the securities (REPO payment) is completely independent from the market value of the securities on the maturity date of the REPO. This reinforces the economic reality that REPO transaction is a collateralized loan.

In a reverse REPO transaction the reverse payment is calculated:

Reverse principal + Interest = Reverse principal $\times$ (1 + (y $\times$ t / 360))

where y is the yield or REPO rate, t is maturity of the reverse REPO.

Example	Assume a financial institution utilizes a reverse REPO to borrow securities and to lend cash. The securities collateral is 1 million of par value government securities paying 6% p.a. semi annually with 5 years to maturity. A REPO rate is 4,5%, 181 day of maturity, with a 50 basis points of haircut. What is the amount of reverse REPO repayment of the transaction?

REPO and reverse REPO markets as well as number of their participants have grown up tremendously, especially due to increased sensitivity to interest rate risk and the opportunity cost of holding idle cash.

REPO transactions are negotiated through a telecommunications network. Dealers and REPO brokers perform the role of financial intermediaries to create REPO transactions fro the companies with funds deficit or excess funds, and receive a commission for such services. However, direct REPO transaction is executed, when there is a possibility to find counterparty for it.

Market participants include central banks, financial institutions, non-financial corporations.

Central banks conduct short-term REPO transactions on bonds of any residual maturity as a means of influencing money market interest rates. '

Non-financial companies, private financial institutions are more likely to utilize reverse REPOs to earn interest on their cash balances during the periods of high interest rates. Speculative REPO and reverse REPO transactions are attractive to financial institutions with the increased volatility of interest rates. Money market funds often take the other side of REPO transactions and hold reverses in their assets portfolios as flexible short-term investment vehicles. Individuals, owning shares in these funds, earn interest on the reverses. The fund managers may speculate on interest rate fluctuations using REPOs and reverse REPOs without being subject to the limitations on speculative derivative transactions. Important participants of the REPO market are security dealers. They make markets by carrying inventories of marketable securities, and can use these securities as collateral on REPO loans. Thus they can reduce the cost of financing, utile REPOs to take positions on interest rates, finance their securities portfolios.

Interest yields for REPOs of different terms reflect a term structure of interest rates which is a market consensus on forecasted interest rates. The REPO rate is significantly lower than other money market rates, however higher than the rate of government securities. It is maintained by possibility to substitute different money market instruments. There is no REPO secondary market.

3.2.6. International money market securities

Apart from variety of money market instruments which enable short-term lending and borrowing to take place in the domestic currency, in recent years some of the fastest growing markets have been the so-called eurocurrency markets. These are markets in which the borrowing and lending denominated in a currency of some other country takes place. In general, eurocurrency market instruments are the same as other money market instruments. When such instruments are denominated in some other currency, they are identified as 'euro-', though it can be *any* currency (e.g. US dollars, or Japanese yen). The trading can also take place anywhere (in European countries or in New York or Tokyo or Hong Kong).

The factor contributing to the long-term development of eurocurrency business was the ability of eurobanks to offer their services at more competitive rates than domestic institutions. 'Eurobanks' are banks which specialize in eurocurrency business. They channel funds between surplus and deficit units and, and thus create assets and liabilities

which are more attractive to end-users than if they dealt directly with each other, also they help to use funds which might otherwise lay idle.

In the Eurodollar market banks channel the deposited funds to other companies which need to receive Eurodollar loans. The deposit and loan transactions are of large denominations, e.g. exceeding 1 million USD. Therefore only governments and largest corporations can participate in the market. The market growth was influenced greatly by **Eurocurrency liabilities** of financial institutions are the following:

- Euro Certificates of deposits
- Interbank placements
- Time deposits
- Call money

Euro certificates of deposits (Euro CDs) are negotiable deposits with a fixed time to maturity.

Time deposits are non negotiable deposits with a fixed time to maturity. Due to illiquidity their yields tend to be higher than the yields on equivalent maturity of negotiable Euro certificates of deposits.

Interbank placements are short-term, often overnight, interbank loans of Eurocurrency time deposits.

Call money are non negotiable deposits with a fixed maturity that can be withdrawn at any time.

Eurocurrency assets of financial institutions are the following:

- Euro Commercial Papers (Euro CPs)
- Syndicated Euroloans
- Euronotes

Euro Commercial Papers (Euro CPs) are securitized short-term bearer notes issued by a large well-known corporation. They are issued only by private corporations in short maturities with the aim to provide short-term investments with a broad currency choice for international investors. Most issues are pure discount zero coupon debt securities with maturities from 7 to 365 days. Issuance may be conducted through an appointed panel of dealers.It can be resold in a highly liquid secondary market. The issuers should be highly rated as Euro CPs are unsecured.

Syndicated Euroloans are related to bank lending of Eurocurrency deposits to non-financial companies with the need for funds. Since they are non-negotiable, banks used to hold the syndicated loans in their portfolios until they mature. Due to their illiquidity, the loans are often made jointly by a group of lending banks, which is called a syndicate. The role of syndication is to share loan risks among the banks that members of the syndicate.

Euronotes are unsecuritized debt instruments, substitutes for non-negotiable Euroloans. They are short –term, most often up to one year. Floating rate notes (FRNs) offer a variable interest rate that is reset periodically, usually seminannually or quarterly, according to some predetermined market interest rate (e.g. LIBOR). For a high rated issuer the interest rate can be set lower than LIBOR.

3.3. Money market interest rates and yields

Short-term money market instruments have different interest rate and yield quoting conventions. The yield on short-term money market instruments is often calculated using simple interest as opposed to compound interest, and as a result is not directly comparable with the yields to maturity.

Short-term government securities (Treasury bills), commercial papers are often quoted and traded on a 'discount' basis, while interbank loan rates, REPO rates are quoted on an "add-on" basis.

Besides, it is a convention in the US Treasury bills market to assume that a year has 360 days, while if it is denominated in sterling it has 365 days, even in a leap year. Short-term money market instruments frequently do not have a specified coupon and as a result investors in them obtain a return by buying them at a discount to their par or maturity value.

Below is provide the comparison of different money market rates and yields.

1) Rate on a discount basis

d = (PAR – P) / PAR x (360 / t)

where d is the yield on the basis of rate of discount, PAR – par value, P – the purchase price of the security and t is the number of days until maturity.

Discount is calculated in this case as a percent from par value. It also assumes a 360 days year.

Example	A 90 day US dollar Treasury bill is issued at 99% of its par value. It will be redeemed at its par value (100 %) 90 days after issue. It is traded on a discount basis. The discount of this issue is:
	$d = (100 - 99) / 100 \times 360 / 90 = 4\%$
	Note that in the US dollar money market a year is assumed to have 360 days.

The discount is often converted into a yield so as to make it comparable with other money market instruments. This yield is often called a 'money market yield'. Using the above example, the money market yield is just $4 \times 100/99 = 4.0404$ %.

2) Add-on rate

y = (PAR – P) / P x (360 / t)

where y is the yield on the basis of add-on rate, PAR – par value, P - the purchase price of the security and t is the number of days until maturity.

Example	Assume 990 000 Euro is lent for a 90 day period at the add-on rate. The par value is 1000 000 Euro.
	The annualized yield of the security at an add-on basis will be
	y = (1000000 – 990000) / 990000) x (360 / 90) =
	= 0,0404 or 4,04 %.

3) Bond-equivalent yield

$$y = (PAR - P) / P \times (365 / t)$$

where y is the yield, PAR – par value, P - the purchase price of the security and t is the number of days until maturity.

Example	Assume the same 90 day US dollar Treasury bill issued at 99% of its par value. It will be redeemed at its par value (100 %) 90 days after issue. The bond equivalent yield this issue is:
	$$y = (100 - 99) / 99 \times 365 / 90 = 4,097\%$$

The bond equivalent yield is used to compare Treasury bill yields with the yields to maturity of coupon bearing Treasury notes and bonds. The bond equivalent yield is is an approximation of the yield to maturity of a bond.

The bond equivalent yield is higher than the discount rate. The difference is larger for longer maturities and for higher levels of discount rate d. Therefore an error of yield using discount rate d increases for longer maturities and for higher rates.

4) Annual yield to maturity

$$y = (PAR / P)^{(365/t)} - 1$$

where y is the yield, PAR – par or maturity value, P - the purchase price of the security and t is the number of days until maturity.

Example	Assume the same 90 day US dollar Treasury bill issued at 99% of its par value. It will be redeemed at its par value (100 %) 90 days after issue.
	Annual yield to maturity of this money market instrument is:
	$$y = (100 / 99)^{(365/90)} - 1 = 4,097\%$$

5) Semiannual yield to maturity

$$y = 2 \times (PAR / P)^{(365/2t)} - 2$$

where y is the yield on the basis of add-on rate, PAR – par or maturity value, P - the purchase price of the security and t is the number of days until maturity.

Example	Assume the same 90 day US dollar Treasury bill issued at 99% of its par value. It will be redeemed at its par value (100 %) 90 days after issue.
	The semiannual yield to maturity of this money market instrument is:
	$$y = 2 \times (100 / 99)^{(365/2 \times 90)} - 2 = 4,097\%$$

Comparison of all the money markets rates and yields are provided in Figure 9.

It shows that the largest is always the annual yield, which is then followed by semiannual yield, bond equivalent yield, the yield on the basis of add-on rate and the yield on discount basis. The difference between bond equivalent yield and the semiannual yield are smaller for longer maturities and approach as the maturity approaches half a year. The longer the maturity, the smaller is the difference between bond equivalent yield and the annual yield.

Finally, the longer the maturity, the larger are the differences between the money market discount rate and other rates.
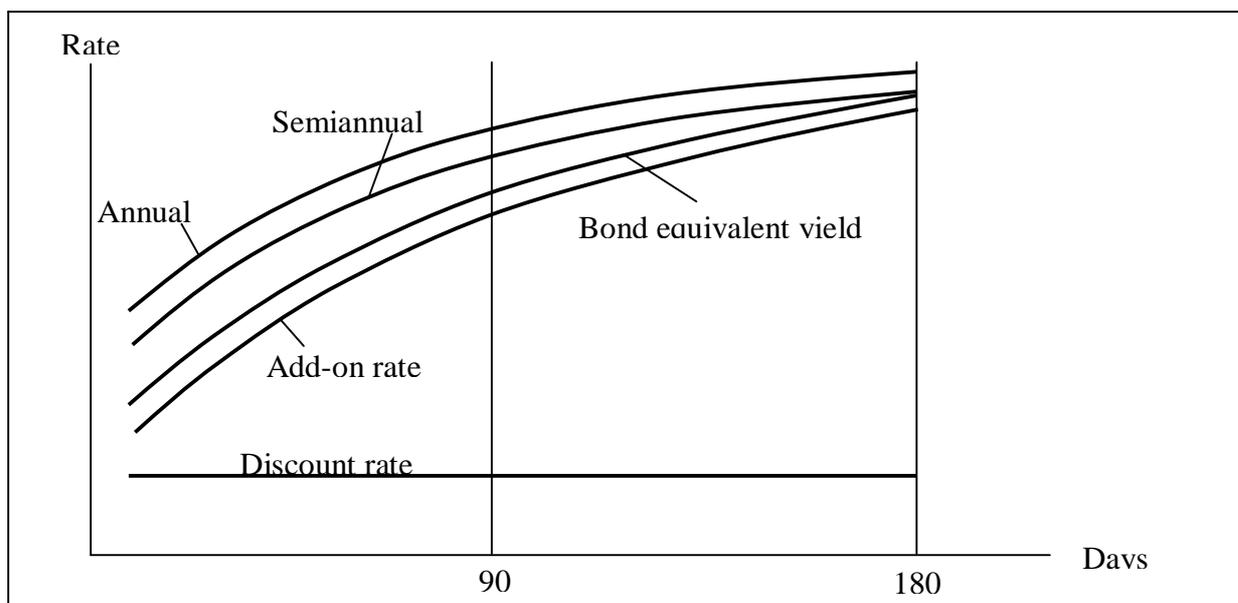
Figure 9. Money market rates and yields

Several specific money market interest rates are used in Europe.

The key European Central Bank (ECB) interest rate is the minimum bid rate, which represents the price floor, which ensures central bank liquidity in the open-market operations. The two other key interest rates, on the marginal lending facility and the deposit facility, define the corridor within which the overnight interest rate can fluctuate.

The Governing Council of the ECB sets the level of the minimum bid rate in the Eurosystem's weekly main refinancing operations (MROs). Through the MROs, the ECB aims to supply the liquidity necessary for the banking system to operate smoothly. This way very short-term money market interest rates are aligned with the monetary policy of the ECB. Through the money-market yield curve, monetary policy is transmitted to financial instruments and credit conditions more generally, which in turn will influence saving and investment decisions and thus will affect price developments in the euro area.

When money market is affected by crisis in the financial markets, the ECB needs to provide additional liquidity in order to support market confidence.

Apart from the ECB interest rates, there are other main market interest rates for the money market:

- **EONIA (euro overnight index average).** The EONIA is the effective overnight reference rate for the euro. It is computed daily as a volume-weighted average of unsecured euro overnight lending transactions in the interbank market, as reported by a representative panel of large banks.

- **EURIBOR (euro interbank offered rate).** The EURIBOR is the benchmark rate of the large unsecured euro money market for maturities longer than overnight (one week to one year) that has emerged since 1999. It is based on information provided by the same panel of banks.

- **EUREPO** (the REPO market reference rate for the euro) for different maturities. The EUREPO is the benchmark rate of the euro REPO market and has been released since March 2002. It is the rate at which one prime bank offers funds in euros to another prime bank when the funds are secured by a REPO transaction using general collateral.

- The rate of interest paid on interbank loans in London (UK) is known as London **InterBank Offer Rate or LIBOR**. It is an important reference to banks of the cost of raising immediate marginal funds. Numerous bank interest rates are therefore tied to LIBOR, particularly to the rate for three-month deposits.

The spreads among the key ECB interest rates and short-term market interest rates are low. E.g., EONIA is mostly slightly above, but very close to, the minimum bid rate. The small spread (about 6 to 7 basis points) reflects that the EONIA is an unsecured interbank rate. It includes a small premium for credit risk and transaction costs. Larger spreads normally occur at the end of the reserve maintenance period when there is a need for the banks to fulfil the reserve requirement.

The yields of money market securities are closely monitored by money market participants. Since money market securities are seen as close substitutes, investors may exchange them to achieve more attractive yields. This causes yields among the securities to come closer. If there is a difference between yields, investors will avoid lower yielding instruments and will favour the ones with high-yield. During the periods of larger uncertainty about the economy, investors tend to shift from more risky money market securities to Treasury bills and other government securities.

3.4. Summary

Money market securities short-term instruments, which have maturities shorter than one year. Trading with these securities in interbank, primary and secondary markets are very active. The volume of transactions in national markets as well as international markets is large. A variety of money market securities allow to meet special needs of borrowers and lenders.

Key terms

- Money market
- Commercial paper
- Certificate of deposit
- REPO
- Treasury bills
- Interbank market

Further readings
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Review questions and problems

1. How do money markets differ from capital markets?

2. Who are the main participants of money markets?

3. What is the difference between money market instruments quoted 'on a discount basis' and 'on a yield basis'?

4. How are government securities (e.g. Treasury - bills) priced?

5. How are commercial papers priced?

6. How are certificates of deposit priced?

7. How are REPO agreements priced?

8. Assume that one-month government security and one-month CDs are both quoted as having a yield of 5 per cent. Which gives the higher yield to an investor?

9. Suppose that long-term interest rates are expected to fall in future. How is this to influence the *supply* of commercial paper and why?

10. Assume that the government makes a major sale of bonds to the private sector. Explain the likely effect on

    a) liquidity of the banking system;

    b) demand for money market instruments.

11. Imagine that the central bank is concerned about the rate of growth of credit in the economy. Explain how it might use its position in the REPO market to address this problem.

12. How can the central bank of a country use REPOs on government bonds to raise interest rates from 4,5 percent to 5 percent?

13. A money market security with the par value of 100000 Euro is selling for 881600 Euro. What is required return of investor, if the security has two years until maturity?

14. Government is selling its 91 days securities with the face value of 1 000 000 Euro for 880 000 Euro.

    a) What is the yield on the investment, if the bank invests and holds the securities until maturity?

    b) How can the annualized yield be affected if the purchase price is lower?

    c) How can the annualized yield be affected if the selling price is lower? Explain the logic of the relationship.

    d) How would the annualized yield be affected if the number of holding days is shorter, but the purchase price and the selling price is constant? Explain the relationship.

15. A company has received a substantial loan from commercial banks. The interest rate on the loans is tied to market interest rates and is adjusted every six months. The company has obtained a credit line to satisfy temporary funds needs. Besides, in order to solve unexpected liquidity problems, it can sell short-term government securities, which it has bought half a year ago. The economic forecasts are rather optimistic, thus in order to satisfy the rising demand, the company may be in need to increase its production capacity by about 40 percent over the next two years. However, the company is concerned about potential slow down in the economy due to possible actions of European central bank aimed at sustaining the inflation rate low. The company needs funding to cover payments to suppliers. It is also considering other possibilities of financing in the money market. The interest rate that the company is paying for its line of credit is less than the prevailing commercial paper interest rate of highly rated companies.

    a) Should the company issue commercial paper on this prevailing interest rate?

    b) Should the company sell its holding of government securities to cover the payments to suppliers?

    c) Should the company use its credit line?

    d) Which alternative has the lowest cost for the company? Provide the reasoning.

4. DEBT MARKETS

Mini contents	• The characteristics of debt markets
	• The characteristics of debt instruments
	• Valuation of bonds
	• Bond duration and convexity
	• Callable bonds and other bond instruments

4.1. Debt market instrument characteristics

Debt markets are used by both firms and governments to raise funds for long-term purposes, though most investment by firms is financed by retained profits. Bonds are long-term borrowing instruments for the issuer.

Major issuers of bonds are governments (Treasury bonds in US, gilts in the UK, Bunds in Germany) and firms, which issue corporate bonds

Corporate as well as government bonds vary very considerably in terms of their risk. Some corporate bonds are secured against assets of the company that issued them, whereas other bonds are unsecured. Bonds secured on the assets of the issuing company are known as debentures. Bonds that are not secured are referred to as loan stock. Banks are major issuers of loan stock. The fact that unsecured bonds do not provide their holders with a claim on the assets of the issuing firm in the event of default is normally compensated for by means of a higher rate of coupon payment.

Important **characteristics of bonds** involve:

The conventional or **straight** bond has the following characteristics:

Residual maturity (or **redemption date**). As time passes, the residual maturity of any bond shortens. Bonds are classified into 'short-term' (with lives up to five years); 'medium-term'(from five to fifteen years) ; 'long-term'(over fifteen years).

Bonds pay a **fixed rate** of interest, called **coupon.** It is normally made in two installments, at six-monthly intervals, each equal to half the rate specified in the bond's coupon.

The coupon divided by the **par value** of the bond (100 Euro) gives the **coupon rate** on the bond.

The **par or redemption value** of bonds is commonly 100 Euro (or other currency). This is also the price at which bonds are first issued.

However, since the preparations for issue take time, market conditions may change in such a way as to make the bonds unattractive at their existing coupon at the time they are offered for sale. They will then have to be sold at a discount to 100 Euro, in order to make the coupon rate approximate the market rate of interest. If, vise versa, the market interest rates fall, the coupon may make the bond attractive at a price above 100 Euro. In these cases the issuers are making a last-minute adjustment to the price which they hope will make the bonds acceptable to the market.

Bond prices fluctuate inversely with market interest rates. If market rates rise, people prefer to hold the new, higher-yielding issues than existing bonds. Existing

bonds will be sold and their price will fall. Eventually, existing bonds with various coupons will be willingly held, but only when their price has fallen to the point where the coupon expressed as a percentage of the current price approximates the new market rate.

The **yield on bonds** are expressed commonly in two forms:

- *redemption yield;*

- *interest yield or running yield.*

Concept	**Interest yield (or running yield) - t**he return on a bond taking account only of the coupon payments.

Concept	**Yield to maturity or redemption yield:** The return on a bond taking account of the coupon cash flows and the capital gain or loss at redemption.

The **types of bonds** include:

Callable and putable bonds. Callable bonds can be redeemed at the issuer's discretion prior to the specified maturity (redemption) date. Putable bonds can be sold back to the issuer on specified dates, prior to the redemption date.

Convertible bonds. These are usually corporate bonds, issued with the option for holders to convert into some other asset on specified terms at a future date. Conversion is usually into equities in the firm, though it may sometimes be into floating rate notes.

Eurobonds. Eurobonds are bonds issued in a country other than that of the currency of denomination. Thus bonds issued in US dollars in London are eurobonds, as are yen bonds issued in New York. The bonds themselves may be straights, that is fixed-interest, fixed redemption bonds like the sterling ones described above, or they may come in any of the variations listed here. Eurobonds are issued by governments but more usually by corporations.

Euro bonds. These are bonds denominated in euros and issued in the euro currency area. If bonds denominated in euros would be issued outside the euro currency area, they would be euro eurobonds.

Floating rate notes (FRNs). These are corporate bonds where the coupon can be adjusted at pre-determined intervals. The adjustment will be made by reference to some benchmark rate, specified when the bond is first issued. An FRN might specify, for example, that its coupon should be fifty basis points above six-month treasury bill rate, or six-month LIBOR, adjusted every six months. FRNs are, in part, a response to high and variable inflation rates.

Foreign bonds. These are corporate bonds, issued in the country of denomination, by a firm based outside that country. Thus, a US firm might issue a sterling bond in London.

Index-linked bonds. These are corporate bonds where the coupon can be adjusted to high and variable rates of inflation. While other bonds have a maturity (redemption) value fixed in nominal terms and therefore suffer a decline in real value as a result of inflation, both the value and the coupon of an index-linked bond are uprated each year in line with lagged changes in a specified price index.

Junk bonds. Junk bonds are corporate bonds whose issuers are regarded by bond credit rating agencies as being of high risk. They will carry a rate of interest at least 200 basis points above that for the corresponding bonds issued by high-quality borrowers.

Strips. Stripping refers to the breaking up of a bond into its component coupon payments and its maturity (redemption) value. Thus a ten-year bond, paying semi-annual coupons, would make twenty-one strips. Each strip is then sold as a zero-coupon bond. That is, it pays no interest but is sold at a discount to the payment that will eventually be received. In this sense, it is like a long-dated bill. The strips are created from conventional bonds.

4.2. Bond market

4.2.1. Bond market characteristics

Debt markets include:

> primary markets for bonds, i.e. the markets in which newly issued instruments are bought,

> secondary markets , in which existing or second hand instruments are traded.

Majority of world bond markets have different institutional arrangements for the issue and trading of government bonds and corporate bonds. The reason is that governments should be able to sell the debt, which they use for budgetary and other purposes. Thus an active market with high rated participants should be ensured. Therefore government bond markets are subject to high level of supervision and regulation by the central bank.

For governments bonds are the main instrument (mainly central governments, but also regional and local government authorities, and social securities funds) to finance their budget deficits. This is true especially for within the euro area countries. Besides, government bonds often serve as a benchmark for pricing other assets and they are also frequently used as collateral in various financial transactions.

In governments debt securities issues form the most important market segment, followed by debt securities issued by financial institutions (consisting of monetary financial institutions (MFIs) and non-MFI financial institutions), and those issued by non-financial corporations. Monetary financial institutions include all financial institutions whose business is (1) to receive deposits and/or close substitutes for deposits from entities other than MFIs and (2) to grant for their own account credit and/or invest in securities..

The non-government bond market is dominated by bank debt securities. This segment includes different types of bonds, including unsecured bank debt securities and **covered bonds**.

Concept	**Covered bonds** are claims of the bond holders against the issuing MFI that are secured by a pool of cover assets on the MFI's balance sheet, such as mortgage loans or loans to the public sector. .

The introduction of the euro in 1999 had a major impact on the operations of government-debt managers as the disappearance of exchange rate risks within the euro area created the conditions for a pan-European capital market. As a result, debt managers became players in a larger European market. Investors turned their focus more on credit risk and liquidity, while bond portfolios have become increasingly internationally diversified, especially in the smaller euro-area countries. Consequently, competition among debt managers has increased, stimulating a more efficient primary market and a deeper, more liquid secondary market. Governments have put great effort into making their outstanding debt and new issues more attractive to international bond investors. In addition to local systems, the European electronic platform for government securities, EuroMTS, was introduced in 1999, enabling quotation and trading of some European benchmark bonds

4.2.2. Bond market yields

Bond yields are influenced by interest-rate expectations, the term premium, credit risk and liquidity.

Risk-averse investors demand a risk premium (term premium) for investments in long-term bonds to compensate them for the risk of losses due to interest rate hikes; those losses increase with bond duration. The term premium leads to a positive term spread, i.e., the spread of yields for bonds with longer maturity over yields for bonds with shorter maturity, even when markets expect increasing and decreasing interest rates to be equally likely.

Liquidity is one of the key characteristics of the bond market.

Liquidity is the ease with which an investor can sell or buy a bond immediately at a price close to the mid-quote (i.e., the average of the bid–ask spread).

A **liquid market** allows market participants to trade at low trading costs. Kyle (1985) identifies three dimensions of liquidity:

- tightness: the cost of turning around a position during a short period. Tightness in essence refers to a low bid–ask spread;

- depth: a market is deep if only large buy or sell orders can have an impact on prices;

- resiliency: a market is resilient if market prices reflect 'fundamental' values and, in particular, quickly return to 'fundamental' values after shocks.

The spread between the yield of a bond with liquidity and a similar bond with less liquidity is referred to as the **liquidity premium**

Credit risk is the risk of loss because of the failure of a counterparty to perform according to a contractual arrangement, for instance due to a default by a borrower. The spread between the yield of a particular bond and the yield of a bond with similar characteristics but without credit risk is the credit-risk premium. Rating agencies – like Moody's, Standard & Poor's, and Fitch – indicate issuers' credit risk by assigning them a rating.

.**Credit risk** and **liquidity premia** of euro-denominated bonds are typically calculated as the spread of the bond yields over those of German government bonds. There are two reasons for this. First, German government bonds have consistently received the highest ranking from the three main rating agencies, indicating that German government bonds are associated with zero or very low credit risk. Second, German government bonds are very actively traded, ensuring that they are very liquid.

Yield differentials vary considerably across countries, while for each country the yield differential varies considerably over time. Pagano and Von Thadden (2008) discuss studies that try to explain these yield differentials, arguing that they may arise from (1) intrinsic differences in country-specific default risk or different sensitivities of bonds' future payoffs to common shocks, or (2) market frictions, like trading costs, clearing and settlement fees, and taxes.

They state that credit risk explains a considerable portion of cross-country yield differences but explains very little of their variation over time.

4.3. Bond valuation

4.3.1. Discounted models

The fair value or fair price of a bond is based on the present value of expected future cash flows. The general formula for estimating the fair price of a bond is:

$$P = C/(1+r) + C/(1+r)^2 + C/(1+r)^3 + \ldots + C/(1+r)^n + B/(1+r)^n$$

where P is the fair price of the bond (its dirty price, which includes accrued interest), C is the regular coupon payment each period, B is the money value to be paid to the bondholder at maturity (redemption), r is the rate of discount per period, and n is the number of periods to maturity (redemption).

