Corporate Finance lesson notes 2019

Corporate Finance (Università Cattolica del Sacro Cuore)

CORPORATE FINANCE
CLASS NOTES

VIVIA MARCHI

If rates go down as time increases, it means there is a recession. It is possible, but it is a bad sign. Normally though the interest rate increases as time passes→ interest rate at time 1 is smaller than interest rate at time 10, which is smaller than interest rate at time 30. Interest rates are important when we discount cash flows.
Discounted cash flows: we discount considering the time value of money and then we consider the risk and return.

(week 1)

LECTURE 1:

Divide the balance sheet in assets vs. liabilities. The main parts of the invested capital are the operating net working capital and the fixed assets. This has to match the financial debts added to equity, which is identified as raised capital. Who gives me capital? Shareholders, equity holders and banks. I use up the raised/collected capital to invest it in CAPEX (invested capital). Operating net working capital is the sum of stock inventory credit receivables and another.
In a pharmacy they do not use FIFO or LIFO but they use FEFO (which stands for First Expiring First Out). Why do we consider stock as a current asset (short-term asset)? Because all the stock has to be sold within the year, in a short-term period. If you have something in the stock that you are not able to sell, it goes from working capital to fixed asset. Though, there are some cases where it is possible to find a scenario with a long-term stock.
In the Fixed Asset section, we have: tangible assets, intangibles (such as software, bid data, patents, good will, etc.) and financial assets. What is the problem with intangibles? Can I capitalize the cost of a patent, no, you can capitalized development cost. Intangibles are difficult to assess.

STRUCTURED MARGIN
We always start from the raised capital. First equity then we have long-term sources and then short-term debt. The invested capital instead has fixed assed, stock, deferred liquidity and then liquidity cash. If I want to compare equity (2.000) with fixed assets (1.400): there a positive difference of 600. Is it safe/strategically convenient to finance fixed assets (long term) with short term debt? No, because it is a liquidity issue. Because fixed assets will be sold after many years, and it will not generate cash soon. Instead, short term debt has to be paid soon (within a year), but if we do not have cash it is difficult. It is better to pay fixed assets with equity or long-term sources. If equity is > than fixed assets it is a safe situation. This is called the STRUCUTRED MARGIN (2.000-1.400). You can also calculate it from the complementary side: the difference can also be: (1.800+2.900+3.900) (left side) - (3.100+4.100+800) (right side). If it is negative the company can still be alive, but it can be a problem in the future.

NET WORKING CAPITAL
Difference between current assets (immediately cashed in or cashed in within a year) and current liabilities. If current assets exceed current liabilities then my net working capital is positive. If the net working capital is positive it means you have a positive difference which has to be financed by sourced of funds. If you go to a shop and buy shoes, and you can't find your number, if you are a manager you have to choose the quantity of the stock. Is it better to have a big or small stock? If you have very few shoes you will not be able to sell them, so it is better to have many, but this is costly. So, what is the good balance? If you want to have a big stock then you have to finance it, and need some cash from equity holders or banks (have a positive difference which has to be financed). Stock plus deferred liquidity (gross working capital)- (short term + net profit to be paid out) is equal to net working capital.

VIVIA MARCHI

LIQUIDITY MARGIN

When stock is ZERO: then the net working capital is the same as the LIQUIDITY MARGIN. The liquidity margin is the difference between the deferred liquidity + immediate liquidity – (short-term funds which is both short-term debt and net profit).

NET FINANCIAL POSITION

Can the net financial position be positive? Yes, but it is really rare. Normally the net financial position is the liquidity minus the bank debt. If I want to buy a company I look at enterprise value (value of all liabilities including equity) instead equity value (includes equity). Net financial position is used to assess the financial position of companies.

LECTURE 2:

In every corporation, economic marginality (revenues greater than costs) has to be positive. If there is a positive economic marginality it has to produce a positive financial marginality (which means liquidity). Is there any margin that is both economic and financial? Yes, it is the EBITDA (earnings before interest, taxes, depreciation and amortization). If a company is not able to have an economic and financial marginality that it is positive it is going to fail, because this means there is a cash deficit (it absorbs cash and doesn't generate enough).

The balance sheet has equity and financial debt (on the right) and capex (fixed assets) and net working capital (on the left). How can we link the income statement with this balance sheet? If we do not have cash, to cover a deficit we have to ask money either to shareholders or banks. If I have a positive economic margin it is not necessarily true that the financial marginality will be positive. I might have a situation where the economic margin is positive and the financial margin is negative and vice versa. This is because it does not consider only EBITDA but it also takes in consideration what happens to CAPEX and Net Working Capital.

SCALABILITY can be physical or intangible. If you have a traditional business it is difficult to have physical scalability. If you have an intangible business, there is no problem of physical limits. Digital scalability means that you can increase the number of sales without having to face too big changes and costs. Example: physical lecture, where if you want to double the number of students you need a bigger room, if you have videos instead of lectures, you do not need a big change. Digital firms can either be fully digital (technological firms) or traditional tangible firms that, at least partially, go digital (such as wine firm that starts selling on e-commerce). You have to understand the business model: the business can already be digital or it can have the possibility to become, at least partially, digital. If a company is not scalable, at it is possible, it is an issue because it means it fails to follow the market.

VALUE ADDED: It is the key parameter in financial statement analysis, since it concerns the economic value that a company internally creates, just considering it typical managerial activities. Ex. without considering extraordinary items, financial issues or taxes (which are ancillary to the ordinary management). I have to create value inside my company, if I don't I'm not going to survive. Value added is the value that I increase due to production. What is the difference between value in use and exchange value. Considering an example of bread, I have a value in use because I can use it and eat it now, or I have an exchange value if I sell it. Before making the bread, I have to buy the ingredients, when I buy them they have an exchange value and when I put them all together the bread will have a value that is greater than the single products. This is an example of added value. So, in this case the exchange value (of the ingredients that I buy) is 100 and my value in use (once I produced the bread) is 180. And if I want to sell again the bread, the exchange value will become

300. The economic margin is 200 (it might be a bit less because you might have other costs). This 200 can also be considered value added. Value added is revenues minus operating expenses/costs. Again, the added value is the increase of value due to transformation. Looking at the income statement: we first have sales revenues minus costs (operating) we obtain the added value. Then we subtract staff costs and we obtain the EBITDA and finally the EBIT. The EBITDA leads to financial margins. To increase the EBITDA, we have to increase the economic marginality (increase the revenues keeping the costs unchanged; with the same costs we must have higher revenues). I'm going to have a higher economic margin if I increase revenues and keep costs the same, this leads to an increase in liquidity.

Going back to added value. Imagine added value as a cake, how can I make the added value bigger/have a bigger cake? How can I divide the cake in an appropriate way? Is there any link between these two questions? There is a big link between the entity of the cake and the way we proportion it. Our target is to increase the added value but we also have to proportion it correctly, if we are not all happy the system is not going to work. How do we know how much each stakeholder deserves of the cake? The entity of the cake is 100. The first slice (30) goes to the employees. Staff costs is fixed or floating? Employee cost in most cases is fixed. Let's say, of the 30, 27 is fixed and the remaining 3 is floating. What happens if the cake doubles? The fixed part remains 27 and the variable part increases to 6, but this is a very small change. So, in most cases this is a fixed component. If the business model is better to have fixed or variable costs? If you have a lot of variable costs you are elastic if you have many costs it is difficult to reach a break-even point. The trend in the future, regarding payroll, is flexibility. Flexibility also means that if things go well you will have a bigger stake.
Now, we have to cut the other slices of the cake: another slide goes to depreciation (to produce a cake do I need a fixed asset? Yes, I need the machines such as oven and kitchen). The depreciation of the oven is fixed or it depends on the size of the cake. The depreciation of fixed assets is mostly fixed, as I don't care if the cake is big or small, I will anyways need the oven. But it also has a floating variable component, ex. I need to buy a car to deliver the cake (the car is a fixed cost and the fuel is a variable cost). But this is not necessarily true, because also the car is variable: it depends how much I use it; if I use it a lot, I will have to buy a new one sooner. Depreciation is mostly a fixed component. Depreciation is the reduction of the value of a tangible asset. Assuming the case of before let's assume that deprecation has value 5. This value is linked to fixed asset, it is a percentage of fixed asset and not of the value of the cake (100). Is there a link between the cake of the added value and the cake of fixed assets? Do I need a big and better oven to get a bigger cake? Maybe yes, it is a case of productivity. In many businesses you can improve productivity if you go digital. Depreciation is a fixed component of another cake. We have our balance sheet (with fixed assets, net working capital, equity and financial debt), then I have my income statement with revenues minus operational costs which results in added value. What is the link between fixed assets (in balance sheet) and added value? To double the added value do we need to double the value of the fixed assets? Maybe, it depends whether the business is digital or not.
I have to cut a third slice to accommodate the remuneration of debt-holders. Let's assume that the interest rate is 7% (the interest rate I have to pay to the banks). This slice of the cake is it fixed or is it variable? Yes, it is fixed. The interest rate is proportional to the loan/financial debt. If I borrow 100 I have to pay 7% of this 100 and not 7% of my revenues. So, it is a slice of the financial debt cake. There is no direct link between the cake represented by the interest rates and the added value cake. But, even though the relationship is not direct, there is some link. Is there any relation between the financial debt cake and the cake of the added value? To produce a cake with an added value we

need fixed assets (input-output). To buy the fixed assets we need money by the shareholders or banks (link between fixed asset cake and financial debt cake).
There is another slice that needs to be cut: taxes. Is this slice fixed or floating? Yes and no. The bigger the cake (added value) the higher the taxes you pay meaning that it is mainly it's not fully variable.
Now, the slice goes to shareholders which represents the residual value (all that is left). It is completely variable because it depends what is left. Can I have a negative loss? Yes, because I might not have the possibility to cut another slice and I might be in the situation where I need extra money to cover and fill my deficit. There is no legal obligation to pay remuneration to shareholders.
Whenever we cut out a slice of the cake, is it a component or not of liquidity? I cash in the value of the cake (ex.100), and I have to use part of this cash to pay the employees (cash out money to pay employees), I also have to cash out money to pay taxes and interest rates and also to pay dividends. But do I cash out money to pay depreciation? No. *Depreciation is going to reduce my economic marginality but it is not going to affect my financial marginality* (it will neither increase or decrease it). EBITDA is both an economic and financial margin, instead depreciation affects economic marginality and it does not affect financial marginality.
Income statement: revenues minus monetary OPEX (operating expenses), this difference gives EBITDA. EBITDA is calculated before depreciation, so I don't care if deprecation is high or low. EBITDA is the starting point of the operating cash flow. But to obtain the OPERATING CASH FLOW I need to do: EBITDA plus or minus the change in NWC, plus or minus the change in CAPEX. In some cases, you can have a positive economic margin (EBITDA is +500) and a negative financial margin because: I create cash in the beginning EBITDA (+500) but then the NWC and CAPITAL are negative (-700). This leads to a scenario where I have a negative (-200) operating cash flow. This means that I absorb cash. If I increase my CAPEX I absorb cash. This is why I might have a positive EBITDA, but I end up with a negative operating cash flow. This can also happen if I decide to increase my stock, as also in this case I absorb cash.

How can I maximize my EBITDA? I can reduce the monetary OPEX and keep revenues the same, or I can increase revenues and keep the monetary OPEX the same. Or I can do them both at the same time, increase revenues and decrease monetary OPEX. This increases economic marginality, but it is very difficult to obtain it. To do it we can use SCALABILITY: scalability indicates the ability of a process, network, or system to handle a growing amount of work (which leads to higher revenues). Ex. physical teaching is not scalable. Instead, e-teaching is more scalable. If our business is digitalized we might face an incredible increase in revenues. Scalability fosters economic marginality, especially in intangible-driven businesses where variable costs are typically negligible. How can we make a traditional business that does digital to improve or marginality?

LECTURE 3:

The economic marginality leads subsequently to a financial marginality. If there is a positive economic marginality there, soon or later, be a positive financial marginality.
What is scalability? Scalability is very powerful. This is why many successful firms are scalable; they have a digital scalability. Digitalization is the final process of having paperless.
Can we transform a rival good into a non-rival good? It depends on the copyright, for example I can print a book or post it online. Non-rival goods, which are mostly intangible, can be scaled as they can be used by many people.
Economic and financial margins that represent a primary parameter for valuation are boosted by cost savings and scalable increases of expected revenues. Digitized intangibles synergistically interact through networked platforms that reshape traditional supply chain.

	T0	T1
Sales	100	1000
Monetary OPEX	(80)	(400)
EBITDA	20	600
EBIT	10	250

This is scalability. It shows that there is a monetary gain, because I increase my sales by 10 times but my monetary OPEX does not increase by 10 time (but less). For this reason, I have a monetary gain, and this is due to the fact that the monetary OPEX consists in both fixed and variable costs.
If I have an increase in sales which is the increase in EBIT? My sales increase by 900 and my EBIT increases by 240. It is important to have a scalable business, because it helps the business be profitable.
What are the main scalability drivers?

- Learning by using: If the scale is bigger I can learn from using and I have very good feedbacks from the already existing users. Ex. when we book a hotel room in Booking.com we see and are asked continuously for feedback. This data is collected and stored as Big Data and, representing artificial intelligence. Artificial intelligence means that the system is learning by doing, more work it does more it learns.
- Networking: a problem of networking is linked to Konigsberg Bridge Problem. How can I define a network? The value of the network increases as the number of people using the network increases. Example: using the metro. There are just two stations: S. Ambrogio and Cadorna, will you use this stop frequently? What if we increase the number of stops? If we increase the number of stops then it will increase the value of the network. Networks are mostly connected with the digital experience and they are very powerful. When you can transform a business into a network you are going to have a business with a lot of economics of scale, impacting liquidity.
- Scale economies: if I produce more I can decrease the costs, also because I have experience. The more I produce the better I am at producing that good.
- Technological relationships: two technologies talk one to the other.
- Real options:
- Blitz-scaling:

DECISION TREES: can be seen as networks, they are networks.

Graph at page 10. Shows the matching of balance sheet and income statement. How to improve scalability? Scalability is an economic concept. I can increase sales keeping constant, or decreasing, monetary OPEX. This leads to having a better EBITDA, and the EBITDA has an impact on the cash flow. If I have sales that grow due to scalability, I will have a higher EBITDA.
The impact of an improvement of scalability (it is an economic concept, I can increase my sales in a more then proportional way compared to costs). If I have a higher EBITDA I will have a higher operating cash flow.

OPERATING MARGIN: is represented by EBIT (earnings before interest and taxes). Operating revenues minus operating = the operating margin.
OPERATING LEVERAGE: is the basic formula for scalability, it applies to every type of businesses, no matter if they are traditional or digital.

INCOME STATEMENT: revenues minus variable costs = Contribution margin. Minus fixed costs = Operating Profit (EBIT). There is an important difference between fixed and variable costs (ex. a car is a fixed cost and the fuel is the variable cost). Though, it is not completely true that the car is a completely fixed cost; if I drive a lot the car then you have to buy a new one sooner.

BREAKEVEN ANALYSIS: when I have revenues that are consistent with the total costs I have a break-even point. After this point 'I start making money'. What is the impact of scalability on this graph? We need Metcalfe's law, which says that the effect of the telecommunications network is proportional to the square of the number of connected users of the system. When we have a network, we have a lot of potential gain. Can you transform a traditional business into a network? If you do so you are going to add up a lot of value. Look at figure 8.
What happens to the breakeven point when we introduce digital scalability devices? Then we can create the real value quickly. We can boost revenues quickly without increasing the monetary OPEX.

If I have exponential growth economic marginality is going to boost. Think about Amazon, it is digital but the delivery of the goods is physical. The business model is not entirely digital.

week 2:

LECTURE 4:

Leverage is the ratio between financial debts and equity. Which is the ratio between financial debts and equity, it is called financial leverage. Normally it is positive. According to Modigliani Miller the leverage doesn't impact the company.

Calculation is really easy; the complicated thing is to give a fair interpretation of the values obtained. Corporate profitability is a core issue of financial statement analysis and corporate finance. We can have a positive marginality (already considered issue; can have it with a strategic value of added value, scalability).

RETURN ON EQUITY: given by the ration between the net profit and the equity. What is the expected return of a bond I buy (an important question I ask myself). We do a similar thing for companies; if I decide to invest in a company, what will the return of my investment be? It is important for shareholders, because they can use to invest in a company or not according to the value of ROE. Looking at the formula on the slides, if I look at the denominator I have E0 and E1, this is because I need to compare some values. The balance sheet shows a screenshot of a single day, the closure day. Whereas, the income statement is not a 'picture', we consider the income statement of the entire year. So, we have to compare a firm with a photo, for this reason we need to compare the balance of a balance sheet. An accounting item that comes from the balance sheet has to be taken in consideration as an average.
Is it possible to improve the ROE (maximize the return on equity)?

- Increase net income keeping constant equity. With the same raised and invested capital I have to increase the revenues keeping constant the costs or vice versa. In other words, I have to increase my economic marginality, through scalability or considering the added value.

If your task is to improve ROE then you need to go inside its composition, so the formula with more variables in the slides is useful. Instead of using only net profit and equity you can focus only on sales, and could increase sales. Can I use scalability to reduce costs? Instead of buying a computer I rent it, instead of having a physical computer I use cloud.
There are other possible compositions of the ROE.

Book value and market value of equity. Apple is listed, market capitalization (price per share * number of outstanding shares) is the market value, instead the book value is what the balance sheet shows). The difference between market value and book value is called GOODWILL, assuming the MV is 350 and the BV is 100; the goodwill is 250. Is it normal for a company to have a price book value above unity? Yes, and the higher it is the better it is. Can it be below unity? Yes, but this means that the company is in a bad shape.

RETURN ON INVESTMENT (ROI): compare EBIT with average invested capital. Why is this ratio consistent? We have to consider balance sheet and income statement together. Net profit divided by equity I get ROE. If I consider negative interest divided by financial debt (money I give back to banks) gives me the COST OF DEBT. Considering also taxes, which in the income statement are considered to be a monetary cost (have to pay them with cash/liquidity).
What do we to calculate EBIT? Start from revenues and go down or start from net profit and going upwards. Look how the numerator is consistent with the denominator.
COMPARING ROE AND ROI: ROI comprehends also ROE.

The INVESTED CAPITAL: it corresponds to the raised capital. Looking at the slides, we have a division between assets and liabilities. All those liabilities not highlighted in green, will be considered under Assets with a negative sign (complicated part). A short cut, is to add financial debt and equity. Consider that you can calculate either invested capital or the raised capital, the last one is much simpler (all the equity and all the financial debt.

Book value and market value of equity. Apple is listed, market capitalization (price per share * number of outstanding shares) is the market value, instead the book value is what the balance sheet shows. The difference between market value and book value is called GOODWILL, assuming the MV is 350 and the BV is 100; the goodwill is 250. Is it normal for a company to have a price book value above unity? Yes, and the higher it is the better it is. Can it be below unity? This means that the company is in a bad shape.

RETURN ON SALES: ratio between EBIT and sales. It represents the profitability out of our sales, it gives an important side on economic marginality. Operating leverage is very similar. Given an amount of sales, are we able to maximize EBIT? We need to have lower costs to attain the same sales (have the same sales with lower costs). The return on sales is a really important ratio. If we want to compare two competing firms, the greater the percentage of return on sales is the better a company is. What happens between sales and EBIT is the big challenge for companies, you can't change taxes and you can't affect the interest rates, as they are decided by banks. This is why the return on sales is so important. Also, inside this ration we have operating leverage. Inside here, inside EBIT we have sales minus fixed costs minus variable costs. How can we make a consideration/link between return on sales and operating leverage?

