EFR summary

Finance 1, FEB12003X

2024-2025

Lectures and Exercise Lectures 1 to 7

Weeks 1 to 7

Deloitte.

DeNederlandscheBank
EUROSYSTEEM

Details

Subject: Finance 1 IBEB 2024-2025

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Finance 1 – IBEB – Lecture 1, week 1

Types of financial statements

Balance Sheet. Firm's financial position at a point in time (firm's assets and liabilities)
Income Statement. Firm's earnings (firm's revenues and expenses)
Statement of Cash Flows. Indicates the amount of cash generated by the firm.
Statement of Stockholders' Equity. Breaks down the stockholders' equity into issuing shares and retained earnings.

Statement of cash flows

Free cash flow (FCF) - the cash flow available for the company to repay creditors, pay dividends and interest to investors.

The statement of cash flow includes **3 sections:** Operating activity, investing activity, and financing activity

Factor	Location
+ EBIT x (1- Tax Rate)	Income Statement
+ Non-cash Expenses (Depreciation, Amortization, etc.)	Income Statement
- Change in (Current Assets - Current Liabilities)	Balance Sheet (current period and previous period)
- Capital Expenditures (CAPEX)	Balance Sheet: Property, Plant, and Equipment (current period and previous period)
= Free Cash Flow	

Valuation indicators

Book value versus market value

Book value: how accountants evaluate a firm based on the sum of the net profits that were not paid out as dividends over the lifetime of the company. This is the book value of the firm's equity (Equity = Assets - Liability).

Financial economists, on the other hand, assess the value of a firm's equity by looking at its **market value** (or market capitalisation). This equals # shares outstanding * stock price.

$$market - to - book\ (MB)\ ratio\ =\ market\ value\ of\ equity\ /\ book\ value\ of\ equity$$

When creditors and shareholders have more positive views on the firm's future than the suggestion from its book value, MB is often greater than 1. An obvious example is the potentially huge difference between the market value and the book value of a (great) football player.

Enterprise value: the market value of the firm's (underlying) assets that generate cash flows. This is the cost one needs to pay when taking over the enterprise.

enterprise value (EV) = market value of equity + debt - cash.

Cash here is the excess cash that is not needed for the firm's operating activities and can be paid back to investors without harming the business. This is different from working capital (cash needed to run the firm).

Risk-return relations

The higher the risk, the higher the required return.

No arbitrage

Arbitrage: without taking risks, you make a profit
No arbitrage: you cannot make a profit without taking risks

Time value of money

Financial decisions are often made by comparing values:

1. Values can be compared only at the same point in time
2. Compound cash flow to move it forward in time

$$FV_n = C * (1 + r)^n$$

3. Discount cash flow to move it backward in time:

$$PV = \frac{C}{(1+r)^n}$$

Valuing a stream of cash flows

Present value of a cash flow stream

$$PV = \sum_{n=0}^{N} \frac{C_n}{(1+r)^n}$$

Future value of a cash flow stream

$$FV = PV(1 + r)^n$$

Annuities - Fixed period. Present value of annuity with growth

$$PV(annuity\ with\ growth) = \frac{C}{(r+g)}[1 - (\frac{1+g}{1+r})^N]$$

Perpetuities - Infinite life.

$$PV(perpetuity) = C/r$$
$$PV(growing\ perpetuity) = C/(r - g)$$

Growing perpetuity: perpetuity where the payments increase at a constant rate, g.

Discounting with the risk-free rate

Risk-free interest rate, r_f: interest rate at which money can be borrowed or lent without risk over that period

If future payments are risky, premium needs to be added to interest rate to account for riskiness (higher risk => higher interest rate).

Financial decision-making

Cost-benefit analysis for an investment opportunity can be done by calculating the Net Present Value (NPV) using the formula:

$$NPV = PV(benefits) - PV(costs)$$

NPV decision rule: invest in the alternative with the highest NPV. Choosing this alternative is equivalent to receiving its NPV in cash today.

The net present value of a stream of cash flows can be valued by summing the discounted values of each future cash flow with the appropriate interest rates regarding the time distance.

Law of one price: If equivalent investment opportunities trade simultaneously in different markets, then the price of trading should be the same everywhere. If this law does not hold, then an arbitrage opportunity exists.

Finance 1 – IBEB
Exercise lecture 1, week 1

Introduction to financial statement analysis

Firms' disclosure of financial information

Financial statements are firm-issued accounting reports with past performance information. They are filled with the SEC (Securities and Exchange Commission). Financial statement analysis is used to compare the firm with itself over time, and compare the firm to other similar firms.

Balance sheet

A firm's balance sheet is a snapshot in time of the firm's financial position.

The balance sheet identity is given by:

Assets = Liabilities + Stockholders' Equity.

Assets: what the firm owns.

- Current assets: cash or assets that are expected to be turned into cash within a year. This category includes cash, marketable securities (short-term low-risk investments like government bonds), accounts receivable, inventories, and other current assets such as pre-paid expenses.
- Long-term assets include net property, plant, and equipment (book value=cost of acquisition-accumulated depreciation), goodwill and intangible assets and other long-term assets, such as investments in long-term securities.

Liabilities: what the firm owes.

- Current liabilities are to be paid within a year. This includes accounts payable, short-term debt/notes payable, current maturities of long-term debt, and other current liabilities such as taxes payable, wages payable.

*__Net working capital__ is the capital that is available in the short term to run the business:

Net working capital = current assets - current liabilities.

- Long-term liabilities consist of other liabilities with the maturity of longer than one year and include long-term debt, capital leases, and deferred taxes.

Stockholders' Equity: the difference between the value of the firm's assets and liabilities.

- Book value of equity can be negative because it is calculated as the difference between book value of assets and book value of liabilities. However, many of the firm's valuable assets may not be reflected in the balance sheet (for example: the firm's reputation).

- Market value of equity (Market Capitalization) = Market price per share × number of shares outstanding. This cannot be negative and often differs substantially from book value.

- Market-to-book ratio (or Price-to-book ratio)

  $market - to - book\ (MB)\ ratio\ =\ market\ value\ of\ equity\ /\ book\ value\ of\ equity$

  Value stocks: $MB\ ratio\ <\ 1$

  Growth stocks: $MB\ ratio\ >\ 1$

- Total enterprise value (TEV)

$$enterprise\ value\ (EV)\ =\ market\ value\ of\ equity\ +\ debt\ -\ cash$$

Income statement

Income statement indicates the flows of revenues and expenses over a period of time.

- An important component of an income statement is the "bottom line" (net income = earnings in a period).

Earning calculations:

Total sales/revenue
-
Cost of sales
—————————————
Gross profit
-
Operating expenses
—————————————
Operating income
+/-
Other income/expenses
—————————————
Earnings before interest and tax (EBIT)
+/-
Interest income/interest expenses
—————————————
Pre tax income
-
Taxes
—————————————
Net income

Net income/No of shares outstanding = EPS

Statement of Cash Flows

Net income typically does not equal the amount of cash the firm has earned, because it includes non-cash expenses such as depreciation and amortization, and excludes cash uses such as investment in property, plant, and equipment or expenditures on inventory.

A statement of cash flows can be used to calculate free cash flows (FCF) and enterprise value. It includes three sections:

1. Operating Activity: Adjusts net income for all non-cash items related to operating activities and changes in net working capital.
Adjustments:

- Depreciation / amortization: add the amount of depreciation / amortization (as a non-cash expense)
- Account receivable: deduct the increases (as the cash is not yet been received)
- Accounts payable: add the increases (cash have not been paid yet)
- Inventories: deduct the increases (any increases in inventory are paid by cash)

2. Investment Activity: all cash required for investment activities

- Capital expenditures (purchasing PPE)
- Trading of marketable securities
- Acquisition related expenditures

3. Financing Activity:

- Payments of dividends (cash outflow, therefore is deducted)
  retained earnings = net income - dividends
- Changes in borrowings (increases in borrowings are cash inflows)

Financial decision-making and law of one price

Financial decision making: Investment should be made when $PV(benefits) > PV(costs)$.

$$NPV = PV(benefits) - PV(costs) \rightarrow NPV > 0$$

Arbitrage refers to taking advantage of the price difference when buying and selling equivalent goods in different markets. An arbitrage opportunity occurs when it is possible to make a profit without taking any risk or making any investment.

Normal market is a competitive market in which there is no arbitrage opportunity.

Law of One Price: If equivalent investment opportunities are traded at the same time in different normal markets, then they must trade for the same price in both markets.