Example	A bond pays a coupon of 4 Euro every six months, and 100 Euro will be repaid at maturity. There are two years to maturity and the next coupon is due in six months. The redemption yield on similar bonds is 6% p.a. Estimate the fair price of the bond.
	An interest rate of 6% p.a. indicates a rate of 3% per six-month period.
	$P = 4/(1,03) + 4/(1,03)^2 + 4/(1,03)^3 + 4/(1,03)^4 + 100/(1,03)^4$
	$P = 3,88 + 3,77 + 3,.66 + 3,55 + 88.85 = 103,71$ Euro

Typically a single rate, the redemption yield or redemption yield, is applied to discounting all future cash flows. The redemption yield of a bond could be viewed as an average of discount rates applicable to the various future cash flows. The redemption yield indicates the average annual return to be received by an investor holding a bond to maturity.

The rate of discount is the required rate of return from a bond. The required rate of return can be regarded as the sum of the yield on bonds that are free of default risk (government bonds) and a risk premium to reflect the default risk of the bond being valued. High default risk entails a high required rate of return and hence a high discount rate.

Therefore, for any particular stream of future cash flows, high risk bonds would have higher rates of discount and hence lower fair prices than low risk bonds. Thus, bond prices have an inverse relationship to interest rates, and second, that they have an inverse relationship to the risk of default. High interest rates and high risk are associated with low prices.

An important distinction when considering bond prices is between the clean and dirty prices. When a bond is purchased, the buyer must include in the purchase price a sum corresponding to the seller's share of the next coupon. If the coupon is paid six-monthly, and the bond is sold three months after the last coupon payment date, the seller would require the price to include half the next coupon so that holding the bond for the previous three months provides an interest yield. The rights to the coupon accumulated by the seller are referred to as accrued interest. The clean price of a bond excludes accrued interest whereas the dirty price includes it.

Concept	**Clean price -** the price of a bond ignoring any interest which may have accrued since the last coupon payment.

Concept	**Dirty price -** the price of a bond, including any accrued interest.

Quoted prices are usually **clean prices** whereas the price to be paid is the **dirty price**.

Example	Assume it is 22 November 2010.Treasury 10% 2012 matures on 21 November 2012. Calculate the fair price of this bond when the redemption yield is 10% p.a. and 5% p.a.
	Assume it is 22 November 2010.Treasury 5% 2012 matures on 21 November 2012. Calculate the fair price of this bond when the redemption yield is 10% p.a. and 5% p.a.
	Assume it is 22 November 2010. A zero-coupon bond matures on 21 November 2012. Calculate the fair price of this bond when the redemption yield is 10% p.a. and 5% p.a.
	Treasury 10% pays 10 Euro per year, i.e. 5 Euro every six months.
	$5/(1,05) + 5/(1.05)^2 + 5/(1.05)^3 + 105/(1,05)^4 = 4,76 + 4,54 + 4.32 + 86,38 = 100$ Euro
	(Note that $105/(1,.05)^4$ is the same as $5/(1,05)^4 + 100/(1,05)^4$)
	$5/(1,025) + 5/(1,025)^2 + 5/(1,025)^3 + 105/(1,025)^4 = 4,88 + 4,76 + 4,64 + +95,12 = 109,40$ Euro
	Treasury 5% pays 5 Euro per year, i.e. 2.50 Euro every six months.
	$2,5/(1,05) + 2,5/(1,05)^2 + 2,5/(1,05)^3 + 102,5/(1,05)^4 = 2,38 + 2,27 + 2,16 + 84,33 = 91,14$ Euro
	$2,5/(1,025) + 2,5/(1,025)^2 + 2,5/(1,025)^3 + 102,5/(1,.025)^4 = 2,44 + 2,38 + 2,32 + 92,86 = 100$ Euro
	A zero coupon bond pays no coupons. The only cash flow receipt is the 100 Euro at redemption.
	$100/(1,1)^2 = 82,64$ *or* $100/(1,05)^4 = 82,27$ Euro
	$100/(1,05)^2 = 90,70$ Euro *or* $100/(1,025)^4 = 90,60$ Euro

Bond prices are inversely related to interest rates, but the relationship is not symmetrical. The proportionate fall in the bond price resulting from a rise in interest rates is less than the proportionate rise in the bond price caused by a fall when the percentage point change in interest rates is the same in the two cases.

This can be illustrated by reference to the case of a bond with no maturity date. The price of such a bond is:

$P = C/r$

where P represents the fair price of the bond, C the coupon, and r is the interest rate (required rate of return). Consider the case of a 5 Euro annual coupon and an initial interest rate of 10% p.a. The fair price of the bond would be estimated as:

$5 / 0,1 = 50$ Euro

If the interest rate falls by 2 percentage points to 8% p.a., the price of the bond is expected to rise to:

$5 / 0,08 = 62.50$ Euro

If the interest rate rises by 2 percentage points to 12% p.a., the fair price of the bond falls to:

5 / 0,12 = 41,67 Euro

Whereas the interest rate fall results in a 25% price rise, the equivalent interest rate increase causes a 16,67% price decline. This asymmetry of price response is referred to as convexity.

Future cash flows from a bond, together with the required rate of return, can be used to estimate the fair price of the bond. The process could be reversed in order to find the redemption yield of the bond knowing its current price and the future cash flows. The redemption yield (y) can be obtained by solving equation for y.

$$P = C/(1+y)^1 + C/(1+y)^2 + C/(1+y)^3 + C/(1+y)^4 + B/(1+y)^4$$

where P is the current market price of the bond, C is the annual coupon, B is the redemption value of the bond, and y is the redemption yield (yield to maturity).

The effective annual yield takes account of the compounding. The effective annual yield is given by: $(1+y)^2 - 1$.

Realized compound yield is the average compound rate of return actually obtained from an investment. Realized compound yield is affected by yield on reinvested coupons.

The calculations of redemption yield assume that coupons are reinvested at the redemption yield. The realized compound yield equals the redemption yield if coupons are reinvested at the redemption yield and the bond is held to redemption. If the reinvestment rate for the coupons exceeds the redemption yield, the realized compound yield will exceed the redemption yield.

If the reinvestment rate for the coupons is less than the redemption yield, the realised compound yield will be less than the redemption yield. Bond duration and risk

There are two types of risk encountered by investors in bonds. There is **price (or capital) risk**, and **reinvestment (or income) risk**. Price risk is the risk that bond prices can change. For example a general rise in interest rates, or a fall in the credit rating of a particular bond, would reduce the price of a bond. A capital loss would result.

Reinvestment risk refers to the uncertainty of the interest rate at which coupons and redemption sums can be invested. This causes uncertainty as to the final sum that will be available at the end of an investment horizon.

4.3.2. Bond price volatility

Bond price volatility is measured by duration. The duration measures include Macaulay's duration, modified duration, and money duration. Macaulay's duration is the average period of time to the receipt of cash flows. Each time period (to the receipt of a cash flow) is weighted by the proportionate contribution of that cash flow to the fair price of the bond. Macaulay's duration is transformed into modified duration by means of dividing it by (1+r/n), where r is the redemption yield (which approximates an interest rate) and n is the number of coupon payments per year.

Macaulay's duration has another meaning, it is the proportionate change in the bond price (fair price of the bond) arising from a unit proportional change in (1 + redemption yield).

Macaulay's duration = $(\Delta P/P) / (\Delta(1+r)/(1+r))$

Where Δ is the change in, and P is the bond price.)

The corresponding interpretation of **modified duration** is:

Modified duration = (ΔP/P) / Δ r

Δ (1+r) = Δ r.

Equations assume annual coupon payments. When coupons are paid more frequently, r is replaced by r/n (the annual redemption yield divided by the number of coupon payments per year).

The calculation of duration can be demonstrated by an example. Suppose that a bond has just paid a coupon, matures in two years, and pays a coupon of 6 Euro six-monthly. The interest rate is 10% p.a. for all maturities. The fair price of the bond is:

$P = 6/(1,05)+6/(1,05)^2+6/(1,05)^3+106/(1,05)^4 = 5,71 + 5,44 + 5,18 + 87,21 = 103,54$

An interest rate of 10% p.a. is 5% per six-month period.

Macaulay's duration is calculated as the weighted average of the periods to the receipt of cash flows. The weighting is based on the contribution of the period's cash flow to the fair price of the bond. The periods are 0,5, 1, 1,5, and 2 years.

Macaulay's duration=$(5,71/103,54)^{0,5}+(5,44/103,54)^{1,0}+(5,18/103,54)^{1,5} +(87,21/103,54)^{2,0}$

=0,028 + 0,053 + 0,075 + 1,685 = 1,841 years.

Conversion of Macaulay's duration to modified duration is made through division by (1+r/n).

Modified duration =1,841/(1 +0,1/2) =1,841/(1,.05) =1,753

Example	A corporate bond pays an annual coupon of £10 and has four years to maturity. It has just paid a coupon. As a result of a downgrading of its credit rating, its required rate of return rises from 8% p.a. to 12% p.a. What are the effects of this change on (a) the price, and (b) the Macaulay's duration, of the bond? (c) Discuss your results.

Example	Treasury 10% 2012, which pays coupons six-monthly, will reach maturity on 10 June 2012. It is now 11 June 2010. Interest rates for 0,5, 1, 1,5, and 2 years are all 7% p.a. Estimate the fair price, Macaulay's duration, and modified duration of the bond.

Example	An investor has two bonds. Bond A pays a 5 Euro annual coupon and matures in five years. Bond B pays a 4 Euro coupon semi-annually and matures in three years. The investor needs to sell one bond immediately and hold the other for two years. The current rate of interest, for all maturities up to five years, is 6% p.a.
	Which bond would the investor sell if that investor expected interest rates to: (a) increase, (b) decrease?

4.3.3. Behavior of Macaulay's duration

Macaulay's duration of a bond behavior can be summarized by a set of rules.

Rule 1: The duration of a zero coupon bond equals its time to maturity. Since a zero coupon bond generates only one cash flow, the payment of principal at maturity, the average time to the receipt of cash flows equals the time to that payment.

Rule 2: Holding time to maturity and redemption yield constant, duration is inversely related to the coupon.

Rule 3: Holding the coupon rate constant, duration generally increases with time to maturity.

Rule 4: Holding coupon and maturity constant, duration is inversely related to redemption yield.

Rule 5: The duration of an irredeemable bond is given by $(1 + r)/r$, where r is the redemption yield. If a bond pays the same coupon each period forever without the principal ever being repaid, the duration equals $(1 + r)/r$.

Example	A fund manager holds a 100-million Euro bond portfolio comprising three bonds: A, B, and C. Bond A has duration of four years and accounts for 25 Euro million of the portfolio. Bond B has a duration of seven years and accounts for 25 Euro million. Bond C, of which 50 Euro million is held, has duration of ten years. What is duration of the portfolio?

4.3.4. Immunization

Bonds are used in institutional investment portfolios not only as means of accumulating wealth but also as means of funding annuity payments. Since it is possible to obtain reasonably reliable estimates of the duration of prospective annuity payment streams as well as the duration of bond portfolios, it is possible to match the duration of the bond portfolio with the duration of the annuity payments. Such duration matching, or immunisation, is very useful for annuity and pension providers since it provides a high degree of protection against interest rate risk.

Duration is also important for the structuring of bond index tracker funds. If such a fund were to be constructed using stratified sampling based on a cell structure, one of the characteristics of a cell would be duration. Other characteristics might be redemption yield and credit rating.

There would be a cell for each combination of characteristics (e.g. high duration, low redemption yield, high credit rating), and the portfolio would contain an appropriately weighted combination of cells. If an annuity fund, index tracker fund, or other bond fund exhibits a duration that differs from the optimum it is possible to use bond futures to adjust the portfolio duration to the desired value.

4.3.5. Bond convexity

Duration provides just an approximation to the relationship between yield changes and bond price movements. The analysis of the price/yield relationship for a bond together with a straight line representing duration (i.e. price value of a basis point, PVBP), shows that for small changes in yield it is sufficient.

However, the actual price change is expressed by the curved price/yield relationship. Thus for large yield changes, the duration line provides a poor estimate of the actual price change. Duration underestimates price rises and overestimates falls. In both cases the new bond price is underestimated. The inaccuracies arise because money duration fails to take account of the convexity (curvature) of the actual price/yield relationship of a bond.

While constructing bond portfolios a bond portfolio manager should be concerned with not only duration, but also convexity. Convexity has value in that it leads to higher bond prices following interest rate movements, when compared with an investment with zero convexity. High convexity bonds provide this benefit to a greater extent than low convexity bonds. The benefits of convexity are greater when interest rate changes are relatively large. This implies that the portfolio manager needs to consider the prospective size of interest rate movement as well as the direction.
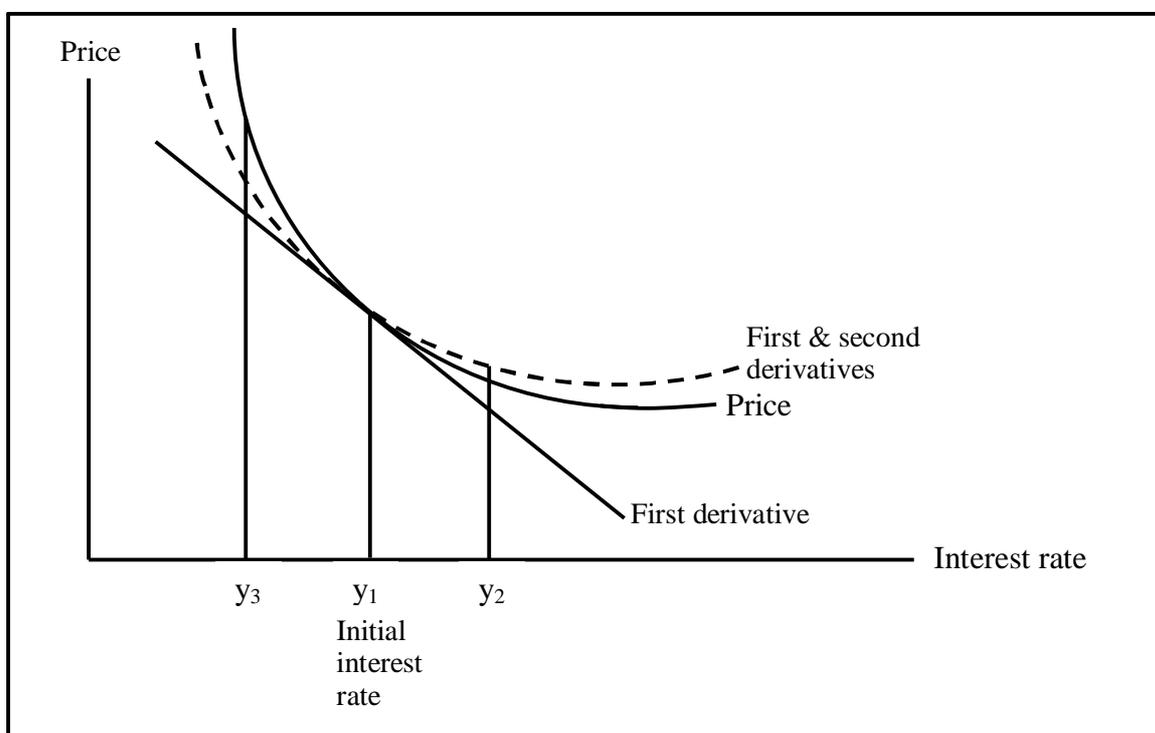
Figure 10. Duration and convexity

If instead of duration a Taylor expansion is used, expressing the percentage change in bond price in terms of the first, second and higher derivatives, the approximation is more accurate. The second derivative incorporates what has been called convexity:

$\text{Convexity} = (d^2P / dy^2) \times (1/P) \times (1 / 2)$ to $y2$.

Figure 10 shows, that for increases of interest rates to y_2 the duration plus convexity approximation gives a high estimate of bond price. For decreases in interest rates to y_3, the duration and convexity approximation give a low estimate of bond price.

Example	A bond has just paid a six-monthly coupon of 4 Euro. There are four more coupons to be paid by maturity. How accurate is modified duration for the purpose of estimating the effect

A bond with high convexity will tend to have a relatively low redemption yield. The advantage from high convexity would be offset by a lower yield. If interest rate movements are small, the gains from convexity would not compensate for the low yield. So if a portfolio manager expects a small interest rate change, bonds with low convexity should be chosen. If the expectation is that there will be a substantial interest rate movement, high convexity bonds should be chosen.

Convexity is greatest for low coupon, long maturity, and low-redemption-yield bonds (i.e. high duration bonds).Convexity can be calculated and combined with measures of duration when evaluating the potential effects of interest rate changes on bond prices. Since measures of duration are accurate only for very small changes in interest rates, a convexity correction is required in the case of large interest rate movements. To estimate the effects of relatively large interest rate changes on bond prices, it is necessary to combine an estimate of convexity with an estimate of duration.

4.4. Bond analysis

4.4.1. Inverse floaters and floating rate notes

Financial engineering can create derivatives from a non-derivative investment, e.g. the division of a conventional bond into an inverse floater and a floating rate note.

Inverse floater is a bond whose interest rate is inversely related to a market rate. For example an inverse floater might pay a coupon rate of 10% p.a. minus LIBOR (LIBOR is a commonly used benchmark interest rate that reflects market rates).

The price of an inverse floater is extremely sensitive to interest rate movements. Not only does the coupon rate fall when interest rates rise, but the rate at which the coupons and principal value are discounted also rises. There are two effects of interest rate rises that act to reduce the bond price. Conversely interest rate falls have two positive effects on the bond price; the higher coupons are accompanied by a lower discount rate. So inverse floaters are very sensitive to interest rate changes, in other words they have very long durations. Inverse floaters are structured by dividing a conventional bond into an inverse floater and a floating rate note.

Floating rate note is a bond whose coupon rate moves in line with market rates. For example the coupon rate on a floating rate note might be 2% p.a. plus EURIBOR. Since the coupon rate moves in the same direction as the rate of discount, effects of interest rate changes tend to offset each other with the effect that there is little net effect on the bond price. Floating rate notes exhibit low price volatility and hence short durations.

The high duration of inverse floaters renders them useful for hedging long-term liabilities.

Falling interest rates increase the value of the liabilities, but that would be offset by the increase in the value of the inverse floaters. Inverse floaters might be attractive to institutions with long-term liabilities such as pension funds, annuity providers, and life assurance companies. Conversely floating rate notes could be attractive to institutions with short-term liabilities, such as banks and building societies.

4.4.2. Callable bonds

Some corporate bonds are **callable**. This means that the issuer has the right to repurchase the bonds at a predetermined price (the issuer has a call option on the bonds). To

compensate for the risk of future calls, the bondholders require a higher coupon (on a callable as opposed to noncallable bond), a call premium, and typically a period of call protection during which the original coupon is locked in (see Figure 11).

A rise in the bond price that makes the repurchase desirable would be brought about by a fall in market interest rates or an improvement in the credit rating of the bonds. Under these circumstances the issuer could repurchase the bonds and issue new bonds at a lower coupon rate. The issuer would choose to repurchase since that would allow for a reduction in financing costs. Bonds with a relatively high coupon could be repurchased with money raised from the sale of bonds with a lower coupon. The issuer thereby reduces coupon payments.

The predetermined price at which the issuer has the right to repurchase puts an upper limit on the value of the bonds. No one would pay a higher price knowing that that they could be forced to sell at the predetermined price. The price/yield relationship for a callable bond has an upper limit to the price.
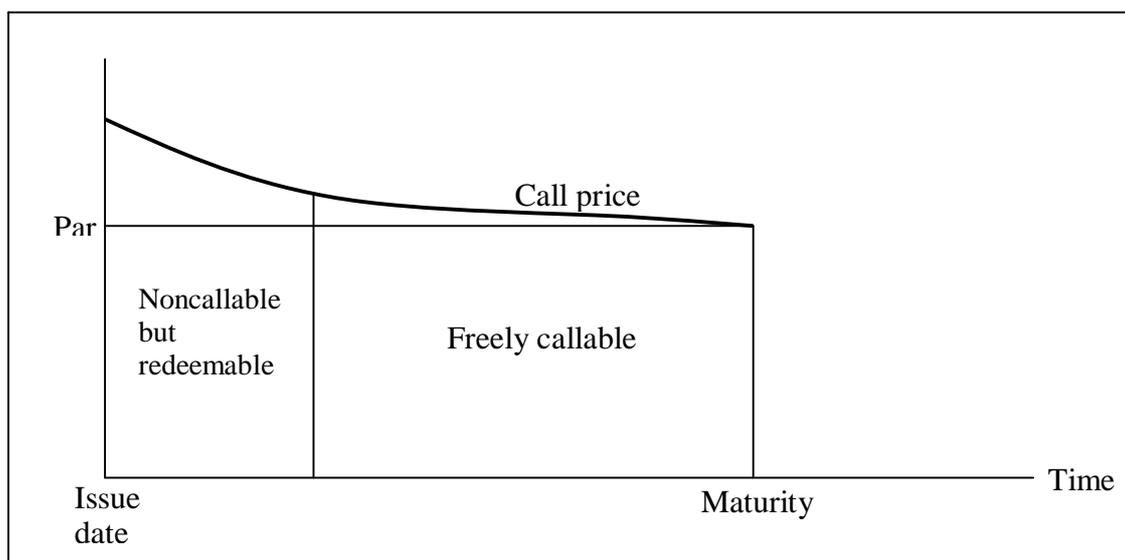

Figure 11. Callable bond

An implication of the upper limit to the price is that the convexity turns into concavity. Another implication is that the coupon rate on a callable bond will be higher than the coupon rate on a bond without the call feature. If investors face a ceiling on their prospective capital gains, they would require an enhanced coupon yield in compensation. Effectively investors are providing the issuer with a call option. The investors would require payment for the call option. The payment to the investors takes the form of increased coupons.

Figure 12clarifies the relationship between the values of the call option, the noncallable bond and the callable bond. On the horizontal axis the figure shows the value of a noncallable bond. As interest rates get lower, the value of the noncallable bond increases.

The left vertical axis shows the value of a call option for a callable bond with the same coupon, par value, and maturity as the noncallable bond. The origin for the left axis is the point where the thick black lines cross. As interest rates go down, the market value of a noncallable bond increases, and the value of the call option also increases.
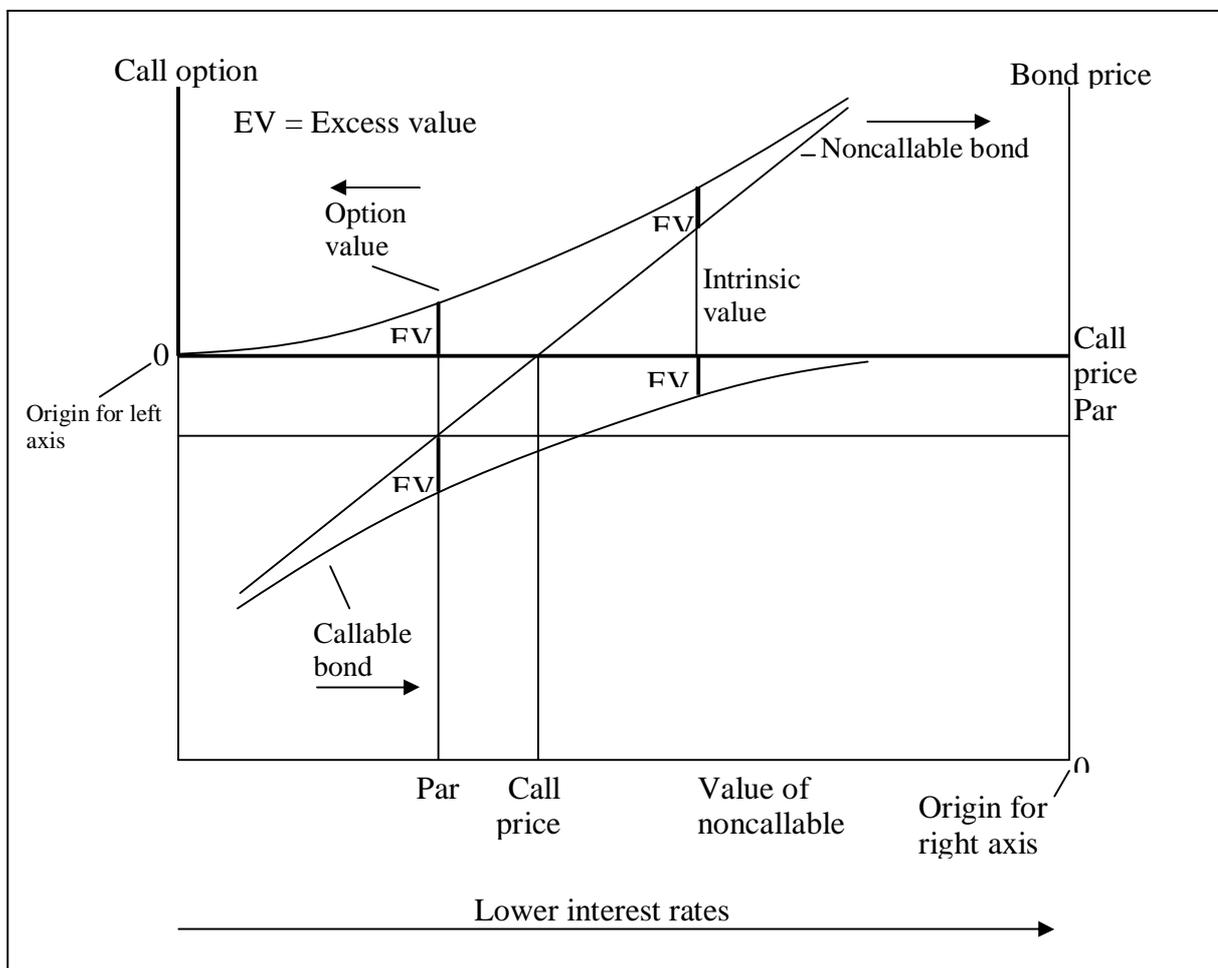
Figure 12. Values of callable bonds, noncallable bonds, and the call option

The right vertical axis shows the price of noncallable and callable bonds with the same coupons, maturity, and call price. The origin of the right axis is the right corner of the figure. The value of the callable bond is equal to the value of the non callable bond minus the call option value. As the interest rates fall, the value of the callable bond approaches the call price.

4.4.3. Convertible bonds

Some corporate bonds may be convertible into common stock of the company at the option of the bond holder. The bonds are usually callable at par plus a call premium. A convertible bond is in the money if the stock value of the bond exceeds the call price. The call feature is included to allow the company to force conversion into common stock.

Conversion can be forced only if the bond is in the money. Call of an out-of-the money convertible induces the bondholders to turn in their bonds at the call price. Sometimes voluntary conversion occurs if the convertible is in-the-money and the dividend yield on the stock exceeds the current yield on the convertible.