We can represent return on equity as net profit divided by equity, it is also equal to EBIT divided by invested capital (return on investment) then we have invested capital divided by equity and then net profit divided by EBIT. To improve/maximize ROE we can use any of these three ratios. In the income statement I go from EBIT to Net profit. If I keep constant my EBIT, how can I increase the net profit? I cannot have an impact on taxes, the only way is to bring down interest rates, by bargaining with banks. Or, what else can I do? I can reduce the amount of raised capital. Looking at the balance sheet, raised capital is equal to financial debt and equity. If my target is to reduce this amount I can obtain this target if I can 'reduce the cake'. Can I reduce my financial debt keeping

constant my equity? If I reduce the raised capital I also have to decrease my invested capital (considering assets). Another solution could be to reduce equity, so I can decrease my interest rates leading to a situation where I increase my net profit keeping my EBIT the same.
If I want to have a strategic level in order to maximize ROE I cannot only concentrate on the net profit and Equity, I have to consider many rations in a comprehensive way.
Also, return on investment is given by EBIT divided by invested capital, this is equal to EBIT divided by sales and sales divided by invested capital. How can I maximize the return on investment? Given the same invested capital can I increase the sales, with the same assets? It is not easy at all.

MODIGLIANI AND MILLER PROPOSITION II:
Number I says that you cannot improve the value of your company just changing the leverage.
Looking at proposition number II: A company can be levered or unlevered. If it has not debt it is unlevered. Is it possible to have a company without debt? Yes, it is not compulsory to have debt. The meaning of the formula: the valued of a levered firm is the same as the value of the unlevered formula plus the tax rate value of the firm. In other words, the value of a levered firm is the same as the value of the unlevered formula plus the tax savings. This is because, when I have a financial debt I also have to pay interest rates, if I pay interest rates my taxes are a bit smaller.
Is this consistent with the original Modigliani and Miller proposition (number 1)? No, here in this case value is going to change with taxation. Why are these theories inconsistent? Because the original one (financial leverage does not have impact on value of the company) does not consider taxation, the tax saving part of the formula is not taken in consideration. In a world without taxation Vl and Vu are the same. But in a world with taxation Vl is higher than Vu, the value of the company is going up. Statement: when we introduce debt, we do have a tax gain, but also, we have a default risk that is going to decrease the value of our firm. So, you have a negative value of default risk. We always start with a firm with no debt, if we have a small debt we can have a small gain in the value of the firm, but if the debt is really high, the value of the firm can go down.

LECTURE 5:

ROE: If equity is the cake net profit is the slice belonging to that cake.
ROI instead, invested capital is the cake and EBIT is the slice belonging to that cake. The income statement shows: Sales/revenues minus variable and fixed costs, resulting EBIT (somewhere in the middle we have EBITDA). After EBIT we have net profit. In the balance sheet: on the left we have assets and on the right, we have equity and financial debt. The EBITDA is always higher that EBIT, unless depreciation and amortization are zero. If the EBIT is positive it means that they are producing a positive liquidity (there are some exceptions). Can I improve the EBIT given the sales?
Is it always possible to increase the sales? If not, I have to change the costs. Can you have an influence or not on the income statement?
ROI: EBIT/ raised capital. This is equal to net profit plus negative interest / Equity plus Financial debt

How are the ratios combined together? Looking at the formulas we have:

1. If I improve the ROS what is the impact on the ROE? Assume I have an improve on return on sales, without changing the sales, but I am increasing the EBIT. What is the impact on ROE?

$$ROE = \frac{Net\ profit}{Equity} \qquad ROS = \frac{EBIT}{Sales}$$

Replacing I obtain: $ROE = \frac{(sales - operating\ cost) = EBIT - negative\ interest = Net\ Profit}{Equity}$. Sales are not going to change, if EBIT is going up, this is possible only if operating costs go down. Assuming that also debt is unchanged, then negative interest remains unchanged. So, if my EBIT increases and my negative interest rate stays the same my Net Profit will increase.

Also: $ROE = \frac{(sales - monetary\ opex) = EBIT - depreciation\ and\ amortization = EBIT - interest = Net\ Profit}{Equity}$

Recap, what happens in the upper part of the income statement is crucial (the difference between sales and operating costs) to understand what is going to happen. If we have some interpretation, we want to see what happens to the other ratios if I change one variable.

ROE

-sales / invested capital→ what does it mean? Can I improve it? What is invested capital? Given my invested capital I want to improve my sales. I start from the raised capital (equity and financial debt), this is equal to my invested capital (fixed assets plus working capital). 1) raised capital 2) invested capital and 3) what happens in the income statement. Can I keep constant my invested capital and anyway improve my sales? Can I increase my output with my same input? Maybe, but it is really difficult, you have to improve your production. With the fixed amount of invested capital, you are asked to increase the sales. Can you do this? Yes, you can, reinventing the business model, maybe through scalability. You have to recompose the business to improve it.
-EBIT / sales (which is return on sales)
-Invested capital / Equity
-Net profit / EBIT

Another really important equation:

$$ROE = [ROI + (ROI - i)d]\frac{net\ profit}{adjusted\ pretx\ profit}$$

$\boldsymbol{(ROI - i)d}$
Based on the income statement, the slice is the EBIT and the cake, based on the balance sheet, cake is the equity plus financial debit (raised capital). If negative interest is the slice, on the income statement, then the cake is the financial debt, in the balance sheet.
I collect money from banks, I have to pay them something. I use this money, together with equity and I have a return. The return of all this cake (equity + financial debt) has to exceed the cost of a smaller cake (financial debt).
The cost of debt: I collect money from the banks (financial debt). There is a cost: the negative interest. The ratio is negative interest / financial debt. The return on raised capital corresponds to the return on the invested capital, can I have a return on the invested capital that is higher than the cost of debt? In some cases, yes. It this is the case, invested capital minus financial debt is equity. If the invested capital has a return that is higher than the cost of debt I have a positive impact on equity. This means that I have a better return on equity.
Try to decompose things to make them comparable. The return on investment has to exceed the cost of financial debt (bank loans).
I borrow money form a bank at 6%: $i = \frac{negative\ interest}{financial\ debt}$= 6% and the ROI is 4%. This is a negative scenario, you are producing less than you need to give back. This is why you need to have a difference between the return on investment and the cost of debt that is positive.

The d in the formula is financial leverage (financial debt /equity). What is the difference between financial leverage and raised capital? One is a proportion the other is a sum, they are completely different but at the very end they are 'similar'.

- Financial leverage: financial debt / equity
- Raised capital: it is equal to invested capital which is equal to financial debt plus equity.

I want to improve: $(ROI - i)d$

To increase financial leverage, you have to increase financial debt proportional to equity. EX. E is 20 and Financial Debt is 80 (versus 50 and 50 in the previous example). We increased financial leverage from 1 to 4. If I multiply 3% by 4 I get 12%. It can be a solution, but it is really difficult and risky.
I can work both on the difference part (inside the brackets) and on the multiplier (d). In this example I worked on the financial leverage.

There is an economic and financial way to create value. The 'healthy way' is the economic.

- Either we improve the $(ROI - i)$. Is the cost of debt completely out of your control? It depends as it is negative interest / financial debt. If we want to improve this part, we are not able to improve the *i*, it is a variable outside of our control.
- Or we increase the financial leverage d; it is much easier.

Increasing financial leverage is easier, but easy money is always risky, there is a 'trick'. For this reason, it is more convenient to concentrate on the difference between ROI and the interest rate.
If there is an increase (or decrease) of financial leverage from 1 to 4, does the difference between ROI and interest rate remain constant? It depends, it can stay constant or it can change.
So, what is the solution? You decompose until you find common elements to solve it.

Rearranging this part of the equation:

$$\left(\frac{net\ profit? + negative\ interests \uparrow = EBIT}{invest.capital = financial\ debts \uparrow + equity \cong} - \frac{negative\ interests \uparrow}{financial\ debts \uparrow}\right) \frac{financial\ debts \uparrow}{equity \cong}$$

Have to understand this equation!!!

LECTURE 6:

Assets represent the invested capital and it generates the ROI (or ROIC – return on invested capital). On the right side instead, we have equity and financial debt. Financial debt generates the interest *i*.
If ROI is greater than *i* (ROI > *i*) → ↑ROE (can increase).
Some companies, for strategic purposes, decide do turnover, reduce the sales by eliminating the products that do not produce profitability. Marginality does not always have to be positive, consider the example of WhatsApp. The most successful companies have good statistics in real time; the market is changing and I adapt to it quickly.
This is the profitability equation (the one shown above in lecture 4).

Is it easy or not to get information today? Easy but complex. There are many information asymmetries. Information asymmetries means that someone knows something but other people don't. The power of information is really important. Try to match information and information asymmetries with knowledge.

A bank is deciding whether or not to give a loan to a company. The bank has to screen the company, which parameters will it use? One of the parameters, as there are others is:

1. Debt equity ratio – financial leverage. If leverage is high the company is less likely to get a loan, it is risky enough. When leverage is too big it is difficult to find additional loans.

Income statement
Revenues 300
-Monetary OPEX (200)
EBITDA 100
-Depreciation/Accumulation (20)
EBIT 80
-negative interests (70)
-taxes
= NET PROFIT (10)

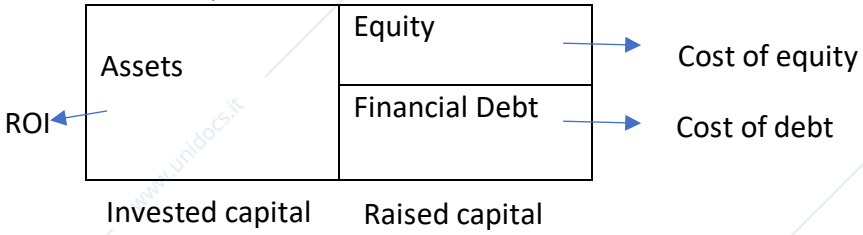
Balance Sheet

Fa= Capex	Equity
NWC	Financial Debt

The EBITDA is 1/3 of the revenues; this is very good. This means that marginality is high, you attract competitors. Since EBITDA is very good, and depreciation is not too much, also the EBIT is good. But why are my negative interest rates so high? Try to figure out a possible balance sheet. This shows that the CAPEX is pretty low and that the financial debt is really high, I need a lot of cash to survive. So, eventually the EBITDA is good, but it is not enough for this financial structure.
If I increase my equity I would decrease my financial debt, from 70 to 40. This also leads to an increase in net profit; from 10 to 40. I can fix my financial structure to comply with my objective.

EVA: economic value added. It is the difference between net operated profit after taxes – weighted average cost of capital * invested capital

- WACC (weighted average cost of capital): it is very similar to the ROI. Looking again at the balance sheet where on the left we have assets and on the right, we have equity and financial debt. Outside of equity we have cost of equity and outside of financial debt we have cost of debt, outside of Assets we have ROI.



Consider the book value of equity, they are official as you can find them in the balance sheet. The market value is an estimate. An investor, instead, looks at the market value.
If I must raise capital, borrow from banks or equity from shareholders, as company. I want to reduce cost of capital, as investor (shareholder or bank) instead, I want to maximize return on capital.

We have a cost in collecting money from equity holders and banks, there is an internal cost. Then I invest this money in project, and I have my assets. When I have my assets I can have a return on my assets, and what is my return on my assets? It is my ROI.
I know that my *i= negative interests/ financial debt.* So, my cost of debt (i) with my cost of equity ($\cong ROE$). I have my WACC. My ROI is connected to my WACC. So, I need to have ROI > WACC.
There is a cost to raise capital, I invest it in assets, the return on investment in these assets has to be greater than the cost of it (WACC).

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WACC is a percentage; the cost of collecting debt is weighted. Equity is 30 and the financial debt is 70 (this last one is going to cost me 8%), the equity instead is going to cost me more than 8%, because it is a riskier investment (if it is not enough at the end you do not have any right to get money). So, the cost of my equity collection is 12%. What is the average?

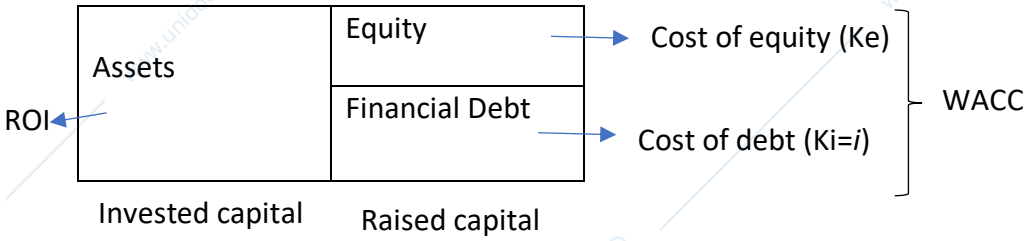
- Considering the example, 8% * 0,7 + 12% * 0,3 = 5,6 + 3,6 id 9.2%

If my NOPAT is 12, minus the WACC (12-9.2) = 2.8
If the difference is positive, there is a good economic value added.

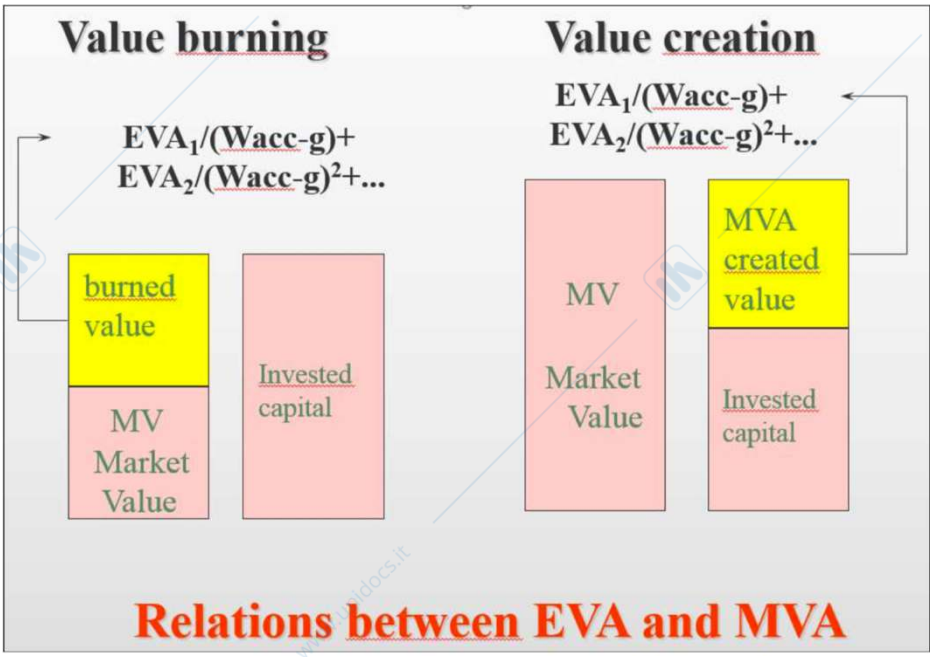
week 3:

LECTURE 7:

Economic value added is given by the difference between adjusted ROI and weighted average capital, multiplied by the invested capital → *EVA= (r-WACC) *Ci*
What is the weighted average cost of capital? We have a classic balance sheet with equity, financial debt and assets. Obviously, the raised and invested capital balance. We have a cost to collect equity and a cost of debt. The raise of capital has a cost. In order for the firm to collect money from shareholders and banks they have to incur a cost. So, we have a cost of equity. We have both a cost of debt and a cost of equity. If we consider them both together we have WACC. Whenever you use these resources (1), we invest funds and we have a return (that is the return on investment – ROI) (2). The part in brackets *(r-WACC)* says that we have to have return on investment that has to be higher than WACC. WACC is the cost of collecting money, *r* is the return I get in using money; the return has to be higher than cost otherwise I will not get a positive marginality. It can happen that the WACC is greater than the return on investment, but it is not a good sign. If the difference is positive I have an added value. If you have a positive differential you can leverage it up. The concept of 'leverage it up' is similar to the one discussed regarding the profitability equation – (return on investment less cost of debt) x financial leverage; it is not the same though. If I have a positive difference between return on investment and the weighted average cost of capital, then I can increase my EVA by increasing the invested capital. Is it a good way to manage a company? It can be so for a little amount, but it can be dangerous for a big portion – same concept of profitability equation. These two parameters are not comparable, just the broad procedure is.



EX. Would it be good for the campus to increase the number of classrooms? Yes, to invest and have more classroom would be good. 200 more though would be too much; this would dilute investments. So, you are going to have additional investments which are not going to be profitable. How can you maximize profitability? Offer digital lectures. When the difference is positive; you can increase invested capital, but there might be a dilution in the difference between *r* and WACC (the marginality). The problem is not only that after a certain threshold the marginality might become negative, but also the fact that the leverage (invested capital) is growing a lot – a big leverage multiplied by a negative marginality is not a good sign.

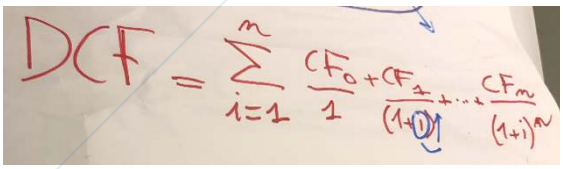


Generically summarizing: We have seen the balance sheet and the income statement and we tried to match them – matching assets, liabilities and equity with costs and revenues. Let's say that the economic value added is positive, if I accumulate value added over time I can have accumulation of market value added. If the market value > than invested capital I have an internal goodwill. I cannot record it in my accounts, I can only record it in my unofficial accounts. Market value > invested capital I can create a market value added. This is considered discounting economic value added (EVA) at a *-g*. When the invested capital > than the market value I have value burning.

CASH FLOWS

We have to consider discounted cash flows. We have to consider cash flows form an accounting point of view. How can we derive cash flows of liquidity? We have to discount liquidity, using discount factors. We can have certainty and uncertainty cash flow. Certainty means that I have future cash flows that are sure. Cash flows may also be uncertain: I expect to get back some cash flows but it is not sure, there is a risk. I consider cash flows in the numerator, and is discount them. The discount rate can be risk free (I am sure that I will get the money back) or it can incorporate a risk premium (the discount factor is higher and the present value is smaller).

Discounted cash flows: a sum of cash flows, without discounting todays money as it is already in present value. I have to discount future cash flows with a discount factor. If the *i* (discount factor in general terms) increases, because I incorporate a risk premium, and the numerator stays the same then the present value goes down.



Three important topics:

1. We have to consider how to derive cash flows from the accounting. Accounting derivation of liquidity of cash flows. We will consider EBITDA, which is both an economic and liquidity margin, in a separate way. Also, we are going to consider operating cash flows.
2. We consider how to discount values. What is the time value of money? Why today's money is worth more than tomorrow's money?
3. We have to define risk, in general term, and eventually incorporate risk in formulation. How can we incorporate risk in the discount factors? The higher the risk the lower is the present value of discounted cash flows.
4. Put everything together. Combine the previous three steps together.

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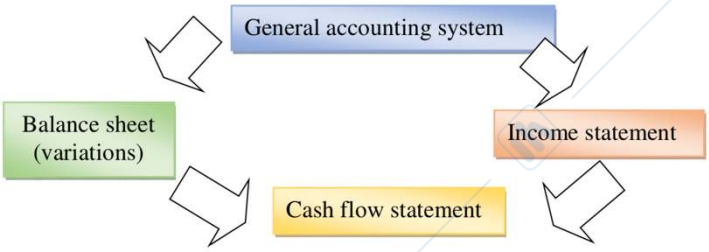
CASH FLOW STATEMENT ANALYSIS- how to derive cash flows from my accounts.

In order to calculate cash flows, do I need other information apart from those present in the balance sheet and income statement? No, the data on these two statements is sufficient. All information concerning cash flows and liquidity are already recorded in the balance sheet differential (comparison of two consecutive years) and in the income statement of the second year. For example, we compare balance sheet of 2017 and 2018, and the income statement of the 2018. But, we need to reclassify the comparison of balance sheets with income statement together in order to sort out what is the liquidity. We have all the information in the combination of these statements in order to obtain the cash flow statement.

From the balance sheet and the Income statement to the Cash Flow Statement



In the cash flow statement, we are going to have:

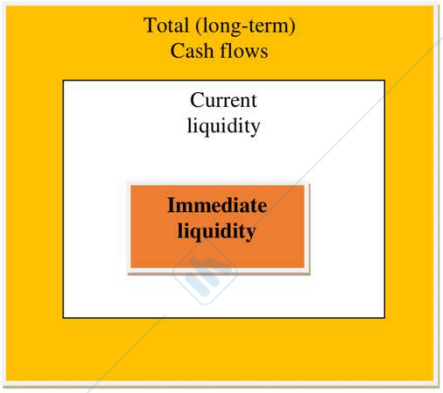
- Operating activities - In the income statement we have revenues minus monetary OPEX; the difference is the EBITDA. (difference between liquid profits and liquid costs).
- Investing activities – composed of invested capital.
- Financing activities – composed of the raised capital.

