BABEŞ-BOLYAI UNIVERSITY
Faculty of Economics and Business Administration
Finance Department
58-60 Teodor Mihali Street, 400.591, Cluj-Napoca, România
Phone: 0264 418.655 Fax: 0264 412.5 70

Preparation guide for specialized knowledge assessment

Bachelor's Degree Examination
Finance and Banking, English Line

A. Summary of theoretical topics

In the following we will present a brief summary of the most important topics of theoretical nature presented in the Corporate finance Syllabus. Nevertheless, the theoretical questions may also cover concepts approached in the Syllabus and not mentioned in the present guide.

1. Supply chain and inventory management

Supply chain management refers to the management of a network of interrelated businesses involved in the provision of product and service packages required by the end customers. Supply chain management spans all movement and storage of raw materials, work-in-process inventory, and finished goods from point of origin to point of consumption. Supply chain execution means managing and coordinating the movement of materials, information and funds across the supply chain, through a bi-directional flow.

The word **inventory** (or *stock*) describes the goods and materials that a business holds for the ultimate purpose of resale. **Inventory management** refers to specifying *the size and placement* of stocked goods in order to protect the regular and planned course of production against the *random disturbance of running out* of materials or goods. The purpose of inventory management is also to optimize important indicators and activities such as asset management, inventory forecasting, inventory valuation, inventory visibility, demand forecasting, quality management, returns and defective goods, etc. Furthermore, the management of the inventories, with the primary objective of determining/controlling stock levels within the physical distribution system, functions to balance the need for product availability against the need for minimizing stock holding and handling costs.

Besides economies of scale, inventories are kept because of the time lags in the supply chain and the uncertainties in demand, supply and movement of goods. Inventories are usually divided into three **categories**:

- *Raw materials*: materials and components scheduled for use in making a product;
- *Work in process*: materials and components that have begun their transformation to finished goods;
- *Finished goods*: goods ready for sale to customers.

In order to set up an inventory control and management system the ideal inventory level must be determined. There are several *factors* that impact the **optimum inventory level**:

- ✓ amount of capital and financing available;
- ✓ consumer demand and projected sales;
- ✓ inventory carrying costs: ordering, financing, receiving, storing, handling, insurance, deterioration, obsolescence costs, physical damage, tax expenses.
- ✓ quantity discounts (discounts for making few larger orders instead of numerous smaller ones)
- ✓ storage space.

2. Depreciation methods

Depreciation is the process by which a company allocates an asset's cost over the duration of its useful life. Each time a company prepares its financial statements, it records a depreciation expense to allocate a portion of the cost of the buildings, machines or equipment it has purchased to the current fiscal year. The purpose of recording depreciation as an expense is to spread the initial price of the asset over its useful life.

Each country adapts and combines the „classical" depreciation systems and develops its own depreciation methods which are correlated to that country's fiscal policy. The law in Romania recognizes 3 depreciation methods: straight-line depreciation; declining-balance depreciation and accelerated depreciation.

1. The straight-line method requires that the same depreciation norm be used for a constant depreciation basis for the entire life-time of the fixed asset. This method is derived from the straight-line system. This method is considered to be the simplest one. It requires simple computation and the cost of the asset is attributed constantly over the entire life-time of the asset.

2. The declining-balance method recognizes a higher depreciation cost earlier in an asset's life-time. This method writes-off depreciation costs more quickly than the straight-line method. Generally, the purpose behind this is to minimize taxable income. The depreciation norm given by the straight-line method is adjusted by the following coefficients:

a) 1.5 if the life-time of the fixed asset is from 2 to 5 years;
b) 2 if the life-time of the fixed asset is from 5 to 10 years;
c) 2.5 if the life-time of the fixed asset is longer than 10 years.

The yearly depreciation charge is used in two ways:

-without taking obsolescence into account;
-by taking obsolescence into account.

1. The declining-balance method without taking into account obsolescence

When determining the yearly charge without taking into account obsolescence we should proceed as follows:

-in the first year, the norm is applied to the innitial value of the fixed asset;

-for the following years, the same norm is used, but each year it is applied to the net book-value from the previous one. This procedure is repeated as long as the yearly charge remains higher than the one determined using the straight line method. When the yearly charge computed like this becomes equal to or smaller than the one determined using the straight line method, we switch and from that year on, the straight line method will be used for the net book-value.

2. The declining-balance method taking into account obsolescence

When determining the yearly charge, considering the influence of obsolescence, the following factors need to be considered:

-the innitial value for the first year and the net book-value for all the following years of the lifetime;
-the standard life time, as given in the directory;
-the declining-balance depreciation norm;
-the time period for which the yearly charge will be computed, i.e. the time period for full depreciation, further divided in the two components: declining-balance and straight-line.

3. The accelerated depreciation method uses a combined approach. For the first year, it is allowed to use any depreciation norm that does not exceed 50%. For the following years a new depreciation norm is computed using the straight line approach. This norm is then applied to the net book-value of the fixed asset after the first year. This depreciation method recognized by the Romanian law is in fact a straight-line method, but uses two different depreciation norms for the first and the following years.