Figure 13shows the relationship between the stock value, the straight bond value and the price of the convertible. The stock value is initially below the par value and the stock value is assumed to grow over time. The straight bond value gradually approaches the par value as the bond gets closer to maturity. The call price declines over time to the par value. As the stock value rises above the call price, the premium of the convertible over the bond value declines and the market price of the convertible approaches the stock value.

The market price of the convertible must be higher than the higher of the straight bond value or the stock value. Otherwise arbitrage occurs.

When convertible bonds are issued, the stock price tends to decline. This evidence is consistent with the view, that issuing convertibles is a negative signal to the market. The evidence supports the view that convertibles are issued when the management has negative information.
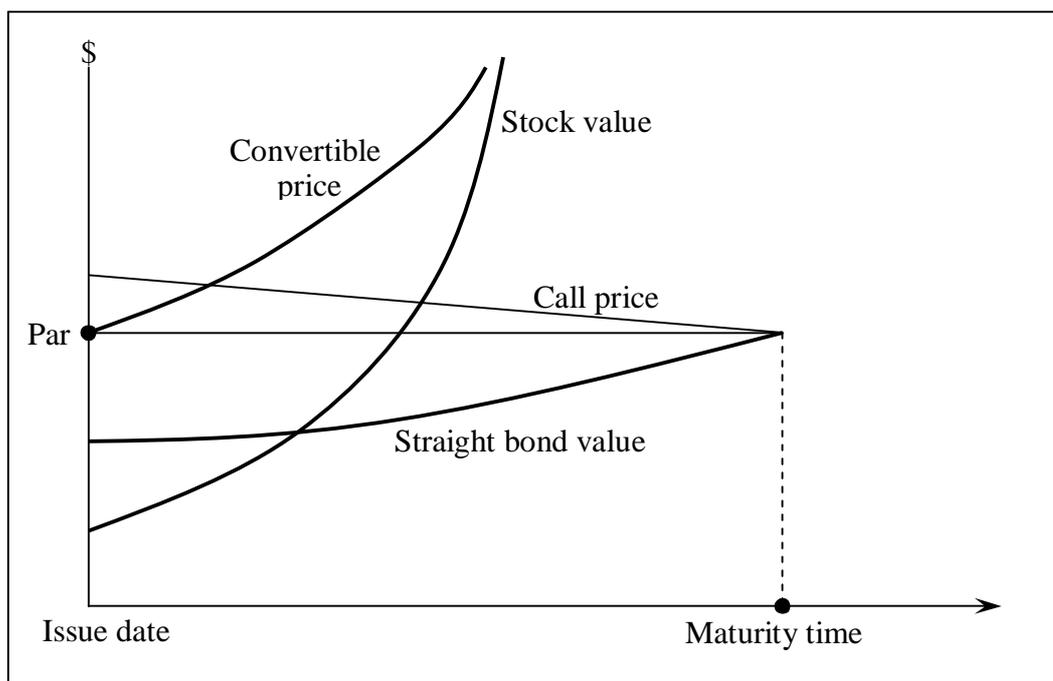
Figure 13. Convertible bonds

4.5. Summary

Bonds are debts of the governments, companies, and organizations that issue them. One of the ways in which bonds differ from shares is in the relative certainty of future cash flows. In the absence of default by the issuer, the future cash flows from a bond are typically known with certainty. This is in contrast to shares since shares typically have dividend payments, which are variable and uncertain. The relative certainty of bond cash flows influences the pricing and analysis of bonds. The fair price of a bond is estimated using a discount model. The relative certainty of bond cash flows means that other characteristics, such as duration and convexity, can also be reliably estimated. Other important bond characteristics are future bond yields and of bond price volatility (risk).

The debt markets are used by both firms and governments to raise funds for long-term purposes, though most investment by firms is financed by retained profits. Firms and

governments can issue corporate bonds of various types of shares. Bonds usually pay a fixed rate of interest at pre-determined intervals. Bonds are traded on a stock exchange and their price fluctuates in response to supply and demand. In the short run the supply of both is fixed and price fluctuations are therefore the result of changes in demand.

Key terms

- Callable bond

- Convertible bond

- Redemption yield

- Duration

- Convexity

Further readings

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Review questions and problems

1. Why does the calculation of a 'present value' of a bond involve discounting?

- Which of the following would be likely to show the greatest short-run price volatility: a short-term bond, a long-term bond? Explain.

- When market interest rates are 10 percent, what relationship would you expect between the price and redemption yields of two 8 percent bonds, one maturing in three years, the other maturing in ten years?

- Give two reasons why institutions like banks prefer to hold short-term rather than long-term bonds.

- Explain the terms: dirty price, clean price, interest yield, redemption yield.

- Are high yield bonds good investments? Why or why not?

- Assume a redemption yield of 8%. Compute the duration for the following bonds each 100 Euro par value. For the 12% coupon bond compute duration.

  a) 10 years, zero coupon;

  b) 10 years, 8 percent;

  c) 10 years, 12 percent coupon.

- In problem 7 assume that yields change from 8 to 9 %. Work out the exact change in price and compare it with the change in price predicted by duration. Explain the difference. Assume 100 Euro par value.

- Compute the duration of a portfolio composed of equal proportions of a ten year, zero coupon bond and a ten year 8 % coupon bond, assuming 89% yields to maturity.

- A firm has decided immediately to refund existing callable bond issue. Under what circumstances is there an immediate benefit to refunding? What does that benefit depend upon?

- How can callable bonds be substitutes for short-term bonds?

- A firm has a perpetual callable bond outstanding with a par value of 100 Euro and an annual coupon of 14 Euro. The firm can refund this with a new noncallable perpetual bond having an 8 percent coupon. The call price on the old bond issue is 114 Euro. Flotation costs for a new issue are 2 percent of par value. What is the myopic benefit of refunding?

5. EQUITY MARKET

Mini contents	• Equity instruments
	• The purpose and functions of stock exchanges.
	• The distinction between primary and secondary markets.
	• Types of stock exchange.
	• Stock market trading systems.
	• Bid-offer spreads.
	• Types of purchase and sale order.
	• Processes by which shares are issued.

Equity market is one of the key sectors of financial markets where long-term financial instruments are traded. The purpose of equity instruments issued by corporations is to raise funds for the firms. The provider of the funds is granted a residual claim on the company's income, and becomes one of the owners of the firm.

For market participants equity securities mean holding wealth as well as a source of new finance, and are of great significance for savings and investment process in a market economy.

The **purpose of equity** is the following:

- A new issue of equity shares is an important source of external corporate financing;

- Equity shares perform a financing role from internally generated funds (retained earnings);

- Equity shares perform an institutional role as a means of ownership.

Within the savings-investment process magnitude of retained earnings exceeds that of the news stock issues and constitutes the main source of funds for the firms. Equity instruments can be traded publicly and privately.

External financing through equity instruments is determined by the following financial factors:

- The degree of availability of internal financing within total financing needs of the firm;

- The cost of available alternative financing sources;

- Current market price of the firm's equity shares, which determines the return of equity investments.

Internal equity financing of companies is provided through retained earnings. When internally generated financing is scarce due to low levels of profitability and retained earnings, and also due to low depreciation, but the need for long-term investments is high, companies turn to look for external financing sources. Firms may raise funds by issuing equity that grants the investor a residual claim on the company's income.

Low interest rates provide incentives for use of debt instruments, thus lowering demand for new equity issues. High equity issuance costs force companies to look for other sources

of financing as well. However, during the period of stock market growth high market prices of equity shares encourage companies to issue new equity, providing with the possibility to attract larger magnitude of funds from the market players.

Check Question	What is the purpose of equity?

Equity markets are markets which organize trading nationally and internationally in such instruments, as common equity, preferred shares, as well as derivatives on equity instruments.

Concept	**Bourse** – a French term often used to refer to stock market.

5.1. Equity instruments

5.1.1. Common shares

Common (ordinary) shares represent partial ownership of the company and provide their holders claims to future streams of income, paid out of company profits and commonly referred to as dividends. Common shareholders are residual claimants, i.e. they are entitled to a share only in those profits which remain after bondholders and preference shareholders have been paid. If the company is liquidated, shareholders have a claim on any remaining assets only after prior claimants have been paid. Therefore common shareholders face larger risks than other stakeholders of the company (e.g. bondholders and owners of preferred shares. On the other hand, if the value of the company increases, the shareholders are entitled to larger potential benefits, which may well exceed the guaranteed interest of bondholders.

Concept	**Common or ordinary share (stock)** – an equity share that does not have a fixed dividend yield.

The **variability of returns to shareholders** is affected by the proportion of debt to equity financing (called the debt to equity ratio) of the company. The higher the proportion of debt financing, the larger the fixed interest payments and the lower is the number of shares over which the net profit is to be distributed. When earned profits exceed the level necessary to pay the interest, all the excess profit accrues to the smaller number of shareholders. On the other hand, if profits decrease below interest payments, the whole reduction in payments is borne by the company shareholders. The higher is the debt to equity ratio, the greater is the variability in dividend payments to shareholders. Thus common shares in 'highly leveraged' companies are usually regarded as riskier than those in 'low leveraged' companies.

Concept	**Leverage:** The amount of debt, relative to equity, in a firm's capital structure. Usually expressed as the ratio of debt to equity, D/E, or debt to total capital D/(D E).

The law requires that the company provides the owners with specified **information** in the annual report and accounts and that the firm must hold an annual general meeting at which management conduct is subject to approval by common (ordinary) shareholders, each of whom has a number of votes matching the size of his shareholding.

The **decision to issue equity** against debt is based on several factors:

- **Tax incentives.** In many countries interest payments are tax deductible, however dividends are taxed. Thus the tax shield of debt forms incentives to finance company by debt.

- **Cost of distress.** Increase of company leverage, increases the risk of financial insolvency and may cause distress as well as lead to bankruptcy. Thus companies tend to minimise their credit risk and increase the portion of equity in the capital structure.

- **Agency conflicts.** When a company is financed by debt, an inherent conflict arises between debt holders and equity holders. Shareholders have incentives to undertake a riskier operating and investment decisions, hoping for higher profits in case of optimistic outcomes. Their incentives are mainly based by limited liability of their investments. In case of worst outcome debt holders may suffer more, in spite of their priority claims towards company assets.

- **Signalling effect.** The companies, which issue equity to finance operations, provide signals to the market, that current share selling price is high and company is overvalued.

Check Question	Why does financial distress increase agency conflicts between equity holders and debt holders?

5.1.2. Preferred shares

Preferred shares is a financial instrument, which represents an equity interest in a firm and which usually does not allow for voting rights of its owners. Typically the investor into it is only entitled to receive a fixed contractual amount of dividends and this make this instrument similar to debt. However, it is similar to an equity instrument because the payment is only made after payments to the investors in the firm's debt instruments are satisfied. Therefore it is call a hybrid instrument.

Technically preferred shareholders share ownership of the firm with common shareholders and are compensated when company generates earnings. Therefore, if the company does not earn sufficient net profit, from which to pay the preferred share dividends it may not pay dividends without the risk of bankruptcy. Because preferred stockholders typically are entitled to a fixed contractual amount, preferred stock is referred to as a **fixed income instrument**.

Concept	**Preferred share** – an equity security, which carries a predetermined constant dividend payment.

Preferred stock investments may have **tax advantage** to institutional investors.

Majority of preferred shares have **cumulative dividend provision**, which entitles to preferred share dividend payments (current and from previous periods) dividend payments on common shares. Usually owners of preferred shares do not participate in the net profit of the company in excess to the stated fixed annual dividend.

Due to the fact that preferred dividends can be omitted, the company **risk** is less compared to risk in case of company debt. However in this case, company may find it difficult to raise new capital before all preferred dividends are paid. Investors may be unwilling to make new investments before the company is able to compensate its existing equity investors.

Preferred stock is an attractive source of financing for highly leveraged companies. Equity markets offer a variety of innovations in preferred shares issues. These varieties include:

- cumulative preference shares

- non-cumulative preference shares

- irredeemable

- redeemable preference shares

- convertible preference shares

- participating preference shares

- stepped preference shares.

With the exception of the first two, these characteristics are not excluding each other. For example it is possible to issue non-cumulative, redeemable, convertible preferred shares.

Non-cumulative preferred shares do not have an obligation to pay any missed past dividends, with the effect that missed dividends may be lost forever.

A redeemable preferred share has a maturity date on which the original sum invested is repaid, whereas most preference shares have no maturity date (the issuer may pay the dividends forever and never repay the principal sum). Some redeemable preference shares provide the issuer with the right to redeem at a predetermined price without the obligation to do so; in effect such preference shares provide the issuer with a call option, which would be paid for by means of a higher dividend for the investors.

Convertible preferred shares give the holder the right to convert preference shares into ordinary shares at a predetermined rate; the investor pays nothing to convert apart from surrendering the convertible preference shares. In some cases the right to convert arises only in the event of a failure to pay dividends.

Participating preferred shares allow the issuing company to increase the dividends if profits are particularly high; the preference share dividend can exceed the fixed level if the dividend on ordinary shares is greater than a specified amount.

Stepped preferred shares pay a dividend that increases in a predetermined way.

Specific **adjustable rate preferred shares** are attractive in increasing interest environment. If the dividend is reset each quarter according to a pre-established formula based on Treasury bill rate, these issues can be considered as company capital.

Auction rate preferred shares (ARPS) or **Single point adjustable rate shares (ARPS)** reset dividend periodically using Dutch auction method. The reset date can be as frequent as 49 days. Because of characteristics close to money market securities, they have significantly lower yields.

Concept	Dutch auction - a method, which allows all investors participating in the auction submitting a bid for the stock by specified deadline. The bid prices are ranked and minimum price for selling of shares is determined. All bids equal or above minimum price are accepted, and all bids bellow the minimum price are rejected.

Preferred equity redemption cumulative stocks (PERCS) are shares that pay dividends and are automatically converted into common stock at a conversion price and date. These

can be callable at any date after the issuance for price above the issue price (e.g. by 40%) and gradually declines as the conversion date approaches.

The **cost of preferred equity financing** may be higher, compared to debt financing. Preferred dividend is not a tax deductible expense to the company. Besides, investors are compensated more, as they assume its risk is higher due to the fact, that the company legally is not required to pay preferred dividends. As a rule, preferred equity has no maturity, thus it may force company to permanent preferred dividend payments.

Check Question	Why does financial distress increase agency conflicts between equity holders and debt holders?

5.1.3. Private equity

When companies are organized as partnerships and private limited companies, their shares are not traded publicly. The form of equity investments, which is made through private placements, is called **private equity**.

In such case investors' liability may not be limited to the amount of contributed capital, and may be extended to total wealth of private owners. It is used mainly by small and medium-sized companies, young or start-up business in need to raise significant funds for investment. However, their access to bank or public stock market financing is limited. Typically banks do not finance start-ups due to significant risks of their operations, and a limited company equity base. On the other hand, a public offering of shares for such companies may be feasible only if it has a significant shareholder base to support an active secondary market. Without an active secondary market such shares are illiquid, founders of the companies find it difficult to "cash out" by selling their original equity investment, can be forced to sell shares at a discount to the fundamental company value, fixed costs of being public company are high, and this prohibits company from being public. Therefore such companies attempt to raise additional capital from wealthy individual or institutional investors. This type of investments has grown significantly since late 1990s, mainly in US and is slowly gaining ground in European countries.

The most important sources of private equity investments come from **venture capital funds**, **private equity funds** and in the form of **leveraged buyouts**.

Venture capital funds receive capital from wealthy individual or institutional investors, willing to maintain the investment for a long-term period (5-10 years). Venture capital market brings together private businesses that need equity financing and venture capitalists (business angels) that can provide funding. Venture capital fund identifies potential of the business, negotiates the terms of investment, return from the investments, exit strategy. The invested funds are not withdrawn before a set deadline. Common exit strategies are either through the public sale of the equity stake in public stock offering, or through cash out if the company is acquired by another firm.

Private equity funds pool resources of their partners to fund most often new business start-ups. They can rely heavily on debt financing, also. Thus, they perform the role of financial intermediaries. Private equity funds usually take over the businesses, manage them and control the restructuring, charge annual fee for managing the fund. Exit strategies are similar to the ones used by venture capital funds.

Leveraged buyouts are company equity purchases by individual or institutional investors, which are financed by a minor portion of share capital and a major portion of debt, provided by banks or other financial intermediaries.

5.1.4. Global shares and American Depository Receipts (ADR)

Investors may invest into foreign shares by purchasing shares directly, purchasing American Depository Receipts (ADRs), Global Depository Receipts (GDRs). Alternatively, investments can be made by investing into international funds or purchasing exchange traded funds (ETFs).

Direct purchases of foreign shares can be limited due to limited access to the stock exchanged, a limited available set of shares, high transaction costs through specialized brokerage companies.

Shares in international funds (International mutual funds (IMFs)) offer possibility of investing into a portfolio of international securities, *created and managed* by various financial institutions. Thus individual investors may get access and diversify across international stocks. IMFs can be specializing on specific country or across several countries or regions.

Exchange traded funds (ETFs) are passive funds, that *track specific index*. Thus investor can invest into a specific index, representing a country's (e.g. foreign) stock market. Although ETFs are denominated in US dollars as a rule, the net asset value of an international ETF is determined by translating foreign currency value of the foreign securities into dollars.

While the price of each international ETF is denominated in US dollars, the underlying securities that make up the index are denominated in non-US currencies. Thus the return on ETF will be influenced by the movement of the country's currency against dollar. If the country's currency appreciates, this will increase the value of the index as measured in dollars. On the other hand, if the foreign currency depreciates, this will reduce the value of the index as measured in dollars. This is also true for IMFs.

Check Question	What are advantages and disadvantages for investing into exchange traded funds (ETFs) and international investment funds?

American Depository Receipts (ADR) is an arrangement under which foreign shares are deposited within a US bank, which in turn issues ADRs in the name of foreign company. In this way the shares of a foreign company is admitted to the well developed stock market, like US or UK. When issued in US, they are denominated in US dollars. Dividends are also paid in US dollars, even if the underlying security's cash flows are denominated in terms of foreign issuer's home currency.

ADR may represent a combination of several foreign shares (e.g. lots of 100 shares). Trading takes place in negotiable certificates representing ownership of shares of the company.

Concept	**American Depository Receipts (ADR)** – a certificate of ownership issued by a US bank to promote local trading on a foreign stock. US bank holds foreign shares and issues ADRs against them.

An ADR program, which is created without company's involvement, is called an **unsponsored ADR**.

If ADR program is created with an assistance of the company, it is called a **sponsored ADR**.

Such shares can be registered within the securities exchange commission and comply with reporting requirements, and thus be traded on an organized stock exchange. Without such registration and reporting compliance, they can be traded on the over-the counter market.

Table 5. Comparison of equity instruments

Instrument	Types	Characteristics	Investors	Market
Common shares	Common (ordinary) shares, Puttable common shares, ADRs GDRs	Corporate ownership	Companies, state, financial institutions, non-financial intermediaries, individual investors	Stock exchange
Preferred shares	cumulative preference shares, non-cumulative preference shares, redeemable preference shares, convertible preference shares, participating preference shares, stepped preference shares.	Hybrid security, Features of equity and debt, Callability	Financial institutions, non-financial intermediaries, individual investors	Preferred stock market / stock exchange
Private equity	Venture capital fund shares Private equity fund shares	Private placements, investments of pool of funds, Partnerships or private limited form of companies	Venture capital companies, institutional investors, individual investors (business angels)	Private equity market

Advantages of ADRs include

- easy and direct access to funding in the foreign market;

- building company name recognition in the foreign country;

- reliable quoting of share prices;

- close following by investment analysts.

Disadvantages of ADRs:

- A costly investment alternative;

- For large institutional investors vs small retail investors differences in prices and return;

- Market for ADRs can be illiquid;

- Multiple listing can result in share price differences in various markets globally.

Global Depository Receipts (GDRs) are negotiable receipts issued by financial institutions in developed countries against shares of foreign companies. GDRs can be simultaneously issued in US and Europe.

Financial institution collects and distributes dividends paid by the foreign firm to the GDR (also ADR) investor. Thus financial institutions facilitate access to world equity markets by intermediating between world investors and companies in developing and transition countries.

Check Question	What are advantages and disadvantages of issuing American Depository Receipts and Global Depository Receipts to issuing companies and to investors?

5.2. Primary equity market

When equity shares are initially issued, they are said to be sold in the **primary market.** Equity can be issued either privately (unquoted shares) or publicly via shares that are listed on a stock exchange (quoted shares).

Public market offering of new issues typically involves the use of an investment bank in a process, which is referred to as the *underwriting of securities*.

Private placement market includes securities which are sold directly to investors and are not registered with the securities exchange commission. There are different regulatory requirements for such securities.

In the private equity market, venture capital is often provided by investors as 'start-up' money to finance new, high-risk companies in return for obtaining equity in the company.

In general private placement market is viewed as illiquid. Such a lack of liquidity means that buyers of shares may demand a premium to compensate for this unappealing feature of a security.

5.2.1. Primary public market

Initial public offering (IPO) means issuing public equity, i.e. when a company is engaged in offering of shares and is included in a listing on a stock exchange for the first time. It allows the company to raise funds from the public.

If a company is already listed and issues additional shares, it is called **seasoned equity offering (SEO)** or **secondary public offering (SPO)**. When a firm issues equity at a stock

exchange, it may decide to change existing unquoted shares for quoted ones. In this case the proceeds from sale of shares are received by initial investors. However, when a company issues newly created shares, the raised funds are received by the company.

Process of going public. The issuing company has to develop a prospectus with detailed information about the company operations, investments, financing, financial statements and notes, discussion on the risks involved. This information is provided to potential investors for making decision in buying large blocks of shares. The prospectus is registered within and approved by the securities exchange commission. Afterwards the prospectus is sent to institutional investors, meetings and road shows are organized in order to present the company.

Concept	**Road show** – travelling of company managers through various cities and making presentations for large institutional investors.

Share issues are often underwritten by banks. A bank, which is underwriting a share issue agrees, for a fee, to buy any shares not acquired by investors. This guarantees that the issuing company receives the funding that it expects. In the case of rights issues, firms sometimes avoid paying a fee to underwriters by using the deep discount route. In a rights issue, failure to sell the new shares would result from the share price (prior to the issue) falling below the sale price of the new shares.

Concept	**To underwrite** – an act of guaranteeing a specific price to the issuer of the security.
	Lead underwriter – key investment bank withinn a group of investment banking firms that are required to underwrite a portion of a corporation's newly issued shares.

The deep discount method prices the new shares at such a low level that the market price is extremely unlikely to fall so far.

The share offer price is determined by the lead underwriter, which takes into account the prevailing market and industry conditions. During the road show the lead underwriter is engaged in **bookbuilding**, i.e. a process of collecting indications of demanded number of shares by investors at various possible offer prices.

IPO factors. Public equity markets play a limited role as a source of new funds for listed corporations. Because of information asymmetry, companies prefer internal financing (i.e., retained earnings) to external financing. Myers and Majluf (1984) have introduced the pecking-order theory, which states that companies adopt a hierarchy of financial preferences. If external financing is needed, firstly, companies prefer debt funding. Equity is issued only as a last resort. Statistics on company sources of financing support this view. On the other hand, during equity markets growth and share price increase periods IPO market tend to increase dramatically, while the drop in share prices is followed by decrease in net issuance of public equity. A large number of the issues in the late 1990s were 'new economy' offerings, like the technology, media, and telecommunications sector.

Exercise	A one for four rights issue assumes offering one new share for every four held. A one for four rights issue may be at 160 Euro when the current share price is 200 Euro. The cost of:
	4 shares each 200 Euro equal to 800 Euro
	1 right each 160 Euro equals to 160 Euro
	Thus, 5 shares cost 960 Euro (192 Euro each).

Among other factors the economic cycle is considered to play a significant role in a company's decision to issue public equity. Equity is often used to finance long-term investments, which fluctuate over the business cycle. Shiller (2003) has related the timing of equity issuance with investor sentiment. Developments in investor optimism over time may have an impact on the cost of equity, thus influencing the amount of equity issued. E.g., excessive increases in risk aversion resulting in falling stock market prices could raise the cost of equity, preventing companies from new equity issues. Companies also issue equity in order to finance the acquisition of other companies, either by using the cash proceeds of public offerings or by issuing shares, which are subsequently exchanged for the shares of a target company. Therefore merger and acquisition (M&A) cycles can also be expected to correlate with equity issuance activity.

There are important **advantages and disadvantages of initial public offerings (IPOs).**

Advantages of IPOs:

- Possibility to obtain funds to finance investment.

- The price of a company's shares acts as a measure of the company's value.

- Increases of company financial independence (e.g. from banks) due to listing of a company's shares on a stock exchange.

- Possibility to diversify investments of current company owners by selling stakes in the company in a liquid market.

- Increased recognition of the company name.

- Improved company transparency.

- A disciplining mechanism for managers.

Disadvantages of IPOs:

- High issuance costs due to underwriters' commission, legal fees, and other charges.

- High costs due to disclosure requirements.

- Risk of wider dispersed ownership.

- Separation of ownership and control which causes 'agency problems'.

- Divergence of managers' and outside investors' interests.

- Information asymmetry problems between old and new shareholders.

- Risk of new shareholders focusing on short-term results.

IPO market has received negative publicity due to several problems:

Spinning. Spinning occurs, when investment bank allocates shares from an IPO to corporate executives. Bankers' expectations are to get future contracts from the same company.

Laddering. When there is a substantial demand for an IPO, brokers encourage investors to place the first day bids for the shares that are above the offer price. This helps to build the price upwards. Some investors are willing to participate to ensure that the brokers will reserve some shares of the next hot IPO for them.

Excessive commissions. These are charged by some brokers when the demand for an IPO is high. Investors are willing to pay the commissions if they can recover the costs from the return on the very first day, especially when the offer price of the share is set significantly below the market value.

The literature contains strong evidence that IPOs on average perform poorly over a period of a year or more. Thus from a long term perspective many IPOs are overpriced. Since introduction of Sarbanes-Oxley Act in US, which aimed at improving company reporting processes and transparency, initially returns from IPOs in general have been lower.

Check Question	Why IPO is often underpriced?

Check Question	What are advantages and disadvantages of IPOs to issuing companies and investors?

5.3. Secondary equity market

Equity instruments are traded among investors in a **secondary market**, in which no new capital is raised and the issuer of the security does not benefit directly from the sale.

Secondary markets are also classified into **organized stock exchanges** and **over-the-counter (OTC) markets**.

Apart from legal structure, numerous historical differences are found in the operations of national stock markets. The most important differences are in the trading procedures.

The trading on secondary markets takes place among investors, however most often through specialised intermediaries - stock brokers (dealers), who buy or sell securities for their clients.

Securities' trading in the secondary market form the means by which stocks or bonds bought in the primary market can be converted into cash. The knowledge that assets purchased in the primary market can easily and cheaply be resold in the secondary market makes investors more prepared to provide borrowers with funds by buying in the primary market. Effective secondary market is an important basis of successful primary market.