We can go from balance sheet + income statement to the cash flow statement. Considering the balance sheet, it is essential to consider variations from one year to another. Whereas, in the case of the income statement I just consider the values of second year. This is because the balance sheet is a picture and the income statement is a movie.

What is liquidity? It can be very-short term (immediate liquidity), short-term or medium-long term (more than one year). I can forecast cash flows according to these three 'time periods'. Immediate liquidity is the most important analysis; it is the cash flow in the very short-term. I have to match the money coming with the money going out. We are going to only consider the liquidity in the short-term; *within one year.*

Cash is 'king', if company is not able to generate positive cash then it is not going to survive. My cash has to be positive. You need to balance cash inflows and cash outflows, if it isn't someone has to cover this gap (in the case of firm's shareholders or/and banks).

- Question: If the operating profit is growing a lot (increasing revenues more than proportionally increase in operating profit, because I have a lot of fixed costs for example). This means that I have a good improvement in economic marginality. But I also have to consider which is the improvement in financial marginality (do I produce or not additional liquidity)? Yes, it should be a case, otherwise it is pointless. Can I have a situation where my economic marginalities increase and my financial marginalities decrease? Yes, it can be the case, but it will not last for long.



Looking at the following graph we have immediate liquidity (within 1 month – up to 90 days) and then we have current liquidity (within one year). This is a sub-system; immediate liquidity is also current liquidity (what is going to expire with a quarter will also expire within one year). And then we have long-term liquidity, what is going to produce or absorb cash in the long run? For example, considering CAPEX (fixed assets), in the balance sheet, are you going to sell fixed assets in the short-term? No, they would not be fixed otherwise. The inventory/stock, is it part of the fixed assets?
In most cases the inventory is going to be short-term (part of the net working capital). I have goods in my stock that I am going to cash them out/ sell them within one year. Ex. The inventory of a supermarket rotates. Salad is going to rotate every 2 days, oranges once a week, dry pasta twice a year, wine once a year. Companies normally have to rotate the inventory. In some exceptional cases, the rotation of the stock is very slow (it can be the case, in a supermarket, for red wine, sugar, etc.). Outside a supermarket it can be the case with spare parts. Also, a tablet has to be rotated every 2 months; after this period, I have to sell the new one. According to the product, 90-95% of the products are going to last less than one year, for this reason they are part of the NWC. If instead, they last for more than one year they are considered fixed assets (ex. spare parts of airplanes which I have to keep for thirty years). So, it is important to know the turnover of the stock. How can the stock be calculated? FIFO, LIFO, AVERAGE COST. Another method is FISH (first-in-still-here); when you don't sell something in your inventory.

Which is the liquidity consequence of my inventory? If my stock/inventory increases, is it going to have an impact on liquidity? Yes, it will have a negative effect on liquidity. I need someone that gives me money to buy this inventory and it will have to incur in costs of capital. When I increase my inventory, it is a cash negative strategy.

JUST-IN-TIME PRODUCTION: products you produce in real time. Ex. I want to buy shoes, but in that shop, you don't find your number you go to another shop. If instead you are in the countryside where there is only one shop, you have to wait. So, for the shop, if I have a lot of shoes I am going to increase my stock which consequently increases my costs but at the same time it might boost my revenues! If I have a high invested capital I have both a problem and a possibility:

- Problem: if I have a high invested capital it is a problem because it is expensive as I have to back it with raised capital (either equity or bank loans).
- Possibility: if my invested capital is high I may produce a better income statement. Because, if my stock is zero also my sales are going to be zero.

In some cases, you have a way to account for stock that is peculiar: FEFO (first expiring first out). It could be the case of a pharmacy.
The stock is a very important part of the business; it is expensive but you need it.

The CAPEX and NWC generates the invested capital. What happens during an economic recession period? Companies don't invest neither in the CAPEX nor in the NWC, because if I make an investment I expect a return in the future. If there is a downturn in the economy I might not be able to sell anything. In conclusion, a big stock can be good, but it can be expensive. You also have to take in consideration the macroeconomic environment.

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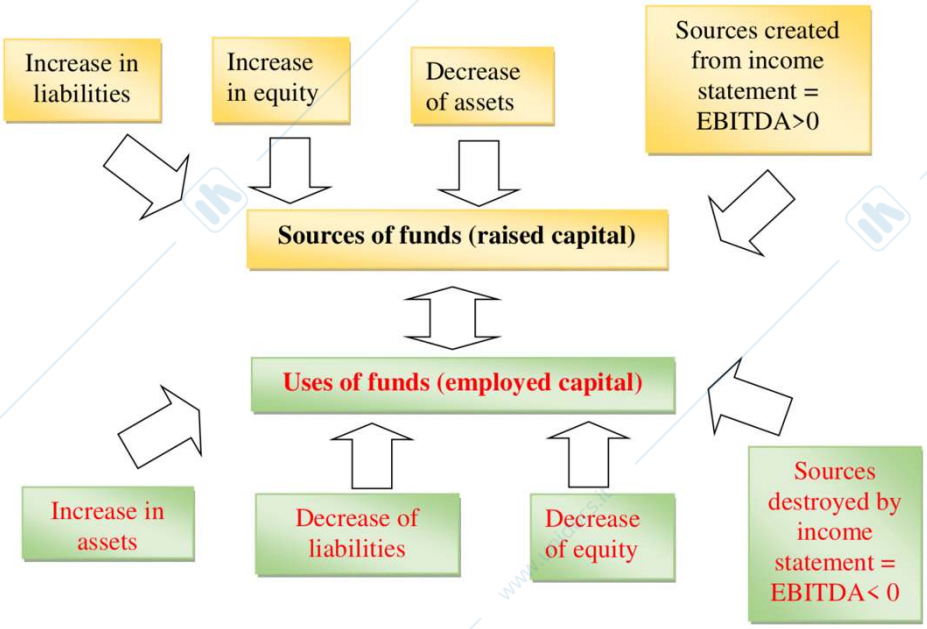
Combination of balance sheets and income statement (graph):



This following graph shows raised capital and invested/employed capital. It represents the balance sheet. For the first time we want to match differences in the balance sheets, form one year to the other, with the income statement. First, I collect the money from banks or shareholders (sources of funds – the raised capital), then I use the liquidity (uses of funds – the invested capital).
In order to have additional cash, I can have:

- Increase in liabilities: I ask a higher/ bigger loan form the bank.
- Increase in equity; capital increase. Shareholders put in company additional money.

→ there is a cost of collecting these sources (cost of capital – WACC).

- Decrease of assets. I sell something out of my inventory and I get cash.

Instead, I absorb liquidity when I have:

- An increase in assets; when I buy an asset. In this case I buy inventory or a fixed asset.
- I decrease liabilities; I pay back a bank loan.
- Decrease of equity, ex. such as dividends.

(all of these elements consider only the balance sheet).

Considering also the impact of the income statement. Does the income statement have an impact on my liquidity? Out of my income statement (the combination of revenues and costs) will I generate or absorb cash? No, the income statement does have an impact on liquidity.
Whenever I consider, in the big picture, also the impact of the income statement I have to consider that I can have both additional liquidity or I can absorb liquidity.

- I have additional liquidity if there are sources created from the income statement. This happens when the EBITDA>0. This means I have a positive economic marginality, which is also a positive financial margin.
- When my EBITDA < 0 I absorb cash. Representing sources destroyed by the income statement.

(now this is the complete picture).
This to show that I need differences form balance sheet and a contribution of the income statement in order to calculate the cash flows statement analysis.

Best (cheapest and safest (#4)) way to have additional cash:

1. Increase in liabilities → a bank loan is going to cost me money, not only interest rates but also commissions. It is expensive. I cost of debt with the weighted average cost of capital.
2. Increase in equity → this is also not free of charge you have to remunerate shareholders, you have to promise something to the shareholders. It is expensive.

→ Which of the two is better? Cost of equity tends to be higher than cost of debt, this is because equity is riskier. There is a proportion between risk and return.

3. A decrease in assets → I can sell an asset to get cash, but there is a limit to it.
4. The best way to create real/safe cash: increase in EBITDA within the income statement. This is because I do not have any intermediation cost (like as in the case of bank loans and equity). An increase in EBITDA, instead, represents liquidity that I product internally: do I have to pay commissions, do I have to ask permission? No. Is it going to alter my equilibrium? No. Also, assuming I have cash to pay back to the bank within 2 years, I have to show I can generate enough EBITDA to pay back the cash. I have to generate enough cash liquidity in income statement in order to pay interest rates, payrolls, taxes and remunerations to shareholders. So, this is the good cash: 'the most positive part of the game'.
   But, which is the 'negative part'? I destroy cash/absorb liquidity when my EBITDA < 0.

I can have invest capital by:

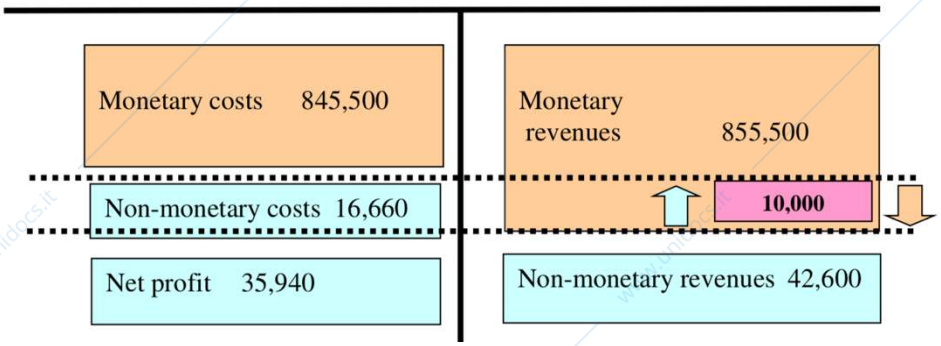
1. Increasing assets. Yes, I invest and I increase my assets to generate a higher cash flow within the income statement.
2. Decreasing liabilities
3. Decreasing equity

→ So, I have to increase assets, decrease liabilities and decrease equity to have a higher EBITDA.

EXAMPLE. Say that my EBITDA is 10,000 (monetary revenues – monetary costs). I can also calculate this amount on the other side (starting from the bottom). This graph divides the income statement in two sections: costs and revenues (when revenues exceed cost I have a net profit). The normal way to calculate EBITDA (monetary revenues – monetary costs), it represents the cash flow I generate within my income statement. The second way to calculate EBITDA: (non-monetary cost + net profit) – the non-monetary revenues = 10,00. The first way is the most straight-forward method. But, the final value, no matter which method I am going to use, is always going to be the same. To calculate EBITDA, I can go both down and up.

EBITDA is an economic but also a financial margin (money I produce within the income statement). It is 'good cash'. It is formed within the company, I don't have to discuss this money with anyone. The other money obtained, such as asking a loan to a bank, has to always be discussed. So, *internally produced money is always good.*

A revenue or even a cost is monetary if it is corresponding to cash. For example, if I have a credit, it is not cash. And if it not monetary (no cash) it is not going to impact the cash flow statement. Remember you are considering only short-term cash.



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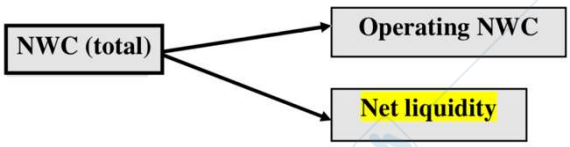
Match in another way the income statement with balance sheet variations

Until now, we have considered an overall consideration of the NWC.

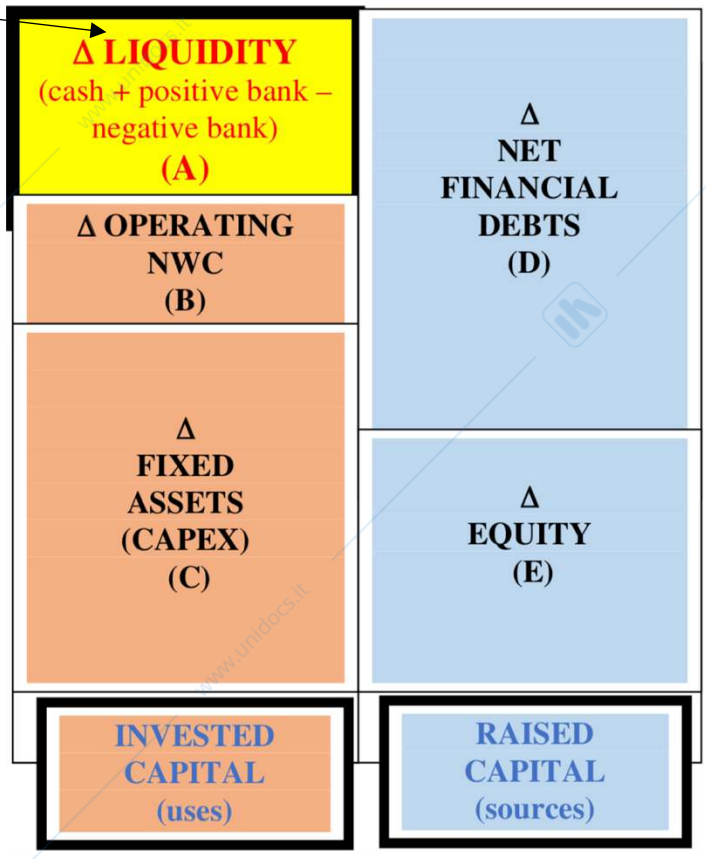
Now, have to split NWC in: Operating NWC and Net liquidity (the sum of these two components gives the total value of the NWC).

The NWC will be split in two parts: Operating Net Working Capital (accounts receivable, accounts payable and stock/inventory), and Net Liquidity.



Overall NWC is given by the difference between current assets and current liabilities. So, inside this NWC I have liquidity (it is current – short-liquidity). I have to separate my liquidity from the other components of the NWC. Net liquidity is net cash you have in a really short-term (up to 1-3 months).

The target of our investigation within cash flow analysis.



This graph shows the very first part of the cash flow statement. We have invested and raised capital. Raised capital is differential meaning that it is the differential in equity plus the differential in equity. This amount is counterbalanced by fixed assets (differential) plus the differential of operating NWC plus the differential of liquidity. Liquidity is the target parameter. We have to calculate cash flow statement in order to get difference in liquidity. Short term liquidity= cash + positive bank – negative bank overdraft.

→ *Remember to follow letters.*

The difference between net financial debt (D) and liquidity (A) gives the NET FINANCIAL POSITION.

Net Monetary Operating Revenues **(F)**
- Net Monetary Operating Costs **(G)** [considering operating taxes but excluding the depreciation]
= EBITDA
- Depreciations **(H)**
= EBIT
- negative interests **(I)**
+/- extraordinary profits & losses **(L)**
- (non operating) taxes **(M)**
= Net Result

With these differences in the balance sheet, we can consider jointly the income statement. We start from, net Monetary Operating Revenues (just the typical ones, not the extraordinary ones) minus Net Monetary Operating Costs (the typical ones, do not include depreciation but include operating taxes). This difference gives the EBITDA (link with cash flow statement). Then we subtract Depreciations; the difference is EBIT. Then we have other values, which are subtracted or added, which lead to the Net Profit.

→ *Remember to follow letters.*

My target is to match the differences in the balance sheet with the income statement of the second year. The balance sheet is picture, reason why I need comparison between two years. The income statement instead is a film, it is sufficient to use only the one of the second year.

We can now calculate the cash flow statement

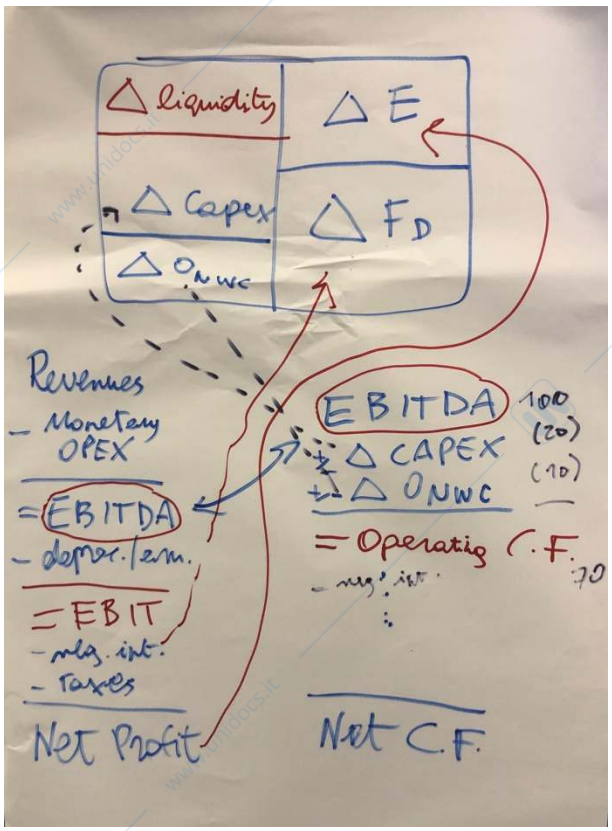
Net Monetary Operating Revenues (F)
- Net Monetary Operating Costs (considering operating taxes but excluding the depreciation) (G)
= EBITDA
± variation of operating NWC (B)
± variation of Capex / Fixed Assets (C) net of depreciation (H)
= OPERATING CASH FLOW (UNLEVERED o DEBT-FREE CASH FLOW)
- Negative interests (net of positive interests) (I)
± variation of financial debts (D)
± variation of equity (E)
± extraordinary revenues and costs (L)
- Non operating taxes (M)
= NET CASH FLOW (LEVERED CASH FLOW) (A)

The following chart shows structure of the cash flow statement. It considers all the components of both the differences in balance sheets and the elements of the income statement.

1. Start form EBITDA (above we have monetary operating revenues - monetary operating costs). EBITDA is the link between income statement and cash flow, between economic marginality and financial marginality.
2. Then we have the variation in operating net working capital
3. Then a variation of CAPEX, net of depreciation.
4. From the elements above we obtain the OPERATING CASH FLOWS.

Differences in income statement, balance sheets and cash flow statement

What does operating cash flow mean, why is it so important?



-EBIT is the remuneration (economic cake) that I need to have to remunerate appropriately negative interest and eventually equity. Negative interest is linked to financial debt and net profit is linked to equity.

-The EBITDA is the linkage between the income statement and the cash flow statement. It is an economic margin and a financial margin.

-For the cash flow statement, we start from the EBITDA minus Capex (capital expenditure) minus Operating Net Working Capital (both deriving from balance sheet).

-Assuming my EBITDA is positive, I create some cash, and that my CAPEX is going to grow (I have net positive investments). This is going to absorb cash. This is because I have uses of funds, I have an increase in my assets: my liquidity is going to decrease. Also, let's say that the Operating Net Working Capital is going to go up (I have a bigger stock/inventory). Also, in this case I absorb cash.

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This is going to affect the Operating Cash Flow. In fact, if we put numbers and we assume that the EBITDA is 100, Capex (20) and ONWC is (10), my Operating Cash Flow is 70.
Also, what is Operating Profit? It is the EBIT: net margin out of my operating activities before the remuneration of financial debts and eventually whatever is left belongs to equity holders.
What is Operating Cash Flow? It is the operating liquidity (liquidity that comes out of my operating activities) before the remuneration of financial debt and then equity holders.
This kind of remuneration is economic within the income statement and financial within the cash flow statement. Similarly to the income statement, after the Operating Cash Flow I have negative interest. In the income statement negative interest is a cost, in the cash flow statement they are a cash outflow. So, I can say that EBIT (operating profit) is similar to Operating Cash Flow and that Net Profit (in the income statement) is similar to Net Cash Flow.
Can I say that Net Profit is the remuneration of Equity (equity is the cake and net profit is the slice belonging to the cake)? Net profit/ Equity is Return on Equity. If I have EBIT/raised capital I have Return on Investment. So, I can compare Net profit to Equity. Can I compare Net Cash Flow to Equity? Yes, in financial terms. Can I compare the EBIT to the total raised capital? Yes, so I can also compare operating cash flow to the total raised capital. The differences in the balance sheet, the values in the income statement and the values in the cash flow statement are consistent.