Time value of money

PV shortcut formulas

Perpetuities

- Constant cash flow: $PV = \frac{C}{r}$
- Growing cash flow: $PV = \frac{C}{(r-g)}$

Annuities

- Constant cash flow: $PV = \frac{C}{r} \times \left[1 - \frac{1}{(1+r)^n}\right]$
- Growing cash flow: $PV = \frac{C}{r-g} \times \left[1 - \left(\frac{(1+g)}{(1+r)}\right)^n\right]$
  (g=growth rate; n=number of periods; C=cash flow; r=interest rate)

Type of cash flows	Constant cash flows	Growing cash flows
Perpetuities *(last forever)*	$g = 0, n \to \infty$ $PV\ (perpetuity) = \frac{C}{r}$	$g < r, n \to \infty$ $PV\ (growing\ perpetuity) = \frac{C}{(r-g)}$
Annuities *(N periods)*	$g = 0, n \to N$ $PV\ (annuity) = \frac{C}{r} \times \left[1 - \frac{1}{(1+r)^N}\right]$	$n \to N$ $PV\ (growing\ annuity) = \frac{C}{r-g} \times \left[1 - \left(\frac{(1+g)}{(1+r)}\right)^N\right]$

Interest rates

Effective Annual Rate (EAR) indicates the total amount of interest that will be earned at the end of one year. Typically used in present value calculations for yearly cash flows as it considers the effect of compounding. Also referred to as the Effective Annual Yield (EAY) or Annual Percentage Yield (APY).

Annual Percentage Rate (APR) indicates the amount of simple interest earned in one year.

Simple interest is the amount of interest earned without the effect of compounding. The APR is typically less than the EAR.
* Note that the APR cannot be used as a discount rate without adjustments made.

The APR with k compounding periods is a way of quoting the actual interest earned each compounding period:

$$Interest\ Rate\ per\ Compounding\ Period\ =\ APR\ /\left(\frac{k\ periods}{year}\right)$$

To convert an APR to an EAR, we can use the following formula:

$$1\ +\ EAR\ =\left(1\ +\frac{APR}{k}\right)^{k}$$

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Lecture & Exercise lecture 2, week 2

Valuing bonds

Bond: A tradable loan, which generally has a fixed maturity and fixed coupon payments (cash flow stream).

Two types of bonds

1. Zero coupon bond: Offers a single payment.

- Purchaser pays the price of the bond
- The bond promises in K-year to pay the bondholder a single payment, called face value (par value)
- The date of this payment is called the maturity date. K is the time to maturity

2. Coupon bond: Zero coupon bonds with additional periodic payments

- The bond promises in K-year to pay the bondholder a single payment, called face value
- The date of this payment is called the maturity date. K is the time to maturity
- Additional coupons: At regular intervals until maturity, the bondholder receives a coupon payment
- Coupon rate: the ratio of total annual coupon to face value

Bond price: present value of cash flows

Step 1: Identify all cash flows
Step 2: Discount these cash flows using rules of time travel. For very long-term bonds, we can use the annuity formula for the coupons + present value of final payment of face value

- Annuity without growth

$$PV_A = \frac{C}{r}\left[1 - \left(\frac{1}{1+r}\right)^T\right]$$

- Bond value = PV (coupon value)+ PV (face value)

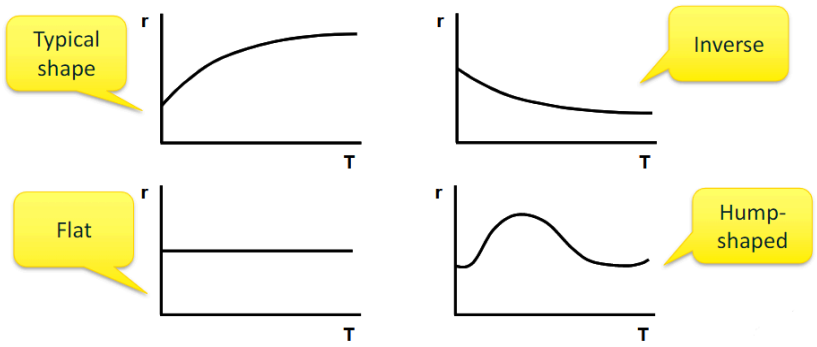
$$PV_B = \frac{Coupon}{r}\left[1 - \left(\frac{1}{1+r}\right)^T\right] + \frac{Face\ value}{(1+r)^T}$$

What drives bond prices

1. Interest rate

When interest rates rise, bond prices typically decline.

Term structure of interest rates indicates how interest rates vary with the maturity at one point in time. The most typical case depicts an upward-sloping term structure, because the longer the time until maturity the higher the interest rate.



2. Risk of default

The possibility of default adds a credit spread, increasing the required return and lowering the bond's price.

$$Price = \sum_{t=1}^{T} \frac{Face\ value}{\left(1+r_f+credit\ spread\right)^t}$$

Bond price: yield to maturity

The bond **yield** is another way to express the bond price:

$$Price = \sum_{t=1}^{T} \frac{C_t}{(1+r_t)^t} = \sum_{t=1}^{T} \frac{C_t}{(1+YTM)^t}$$

*YTM: weighted average of spot rate used for discounting.

Spot rates and forward rates

The difference between the spot rate (r) and forward rate (f) is that the spot rate always starts at time t=0 and lasts until a further point in time regardless how far this point is. But forward rates last from one point in time to the next point in time.

The law of one price must hold, therefore the general formula for period n:

$$(1 + f_{n-1,n}) = (1 + r_n)^n / (1 + r_{n-1})^{n-1}$$

Investment decision rules

1. Net present value (NPV)

$$NPV = \sum_{t=0}^{T} CF_t / (1 + R_t)^t = -INV_0 + \sum_{t=1}^{T} CF_t / (1 + R_t)^t$$

Choose the investment with the highest NPV

Complexities in Using NPV

1. Comparing projects with varying durations.
2. Capital constraints

Duration of the projects

When choosing from the projects with different duration, we have to extend the timeline of the projects as fair comparison can be done only if periods are equal.

Capital constraints

Sometimes firms have many positive NPV projects and they can't invest in all of them simultaneously

To tackle this, we take the following steps:
Step 1: Form all possible combinations between available projects
Step 2: Cancel those combinations that are impossible due to limited budget
Step 3: Choose the combination with the highest NPV

Profitability index (NPV per constrained resource) = NPV/Investments

It can be used to identify the optimal combination of projects to invest in under the budget constraint. Rank projects by PI and select the ones with the highest indicator.

$$PI = \frac{value\ created}{resource\ consumed} = \frac{NPV}{resource\ consumed}$$

Strengths of using NPV

- Often right and unambiguous
- Incorporates time value of money
- Easy to compare between projects
- Takes investment size into account
- Can compare one large project versus several smaller ones

Weakness:

- Needs an appropriate discount rate

2. Payback period

The payback period (PBP): The amount of time it takes to recover or pay back the initial investment
=> If the payback period is less than a pre-specified length of ime, you should accept the project. Otherwise, you reject it

Formula:

$$INV_{t=0} \leq \sum_{t=1}^{PBP} CF_t$$

Pitfalls of the PBP method

- Ignores the project's capital cost and value of money
- Ignores cash flows after the payback period

Even though the answer is not always correct, this alternative method is used because of uncertainty in the long run, because the future is hard to predict.

3. Internal rate of return (IRR)

Internal rate of return (IRR) is the interest rate at which the NPV of an investment project equals zero.

- Invest if IRR > capital cost and don't invest if IRR < capital cost
- If $IRR > r$ this indicates that $NPV > 0$ and hence it is attractive to do the project.
- Choose the project with the highest IRR

The IRR can only be deduced by trial and error and the formula is such that:

$$0 = \sum_{t=0}^{T} CF_t / (1 + IRR)^t$$

Pitfalls of the IRR method: It ignores the size of a project, and with longer duration projects where reinvestment is assumed this might be a disadvantage. In case of

positive and negative cash flows there is a possibility for multiple IRRs to exist with positive and negative interest rates when NPV is zero.

Capital budgeting

The process of analyzing investment opportunities and deciding which one to choose is called capital budgeting.

Incremental cash flows = the difference between doing and not doing the project.

Cannibalization occurs when the introduction of a new product has an adverse impact on the sales of existing products.

Opportunity cost - the revenue that could have been earned with an alternative use of the asset.

Sunk costs - unrecoverable costs that are already incurred and therefore irrelevant for the decision making.

$$net\ working\ capital = current\ assets - current\ liabilities$$

$$Free\ Cash\ Flow = (Revenues - Costs - Depreciation) \times (1 - \tau) + Depreciation - \Delta NWC - CapEx$$

Dealing with uncertainty

- **Break-even** analysis: this analysis finds the value of a parameter for which the $NPV = 0$. After this we can determine how likely it is that the parameter value is below or above the break-even amount
- **Sensitivity** analysis: input assumptions in this analysis will be changed within a plausible range, which will affect the NPV.
- **Scenario** analysis: in this analysis, the values of parameters will be determined for multiple scenarios, like a best case and worst case. These scenarios will be compared by their NPV when multiple parameters are changed at the same time.

Valuing stocks

For bonds, the cash flows were known, they consisted of coupons and a principal. But stock only pays dividends, we get the value of what is left of the earnings of a company, which are not known in advance.