3. Break even point and analysis

The break-even point (BEP) is the point at which cost or expenses on the one hand and revenue on the other hand are equal: there is no net loss or gain, and one has "broken even". A profit or a loss has not been made.

Example. If a business sells less than 220 chairs each month, it will register a loss, if it sells more, it will have some profit. With this information, the business managers will then need to see if they expect to be able to make and sell 220 chairs per month.
If they think they cannot sell that many, to ensure viability they could:

- ✓ Try to reduce the fixed costs (by renegotiating rent for example, or keeping better control of telephone bills or other categories of fixed costs)
- ✓ Try to reduce variable costs (the price it pays for the chairs by finding a new supplier)
- ✓ Increase the selling price of their chairs.

Any of these would reduce the break even point. In other words, the business would not need to sell so many chairs to make sure it could pay its costs.

The break-even point (in terms of Unit Sales (X)) can be directly computed in terms of Total Revenue (TR) and Total Costs (TC) as:

$$TR = TC$$
$$p * X = FC + vc * X$$
$$p * X - vc * X = FC$$
$$(p - vc) * X = FC$$

$$\Rightarrow \quad X = \frac{FC}{p - vc}$$

where:
FC is Total Fixed Costs,
p is Unit Sale Price, and
vc is Unit Variable Cost.

The quantity $\boldsymbol{p - vc}$ is of interest in its own right, and it is called the Unit Contribution Margin (C), being the marginal profit per unit, or alternatively the portion of each sale that contributes to Fixed Costs. Thus the break-even point can be more simply computed as the point where Total Contribution = Total Fixed Cost:

$$\text{Total Contribution} = \text{Total Fixed Costs}$$
$$\text{Unit Contribution} \times \text{Number of Units} = \text{Total Fixed Costs}$$
$$\text{Number of Units} = \frac{\text{Total Fixed Costs}}{\text{Unit Contribution}}$$

In currency units (sales proceeds) to reach break-even, one can use the above calculation and multiply by Price, or equivalently use the Contribution Margin Ratio (Unit Contribution Margin over Price, i.e. C/P) to compute it as: $$\text{Break-even(in Sales)} = \frac{\text{Fixed Costs}}{\text{C/P}}.$$

Target Income Sales. *Target Income Sales* are the sales necessary to achieve a given Target Income (or Targeted Income). It can be measured either in units or in currency (sales proceeds), and can be computed as follows:

$$\text{Target Income Sales (in Units)} = \frac{\text{Fixed Costs} + \text{Target Income}}{\text{Unit Contribution}}$$
$$\text{Target Income Sales (in Sales proceeds)} = \frac{\text{Fixed Costs} + \text{Target Income}}{\text{Contribution Margin Ratio}}$$

The break-even point is a special case of Target Income Sales, where Target Income is 0 (breaking even). This is very important for financial analysis.

4. Dividends and dividend policies

The dividend represents a distribution of a company's earnings decided by the board of directors, to a class of its shareholders. The dividend is often quoted in terms of the lei, euro, dollar amount each share receives (dividends per share) or as a percent of the current market price (dividend yield).
The dividend policy is the trade-off between retaining earnings on the one hand and paying out cash and issuing new shares on the other. Basically the dividend policy is the policy a company uses to decide how much it will pay out to shareholders in dividends.

1. Types of Dividends

The dividend is set by the firm's board of directors. Dividends come in different forms:
a) cash dividends;
b) stock dividends;
c) stock split;
d) share repurchase.
Dividends are usually paid in cash. A company may also pay a stock dividend, i.e. a dividend payment made in the form of additional shares: e.g. a 2% stock dividend implies that shareholders receive 1 share for each 50 shares they own. A stock split means a company's existing shares are divided into multiple shares: e.g. a 2-for-1 stock split means each shareholder receives an additional share for each share he/she holds (this is equivalent with a 100% stock dividend). A share repurchase is a program by which a company buys back its own shares from the marketplace.

2. Method of Dividend Payments

The announcement of the dividend states that the payment will be made to all those stockholders who are registered on a particular record date.

When dividend has been declared it becomes a debt of the firm and cannot be rescinded.
Dividends are normally paid quarterly and, if conditions permit, the dividend is increased once a year.