Which is more relevant between Operating Cash Flow or Net Cash Flow? It depends, shareholders look at net cash flows, banks look at the operating cash flows. This is because if the operating cash flow is enough, they are confident you are going to pay back your debt; you create enough cash to pay back debt (negative interest and the serve debt with the variation of financial debt (D)).

Final Target? Calculate risky discounted cash flows. What we saw above are the cash flows (the numerator). Which ones are we going to use in our discount formulation? The operating or net ones? Both; two different and complementary formulations. We will discount both OCF and NCF.

OCF is positive and NCF is negative. Is the bank really happy? No, if the OPC is positive you produce enough cash to pay back your debt but if the NCF is not only occasionally negative, and it will stay negative for many years, the shareholders might wind up the company.
In some exceptional/peculiar cases, I can have a negative OCF and a positive NCF. In this case, shareholders are happy and banks are not? If banks are not happy then they are not lending money. So, in a comprehensive and sustainable system we all have to be happy at the same time (both banks and shareholders).

LECTURE 8:

We have to consider the present value of money. We have cash flows (stream of liquidity), and have to calculate the value today of this discounted sum of money. The present value of a sum of cash flows that do not occur at the same time. EX. owner of the room, and I want to rent if for 10 years. Each year I have a cash flow of 100; 100 today, 100 at year 1, 100 at year 3… until year 9.

$$PV= \frac{100}{1}+\frac{100}{(1+i)}+\frac{100}{(1+i)^2}+\cdots+\frac{100}{(1+i)^9}$$

KEY POINT: What happens if in a company leverage is zero? In the case in which a firm has no financial debt/no financial leverage, the operating cash flow matches the net cash flow. Also, in the income statement, if there is no debt, EBIT corresponds to the Net Profit.

From the previous lesson we have seen how to calculate the cash flows form an accounting point of view. These cash flows are part of the numerator, which kind of cash flows?

- The operating cash flow. Going back to the ex. of the room: if I rent the room with my money, I did not ask money to the bank or I did but it has expired, I consider net cash flow.
- The net cash flow. If, instead, I pay the rent and then I also have to give money to the banks I have to consider the operating cash flow.

The numerator of the previous formula can either be operating cash flow or net cash flow. It depends on the circumstances; in some cases, you calculate both operating discounted cash flows and net discounted cash flows.

What is missing in this discounted cash flows analysis? The denominator. In the denominator we have to incorporate the time value of money in a risk-free scenario. If the risk free is 2% we have to substitute in the previous formula *i* with 0.02. If this is the case, 100 in 1 year gives a present value of 98.03. In most cases though, I have to incorporate risk in this discount factor. Risk can be included in two alternative ways:

- Reduce the numerator (for example reduce the 100 by 10%)
- I add up a risk factor in the denominator of the formula. Assuming the risk factor is 5%, then to calculate the present value of 100 euros in 1 year I have to solve $\frac{100}{(1+0.02)+0.005}$ = 93.

→ it is better to have 100 today rather than 100 in one year. Is it better to spend money today or put off consumption? It is risky to put off consumption, the value of money today is certain. If I have 100 next year, its present value is lower. The market rates today are very low, meaning that the discount factor may also be negative. This means that if you leave money in the bank not only you don't get an interest rate but you also have to pay a bit. Though if you normally delay consumption, you may earn some interest.

In order to improve the cash flow, you want to improve the EBITDA (revenues -monetary OPEX). So, the most important part is what happens in the first part of the income statement – between the revenues and the EBIT. Which are the consequences, on the cash flow statement, of what happens in the top section of the income statement?

The Present Value, more specifically the NPV (net of the initial investment) is the key parameter of business planning.

<u>Summary of Previous Lecture:</u>

Derivation of the accounting cash flows in the numerator, before discounting it. How can we reclassify the differences in the balance sheets from one year to another; I raise capital when:

i. Increase in liabilities
ii. Increase in equity

→ these two are very different. Do I have to remunerate equity anyway? No, it is not compulsory to remunerate equity, but if I don't it creates problems with shareholders. I have a higher risk with equity, which is counterbalanced by a higher expected return. All of this compared to liabilities, where I am forced to remunerate liabilities and financial debt – pay back banks, with interests, if lend me money.

iii. Decrease of assets: if I sell off assets I can get some cash.

Instead, I burn cash, I use my cash (invested capital) when:

i. Increase in assets
ii. Decrease of liabilities: pay out and pay back some debt
iii. Decrease of equity

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(these elements consider the balance sheet, and it does not, only for now, differentiate between short-term and long-term assets/debt. The distinction between short-term and long-term debt is important. At this step it is not necessary – no distinction has to be made). For example, in the case of the profitability equation it is really important to differentiate between short- and long-term.

Then we have to consider the contribution of income statement to cash. The EBITDA can either be positive or negative. They are complementary, EBITDA can either increase or decrease cash. If we create cash out of the income statement it means that the EBITDA is positive. This 'type' of cash is the best one since it is risk free (it is created internally – within the business), as you do not have to contract anything with anyone. Increase liabilities, increase equity, decrease assets are all possible cash possibilities but they are expensive, there are also negotiation costs. The only good cash comes from the EBITDA, formed internally. Whenever you have a of external money (banks) there is a system of monitoring, the bank is going to investigate on you. Also, the shareholders are going to investigate/monitor if they put extra money within the business. Lastly, selling out assets is limited because you need your assets to keep running the business.
EBITDA is an economic margin (when it comes from the income statement) but it is also a financial margin (when considered in the cash flow statement).

- How can I increase EBITDA? It is important in a business, but it is really complicated. We can increase it by: boosting operating leverage, with digital scalability, saving on fixed and floating costs, improving productivity and efficiency.
- Assuming we destroy cash out of our income statement: EBITDA is negative (it can be the case with star-ups). If I burn out cash, someone has to provide for the amount of cash burned. Who is going to pay for the cash I destroy? If the EBITDA is negative it is difficult to increase my assets (make new investments), to decrease my liabilities and it is impossible to decrease equity. If you burn liquidity you do not have enough resources to pay back the loan borrowed by banks. Also, if you don't have cash you can't pay dividends. The bank may say I don't care about assets and equity holders – I just consider my situation. No, because if shareholders do not get dividends the company may liquidate and this becomes a problem for the bank. The bank may be also worried about investments, if a company does not invest it will not produce cash flows in the future. What is the link between invested capital and the income statement? Invested capital is the input, and revenues and costs are the output. How can I have revenues, net of cost, if I do not invest? You can't. So, banks are also interested in investments (especially in the long-run).

The income statement shows:
Revenues ----- 100
-Costs ------ 70

EBITDA -----30
EBIT ------25
Net Result -10
This means that negative interest and taxes account for (-35).

The cash flow statement shows:
Starting from my EBITDA (30), I prepare my cash flow statement: OCF (10) and my NCF (-25). The difference in liquidity is negative. Assuming that in the beginning of the year my liquidity was 100, now it is 75 (I destroyed cash). So, cash: -25. Where will do I put it in the BS? Since cash is negative, I have to put it on the right-hand side of the balance sheet, more specifically within the net financial

debts. If the ONWC has increased, it has to be located on the left-hand side of the balance sheet. If it decreases I put it on the other side (right-hand side).

What happens between the EBITDA and the Operating Cash Flow?

Assuming I have a positive EBITDA. What happens between the EBITDA and the Operating Cash Flow? After the positive EBITDA you have to look at the variation in operating NWC. What is the link between positive EBITDA and the Operating NWC? I have a revenue of 100 and monetary OPEX of 70, so my EBITDA is 30.

→ →→The ONWC is composed of trade credits + stock – suppliers.

- If I increase my revenues my credits are going to up – I sell more my credits are going to increase, they might even more than proportionally.
- If I sell more, my stock is going to increase.
- If I sell more I will have more costs as I am going to buy more from suppliers, so what I have to give to the suppliers is going to increases.

This means that they all grow. But, the supplies have a minus sign, so they might compensate. On average, if my EBITDA is growing my revenues are growing net of the monetary OPEX. If I sell more my economic marginality is going to improve. If this is the case, in most cases, I am going to increase my Operating Net Working Capital.

Answer: If my EBITDA is growing I create some cash in my cash flow statement, but I consume a part of this cash with the increase in the Operating NWC. (in the example it is going to increase by 10).

What happens also to the CAPEX? In order to improve my revenues and have a good EBITDA do I have to make additional investments? In most situations yes. If this is the situation, CAPEX is going to increase (in the example is going to increase by 8). It is not a golden rule, in some cases I can improve my income statement without making additional investments – using in a better way what I have (in most cases up to a certain point).

So, the *cash flow statement*:

EBITDA (30)

Change in the Operating NWC (-10): It has to be minus because I absorb cash.

CAPEX (-8): also, in this case I destroy cash

OCF: (+12)

So, it's normal that when I have an increase in EBITDA some of the cash goes away in the remuneration of a higher ONWC and a higher CAPEX. I burn out a part of cash to remunerate the growth.

Since the Operating Cash Flow is precious, can you keep the increase in the EBITDA of 30, decreasing the increase in the ONWC and in the CAPEX (using less working capital and less additional capex)? This is a productivity gain. For example, you can keep sales steady decreasing the period of credit. But, it is not easy, it is really difficult. I can create a cake with the 'EBITDA' but then I have to consume a part of it in order to finance increase in ONWC and increase in the CAPEX.

Is it possible to increase the EBITDA without any additional investment either in the NWC or in the CAPEX? Theoretically yes, if I can add up some productivity.

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Look at the EXERCISE on Lecture Notes:

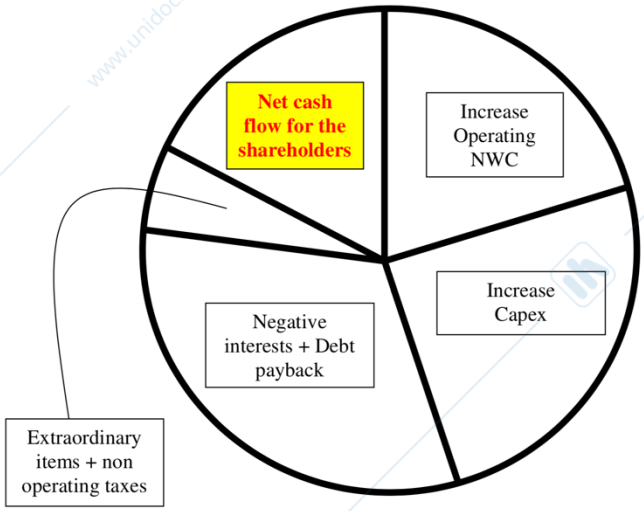
1. We start form the EBIT, we add up depreciations and provisions to get the EBITDA. We go up rather than down. EBIT includes both monetary and monetary cost. In the cash flow statement only monetary costs are important.
2. Then we start from the EBITDA to get the operating cash flow/unlevered cash flow. Since in 2013 the ONWC variation is decreasing, the operating net working capital variation is added to the EBITDA. In the following years instead, it is increasing, so I have to subtract it. Only in the first year the operating cash flow is positive, because of the operating net working capital variation contribution. This decrease could be given by the sale of stock and deciding to not buy other stock. This is good for the year but it might be negative for the following years, as you have to buy the stock back.
3. When I have the unlevered cash flow I have to subtract/add negative interest, credit towards shareholders variation, financial assets not constituting fixed assets variation, funds for liabilities and charges variation, severance indemnity for employee's variation (trattamento di fine rapporto – typical in Italian system), net financial liabilities variation (payback of financial debt), etc. Then you have the equity variation.
4. At the end you have Net Cash Flow (levered cash flow), after considering appropriate debt.

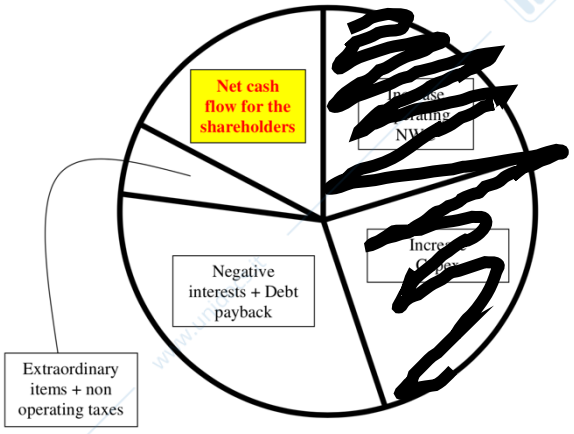
→ *do exercises at home alone.*

Considerations-- How can I check?

- You have to match variations in the balance sheets with the income statement. The difference between variation in assets and variation in liabilities has to be zero. If these two variations are not zero it means that there is a mistake.
- When the NOWC increases, I absorb cash; I have to subtract it and not add it.
- Check final cash minus initial cash (synthetic calculation). This value should match with the net cash flows (analytical calculation). If these two numbers do not match then there is a mistake. The synthetic calculation should match the analytical calculation. (D=C).

We can consider the following graph as the 'cake' of the cash flow. The cake represses the EBITDA. If I have an increase in the Operating NWC, I have to absorb some cash so I cut a slice of the cake. This same mechanism works for the other slices of the cake that absorb cash. Whatever is left is given by the net cash flow. What is operating cash flow? Everything except increase in ONWC and increase in CAPEX.





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So, we have three big sections of the cash flow statement:

1. EBITDA (starting point) with a direct link to the income statement)
2. The Operating Cash Flow – linked to the EBIT
3. The Net cash Flow – linked to the net profit.

Also, can I make a final link with variation in the balance sheet? The net result (economic profit for shareholders) is linked with the net cash flow (net cash that belongs to the shareholders – free cash flow to equity). These two margins can be linked to the equity.
Also, we can link negative interest plus taxes to financial debt. I can also link OCF to EBIT. These two margins, economic and financial, can be linked to raised capital.

Additional Considerations

How can we discount these cash flows? Which is the discount factor? In the denominator you have to consider time value of money, that is risk free, then we add up a risk premium. Is this complete/correct? No. In the denominator I have to use a discount factor called the cost of capital.

- In order to get positive cash, I have to collect capital – the raised capital. If I collect financial debt this is a cost of raising debt / cost of debt.
- If I get equity from shareholders, this is cost of equity.
- If I collect raised capital, as a total, I have weighted average cost of capital.

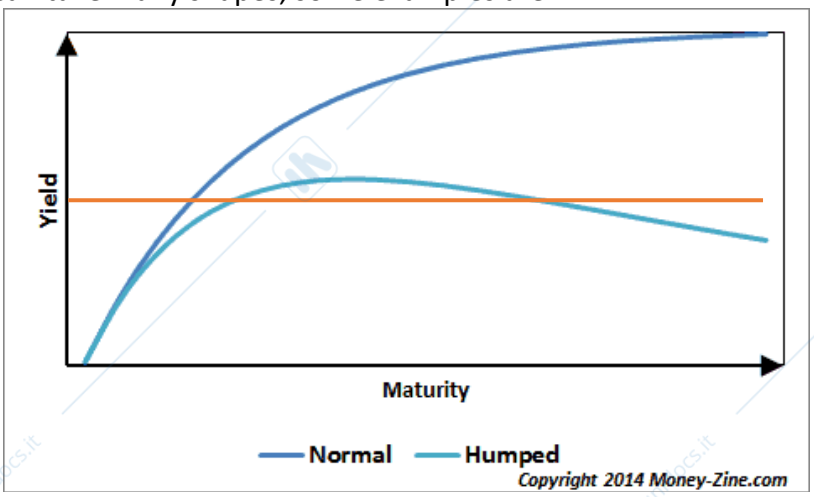
So, the denominator of the discount formula has to be consistent with the numerator. Three cases:

1. In the numerator I have Net Cash Flow (liquidity belonging to the shareholders). In this case, I discount net cash flow using is the cost of equity. Meaning that you have to discount the liquidity, over time, considering the cost of collecting money from the shareholders. Shareholder liquidity in numerator – shareholder cost of capital in the denominator.
2. If in the numerator I have the cash flow that I have to give back to banks, the operating cash flow. You have to discount with the cost of debt.
3. If you consider the sum of net cash flow and debt service I get operating cash flow. From an economic point of view, net result plus negative interest I get EBIT. I should discount this kind of operating cash flow with the cost of capital that is a weighted average of the cost of debt and the cost of equity.

→ *the numerator has to be consistent with the denominator.*

Term Structure of Interest Rates

How do interest rates behave across time? For now, I consider interest rates riskless. How can the yield curve be? It can take many shapes, some examples are:



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The graph can be upward, flat and downward sloping. Which is the right/good one?
→ *Premise: they are all risk free. In these cases, we do not consider risk (don't add up anything), we consider very safe treasury bills/bonds with a specific currency (dollar, euro, sterling, the yen, etc.). The basic yield curve within the euro-zone is the same because we only have an ECB. For a yield curve of a specific euro-area country, we use the basic yield curve and add up the specific country risk.*

- Upward means that my interest rate after one year is going to be smaller than the interest rate at year 30. (ex. 5% versus 8%). This shows that I have a premium if time get longer. This is because risk increases as time increases. You have to remunerate this extra risk.
- Can I have a term structure where the rate is flat/almost flat? It does not exist, it is only an ideal one. In this case the term structure is almost flat; but it is a really rare case.
- What about the humped (first go up and then downward sloping)? If you lend money for 2 years you have a higher interest rate than if you have a lower interest rate (it is better to lend money for a short time horizon rather than for a long-time horizon). Did it every happen in real life that long term interest rates are lower than short term ones? Yes, it is happening now (in these last months). When the yield curve has a negative slope, it will anticipate a recession. It is done in order to facilitate, ease, long term investment. This is not a normal case.

LECTURE 9:

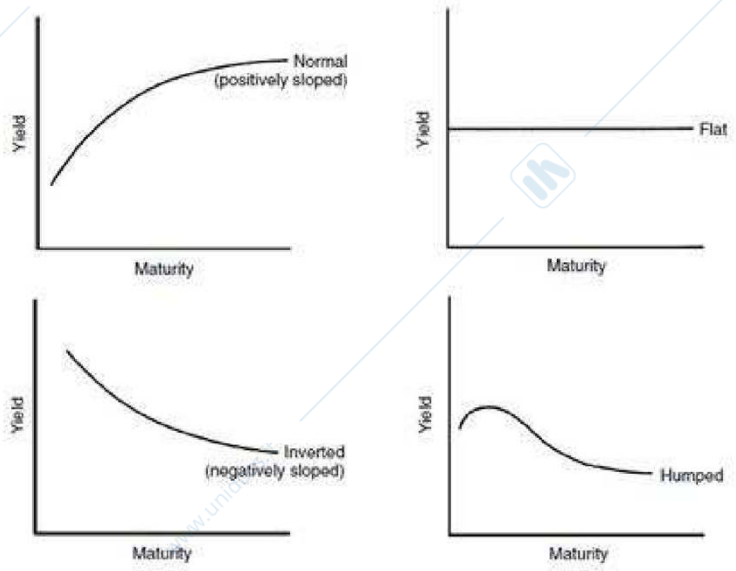
$$DCF = \sum \frac{CF}{1} + \frac{CF1}{(1+i)^1} + \cdots + \frac{CFn}{(1+i)^n}$$

The cash flow can either be CF_0 or CF_n. Meaning that they can either be from operating cash flow or net cash flow (the value of the numerator). Instead, in the denominator we have to consider *i*= real rate of interest + expected inflation + risk premium.
If is sum up the real interest rate and the expected inflation I get the nominal interest rate.

<u>How can interest rate change over time?</u>
If the interest rate is constant:

$$DCF = \sum \frac{CF}{1} + \frac{CF1}{(1+i)^1} + \frac{CF2}{(1+i)^2}$$

Figure 1 – *Examples of Yield Curve*



If the yield curve is flat, the term structure of the interest rate is flat, it means that it does not change over time. If this is the case, *i* in the denominator is constant (impossible in the real life that interest rates are going to be flat).