Terminology

- Common Stock: security representing a share in the ownership of a corporation.
- Initial Public Offering: the first sale of stock in a corporation to the public.
- Secondary Market: a market, often a stock exchange, in which previously issued shares are traded amongst investors.
- Dividends: payments made by companies to shareholders.
- Dividend yield: ratio of annual dividend to share price. There are different types (for example, stock or cash; preferred and common)
- P/E Ratio: share price divided by earnings per share (price-to-earnings)

Two ways to estimate the value of a stock: **Dividend Discount Model (DDM)** or estimating the **value using comparable firms**.

Dividend Discount Model (DDM)

$R_E = R_t + \ equity\ risk\ premium;\ P_0 = \frac{div_1}{1+r_E} + \frac{P_1}{1+r_E} \Rightarrow r_E = \frac{div_1}{P_0} + \frac{P_1 - P_0}{P_0}$

where $\frac{div_1}{P_0}$ represents dividend yield, and $\frac{P_1 - P_0}{P_0}$ the capital gains rate. If we assume there will be no dividend growth, we use the following formula to calculate the value of a stock:

$$P_0 = \sum_{t=1}^{\infty} div\ /\ (1 + R_E)^t$$

The **Gordon growth model** assumes a constant dividend growth, g, shown in the formula:

$$P_0 = \sum_{t=1}^{\infty} (div \times (1 + g)^{t-1})/\ (1 + R_E)^t = \frac{div}{R_E - g}$$

Disadvantages of this model: Everything is very dependent on the first dividend forecast, if this is wrong, this has a big impact on the value of the stock. Also, the growth rate cannot be bigger than the equity cost of capital here.

Multiple valuation of comparable stocks

A company does not have to pay all earnings, they can keep them as retained earnings, which they can use for new investments.

$$div_t = EarningsPerShare_t \times Dividend\ payout\ rate\ (k)_t$$

$$EPS = \frac{earnings_t}{shares\ outstanding}$$

By combining this formula with dividend discount model we can arrive at P/E ratio:

$$\frac{Price}{Earnings} = \frac{k}{R_E - g}$$

Finance 1 – IBEB – Lecture and Exercise lecture 3, week 3

Valuing stocks

Information

The first version of the three levels of informational efficiency was constructed by Fama in 1970:

- Weak: The stock prices reflect all information on its historical price. In technical analysis, trends of history are used to predict the future, but these cannot be considered useful.
- Semi-strong: the prices of the stock are based on the publicly available information which is relevant for pricing. The prices adjust to public information.
- Strong: not only is the publicly available information reflected in the prices, but also insider information of firms which is not yet public to all investors.

Lessons from efficient markets

Efficient market hypothesis - when relevant information is available it is immediately and completely reflected in prices, therefore it is not possible to systematically achieve abnormal profits.

For investors to have positive-NPV trade opportunities, competitive advantage is needed, with low transaction costs, no regulation, no benchmark index, etc. In this scenario, research is not needed and investors can just buy stock at or close to fair value.

Corporate managers should focus on finding positive-NPV projects in real markets, they will be fairly financed. Analysts will focus on free cash flow to determine the value.

In efficient markets, no arbitrage opportunities can exist. The same amount of risk corresponds to the same expected return. To determine whether a market is efficient, we need a theory for risk and return.

Capital markets and the pricing of risk

Risk and return measures

Expected return

$$E[R] = \mu = \sum_{all\ possible\ R} probability_R \times R$$

Variance - indicates how much the squared deviation from the mean is, which can be calculated with the formula:

$$variance = E\left[(R - E[R])^2\right] = \sum_{all\ possible\ R} probability_R \times (R - E[R])^2$$

The standard deviation, σ(R), which is the square root of the variance, in Finance is also known as **volatility**. It measures how returns vary with the spread of the distribution of the return. The bigger the volatility, the higher the risk, which is compensated with a higher return..

$$volatility = standard\ deviation = \sigma = \sqrt{variance}$$

Covariance

$$cov_{AB} = \sum_{j=1}^{z} p_j \times \left[R_{A,j} - E\left(R_A\right)\right] \times \left[R_{B,j} - E\left(R_B\right)\right]$$

Historical returns

Instead of using expected outcomes, historical data can also be used to calculate variance. However, they are often uncertain with problematic data

Formula when estimating using sample of historical returns

Expected return: $E(R_A) = \overline{R_A} = \frac{1}{N}\sum_{t=1}^{N} R_{A,t}$

Variance: $\sigma_A^{\ 2} = \frac{1}{N-1}\sum_{t=1}^{N}\left[R_{A,t} - \overline{R_A}\right]^2$

Covariance: $cov_{AB} = \frac{1}{N-1}\sum_{t=1}^{N}\left[R_{A,t} - \overline{R_A}\right] \times \left[R_{B,t} - \overline{R_B}\right]$

Positive linear correlation $cov_{AB} > 0$

Negative linear correlation $cov_{AB} > 0$

Correlation coefficient: $\rho_{AB} = \frac{cov_{AB}}{\sigma_A \sigma_B}$

Diversification in stock portfolios

There will be no risk premium for diversifiable(=idiosyncratic) risk, thus investors will not be compensated for holding firm-specific risk. This is because if they diversify their portfolio, this risk will be eliminated for free.

A risk premium will only be determined by the systematic risk, which cannot be avoided even when a portfolio is diversified.

$$volatility = total\ risk = systematic\ risk + diversifiable\ risk$$

What should determine the expected return of an asset

β - the sensitivity of the asset to movements of the market portfolio;
The expected percentage change in the excess return of an asset for a 1% change in the excess return of the market portfolio. (Beta is a measure of systematic risk)

$$\beta_i = \frac{cov(R_i, R_{mkt})}{var(R_{mkt})} = \frac{\sigma(R_i) \times \rho(R_i, R_{mkt})}{\sigma(R_{mkt})}$$

$$E[R_i] = risk\ free\ rate\ +\ risk\ premium\ = R_f + \beta_i \times (E[R_m - R_f])$$

Optimal portfolio choice

The portfolio weight is the fraction of a stock in the total portfolio held by an individual. Thus, if we have n different investments, we call this an n-stock portfolio.

$$portfolio\ weight\ (w_i) = \frac{value\ of\ asset\ i}{total\ value\ of\ portfolio};\ \sum_{i=1}^{N} w_i = 1$$

Also, the expected return of a portfolio will be equal to the sum of the expected returns of all investments held in the portfolio.

$$E[R_p] = \sum_{i=1}^{N} w_i \times E[R_i]$$

And the variance of the return of this portfolio can be calculated with:

$$Var[R_p] = \sum_{i=1}^{N}\sum_{j=1}^{N} w_i \times w_j \times Cov\{R_i, R_j\}$$

When choosing an efficient portfolio, we want to choose the lowest risk given a certain level of expected return, or if the risk is given, we will want to maximise the expected return.

Finding minimum variance portfolio

$$min\ (w_1, w_2)\ w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w_1w_2\sigma_{12} \qquad ;\ w_1 + w_2 = 1$$

$$\Rightarrow min\ (w_1)\ w_1^2\sigma_1^2 + (1 - w_1)^2\sigma_2^2 + 2w_1(1 - w_1)\sigma_{12} \qquad ;\partial/\partial w_1 = 0$$

$$\Rightarrow w_1 = \frac{\sigma_2^2 - \sigma_{12}}{\sigma_1^2 + \sigma_2^2 - 2\sigma_{12}}$$

Capital Asset Pricing Model (CAPM)

CAPM implies that investors hold a portfolio that consists of two assets:

1. Market portfolio
2. Risk-free investment

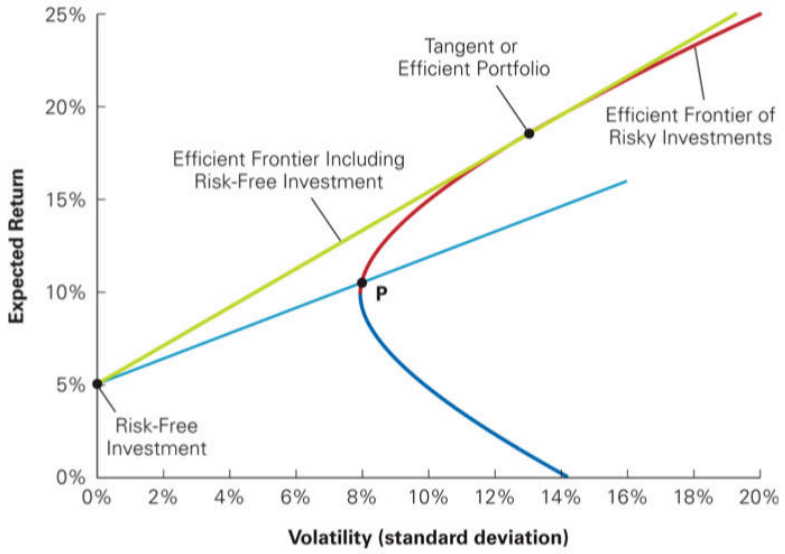
The CAPM equation

$$E(R_i) = R_f + \beta_i(E(R_M) - R_f), \qquad \beta_i = \frac{Cov(R_i, R_M)}{Var(R_M)}$$

Capital market line

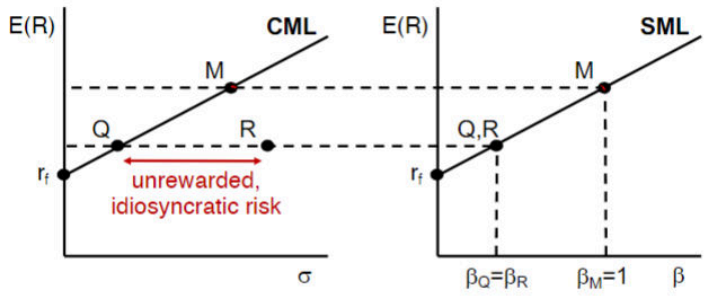
The capital market line (CML) is the best expected return that can be obtained for each level of the total risk(volatility). The CML is in fact the efficient frontier.