3. Dividend policy

There are three parties of economists upholding three dividend theories:

a) ***the middle-of-the road party*** claims that given the investment decision of the firm, the dividend policy is irrelevant. Increasing and decreasing dividends have not effect on stock price.
Representants: Miller and Modigliani (1961); Black and Scholes (1974); Miller and Scholes (1978)
The middle-of-the-road party supports the dividend irrelevance theory. Miller and Modigliani showed that as long as the firm is realizing the returns expected by the market, it doesn't matter whether that return comes back to the shareholders now as dividend or is reinvested and leads to an appreciation in dividend or price. The shareholder can thus create their own dividend by selling the stock when he needs cash.

b) ***the rightists*** claim that if the firm increases the level of dividends the stock price will also increase.
Representants: Graham and Dodd (1951); Gordon (1963); Lintner (1962).
The rightists support the bird-in-the-hand theory. Gordon argued that the dividend-in-the hand is worth more than the present value of a future dividend. Basically, when making decisions related to stocks, investors value dividends more than capital gains.

c) ***the leftists*** claim that if the firm increases the level of dividends the stock price will decrease.
Representant: Michael Brennan (1970).
The leftists support the differential theory or tax preference theory. Dividends received are taxable in the current period meanwhile taxes on capital gains are deferred into the future when the stock is actually sold. In addition the tax on capital gain is usually lower than the tax rate on dividends (ordinary income). As such, investors may prefer capital gains to dividends.

Dividend policy in practice

In practice investors prefer to have the firm retain and reinvest earnings if they can earn a higher risk adjusted return.

a) ***the residual dividend policy*** suggests that dividends should be that part of earnings which cannot be invested at a rate at least equal to the WACC.
Residual dividend policy steps:

1. determine the optimal capital budget;
2. determine the retained earnings that can be used to finance the capital budget;
3. use retain earning to supply as much of the equity investment in the capital budget as necessary;
4. pay dividends only if there are left-over earnings.

Example: Suppose a company has a target equity ratio of 60% and needs to spend 50 million euro on new projects. Then, that company needs 0.6 x 50 = 30 million euro in equity. If their net income is 100 million euro, its dividend will be 100 - 30 = 70 million euro. If capital requirements were 200 million euro, the company would not pay any dividend.

b) ***the stable (predictable) dividend policy*** according to which firms try to keep the dividend constant. It is never reduced. However it may be increased if management is certain that future earnings will support such a high dividend.

Stable dividend policy steps:

1. pay a predictable dividend every year;
2. base optimal capital budget on residual retained earnings.

The greatest danger in adopting a stable dividend policy is that once it is established it cannot be changed without seriously affecting investors' attitude and the financial standing of the company.

Example: Suppose a company earned 10000 euro for the year. If the company decided on a stable policy of 10% of the yearly earnings (i.e. 10% x 10000 = 1000 euro), it would pay 250 euro (i.e. 1000 / 4) to shareholders every quarter. So, companies following this policy are always attempting to share earnings with shareholders rather than searching for projects in which to invest excess cash.

B. Summary of applicative topics

In the following we will present a summary of the most important topics of applicative nature presented in the Corporate finance Syllabus. Nevertheless, the applicative questions may also cover concepts approached in the Syllabus and not mentioned in the present guide.

Notes on applicative questions:

- Some applications might cover 2 or 3 questions depending on the complexity of the solution.
- The data will consist in low numerical values, mainly whole numbers (for example: 100, 50, -250, -10, 5000) in order to simplify computation by avoiding large numbers (millions, billions etc.). If the data is in percentages, maximum two decimals will be used (for example, 7,58% or 11,5%).
- It is recommended for students to use four decimals in intermediate computations. For example, a percentage of 5,18%, will be written as 0,0518.
- Rounding is not necessary if the solution is a whole number (for example, 35) or a number with maximum two decimals (for example, 12,4 or 105,26).
- If the solution is expressed with three or four decimals the final answer will be rounded at two decimals as follows:

  15,3201 → 15,32 15,3211 → 15,32 15,3221 → 15,32 15,3231 → 15,32 15,3241 → 15,32

  15,3258 → 15,33 15,3268 → 15,33 15,3278 → 15,33 15,3288 → 15,33 15,3298 → 15,33

- There is no risk of choosing a wrong answer due to decimal rounding. Differences in possible choices will be substantial enough to avoid that rounding errors will cause a wrong selection. For example, if the correct answer is NPV= 31,2768 and the choices are (a) 15,36 (b) 42,19 (c) 31,28 (d) 100. It is obvious that you will choose (c) 31,28.

1. Time value of money

Interest rates may be regarded as the price paid to use money over a given period of time. Interest rates are meant to compensate lenders and savers for foregoing the use of money for some interval of time. Lenders of capital receive interest, and borrowers pay interest due to the positive time value of money.

A lender who provides 1000 lei today at a 10% interest per year is paid back 1100 lei at the end of the year. The 100 lei amount compensates the lender for not making an alternative investment, for giving up personal consumption or for the risk that the money might not have been repaid.

Managers are often confronted with investment opportunities with different length lives, different sized investments, differing financing terms, differing tax implications, etc. In all cases the cash flows associated to an investment are converted to their equivalent values at a common point in time by using tools and techniques that collectively comprise the concepts known as the Time Value of Money.
Basically, the time value of money principle may be encompassed in the following formulas:

$$PV = \frac{FV_t}{(1+k)^t}$$

Where: PV = the present value of a certain amount (cash-flow);
FV_t = the expected value of the cash-flow after t years;
k = the discount rate (the opportunity cost of capital).