If the interest rate is not constant: the discount factor is going to be $(1+i_1)x(1+i_2)$. The last parenthesis is necessary to bring form year 2 to year 1 and the first one to bring it from year 1 to year zero (today).

As the previous graph shows we tend to have four types of yield curves. The normal yield curve is positively sloped, because longer term maturities tend to yield a higher return compared to shorter term ones. If I make an investment that has a later maturity date, I expect to get a higher premium because my personal investment tends to be riskier – many more uncertain things might happen in the long term. So, the normal yield curve is positively sloped. In text books we find flat yield curves – but it is never the case. The yield curve can also be negatively sloped – inverted – in some extreme and particular cases. Normally when this is the case it is an anticipation of a recession. If there is a recession, what is the impact on the balance sheet/on the invested capital? Firms are not going to make many investments, they are not going to have a full stock and so their investment capital may shrink. Why? Because it is expensive to keep this capital invested/employed, it is going to have a cost that is given by uses of funds. Also, what is the monetary policy of central banks when there is an incoming recession? Interest rates go down because if money is cheaper people are going to make more investments and consumers are going to purchase more goods. When there is a recession inflation *normally* goes down, because during a recession the strategic purchasing power of employees is low (it is difficult to find a job so people don't ask for an increase in wages and they keep prices down). When there is an economic recovery there is an economic growth, and companies are going to accumulate stock to make investment in CAPEX and inflation might go up. The desired level of inflation is 2% within the European Union. When the economy goes up, normally interest rates also go up, to prevent inflation from growing too much.

INFLATION: general increase in prices. I have an average inflation, and then I have a specific inflation for each product.
DEFLATION: when prices go down.
DISINFLATION: when inflation is reduced.
Is deflation worst of better than inflation? It is always much worst. You want to buy a pen that now costs 1 euro, in November it will be 90 cents, in December 80 cents and in January 75 cents (the price is going down). What do you do? If you really need it you buy it today otherwise you put off consumption. If you put off consumption the trend of prices will go down, it will self-fulfill this negative spiral. So, whenever inflation is growing the problem is that inflation may grow more than your purchasing power. Example: the pen costs 1 euro and you have a 20% inflation, it will cost you 1.20 euros next year. Assuming you have a wage increase of only 15% in purchasing power terms, the pen is going to cost you more next year. Whenever inflation is high you may have big issues.
Now inflation is really low, close to zero. But, when you have to do a business plan that is long term, for example 25-30 years, then the inflation parameter is very important. If you consider an inflation parameter of just 1% over the next 20 years, it is a big danger. What happens if I forecast an inflation of 1% for the next 30 years but the real inflation along that period is 2%? It happens that there is a higher discount rate in the denominator, and the present value is lower (the numerator stays the same). Even if inflation is not a big issue today, you always have to consider it in the long run.

<u>What is the impact of inflation on our income statement?</u>

	Year 1	Year 5	Year 10
Revenues	100	200 -- 206 -- 202	500
Costs	(85)	(170) -- 175.1 -- 172	(425)
EBIT	15	30 -- 30.9 -- 30	75

→ costs are 85% of the revenues.
→ real inflation is 1%
→ expected inflation (E(i)) is 3%

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The black values are without inflation. If we add inflation, we add an index both to revenues and to costs (3% which is the contractual inflation). If we consider these blue values, the different between revenues and costs is greater than 30. If instead we consider the real inflation (in red), the difference is again 30. What does this example mean? I have a contract/agreement between the private and the public. The private is going to have some indexed revenues and some indexed costs, and the marginality is positive. If the forecast inflation is 3% and the marginality is positive and todays inflation is lower than 3% the public player (the one with this income statement) is going to make more money. Because there is a higher indexation of a positive margin. There is a transfer of wealth from the public to the private.

What is the impact of inflation on the balance sheet?

Assets (100)	Equity (15)
	Financial Debt – *fixed interest* (85)
Invested capital = 100	Raised capital = 100

What does it mean that I have 85 as a long-term financial debt? That after 10 years from now I have to pay back to the bank 85 (the nominal rate). Assuming I have to make, 10 years from now, a bullet payment. In nominal terms, this payment is going to be 85. If inflation is very high in this period, the real value in 10 years time of this 85 is consistently lower than 85. Whenever I have a debt, inflation leads to a big wealth transfer from the creditor to the debtor. It is convenient for me to get a fixed rate loan when inflation is high. What I am going to pay in 10 years' time is lower than the fixed amount.

Let's apply this principle to the public debt of a country. Italy: the Italian public debt is really big; there are good and bad news. It is good news when the interest rates are low but the bad news are that if the inflation is very low the gain for the debtors (the Italian country) is very small. Should inflation be 20% in nominal terms the present value of the Italian debt would be consistently lower, and this is not the case now. So, whenever there is inflation there is always a big transfer of wealth that is going to benefit the debtor/ the borrower. The lender though is going to suffer. Which is the period when inflation is going to peak? During wars: when there is a war the public expenditure goes up and so there is a big transfer of money from ordinary people to the government. Assuming you buy a government bond before the war, after the war the nominal value of that bond is very little. You have to pay attention to inflation, even if it not an issue now. We do consider a lot of expectation when we forecast. Business plans are normally short-term, 2,3,5 years, but in some cases, you have to make a very long-term plan. If you have a 30-year plan, inflation is going to become a sensitive issue.

Whenever you get a loan it can be fixed rate or floating rate. It is an issue for us, since we are households: if you want to buy a home and ask for a mortgage would you do it fixed or floating? I would do it fixed since rates are historically low, but the banks know it, so the fixed rate would be a big higher than the floating ones. If it a short-term mortgage (three years from now), then the difference between floating and fixed would not be so crucial. If instead it is a mortgage of 10,15,20 years then the fixed rate is the best one.

Also, when we have the profitability equation, considering the return on investment and the cost of debt, is it fixed or floating? We do have different implications on our balance sheet.

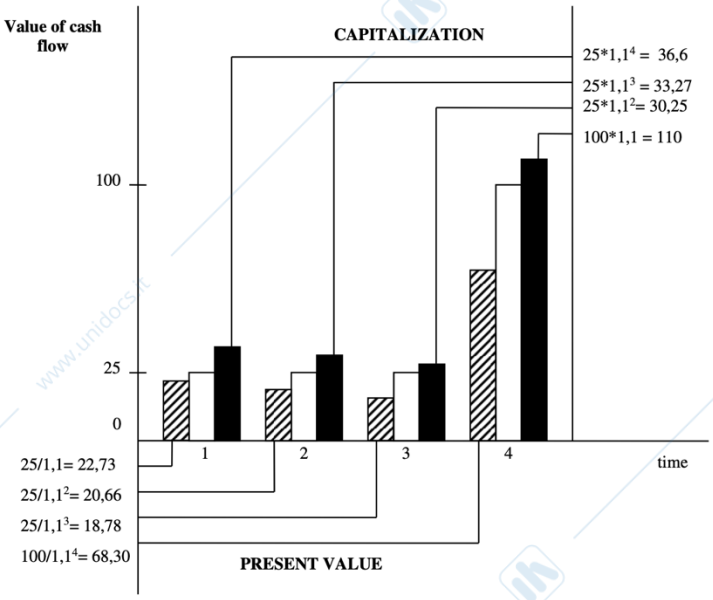
Cash flow considered as an investment

What does it mean? I have the price that corresponds to the cash flow, and this is divided by the denominator. *P* is the price and *FC* is the periodical cash flow, *n* is the number of period and *y* is the yield to maturity (the interest rate from not to the end).

Is it the same to have an interest rate of 12% per year or 1% per month? I invest today 100, the interest rate is 12%, at the end of the year I am going to get 112. Now, let's consider that my rate, instead of being 12% per annum, is 6% every six months. After 6 months is have 106 and at the end of the year is have 112.12. This is because I calculate the 6% on the capital after the six months and not on the initial capital. If instead I have 1% each month, at the end I am going to have a value much higher then 112 (because I re-price the capital every month).

→*Consider Table 1: Simple and compound interest rate considering an investment whose current value corresponds to the payback at maturity (100), with an annual posticipated cash flow of 5%.*
Let's say that I get a loan and I have to pay interest rates once a year (12%). My loan is 100. Do I pay this 12% of interest at the beginning of the loan, 1st of January, or at the end, 31st of December? Normally the interest rate is posticipated, in some cases it is anticipated. For example, if you rent a home you pay the rent at the beginning of every month. Assuming I underwrite a government bond, when do I get the interest rate (posticipated or anticipated)? Always posticipated, every 3,6 months or every 1 year. When I underwrite treasury bills – very short-term (BOT – in Italian), do I get a real/physical interest rate? No, I just buy the bill at a discount and then at maturity I am paid back for full. I am in the 1st of January and I buy a treasury bill for one year at 99.2 and then I get a return at the end of the year of a nominal 100. The interest rate is the difference between 100 and 99.2: 0.8%. Considering the actual example in Table 1: we can say that in this case I have an annual rate of 5 and the compound rate is going up because this 5% is calculated on the future value. So, since it is 5% and capital is 100, the first year it is 5. The 2nd year it is 5.25, calculated on future value 105.

Figure 2 – *Capitalization and present value of a security*



We are at time zero and we have three kinds of histograms. The white one is the one where there is no time value for money (theoretical example). Then I can have present value, the black and white one. Then I can have capitalization (the black one).
We are time zero and we consider the future cash flows one year from now, two years, three years and 4 years (with the payback of the loan). The white histogram shows that with a 10% interest rate I get 25, 25, 25 and 100. If I discount the white histogram, considering a 10% rate, I calculate the present value. After 1 year 25 is 22.73 and after 2 years it is even smaller: the present value is 20.66. After 3 years it is 18.78 and at the end the face value I should get back is 100, in present value terms it is 68.30.
In some cases, though you want to calculate the value of 100 euros 5,10,15 years ago – you have to go back. And so, you don't discount values, but you multiply values. Consider yourself at year 5 (as if it was the present value. If you go back year, with an interest rate of 10%, the value would be 110. You go back 2 years the interest rate of 25 is 30.25, 3 years is 33.27. What is an implication of going back? If I go back I don't consider risk, because I know what happened.
So, if today we consider the present value of future money we have to incorporate risk. If we go backwards, today we look at the past, we are not going to incorporate real risk. In the majority of

the cases though, you consider present value from now to the future, so you have to incorporate risk in the discount rate.

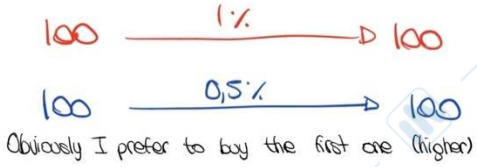
DURATION

What is duration? It is the sensitivity of the price of a bond to changes in the market interest rates. The formula of Macaulay duration:

$$D_{MC} = \frac{\frac{1FC_1}{(1+y)} + \frac{2FC_2}{(1+y)^2} + \ldots + \frac{nFC_n}{(1+y)^n}}{P} = \frac{\sum_{t=1}^{n} t\frac{FCt}{(1+y)^t}}{P} = \sum_{t=1}^{n} twt$$

The numerator is the standard discounted cash flow formula where you add in each term a number, number 1 to year 1, number 2 to year 2 and number *n* for year *n*. In the denominator you have the price of the bond.

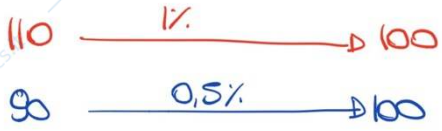
If we issue a fixed coupon bond, and the bond is going to expire 3 years from now and the interest rate is 1%. Assuming there is a recession, and interest rates are going from 1% to 0.5%. What does it mean? For the next three years you are going to get 1%, other people that underwrite new bonds do not get 1% but they get 0.5%. If the average price of the bond is 100, the price of 'your' bond (that is going to yield a bigger return compared to the market) is going up or down? In other words, if the bond I have gives a return that is higher than the standard market for that kind of bond, the price should go up or down?



Consider a numerical example: I have a bond whose price is 100 and it is going to give me back 100 three years from now. My return is 1%. Another bond, still paid 100 has a yield of 0.5%. They have similar risk. You would buy the red one (the first one): the one with 1% yield.

What happens in the market? Everyone buys the first one and sells the second one. This has some consequences on the price of the first bond, its price goes up (more people want to buy and few people want to sell).

The market price of the first bond goes up to 110 and the price of the second bond goes down to 90. Which one would you buy for three years? The discount factor is so big in the first case that I prefer to buy the second one (I get 0.5 less for three years, but I also pay 20 less).



We have an inverse relationship between interest rates and prices. If market interest rates go up the price goes down. Why? if during the life of a bond, the interest rate goes up, the present value of the price goes down. This is because I have the same coupon (that is fixed) discounted by a higher factor. This shows that there is a sensitivity: if the market interest rate goes up the price of my bond goes down.

$$\downarrow P = \frac{C_1}{(1+y)^{\uparrow}} + \frac{C_2}{(1+y)^2} + \ldots$$

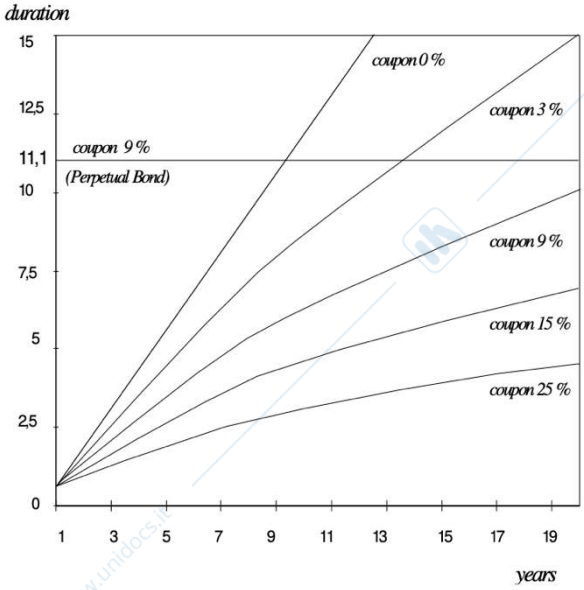
So, with duration I can calculate the sensitivity of an interest rate change on the market price. Some bonds are more sensitive, to market interest rates, than others, and they tend to have a higher duration. And if a bond has a higher duration it is riskier than the other ones.

Fisher – Weil duration:

$$DFW = \frac{\frac{1FC_1}{(1+y_1)} + \frac{2FC_2}{(1+y_1)(1+y_2)} + \ldots + \frac{nFC_n}{(1+y_1)(1+y_2)*\ldots*(1+y_n)}}{P}$$

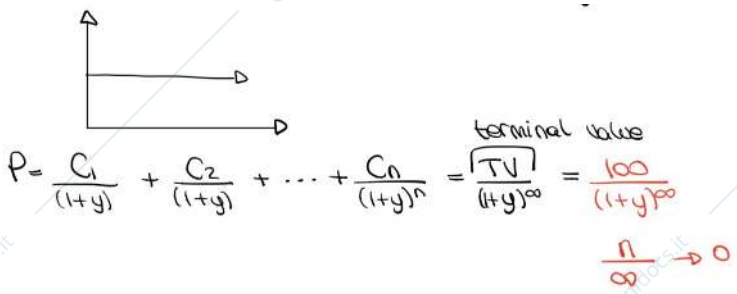
Similar to the previous formula, but in this case the yield curve is not flat; it is going to change (so I have a split year after year).

What happens to duration when I have a coupon payback? When I pay a coupon (a periodic interest rate) the cash flow is going down and the duration is going to grow. This is because there is a higher sensitivity of the remining part of the cash flows with changes in market interest rates. So, duration grows after coupon payback. But duration decreases when it converges towards the maturity of the bond. If your bond is long-term, with expiring date 5 years from now, duration is going to be high. In 5 years, many things can happen and this has an impact on the price of the bond. If the expiring date is 1 month from now, who cares if market interest rates change and are volatile, the time to payback period is so small that i don't care: sensitivity is smaller.
So, it is true that whenever I pay a cash flow duration is going to grow, but it is also going to decrease a bit (a compensation of the increase) because time to maturity is getting shorter. The shorter the period to payback the lower the duration of the bond, because sensitivity is not big.



If I have a zero-coupon-bond the duration is proportional to the time to maturity. A coupon bond has a lower duration. If my coupon is 0%, my duration is bigger. Whenever my coupon is going to grow the sensitivity of a change in market interest rates is going down. There is also the specific case of a perpetual bond (a bond that does not have any maturity – the interest rate is going to be payed out forever and so the payback value is zero).

Why is the payback value of a perpetuity bond zero, in mathematical terms? Even in financial terms, what is the value today of a terminal value that I am never going to pay? It will converge to zero.
This coupon is not sensitive to duration.
→ *Assuming that the yield curve is flat.*



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Purchasing Power of Parity

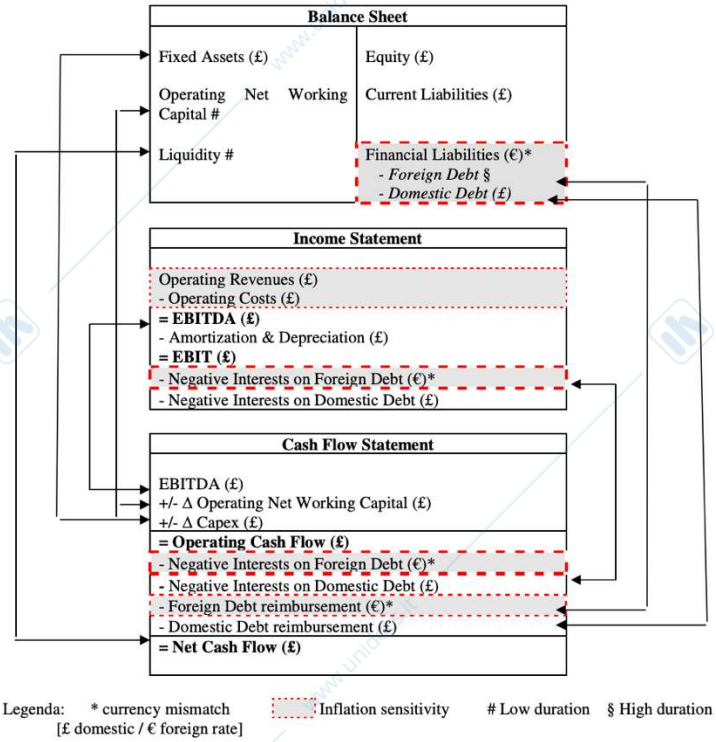
When we need input numbers for corporate finance calculation, in most of the cases we will consider accounting data, but in some other cases we will consider macroeconomic parameters (interest rates, inflation rates and exchange rates).

What happens if inflation is different across countries? I can have purchasing power of parity. Assuming I have the euro-area against the dollar. If inflation is higher in the Us than in Europe (the price of the goods is going to grow), to keep a balancing purchasing power the dollar should depreciate against the euro (to compensate this increase in prices). Example: I want to buy a pen: the cost of the pen is 1 euro or 1 dollar (the exchange rate is 1). After one year, inflation in Europe is zero (again 1 euro) inflation in the US is 10% (1.1 dollars is the value of the pen). To keep the same purchasing power the dollar should devaluate of 10% to compensate for a higher inflation. So, in purchasing power terms, the price, net of the exchange rate, should be similar to the 1 of today. Countries that have a higher inflation – developing countries, always depreciate their currency. If inflation is higher, the local currency is going to depreciate.

Asset-liability Management

You have assets and liabilities (accounting items) that may be or may not be sensitive to interest rates, inflation and currency rates. Is it better to have a company that is very sensitive to interest rate or not sensitive at all? It does not matter; what matters is the balance between assets and liabilities. If my assets are very sensitive to interest rates and my liabilities are similar, I have an elastic structure. Whenever I have a shock in interest rates I don't have many influences in my income statement. Also, when I consider sensitivity to macroeconomic variables (interest rates, inflation or exchange rates) I normally consider the balance sheet more than the income statement. Why? For time reasons. The income statement is a short-term flow (up to 1 year) while the balance sheet is going to consider cumulated values for many years. If there is an inflation shock, the impact on the income statement is small but potentially bigger on the balance sheet.