All the stocks and portfolios that are to the right of the CML have some diversifiable risk, on the CML we only have systematic risk.



Security market line

The security market line (SML) goes through the points of risk-free investment and market portfolio. If there will be a negative beta for a security, this means the security does well when the market is not doing well. The expected return of the security will be lower than that of Rf, the risk premium is smaller than zero, but this does not mean it is risk free. This security can be held with other securities to diversify the portfolio, but this does decrease the return.



SML: $E(R_p) = r_f + [\, E(R_M) - r_f \,] \cdot \beta_p$

The SML matches the expected return for each security with the corresponding beta to the market. Because all stocks and portfolios are part of the efficient market portfolio, they should lie on the SML.

Beta(β) of a Portfolio

The beta of the portfolio corresponds to the weighted average beta of the securities in the portfolio and can be calculated using the formula:

$$\beta_p = \frac{cov\left(\sum_i w_i R_i, R_{mkt}\right)}{var\left(R_{mkt}\right)} = \sum_i w_i \frac{cov\left(R_i, R_{mkt}\right)}{var\left(R_{mkt}\right)} = \sum_i w_i \beta_i$$

Finance 1 – IBEB – Lecture 4 and Exercise lecture 4, week 4

Cost of capital

Resources are not obtained by a firm for free, because this amount could have been used to find other projects. Thus, the opportunity cost of using this resource is equal to the value it would have when using the resource for the best possible alternative. The cost of capital of an investment is the expected return of available investments with the same beta.

- Debt cost of capital
- Equity cost of capital

- Project cost of capital

Equity cost of capital

The CAPM can be used to estimate cost of capital by the Security Market Line (SML) equation: $r_i = r_f + \beta_i \times \left(E\left(R_{mkt}\right) - r_f\right)$

The Market Portfolio

Value-Weighted Portfolio - a portfolio that consists of securities that are held in proportion to their market capitalization.

A Value-weighted portfolio is also an **Equal-Ownership portfolio** as it contains an equal fraction of the total number of shares outstanding of each security in the portfolio.

Additionally, it is also a **Passive portfolio** that does not require rebalancing even if market prices change.

In a portfolio like the market portfolio the investment in each security i is proportional to its market capitalization:

$$MV_i = \#\,Shares\ outstanding \times Price\ of\ i\ per\ share$$

The weight of each security in the portfolio can be calculated as follows:

$$x_i = \frac{Market\ Value\ of\ i}{Total\ Market\ Value\ of\ all\ securities} = MV_i \,/\, \sum_j MV_j$$

The Market Risk Premium

The risk-free rate is most commonly determined by the yield on US Treasury securities.

Market risk premium can be approximated by so-called **market indices**. For example, S&P 500 (value-weighted portfolio).

The expected return on the market can be determined using the historical average of market return. However, there is a drawback for using historical data. It is backward-looking and, hence, may not be representative of expectations about the future.

A possible alternative could be to look at what is implied by the market and solve for the discount rate: $r_{mkt} = \frac{div_1}{P_0} + g = Dividend\ yield + Expected\ dividend\ growth\ rate$

Beta estimation

Linear regression can be applied to estimate the excess return on stock i (dependent variable) with market excess return (independent variable):

$$\left(R_i - r_f\right) = \alpha_i + \beta_i\left(R_{mkt} - r_f\right) + \varepsilon_i$$

Where α_i is the intercept term, $\beta_i\left(R_{mkt} - r_f\right)$ is the sensitivity of the stock to market risk and ε_i is the error term (zero on average)

Essentially, α_i is the measure of historical return on stock against the estimation of SML.

- Positive alpha means that historical return on stock was better than predicted by CAPM
- Negative alpha means that historical return was below SML.

Debt cost of capital

Yield to maturity is the IRR an investor will earn from holding the bond to maturity and receiving its promised payments.

Yield to maturity is a reasonable estimation of investors' expected rate of return if there is little risk of default. If there is a high risk of default, yield to maturity exceeds investors' expected return.

Expected return of the bonds can be calculated using the formula:

$r_d = (1 - p)y + p(y - L) = y - pL =$

$= Yield\ to\ Maturity - probability\ of\ default \times Expected\ loss\ rate$

Project's cost of capital

All-equity comparables

To measure the compensation for the risk of a new project when it is fully equity financed, but different from the average project in the company, we want to find an all-equity financed firm with similar business operations to a new project for comparison.

By using comparable firm's beta and cost of capital we can estimate the cost of capital for the new project. If it is not possible to find an all-equity financed firm we can also make estimates from a levered firm (financed by both debt and equity) with similar business activities. As a result of having debt financing the return on equity will be higher due to higher risk. Hence we want to use the unlevered cost of capital.

The **unlevered cost of capital** - the expected return required by investors to hold the firm's underlying

The weighted average of the firm's equity and debt cost of capital can be calculated using the formula:

$$r_u = r_a = \frac{E}{E+D} \times r_E + \frac{D}{E+D} \times r_D$$

where r_a stands for return on assets
*note: "perfect" world without taxes and frictions assumed

Similarly:

$$\beta_u = \frac{E}{E+D} \times \beta_E + \frac{D}{E+D} \times \beta_D$$

When calculating $\frac{D}{E+D}$ration it is important to use the net debt. This is because cash is a risk-free asset that reduces the average risk of a firm's assets.

$$Net\ Debt = Debt - Excess\ cash - Short\ term\ investments$$

Operating Leverage is the proportion of fixed to variable costs of the project. A higher proportion of fixed costs implies higher sensitivity of the project's cash flows to market risks, meaning higher beta and cost of capital.

The Weighted Average Cost of Capital (WACC)

When the assumption of the "perfect" world is relaxed, we need to account for taxes.

$$Effective\ after\ -\ tax\ interest\ rate\ = r\left(1\ -\ \tau_c\right)$$

The Weighted Average Cost of Capital is then equal to:

$$r_{WACC} = \frac{E}{E+D} \times r_E + \frac{D}{E+D} \times r_D \times \left(1\ -\ \tau_c\right)$$

Given a target leverage ratio:

$$r_{WACC} = r_u - \frac{D}{E+D} \times \tau_c r_D$$

Where r_u is the unlevered cost of capital or pre-tax WACC.

WACC and pre-tax WACC

Unlevered cost of capital shows the expected return on holding a firm's assets, which in the real world with taxes can be used for evaluation of all-equity projects with the same risk as the firm.

Taking in account taxes, WACC adjusts for the capital structure of the firm.

Investor behavior and capital efficiency

Competition and Capital markets

Stock's alpha - the difference between a stock's expected return and its required return according to the security market line (CAPM return). When the market portfolio is efficient all stocks are on SML. If there is no deviation from SML, alpha is equal to zero.

Stock's alpha: $\alpha_s = E\left[R_s\right] - r_s$

Security market line: $r_s = r_f + \beta_s \times \left(E\left[R_{mkt}\right] - r_f\right)$

Deviation from SML

Stock prices adjust to news

- Positive alpha (=higher expected return)
- Investors buy at a lower price than CAPM prediction until expected returns go down again
- The stock is back on SML

Information and rational expectation

In CAPM investors should hold a combination of market portfolio and a risk-free investment.

The market portfolio can be inefficient if

- Information was misinterpreted by a substantial number of investors;
- A significant number of investors are willingly hold inefficient portfolio because they also care about other aspects of portfolios other than returns and volatility

Systematic trading biases

Biases become problematic when they occur systematically instead of randomly. Some common biases are:

- **Disposition effect**- tendency to hold losing stocks for too long, as investors do not want to realize losses
- **Herd behavior**- occurs when individuals start actively following each other

Multiple factor model

CAPM used so far is an example of a single-factor model.