If transaction costs are high in the secondary market the proceeds from the sale of securities will be reduced, and the incentive to buy in the primary market would be lower. Also high transaction costs in the secondary market might tend to reduce the volume of trading and thereby reduce the ease with which secondary market sales can be executed. Therefore high transaction costs in the secondary market could reduce primary market asset liquidity. In consequence there can be adverse effects on the level of activity in the primary market and hence on the total level of investment in the economy.

5.3.1. Organized exchanges

Stock exchanges are central trading locations, in which securities of corporations are traded. These securities may include not only equity, but also debt instruments as well as derivatives.

Equity instruments can be traded if they are listed by the organized exchange, i.e. included in a stock exchange **trading list**. The list is formed of instruments that satisfy the requirements set by the exchange, including minimum earnings requirements, net tangible assets, market capitalization, and number and distribution of shares publicly held. Each stock exchange specifies the set of requirements.

Advantages of listing on the stock exchange to the corporation and its shareholders are:

- The ability to sell shares on the stock exchange makes people more willing to invest in the company.

- Investors may accept a lower return on the shares and the company can raise capital more cheaply.

- Stock exchange provides a market price for the shares, and forms basis for valuation of a company.

- The information aids corporate governance, allows monitoring the management of the company.

- Listing makes takeover bids easier, since the predator company is able to buy shares on the stock market.

- The increased transparency may reduce the cost of capital.

However there are several **disadvantages of listing**, which include:

- Listing on the stock exchange is costly for the company.

- It requires a substantial amount of documentation to be prepared, e.g. audited and prepared according to IFRS financial statements.

- It increases transparency, which may cause problems in terms of market competition and in takeover cases.

Stock market **dealers and brokers** fulfill specific functions at the equity market. Dealers make market in securities, maintain securities inventories and risk their own funds. In

contrast to dealers, who risk their own funds, brokers do not own securities, but execute matching of buyers and sellers for a specific fee.

<table>
<tr><td>Concept</td><td>Dealer – an agent who buys and sells securities as a principal on its own account, rather than as a broker for his clients. Dealer may function as a broker, or as market maker.</td></tr>
</table>

Dealers stand ready to buy at the bid price and to sell at the ask price, and making profit from the average spread. However, when the stock prices are going down, dealers experience loss of value of stock inventory. This forms the primary risk for the dealer.

<table>
<tr><td>Concept</td><td>Broker – an agent who executes orders to buy and sell securities on behalf of his clients in exchange for a commission fee.</td></tr>
</table>

In order to profit from different price movements directions dealers make **positioning**.

- If the dealer expects the stock prices to increase, it buys the stock and takes **a long position**. Profit is earned, if the stock is sold at a higher price.

- If a dealer expects the stock price to decline, he tries to benefit from **a short position**. In a short sale the security is borrowed and sold in the expectation of buying this security back later at a lower price. The investor tries to sell high and buy low, profiting from the difference. Proceeds from a short sale cannot be used by the shortseller, and must be deposited at the broker. The shortseller must pay any cash dividends to the lender of the security. This rule is related to the amount of drop in stock prices by approximately the after-tax amount of a cash dividend after the dividend payment date. Stock exchanges apply downstick restrictions on short sales in order to prevent from panic selling and driving stock prices sharply down.

If the dealer's forecast is wrong, the dealer must close the position at unfavorable price and absorb the loss. This creates the risk of dealer bankruptcy, and forces stock exchanges as well as securities exchange commissions to impose the specific regulations in order to prevent this type of price manipulations.

<table>
<tr><td>Concept</td><td>Short sale – the sale of the security, which is not owned by the seller at the time of trade.</td></tr>
</table>

Security dealers are heavily **levered**. Typically the dealer's equity forms a small percentage of the market value of his inventory. Most dealers financing is in the form of debt (e.g. bank loan). Majority of dealer debt financing is in the form of repurchase agreements (REPO, see chapter on Money markets).

There are several types of **stock exchange members**:

- **Commission brokers** – who execute buy and sell orders for the public for the fee. This is the largest group of market participants, acting as agents of lenders or buyers of financial securities. They may find the best price for someone who wishes to buy or sell securities.

- **Odd-lot brokers** – a group of brokers, who execute transactions of fewer than 100 shares. These brokers break round lots (a multiple of 100 shares) into odd-lots and vise versa for a fee.

- **Registered trader** – who owns a seat on a stock exchange and trades on his own account. Large volume of trades, along with the possibility of speedy execution of

orders, allow the traders to cover their large investments into the seat of a stock exchange.

- **Specialists** – who are market makers for individual securities listed on an organized stock exchange. Their purpose is to reduce variability of the securities prices. When there are too many sell orders, the specialists have to perfume a role of buyers to keep the prices from falling for a period. When there are too many buy orders, the specialists have to perfume a role of sellers to prevent the temporary rise in prices.

- **Issuing intermediary** - who undertakes to issue new securities on behalf of a borrower. An issuing house acts as an agent for the borrower in financial markets. This task is usually carried out by investment banks

- **Market-maker** is an intermediary who holds stock of securities and quotes a price at which each of the securities may be bought and sold. Market-making is usually performed by the securities divisions of the major banks

- **Arbitrageur** - who buys and sells financial assets in order to make a profit from pricing anomalies. Anomalies occur when the same asset is priced differently in two markets at the same time. Since financial markets are well informed and highly competitive, usually these anomalies are very small and do not last long. Anomalies are usually known, thus there is no risk of arbitrage, which makes it different from speculation.

- **Hedger** - who buys or sells a financial asset to avoid risk of devaluation of currency, change of interest rates or prices of the securities in the market.

Concept	**Arbitrage** – is the simultaneous purchase of an undervalued asset or portfolio and sale of an overvalued but equivalent asset or portfolio, in order to obtain a riskless profit on the price differential. It takes advantage of market inefficiencies in a risk-free manner.

Stock exchanges set quite high **commissions** for all member firms. The competition from other types of markets, e.g. OTC or third market (direct trading transactions), force stock exchanges to move to negotiated commission schedule, where lower fees can be applied to larger transactions.

Majority of transactions at the stock exchanges are fully automated. Small buy and sell orders are matched by computers.

5.3.2. Over-the-counter (OTC) market

Over-the-counter (OTC) market is the marketplace for trading financial instruments, which are generally unlisted financial instruments. These markets are networks of dealers, who make markets in individual securities. Common equity shares that are traded on it can be listed and unlisted shares.

Concept	**Over-the-counter (OTC) market** – a market for securities made up of dealers. It is not an organized exchange, and trading usually takes place by electronic means.

Two large **segments of OTC markets** can be distinguished:

- **Unorganized OTC markets** with unregulated trading taking place between individuals. Typically these markets do not restrict possibilities to buy and sell outside of organized exchanges.

- **Highly organized and sophisticated OTC markets**, often specializing in trading specific company shares. Examples of organized over-the-counter markets are the NASDAQ and upstairs markets in the United States. Trading takes place via a computer network. Market makers display the prices at which they are prepared to buy and sell, while investors trade with the market makers, usually through brokers. *The upstairs market* is mainly used by institutional investors and handles large buy and sell orders (block trades). Institutions place orders through brokers, who an attempt to find a transaction counterparty. In the absence of such a counterparty, the broker attempts to execute the order with market makers.

5.3.3. Electronic stock markets

Since the middle of 1990s a number of electronic stock markets were created for disclosing and executing stock transactions electronically. While publicly displaying buy and sell orders of stock, they are adapted mainly to serve execution of orders institutional investors mainly. Registered and regulated electronic stock exchanges developed from electronic communication networks (ECN). Some **electronic communication networks (ECNs)** exist along with official exchanges.

Concept	**Electronic communication networks** – order-driven trading systems, in which the book of limit orders plays a central role.

The popularity of ECNs stems from the possibility to execute security trade orders efficiently. They may allow complete access to orders placed on other organized or electronic exchanges, and thus eliminate the practice of providing more favourable quotes exclusively to most important clients. As a result quote spreads between the bid and ask prices are reduced.

Since ECNs can execute orders of stocks listed and traded on organized or other electronic exchanges, they form the increasing competition among the stock exchanges. Examples of well known electronic trading systems include Instinet (acquired by NASDAQ), Archipelago (merged into NYSE), SETS (London Stock Exchange's premier electronic trading system).

As an alternative to organized stock exchanges the so called **alternative trading systems (ATS)** have developed, based on the idea there is no necessity to use an intermediary in order to conduct a transaction between two parties. In fact the services of a broker or a dealer are not required to execute a trade. The direct trading of stocks between two customers without the use of a broker or an exchange is called an ATS.

There are two types of **alternative trading systems (ATS)**:

- crossing networks;

- dark pools.

Electronic crossing networks do not display quotes but match large buy and sell orders of a pool of clients (dealers, brokers, institutional investors) anonymously. These networks are batch processors that aggregate orders for execution. Market orders are crossed once or a few times per day at prices, which are determined in the primary market for a security.

The trade price is formed as a midpoint between bid and ask prices, observed in the primary market at a certain time. There is a variety of ECNs, depending upon the type of order information that can be entered by the subscriber and the amount of pretrade transparency that is available to participants. An example of an electronic crossing network is POSIT.

Concept	**Electronic crossing networks** – order-driven trading systems, in which market orders are anonymously matched at specified time, determined in the primary market for the system.

Electronic crossing networks provide low transaction costs and anonymity, which are important advantages for large orders of institutional investors. They are specifically designed to minimize market impact trading costs.

However, there is no trading immediacy, since the traders have to wait until the crossing session time to execute the orders and an offsetting order entered by other market participant. Thus their execution rates tend to be low. Besides, if they draw too much order flow away from the main market, they can reduce the quality of the prices on which they are basing their trades.

Dark pools are private crossing networks, which perform the traditional role of a stock exchange and provide for a neutral gathering place at the same time. Their participants submit orders to cross trades at prices, which are determined externally. Thus they provide anonymous ("dark") source of liquidity.

Dark pools are electronic execution systems that do not display quotes but execute transactions at externally provided prices. Buyers and sellers must submit a willingness to transact at this externally provided price in order to complete a trade.

The key advantage of dark pools systems is that they are designed to prevent information leakage and offer access to undisclosed liquidity.

A separate form of computerized trading is **program trading**, which is defined as simultaneous buying and selling of a large portfolio of high rated stocks with a significant aggregate value. Another understanding of programme trading refers to the use of computer system (Designated order turnaround (DOT)), which allows traders to send orders to many trading posts at the exchange. Program trading is used to reduce the susceptibility of stock portfolio to stock market movements, e.g. by selling a number of stocks which become overpriced, or by purchasing of stocks which become underpriced.

The critics of program trading state that it is one of the major reasons for decline or rise in the stock market and increases market volatility. Due to these concerns, stock exchanges implement *collars*, which restrict program trading when a wide stock index changes (e.g. by 2 percent) from the closing index on the previous trading day. When the collars are imposed, program trading for the sell orders becomes allowed when the last movement in the stock price was up (or "uptick"). Conversely, when program trading is for the buy orders, it becomes allowed when the last movement in the stock price was down (or "downtick"). Such restrictions are supposed to half stabilizing effect on the market.

5.4. Secondary equity market structure

Secondary markets are characterized based on the trading procedures.

5.4.1. Cash vs forward markets

Cash markets are markets where stocks are traded on a cash basis and transactions have to be settled within a specified few days period. Typical period is three days after the transaction.

In order to increase the number of trades most cash markets allow **margin trading.** Margin trading allows the investor to borrow money or shares from a broker to finance the transaction.

Forward markets are markets in which in order to simplify the clearing operations, all transactions are settled at a predetermined day, e.g. at the end of a period (month). This is a periodic settlement system, in which a price is fixed at the time of the transaction and remains at this value in spite of market price changes by the settlement time. In order to guarantee a position, a deposit is required. Such a system does not prevent short-term speculation. Some cash markets provide institutionalized procedures to allow investors to trade forward, if they desire.

5.4.2. Continuous markets and auction markets

Continuous markets are markets where transactions take place all day and market makers are ensuring market liquidity at moment.

Dealer market is the market in which dealers publicly post bid and ask prices simultaneously, and these become firm commitments to make transaction at the prices for a specific transaction volume. Investors are addressing the dealers offering the best price (quote).

Auction market is a market in which the supply and demand of securities are matched directly and the price is formed as an equilibrium price.

An **open outcry** system allow brokers to negotiate loudly until price, which is an equilibrium of buy and sell orders, is determined.

In a **call auction** market all orders are put into an order book until an auction and are executed at a single price. Liquidity requires that such trades take place one or several times during a day. Such trading procedures are aimed at defining the auction price that maximizes the trading volume.

Concept	Call auction – a method of determining the market price of a security by finding the price, which balances buyers and sellers. Such price *fixing* takes place periodically each day at defined time.

5.4.3. Order-driven markets and quote-driven markets

The mechanism by which buyers and sellers interact to determine price and quantity of securities in the trade is called **market structure.**

There are two overall market structures for trading financial instruments:

- order driven and
- quote driven.

Order-driven market structure allows buyers and seller orders submit their orders through their broker. The latter sends these orders to a centralized location, where orders are matched and the transaction is executed.

Concept	**Order - driven market** – a market without active market makers, in which buy and sell orders directly confront each other. *An auction market*.

There are different forms of order-driven markets. In *call markets*, the price is determined several times at specified moments. In that way, orders can be collected and the auction takes place at the specified time. This type of auction is widely used for initial public offerings of equity (and new issues of government debt). The call market mechanism has disappeared in secondary markets for bonds and equity, and has been replaced by continuous trading systems. In *continuous auction markets*, public investors send their instructions ('orders') to buy or sell to brokers.

Typically order-driven trading systems are computerized. If not all orders at a price can be executed, a priority is given to the oldest order. Order driven markets are highly formalised as the auction rules for matching trades have to be specified in great detail to ensure an orderly and fair trading process.

Advances in information technologies have supported the development of order-driven markets, in particular for equity trading. The combination of smart trading rules (software) with fast computers (hardware) allows an almost instantaneous matching of orders.

A group of stock exchanges worldwide (e.g. Paris, Frankfurt stock exchanges) use electronic order-driven systems, which allow all limit orders to be stored in the central order book. A new arriving order is immediately matched with the previously submitted orders from the order book. The trader can view all submitted orders and foresee what trades will be executed if a new order is entered. The highest limit order and the lowest limit order are in fact the bid and ask prices of the market. One of the examples of trading platform of the order-driven system is XETRA, used by Frankfurt stock exchange.

Quote-driven market structure is the one, in which market makers or dealers quote the prices at which the public market participants are trading. Market makers provide a *bid quote* (to buy) and an *ask quote* (to sell). Market makers or dealers earn profit from the spread between the two quotes and the turnover of the shares.

Concept	**Quote-driven market** – a market in which dealers (market makers) adjust their quotes continuously to reflect supply and demand. This is a dealer market. Also called *price-driven market*.

Anyone who wants to trade in a quote-driven market must trade with a dealer. Either the investors negotiate with the dealers themselves or their brokers negotiate with the dealers.

Quote-driven markets require little formal organisation, however require mechanisms for publishing the dealers' price quotations and for regulating the conduct of dealers. Stock exchanges usually provide the dealers or market makers with privileged access to certain administrative procedures or market information. In return for these privileges, dealers have particular obligations, i.e. to quote 'firm' bid and ask prices at which they guarantee to make trades of up to specified volumes.

A typical quote-driven system is applied by NASDAQ, in which an automated system posts firm stock quotes of the dealers, who place equivalent buy limit orders and sell limit orders. However, when posting the quotes, the dealers do not know, which trades will be generated.

5.4.4. Hybrid markets

Hybrid market structures are the ones, which have elements of, for example, quote-driven and order-driven market structures.

A market that integrates traditional floor trading with electronic auction trading has been developed by NYSE (US). Another example is Euronext, which uses an order-driven trading system with a centralised electronic order book. Euronext also enables small and medium-sized listed companies to hire a designated market maker to act as 'liquidity provider' in their stock. London Stock Exchange combines electronic order-driven trading with liquidity provision by market makers.

Market structures are often compared from the point of view of their **transparency and liquidity.** In spite of expectations of the same market prices both in quote-driven and order-driven markets, in reality quote-driven markets tend to be more fragmented. Dealers quote different bid and ask prices, information on executed orders can be made available with some delay (to allow dealers some time to off-load large trades in the market). As a result, order-driven markets tend to be more transparent than quote-driven markets.

Liquidity can be also different. Investors can trade immediately in continuous order-driven markets, but have to wait for the next price fixing in a call market. The price, however, depends on the availability of sufficient number of orders, i.e. liquidity. Thus investors may prefer to negotiate price individually with dealers in quote-driven markets. In quote-driven markets information about transactions may be delayed also.

5.5. Equity market transactions

5.5.1. Bid-ask spread

When a security is traded, a dealer, operating as a market-maker, quotes a price at which he/she is prepared to sell – the offer price – and a price at which he/she is willing to buy – the bid price. In the transaction the buyer pays the ask price and the seller receives the bid price. The ask price is always above the bid price.

Concept	**Ask price** – the price at which market maker is willing to sell a security. Also called an *offer price*.

Concept	**Bid price** – the price at which market maker is willing to buy a security.

The difference is called the bid–ask spread and is the profit of the dealer:

Spread = ask price – bid price.

The market bid-ask spread is the excess of the lowest ask price over the highest bid price and is normally smaller than the spreads of individual market-makers.

Concept	**Bid - ask spread** – the difference between the quoted bid and ask prices.

Example	Company's shares are quoted by a broker as bid for 49,8 Euro

and 50,0 Euro. The bid- ask spread in percentage is:
Spread = (50,0 Euro – 49,8 Euro)/ 50,0 Euro = 0,2 / 50,0 =
= 0,4%

If investor purchases the share and then immediately sells it before the market price of the share changes, he will incur a cost of 0,4% of his investment for the round-trip transaction.

The bid-ask spread of dealer can be seen as the price to be paid by investors for his services. On the other hand, from the perspective of the dealer the spread can be seen as a compensation for his costs and risks. The dealer typically holds an inventory of securities during the day to be able to sell (and buy) immediately. From his return (i.e., the bid–ask spread), the dealer has to cover the costs of holding his inventory (e.g., interest costs of financing the securities inventory) and the risks (e.g., prices may move while the securities are in the inventory).

From the perspective of investors, dealers (in their role as market-makers) provide two important services:

- possibility to execute a trade immediately from inventory, without having to wait for a counterparty to emerge.

- maintenance of price stability in the absence of corresponding sell or buy orders. By trading from their own stockholdings, dealers reduce price fluctuations.

The dealer costs include the administrative costs of transferring shares.

The dealer risks arise from price fluctuations and information-based investors.

For shares that are infrequently traded, such as shares in smaller companies, the risks are greater, because positions are held for longer periods between trades. If shares are held for a long time, the risk of losses from price falls is greater. As a result the bid-offer spreads for such shares tend to be relatively high.

Dealer risk is also related to the possibility of investors possessing information that the dealer does not. Such investors are able to make profit at the expense of the dealer. Investor can sell shares to the dealer at a high price, while he is informed about a possible fall of share price. As a result the dealer may suffer the loss from a fall in the share price. The bid-offer spread is to provide the dealer with compensation for bearing this kind of information risk.

Dealers have a possibility to negotiate special prices for large transactions. The spread can be broader for particularly large transactions (i.e., block trades) to cover the price risk of such block trades before the dealer can sell on (or buy) the bought (sold) securities to (from) other dealers in the market.

Thus the spread is influenced by the following factors:

- order costs – costs of processing orders, including clearing costs and costs of recording transactions;

- inventory costs – include the costs of maintaining an inventory of particular shares;

- competition – the larger the number of market makers, the greater their competition, and the narrower is the spread;

- volume – the larger the trading volume, the more liquid are the shares, the less risk of share price change;

- risk – the more risky are company operations, the more volatile are its shares, the higher spread is set.

Several research studies showed that bid-ask spreads on specific large stock exchanges are wider as they should be. Due to specific trading practice, market makers kept their profits margins wide. Some analysts called this phenomenon "under-the-table-payment" for **order flow** or the right to execute customers' trades. Therefore it abuses small investors, who do not receive the best price for their quotes.

Concept	**Order flow** – the right to execute customers' trades.

5.5.2. Placing order

An investor who wants to buy shares on a stock exchange has a possibility to submit different types of orders through a broker.

Market order is the simplest and most common. It requires that the shares should be traded at the most favorable price available. The most favorable price is the lowest obtainable price for a purchase, and the highest available price for a sale shares. The trade then takes place at a price that is currently available in the market.

Concept	**Market order** – an order to buy or sell a security immediately at the best obtainable price.

Limit order places a limit on the price at which shares can be bought or sold. Thus it specifies purchase or sale of shares at maximum buying price or minimum selling price, respectively.

The outstanding limit-orders are generally listed in a limit-order book, which allows automatic trade matching. However in practice some possibility in setting the priority of orders remains. Limit orders remain on the limit order book until they are withdrawn by the investors, or until they can be executed as a result of new orders arriving.

Concept	**Limit order** – an order to buy or sell a security at a specified price or better, i.e. lower for a buy order and higher for a sell order.

Specific types of orders include:

- **Buy limit order (stop buy order)**, which specifies that the purchase should take place only if the price is at, or below, a specified level.

- **Sell limit order (stop loss order)**, which specifies a minimum selling price such that the trade should not take place unless that price, or more, can be obtained.

- **Market-if-touched order** becomes a market order if the share price reaches a particular level. It is different from a limit order as there is no upper limit to the purchase price, or lower limit to the selling price. As soon as trade in the market happens at the specified price, the order becomes a market order. However, the specified price is not necessarily obtained.

- **Stop order** is also an order that becomes a market order if there is a trade in the market at a particular price. However it involves selling of shares after the price has fallen to a specified level, or buying after the price has risen to a level. Stop orders are aimed at protecting market participants' profits, or limiting their losses.

They seek to ensure that a selling price is not too low, or that a buying price is not too high.

<table>
<tr><td rowspan="15">Example</td><td colspan="4">A broker is intending to by company X shares. He can access the central limit order book directly on the internet. The following information sell orders (limit prices) and buy orders (ask prices) is provided.</td></tr>
<tr><td colspan="2">Sell orders</td><td colspan="2">Buy orders</td></tr>
<tr><td>Quantity</td><td>Limits</td><td>Limits</td><td>Quantity</td></tr>
<tr><td>1000</td><td>58</td><td>49</td><td>2000</td></tr>
<tr><td>3000</td><td>54</td><td>48</td><td>500</td></tr>
<tr><td>1000</td><td>52</td><td>47</td><td>1000</td></tr>
<tr><td>1000</td><td>51</td><td>46</td><td>2000</td></tr>
<tr><td>1000</td><td>50</td><td>44</td><td>10000</td></tr>
<tr><td colspan="4">A broker has an order to buy 1000 shares and enter a market order to buy those shares. A market order will be executed against a best matching order. At what price will he buys the shares?</td></tr>
</table>

Another dimension to an order is the length of time for which it remains in force.

- **Fill-or-kill order** is to be cancelled if it cannot be executed immediately.

- **Open order**, or **good-till-cancelled order**, remains in force until it is specifically cancelled by the investor.

<table>
<tr><td rowspan="2">Example</td><td>Company X shares is traded at one of European stock exchanges and its last transaction has been at 40 Euro per share. An investor entered a limit order to sell the shares at 41 Euro while the market price was still 40 Euro.</td></tr>
<tr><td>Company X shares are also traded on NASDAQ as an ADR. One ADR represents one fourth of the share (4 ADRs equal 1 share). ADR price is quoted by a market maker at 10-10,20. Suppose favourable information is disclosed to the market participants, which drives company share prices to 45 Euro. Who are the parties exposed to losses at the European stock exchange and on NASDAQ if they do not react immediately?</td></tr>
</table>

Investors can also specify the period of time for which the order should remain open, e.g. a day, a week, or a month.

<table>
<tr><td>Example</td><td>Market orders for a company X shares have been entered on a crossing network for European shares. There is one order from participant Z to buy 60000 shares, one order from</td></tr>
</table>

5.5.3. Margin trading

Investors can borrow cash to buy securities and use the securities themselves as collateral. A transaction in which an investor borrows to buy shares using the shares themselves as collateral is called **margin trading** or **buying on margin**.

Concept	**Margin trading** – an arrangement in which an investor borrows money or shares from a broker to finance a transaction.

The funds borrowed to buy the additional stock are provided by the broker, who in his turn borrows from a bank. The interest rate that bank charges broker for funds for this purpose is called the **broker call rate** or **call money rate**. The broker charges the borrowing investor the call money rate plus a service charge.

Stock exchange regulations set **margin requirement**, which does not allow brokers to lend more than a specified percentage of the market value of the securities. The aim of margin requirement is to discourage excessive speculation and ensure greater stability in the markets. Margin requirement has to ensure that investors can cover their position in case the value of their investments into shares reduces. In such a away the possibility of default on broker loans should be reduced.

In order to purchase shares on margin investors have to create an account with a broker, which is called a margin account. The initial deposit of cash is called **initial margin**.

Concept	**Margin deposit** – the amount of cash or securities that must be deposited as guarantee on a futures position. The margin is a returnable deposit

Stock exchange regulations set **initial margin requirement**, which is the proportion of the total market value of the securities that the investor must pay as an equity share, and the remainder is borrowed from the broker.

Example	Assume an investor buys 200 shares of a stock at 30 Euro per share for 6000 Euro of stock on 50% margin and the maintenance margin is 30%. By purchasing 6000 Euro of a stock on 50% margin, the investor must put up 3000 Euro of cash (or other equity) and so borrows 3000 Euro. The investor, however, must maintain 30% margin. Accordingly, if the stock price declines 21,43 Euro the stock position has a value of 4286 Euro (21,43 Euro × 200 shares). With a loan of 3000 Euro, the equity in the account is 1286 Euro (4286 Euro – 3000 Euro), or 30% of the account value (1286 Euro / 4286

As time passes, the market value of the shares is changing. The investor's equity position then represents the value of shares, which is left to the investor after the loan from the broker is paid back. In order to reduce the possibility of default, the stock exchange regulation rules establish a **maintenance margin requirement**. This is the minimum proportion of the equity in the investor's margin account to the total market value.

Concept	**Maintenance margin** – the minimum margin that an investor must keep on deposit in a margin account at all times.

Example	Consider a margin example for a short position. An investor shorts (borrows and sells) 200 shares of a stock at 30 Euro for a total stock value of 6000 Euro. With an initial margin of 50%, the investor must deposit 3000 Euro (in addition to leaving the 6000 Euro from the sale in the account). This leaves the investor with a balance of 9000 Euro (which does not change with the stock price since it is in cash).
	However, the investor owes 200 shares of the stock at the current market price. Assuming the maintenance margin is 30%, if the stock price rises to 34,62 Euro the 200 shares are worth 6923 Euro or 30% of the market value of the position (2077 Euro / 6923 Euro) and additional margin must be posted.