I can have a comprehensive representation of the balance sheet, the income statement and the cash flow statement. Starting from the balance sheet, I can have financial liabilities in other currencies (such as euros). In my income statement I have revenues and monetary OPEX in the local currency (pound-sterling), but I pay negative interest on foreign debt in euros. If the pound is going to devaluate against the euro the charge of my interest rates is going to grow (I pay interest in a harder currency – this is going to negatively affect my income statement and cash flow statement). What happens is emerging/poor countries? Most of these countries have their own currency which are indexed/linked to the American dollar – when the dollar gets stronger these countries are going to suffer because they are will have to pay back loans in a harder currency. When the dollar is weak they are going to benefit.



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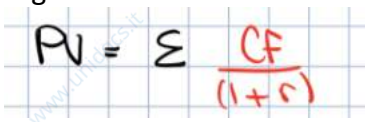
week 4:

LECTURE 10:

K=i= real interest + expected inflation + risk premium. The first two variables consist in the nominal interest. Don't ever consider risk the denominator separated from the nominator. The risk in the denominator is not only going to incorporate the time value of money but we are also going to incorporate in the denominator the risk that the numerator might be different from the expected/what we forecasted. So, it is a sort of risk premium linked to the volatility of cash flows.
If I am going to have a cash flow of 100 next year, 120 the following year, 140, 160, etc. and if this is for sure I don't have to incorporate in the denominator any risk factor. Since in most cases it is normal that I have a difference between expectations and the real outcomes, I have to incorporate in the denominator a risk premium.
Our intermediate target is to determine the risk premium. The final target instead is to recombine together all the formulations to calculate how we can use risk in a comprehensive way.



Risk-free bonds and Risk Premium

Normally, at the basis of our considerations, we have risk free. What does it mean? A situation/context where risk is not existent. If we have a risky context it means that in the denominator of the previous formula (discounted cash flow) we have to introduce and use risk. The cash flow (numerator) can be either operating cash flow (comparable to EBIT) or net cash flow (comparable to net equity). No matter which numerator we use, it has to be consistent with the denominator.
Can we find in the market for stocks, bonds, corporate bonds and government bonds a case where we have some risk-free bonds? If it is risk-free it means that risk is zero (if this is the case; if we discount a risk-free bond we have in the numerator the coupon/interest rates of the bond and the payback at maturity and in the denominator we just have time value of money plus a risk premium that is zero). So, start from a risk-free bond, then we add up the risk premium.
Why do I have to consider a risk premium? Because assuming that I have two kind of bonds, they have the same issue date, the same expiring date (two years from now), the same coupon rate but bond A is completely riskless and bond B is risky. Which one would you buy? The one that is risk-free. How do you incorporate in the price of the risky bond this type of uncertainty about the future? You may either reduce the numerator (almost never done) or put a higher discount rate in the denominator. This is why you have to incorporate a risk premium within a higher discount rate. And with this type of calculation, the present value of the risky bond is going to be lower than the present value of the riskless bond.

So, we start our analysis form a risk-free bond. Government bonds normally have a zero-default risk. This used to be the case around 20 years ago. Is it still like this? Default risk concerning government is theoretically impossible, in practice it happens (it did happen), but they are unlikely. We are going to define and measure the specific risk of a country with credit default swaps. This is the reason why we normally consider government bonds that are completely risk-free. But this may not be the case always.

We need a basic rate (risk-free) to build up the additional/incremental risk premium. Also, risk and expected return have to be consistent. Whenever we have an asset/stock/bond that is risky we can accept to undertake a higher risk because we have an expected a higher return – they have to be

proportional. The higher the risk the higher the expected return. What happens if a bond/stock is very risky and I refuse to offer a higher return? Nobody is going to buy it.
In many cases we tend to underestimate risk. If I have to choose between underwriting an American bond and get 2% or an Argentinean bond and get 12%, I may become greedy and decide to underwrite the south-American one because it gives me a higher return. Maybe you underestimate the very fact that since you have a differential in return of 10% (between 2% and 10%), it means that this kind of difference is going to incorporate a consistent risk. Is the risk going to be priced in the correct way? Difficult to say in advance.
This is why we have to start from a basis of risk-free interest rates and we add up some risk premium. Whenever as an issuer, a collector of money, you go against the market meaning that you don't pay, markets are going to remember it for ages. It takes a lot of money to build a reputation for a borrower and it may take few seconds to destroy it completely (considering the case of a country).

So, government bonds normally (not always) have a zero-default risk and so they are useful because they represent the basis for the calculation of the extra-return that shares must guarantee to be desirable/to be attractive. You can choose to underwrite either a government bond or a risky share; would you buy a German bond or stocks of Volkswagen? German bonds are safer, shares of Volkswagen are risker. If you issue a stock you have to increase the premium in order to make them attractive. This additional risk is called risk premium (it is going to increase the cost of capital – the denominator of the formula).
Also, we can analyze shares and determination of risk to get a good portfolio diversification. What does it mean to diversify a portfolio? Assuming you have 1000 euros to invest. Would you invest all this money in one share? No, you can diversify your investment. Can we reduce overall risk with diversification? Yes. This is why we consider portfolio strategy. Would you invest 1000 euros in 1000 different stocks, 1 euro per stock? No, don't exaggerate in diversification; be consistent.

We have to consider three kind of investments:

1. Risk-free treasury bonds
2. Corporate bonds (bonds issued by corporation/firm) – that have the same basis return and then they add up a risk premium.
3. Equity – stock issues. Stock market securities are riskier than government bonds.

Going back to the example, we can buy German bonds, Volkswagen bonds and Volkswagen equity. Which is the difference between the corporate bond and equity? If you underwrite a bond you are entitled to get back the principal at maturity and interest. With stock there is no maturity and it is also risky since you are not entitled to get a fixed dividend anyway. There is no right to have a remuneration, this is risky. With bonds risk is smaller. If you can choose a bond issued by the Italian treasury or a bond issued by Alitalia, which one would you choose? If they issue at the same rate Alitalia is very risky. Let's say that instead, you can choose between underwriting the bonds of Google or the bonds of the Us treasury. Let's say there is a problem with the digital market that is going to hit Google. Assuming both Google and the American treasury are in trouble, are you going to defend these different entities? Google is very big, if it goes on default, even though it is a big company it can 'fail' anyways without dramatic effects. If Google has issues it may suffer and I can let it go, can I let go the US treasury? It is the first economy in the world, so it is going to cause enormous troubles. So, are politicians going to support Google in trouble? Yes, until a certain point. Are they going to support the US treasury? Of course. What about the investors in other parts of the world? If the US treasury is in trouble, it is not only an American problem but it is also a European, Russian, Chinese problem (all around the world) since we have contagion in the financial markets. It is very difficult that the return of a single corporate bond is lower than the return of the

comparable treasury bill in that very country. For this very reason, corporate bonds have to demand for a higher return. The way risk is calculated in financial market is not always a good one. Ex. stock market analysts didn't analyze/assess risk in an appropriate way before the market crisis of 2008.

The tradeoff between risk and return in stocks

Which are the two key parameters for evaluating stocks?

- The expected return
- The risk.

Whenever we consider a portfolio of stock entities we can consider the risk and the proportions of the investments in the portfolio (the composition of the asset portfolio). For this reason, we consider the expected return and risk of each asset/security that is part of the portfolio. Then we consider the whole portfolio in a comprehensive way using weights. The sum of the proportion has to be equal to 1 (100%).

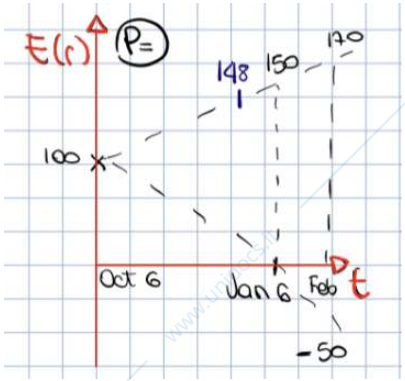
EXAMPLE: I invest in four stocks: Alfa, Beta, Gamma and Delta. I invest 35% of my portfolio in Alfa, 15% in Beta, 20% in Gamma and 30% in Delta (this adds up to 100%.) In this case I have long-position: I invest and buy this stock and I may sell it back to the market whenever I want. But in some cases, I might have short sales. What does it mean? I sell out a stock that I don't own. If we have a short position, the percentage of that investment is negative (ex. -20%). But the total of the portfolio always has to be equal to 100%. So, if I have a -20% in one position, the difference has to be 120% to get a final total of 100%.

So, we have three parameters/components to analyze a stock market portfolio:

- Expected return of any asset included in our portfolio
- Expected risk/volatility of any stock market investment
- We have to combine single expected return and single expected risk in a comprehensive way within a bigger portfolio. So, we have the expected return and the expected risk of Alfa, Beta, Gamma and Delta and then we combine them together. To combine we have to consider weights (as we did with the weighted average cost of capital).

Short-selling

If we have a bear market, it is a symbol of a market that is going down. Why is it linked to short-selling? Because with short-selling I have a sale of a security that is not owned by the seller or that the seller has borrowed. I am motivated by the belief that the security is going to decline. So, there is speculation. Why risk is so big with short-selling? Assuming I have a long position (the opposite of short-selling), meaning that I own the stock and that the price of it today is 100. What is my risk as an investor? The company fails and the price goes from 100 to 0. Can it go below zero? Not for me, I don't have unlimited liability. If I am long in a position the risk is the difference between todays price and zero (zero is pavement – I can't go below zero). If is am short in a position the contrary happens: I have no limit to my risk.



EXAMPLE. Here price is combined with expected return. The price now is 100. Assuming I have a long position, I buy the stock on October 6th at 100 and in January 6th the price can go up to 150 or it can go to zero. In February, after one month, it can go up to 170 or down to -50. If I am long in this kind of position I can have a situation where I can make more money (capital gain if the price goes up) and if the price goes down there is a limit to my losses (the limit is zero). Is there any difference between 0 and -50 for me? No.

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If I am short in this position it means that I don't own the stock market asset, I have to deliver it to somebody. Ex. I have to deliver to Ines a share of a listed company in 3 months' time, it's price today is 100 and we agree to get the same price in 3 months' time. I don't own this stock. So, what do I have to do to fulfill the obligation? Within these three months I have to buy the stock in the market and deliver it to Ines at the agreed price of 100. Who makes a good business? Sometimes, before maturity, even one day before, I have to buy in the market the stock at any price and deliver it to Ines. What if I buy the stock just two days before at 148 and I sell it to Ines at 100? I fulfill my obligation but I lose some money. If instead the price goes to zero (below zero it is impossible) in the beginning of January, I buy the stock at a low market price (close to zero) and deliver it to Ines at 100 (because of the contractual agreement). So, whenever I have short selling I am speculating; I want prices to go down. But if I have a long position, is there any limit to my losses? Yes, below zero I don't care – so my flow is the difference between todays price and zero. Is there any potential limit to my gains? No, I can keep the stock as long as I want and the price can go up to infinity (theoretical possibility). So, if I am long position, there is a specific limit to my losses and there is no limit to my potential gains. In the case of short-selling, it is the contrary. The limit to my gain is the difference between 100 and zero. Is there any limit to my losses? No because if the price goes up I have to buy it at a higher price than 100 and deliver it at 100. For this reason, short-selling is more dangerous/riskier than long position. Whenever the stock market is very volatile, short-selling may be suspended for a period of time (to decrease expected volatility).

From Price to Returns…

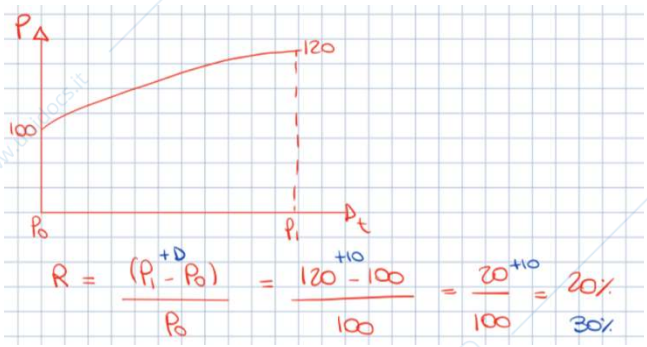
How can we go from price to returns? Why do we start from stock market prices? It is easy to get stock market prices on the web.

$E(r) = (P_1 + D - P_0) / P_0$, where:

- P_1 is the expected price at the end of the period/future.
- P_0 is the price today/initial price.
- D is dividend (it can also be zero if dividends are not payed out).

→ this is the formula to pass from the price to the expected return.

EX:



The price at time zero is 100 and the goes up at the end of the year (P_1) to 120. Also, there are no dividends. Today, I forecast that in one year the price is going to increase by 20%, so what is the expected return? 20%. Also, it can be applied oppositely. Last year an investor invested for 1 year, the price last year was 100 and today the price is 120. The return is 20%.

The values in blue shows the case in which dividends have been distributed.

→The return of a portfolio corresponds to the weighted average return of any stock investment.

EXAMPLE. We have a portfolio with three kind of stocks: A, B and C. We don't have short-selling. The second column shows the composition of the portfolio.

	E(r)	%	
A	12%	20%	2,4
B	8%	50%	4
C	5%	30%	1,5
		100%	7,9

What is the expected portfolio return? The weighted average of the single returns (values in green). 7.9 is the expected return of the portfolio (the weighted average of the returns.

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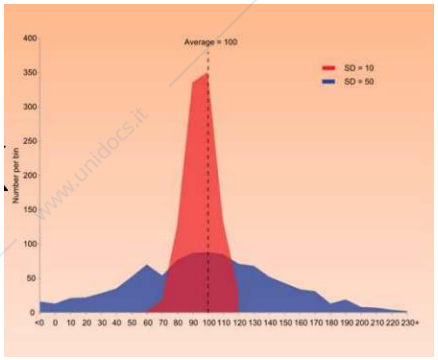
Missing component is Risk. So, we will consider risk in two ways:

- Individual risk of any stock (example A, B and C).
- Then we will consider a comprehensive portfolio risk.

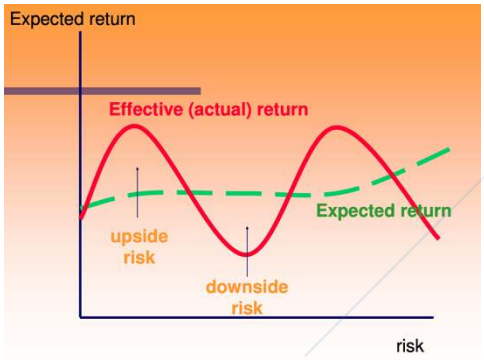
What is Risk?

We understand that the expected return of a portfolio corresponds to the weighted average of the expected return of the assets that compose this portfolio. Now we have to consider what is risk.
First of all, we have to consider variance. Variance is the expectation of the square variation of the square deviation of a random variable from its mean. Informally, it is going to measure how far a set of random numbers are spread out from the average value. For example: the dotted line represents the average and there are two kinds of stocks (red and blue one). Which one is riskier? Which one has a higher variance? The blue one, as the distance from the average mean is higher in the blue portfolio.



There is a difference between expected returns and real returns. Assuming that the expected return is equal to the real/effective return. Which is the risk now? Zero, there is no risk because there is no unexpected situation. If this is the case we live in a risk-free world. So, the denominator of our cash flow is just going to consider the time value of money (without additional risk premium). In other cases, we are going to consider a different situation. So, how can we define risk? It is the statistical (measure it in statistical terms) possibility that real outcomes are going to differ from expected ones. In this situation, expectation is the mean/average and reality is the difference between what really happens and the forecast/expected average. The higher the difference the bigger the risk. The difference is measured either by the variance or by the standard deviation. The standard deviation is the square root of the variance. In some cases, we can use both of them but in most cases, we use the standard deviation.
In our world, to identify a portfolio, for the moment, we consider weights to have a total corresponding to 100 then we have expected returns of each single investment and then the total that is going to coincide with the expected returns of the portfolio and then we consider risk (risk belonging to any stock and then portfolio risk).

Risk can be upside or downside. Downside risk is the bad risk, it is the probability that the effective return is lower than the expected one. Reality can be better or worse than expectation. If reality differs from expectation then we have risk. Risk can even be a positive one (better than expected).



Consider the green line as the representation of the expected return. Real life is much more volatile (red curve). In the first part of the curve, there is an upside risk – comparing the effective/actual return to the expected one. It is the case when thing go better than expected. In the second part of the graph, things go worse than expected because the real return is lower than the expected one. From a statistical point of view, the green line represents the mean/average. And the red curve considers the differences/variance/standard deviation from a standard mean.
So, we calculate the risk factor of any asset considering its variance. How can we have the variance? We consider the price volatility of returns.

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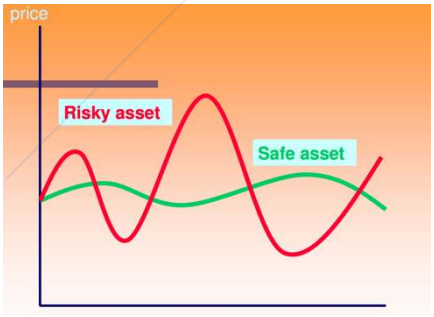
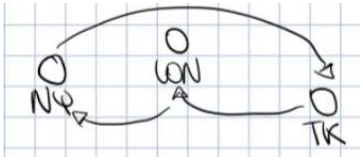
The red line represents a risky asset. The green line represents a much safer asset (less volatile).



Now, we consider not only the risky component (variance or standard deviation) of any asset but also how this kind of asset is going to co-vary (covariance) with other securities. What does it mean? The risk of each asset in the portfolio is represented by the standard deviation. Can I say that the risk of the overall portfolio is represented by the weighted average of the single variance of each asset? I can say yes only if all the stocks are completely unrelated – there is no network, otherwise the answer is no. Can we say that in the stock market there is some co-movement (move together)? Can we say that if some important stock market shares go down also the rest of the shares are likely to go down? Yes. Can we say that if a single asset is very volatile this higher volatility might be, at least partially, transmitted to other stocks? Yes.

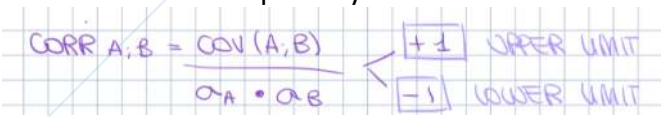
Example about stock markets. To simplify, we have three stock exchanges in the world: Tokyo, London and New York. Whenever Tokyo closes, are the Asian stock markets going to influence Europe? Yes. Are European stock markets going to influence New York? Yes. Is the closing of New York going to influence Tokyo? Yes. This transmission of contagion/networking did it increase in the last 20 years? Yes, also because of new technology. Was it easy 30 years ago to know the closing of Tokyo? No, now you instantly now with the web. You have much lower information asymmetries. Also, the single companies that compose the stock market are going to be more integrated because of this network. Ex. Pirelli 50 years ago was an Italian company producing tires. Now it is not really an Italian company as it has many manufacturing entities all around the world. Is Amazon really an American firm? No, it is an international company. When you have international companies, you have a contagion all around the world. Contagion is increasing.



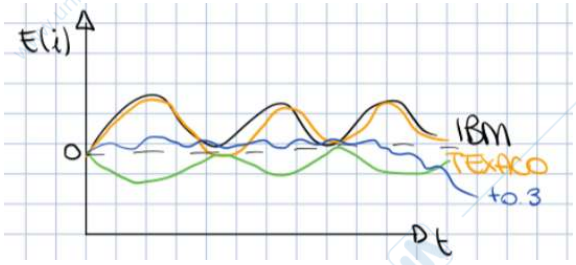
Co-variance

The way two entities change together. If I follow a pattern and you follow a similar one, our co-variance is going to be high. Let's consider two extreme cases. Is there any upper or lower limit to covariance? No, it is bondless (plus and minus infinity).