For example, the present value of 100 lei to be received 1,2,3,4 and 5 years from now at a 7% interest rate is presented in the table below:

Year	**1**	**2**	**3**	**4**	**5**
Discount factor	0.934	0.873	0.816	0.763	0.713
Present value	93.4	87.3	81.6	76.3	71.3

The discount rate or the normal rate of return associated to an investment opportunity is composed of the risk-free rate (Rf) and a risk-premium which rewards the investor proportionally to the level of risk assumed.

$$k = R_f + \textit{the risk premium}$$

The initial investment outlay of a one-year project equals 50000 lei. The project generates in the following year a cash flow of 70000 lei with a probability of 30% and of 48000 lei with a probability of 70%. The average discounted cash flow equals the cost of investment. Determine the risk premium of the project knowing that the risk-free rate is 4%.

$$\overline{CF} = 70000\times30\% + 48000\times70\% = 54600 \text{ lei}$$

$$50000 = \frac{54600}{1+k}$$

k = 9.2%; R_f = 4%; risk premium = 5.2%

The rate of return on an investment is simply the profit as a proportion of the initial outlay. The expected return that an investor gives up when choosing to finance an investment project rather than investing on the stock market represents the opportunity cost of capital of the project.

You are analyzing an investment project of which cashflows are dependent on the evolution of the economy. Analysts have forecasted three equally likely economic scenarios and you have forecasted the following cash-flows for your project one year from now:

Scenario	Recession	Normal	Boom
Cash-flow (m.u)	10000	20000	30000

The expected cash-flow $E(CF)$ considering the scenarios and the associated probabilities equals 20000 m.u. with a standard deviation of the cash-flows $\sigma(CF)$ of 8164.97 m.u.

$$E(CF) = \sum_{i=1}^{n} CF_{S_i} \cdot p_{S_i}$$

$$\sigma(CF) = \left(\sum_{i=1}^{n} \left[CF_{S_i} - E(CF) \right]^2 \cdot p_{S_i} \right)^{\frac{1}{2}}$$

where: CF_{S_i} = the forecasted cash-flow in scenario i;
p_{S_i} = the likelihood associated to scenario i.

$$E(CF) = (1/3) \cdot 10000 + (1/3) \cdot 20000 + (1/3) \cdot 30000 = 20000\ m.u$$

$$V(CF) = (1/3) \cdot (10000 - 20000)^2 + (1/3) \cdot (20000 - 20000)^2 + (1/3) \cdot (30000 - 20000)^2$$

$$V(CF) = 66666667\ m.u^2$$

$$\sigma(CF) = 8164.97\ m.u$$

On the stock market you find the stock of corporation Z of which expected price equals 100 m.u in recession, 200 m.u under a normal evolution of the economy and 300 m.u in boom. The expected price of the stock $E(CF) = 200\ m.u.$ and the standard deviation is $\sigma(CF) = 81.6497\ m.u$. The risk associated to stock Z is similar to the risk of your project.
If the current price of the stock is 160 m.u the expected return on stock Z $E(R_Z)$ will equal 25% considering that no dividend is expected.

$$E(R_Z) = \frac{E(P_Z) - P_{Z_0}}{P_{Z_0}}$$

where: $E(P_Z)$ = the expected price of stock Z;
P_{Z_0} = the current price of stock Z.

$$E(R_Z) = \frac{200 - 160}{160} = 25\%$$

The 25% expected on stock Z of which risk equals the risk of the project is the opportunity cost of capital of the project. The present value of the project's expected cash-flow equals 16000 m.u. If the initial outlay on the project exceeds 16000 m.u, the project should be rejected, and the amount invested in stock Z. If the initial outlay is for example 15200 m.u than the project will add a 800 m.u supplementary discounted value over the investment in stock Z (the investor could buy 95 shares of stock Z).

$$PV_{CF} = \frac{20000}{1.25} = 16000\ m.u$$

$$NPV_{25\%} = -15200 + 16000 = 800\ m.u$$

2. Risk, return and capital market equilibrium

Securities derive their value from the cash flow they are expected to generate. Since the cash flow will be received over future periods, there is need to discount these future flows in order to derive a present value or price for the security.

Assuming that we are valuing the security over a single holding period (say, a year) we can illustrate the process of valuation with a particularly simple model:

$$P_0 = \frac{CF + E(P)}{(1+k)}$$

The model indicates that the present value or current price P_0 of the security is the cash-flow (dividends or coupons) received over the period plus the expected price at the end of the period, $E(P)$ discounted back at the rate k.

By rearranging the previous equation, we obtain the discount rate k. In this form it is usual to think of the discount rate as a return expected by investors, that is, an expected return.

$$E(R) = \frac{CF + E(P) - P_0}{P_0}$$

For a common stock, the expected return consists of a yield component – dividend divided by beginning-of-period-price – and a capital gain component, which is the percentage change in price over the period.

$$E(R) = \frac{E(D)}{P_0} + \frac{E(P) - P_0}{P_0}$$

where: E(D) = expected dividend

The past return or realized return is computed similarly based on past prices of the stock:

$$R_t = \frac{D_t}{P_{t-1}} + \frac{P_t - P_{t-1}}{P_{t-1}}$$

where: R_t = the realized return on the stock at time t;

D_t = the dividend paid by the company at time t;

P_{t-1}, P_t = stock price at time t-1 and t.