The use of borrowed funds for investments into shares can magnify the returns on the investment. However, when borrowed funds are used, any losses are also magnified.

Exercise	Assume investor X has 59500 Euro to invest and is considering buying corporation's shares at a price of 59,5 Euro per share. With his 59500 Euro investor X can buy 1000 shares (ignoring commissions). Suppose investor's X broker can arrange for him to borrow an additional 59500 Euro so that investor X can buy an additional 1000 shares. Thus by investing 119000 Euro, he can purchase a total of 2000 shares. The 2000 shares will be used as collateral for the 59500 Euro borrowed, and investor X will have to pay interest on the amount borrowed.
	By borrowing funds, an investor creates financial leverage. Investor X, for a 59500 investment, realizes the consequences associated with a price change of 2 000 shares of the corporation rather than 1 000 shares. He will benefit if the price rises but will be worse off if the price falls (compared to borrowing no funds).
	If the price of corporation's shares rises to 68,5 Euro per share, ignoring commissions and the cost of borrowing, investor X will realize a profit of 9 Euro per share on 2,000 shares, or 18000. Had investor X not borrowed 59500 Euro to

The return from the investment into securities is influenced by the proportion of the investment that comes from borrowed funds.

The return on stock purchased on margin is defined:

$r = (SP - INV - L + D) / INV$

where SP – is the selling price of securities, INV – is initial investment by investor not including borrowed funds, L – loan payments on borrowed funds including principal and interest payments, D – dividend payments on the security.

Example	Assume investor decides to purchase on margin company shares, which have current market price of 60 Euro per share. Annual dividend is 3 Euro per share. The investor pays 30 Euro per share in cash and borrows the remaining amount from a broker at 10% interest p.a. After a year the share is sold in the market at 90 Euro per share.
	The return for the investor is equal:
	$r = (90 - 30 - 33 + 3) / 30 = 100\%$
	However, if the share price declines to 40 Euro and is sold for that price, the return over a year will be equal to:
	$r = (40 - 30 - 33 + 3) / 30 = -66,7\%$

If the investor's margin account falls below the minimum maintenance margin (which would happen if the share's price fell), the investor is required to transfer additional cash. The investor receives a **margin call** from the broker specifying the additional cash to be put into the investor's margin account. If the investor fails to put up the additional cash, the broker has the authority to sell the securities for the investor's account. Because of potential margin calls, a large volume of margin lending exposes the stock market to potential crisis. When a sudden huge downturn in the market happens, many margin calls are submitted. This may force investors to sell their share holdings, if they do not have sufficient cash to transfer in order to reach required maintenance margin. Such sales place additional downward pressure on share prices and magnify the negative effect in the market.

5.5.4. Short selling

In a short selling, investor place an order to sell a security that is not owned by the investor at the time of sale. Investors sell the stock short (or short the stock) when they expect decline of the stock price.

They arrange to have their broker borrow the stock from other investor, and the borrowed stock is delivered to implement the sale. To cover their short position, investors must subsequently purchase the stock and return it to the party that lent the stock. Thus investor,

who owns the stock is unaffected when his shares are borrowed, are not aware about the fact that their shares were borrowed.

If the stock price declines by the time the short-seller purchases it in the market in order to return to the investor, from whom he has borrowed, the short seller earns a profit from the difference between the initial selling price and the subsequent purchase price of the stock. However, his profit will be less, if he has to pay to the investor, from whom he has borrowed the stock, dividends which the investor would have received if he had not borrowed the stock.

The risk of a short sale is that the stock price may increase over time, which forces the short-seller to pay a higher price for the stock than the price at which it was initially sold.

Stock markets and financial analysts provide information on level of short sale. Several indicators are used to measure the short position on stock:

- **a degree of short positions.** It is a ratio of the number of shares that are currently sold short, divided by the total number of shares outstanding. Statistics shows, that most often this measure is in the range of 0,5-2%. A high measure of 3% shows a large number of short positions in the market, which may indicate that a large number of investors expect the stock price to decline.

- **Short interest ratio** for specific shares**.** It is the number of shares which are currently sold short, divided by the average daily trading volume over the recent period. The higher the ratio, the higher the level of short sales. The ratio of 20 or more reflects an unusually high level of short sales, indicating that many investors believe that the stock price is currently overvalued. For some stock this ratio may exceed 100 at particular points in time.

- **Short interest ratio** for the market**.** The higher the ratio, the higher the level of short selling activity in the market overall.

Investors, who have established a short position, quite often request a stop-buy order to limit their losses.

5.5.5. Stock trading regulations

Stock market regulations aim at ensuring fair treatment of all investors in the market. Stock trading is regulated by national securities exchange commissions and by individual stock exchanges. It is widely understood, that the development of financial markets and success of new issues of securities cannot be handled without efficient and fair secondary stock markets.

Analysis of average real returns on stock in the well developed markets indicate that historically it has been about 6% percent higher than return on Treasury bills, which reached on average only 1% p.a. The difference between the return on stocks and the risk-free-rate is a measure of risk premium on equities. However, the size of this risk premium is not justified by the stock market's risk exposure, if only investors are assumed to be unreasonably averse to risk. The research has shown that only 0,35% of an equity premium can be justified as risk premium. Such persistent overpricing of risk premium is called an **equity premium puzzle**.

Concept	**Equity premium puzzle** – the persistent overpricing of risk premium on stocks.

If the equity premium puzzle is the result of security mispricing, then there is an arbitrage opportunity. It means that investor can gain by borrowing at the Treasury bill rate and investing in stocks. Borrowing limitations and transaction costs may reduce this arbitrage profit, but not eliminate it.

The concern about the fair and ethical stock market trading require imposing discipline on individuals and institutional investors. The organized stock exchanges introduce surveillance of all transactions at the exchanges. Computerized systems are installed to detect unusual trading of any particular stock. Any abnormal price or trading volume of particular stock or unusual trading practices of market participants is investigated.

Additional regulations on imposing good corporate governance practice for listed companies are imposed through introduced corporate governance codes. Regulations require disclosure of financial statements, having a majority of independent directors (not employees of the companies) on their boards of directors. Such requirements are aimed at reducing existing or potential conflicts of interest between management and minority as well as majority shareholders, focusing management on maximizing stock value for company shareholders. Specific regulation concerns are related to restrictions on trading in case of market downturns.

Stock exchanges can impose **circuit breakers**, which are restrictions on trading when stock prices or stock indexes reaches a specified threshold level. The necessity of such restriction became vivid during stock market crashes, e.g of NYSE in October 1987 and the later ones. When market maker swamp market with sell orders, stock prices cannot reflect the fair value any longer and move into a freefall. The market experiences huge liquidity crisis, which feeds panic and exacerbates the price decline. As a result of such experience, in order to provide time for market participants to regroup and obtain backup sources of liquidity, a series of circuit breakers are put to use.

Concept	**Circuit breakers** – automatic halts or limitations in trading that are triggered upon the attainment of certain stipulated price moves.

The NYSE prevailing circuit breakers have three threshold levels for a daily change of Dow Jones Industrial average index from its previous closing level: Level 1 – 10%, Level 2 – 20%, Level 3 – 30%. If the Level 1 threshold is reached, there is a brief 30 or 60 minute halt in trading. If the Level 2 threshold is reached, there is a slightly longer 1 to 2 hour halt in trading. If the Level 3 threshold is reached, the market is closed for a day. NASDAQ and other large international exchanges impose similar circuit breakers.

Concept	**50 point collar** – provision that prohibits computer assisted trading if Dow Jones Industrial average index rises or falls by 50 points.

Concept	**250 point rule** – provision that halts all trading for one hour if Dow Jones Industrial average index falls by 250 points in a day.

Trading halts may be imposed on particular stocks if stock exchanges believe that market participants need more time to receive and absorb material information, which can affect stock price. Such trading halts are imposed of stocks that are associated with mergers and acquisitions, earning reports, lawsuits and other important news. The purpose of them is to ensure that market has complete information before trading on the news. A halt may last a few minutes, hours or several days. Trading is resumed after it is believed that the market has complete information. This does not prevent investors from a trading loss in response

to the news. However, it can prevent from excessive optimism or pessimism about a stock, and can reduce stock market volatility. Drawbacks of trading halts are related to slowing down the inevitable adjustment of stock prices to the news.

5.6. Equity market characteristics

5.6.1. Stock indicators

Trading of stocks in the secondary market is related to stock price changes. Investors monitor stock price quotations, provided in financial websites and press. Though format is different, most of tem provide similar information.

Stock exchanges provide information on **market capitalization**, which is the market's valuation of the firm and is found by multiplying the number of shares by their market price.

Earnings per share are net profits attributable to common shareholders divided by the number of common shares outstanding.

Annual **dividend** is a net profit portion distributed to the shareholders over the last year on a per share basis.

Dividend yield is the annual dividend per share as a percentage of the stock's actual price.

The **price/earnings ratio (P/E ratio)** is the reciprocal of the earnings yield. It conveys the same information but avoids the use of percentages.

Concept	**Price / earnings ratio (P/E ratio)** – the ratio of the stock market price to the earnings per share. Sometimes called *earnings multiplier*.

If a firm has a high P/E ratio, the indication is that the market values it highly for some reason other than current earnings. The usual presumption is that future earnings are likely to grow rapidly and the price increased in its anticipation. Shares of another company in the same sector might be judged 'cheap' if their P/E ratio were low by comparison (for no obvious reason).

Stock quotations also include **volume** of shares traded the previous day. Stock price quotations show the "last" or **closing price** on the previous session.

5.6.2. Stock market indexes

Stock market indexes are measures of the price performance of stock portfolios, which are formed to represent a stock market as a whole or a specific segment of the market, or sub-indexes. The well- known indices include the Dow Jones Industrial Average, the Standard & Poor's 500 in the United States; the FTSE 100 in the United Kingdom; the Nikkei 225 in Japan; the DAX in Germany; the CAC 40 in France; and the Hang Seng in Hong Kong. National stock markets have at least one index, and some countries with well developed stock markets (in particular the United States) have numerous indexes.

Indices can be categorized by the way:

- the number of stocks included;
- the method of weighting the stock prices;
- the method of averaging.

The **number of stocks** can vary from a small number of largest most liquid company stocks to a wide portfolio of all stocks traded on a particular market. The indexes based on a small number of stocks have the advantage of easy calculation; however they can hardly represent stock market as a whole.

Weighting of the stock prices is diverse. Contribution of individual stock prices to an index may be

unweighted (as in the case of the Financial Times Ordinary Share Index),

value weighted (for example the Financial Times Stock Exchange (FTSE) 100),

price weighted (such as the Dow Jones Industrial Average).

In the case of *unweighted indexes* all stocks equal influence irrespective of the sizes of the companies. Average of daily rates of share price change is calculated each day and gives stock price change average on one day. The product of such changes starting from a base date provides the index. The calculation involves two stages: 1) averaging stock price changes on a single day; 2) compounding the daily averages over time.

Example	An average of 10% rise of share prices on one day is followed by an average 20% rise of share prices the next.
	This gives a rise of 32% over the two days: 1.1 x1.2 =1.32.
	Thus unweighted index is equal to 1,32.

Indexes have a number of uses:

- to measure and monitor market movements;

- To provide a means of ascertaining changes in aggregate wealth over time.

- To perform a role as barometers of the economy; in particular stock market movements tend to be leading indicators which means that they provide indications of likely future changes in the level of activity in the economy as a whole. Fourth, they provide a means of evaluating the performance of fund managers by providing benchmarks against which portfolio managers can be compared.

- To provide the basis for derivative instruments such as futures and options;

- To provide the framework for the creation of tracker funds, which is to reflect the performance of a stock market.

- To be used by capital market models, in particular the capital asset pricing model (for discount rates for capital projects, estimating required rates of return on shares, deriving fair rates of return for utilities).

Value weighted and arithmetically averaged indexes a key ones. In order to measure stock market values, an index has to reflect accurately the total market capitalization. An arithmetically averaged value-weighted index accurately measures the aggregate value of the stocks covered by its index. A reliable measure of the total value of the market is also required for measuring changes in aggregate wealth over time and as a basis for derivative instruments.

Example	Suppose index is based on just three stocks whose prices and numbers of shares issued are the following.
	Stock A Price 50Euro, total 10 million shares
	Stock B Price 100Euro, total 10 million shares

Arithmetically averaged value-weighted stock indices are the only indices that are macroconsistent, i.e. it is possible for all investors to hold the index portfolio simultaneously. An index portfolio is a portfolio of shares that matches a stock index in terms of its constituent shares and their relative proportions.

The larger number of stocks is covered by an index, the more effective it is.

Indices that provide a very broad coverage, and hence reliably reflect the whole market, are referred to as **broad capitalization** indices. A good broad capitalization index is characterized by *completeness* and *investability*. This should make it possible for fund managers to buy all the shares in the index. Investability is particularly important for the managers of *index tracker funds*, but may require some sacrifice of completeness in order to eliminate illiquid stocks.

The calculation of value-weighted indices has moved towards a free-float basis and away from a total capitalization basis. Free float includes only those shares that are available for purchase, rather than all shares. The free float basis excludes shares held by governments, founding families, and non-financial companies.

The stock-index weighting is thus based on the total value of a company's shares available for purchase, and not on the full market capitalization of the company.

Weighting for multi-country stock indices is subject to discussion. One view is to weight each country by its contribution to global market capitalization. However the ratio of stock market capitalization to national income (GDP) varies considerably between countries. Another view is to use national income (GDP) rather than market capitalization for weighting. .This approach would provide a more stable weighting since relative GDP is less volatile than relative market capitalization.

Two types of emerging-market stock index are available. There are indices based on total market capitalization and indices based on the shares available for foreign investors. The performances of the two different types of index can be significantly different.

Stock indexes are used by institutional investors as benchmarks for performance measurement. Index tracker funds aim to replicate the performance of an index.

Although most stock indexes are based on arithmetic averages, there are some that use geometric averaging. However geometric averaging has particular problems. The geometric mean overestimates the effects of rises in the prices of smaller company stocks and underestimates the effects of changes in the stock prices of larger companies. Since large corporations are large because of rapid growth in the past, it follows that the use of geometric means gives too little weight to the stock prices of rapidly growing companies and too much weight to the stock prices of slow growth companies. So the use of geometric means underweights stocks, whose prices rise rapidly, and overweights stocks, whose prices increase slowly. In consequence, over time, indices based on geometric means tend to understate the true rate of increase in stock prices. The cumulative effect of such understatement over time can substantially distort the calculated market rise.

5.6.3. Stock market indicators

In order to characterize and compare national as well as international stock markets, a number of indicators are being used.

Market size is characterized by market capitalization. Relative national market capitalizations give indications of the importance of each country to international investors. Market capitalization weights are used in the global benchmarks. Thus market size forms the basis for global investment strategies.

Market liquidity. In liquid markets investors can be more active and design various arbitrage strategies. Market illiquidity tends to imply higher transaction costs. Thus those investors, who measure performance relative to a global benchmark, will tend to be more passive on such illiquid markets.

Market illiquidity can be measure by *transaction volume* and *turnover ratio*. Turnover ratio is sometimes called *share turnover velocity*.

Price volatility is an important measure in the secondary market, but might also be important to the operations of the primary market. High volatility means that buyers in the primary market are subject to a considerable risk of losing money by having to sell at a

lower price in the secondary market. This can reduce the motivation to buy in the primary market.

Two factors that affect the price volatility of securities in the secondary market are the depth and breadth of that market.

The **depth of the market** is based on the likely appearance of new orders stimulated by any movement in price. If a rise in price brings forth numerous sell orders, the price rise will be small. A decline in price that stimulates many buy orders would be a small decline. A deep market would be characterized by the appearance of orders that tend to dampen the extent of any movement in price. Greater depth is thus associated with lower volatility.

Breadth of that market reflects the number and diversity of the traders in the market. If there is large number of market participants with differing motivations and expectations, then there is less likely to be substantial price changes, compared to when there is small number of traders, or when the traders have common views such that they buy or sell together. A broad market is a large heterogeneous market characterized by relative price stability.

Concentration. Also called *degree of concentration* can be measured based on market capitalization for specific stock exchanges, as well groups of stock exchanges in a region. This an important measure for investors interested to know if a national market is formed of a large number of diverse companies, or concentrated on a few companies. Institutional investors are reluctant to invest in small companies, fearing that they offer poor liquidity. Besides, it is easier for investors to track performance of a market index (based on market capitalization weights), if it is dominated by a few large issues. A market dominated by a few large companies provides less opportunities for risk diversification and active portfolio strategies.

5.6.4. Transaction execution costs

Transaction costs are an important aspect of implementing an investment strategy. However, measurement of trading costs meets difficulties.

Trading costs consist of two major components:

- explicit costs and
- implicit costs.

Explicit trading costs are the direct costs of trading, such as broker commissions, fees, and taxes. The main explicit cost is the commission fee, which is paid to the broker for execution of an order. Commission costs are fully negotiable and vary systematically by broker type and stock market mechanism. The commission fee may be set, dependent upon both the price per share and the number of shares in the transaction.

In addition to commissions, other explicit costs include custodial fees, which are the fees charged by an institution that holds securities in safekeeping for an investor, and transfer fees, consisting of the fees associated with transferring an asset from one owner to another.

Implicit trading costs represent such indirect costs as the price impact of the trade and the opportunity costs of failing to execute in a timely manner or at all. Whereas explicit costs are associated with identifiable accounting charges, no such reporting of implicit costs occurs.

Implicit trading costs include

- impact costs,

- timing costs, and

- opportunity costs.

The *impact cost* of a transaction is related to the change in market price due to supply and demand imbalances, caused by the trading transactions. Bid-ask spread estimates fail to capture the fact that large trades — those that exceed the number of shares the market-maker is willing to trade at the quoted bid and ask prices — may move prices in particular direction. That is, large trades may increase the price for buy orders and decrease the price for sell orders. The resulting market impact, or price change due to the transaction can be described as the deviation of the transaction price from the "unperturbed price" that would prevail if the trade did not occur.

The *timing cost* of a trade is measured as the price change between the time the market participants assume responsibility for the trade, and the time they complete this responsibility for the transaction. Timing costs occur when orders are on the trading desk of a buy side company (e.g., an investment management company), but are not yet released to the broker, because the trader fears that the trade may swamp the market.

The *opportunity cost* of a trade is the "cost" of securities not traded. This cost results from missed or only partially completed trades. These costs are the natural consequence of the trade order delays. For example, if the price moves too much before the trade can be completed, the asset manager will not make the trade. In practice, this cost is measured on shares not traded based on the difference between the market price at the time of decision and the closing price 30 days later.

Commission fees and impact costs are actual and visible; however, the opportunity costs and timing costs are the costs of forgone opportunities and are invisible. Opportunity costs can arise for two reasons. Firstly, some orders are executed with a delay, during which the price moves against the investor. Secondly, some orders incur an opportunity cost because they are only partially executed or are not executed at all.

Exercise	An asset manager follows an active international asset allocation strategy. The average execution cost for a buy or a sell order is forecasted at 0,5 percent. On average the manager turns the portfolio over 1,5 times a year. The annual expected return before the transactions costs is 10 percent. What is the annual return net of execution costs?

Several **methods of reduction of transaction costs** are applied by institutional investors:

- **Internal crossing**, i.e. manager attempts to cross the order with an opposite order for another client of the firm;

- **External crossing**, i.e. manager sends the order to an electronic crossing network;

- **Principal trade**, i.e. the manager trades through the dealer, who guarantees full execution at a specified discount or premium to the prevailing price. The dealer then acts as principal, because he commits to taking the opposite side of the order at the firm price.

- **Agency trade**, i.e. when fund manager negotiates a competitive commission fee and selects a broker on the basis of his ability to reduce total execution costs. This way the search for the best execution is delegated to the broker.

- **Use of dealer indications of interest (IOI)**. Some party may wish to engage in an opposite trade for a stock or a basket of stocks. Pooling IOIs from various dealers helps to identify possible pools of liquidity.

- **Use of futures.** There is an opportunity cost associated with the delay of execution of large trade. The fund manager could use futures to monitor the position while the trade is executed.

Seeking to control (minimize) the costs, institutional investors have developed computer-automated programs to enter trading orders. The use of computer programs for this purpose is known as **algorithmic trading**. Once an asset manager makes a decision to buy or sell a large stock position, the program separates the trade into several smaller orders so as to minimize transaction costs. Sometimes algorithmic trading is confused with automated trading. The latter uses computer programs to make investment decisions about which shares to buy or sell. Algorithmic trading is used to determine how to place the order. However, algorithmic trading does not require that the decision of which shares to buy or sell be made by automated trading.

5.7. Stock market efficiency

Investors do not like risk and they must be compensated for taking on risk—the larger the risk, the more the compensation. An important question about financial markets, which has implication for the different strategies that investors can pursue, is:

> Can investors earn a return on financial assets beyond that necessary to compensate them for the risk?

Economists refer to this excess compensation in the stock markets as an *abnormal return*. Whether this can be done in a particular financial market is an empirical question. If a strategy is identified that can generate abnormal returns, the attributes that lead one to implement such a strategy is referred to as a *market anomaly*.

This problem of how efficiently financial market is pricing the assets traded in those market, is referred to as *market efficiency*. An *informationally efficient market* is defined as a financial market where asset prices rapidly reflect all available public information.

Concept	**Efficient market** – a market in which any relevant information is immediately impounded in asset prices.

This means that all available information is already impounded in an asset's price, so investors should expect to earn a return necessary to compensate them for their opportunity cost, anticipated inflation, and risk. That would seem to preclude abnormal returns.

Check question	What are market forces that tend to make financial markets informationally efficient?

As investors attempt to capitalize on new information, which is not already accounted for in prices, the stock prices should adjust immediately. It is commonly agreed that investors over- or under-react to information. This does not mean markets are inefficient unless the reaction is biased (consistently over- or under-reacting). In this case investor, who recognizes the bias, will be able to earn abnormally high risk adjusted returns.

Check question	How should investors behave in a market that is informationally efficient? How does this differ from behaviour in a market that is not informationally efficient?

This concept is illustrated in Figure 14. Before the information becomes public, the security has an old value. The new information hits the market. In an efficient market the price instantly adjusts to its new equilibrium level. If the market is inefficient, the market

may underreact or overreact to new information. If there is underreaction, the price adjustment is gradual. If there is overreaction, the market price overshoots the new equilibrium value. If market is inefficient, between the time of the news revelation and the adjustment to the new equilibrium value, informed investors would be able to profit at the expense of less sophisticated investors.
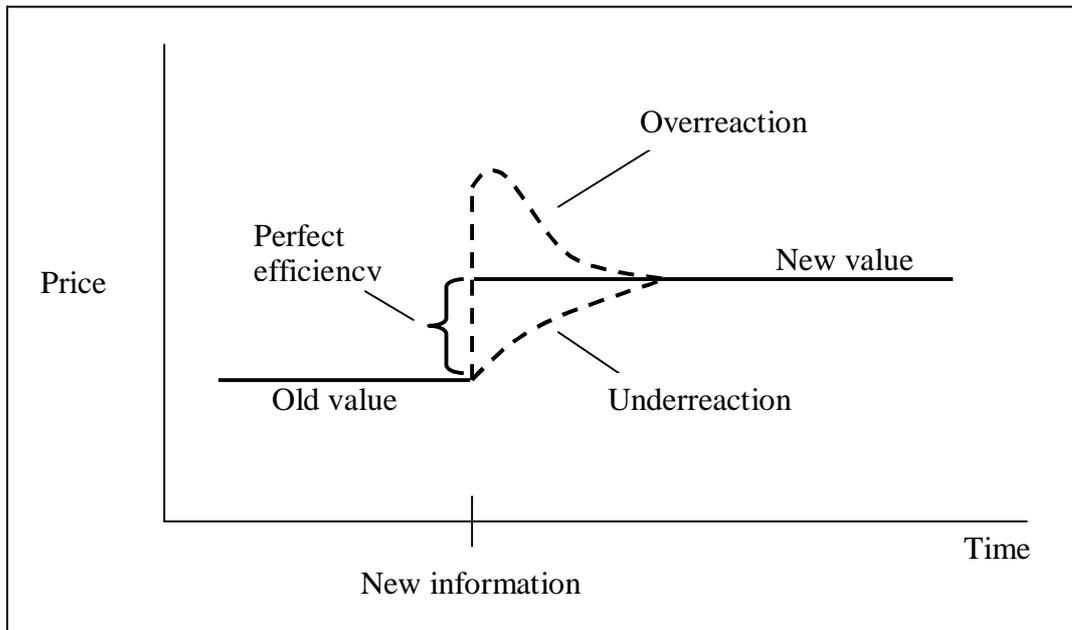
Figure 14. Market reaction to new information

According to Fama (1970), there are three levels of efficiency:

- Weak form efficiency

- Semi-strong form efficiency

- Strong form efficiency

Weak form of market efficiency suggests, that current asset prices reflect all past prices and price movements, i.e. all trade-related information. In other words, all worthwhile information about previous prices of the stock has been used to determine today's price. So the investor cannot use the same information to predict tomorrow's price and still earn abnormal profit. Empirical evidence from the most of world stock markets suggests that these markets are weak-form efficient. In other words, it is not possible to outperform ("beat") the market by using information on past stock prices.

Concept	**Random walk theory** – a theory stating that all current information is reflected in current security prices and that future price movement are random because they are caused by unexpected news.

The view that price changes cannot be predicted has been called the random walk hypothesis. According to it, price changes are drawn from a probability distribution which does not change over time. This constant distribution assumption is a subset of weak form of efficiency. Weak form of efficiency can hold, even though the distribution of prices shifts over time.

Semi-strong form of market efficiency suggests that current stock prices reflect all publicly available information. The difference between public information and market related information is that public information also includes announcements of company events, economic and political news and events. Thus, if investors employ investment strategies based on the use of publicly available information, they cannot earn abnormal profits. It does not mean that prices change instantaneously to reflect new information, but rather that information is accounted for rapidly in stock prices.

Testing semistrong efficiency raises two serious problems. First, a model of the determinants of the stock prices has to be chosen. Second, tests of the model have to distinguish between the anticipated and unanticipated information. Fully anticipated information should be already incorporated into security prices. Only unanticipated information or surprises have an impact on stock prices.

Empirical evidence supports the idea that the largest world stock markets are for the most part semi-strong efficient. This, in turn, implies that careful analysis of companies that issue stocks cannot consistently produce abnormal returns.

Strong form of market efficiency assumes that asset prices reflect all public and private information. In other words, the market (which includes all investors) knows everything about all securities, including information that has not been released to the public. The strong form implies that you cannot make abnormal returns from trading on inside information, where inside information is information, which is not yet public.

Corporate insiders (directors, large shareholders) are a group of market participants, who are involved in management and have access to non-public information. Profit from insider information through short-term trading gains is illegal. However, they are allowed to buy and sell securities of the company they are employed in, for long-term investment purposes. Such transactions are called insider trading and have to be disclosed to securities exchange commission and to the public.

Stock market analysis has shown that when insiders are trading company shares, usually their results are good. Therefore, insider reports to securities exchange commission has become an important source of investor's information.