It is difficult to use this parameter. So, instead of co-variance we tend to use coefficient of correlation. Correlation is a standardized covariance (covariance divided by the standard deviation of the single components). Correlation of assets A with B, is the covariance of A and B (unbounded) divided by the standard deviation of A multiplied by the standard deviation of B.



The correlation coefficient between two different stocks is between +1 and -1. Any number between +1 and -1 is acceptable. The average is zero, but it does not have any meaning. If the correlation between two stock market securities is fully positive (+1), the two assets are consistent. In this case, if one goes up by 10% the other does the same – they go up and down simultaneously. Consider



IBM and Texaco as an example of two stock market securities. Which is the coefficient of correlation of these two companies? +1. Do i have any gain out of diversitifation? Absolutely no. If my porfolio is composed of 60% IBM and 40% Teaxaco. Expected return is the weighted average of the single expected returns. Which is the expected risk? Is it the weighted average of volatility of each stock? Yes it is only in this theoretical case because they are the same. Whenever you have this kind of perfectly positive correlation (impossibile in real life) the porfolio risk is going to correspond to the weighted average (like with expected returns). So, there is no gain from diversification. Let's consider a completely different case, where I have a thrid stock that is GE (green line). When IBM/Texaco goes up GE goes down and vice versa. Which is the correlation coefficient between GE and IBM? -1 (it is completely opposite). If i make a mean it is going to be flat (black dotted line). These are two theoritical cases. The first one shows no gain from diversification: the portfolio risk is going to correpsond to the weighted average of the risk of each single asset. The second case shows the situation when the coefficient of correlation is -1 (when a stock price goes up the other goes down by the same amount). They are not possibile in the real life. When we have these two cases there can be a consequence: if the coefficent of correlation is -1 the risk is zero.
What about the real life? The coefficient of correlation is between +1 and -1 (0.8 or it can also be negative). Assuming the coefficient of correlation is +0.3 (blue line). In this case can I have diversification gains out of my portfolio? Yes. In the real life I always have some benefit out of diversification. The total risk (total standard deviation) of a portfolio is not the weighted average of the standard deviation, it is a lower number. This difference is represented by the benefit of risk diversification.

	r' (%)	σ (%)
A	5	20
B	15	40

EXAMPLE. Consider a portfolio of two stocks, with the following expected return and standard deviation. We invest 2/3 in portfolio A and 1/3 (complementary) in portfolio B. To calculate the total expected return, we do: 2/3 * 0.05 + 1/3 * 0.15 = 0.083 = 8,3 %, using the formula on the slides.

What about the Portfolio Risk? We use the following formula.

$$\sigma_p = \{ x^2_A\sigma_{A,A} + x^2_B\sigma_{B,B} + 2x_Ax_Br_{A,B}\sigma_A\sigma_B\}^{1/2}$$

What we have within the brackets is the variance, if we extract the square root we get the standard deviation. The first 'value' is the variance of portfolio A with A (volatility of asset A multiplied by its weight: 2/3), the second is volatility of asset B multiplied by its weight and then we have a product. We sort the formula with the numbers and we get: $\{(2/3)^2\ (0.2)^2 + (1/3)^2\ (0.4)^2 + 2(2/3)(1/3)(0.2)\ (0.4)rA,B\}1/2 = \{0.035 + 0.035\ rA,B\}^{1/2}$. The value to be determined is the correlation coefficient – depending on the correlation coefficient you can have different measures of portfolio risk.

- What happens if the correlation coefficient is -1? If the two stocks are completely unrelated the overall portfolio risk is zero.
- What happens if the correlation coefficient is +1? The standard deviation is 26.7%. This is the weighted average of all the portfolio standard deviations. Whenever we have a portfolio where the correlation coefficient is +1, we do not benefit from diversification. Not only the expected return is the weighted average of the expected returns but also the risk corresponds to the weighted average risk of the portfolio.
- What happens if the correlation coefficient is 0? You have a risk gain of some 18.7% due to portfolio diversification.

→ standard way to calculate risk of a portfolio.

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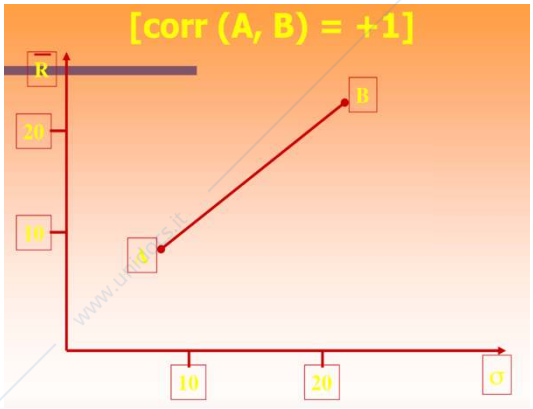
Consider together the standard deviation and the risk, there is a sort of trade-off. The higher the risk the higher the return that I demand for this portfolio. If this is not the case, I am going to invest somewhere else. Can I have some benefit out of diversification? Yes, only if the coefficient of correlation is even slightly lower than +1. Since +1 is the never the case, in many cases I can have a gain out of my diversification.

Perfectly Positive Correlation

Assuming I invest 100% of my portfolio in stock A and I have a return of 9% and the risk shown in the graph. So, can I have a portfolio invested just in one asset? Yes, if the weight is 100.

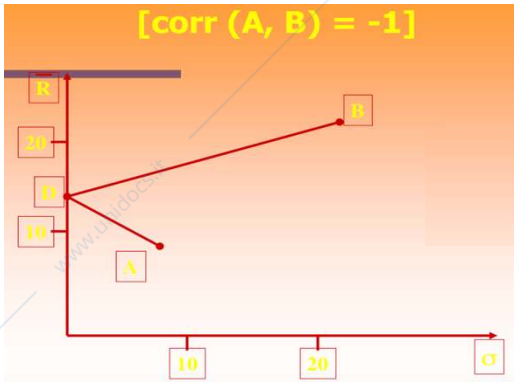


Can you rebalance the portfolio just changing the weights? In this case you can say: I just have two stocks, how many portfolios can I have? No limit. 100% invested in A, 100% invested in B, 50% in A and 50% in B (in the middle); are all portfolios. I can move along the line just changing the weights. Changing the weights can completely redefine my portfolio. Which asset is riskier A or B? B. Can I move along my portfolio? Yes, just changing the weights.

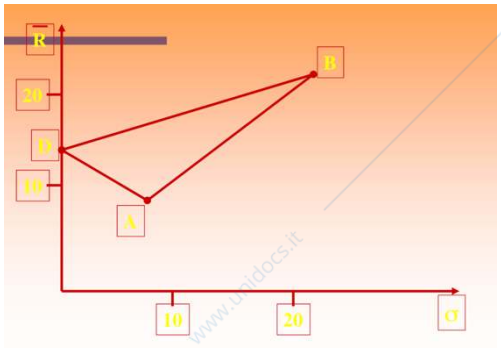
The vertical axis shows expected returns and the horizontal one shows standard deviation. We have two assets, we can move from one asset to the other just within the portfolio. We do have any gain out of diversification. If this is the case, the standard deviation of the portfolio corresponds to the weighted of the standard deviation of asset A and B.

Perfectly negative Correlation

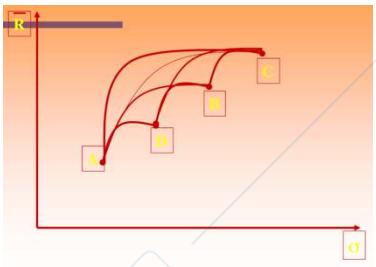
The same stocks A and B are completely uncorrelated. In this case, I have an expected return that corresponds to the weighted average of the returns of any asset and the overall risk corresponds/tends to zero. If the relation coefficient is -1 then the risk of the portfolio is zero (only zero risk case). In this portfolio we have two assets, A and B, and they are perfectly negatively correlated. If I invest 50% of money in asset A and 50% of my money in asset B then the volatility of my overall portfolio is zero. If we invest 80% of our portfolio in stock A and 20% in stock B, can we say that volatility is completely flat and zero? No. These assets are perfectly negatively correlated but weights are going to introduce some factor of risk.

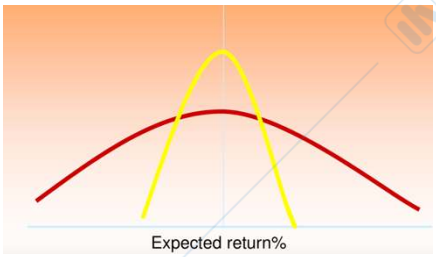


Limits to Diversification



What happens if I have more than 2 stocks (case analyzed until now)? Consider four stocks: A, B, C and D? I have correlation between A and B, A and C and A and D. Correlation between A and D is the same as correlation between D and A? Yes.



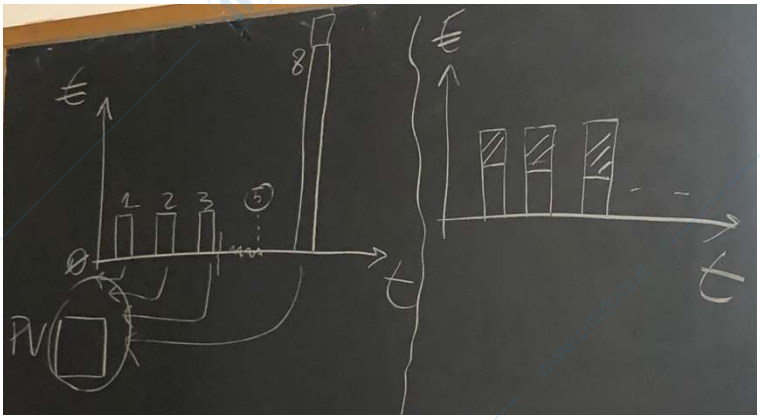


The line is the middle is the average/ mean. I have two different types of assets. The yellow one is safer and the red on is the riskier. The yellow is safer because it has a lower standard deviation from the same mean or average.

LECTURE 11:

RECAP: in the numerator we have cash flows deriving from accounting procedures. In the denominator we are going to have the cost of capital – the discount factor that is going to incorporate risk. The cost of capital it has to be consistent with the numerator. We have to incorporate in the denominator not only the time value of money (in a risk-free scenario) but also what happens when we introduce risk. So, we start from government bonds that are apparently risk free because they don't incorporate any default risk. I (government or corporate) issue today a bond and I have to pay coupons or interest rates periodically and then I have to pay back the principal, typically at maturity.

The graph shows that I have a distribution of cash flows. For me, issuing firm, they are cash outflows and for the underwriter they are cash inflows. We have to bring back the cash flows at the present value, so we discount all of the factors. In most cases, I pay back the principal at maturity (left side). If is so, the average cash flow/barycenter is the wavy line. If I increase the coupons, the barycenter is going to shorten. In some cases, whenever I issue a bond, I can have the payback of the capital not as a bullet payment (at the end) but we may have constant installments (reimbursement of interest rate/coupon and capital) along the life of the bond. Why is the payback of principal (black and white part) going to increase over time? Because if I start paying back the principal the following coupon is going to be calculated on a lower principal in order to have a fixed rate. Where do we see this second bond (right side)? They are municipal bonds, issued by regions/local entities. Why do they issue bonds without a bullet repayment? For political reasons. This is done in order to avoid that the problem of paying back a loan is left to future politicians and municipalities. For the



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underwriter of a bond, the graph on the right is safer/less risky because it splits the payback of the capital and it also has a lower duration.

Government bonds are theoretically risk free, but this is not true anymore. When there is an international issue, the local government bonds may become riskier. So, it is wrong to say that government bonds are completely risk-free (no risk of default).

We have considered what happens when an asset is risky. We considered government bonds, corporate bonds (riskier because the issuer is a riskier one) and eventually we consider stocks.

<u>We have to consider three parameters to evaluate a portfolio:</u>

1. Expected return. We can go from prices to expected returns with the specific formula (increase in price including divided compared to the beginning price). The expected return of a portfolio corresponds to the weighted average of the returns of any single asset.
2. Risk. It is represented by the variance or the standard deviation. Risk, for any asset, can be calculated as the standard deviation. The overall portfolio risk is going to correspond to the weighted average risk of each single security composing the portfolio if and only if the coefficient of correlation (the standard covariance between an asset and another one) is +1 (two assets are completely correlated).
3. Weights. Total weighing within a portfolio has to be equal to 100. The weights can be negative if there is short-selling.

Due to diversification I can decrease risk by just investing in two or more securities, that compose a portfolio, that are not perfectly correlated among them. If I have two stocks which are perfectly negative correlated, overall risk is zero (when one goes up the other goes down by the same amount and vice versa). Also, volatility is something that tends to zero.

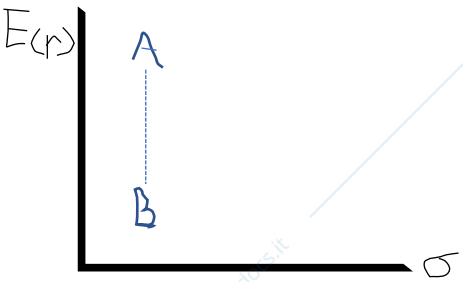
→ it is impossible to understand how a portfolio works without considering simultaneously the three parameters mentioned above. Just in the case in which I have a perfectly negative correlation with 50%/50% investment in two assets or more I can have a situation where risk is zero. Remember: we consider the weighted average of risk when the correlation is perfectly positive. This is because when two assets are positively correlated I don't have any gain from portfolio diversification.

An EXAMPLE: I have stock A and stock B, they are perfectly correlated (+1), they have the same degree of risk, but stock A has a higher expected return.

	E(r)	σ (S.D)	X_i
A	12%	20%	50%
B	8%	20%	50%

Would you invest 50%/50%? I would invest 100% in A, it has the same risk and a higher return. Everyone will sell B and buy A.

The graphical representation would be:



Why are they on a vertical axis? Because they have the same risk. Would you invest 50%/50%? I would invest 100% in A, it has the same risk and a higher return. Everyone will sell B and buy A. So, what happens the price is going up and the return is going down. Sooner or later, B has to offer a higher return to be attractive so there will be a 'recomposition' in the expected return where A goes down and b goes up until they reach an equilibrium.

International portfolio Diversification

EXAMPLE 1 (slide 26). There was an economic crisis, some 25 years ago, in Mexico. The table shows the Mexican stock market price in the first row, the second row is a stock market index of the first 500 stocks in the Wall Street market (New York, American), the third row represents the German stock exchange, the fourth row represents the London stock exchange, the fifth row represents Japan's stock exchange and the sixth represents the Italian stock exchange (now its name is MIB).
How do we call this table from a mathematical point of view? Matrix, but not only. It is also symmetric (it is a mirror). Why do we have, in the diagonal axis, always the number 1? It represents one stock market against itself which is why the correlation is 1.
25 years ago, did we get any advantage with our portfolio diversification? No if I have the number plus one everywhere. Assuming the number is -1? The risk is zero. But in this case, as we can see from the table, we have a mixed case, we have numbers that are somewhat in the middle between +1 (roof) and -1 (bottom). In some cases, the coefficient might also be negative (correlation between Germany and Mexico). So, was it good during the Mexican crisis to invest in many stock markets? If I invested 100% of my money just in the Mexican economy I would have lost a lot of money. If I can diversify I might lose money in Mexico, make money in the US, etc. It is always good to diversify.
Do the correlation coefficients, among different markets, are stable or change over time? They change, they have increased and are increasing. This is because markets are becoming more and more correlated. Can we say that correlation coefficients are steady across time? No, because assets are continuously moving.

EXAMPLE 2 (slide 27). It is the south east Asian crisis some years later (1997 – 22 years ago). We don't have the Mexican stock market but we have the Hong Kong stock market. Can we say that correlation is influenced by geography? Can we say that two bordering countries are more correlated – their economies are more linked among them? Geography does matter, it is very important. For example, Italy is mostly related for buying and selling to France and Germany. There has been a legal sue between Europe and the United States that lasted 10-15 years. Europe is going to be fined and there are Us sanctions that are against European products. The countries that do not participate in this consortium are less hit than others? No, there is a lot of inside correlation. Assuming that it is more expensive for Germans to sell BMW cars to the Us, Italians may say we don't as BMW is a German car. Is BMW really a German car, when 1/3 of the components are Italian? Difficult to say. So, all the economies are more linked. The supply chain of a firm is usually really international. Whenever I want to make an investment I can say: I have at my disposal 1 million euros to invest, I am just going to diversify. Which is the basic criteria that I am going to follow? Geography because I understand that correlation is not perfectly positive among different countries, if there is an issue in Germany it may not be the case in Mexico (they are not close). Other people, instead, say that we can conduct a diversification considering industries/sectors instead of countries. Assuming I am a producer of mineral water and that plastic has been recently forbidden. The cost for a producer of water to completely change its plants is high (the process to produce water and put it in plastic is completely different than the one to put it in a bottle of glass). So, if there is an issue that is going to hit completely an industry (and not a specific country), then I might diversify considering investments in industries that are not strongly correlated among themselves.
→ is it better to have diversification considering different countries or different industries? You might consider both simultaneously. Do you expect a high or low correlation of different stocks in different countries belonging to the same industry? Low, if there is a crisis in the American supermarket system who cares about it in China (they should be uncorrelated). Consider also an American bank and a Chinese bank, and there is a crisis in the Chinese bank. Are banks more or less correlated than supermarkets? More, there are many links between financial institutions.

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The total variance of a security i (or a portfolio p) can be divided into:

1. SYSTEMATIC RISK. It is impossible to diversify (non-diversifiable market risk). It belongs to the system.
2. REDISUAL RISK/NON-SYSTEMATIC. It can be progressively eliminated with a portfolio diversification.

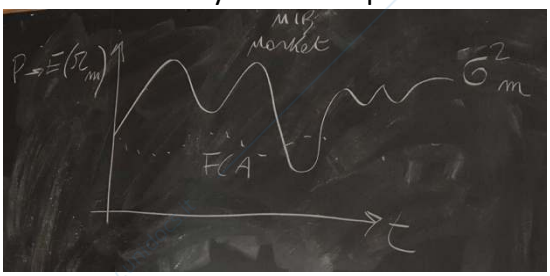
Can I reduce overall risk of my portfolio just adding up some further securities? I diversify considering different countries and at the same time I also consider different industries. Before doing this, I choose additional stocks (belonging to different countries and industries) whose correlation coefficient is low (the lower the better).

Formula that represents the total variance of a security done by systematic risk plus non-systematic risk (it can be progressively eliminated with a portfolio diversification).

$$\sigma^2_{ri} = \beta^2_i \sigma^2_{rm} + \sigma^2_{\varepsilon i}$$

The second part of the formula can converge towards zero (it can be totally eliminated if my diversification using different countries and different not-related industries is a good one). The first part of the equation is what I am going to have anyways, even if I am good in diversifying. So, we just concentrate on systematic risk. Why do I still have a systematic risk in my portfolio even if I am really good in diversification? Why is there some risk that I am not able to diversify in my portfolio?