Multi-factor model of risk is used where there are other factors that explain returns, hence, CAPM proposed portfolios may not be efficient. In this case, to construct efficient portfolios we need to use factor portfolios that are covering different risk factors.
Multifactor model of risk for given N factor portfolios:

$$E[R_s] = r_f + \beta_s^{F1} \times (E[R_{F1}] - r_f) + \beta_s^{F2} \times (E[R_{F2}] - r_f) + \ldots + \beta_s^{FN} \times (E[R_{FN}] - r_f)$$
$$= r_f + \sum_{n=1}^{N} \beta_s^{FN} \times (E[R_{FN}] - r_f)$$

Self-financing portfolio

A self-financing portfolio can be constructed by going short in some stocks and long in others with the same market value.

For self-financing factor portfolios the formula comes down to (as the risk free rate drops out):

$$E[R_s] = r_f + \beta_s^{F1} \times E[R_{F1}] + \beta_s^{F2} \times E[R_{F2}] + \ldots + \beta_s^{FN} \times E[R_{Fn}] =$$
$$= r_f + \sum_{n=1}^{N} \beta_s^{FN} \times (E[R_{FN}])$$

Arbitrage Pricing Theory (APT)

There are no systematic possibilities available to investors for arbitrage, therefore the arbitrage pricing relationship (APR) holds:

$$E[R_i] = \lambda_0 + \beta_{i,1}\lambda_1 + \beta_{i,2}\lambda_2 + \ldots + \beta_{i,k}\lambda_k$$

Where λ_0 corresponds to risk-free rate, other λ are risk premiums for different factors that together measure the systematic risk, β is the sensitivity of the security to each risk factor.

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Capital structure in a perfect market

The **capital structure** of a firm indicates whether the firm's assets are financed with equity or debt. An **unlevered firm** will only use their own resources to finance projects. A **levered firm** instead used debt and sometimes equity to finance the projects.

Modigliani-Miller without taxes

Notation: E- market value of equity in a levered firm, D- market value of debt in a levered firm, U- market value of equity in an unlevered firm, A- market value of firm's assets.

Perfect capital market

- Investors and firms can trade the same set of securities at competitive market prices equal to the present value of their future cash flows
- No taxes and transaction cost
- A firm's financing decision do not change the cash flow generated by its investment nor do they reveal new information about them

Proposition I: In the presence of a perfect capital market, the cash flows generated by a firm's assets equals the total value of the firm, and this cannot be affected by the chosen capital structure of the firm (**pie theory**).

$$E + D = U = A$$

Changes in capital structure only affect the distribution of the cash flows among stakeholders, but not the cash flows themselves. Financing with more debt will make equity more risky, so higher equity cost of capital will offset the low debt cost of capital.

As previously discussed, the return on unlevered equity is related to the returns of levered equity and debt: $R_u = R_a = \frac{E}{E+D} \times R_E + \frac{D}{E+D} \times R_D$

Solving for R_E: $R_E = R_u + \frac{D}{E}(R_u - R_D)$ => **Proposition II:** the cost of capital of levered equity is equal to the cost of capital for unlevered equity plus an additional risk premium due to leverage, that is proportional to the firm's market value debt-to-equity ratio.

Beta: Similarly, the effect of leverage on the risk of security can be expressed in terms of beta: $\beta_E = \beta_u + \frac{D}{E}(\beta_u - \beta_D)$

Relating to MM proposition 1 is the concept of **homemade leverage**: If a firm does not take on debt (fully equity funded) but the investors want to earn a more risky and higher levered return, they can create their own leverage by borrowing money themselves to invest => **Return is the same as the levered equity return.**

Equity Issuances

Dilution- an increase in the total number of shares that will divide a fixed amount of earnings.

If a firm issues new shares, there will be no gain or loss for the shareholders if the shares are sold at a fair price. This is because the price of the share has to remain constant. But we do have **earnings dilution** in this case, this is because the same amount of earnings now has to be divided among more shares. Which leads us to the **dilution fallacy**, that if a firm starts issuing equity, this will reduce the value of the existing shares of the shareholders. But here it is not taken into account that if a firm starts issuing new shares, the cash earned by a firm will increase, thus a firm will have more assets and higher cash flows. The increases of this will be equal to the dilution of the shares. The fallacy should not affect the decision on equity vs debt financing.

Capital structure with corporate tax

Until now we assumed that the capital structure a firm chooses does not influence the value of the firm in a perfect capital market. But in fact, the amount of leverage a firm has does affect the value of the firm via the corporate tax. Firms have to pay tax

on their EBIT. The interest expense is the amount of payments made to debt holders, and the left-over cash flows that are paid to debt holders. The income before taxes are deducted is the pre-tax income. The corporate taxes will be the corporate tax rate, τ_c times the earnings of a firm minus the interest payments. The net income a firm will have left is the cash flow which can be used to pay equity holders, $(1-\tau_c)(EBIT - r_D D)$. As the interest expense reduces the amount of corporate tax, it incentivises the use of debt. The reduction in taxes paid due to interest expenses can be calculated as follows:

$$Interest\ Tax\ Shield = Corporate\ Tax\ Rate \times Interest\ payments$$

Modigliani-Miller with taxes

Proposition I: the value of firms with leverage will be higher than that without leverage due to tax savings from the debt.

$$V^L = V^U + PV(Interest\ Tax\ Shield)$$

If the debt a firm has issued comes due, it will be refinanced with new debt. This way the debt is permanent, and they use the interest tax shield as a perpetuity.
$PV(Interest\ Tax\ Shield) = \tau_c D$

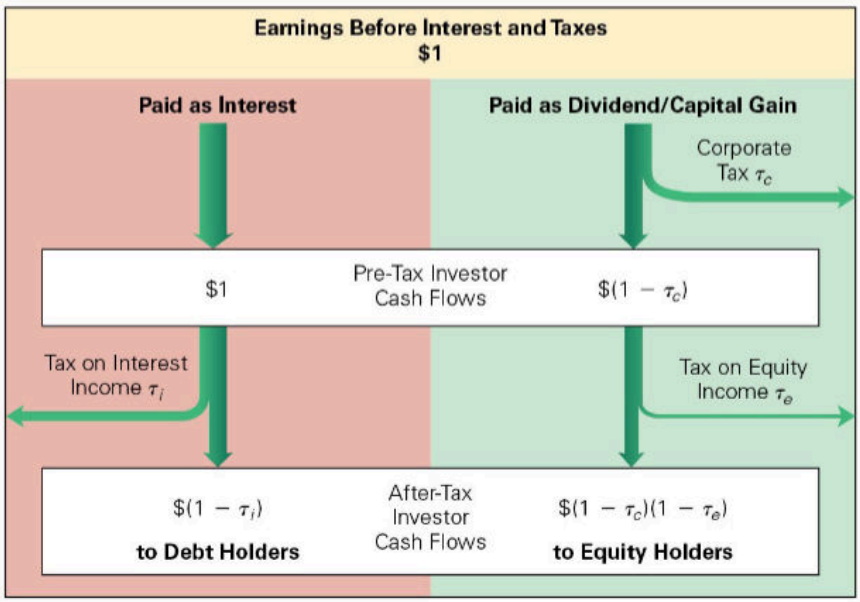
Adjusting WACC

The weighted average cost of capital (WACC) (including taxes) will give us the effective after-tax cost of capital to the firm, where the reduction of the interest tax shield is taken into account. The Weighted Average Cost of Capital is then equal to:

$$r_{WACC} = \frac{E}{E+D} \times r_E + \frac{D}{E+D} \times r_D \times (1-\tau_c)$$

Capital structure with corporate tax and personal taxes

Notation: τ_c - corporate tax rate, τ_i - personal tax rate on interest payments (debt income), τ_e - personal tax rate on dividends and capital gains (income from equity)



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Now we assume that individuals also pay taxes, debt holders pay tax on interest payments, which is typically taxed as income, and equity holders pay taxes on dividends. The **effective tax advantage of debt** (with personal tax) can be computed as follows:

$$\tau^* = \frac{(1-\tau_i)-(1-\tau_c)(1-\tau_e)}{(1-\tau_i)} = 1 - (1-\tau_c)(1-\tau_e)/(1-\tau_i)$$

With personal taxes, the firm's equity and debt cost of capital will adjust to compensate investors for their tax burdens, therefore, WACC will be calculated using the same formula as before:

$$r_{WACC} = \frac{E}{E+D} \times r_E + \frac{D}{E+D} \times r_D \times (1-\tau_c)$$

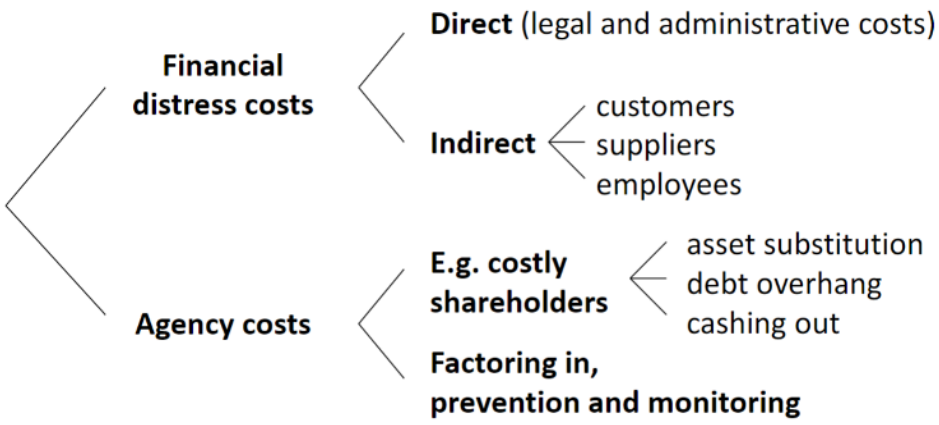
Financial distress, managerial incentives & information

Financial distress: When a firm has trouble with paying the debt obligations that are due as a result of unstable cash flows.