In merger and acquisition transactions the price of the acquired firms stock tends to rise significantly before public announcement of the transaction. The assumption is made, that some insiders may be profiting from non-public information.

Another group of research is related to investment fund earnings analysis. For example, it has shown that average fund earns fair rates of return at the certain the risk levels. However in some studies the experts forecasted interest rates do not beat the simple extrapolation of the current interest rates. The studies showed that the current interest rate is a better forecast of the next period interest rate than the experts' forecasts.

Besides, investment advisory services have not managed to produce return larger than a fair return. This evidence is consistent with market efficiency hypothesis.

On the whole, the strong form of market efficiency is not supported by the empirical studies. In fact, event studies state that the opposite is true; gains are available from inside information. Thus, various stock markets, as the empirical evidence suggests, are essentially semi-strong, but not strong efficient.

Check question	What are the differences among the three forms of market efficiency?

The implications for market efficiency for issuers of shares is that if the financial markets in which they issue securities are semi-strong efficient, issuers should expect investors to pay a price for those shares that reflects their value. This also means that if new information about the issuer is revealed to the public (for example, concerning a new product), the price of the security should change to reflect that new information.

Concept	**Volatility** – a measure of uncertainty about the future price of an asset. Typically measured by the standard deviation of returns on the asset.

5.8. Stock valuation

In order to make investment decisions investors conduct valuation of stocks. They search for undervalued stocks for investing and sell holdings of stocks if they are considered overvalued.

There are two approaches to what information is useful in the selection of stocks and the timing of the purchase of stocks:

- fundamental analysis and

- technical analysis.

5.8.1. Fundamental analysis

Fundamental analysis is one of the methods of valuing stocks, which involves the analysis of a company's operations to assess its economic prospects. It is based on fundamental financial characteristics (e.g. earnings) about the company and its corresponding industry that are expected to influence stock values. The analysis is based on financial statements of the company in order to investigate the earnings, cash flow, profitability, and financial leverage. The fundamental analysis includes analysis of the major product lines, the economic outlook for the products (including existing and potential competitors), and the industries in which the company operates.

This analysis results in projections of earnings growth. Based on the growth prospects of earnings, the fair value of the stock using one or more of the equity valuation models is determined. The fair value is based on present value calculations.

Concept	**Present value** – the current value of a future cash flow. It is obtained by discounting future cash flow by the market – required rate of return.

There are various models to estimate the fundamental value of company shares. One approach is to estimate expected earnings and then multiply by expected price/ earnings ratio. Another approach is to estimate the value of the assets of the company.

Check question	Describe the price/earnings multiple approach to investing. What determines the company's multiple? Are multiples stable over time? What does this approach assume about market efficiency?

The estimated fair value is compared to the market price to determine if the stock is fairly priced in the market, cheap (a market price below the estimated fair value), or rich (a market price above the estimated fair value).

Traditional fundamental analysis has several limitations. It does not quantify the risk factors associated with a stock and how those risk factors affect its valuation.

In a perfectly efficient market all securities are always correctly priced. The market price equals to the fundamental value of the security. In a market that is partially inefficient, the market prices deviate from fundamental value. Financial analysts aim to discover the fundamental value ahead of the rest of the market participants before the market prices approach the fundamental value in order to make profits. The actions of such profit-seeking investors push the market towards efficiency.

5.8.2. Technical analysis

The aim of the technical analysis is to identify stocks that are candidates for purchase or sale, and the investor can employ technical analysis to define the time of the purchase or sale. Such analysis is used not only for investigation of common shares, but also in the trading of commodities, bonds, and futures contracts. This analysis can be traced back to the seventeenth century, where it was applied in Japan to analyze the trend in the price of rice. The father of modern technical analysis is Charles Dow, a founder of the *Wall Street Journal* and its first editor in the period of 1889 -December 1902.

Technical analysis ignores company fundamental information, focusing instead on the study of internal stock market information on price and trading volume of individual stocks, groups of stocks, and the overall market, resulting from shifting supply and demand. Technical analysts believe that stock markets have a dynamic of their own, independent of outside economic forces.

Concept	**Technical analysis** – a forecasting method for asset prices based solely on information about the past prices.

Technical analysis is aimed to determine past market trends and patterns from which predictions of future market behavior are derived. It attempts to forecast short-term price movements. The methodology of analysis is based on the belief that stock market history tends to repeat itself. If a certain pattern of prices and volumes has previously been followed by particular price movements, it is suggested that a repetition of that pattern will be followed by similar price movements.

Question	What is technical analysis? Why is there a difference between technical analysis and efficient markets?

The study of past patterns of variables such as prices and trading volumes allows investors to identify times when particular stocks (or sectors, or the overall market) are likely to fall or rise in price. The focus tends to be on the timing of purchases and sales.

H. Levy has suggested that technical analysis is based on the following assumptions:

1. The market price of securities (such as shares and bonds) is determined by supply and demand.

2. Supply and demand are determined by numerous rational and irrational factors. These include both objective and subjective factors.

3. Apart from minor fluctuations the prices of individual securities, and the level of the market as a whole, tend to move in trends which persist for significant periods of time.

4. Trends change in reaction to shifts in supply and demand. These shifts in supply and demand can be detected in the action of the market itself.

Assumptions 3 and 4 are controversial.

Supporters of the efficient market hypothesis (EMH) take the view that new information is very quickly reflected in security prices. If information is very quickly reflected in prices, trends do not have an opportunity to emerge. Technical analysts believe that new information does not arrive in the market at a single point in time; they take the view that new information comes to the market over a period of time. For example new information may be available first to insiders, second to professionals, and lastly to the public.

As the information gradually becomes more widely available, the share price gradually moves to its new equilibrium price. Technical analysts look for the beginning of a movement from one equilibrium price to another without attempting to predict the new equilibrium price.

They attempt to profit from forecasting the direction of movement; that is they try to identify trends and profit from them.

Whatever the reason for a change in price, if the share price responds sufficiently slowly, a trend emerges. A slow response of prices to shifts in supply and demand provides the potential to profit from technical analysis.

There are many **technical analysis** and trading **techniques,** including chart and non-chart ones.

Price charts are a more frequent technique. Price charts are made for each day, or other chosen time interval, with the help of a vertical line. The top of the vertical line indicates the highest price reached during the day and the bottom shows the lowest price. A short horizontal line on each vertical line indicates the closing price on the day.

A variety of price charts include *line charts, Japanese candlestick charts, a point-and-figure.*

One aim of the charts is to find areas where price reversals are frequent since this is seen as presaging a substantial price movement (break out from a trading range).This would appear as a horizontal stretching out of the chart.

Technical analysts use a vast number of **chart patterns**.

Price channels (Trend channels). Trend channels can be horizontal, upward or downward sloping. The share price remains within the channel, and some points in time breaks out of the channel. If it breaks out of the channel in a downward direction, the chartist may interpret this as a signal to sell the stock since it is seen as forecasting a fall in the stock price, and vise versa. Price channels are often interpreted in terms of the bounds providing limits to the extent of variation of share prices, such that share prices tend to remain within the bounds.

Reversal patterns. Chartists frequently believe that when the direction of a share price (or market index) changes, characteristic chart patterns may develop as the turn occurs. One of those reversal patterns is **head-and-shoulders** configuration. The highest peak is the head, and the lower peaks are the shoulders. When the share price falls below the lower peak, further price fall is forecasted and eventually constitutes a sell signal.

Converse reasoning would explain the use of reverse head-and-shoulders, which indicates that stock prices will rise and that therefore shares should be bought.

Moving averages. Technical analysts use not only prices relating to individual dates, but also moving averages. A moving average is an average of a series of previous prices, for example the average of the last 200 daily prices. (Each day the oldest price is removed from the calculation of the average and the most recent price introduced). Chart patterns can be based on moving averages as well as daily prices.

One popular technique is to use moving averages and daily prices on the same chart. If the current price is a predetermined percentage above or below the moving average, a buy or sell signal may be indicated. For the market as a whole, the proportion of stocks currently above their moving average is seen as an indicator of general market sentiment. Points at which a chart of daily prices crosses a chart of moving averages are seen as significant. A daily price chart that crosses a moving average chart from below might be seen as providing a buy signal. The signal may be dependent upon whether the moving average is rising or falling at the time.

Studies have suggested that moving average strategies could be successful, e.g. stock returns following buy signals from a moving average rule were higher than those following sell signals.

Dow theory. This is one of the oldest technical tools, aimed to forecast the future direction of the overall stock market. Dow theory is based on the belief that market movements are analogous to movements of the sea. It sees three simultaneous movements in the market. Daily and weekly fluctuations correspond to ripples. Secondary movements (which last a few months) are the waves. Primary trends of a year or more are analogous to tides. It is the primary trend that is referred to as either a bull or a bear market. The daily or weekly movements are seen as having little or no predictive value. However, secondary movements in stock indices are used to forecast changes in the direction of the primary trend. A bull market is characterized by both high and low points of successive secondary movements moving in an upward trend, especially if this were accompanied by rising volumes of stocks traded. Each new peak is above the previous peak, and each new trough is above the previous trough.

Trading volume should increase with moves made in the direction of the primary trend; for a rising primary trend, volume should be heavier for advances than for falls. The market is sustained by rising support levels and would break through successively higher resistance levels. When the market eventually falls through a support level and then is unable to bounce back beyond a previous resistance level, the beginning of a bear market is signaled.

A bullish primary trend is seen as being initiated by informed investors, who anticipate a recovery. Subsequently uninformed investors start buying, thereby reinforcing the upward trend.

While the uninformed investors continue to buy, the informed investors start to sell. Sales by informed investors cause the temporary downturns (the waves).

Elliot wave theory. The theory sees markets as moving in cycles. There are very long-run cycles that last many decades. Superimposed on these are cycles of shorter duration. In turn there are cycles of even shorter duration superimposed upon the latter cycles. This pattern of cycles within cycles continues down to cycles of very short duration.

Analysis of the Elliot cycles is based on waves. Each cycle has eight waves. Five waves carry the market up and three waves carry it down. At the end of the cycle the market is higher than at the beginning.

The pattern of waves entails a succession of support and resistance levels, similarly to Dow theory. Elliot wave theory assumes that markets are driven by investor psychology. After a fall in prices, investor optimism is seen as growing slowly at first but later the

optimism becomes excessive and leads to a bubble at which prices peak. The bubble bursts and the market is then carried lower in the wave pattern.

Elliot wave theory is sometimes supplemented by the use of *Fibonacci numbers*. Fibonacci numbers seem to fit the pattern of development of a range of natural phenomena from the reproduction of petals on a flower to the formation of galaxies. They are also believed to explain stock market developments. Fibonacci numbers are taken from a sequence in which each number is found by adding together the previous two in the series. The sequence runs 1, 1, 2, 3, 5, 8, 13, 21, 34, and so forth. Users of the theory employ various combinations and ratios of Fibonacci numbers to predict market tops and bottoms, along with support and resistance levels. Elliot wave theory sees cycles as comprising eight waves, five on the upswing and three on the downswing, which are Fibonacci numbers.

Technical analysts also use **other indicators**, such as filter rules, relative strength, and short interest ratios.

Filter rule states that an investor should buy when a stock price (or market index) has risen by a predetermined percentage above a previous low point. Conversely, the investor should sell when the price or index falls by a particular percentage below a previous high. The percentages are decided by the investor, but they should be established prior to the market movements.

Relative strength is measured by the ratio of a stock price to a market index. Changes in the ratio are taken to indicate buy or sell opportunities. For a momentum trader a rise in the ratio is a signal to buy the stock (and a fall is a signal to sell).A contrarian trader would interpret a rise in the ratio as a sell signal (and a fall as a buy signal).

The **short interest ratio** is the ratio of short sales to total trading. A rise in the ratio has two opposite interpretations. First, a rise in the ratio as indicative of bearish sentiment, and hence is a sell signal. Second, a rise is a buy signal, since it is believed that the short positions will have to be covered by stock purchases. These stock purchases would tend to push up stock prices.

Trin statistic is the ratio of the average trading volume in stocks with declining prices to average volume in stocks rising prices. Ratio above 1 show a bearish market, since a relatively high volume of trades in declining stocks is indicating net selling pressure. Conversely, ratios below 1 are seen as indications of a bullish market.

Trading volume is considered an indication of the strength of a trend. If a price movement is accompanied by a relatively high quantity of trades, it is considered more significant than the price movement in a low trading volume market.

Breadth of the market shows the extent to which movement in a market index is reflected widely in the price movements of individual stocks. The most common measure of breadth is the difference between the number of stocks that rise and the number that fall. If the difference is large, the market movement is considered to be strong, since it is widespread. A market rise is viewed stronger, if prices of large majority of stocks are rising. Conversely, market rise is viewed as weaker, when only prices of stocks of a few large capitalization companies are increasing.

Mutual fund cash holdings, if they increase, might an indication of a market rise based on belief that the cash will be used to buy shares. This demand for shares would tend to push prices up. Conversely, low mutual fund cash holdings are seen as a bearish signal.

Put-call ratio. Put options give the right to sell shares at a specified price, and are bought by investors who expect share prices to fall. Call options give the right to buy shares at a specified price, and are bought by investors who expect share prices to rise. The ratio of puts bought to calls bought is used as an indicator of the expectations of investors.

However technical analysts have different interpretations of the ratio. Some see a high put-call ratio as a sign of a bearish market based on the belief that it indicates that investors in general expect stock price falls. Others have a contrarian view, and see a high put-call ratio as a buy signal. Contrarian analysts base their analysis on the belief that investors are usually wrong.

Technical analysis is often, though regarded as an essential tool of investment analysis by market practitioners, however is criticized by academics. The criticism from academics tends to focus on the absence of a coherent body of theory to explain technical analysis, and on the difficulty of using statistical tests to ascertain its effectiveness.

The past theories proposed by technical analysts tended to be ad hoc and inconsistent. There has been no coherent rationale as to why technical analysis should work. However, the recent development of behavioral finance is contributing to the emergence of theoretical justifications of technical analysis.

If social and psychological forces influence stock market behavior in consistent ways, technical analysis could be seen as a technique for identifying those forces and forecasting their effects. Besides, behavioral finance can also be applied to explain the behavior of technical analysts. Technical analysts may be influenced by the same social and psychological biases as other market participants. Those biases would tend to influence technical analysts' interpretations of their charts and other data. The forecasts of technical analysts could be affected by the same biases, which the analysts may be seeking to identify among other market participants.

Institutional investors tend to use technical analysis alongside other methods of investment analysis. The research evidence on the ability of institutional investors to outperform stock market indices indicates that, at best, such outperformance is marginal. This evidence throws doubt on the effectiveness of investment analysis, including technical analysis. However since the stock market in aggregate is equal to the sum of investment portfolios, such findings might be expected. Investment analysis may be a zero-sum game in that those making profits make them at the expense of other analysts.

5.9. Processes of consolidation of stock exchanges

The importance of equity finance in the world markets is growing, although there are large differences across stock exchanges. The market capitalisation of the largest world markets (e.g. NYSE, NASDAQOMX, Euronext, London Stock Exchange (LSE)) are much higher than those of other stock exchanges. Stock market is highly concentrated. For example, measured by trading activity, the market share of the five largest stock exchanges in Europe exceeded 90 per cent in 2009, with the LSE having the largest share of total EU turnover. The stock-market concentration level is almost identical in terms of market capitalisation. This high level of concentration may be explained by the fact that financial exchanges exhibit network externalities, as higher participation of traders on both sides of the market positively affects market liquidity and increases traders' utility. For some of the key stock markets it appears that even if market capitalisation is similar in value (e.g. LSE and Euronext), there are significant differences in the turnover. This suggests that when shares are more actively traded, the stock market provides for a deeper and more liquid market.

Despite the increase in equity finance, public equity markets play a limited role as a source of new funds for firms that raise external financing generally via bank loans or debt securities. Still, the number and value of initial public offerings (IPOs) grew spectacularly from the mid-1990s.

The recent development of the stock exchanges has shown an intensive regional cross-border consolidation, which is especially vivid among EU stock markets. Euronext resulted from a merger of the Paris, Amsterdam, Brussels, and Lisbon stock exchanges during 2000–2002. Stock exchanges of Copenhagen, Stockholm, Helsinki, Tallin, Riga, Vilnius, and Iceland merged between 2004 and 2006, creating the OMX Nordic Exchange. It was followed by a merger of NASDAQ and OMX Nordic Exchange to form NASDAQOMX. In June 2007 Italy's stock-exchange operator Borsa Italiana accepted a takeover from the LSE. In 2006, a trans-Atlantic stock exchange merger took place between Euronext and the New York Stock Exchange (NYSE), strengthening its position as the largest securities trading venue in the world.

In 2007, two other trans-Atlantic deals were announced: an acquisition of the International Securities Exchange (New York) by Deutsche Börse and a merger between NASDAQ and OMX to form NASDAQOMX.

Processes of consolidation are fostered by multiple share listings of the companies. Multiple share listing happens when company shares are listed on more than one stock exchange. They can also be simultaneously traded on formal stock exchanges and OTC markets. Stocks of very large multinational companies list their shares on several national stock exchanges. Trading in such stocks can effectively be global and may operate on a 24-hour basis (as one exchange closes, trading may continue on others).

Further globalization of financial markets is related to the tendency for financial markets in different countries to become integrated into a single market. A major factor leading to globalization has been the development of telecommunications. Other factors have been the tendencies towards international diversification of portfolios, and deregulation of national financial markets.

Consolidation is viewed to have several advantages. Larger exchanges enjoy economies of scale that reduce trading costs, which in turn attracts more traders and listed companies. After the merger market capitalisation of the merged stock exchanges has grown faster than that of its smaller competitors.

While consolidation allows an exchange to exploit economies of scale, it may also reduce competition and thus lower an exchange's incentive for financial innovation (in the form of developing new, cheaper, trading mechanisms). The impact of competition is interesting in equity trading. Competition may reduce trading fees, but fragmentation of the order flow between exchanges may reduce the liquidity of equity trading. However, some of the stock market studies have found evidence of reduced fees and improved liquidity. Liquidity is improved as some brokers automate the routing decision between the two exchanges to obtain the best execution price. In that way, the order flow at the two exchanges is indirectly combined.

There are still some challenges for further consolidation in stock markets. First, the clearing and settlement infrastructure in Europe has remained fragmented so far. Studies suggest that post-trading costs per transaction in the EU are substantially higher than in the US. Next, cross-border exchanges like Euronext and NASDAQ OMX force national financial supervisors to co-operate.

5.10. Summary

Equity markets exist to facilitate the transfer of funds from savers of funds to investors, which need to raise money. Organized stock exchanges as well as over the counter markets ensure that a secondary market provides a means for existing investors to sell their equity securities.

Newly issued shares are sold in the primary market by public offer, tender, placement, or through a rights issue. In addition to common (ordinary) shares there are various types of preferred shares.

Stock exchanges may be order-driven, quote-driven, or a hybrid of these two systems. In all stock market trading systems share prices are determined by the demand and supply. The key types of orders are market orders, which accept the existing share price, and limit orders which specify upper limits to buying prices or lower limits to selling prices.

Most individual investors buy equity instruments indirectly through institutional investors such as pension funds, insurance companies, and investment funds. Therefore most of the trading on stock exchanges is done through institutional investors. Some types of institutional investment, like investment funds or exchange-traded funds (ETFs), trade their own shares on a stock exchange directly.

Stock markets operate most efficiently if they have sufficient depth and breadth. A deep market has a large number of traders, who ensure that small price movements raise many new buy or sell orders. This helps to avoid excessive share price volatility, since price falls are met by new purchase orders, and price rises are met by new sell orders. A broad market contains traders with differing opinions such that some will be forecasting price rises whilst others expect falls.

The diversity of views helps to prevent large price swings. When stock markets are characterized by uniformity of opinion, extreme share price movements can result. If the overwhelming majority of investors expect a rise, there would be many buyers and few sellers. Sharp price rises (a bubble) would result. If the majority expects a price fall, sales would dominate purchases and share prices could fall dramatically (and a stock market crash can occur).

Key terms

- Initial public offering (IPO)
- Leveraged buy-out
- Stock repurchases
- Bid-ask spread
- Market order
- Limit order
- Short sale
- Program trading
- Transaction costs
- Buying on margin
- Maintenance margin

Further readings

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Relevant websites

- www.nasdaqomx.com

- www.nyse.com

- www.londonstockexchange.com

- www.finance.yahoo.com

Review questions and problems

1. Discuss the concept of asymmetric information. Explain how it may cause managers to serve company investors.

2. Describe how interactions between buyers and sellers affect the market value of the firm.

3. Why do firms engage in IPOs?

4. What is the danger of issuing too much equity shares in an IPO?

5. What is the role of the investment bank that serves the underwriter in an IPO? How can it ensure, that the firm does not issue too much shares?

6. What factors influence the offer price in an IPO?

7. Explain the differences between generating funds from a venture capital firm and through an IPO. Why does a firm do a road show before it goes to an IPO?

8. Explain why the stock price of a firm may rise when the firm announces that it is repurchasing its shares.

9. Discuss the statement: "IPO transfers wealth from unsophisticated investors to large institutional investors who get in at the offer price and get out quickly."

10. A pharmaceutical company is going through an IPO. It plans to issue 5 million shares at 12 Euro per share. The investment bank suggests that the offer price for the shares should be 10 Euro per share to ensure that all the shares should be sold easily. Explain the dilemma for the pharmaceutical company. What is the advantage of following the advice of the investment bank? What is the disadvantage? Is the investment bank incentive to place the shares aligned with the interests of the pharmaceutical company?

11. Explain the difference between a market order and a limit order.

12. How can margin requirement affect the potential return and risk from investing in shares?

13. What is the maintenance margin?

14. How would the return on stock be affected by a lower initial investment and a higher loan amount? Explain the relationship between the proportion of funds borrowed and the return.

15. Describe the short selling process. Under what conditions investor might consider short selling a specific stock?

16. What are electronic communication networks (ECNs)?

17. What is programme trading?

18. Describe the functions securities exchange commission.

19. What is the role of depository?

20. Assume a company's shares are priced at 50 Euro per share. The company has declared 1Euro per share dividend. An investor purchases the stock on margin paying 30 Euro per share and borrowing the remainder from the dealer at 10 % annualized interest. What is the return to the investor, if after one year the stock is sold at a price of 60 Euro per share?

21. What determines the size of the bid-ask spread?

22. Calculate the bid-ask spread for 100 000 shares of X company for the following market prices in US NYSE:

    a)   bid price 11 7/8, ask price 12 ¼;

    b)   bid price 44 1/4, ask price 44 17/64;

    c)   bid price 35 3/8, ask price 35 ½.

15. A company with 20 million Euro assets and 45 million Euro liabilities is technically insolvent. Which of the following investment projects is preferred by stockholders and which is preferred by bondholders?

    a) 22 million investment into a project, which will be worth 24 million with a probability of 60% and 20 million with a probability of 40%;

    b) 22 million investment into a project, which will be worth 40 million with a probability of 5% and 20 million with a probability of 95%;

    c) explain, how elimination of equity's limited liability could resolve the problem?

16. A money market fund is started with assets consisting of 75 day zero coupon debt instruments with a face value of 200 million Euro, and a simple interest yield of 3,9%.

    a) what is the value of the fund liabilities sold to shareholders?

    b) if interest rates rise by 100 basis points, what is the net asset value of the money market fund's assets?

    c) if the fund is liquid immediately upon the increase in rates, what is the net asset value paid out to each fund shareholder?

17. What is the impact on retirement benefits if a 2,5 billion Euro pension fund experiences a 2% default rate on its assets, if

    a) it is defined benefit fund that pays retired people 35% of the average of their last three years of salary?

    b) it is defined contribution fund that obligates the firm to contribute matching funds equal to 50% of the employees' contributions;

    c) it is a defined contribution fund with no matching funds contributed to the employer.

18. Calculate the net asset values and share prices of the following mutual funds:

    a) a 500 000 million shares of an open – end money market fund with assets consisting of 91 day Eurodollars CDs with face value of 350 million USD, which yields 6,25% annually, and 250 day prime-rated commercial paper with face value of 330 million USD, which yields 6,1% annually (use simple yields on a 365 day basis);

    b) closed-end Baltic fund with assets consisting of 10 years 6,7% annual coupon bonds, yielding 12,5% annually, with a face value of 25 million Euro, and a perpetual preferred shares with a cumulative annual dividend of 7%, face value of 30 million Euro and the annual yield of 12,4%.

6. DERIVATIVES MARKETS

Mini contents	• The meaning of hedging against risk
	• Definition of derivatives markets
	• Financial futures and hedging against risk
	• Options and their use

6.1. Hedging against risk

Investments based on some underlying assets are known as derivatives. The capital invested is less than the price of the underlying asset. This creates financial leverage and allows investors to multiply the rate of return on the underlying asset. Because of this leverage, derivatives have several uses,

- Speculative or taking an advantage over specific profit opportunity,
- Hedging a portfolio against a specific risk.

Participants in derivative markets own portfolios of financial securities, which must be taken into consideration when understanding impact of any particular derivatives transaction.

Any derivatives transaction involves cash flows, which are more or less opposite to the cash flows generated by the other securities in the portfolio. When the two sets of cash flows moves in the opposite direction, it is a **hedge**. When the two sets of cash flows moves in the same direction, it is a **speculative position**. This is why speculative trades increase risk exposure, while hedging reduces risk exposure.

Hedging ensures counterbalancing cash flows, which reduce dispersion of possible outcomes and therefore reduces the risk. Conversely, by adding more cash flows, which move in the same direction, speculating increases profit when outcomes are favourable, but increases losses when outcomes are unfavourable. Thus the risk is increased.

The underlying cash position is the twin transaction that is undertaken simultaneously with the derivatives trade. The underlying cash position motivates the hedge transaction. If the underlying cash position consists of only one financial security, then it is called microhedge. If the underlying cash position consists of a portfolio of financial securities, then it is called macrohedge.

Macrohedging is prevalent in financial institutions than in non-financial companies, which may be hedging only a single financial security on their balance sheets. The hedge is always tailored to the hedger's underlying cash position. The hedger's cash flows as well as his goals will determine the configuration of the derivatives transaction.

6.2. Description of derivatives markets

The establishment and growth of financial derivatives markets has been major development trend in financial markets over the past thirty-five years. Financial innovation and increased market demand led to a rapid growth of derivatives trading. Development of financial derivatives was speeded up by the globalization of business, the increased volatility of foreign exchange rates, and increasing and fluctuating rates of inflation.

In general derivatives contracts promise to deliver underlying products at some time in the future or give the right to buy or sell them in the future. They can be based on different types of assets (such as equities or commodities), prices (such as interest rates or exchange rates), or indexes (such as a stock-market index).

The derivative contract can then be traded in a different market from that in which the underlying product (equity, bonds, currency) is itself traded. Markets in which underlying products are traded (such as the forex market) are often referred to as *cash markets* to distinguish them from *derivatives markets.* Although cash and derivatives markets are separate, the derivatives markets are linked to cash markets through the possibility that a delivery of the underlying product might be required.