The past return on a portfolio of assets is a weighted average of the past returns of all stocks included in the portfolio:

$$R_{pf_t} = \sum_{i=1}^{N} w_i \times R_{it}$$

where: w_i = the security's proportion in the portfolio;

R_{it} =the realized return of stock i at time t;

N = the number of stocks included in the portfolio.

The expected return of a portfolio of securities is merely a weighted average of the expected returns of the individual securities. Alternatively, the expected return on the portfolio equals the average of past portfolio returns.

$$E(R_{pf}) = \sum_{i=1}^{N} w_i \times E(R_i)$$

$$E(R_i) = \frac{1}{T} \times \sum_{t=1}^{T} R_{i_t}$$

$$E(R_{pf}) = \frac{1}{T} \times \sum_{t=1}^{T} R_{pf_t}$$

where: T = the total number of observations.

During the last five months stocks A and B sold at the following prices:

Month	December	January	February	March
A	10	10.5	12.5	12
B	110	121	121	132

Compute the returns of a portfolio composed of A and B in proportions of 40% and 60%.
The realized monthly returns on each stock and on the portfolio are computed below:

Month	January	February	March
A	5%	19.05%	-4%
B	10%	0%	9.09%
Pf	8%	7.62%	3.85%

For example, in January the arithmetic return on stock A equals:

$$R_{A_{Jan}} = \frac{10.5 - 10}{10} = 5\%$$

Portfolio's return in January is a weighted average of the returns of stocks A and B.

$$R_{pf_{Jan}} = 40\% \cdot 5\% + 60\% \cdot 10\% = 8\%$$

The variance of return and standard deviation of return are alternative statistical measures that are proxies for the uncertainty or risk. These statistics measure the extent to which returns are expected to vary around the average over time. Extensive variations around the average would indicate great uncertainty regarding the expected return.
The variance is the average of the squared deviations of the individual returns from the average. The standard deviation is the root of the variance.

$$V(R) = \frac{1}{T} \cdot \sum_{t=1}^{T} [R_t - E(R)]^2$$

$$\sigma(R) = \sqrt{V(R)}$$

The riskiness of a portfolio will depend on how a security blends with the existing securities and contributes to the overall risk of a portfolio. The ***covariance*** is a statistic that measures the riskiness of a security relative to others in a portfolio of securities.

$$cov(R_i, R_j) = \frac{1}{T} \sum_{t=1}^{T} (R_{it} - \bar{R}_i)\,(R_{jt} - \bar{R}_j)$$

If the securities move counter to each other than the covariance is a negative value. If the securities move consistently in tandem than the covariance is positive.
To facilitate interpretation, it is useful to standardize the covariance. Dividing the covariance between two securities by the product of the standard deviation of each security produces a variable with the same properties as the covariance but scaled to a range of -1 to +1. The measure is called the correlation coefficient.

$$\rho_{ij} = \frac{cov(R_i, R_j)}{\sigma_i \cdot \sigma_j}$$

Negative correlation is desirable in a security because such a security has great risk reducing potential in a portfolio context. So the variance or risk of a portfolio is not simply a weighted average of the variances of the individual securities in the portfolio. The relationship between each security in the portfolio and every other security as measured by the covariance of returns needs to be also considered.
For a portfolio of two securities i and j the risk measured by the portfolio variance is calculated as follows:

$$V(R_{pf}) = \sigma^2(R_{pf}) = w_i^2 \cdot \sigma^2(R_i) + w_j^2 \cdot \sigma^2(R_j) + 2 \cdot w_i \cdot w_j \cdot cov(R_i, R_j)$$

The risk of a portfolio measured by the variance is a weighted average of the variances of the individual securities plus the covariance between each security and every other security in the portfolio. By

diversifying the portfolio (increasing the number of securities) investors manage to substantially reduce the risk. Diversification works because prices of different stocks do not move exactly together.
The risk that potentially can be eliminated by diversification is called diversifiable risk, specific risk, unsystematic risk or residual risk. This specific risk stems from the fact that many of the perils that surround an individual company are peculiar to that company and perhaps its immediate competitors.
But there is also some risk that can't be avoided regardless of how much the portfolio is diversified. This risk is generally known as market risk, systematic risk or undiversifiable risk. Market risk stems from the fact that there are other economy wide perils which threaten all businesses. That is why stocks have a tendency to move together. And that is why investors are exposed to market uncertainties no matter how many stocks they hold.