A firm **defaults** If it fails to make any of these payments to debt holders.

Leverage increases the risk of bankruptcy as debt is a formal commitment to pay the debt holder, whereas in equity financing a firm is not obligated to pay dividends.

Debt holders will receive certain rights to the assets of the firm when a firm defaults. A **bankruptcy** shifts ownership of the firm from equity holders to debt holders. This does not have any effect on the total value that is available to all investors.



The cost of capital of debt will be higher than the risk-free rate. When debt is low and leverage increases, the cost of capital for equity holders will be higher because risk is shared among more equity holders. But this is compensated by higher returns. But as debt keeps increasing the cost of capital for debt will start to rise as well, which is the same for the cost of equity but less strong.

The **costs of bankruptcy** can be divided among two groups, the direct and indirect costs.

- **Direct costs:** legal costs (decrease the firm's asset values).
- **Indirect costs**: Loss of customers, the more firms rely on trade credit, the bigger the cost due to loss of suppliers will be, the loss of employees.

Tradeoff theory

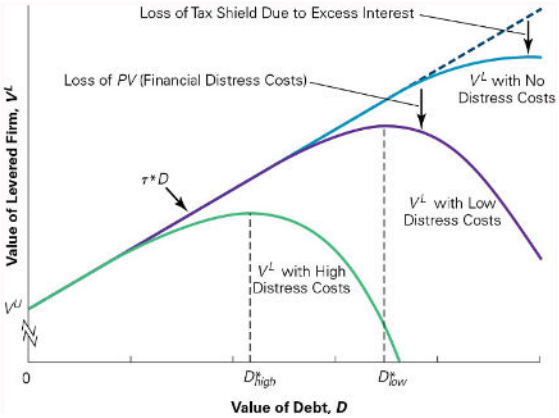
According to tradeoff theory, the firm will balance equity and debt in its capital structure by taking into account the benefits of the tax shield and the costs of financial distress.

Therefore, the total value of a levered firm is equal to the value of unlevered firm plus the present value of interest tax shield minus the present value of financial distress costs.

$$V^L = V^U + PV(Interest\ Tax\ Shield) - PV(Financial\ distress\ costs)$$

The present value of financial distress costs is determined by:

1. The probability of financial distress
2. Magnitude of the costs
3. The discount rate of distress costs



Agency costs

Agency costs are costs that are incurred when there are different interests between the holders of a firm. The costs will be created due to the conflicts between debt and equity holders that need to be solved due to the amount of leverage a firm chooses.

Excessive risk-taking

When a firm is in financial distress it may choose to engage in very risky activities with a small probability of large gains. In a firm, shareholders will be the owners of a firm, but they bet on risk with the money of the debt holders, which is known as **risk shifting**. Due to this, shareholders will take more risky assets instead of low-risk ones, for example by implementing a project with negative NPV, which is known as the **asset substitution problem.**

Under-investment

When a firm is in financial distress it may also choose not to invest in a new low-risk and NPV-positive project. Because part of the project gains will go to debt holders to resolve the financial distress, NPV to equity holders will be reduced and may even be negative, thus the shareholders would decline the project. The agency cost of debt reflected is the **debt overhang**.

Cashing out

Shareholders may liquidate assets below the market value when a firm with a lot of debt is on the verge of bankruptcy to pay out the proceeds as dividends.

Leverage ratchet effect - Summary agency cost

Leverage ratchet effect: companies find it easier to increase leverage but much harder to reduce it.

When an unlevered firm issues new debt, equity holders bear any anticipated agency or bankruptcy cost through a discount in price they receive for that new debt. However, once a firm has debt already in place some of the agency or bankruptcy cost of taking additional leverage fall on existing debt holders.

1. Shareholders may have an incentive to increase leverage even when this does decrease the value of the firm.
2. Or the shareholders will not decrease leverage by buying back, even though this would increase the firm value.

If a firm would start issuing more debt, the r_D will increase, wealth will be transferred from debt holders to equity holders. Even though the firm value is reduced by increasing leverage, it does benefit shareholders.

Debt maturity and debt Covenants

To mitigate agency costs of debt, debt holders can either issue shorter term debt or use restrictions such as **debt covenants** (limit the firm's ability to pay large dividends, the types of investment the firm can make and the amount of new debt the firm can take on)

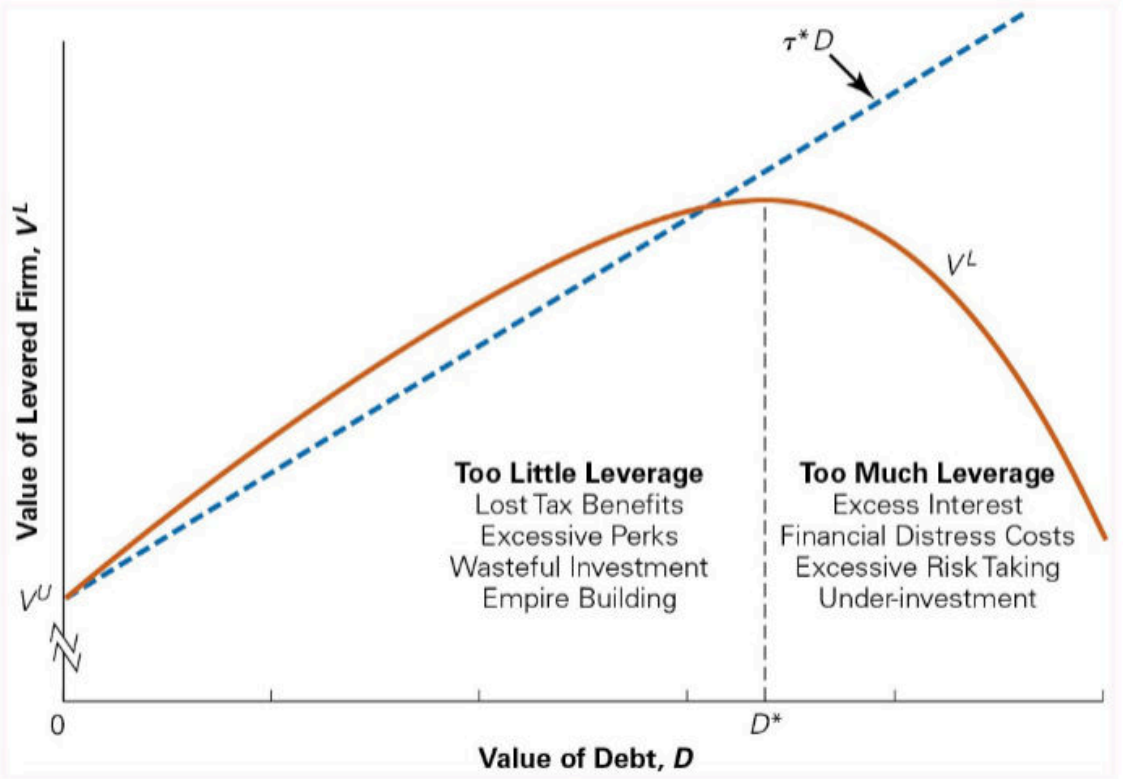
Optimal leverage with Taxes, Financial distress and Agency costs

For the optimal level of debt there will be a trade-off between the tax shield of debt against the costs of financial distress and agency costs, which is known as the trade-off theory

$$V^L = V^U + PV(Interest\ Tax\ Shield) - PV(Financial\ distress\ costs) - PV(Agency\ cost\ of\ debt) + \\ + PV(Agency\ benefits\ of\ debt)$$

Agency benefits

- Maintain ownership concentration (equity stake)
- Reduce wasteful spending, which is more likely to when firms have excess cash (free cash flow hypothesis problem)
- Increase commitment (managers use more effective strategies when there's threat of financial distress)



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The optimal debt level

R&D intensive firms: Firms with high R&D expenditures and low current free cash flow. Because of a low EBIT the tax shield needed is very small thus there is only a little bit of debt.