There is a close relationship between the prices of derivatives contracts and the prices of the underlying assets they represent, and that the value of a derivative, and hence its price, varies as the price in the cash market fluctuates. However, in practice, derivatives seldom lead to the exchange of the underlying product. Instead, contracts are *closed out* or allowed to lapse before the delivery date arrives.

For portfolio managers change of the risk profile through derivative transactions takes a very low cost. Without derivatives, portfolio managers have to conduct transactions in the underlying cash markets (i.e., money, bond, or equity markets) at a higher cost, including the costly transfer of securities. Thus the dynamic growth of hedge funds can be explained by the rise of low-cost derivatives markets. Hedge funds typically exploit small price differences of similar financial products. Only when the transaction cost is smaller than the price differential, then hedge fund takes a position.

The **types of derivatives** include:

- Options,
- Forwards,
- Futures,
- Swap contracts
- Various forms of bonds.

A forward contract gives the holder the obligation to buy or sell a certain underlying instrument (like a bond) at a certain date in the future (i.e., the delivery or final settlement date), at a specified price (i.e., the settlement price). Forward contracts consist of futures and swaps. Futures contracts are forward contracts traded on organised exchanges. Swaps are forward contracts in which counterparties agree to exchange streams of cash flows according to predetermined rules. For example, an interest-rate swap is a derivative in which one party exchanges a stream of interest payments for another party's stream of cash flows. The most important difference with options is that options give the holder the right (but not the obligation) to buy or sell a certain underlying instrument at a certain date in the future at a specified price.

Derivatives are traded on organised exchanges or over-the-counter (OTC) market. Derivatives contracts traded and privately negotiated directly between two parties belong to the OTC market, generally interest-rate linked derivatives, like swaps and forward-rate agreements. All contract terms, such as delivery quality, quantity, location, date, and price,

are negotiable in it. The total value of derivative contracts outstanding in global OTC markets is substantially higher than the exchanges-traded amount. A trend is a provision of standard contracts, which makes it easier for more participants to access the OTC markets. Besides, OTC trades are increasingly being cleared through clearinghouses in much the same way as exchange-based contracts.

Derivative contracts like futures and options, which are traded in organised exchanges are generally standardised, based on electronic trading. The traditional distinction between exchange-based and OTC derivatives is becoming less clear.

6.3. Forward and futures contracts

6.3.1. Principles of forward and futures contracts

A **futures contract** is a legally binding commitment to buy or sell a standard quantity of a something at a price determined in the present (the futures price) on a specified future date.

The buyer is called the **long**, and the seller is called the **short**. Futures contracts are "**zero sum games**".

Concept	**Futures contracts** - a customized contract to buy (sell) an asset at a specified date and a specified price (futures price). The contract is traded on an organized exchange, and the potential gain/ loss is realized each day (marking to market).

The **forward contract** is a private agreement between the two parties and nothing happens between the contracting date and the date of delivery.

Concept	**Forward contract -** a customized contract to buy (sell) and asset at a specified date and a specified price (forward price. No payment takes place until maturity.

Forwards and futures contracts markets include diverse instruments on:

- Currencies;
- Commodities;
- Interest rate futures;
- Short-term deposits;
- Bonds;
- Stock futures;
- Stock index futures;
- Single stock futures (contract for difference).

There is no money exchanged when the contract is signed. To ensure that each party fulfills its commitments, a *margin deposit* is required. The exchanges set a minimum margin for each contract and revise it periodically. Margin is determined depending upon the risk of the individual contract

Futures prices fluctuate every day. Therefore all contract positions are **marked to market** at the end of every day. If net price movements result in gain on a position of the previous day, the customer immediately receives cash in the amount of the gain. And vise versa, if there is a loss, the customer must cover the loss. As soon as a customer's account falls

below the *maintenance margin*, the customer receives a margin call to fill up the initial margin. If this is not done immediately, then the broker closes down the position on the market. In effect future contracts are canceled every day and replaced by new contracts with a delivery price equal to the new futures price, i.e. the settlement price at the end of the day.

It is rare for a futures contract to be used for the exchange or physical delivery of the underlying instruments. Many contracts have no facility for the exchange of the financial instrument. Thus financial futures markets are independent of the underlying cash markets, and are operating in parallel to those markets. Most future contracts are closed out by an **offsetting position** before the delivery occurs. A long offsets by going short and the short offsets by going long at any time before the delivery date.

Offsetting does not involve incremental brokerage fees because the fee to establish initial short position includes the commission to take the offsetting long position, i.e. the **round trip commission**.

The total number of outstanding contracts is called **open interest**. For every outstanding contract one person is short (has taken a short position) and one is long (has taken a long position. If a particular transaction involves a new long and a new short, the open interest increases by one contract. If a transaction involves offsetting by an existing long and offsetting by an existing short, the open interest decreases by one contract. However, if a transaction is made by offsetting an existing short or long, and if the other side of transaction is a new investor, the open interest remains unchanged. Each futures exchange has a clearing house to keep track of the short and long positions.

Concept	**Open interest** or a financial instrument at some specified future date.

The main economic function of futures is to provide a means of hedging. A hedger seeks to reduce an already existing risk. This risk reduction could be achieved by taking a futures position that would provide profit in the event of a loss on the underlying position (and a loss in the case of a profit on the underlying position).

Concept	**Long hedge** – a long anticipatory hedge generally involving buying futures contracts in anticipation of spot purchase.

Concept	**Short hedge** – a short hedge involves selling futures contracts to cover the risk on a position in the spot market. This is the most common use of hedging in investment management.

The most common products underlying futures contracts are foreign currencies (exchange rates), interest rates on notional amounts of capital, and stock exchange indices. The futures contracts are themselves tradable – that is, they can be bought and sold in futures markets. To increase their tradability, futures contracts are standardized in terms of both time period and amount. They specify the quantity and quality of the underlying product, the agreed price and the date of delivery.

The procedure of marking to market of futures contract, which implies that all potential profits and losses are immediately realized, is the basis for the key difference between the forward and future contracts.

A forward contract may or may not be marked to market. Where the counterparties are two high-credit-quality entities, the two parties may agree not to mark positions to market.

However, if one or both of the parties are concerned with the counterparty risk of the other, then positions may be marked to market. When a forward contract is not marked to market, then there are no interim cash flows.

Because there is no clearinghouse that guarantees the performance of a counterparty in a forward contract, the parties to a forward contract are exposed to *counterparty risk*, the risk that the other party to the transaction will fail to perform.

When hedging the specified source of risk two questions have to be answered:

- Which contract should be used?

- What amount should be hedged?

The answer to the first question depends upon the source of risk, which will dictate the use of some specific stock market index, interest rate or currency contract.

The answer to the second question depends upon **optimal hedge ratio to be used**.

The hedge ratio is the ratio of the size of the (short) position to be taken in futures contract to the size of the exposure (the value of the portfolio to be hedged).

Hedge ratio = (Number of contracts x Size x Spot price) / V

where V – is the market value of the underlying asset position.

The number of contracts to be sold if hedge ratio, that is to be implemented, is known, can be derived from this equation:

N = Hedge ratio x V / (Size x Spot price)

Example	Assume the manager of a futures fund has 1000000 Euro. The fund manager buys FTSE 100 futures relating to 1000000 of shares when the FTSE 100 stands at 5000.The futures mature in one year.
	Let's determine the key characteristic of the contract
	The number of futures contracts bought will be equal:
	1,000,000/(5000 x 10) = 20 contracts
	Does any of the 1000000Euro need to be used in the purchase of the futures? Yes, the initial margin must be provided
	The approximate capital gain on the fund over a year, if the FTSE 100 rises by 7%, will be equal to 7% (minus the net cost of carry).
	In order to find the total return on the fund, interest on the money on deposit plus interest on maintenance margin (i.e. interest on approximately 1,000,000) should be added to the capital gain.

6.3.2. Forward and futures valuation

Valuation of all derivative models are based on arbitrage arguments. This involves developing a strategy or a trade wherein a package consisting of a position in the underlying (that is, the underlying asset or instrument for the derivative contract) and borrowing or lending so as to generate the same cash flow as the derivative. The value of the package is then equal to the theoretical price of the derivative. If the market price of

the derivative deviates from the theoretical price, then the actions of arbitrageurs will drive the market price of the derivative toward its theoretical price until the arbitrage opportunity is eliminated.

The pricing of futures and forward contracts is similar. If the underlying asset for both contracts is the same, the difference in pricing is due to differences in features of the contract that must be dealt with by the pricing model.

A futures price equals the spot (cash market) price at delivery, though not during the life of the contract. The difference between the two prices is called **the basis**:

Basis = Futures price – Spot price = F – S

The basis is often expressed as a percentage of the spot price (discount or premium) =

Percentage basis = (F – S) / S

Futures valuation models determine the theoretical value of the basis. This value is constraint by the existence of profitable riskless arbitrage between the futures and spot markets for the asset.

In a well-functioning market, when arbitrageurs implement their strategy by selling the futures and buying underlying asset, this would force the futures price down so that at some price for the futures contract, the arbitrage profit is eliminated. This strategy that results in the capturing of the arbitrage profit is referred to as a *cash-and-carry trade*. The reason for this name is that implementation of the strategy involves borrowing cash to purchase the underlying asset and "carrying" that underlying asset to the settlement date of the futures contract.

In general, the formula for determining the theoretical price of the contract, assuming that lending and borrowing rates are both the same and equal to financing cost, and that there is no margin, becomes:

Theoretical futures price = Spot price + (Spot price) x (Financing cost - Cash yield)

where financing cost - is the interest rate to borrow funds, cash yield - is the payment received from investing in the asset (e.g. dividend) as a percentage of the cash price.

Example	Assume that the underlying asset price is 100 Euro, financing cost is 1% and cash yield is 2%. Then the theoretical futures price is: 100 Euro + [100 Euro $\times$ (1% $-$ 2%)] = 99 Euro

The future price can be above or below the spot (cash) price depending on the difference between the financing cost and cash yield. The difference between these rates is called the *cost of carry* and determines the *net financing cost*.

Positive carry means that the cash yield exceeds the financing cost, while the difference between the financing cost and the cash yield is a negative value.

Negative carry means that the financing cost exceeds the cash yield.

Zero futures happen when the futures price is equal to the spot (cash) price.

At the settlement date of the futures contract, the futures price must equal the spot (cash market) price. The reason is that a futures contract with no time left until delivery is equivalent to a spot (cash market) transaction. Therefore, as the delivery date approaches, the futures price is converging to the spot (cash market) price. This happens as financing cost and the yield that can be earned by holding the underlying asset, and finally the cost of carry, approaches zero, when the delivery date approaches.

However, the borrowing rate is usually higher than the lending rate. The impact of this difference is important when defining theoretical futures price.

In the cash-and-carry trade, the theoretical futures price based on borrowing rate becomes

Theoretical futures price = Spot price + (Spot price) ×(Borrowing rate -Cash yield)

In the reverse cash-and-carry trade, the theoretical futures price based on lending rate becomes:

Theoretical futures price = Spot price + (Spot price)×(Lending rate - Cash yield)

Both equations together provide a band between which the actual futures price can exist without allowing for an arbitrage profit. The first equation establishes the upper value for the band while the second equation provides the lower value for the band.

The *reverse cash-and-strategy* trade requires the short selling of the underlying. It is assumed in this strategy that the proceeds from the short sale are received and reinvested. In practice, for individual investors, the proceeds are not received, and, in fact, the individual investor is required to deposit margin (securities margin and not futures margin) to short sell. For institutional investors, the underlying may be borrowed, but there is a cost to borrowing. This cost of borrowing can be incorporated into the model by reducing the cash yield on the underlying.

For strategies applied to stock index futures, a short sale of the components stocks in the index means that all stocks in the index must be sold simultaneously. This may be difficult to do and therefore would widen the band for the theoretical future price.

For valuation of stock index futures the fair value premium is used.

The excess of the fair futures price over the spot (i.e. actual) stock index is called the fair value premium. The formula for the fair value premium is:

FP = I x [{(r - y)/100} x{d/365}]

where FP is the fair value premium, I is the spot FTSE 100 Index, r is the interest rate, y is the expected percentage dividend yield on the index portfolio, and d is the number of days to maturity of the futures contract.

Exercise	Assume that the rate of interest on risk-free bank deposits were 2.5% p.a.. If money could be borrowed at the same rate of interest, estimate the price of a FTSE 100 futures contract which matures in four months on the basis of a spot index of 4000 and a zero expected rate of dividend yield on the FTSE 100 portfolio. How would the answer change if the expected rate of dividend yield were 0.5% p.a. (while the other values were as before)?

Short cash and carry involves selling the borrowed stock and buying futures. In this case the excess of interest over dividends is a net inflow and this gain should be matched by having a guaranteed future purchase price that exceeds the spot sale price by the amount of this net inflow. The money from the stock sale is put on deposit. In the case of short selling, the borrower of the stock must pay sums equivalent to the dividends to the lender of the stock. The excess of interest over dividends is a net inflow that should be matched by a capital loss guaranteed by the futures price.

| Exercise	Assume a fund manager has 10000000 Euro for a futures fund. The fund has an investment horizon of one year. The FTSE 100 stands at 5000.The one-year interest rate is 4% and the expected rate of dividend yield on the FTSE 100 over the

6.3.3. Use of forwards and futures

Going long or short in futures market without any offsetting position is described as taking a **speculative position**.

In a **futures hedge** an investor offsets a position in the cash (spot) market with a nearly opposite position in the futures market. The objective is to reduce the overall risk position. The hedged position has lower expected return than an unhedged position.

In a **long hedge** the investor takes a long position in futures. In a **short hedge** the investor takes a short position in futures. A very important type of hedge occurs when an investor with the long position in the spot market simultaneously take a short position in the futures contracts.

In short hedging the hedger may be able to find a futures contract for a virtually identical item as hedgers cash (spot) position. Then the gains (losses) in the spot market are offset by the gains (losses) in the futures market. This offset is shown in the figure bellow.
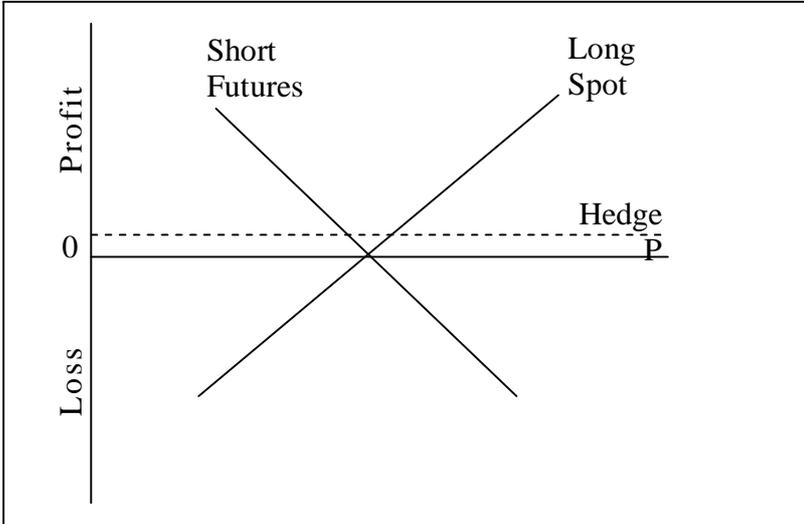
Figure 15 . **Profit profile for perfect hedge**

The Figure 15 provides profit profiles. Assume, the investor goes long in the spot market at 50 Euro. As the spot price increases (decreases) the investor gains (loses) exactly the same amount. The profit profile for a spot position is offset exactly by the short futures position. Profit profile for the net position is a horizontal line, indicating no change in the value of the net position as the spot price changes. Flat profile represents a perfect hedge.

However most often identical or similar future contracts do not exist. In this situation, the hedger must utilize a short position in a similar, but different asset. This is called a **cross hedge**. The relationship between a spot position and a futures contract in a cross hedge is not a perfect straight line. It is shown as a dotted line in the figure below. Here it is assumed that the investor takes a long position in the spot market in grade A investment assets, and offsets by taking short position in the futures market in grade B investment assets. Grade B asset prices are assumed to move half as fast as grade A asset prices. The Figure 16 shows profit profile for long spot grade A investment assets, short futures grade B investment assets and the net position. The gains and losses on the spot position are cut in half for grade A investment assets by the short hedge.
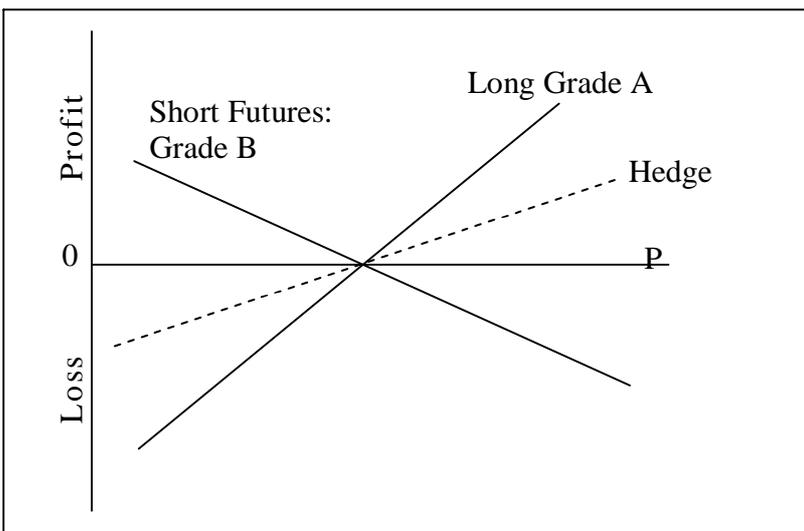
Figure 16. Profit profile for a cross hedge

The hedger can estimate the slope of the line (β) by using regression analysis in order to find the best-fitting relationship. For every unit of the spot asset (cash market), the hedger shorts β units of the futures. β is called the optimal hedge ratio.

<table>
<tr><td>Exercise</td><td>Assume a fund manager anticipates the receipt of 5 million Euro in one month. The intention is to invest the money equally between the three stocks X, Y, and Z. These stocks have betas of 0,9, 1,1, and 1,3 respectively. The FTSE 100 is equal now to 8800.How can the fund manager hedge against a rise in stock prices using futures?</td></tr>
</table>

The optimal hedge ratio is not a perfect hedge, because the link between the spot and futures is not perfect. The optimal hedge ratio is the best in the sense that the expected change in the hedged position is zero.

6.3.4. Futures contracts: stock index futures

For stock index futures the deliverable commodity (underlying asset) is a common stock index. Some stock index futures are actively traded contracts.

The stock index future price depends upon the value of the stocks in the index, the dividends on these stocks, and the interest rate until the delivery date on the futures contract.

Arbitrage ensures that the futures contract should be equivalent of a buying the stock in the index, borrowing the funds for this purchase, paying interest on the borrowed funds at the delivery date, and receiving any dividends.

$$F_{stock} = P_{stock} (1 + r_d)^d - Div$$

when P_{stock} - is the current market value of stocks in the index, r – the spot interest rate from now until delivery date, Div – amount of dividends on these stocks.

Unless the futures price is equal to $P_{stock} (1 + r_d)^d - Div$, arbitrage occurs. This arbitrage is called program trading. The figure below illustrates the case, when the futures price is above $P_{stock} (1 + r_d)^d - Div$.
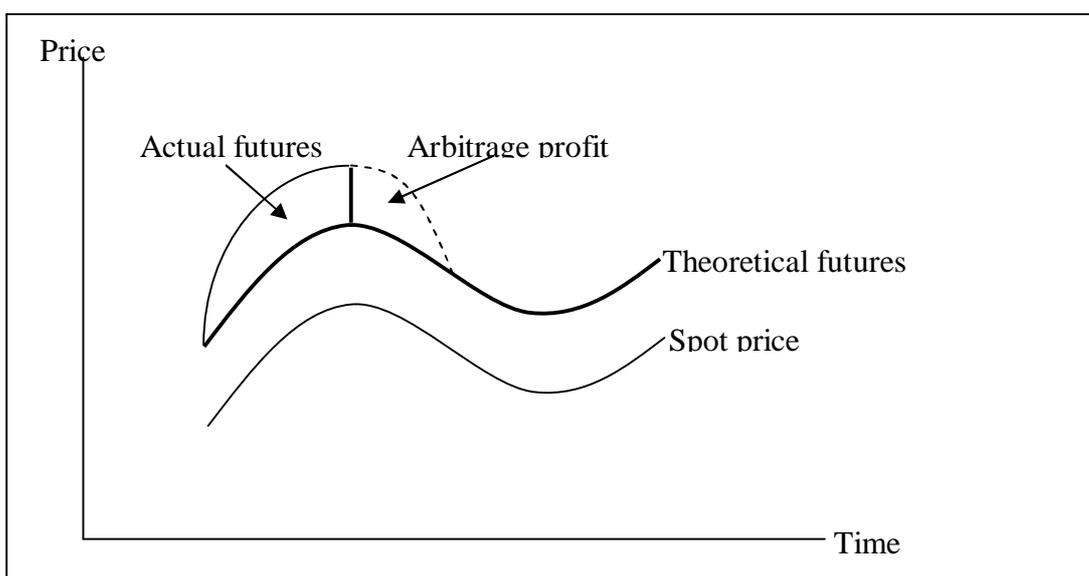

Figure 17. Program trading arbitrage

This arbitrage is to take short position in futures and buy the stocks in the index. The arbitrage position is held until the futures and spot prices are once more in line. Both positions are closed for profit.

Such type of arbitrage involves the purchase and sale of large number of stocks in the index. In order to uncover the arbitrage opportunity initially, a computer program is needed. Afterwards, the buy or sell orders for a large number of stocks must be executed rapidly by computer program before the arbitrage profit opportunity disappears.

6.3.5. Contracts for difference (CFD)

A contract for difference (CFD) is an instrument that has similarities with a futures contract. Frequently it is related to a particular stock, but could relate to any marketable asset (or even non-marketable instruments such as stock indices).

CFD contracts do not have fixed expiry dates and can be closed at any time. A CFD is a deal between an investor and a broker. The investor is expected to pay a deposit (typically 10% of the value of the shareholding to which the CFD is related). If losses are made from the transaction, the broker takes cash from the deposit (margin) and the investor is required to provide more cash in order to maintain the value of the deposit at 10%. If the position makes a profit, the investor receives cash.

An investor who takes a long position in a CFD relating to a share would profit from a share price rise, and lose in the event of a share price fall. The profits or losses would be calculated by reference to a specified share price (typically slightly above the share price when the contract was entered into; the offer price of the share might be used). If the share price were above the specified price, there would be a profit equal to the difference between the current price and the specified price.

Conversely, there would be a loss equal to the extent to which the current stock price is below the specified price. An investor with a long CFD is treated as if the shares are bought with borrowed money and the broker can do in the absence of offsetting short positions. The investor pays interest and receives dividends.

An investor who takes a short position in a CFD profits from price falls and loses from price rises. The extent of profit or loss is based on the difference between the current share price and a share price slightly below the share price at the time that the contract was entered into. The bid price of the share might be used also.

An investor with a short CFD is treated as if the shares are sold short and the receipts are put on deposit. The investor receives interest and pays sums equal to the share dividends. Bid/offer prices might be quoted.

Potential losses are very large in the event of prices moving heavily against the anticipations of an investor. The use of stop-loss order ensures automatic closure of a position in the event of a price movement beyond a particular level. However, there is a risk that the price movement is so rapid, that closure occurs only after the price has moved significantly beyond the chosen stop-loss price.

A broker, who is providing CFDs, can take corresponding positions in the share. However if a broker has investors on both the long and short sides, the need to take positions in the share is reduced since the cash flows of long and short investors would match each other. Some concern has been expressed that if investors use CFDs as a substitute for share purchases, liquidity is taken from the stock market. Although brokers take offsetting

positions in the stock market, liquidity is reduced to the extent that there is matching between long and short positions.

By using CFDs investors can obtain leveraged investments or short positions on a share (or other instrument).An almost identical alternative to CFDs is spread betting.

6.4. Swaps

A **swap** is an agreement whereby two parties (called **counterparties**) agree to exchange periodic payments. The cash amount of the payments exchanged is based on some predetermined principal amount, which is called the **notional principal amount** or simply *notional amount*. The cash amount each counterparty pays to the other is the agreed-upon periodic rate times the notional amount. The only cash that is exchanged between the parties are the agreed-upon payments, not the notional amount.

A swap is an over-the-counter (OTC) contract. Hence, the counterparties to a swap are exposed to **counterparty risk**.

Swap can be decomposed into a package of derivative instruments, e.g. a package of forward contracts. However, its maturity can be longer than that of typical forward and futures contracts, it is negotiated separately, can have quite high liquidity (larger than many forward contracts, particularly long-dated (i.e., long-term) forward contracts).

The types of swaps typically used by non-finance corporations are:

- interest rate swaps,
- currency swaps,
- commodity swaps, and
- credit default swaps.

Interest rate swap is a contract in which the counterparties swap payments in the same currency based on an interest rate. For example, one of the counterparties can pay a fixed interest rate and the other party a floating interest rate. The floating interest rate is commonly referred to as the *reference rate*.

Currency swap is a contract, in which two parties agree to swap payments based on different currencies.

Commodity swap is a contract, according to which the exchange of payments by the counterparties is based on the value of a particular physical commodity. Physical commodities include precious metals, base metals, natural gas, crude oil, food.

A **credit default swap (CDS)** is an OTC derivative that permits the buying and selling of credit protection against particular types of events that can adversely affect the credit quality of a bond such as the default of the borrower.

Although it is referred to as a "swap," it does not have the general characteristics of a typical swap. There are two parties in the CDS contract: the *credit protection buyer* and *credit protection seller*. Over the life of the CDS, the protection buyer agrees to pay the protection seller a payment at specified dates to insure against the impairment of the debt of a *reference entity* due to a credit-related event. The reference entity is a specific issuer. The specific credit-related events are identified in the contract that will trigger a payment by the credit protection seller to the credit protection buyer are referred to as *credit events*. If a credit event does occur, the credit protection buyer only makes a payment up to the credit event date and makes no further payment. At this time, the protection buyer is

obligated to fulfill its obligation. The contract will call for the protection seller to compensate for the loss in the value of the debt obligation

6.5. Options

6.5.1. Options definition

An option is a contract in which the option seller grants the option buyer the right to enter into a transaction with the seller to either buy or sell an underlying asset at a specified price on or before a specified date.

Options, like other financial instruments, may be traded either on an organized exchange or in the over-the-counter (OTC) market.

The specified price is called the **strike price** or **exercise price** and the specified date is called the **expiration date**.

The option seller grants this right in exchange for a certain amount of money called the option premium or option price. The option seller is also known as the option writer, while the option buyer is the option holder.

The asset that is the subject of the option is called the **underlying**. The underlying can be an individual stock, a stock index, a bond, or even another derivative instrument such as a futures contract.