Consider stocks A and B with the following past returns:

Month	January	February	March
Stock A	2.5%	4.5%	3.5%
Stock B	3.5%	5.5%	7.5%

a. compute the expected return and risk on each stock.
b. what is the correlation between A and B?
c. what is the expected return and risk on an equally weighted portfolio composed of A and B.

a. The expected returns and risks of stocks A and B are presented in the following table:

Stock	Expected return	Variance	Standard deviation
A	3.5%	0.0067%	0.82%
B	5.5%	0.0267%	1.63%

$E(R_A) = \frac{1}{3} \cdot (2.5\% + 4.5\% + 3.5\%) = 3.5\%$

$V(R_A) = \frac{1}{3} \cdot [(2.5\% - 3.5\%)^2 + (4.5\% - 3.5\%)^2 + (3.5\% - 3.5\%)^2] = 0.00006667 \approx 0.0067\%$

$\sigma(R_A) = \sqrt{0.00006667} = 0.008165 \approx 0.82\%$

b. $cov(R_A, R_B) = \frac{1}{3} \cdot [(2.5\% - 3.5\%) \cdot (3.5\% - 5.5\%) + (4.5\% - 3.5\%) \cdot (5.5\% - 5.5\%) +$
$+(3.5\% - 3.5\%) \cdot (7.5\% - 5.5\%)] = 0.00006667 \approx 0.0067\%$

$\rho_{AB} = \frac{0.00006667}{0.008165 \cdot 0.016329} = 0.5$

c. $E(R_{pf}) = 50\% \cdot 3.5\% + 50\% \cdot 5.5\% = 4.5\%$

$V(R_{pf}) = 0.5^2 \cdot 0.0067\% + 0.5^2 \cdot 0.0267\% + 2 \cdot 0.5 \cdot 0.5 \cdot 0.0067\% = 0.00011667 = 0.0117\%$

$\sigma(R_{pf}) = \sqrt{0.00011667} = 0.0108 \approx 1.08\%$

3. Investment decisions

Capital budgeting is the planning process used to determine whether a firm's long term investments such as new machinery, replacement machinery, new plants, new products and research and development projects are worth pursuing.
There are two equivalent decision rules for capital investment:
1. Net present value rule: accept investments with positive net present values.
2. Rate of return rule: accept investments that offer rates of return in excess of their opportunity cost of capital.
The rate of return of an investment is simply the profit as a proportion of the initial outlay:
The net present value is the total present value of a time series of cash flows. This method uses the time value of money in order to appraise long term projects. Future cash inflows and outflows are discounted back to their present value and then are summed up.

$$NPV = \sum_{t=0}^{n} \frac{CF_t}{(1+k)^t}$$

$$NPV = -I_0 + \sum_{t=1}^{n} \frac{CF_t}{(1+k)^t}$$

where: I_0 = the investment outlay
CF_t = the net cash flow at time t (inflow minus outflow)
k = the opportunity cost of capital.
Usually the first cash flow CF_o is a negative one, a cash outflow that equals the initial required investment which is the funding of the project.
The discount rate is often referred to as the hurdle rate or the opportunity cost of capital. The opportunity cost of capital for a project is the expected rate of return demanded by investors in common stocks and other securities subject to the same risk as the project. For example, if the capital required for a project A can earn a certain percent elsewhere we will use this discount rate in the NPV calculation to allow a direct comparison to be made between project A and the alternative. When you discount the project's expected cash flow at its opportunity cost of capital, the resulting present value is the amount that investors (including your own company's shareholders) would be willing to pay for the project.
As an alternative to the opportunity cost of capital the firm's weighted average cost of capital after tax is often used as a discount factor.

A corporation must decide whether to adopt an investment project. The project implies costs and incoming cash flows over five years. The immediate cash outflow is 50000 lei (the investment initial cost), while the other cash outflows for the following years are expected to be 5000 lei per year. Starting with the following year the expected cash inflows are 20000 lei per year. The required rate of return is 10%. Using the NPV criteria decide whether this project should be adopted.

$$NPV = -50000 + \frac{15000}{(1+0{,}1)^1} + \frac{15000}{(1+0{,}1)^2} + \frac{15000}{(1+0{,}1)^3} + \frac{15000}{(1+0{,}1)^4} + \frac{15000}{(1+0{,}1)^5} = 6861.8\ lei$$

The internal rate of return is the annualized effective compounded return rate which can be earned on the invested capital. The IRR is compared to any alternate cost of capital including an appropriate risk premium (investing in other projects, buying bonds, putting money in a bank account, etc). If the IRR is greater than the rate of return that could be earned by alternate investments of equal risk then the project is a good investment.
In general, if the IRR is greater than the project's cost of capital the project will add value for the company. Given a series of cash flows involved in a project, the IRR is that rate for which the net present value equals zero.

$$\sum_{t=0}^{n} \frac{CF_t}{(1+IRR)^t} = 0$$

Knowing that for a r_1 =15% discout rate the net present value of the previous investment project equals NPV_1 =282.33 lei, and for a r_2 =20% discout rate the net present value of an investment project is of NPV_2 =– 2009.8 lei, determine the internal rate of return of the project.

$$IRR = r_1 + \frac{NPV_1(r_2 - r_1)}{[NPV_1 - NPV_2]} = 15\% + \frac{282.33 \cdot 5\%}{282.33 - (-2009.8)} = 15{,}61\%$$

The Profitability Index (PI), also known as value investment ratio (VIR), is the ratio of *payoff to investment* of a proposed project. It is a useful tool for ranking projects because it allows managers to quantify the amount of value created per unit of investment.

$$PI = \frac{\sum_{t=1}^{n} \frac{CF_t}{(1+k)^t}}{I_0}$$

A profitability index of 1 indicates breakeven. Any value lower than one would indicate that the project's PV is less than the initial investment. As the value of the profitability index increases, so does the financial attractiveness of the proposed project.