Mature firms: usually have stable cash flows, tangible assets and fewer investment opportunities. Because tangible assets will have a high liquidation value, the financial distress costs will be low. The optimal level of debt for mature firms will be higher than that of growing firms

Information

Asymmetric information is existent when the managers of a firm for example have superior information compared to investors about the future cash flows of a firm. With asymmetric information the parties will not all have the same information thus the assumptions that securities are fairly priced are not accurate any more. The investors will get this information via press releases, and penalties will be there for when intentionally no or wrong information is given.

The credibility principle states that an action will only be credible if the costs of taking this action would be too costly if the event was not true. When debt is used to signal some kind of information to investors, this is called the **signaling theory of debt**.

Pecking-Order theory

Similarly to trade-off theory, **Pecking-Order theory** explains the choice capital structure of a firm. In this case, the key assumption is asymmetric information, meaning the management of the company is informed better about the prospects, risks and future profitability of the company than outside capital providers. Because of that, capital providers tend to ask for a higher premium to compensate for information asymmetry.

The signaling effect then causes the pecking order of financing, in which the firm will **use the cheapest form of financing first**. In this theory, using retained earnings is the cheapest way of financing with a lowest degree of asymmetric information, whereas issuing new shares (new equity) is considered the most expensive and used only if other sources are already exhausted.

$$Internal\ financing \rightarrow New\ debt \rightarrow New\ equity$$

Issuing equity

A seller can give some information via the way he is selling his product. Because the bigger his desire to sell, the higher the probability the product is of low quality.

Adverse selection is when buyers and sellers have different information about the product. The **Lemons principle** states that when sellers have private information about the product and its value, buyers are likely to ask for lower prices because they do not know of which quality the product will be.

The Lemons principle implies that firms who start issuing new equity will sell these stocks at a discounted price to investors because investors are not willing to pay this much due to the possibility that bad news will be announced.

Finance 1 – IBEB – Lecture and Exercise lecture 6, week 6

Payout policy

Uses of free Cash Flow

Assuming a perfect capital market, a firm's free cash flows either be

1. **Paid out**: Repurchase shares or pay dividends.
2. **Retained:** Increase cash reserves or invest in new projects

Free cash flows in perfect capital market = money left *after* investing in all NPV-positive projects

1. Dividends - Does affect share price

At the **declaration date**, known as the announcement date as well, the board of a firm authorizes the dividend that will be paid to shareholders. **Record date** specifies

the date on which the shareholder has to be on record to receive the dividend. The stock is said to trade before the ex-dividend date at the **cum-dividend price**, denoted as P_{cum}. Investors who buy a stock of this firm on or after the **ex-dividend date** (two days before record date) will not receive a dividend, the price after ex-dividend date is known as P_{ex}. **Payable/ Distribution date** is a date on which the dividends are distributed to the shareholders.

$$P_{cum} = Current\ Dividend + PV(Future\ Dividends)$$
$$P_{ex} = PV(Future\ Dividends)$$

In a **perfect capital market** the **share price drops** when a dividend is paid out **by the amount of dividend**.

Types of dividends

Regular dividends- a certain dividend paid on a regular basis.
Special dividend- a one-time payment that is typically larger than a regular dividend.
Stock dividend- a firm pays a dividend in a form of shares instead of cash to its shareholders.

2. Share repurchase - Does not affect share price

A firm can use the cash it has generated to repurchase outstanding shares today. If a firm does this, no dividends are paid to current shareholders, but in the future the dividend received will be higher (earnings will be divided between lower number of shares outstanding). Due to this the price of the stock will not be affected by the share repurchase: $P_{rep} = P_{cum} = Div + P_{ex}$.

Types of repurchase

Open market repurchase- a firm announces that it intends to repurchase shares and executes it as any other investor.
Tender offer- company offers to buy shares at a predetermined price, which is usually around 10-20% higher than a current market price.
Targeted repurchase- a company approaches a specific shareholder and buys the shares directly from that shareholder (can be used to prevent potential takeover).

Investor's preference

- If the firm repurchases shares but the investor wants cash: Raise cash by selling shares (**homemade dividend**)
- If the firm pays out the dividend but the investor wants stock: Use dividend pay out to purchase additional shares.

Shares repurchased = excess cash/shares price

Modigliani-Miller Dividend Dividend Policy Irrelevance

Trade off between current and future dividend

- Higher current dividend = lower future dividend
- Lower current dividend = higher future dividend

In a perfect capital market, holding fixed the investment policy, the firm's choice of dividend policy **will not affect the initial share price**

Tax disadvantage of Dividends

Dividend tax is often higher than tax on capital gains (long term investors can defer capital tax gain forever by not selling shares) => **Investors prefer companies using cash for shares repurchase rather than dividend payout.**

Signaling

Dividends

- Dividends are much less volatile
- Managers prefer a long-term target level for their dividends as a fraction of earnings
- Investors prefer stable dividends with sustained growth.

=> **Dividend smoothing**: Companies prefer to keep dividend payouts stable rather than changing them frequently, even if earnings fluctuate

Firms only raise their dividends when they see a long term increase in the expected future earnings => **Dividend signalling hypothesis**: dividend changes reflect the expectations of the management about the firm's future earnings.

Caveat: Change in dividends also signal investment opportunities. A firm may cut on dividends to instead invest in attractive positive NPV project (this might lead to a positive stock price reaction). Similarly, an increase in dividends may mean a lack of investment opportunities.

Summary: used to pay out long ren expected FCF and is only changed if long run prospects change

Repurchase

Share repurchase is a credible signal that shares are underpriced, as otherwise it would be too costly => If investors believe that management has better information, they'll act favorable to share repurchase announcement.

Summary: used to pay out transitory earning shocks and used strategically by management to boost share price.

Retaining cash vs Paying out

Perfect capital markets: the firm is indifferent between retaining excess cash after investing in all NPV-positive projects and paying it out.

With taxes: there is a trade off when saving excess cash.

Benefits to holding cash

- Reduce the costs of raising capital in the future
- Avoid distress cost: cover potential future cash shortfalls

Cost of holding cash should be compared with the reduction in cost when capital is raised through debt or equity.

Cost of holding cash

- The cash is equal to the negative leverage => holding cash gives a tax disadvantage.
- Agency cost: Paying out excess cash through dividends or share repurchase can boost stock price by reducing managers' ability to waste resources

Assuming a firm has already invested in NPV-positive projects it is left to invest in negative-NPV projects. Instead, a firm can purchase financial assets. The value of a firm will not be affected as in perfect capital market security trade is a zero-NPV transaction.

Modigliani-Miller pay-out irrelevance

In perfect capital markets, buying and selling securities is a 0 NPV translation so it should not affect the firms' value

=> When a firm decides to invest excess cash into financial securities, its choice between pay-out and retention does not affect the initial share price.

Raising Equity Capital

Debt vs equity

Debt

- Small firms: bank debt
- Large firms: bonds
- Pros: tax benefit
- Cons: distress cost

Equity

Young firms normally prefer to finance their business by equity rather than debt, because of the risk sharing advantage and more flexible (postponable) payments

Private equity

1. **Angel investors**: provide the initial capital to start the business.
2. **Venture capital firm:** a limited partnership that specializes in raising money to invest in the private equity of young firms.

- **General partners:** the ones who run the venture capital firm.
- **Limited partners**: outsiders who can invest at a cost (2% fee for management + 20% of any positive returns).
  => typical limited partners include **institutional investors** (eg. universities and pension funds)
  => They can benefit from diversification and the expertise of the general partners.

3. **Private equity firm**: investments in private firms or buyouts of public companies to take them private

- **Leveraged buyout**: acquisition of another company using a significant amount of borrowed money to meet the acquisition cost

Initial Public Offering (IPO)

Initial public offering is the process of selling stock to the public for the first time.

Advantages: greater liquidity
better access to capital
Disadvantages: equity holders become more widely dispersed, making it difficult to monitor management. The company has to satisfy regulations.

An **underwriter** is an investment banking firm that manages the IPO process and helps the firm sell its stock. The lead underwriter is the primary firm involved, which is responsible for managing a security issuance. The syndicate is a group of underwriters who jointly underwrite and distribute a security issuance.
During an IPO, the shares sold may represent either a primary offering or a secondary offering. **Primary offering** is the case if the shares are being sold to raise new capital, and **secondary offering** is when the shares are sold by existing investors of the firm.

Types of IPOs

1. **Best-efforts basis** is a situation in which the underwriter does not guarantee that the stock will be sold, but instead tries to sell the stock for the best possible price. Such deals often have an **all-or-none clause** (either all shares are sold or the deal is called off).

2. **Firm commitment** is an agreement between an underwriter and an issuing firm in which the underwriter guarantees that it will sell all of the stock at the offer price. When an underwriter provides a firm commitment, there is a risk that the banking firm will have to sell the shares at a lower price than the offer price incurring a loss.
3. **Auction IPO** is a method of selling new issues directly to the public, where the underwriter takes bids from investors and then sets the price that clears the market.