The option writer can grant the option holder one of two rights. If the right is to purchase the underlying, the option is a **call option**. If the right is to sell the underlying, the option is a **put option**.

.Concept	**Call options:** Options that give the right to buy a given amount of a financial instrument or commodity at an agreed price within a specified time but, like all options, do not oblige investors to do so.

| Concept	**Put options:** Options that give the right to sell a given amount of a financial instrument or commodity at an agreed price within a specified time, but that do not oblige investors to do so.

An option can also be categorized according to when it may be exercised by the buyer or the **exercise style:**

- **European option** can only be exercised at the expiration date of the contract.

- **American option** can be exercised any time on or before the expiration date.

- **Bermuda option** or **Atlantic option –** is an option which can be exercised before the expiration date but only on specified dates is called.

The terms of exchange are represented by the contract unit and are standardized for most contracts. The option holder enters into the contract with an opening transaction. Subsequently, the option holder then has the choice to exercise or to sell the option. The sale of an existing option by the holder is a closing sale.

A profit profile for a call option is provided in the figure bellow. Suppose an investor is buying a bond, which is currently selling at its exercise price of 100 Euro, and holds this bond for three months until the option expires. Possible profits or losses will be on the solid line. If a call option costs 4 Euro, this will be the maximum loss for a call option

buyer. If the bond price at expiration is above the exercise, the profit equals $P - E - 4$ Euro.
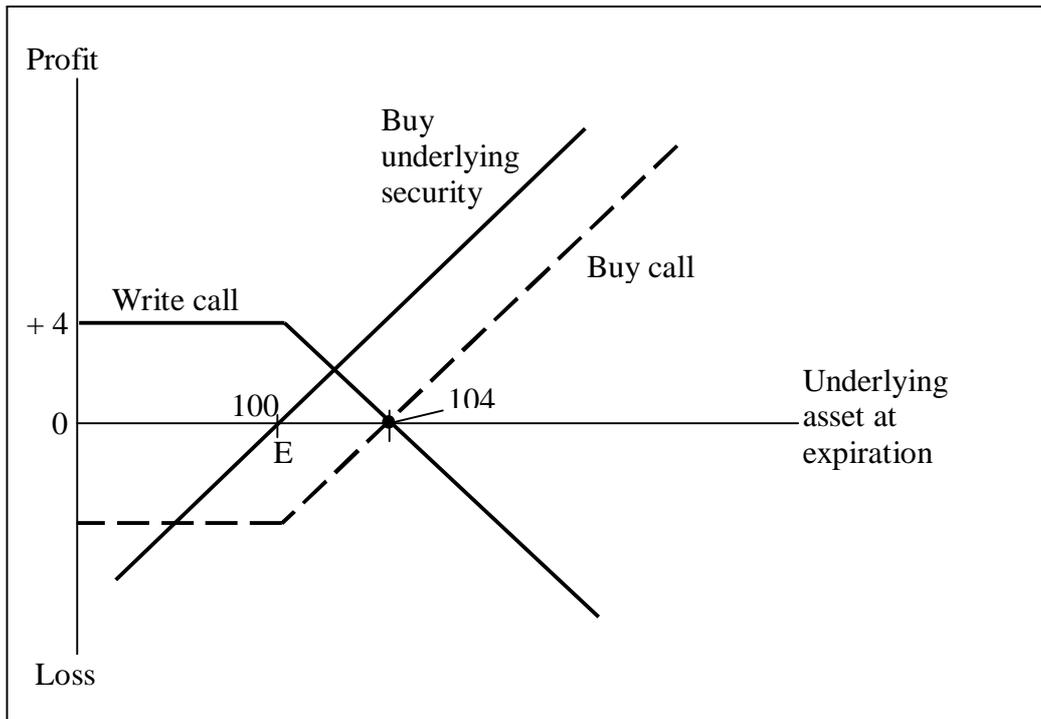
Figure 18. **Profit profiles for a call option**

The maximum profit that the option writer can realize is the option price. The option buyer has substantial upside return potential, while the option writer has substantial downside risk.

The described call option is called a naked call option. This is a risky position because the potential of loss is unbound.

Another less risky contract is writing a covered call. Such a contract involves the purchase of the underlying security and the writing of a call option on that security. Profit profile for the covered call is shown in the Figure 19. If a call option is profitable, then it it is exercised and the covered call writer must sell the underlying security at the exercise price (100 Euro). The maximum gain is 4 Euro, i.e. the original sale price of the call option. If the call option is unprofitable, the covered call option writer receives 4 Euro for writing the call, and this reduces the loss from owning the underlying security.

The purchase of a call option creates a position referred to as a **long call position**.

The writer of a call option is said to be in a **short call position.**

The **buying of a put option** creates a financial position referred to as a **long put position**.

The profit or loss for this position at the expiration date depends on the market price of the underlying asset. As with all long option positions, the loss is limited to the option price. The profit potential, however, is substantial: The theoretical maximum profit is generated if asset's price falls to zero.

Writing a put option creates a position referred to as a **short put position**. The profit and loss profile for a short put option is the opposite of the long put option. The maximum profit from this position is the option price.
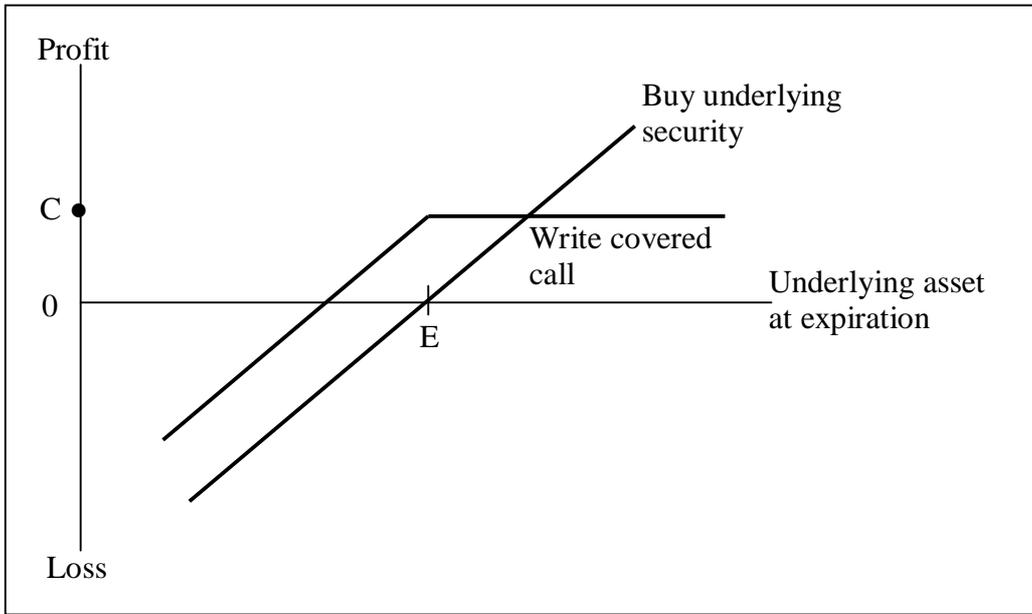
Figure 19. **Profit profile for writing a covered call option**

The theoretical maximum loss can be substantial, if the price of the underlying falls. If the price falls to zero, the loss would be as large as the exercise price less the option price. Figure 20graphically shows this profit and loss profile.
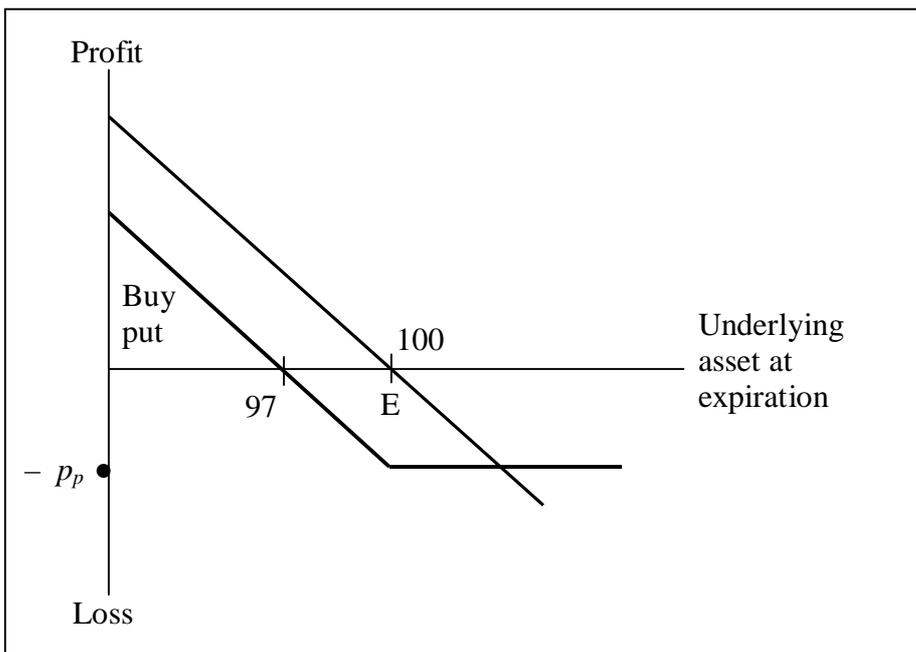
Figure 20. Profit profile for a put option

To summarize, buying calls or selling puts allows the investor to gain if the price of the underlying asset rises. Selling calls and buying puts allows the investor to gain if the price of the underlying asset falls.

6.5.2. Components of the Option Price

The theoretical price of an option is made up of two components:

- intrinsic value;
- premium over intrinsic value.

The *intrinsic value* is the option's economic value if it is exercised immediately. If no positive economic value would result from exercising immediately, the intrinsic value is zero.

For a call option, the intrinsic value is the difference between the current market price of the underlying and the strike price. If that difference is positive, then the intrinsic value equals that difference; if the difference is zero or negative, then the intrinsic value is equal to zero.

Concept	**Intrinsic value of an option:** The profit available from immediately exercising an option. Where the value of the right granted by the option is equal to the market value of the underlying instrument (the intrinsic value is zero), the option is said to be *at-the-money*. If the intrinsic value is positive, the option is *in-the-money*. If exercising an option would produce a loss, it is *out-of-the-money.*

For a put option, the intrinsic value is equal to the amount by which the underlying's market price is below the strike price.

Time premium of an option, or time value of the option, is the amount by which the option's market price exceeds its intrinsic value. It is the expectation of the option buyer that at some time before the expiration date the changes in the market price of the underlying asset will increase the value of the rights of the option. Because of this expectation, the option buyer is willing to pay a premium above the intrinsic value.

An option buyer has two ways to realize the value of an option position.

The first way is by exercising the option. The second way is to sell the option in the market.

Put-Call Parity Relationship. For a European put and a European call option with the same underlying, strike price, and expiration date, there is a relationship between the price of a call option, the price of a put option, the price of the underlying, and the strike price. This relationship is known as the **put-call parity relationship**.

The relationship is equal to:

Put option price − Call option price = Present value of strike price + Present value of cash distribution − Price of underlying asset

Put-call parity implies that:

Call option price >= Put option price - Lending present value of exercise price

The value *Put option price - Lending present value of exercise price* has been called **Merton's lower bound**. It follows that the cash flows from buying a call option can never be less than buying the underlying security and borrowing the underlying value of the

exercise price. Merton's bound is illustrated in the   Figure 21. As the price of the underlying asset rises, the value of the call approaches Merton's bound, and consequently, the value of a put gets very small. When the price of the underlying asset is small, the value of the call option is small, and the value of a put becomes large.
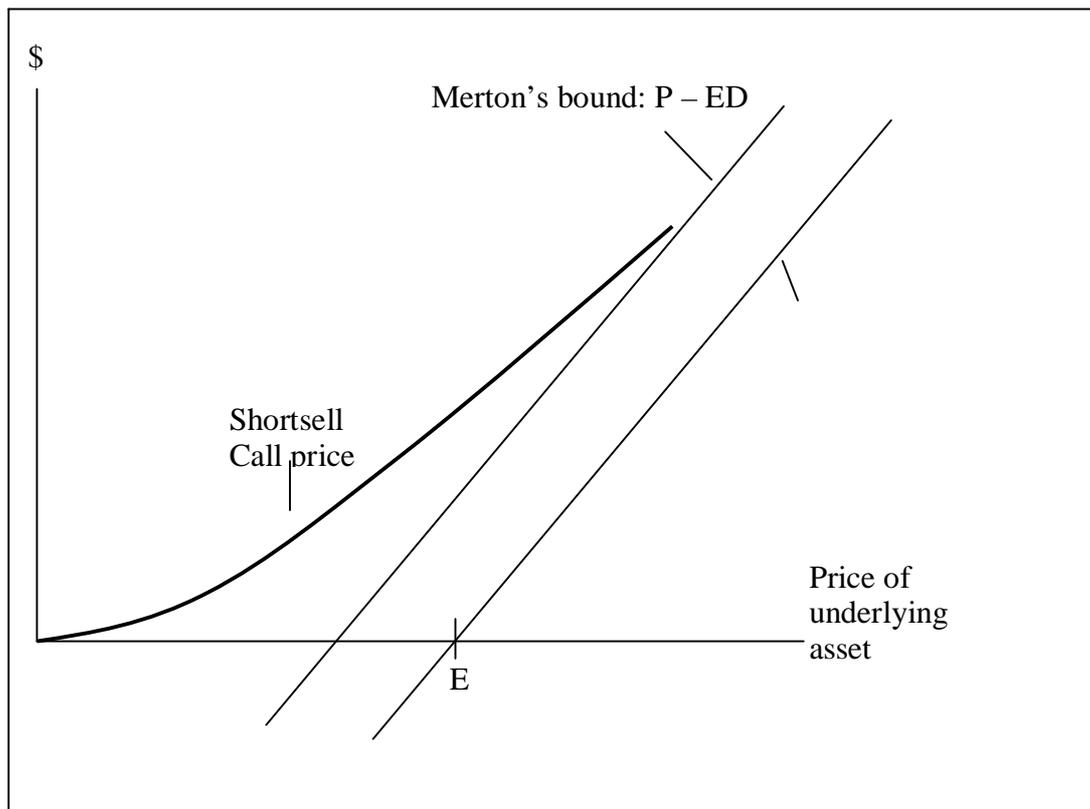

Figure 21. **Merton's bound**

6.5.3. Determinants of the Option Price

The factors that affect the price of an option include:

- Market price of the underlying asset.

- Strike (exercise) price of the option.

- Time to expiration of the option.

- Expected volatility of the underlying asset over the life of the option.

- Short-term, risk-free interest rate over the life of the option.

- Anticipated cash payments on the underlying over the life of the option.

The impact of each of these factors may depend on whether (1) the option is a call or a put, and (2) the option is an American option or a European option.

Market price of the underlying asset. The option price will change as the price of the underlying asset changes. For a call option, as the underlying assets's price increases (all other factors being constant), the option price increases. The opposite holds for a put option, i.e. as the price of the underlying increases, the price of a put option decreases.

Exercise (strike) price

The exercise price is fixed for the life of the option. All other factors being equal, the lower the exercise price, the higher the price for a call option. For put options, the higher the exercise price, the higher the option price.

Time to expiration of the option. After the expiration date, an option has no value. All other factors being equal, the longer the time to expiration of the option, the higher the option price. This is because, as the time to expiration decreases, less time remains for the underlying asset's price to rise (for a call buyer) or fall (for a put buyer), and therefore the probability of a favorable price movement decreases. Consequently, as the time remaining until expiration decreases, the option price approaches its intrinsic value. The impact of longer remaining life is shown in Figure 22
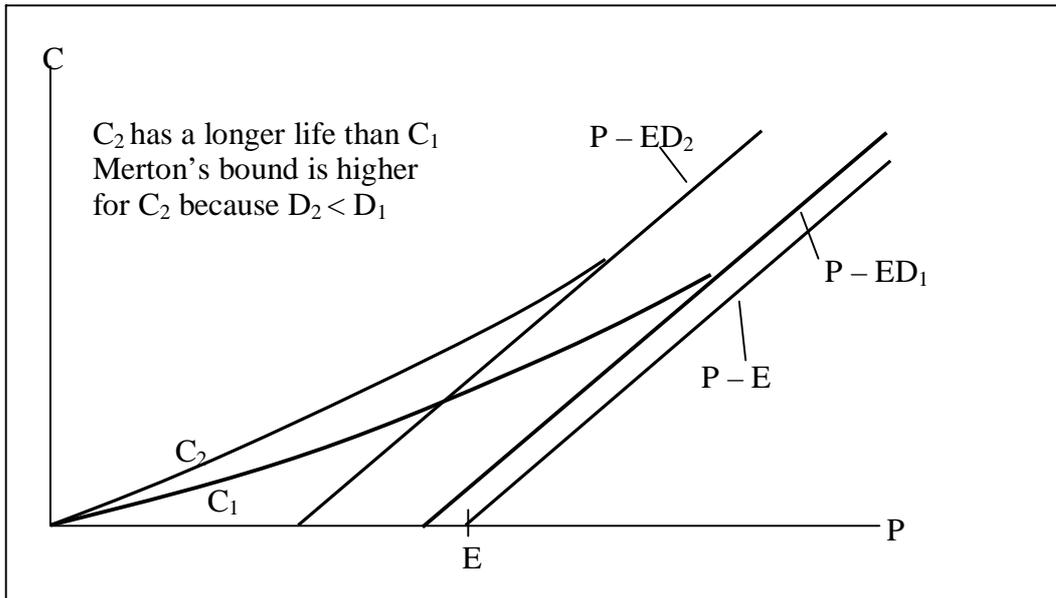

Figure 22. **Impact of longer remaining life on the value of a call option**
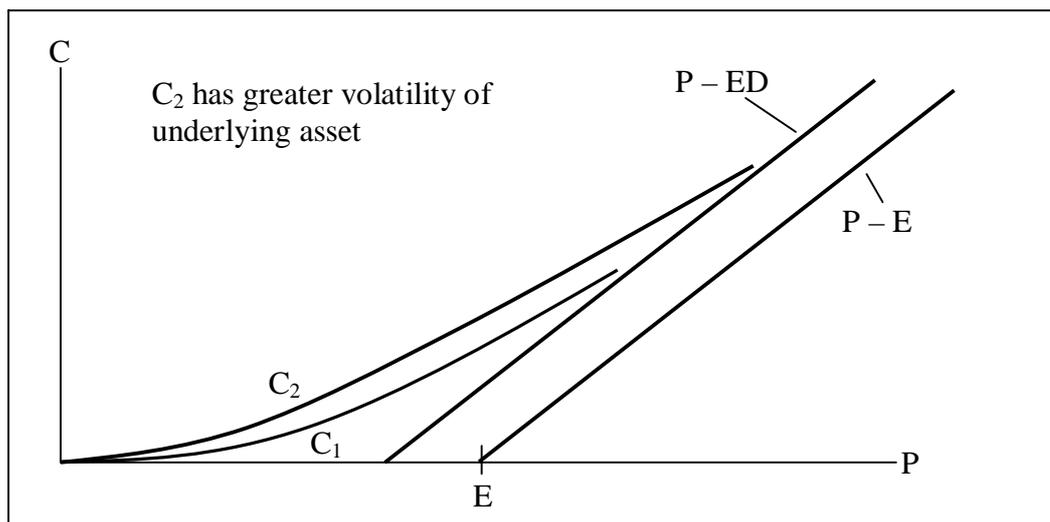
Figure 23. **Impact of the volatility of the underlying asset on the value of a call option**

Expected Volatility of the Underlying asset over the life of the option. All other factors being equal, the greater the expected volatility (as measured by the standard deviation or variance) of the underlying, the more the option buyer would be willing to pay for the option, and the more an option writer would demand for it. This occurs because the greater the expected volatility, the greater the probability that the movement of the underlying will change so as to benefit the option buyer at some time before expiration.
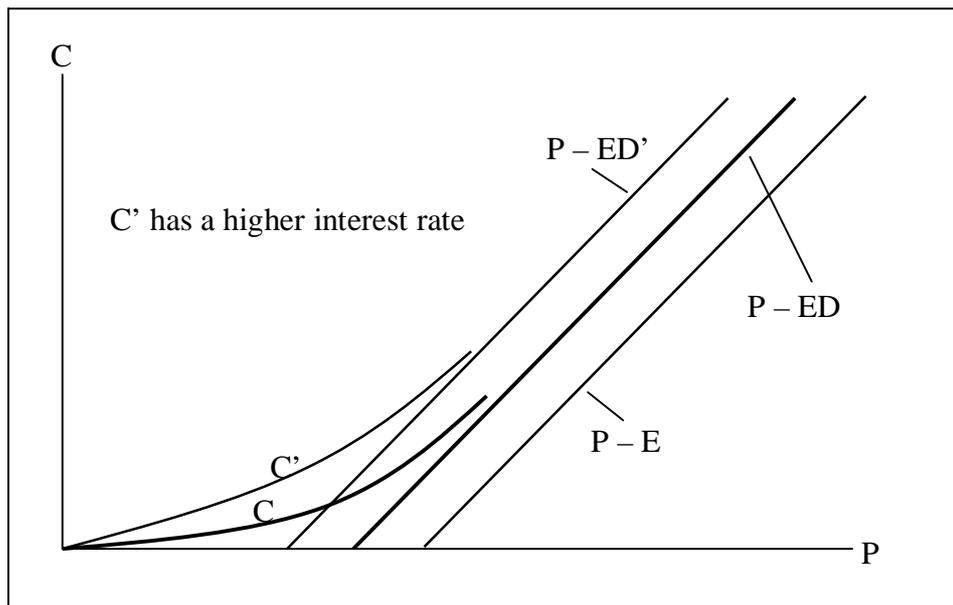
Figure 24. **Impact of higher interest rate on value of call option**

Short-term, risk-free interest rate over the life of the option. Buying the underlying asset requires an investment of funds. Buying an option on the same quantity of the underlying makes the difference between the underlying's price and the option price available for investment at an interest rate at least as high as the risk-free rate. Consequently, all other factors being constant, the higher the short-term, risk-free interest rate, the greater the cost of buying the underlying asset and carrying it to the expiration date of the call option. Hence, the higher the short-term, risk-free interest rate, the more attractive the call option will be relative to the direct purchase of the underlying. As a result, the higher the short-term, risk-free interest rate, the greater the price of a call option.

Anticipated cash payments on the underlying over the life of the option cash payments on the underlying tend to decrease the price of a call option. The cash payments make it more attractive to hold the underlying than to hold the option. For put options, cash payments on the underlying tend to increase the price.

6.5.4. Option pricing models

An option pricing model uses a set of assumptions and arbitrage arguments to derive a theoretical price for an option. Deriving a theoretical option price is much more complicated than deriving a theoretical futures or forward price because the option price depends on the expected volatility of the underlying over the life of the option.

Several models have been developed to determine the theoretical price of an option. The most popular one was developed by Fischer Black and Myron Scholes (1973) for valuing European call options on common stock.

6.5.5. Mixed strategies in options trading

Call and put options and the buying and writing of options can be combined to try to profit from expected conditions in the market. Some of such strategies are as follows:

Cases where a trader either buys or writes options but does not do both

Straddle – a call and a put at the same strike price and expiry date

Strangle – a call and a put for the same expiry date but at different strike prices

Strap – two calls and one put with the same expiry dates; the strike prices might be the same or different

Strip – two puts and one call with the same expiry date; again strike prices might be the same or different

In general, the buyer of these options is hoping for market prices to move sharply but is uncertain whether they will rise or fall. The buyer of a strap gains more from a price rise than from a price fall; the buyer of a strip gains more from a price fall. The writer in all four cases is hoping that the market will remain stable, with little change in price during the life of the option.

Spreads: combinations of buying and writing options

Butterfly – buying two call options, one with a low exercise price, the other with a high exercise price, and writing two call options with the same intermediate strike price or the reverse.

Condor – similar to a butterfly, except that the call options which are written have different intermediate prices.

Both a butterfly and a condor are vertical spreads – all options bought or sold have the same expiry date but different strike prices. *Horizontal* spreads have the same strike prices but different expiry dates. With diagonal spreads both the strike prices and the expiry dates are different. Other mixed strategies have equally improbable names. They include vertical bull call; vertical bull spread; vertical bear spread; rotated vertical bull spread; rotated vertical bear spread.

6.6. Summary

The need for sophisticated risk management in the face of highly volatile exchange rates provides one of the principal reasons for the growth of derivatives markets. These allow firms to hedge risk by taking out contracts in derivatives markets, which carry the opposite risk to that which they face in the underlying markets. The principal types of derivatives are futures, forwards, swaps and options. Futures promise the delivery of an underlying asset of a specified kind on a given date, although delivery is seldom made.

Options give the right to buy and/or sell an underlying asset, although that right need not be taken up. In order to increase tradability, futures and options are highly standardised. Both offer the possibility of very high rates of profit. Futures do this through the system of margin payments. In the case of options, this occurs because buyers of options pay only the premium for the right to trade at the specified price.

Derivative contracts are offered in relation to exchange rates, short-term and long-term interest rates and stock exchange indices. They are widely used for speculation as well as for risk management. In recent years, options have become extremely complicated, with new forms of options contracts appearing regularly.

Forward and futures contracts are likely to provide cheaper protection against loss than options, but remove the profit opportunity if prices move in favour of the firm. Thus, options are generally preferable if the hedger is uncertain about the direction the price of the underlying asset is likely to move. A hedger who is confident about the direction in which the price will move is more likely to choose forward or futures contracts or remain in an open position and accept the risk of a price change.

A trader who is confident that the price will fall may (a) sell the product before the price falls; (b) take an offsetting short position by selling futures contracts; or (c) sell the currency forwards. This eliminates entirely her exposure to the price fall.

A trader who is uncertain in which direction the price will move may choose options. Even then, if she thinks that the price is more likely to fall than to rise, financial futures are preferable to options because they are likely to offer her cheaper protection. Options are preferable if the trader has no view or thinks that the price is more likely to rise than fall.

Derivatives markets have been controversial in recent years. Many companies have experienced losses badly in these markets, and fears about causing serious problems for the international financial system continue to be widespread

Key terms

- Options

- Futures

- Forwards

- Swaps

Review questions and problems

1. Consider the relative advantages and disadvantages of using forward contracts, futures contracts and options as means of speculation.

2. How do futures markets seek to protect themselves and their clients against default risk?

3. Why might the increased protection provided to individual traders by the derivatives markets increase the risk of the whole financial system running into difficulties?

4. Why did the US central bank (the Federal Reserve) feel the need to rescue a privately owned and run hedge fund (LTCM) in late 1998? Should public resources be used in this way?

5. How many ways are there of a Latvian investor going short in US dollars or giving itself the opportunity of going short? Why might a Latvian investor wish to go short in US dollars?

6. Why is it more risky to write (sell) options contracts than to buy them?

7. Consider the following statement: A speculator who felt that interest rates were likely to rise or a currency's value *decline would go short in the relevant asset by selling a futures contract.*

   a) Why would a speculator go short rather than long in these two cases?

   b) What does going short in interest rates mean?

   c) How does selling a futures contract allow one to go short?