The present value of the cashflows associated to projects A and B, at a discount rate of 30%, is given in the table below:

Project	PV_{CF0}	PV_{CF1}	PV_{CF2}	PV_{CF3}
A	-10000	5384.61	2958.58	910.33
B	-10000	3846.15	3254.44	2275.83

a. Knowing that the after-tax cost of capital (WACC) of the corporation is 15%, compute the profitability index for these projects.

b. Compute the internal rate of return for A and B. How do you decide which project is better based on this criterion?

The table below presents the forecasted cash-flows of projects A and B:

Project	CF_0	CF_1	CF_2	CF_3
A	-10000	7000	5000	2000
B	-10000	5000	5500	5000

$$CF_t = PV_{CF_t} \cdot (1+k)^t$$

$$CF_{A2} = 2958.58 \cdot (1+30\%)^2 = 5000\ m.u$$

$$PV_{CF_A} = \frac{7000}{1.15^1} + \frac{5000}{1.15^2} + \frac{2000}{1.15^3} = 11182.7\ m.u$$

$$PI_A = \frac{PV_{CF_A}}{I_{A0}} = \frac{11182.7}{10000} = 1.12$$

$$PV_{CF_B} = \frac{5000}{1.15^1} + \frac{5500}{1.15^2} + \frac{5000}{1.15^3} = 11794.2\ m.u$$

$$PI_B = \frac{PV_{CF_B}}{I_{B0}} = \frac{11794.2}{10000} = 1.18$$

4. The financial structure and the cost of capital

The firm's mix of different securities is known as its capital structure. The firm attempts to find the particular combination of securities that maximizes its overall market value.
After analyzing a number of factors, a firm establishes a target capital structure it believes is optimal, which is then used as a guide for raising funds in the future. This target might change over time as conditions vary, but at any given moment the firm's management has a specific capital structure in mind, and individual financing decisions should be consistent with this target. If the actual proportion of debt is below the target level, new funds will probably be raised by issuing debt, whereas if the proportion of debt is above the target, stock will probably be sold to bring the firm back in line with the target debt/assets ratio.
Capital structure policy involves a trade-off between risk and return. Using more debt raises the riskiness of the firm's earnings stream, but a higher proportion of debt generally leads to a higher expected rate of return. A higher risk associated with greater debt tends to lower the stock's price. Therefore, the optimal capital structure is the one that strikes a balance between risk and return to achieve the ultimate goal of maximizing the price of the stock.
The dividend discount model is the most commonly used stock valuation model. The current price of the stock equals the present value of future cash-flows expected by the shareholders (dividends and the selling price).

$$P_0 = \sum_{t=1}^{n} \frac{D_t}{(1+k)^t} + \frac{P_n}{(1+k)^n}$$

where: D_t =the dividend paid by the corporation in year t;
P_n = the selling price after n years;
k = the cost of equity.

For the model to be used in practice, some assumptions need to be made regarding dividend payments. According to Gordon model, dividends are expected to grow at a constant rate g into the indefinite future. This is, in fact, the case for many companies. If dividends grow at a constant rate g, we just need to forecast the next dividend *D1* and the constant growth rate *g*.

$$P_0 = \frac{D_1}{k-g}$$

The model isused in practice both as a stock valuation model and a cost of equity estimation model. The cost of equity k is obtained from the above relationship as follows :

$$k = E(R) = \frac{D_1}{P_0} + g$$

A corporation delivered dividends annually starting with 2012 when the value of the dividend was 10 lei per share, at an annually growth rate of 6%. What is the return expected in 2020 if the price of the stock at the beginning of the year was 60 lei?

$$D_1 = E(D) = 10 \cdot 1.06^8 = 15.94\ lei$$

$$k = E(R) = \frac{15.94}{60} + 6\% = 32.56\%$$

In financial theory, the cost of equity is the return that stockholders require for a company. A firm's cost of equity represents the compensation that the market demands in exchange for owning the asset and bearing the risk of ownership. The cost of debt is the effective rate that a company pays on its current debt. This can be measured in either before- or after-tax returns; however, because interest expense is deductible, the after-tax cost should be used.
The weighted average cost of capital is the calculation of a firm's cost of capital in which each category of capital is proportionately weighted. All capital sources - common stock, preferred stock, bonds and any other long-term debt - are included in a WACC calculation.

$$WACC = R_E \cdot \frac{E}{V} + R_D \cdot (1 - T_C) \cdot \frac{D}{V}$$

where: R_E = the expected return on equity or the cost of equity (k_E)

R_D = the expected return on debt (the average interest rate)

E = market value of the firm's equity

D = market value of the firm's debt

V = E + D the value of the corporation

Tc = corporate tax rate

A company has the following capital structure:

Security	Expected return	Market value
Debt	5%	100
Preferred stock	6.2%	40
Common stock	12.2%	200

What discount rate should the company set for investments that expand the scale of its operations without changing its risk? The corporate ta

x rate is 16%.