Valuation

There are two ways to value a company:

1. Computing the present value of the estimated future cash flows
2. Estimating the value by examining comparables (recent IPOs).

Road show - Market tour to convince large customers (institutional investors) about the offer price.
Book building - a process used by underwriters for coming up with an offer price based on customers' interest.
Lock up - is a restriction on selling shares by existing shareholders for some time after an IPO (often around 180 days).

IPO underpricing

IPOs are generally underpriced on the first day of trading to ensure that the average first-day return is positive.
Early investors and underwriters benefit from the under-pricing while pre-IPO shareholders bear the cost (they are selling their stock for less than they could get in the aftermarket).

However, it is not an easy win

- If the IPO goes well, demand exceeds supply and the allocation of the shares to each investor will be rationed
- If the IPO doesn't go so well, demand at the issue price is weak, so all initial orders will be fulfilled.

=> Thus, the typical investor's investment in good IPOs are rationed while their investment in bad IPOs are fulfilled.

Winner's Curse: a situation in competitive bidding when the high bidder has very likely overestimated the value of the item being bid on.
=> You "win": you get all the shares requested when demand for the shares by others is low and there is a high chance that the shares will perform poorly.

Seasoned equity offering (SEO)

A seasoned equity offering (SEO) is when a public company offers n shares for sale to raise additional equity

The steps are the same as for an IPO but the main difference is that the price-setting process is not necessary, as a market price already exists. Similarly to IPO there are Primary and Secondary shares.

There are two types of SEOs: **cash offer** (when new shares are sold to anyone who is interested) and **rights offer** (when new shares are offered only to existing shareholders). Rights offer is a way to protect the existing shareholders from underpricing.

The stock price reaction to an SEO is often negative due to adverse selection and because firms are more willing to sell equity if they think prospects are bad (signalling to investors).

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Mergers and Acquisitions

Background and facts

Mergers can be horizontal, vertical, or conglomerate. **Horizontal mergers** are ones where the target and the acquirer are in the same industry. **Vertical merger** is the case where the target's industry buys from or sells to the acquirer's industry. Lastly,

the **conglomerate merger** is mergers involving target and acquirer operating in unrelated industries.

Acquirer can either pay for the acquisition with cash or with stock. The latter is known as **stock swap**, where the target shareholders are swapping their stock for stocks in the acquirer's firm.

Reverse merger/SPAC: public company acquires private company to go public easily (on initiative of the private company)

- SPAC: the public company is a **blank-check** company (raises funds with no pre-specified business plan, typically aiming to acquire a private company)

The **acquisition premium** is paid by an acquirer in a takeover, it is the percentage difference between the acquisition price and the pre-merger price of a target firm.

- Acquirers pay an average premium of 43% over the pre-merger price of the target.
- Upon the takeover announcement, target shareholders enjoy a gain of 15% on average in their stock price while acquirer shareholders see an average gain of 1% with half of them receiving a price decrease

Reasons to acquire

1. Synergies:
    - Economies of scale and scope
    - The control provided by vertical integration
    - Expertise of the target
    - Production/operating efficiency gains
    - Diversification (this can benefit the acquirer because of increased borrowing capacity and tax savings)
2. Monopolistic power gains
3. Managerial motives

Synergies usually fall into two categories: cost reductions and revenue enhancements.

- **Cost-reduction** synergies are more common and easier to achieve because they generally translate into layoffs of overlapping employees and elimination of redundant resources.

- **Revenue-enhancement** synergies, on the other hand, are much harder to predict and achieve.

Vertical integration: merger of two companies in the same industry that make products required at different production stages. Vertical integration can be effective to **prevent the hold-up problem**.

Expertise: Instead of hiring separate experienced workers it can be more convenient to acquire the required expertise as an already functioning firm.

Efficiency gain: Elimination of duplication

Diversification

- Reduced risk - Like a large portfolio, large firms bear less unsystematic risk, so often mergers are justified on the basis that the combined firm is less risky. However this argument ignores the fact that shareholders can achieve diversification of the portfolio themselves by purchasing shares in the 2 separate firms.
- Cost of debt - since the firm becomes larger and more diversified after the merger, they can increase leverage and thereby lower their costs of capital.
- Asset allocation - diversified conglomerate may benefit by being able to quickly reallocate assets across industries (e.g. redeploying managerial talent to where it is most needed). However, there could also be agency costs: profitable divisions may subsidize money-losing ones for longer than is optimal.
- Liquidity - allows private company's shareholders to convert their illiquid holdings into cash or publicly traded shares, which can be sold or diversified more easily.

Monopoly gains. Merging or acquiring a major rival allows the firm to reduce competition and increase profits that can reduce consumer welfare. However there are often antitrust laws to prevent this.

Managerial motives.

- Conflicts of interest happen when managers prefer to run a larger company for additional pay and prestige.
- Overconfidence (Roll's hubris hypothesis): managers are overconfident about their ability to create value.

Valuation and offers

A key issue for takeovers is quantifying and discounting the value added as a result of the merger.

Takeover synergies: any additional value created.

The price paid for a target is equal to the target's pre-bid market capitalization plus the premium paid in the acquisition. If the pre-bid market capitalization is viewed as the stand-alone value of the target, then from the bidder's perspective, the takeover is a positive-NPV project only if the premium it pays does not exceed the synergies created.

The offer

Once the valuation process is over the acquirer is ready to make a **tender offer**, which is not always successful and might require a raise to complete the deal. Bidder can pay for a target in cash or stock.

In a **stock-swap transaction**, the bidder pays for the target by issuing new stock and giving it to the target shareholders. The bidder offers to swap target stock for acquirer stock. The **exchange ratio** is the number of bidder shares received in exchange for each target share. A stock-swap merger is a positive-NPV investment for the acquiring shareholders if the share price of the merged firm exceeds the pre-merger price of the acquiring firm.

The acquirer's share price should increase post-acquisition if:

$$\frac{A+T+S}{N_A+x} > \frac{A}{N_A} = P_A$$

where A is the pre-merger value of acquirer, T is the pre-merger value of target, S is the value of synergies created and x is the number of new shares to pay for the target.

In other words, the acquiring shareholders will agree to this deal if they think that the value per share of the new firm is bigger than the value per share of the old firm.

The condition to achieve a positive NPV project: $xP_A < T + S$ (issue x shares that the current market price P_A)

Exchange ratio: $\frac{x}{N_T} < \frac{P_T}{P_A}\left(1 + \frac{S}{T}\right)$ where $\frac{x}{N_T}$ represent how much new shares you have to issue to obtain the target firm's shares.

This can be done by substituting $P_T = \frac{T}{N_T}$ into the above equation

Risk and uncertainty

For a merger to proceed, both the target and the acquiring board of directors must approve the deal.

A **friendly takeover** is when a target's board of directors supports a merger, negotiates with potential acquirers, and agrees on a price that is ultimately put to a shareholder vote.

A **hostile takeover** is a situation in which the acquirer purchases a large fraction of the target corporation's stock and in doing so gets enough votes to replace the target's board. The acquirer in a hostile takeover is called a corporate raider.

"Poison pill" is one of the methods used against the hostile takeover and it involves allowing existing investors to buy shares at substantial discount to dilute the holdings of new investors.

Merger "arbitrage"

Merger arbitrage: an investment strategy that seeks to profit from the price differences that arise when a company announces a merger or acquisition. It typically involves buying and selling shares of the companies involved to capture the potential spread between the current price and the final deal price.

Merger-arbitrage spread: the difference between the target stock's price and the implied offer price

Who gets the value added from an acquisition?

The premium the acquirer pays is approximately equal to the value it adds, which means the target shareholders ultimately capture the value added by the acquirer. It does not appear that the acquiring corporation generally captures this value, because of the free rider problem.

Free rider: As a result of acquisition, the corporate raider can increase the firm's value and hence the target firm's share price. However, the non-tendering shareholders can "free ride". By not tendering, these shareholders will see the value of their shares increase more. If all shareholders feel the same, they will all not tender their shares and the deal will not go through.

The only way to persuade shareholders to tender their shares is to offer them at least the price they expect the price will rise to, which removes any profit opportunity for the corporate raider.

Acquirers often choose to pay so large a premium due to the **competition**: Once an acquirer starts bidding on a target company it becomes clear that a significant gain exists, therefore, other potential acquirers may submit their own bids => the target is sold to the highest bidder.

Summary

1. Why do mergers and acquisitions take place
    - Good: synergies
    - Monopoly gains and managerial incentives
2. Why do acquirers pay a premium over the market value for a target company
    - Free rider problem (non-tendering)
    - Competition (bidding)
3. Although the target company's price rises on average upon the takeover announcement, why does it rise less than the premium offered?
    - Risk and uncertainty (it is not guaranteed that the deal will go through due to antitrust and board oppositions for example)
4. Why does the acquirer not consistently experience a price increase
    - Bad decisions
    - Premium

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