The cost of equity is a weighted average of the cost of common stocks and preferred stocks:

$$R_E = k_E = 6.2\% \cdot \frac{40}{240} + 12.2\% \cdot \frac{200}{240} = 11.2\%$$

The weighted average cost of capital (recommended discount rate) is a weighted average of the cost of equity and the after-tax cost of debt:

$$k = WACC = 11.2\% \cdot \frac{240}{340} + 5\% \cdot 0.84 \cdot \frac{100}{340} = 9.14\%$$

5. Financial Indicators

The objective of financial analysis is to rearrange data from financial statements into financial ratios that provide information about the main areas of financial performance such as:

Short-term solvency measures the ability of a firm to meet its short-run financial obligations.

Accounting liquidity measures short-term solvency and is often associated with net working capital, the difference between current assets and current liabilities (debts that are due within one year from the data of the balance sheet). The basic source from which to pay current liabilities is current assets.

$$current\ ratio = \frac{Total\ current\ assets}{Total\ current\ liabilities}$$

If a firm is having financial difficulty it may not be able to pay its bills (accounts payable) on time or it may need to extend its bank credit (notes payable). As a consequence current liabilities may rise faster than current assets and the current ratio may fall as a sign of financial trouble.

$$quick\ ratio = \frac{Quick\ assets}{Total\ current\ liabilities}$$

Quick assets are those current assets that are quickly convertible into cash. They are obtained by subtracting inventories from current assets. It is important to determine a firm's ability to pay off current liabilities without relying on the sale of inventories.

Financial leverage is related to the extent to which a firm relies on debt financing rather than equity.

$$debt\ ratio = \frac{Total\ debt}{Total\ assets}$$

$$debt\text{-}equity\ ratio = \frac{Total\ debt}{Total\ equity}$$

$$equity\ multiplier = \frac{Total\ assets}{Total\ equity}$$

Debt ratios provide information about protection of creditors from insolvency and the ability of firms to obtain additional financing for potentially attractive investment opportunities.

Profitability ratios measure the extent to which a firm is profitable. Accounting profits are the difference between revenues and costs.

$$net\ profit\ margin = \frac{Net\ income}{Total\ operating\ revenue}$$

$$gross\ profit\ margin = \frac{Earnings\ before\ interest\ and\ taxes}{Total\ operating\ revenues}$$

Profit margins express profits as a percentage of total operating revenue. They reflect the firm's ability to produce a project or service at a low cost or a high price.

$$net\ return\ on\ assets = \frac{Net\ income}{Total\ assets\ (average)}$$

$$gross\ return\ on\ assets = \frac{Earnings\ before\ interest\ and\ taxes}{Total\ assets\ (average)}$$

One of the interesting aspects of return on assets (ROA) is how some financial ratios can be linked together to compute ROA.

$$ROE = \frac{Net\ income}{Shareholder's\ equity} \times 100$$

In 2019 the return on assets was 5.71% and the debt ratio was 42.86%. Compute the return on equity.

$$ROE = \frac{Net\ profit}{Equity} = \frac{ROA \cdot TA}{E} = \frac{ROA \cdot (E + D)}{E} = ROA + ROA \cdot \frac{D}{E}$$

$$ROE = 5.71\% + 5.71\% \cdot \frac{0.4286 \cdot TA}{(1 - 0.4286) \cdot TA} = 9.993\% \approx 10\%$$

The most important difference between ROA and ROE is due to financial leverage.

ROE = Profit margin × Asset turnover × Equity multiplier

$$\text{ROE} = \frac{Net\ income}{Total\ operating\ revenue} \times \frac{Total\ operating\ revenue}{Total\ assets} \times \frac{Total\ assets}{Stockholder's\ equity}$$

$$payout\ ratio = \frac{Cash\ dividends}{Net\ income}$$

$$retention\ ratio = \frac{Retained\ earnings}{Net\ income}$$

The payout ratio is the proportion of net income paid out in cash dividends and the retention ratio is the proportion of net income retained by the corporation for future investments.

In 2019 a corporation with equity in value of 100 millions lei obtained a ROE of 10%. Knowing that the financial leverage is 75% compute the return on assets.

$$Net\ profit\ = ROE \cdot Equity = 10\% \cdot 100 = 10\ millions\ lei$$

$$Assets\ = Equity\ + Debt\ = 100\ + 100 \cdot 75\% = 175\ millions\ lei$$

$$ROA = \frac{10}{175} = 5.71\%$$

The members of the Finance Department
Wish you good luck in preparing for the bachelor's degree examination!
Good luck with your final exams!