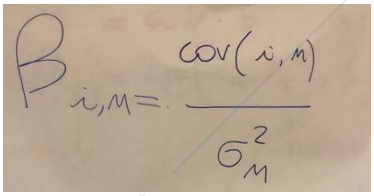
We have portfolio and we have a good kind of diversification, so non-systematic risk is approaching zero. We are just going to consider systematic risk. In this kind of risk, the key coefficient is represented by the Beta. At this point, risk is not represented anymore by the standard deviation because I am going to diversify, but by the coefficient Beta. Why is there some risk that belongs to the system? Ex relating Italy. In this country we have the Italian stock exchange. I can say I want to invest 100% of my portfolio in the Italian stock market. Is it good diversification? At an industry level it might be a good one, because the Italian stock market is big and it is represented by many different complementary industries and the correlation coefficient among these industries is below +1. But there is also an issue: consider that in Italy there is a political crisis. Whatever happens there might be systematic risk. Is risk always bad? No as it is the statistical possibility that the real returns differ from the expected ones. So, we might even have positive risk. Whenever you have an issue in a country, for the good or for the bad, you always have an overall impact on that country. You have a specific risk that in no way you can diversify – it is whatever is left over after a good portfolio diversification. It can be a political crisis, but it can even be good news: political solution of a crisis, good economic indicators belonging to the country, etc. – in general it is something good or bad considering the country. Markets tend to over react to bad news.
(the example: I invested entirely in the Italian market, I diversified between oil and gas, automotive, insurance, mechanics, etc., whenever there is an issue it is going to concern the entire country).
What is the measure of this systemic risk? It is represented by the variance of the return of the market. The market has an overall volatility, and the beta is the beta of my asset compared to the market. Example with a graph:



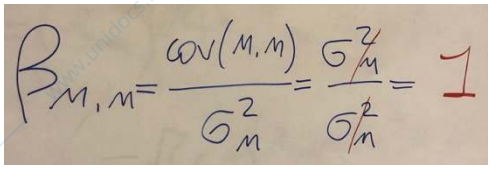
We have a market. On the y-axis we have the price that gives the expected return of m (the market). The Italian stock market has the trend shown by the white line. It is the variance of the expected return of the Italian stock market. Then there a single stock (dotted line) : FCA.
If the Italian stock market is volatile, is the change in the Italian stock market going to have an impact on the FCA stock? If the Italian economy is going well

(political stability and GDP is good) the FCA stock is going to improve. Is it really like this? 40, 30 years ago it was like this. Now, is FCA an Italian company? How much of its turnover/EBIT is done in Italy? If the FCA really depends on the Italian stock market and if there is a political issue then the stock market price is going to be hit – there is no way to avoid the impact of the market. Instead of FCA, we consider a bank: Intesa San Paolo. If there is political crisis in Italy that it is going to affect all the listed stocks in the Italian stock exchange. Can we say that Intesa is more affected than FCA? Yes, Intesa is more local. Which is the sensitivity of the Italian stock to the overall stock market?

Formula:



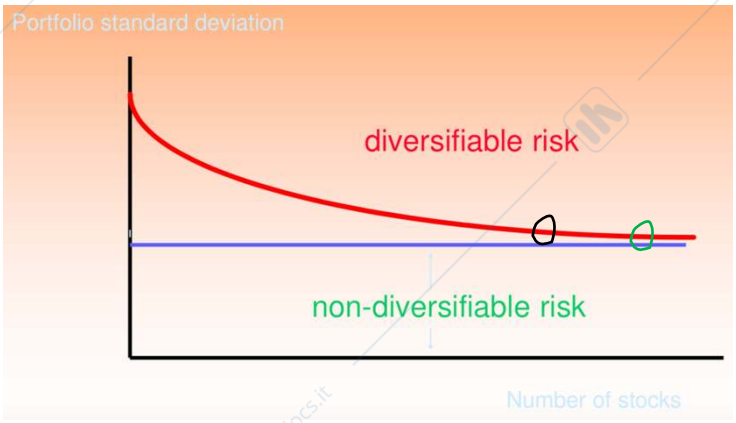
The Beta of asset i compared to the market tis given by: the covariance between asset i and the market divided by the variance of the market. If the stock market is going to change, which is the impact on any single stock? Some stocks tend to overreact to changes in the market, other stocks tend to underreact to the changes in the market.



The beta of the market against the market corresponds to the covariance of the market with the market divided by the variance of the market. Covariance of an asset against the same asset corresponds to the variance. So, I can say that the average market beta is 1 – on average stocks have a beta of 1.
Ex. there is a stock that has a beta of 1.2 and another one that has a beta of 0.8. What does it mean? I have an asset whose beta is aggressive, more than the average. Whenever there is an increase in the stock market prices of 20%, if my beta is 1.2, the increase of price is? 0.2*1.2= 24%. So, if there is an increase in the stock market and my beta is aggressive (above unity) my kind of reaction is more than the average. It is good news if the market is going up, it is bad news if the market is going down (stock prices goes down by 30% by stock is going down by 36%). The other stock is defensive (0.8): it is going to make less money when the market goes up, but it will have a smoother reaction when the market goes down.
So, what is BETA? Beta is the sensitivity of a single asset corresponding to the stock market.

NON-SYSTEMATIC RISK can be progressively eliminated with portfolio diversification, when the selected portfolio gets closer to the market portfolio, replicating it. To reach a risk similar to the market risk is it enough for the portfolio to reach some 20-30 stocks, considering their weight and representativeness in the stock market. Ex. not to keep all the eggs in the same basket.

<u>Risk Reduction through Portfolio Diversification</u>



In the vertical axis we portfolio standard deviation, the risk of the portfolio. In the horizonal axis we have number of stocks. Whenever we have a growing number of stocks added up in our portfolio the overall risk is going down. If I have only one stock, my risk is high. If I add up more stocks, decreasing the weights, the overall risk of my portfolio is going down (red line). I marginally improve my risk reduction adding up stock after stock (diversifying). Remember: total weight of portfolio has to be 100.

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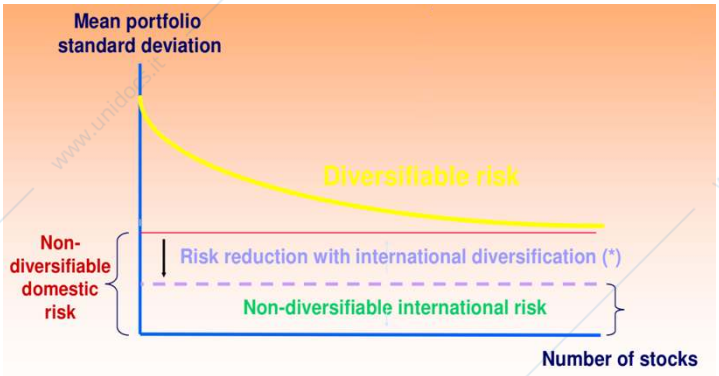
The meaning of this graph is: assuming where there is the black circle you have 25 stocks and where there is the green circle you have 250 stocks. Is it convenient to pass from 25 to 250 stocks just to have a very small reduction? No, you would be killed by commissions.
How do we call the red and the blue lines in mathematics? Asymptotes: they converge but they never reach and interaction point. So, whenever we get close to the blue line (imagine it as being the pavement – we cannot go down with diversification) it is convenient to stop. This shows how the non-systematic risk tends to zero. We cannot go below the blue line because we cannot diversify risk anymore within the same country. This can also be represented by industry diversification (ex. car manufacturing, banking, etc.).
How can I reduce risk even more? I can invest abroad, I can invest in other countries and not only my country in order to diversify more the overall risk. Here we are considering an international portfolio diversification. The red line represents the domestic overall systematic risk, but the difference here is that we might reduce this pavement/floor investing in international assets. So, we have a further risk reduction with international stock diversification.



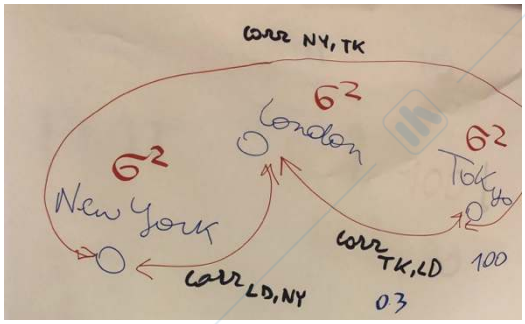
The purple dotted line is the pavement if I diversify internationally. This floor, the last years, is rising because there is less gain from diversification – correlation is going up.

Assuming the US dollar is appreciating (going up) they increase interest rates. This means that the currency is getting stronger. Is it better to have a strong or a weak currency? Some people say that they want to have a weak currency to facility exports, on the other side, if my currency is weak I am going to export a lot but my imports will be more expensive (I will also import inflation and the purchasing power of my citizens may go down). So, which one is better? It depends on many different factors. In the last years, there are currency wars: all the biggest central banks of the world want to make competitive devaluations. But, if someone devaluates someone else is going to appreciate. Going back to the example (the dollar is appreciating): is the Egyptian currency linked or not to the dollar? Yes. If the dollar is going up, and in you live in country whose currency is linked to the dollar, if is more difficult for you to pay back your debt. If the dollar goes down, it is easier. Is also the Brazilian currency linked to the American dollar? Yes, even more than the Egyptian one.
So, is there a link between Brazil and Egypt? Yes, there is an international chain effect through the American dollar. This shows a contagion, even though Brazin and Egypt don't interact a lot they are both linked by the American dollar. So, pay attention to also non-geographical links depending on a currency. Example: some years ago, all prices are going up. If this occurs that you sell less cars. Would I have an increase also on the price of the local bread? It might be so because I might start investing in new ways to obtain energy (bio-fuel) and so also the price of agriculture might go up. These examples show relation among apparently completely unrelated countries or industries. It also shows international links. Another past example is what happened during the crisis of 2008: a problem in the US that affected many countries around the world (what we studied in markets).
→All this to say that, we have an international risk that we can diversify a bit but not completely. The lower the correlation among stock exchanges the higher the risk reduction.

LECTURE 12:

Network Theory

This representation shows the transmission of volatility through correlation. Can we transmit volatility? Each node has a specific volatility, and the intensity of the of the link is given by correlation. It is identified as 'Network Theory'.



Assuming there is central node, and many single nodes within the classroom. Which is the intermediator between the central node and the other nodes? There is a physical link during classes. But there is also technological link with virtual learning: blackboard is another link, a digital one. Is this virtual link going to make our social network better? Yes. We can use digital platforms to strengthen and improve our links. This also happens when we have interactions between different stock exchanges because through interest we immediately have information. Also, companies are more and more international. Let's consider Mitsubishi, (producer of cars, bank, etc. – it is an articulated group of companies) which has producing sites all around the world. If Mitsubishi is listed in Tokyo and if Mitsubishi stock is volatile it is going to transmit volatility all around the world (not only because there is a link between the stock exchanges in the world but also because it is a really international company). It, information and computers are getting the world closer and for this reason interactions among different links within the network theory are going to be immediate. They reduce information asymmetries. We can interpret how stock markets interact even using the network theory.

Network Theory within a company

I have a company whose target is to expand the operating margin of the company. So, I want to economic marginality and liquidity (cash flows deriving from EBITDA). How can I improve sales? I can do this also thanks to the multiplier of social networks. A product might become viral (understood and seen by many people) also thanks to social networks. When you make a product viral, you can increase sales. Transmission can be of good or bad news; volatility can be positive or negative. An example of a negative transmission is the one related to the financial crisis of 2008. Why did the crisis not hit low-middle income crisis? They were less connected/correlated. This shows that if you are not connected you may shelter from contagion and transmission. Bigger connections mean bigger opportunities but also a higher risk.

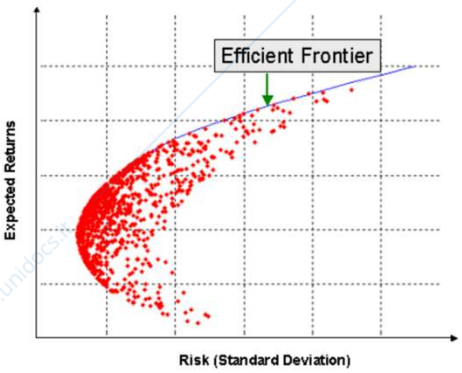
Going back to international portfolio diversification

$$\sigma^2_{rp} = \beta^2_{pm}\sigma^2_r + \sigma^2_{\varepsilon p}$$

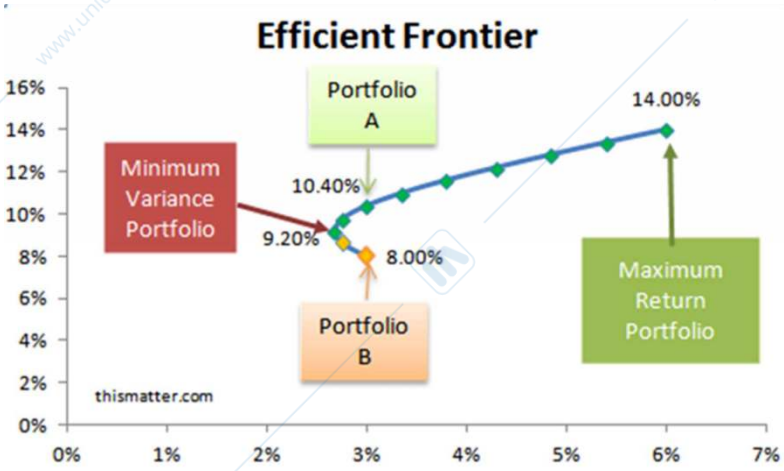
The second parameter approaches zero, so we mostly consider the Beta – it is covariance between a single asset and the stock market all divided by the variance of the market.

Efficient Frontier

We can consider the efficient frontier considering two kinds of risk. We always have a relationship between expected returns (vertical axis) and risk (horizontal axis). Which is the risk we consider? If and only if the diversification process is not complete we consider standard deviation. Whenever we complete diversification, we replace standard deviation with the Beta coefficient. The efficient frontier represents the ratio between expected returns and risk.



VIVIA MARCHI



The left frontier of the efficient portfolio represents the minimum variance portfolio (MVP). All the efficient portfolios lie on the efficient frontier.
The shape of the efficient frontier does not always have to be the same (it can have many different shapes). If the portfolio is different the shape/slope of the efficient frontier is different.

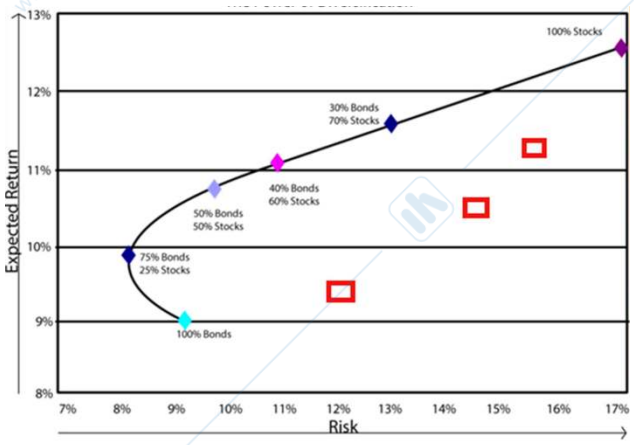
All the assets/stocks/portfolios that lie on the efficient frontier are efficient (as they maximize expected return-risk). In other words, they have the highest possible return considering the risk class. Compare portfolio A and portfolio B: they have the same risk. Though, the expected return of A is higher than the expected return of B. A is better, the risk is the same but the return is higher. What happens in this case? Everyone wants to buy A and sell B so at the end they will converge to an equilibrium price – arbitrage is going to disappear. All portfolios that don't lie on the line on the efficient frontier are not efficient, and they are brought back to the equilibrium with an arbitrage. The market is going to push all the stocks towards an equilibrium with an arbitrage mechanism. Does it work or not? Is it true that we have a constant equilibrium within the stock market? Only if the market is perfect, working well. In most cases we tend to have some mis-pricing where risk is not perfectly calculated (exaggerated or underestimated).
If we are not able to properly assess risk, then miscalculation of discounted cash flow is likely.
How can I move from the minimum variance portfolio to the maximum return portfolio? I have to change weights within the portfolio. Whenever I go up I increase the proportion of risky shares.

If there is a security outside the efficient frontier set, it will go back to equilibrium with arbitrage. What is Arbitrage? Example:

	Milan	Turin
FIAT	80	100

What would you do if this were the situation? You buy in Milan and sell in Turin. Everyone will have this idea, depending on the information. If everyone knows, they all buy in Milano and sell in Turin, so, the price of Milano goes up and the one of Turin goes down – arbitrage. Then you reach an equilibrium where the price becomes 90 in Milan and 90 in Turin. If this is the case, there will be no more arbitrage. How much time does it take to go from the situation where prices are 80/100 to where price are 90/90? It depends on the speed of information and on your reaction. You have to be fast to make these transactions. If you buy at a lower price than the one you sell at, then you are a speculator: you contribute to make the market efficient. Without any speculation there would be an impairment in the price and this is not going to make the market efficient. With arbitrage we reach very soon an equilibrium price. Is it likely in today's world to have an arbitrage? It depends on the information asymmetries. Today we have information in real time. When information is good there is little room for arbitrage.

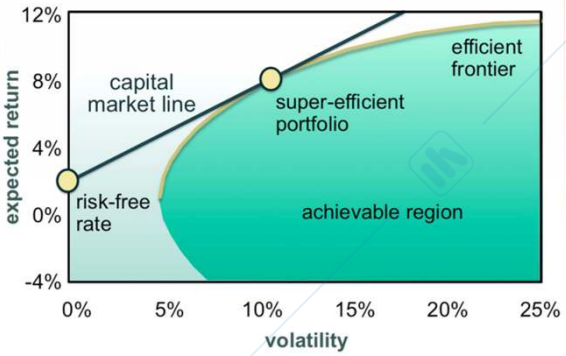
Another representation of the Efficient Frontier



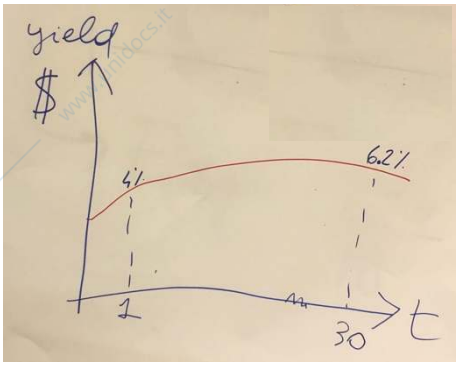
Is the light blue on the efficient frontier? No, because it is dominated by the other portfolio, that has the same risk and a higher expected return. So, the efficient frontier starts with the portfolio composed of 25% stocks and 75% bonds. Why does it have bonds than stocks? In order to have a lower risk you have to invest more in bonds. It is also a balanced portfolio: composed of both bonds and stock. If you want to move up, with a higher return but also a higher risk you have to increase the proportion of risky assets, represented by equity shares. If you move up (50% bonds /50% stocks) you increase risk but you also increase expected return. At the end you have 100% stock.
What is risk? It depends it can either be standard deviation, or if diversification is a good one you can replace it with the beta coefficient.

The Capital Market Line

On one axis we have the expected return. On the other axis, we have volatility which here is represented by the standard deviation. So, with the capital market line the diversification process is not completed (not optimal). We still have some residual risk, this is why we use standard deviation as a risk measure.



We want to match the efficient frontier with the capital market line. What is it? It is a line that starts form the risk-free rate. What is the risk-free rate? It is a treasury bond rate that we consider completely risk free. A bond is risk free if the issuer of that bond is a very solid one.

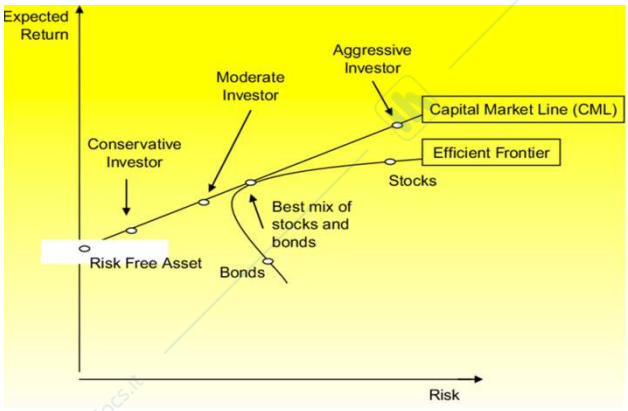


This is the yield curve or the term structure of interest rates. I want to consider the risk-free rate. The yield curve is going to represent the returns of a risk-free bond along the possible years. Assuming I have a treasury bond, issued by the US, that after one year has a 4% yield and after 30 years has 6.2% yield. Which one do you use in the representation of the capital market line? If the term structure is flat there is no different. Since it normally is not flat, which one do you choose? We have to compare a risk-free rate to equity shares. We have to be consistent considering time. Equity shares are normally long-term, so, it is better to consider the 6.2% as the intercept of the capital market line. This is because this long-term bond is more consistent with an equity/stock that has no maturity.

So, the capital market line is a line that intersects the vertical axis (expected return) at the risk-free rate and is tangent to the efficient frontier. The point of tangency is calculated by the market portfolio (the super-efficient portfolio).
Summary: the line has to start from the risk-free rate (long term, that is consistent to the non-expiring date of stocks) and it has to be tangent to the efficient frontier.

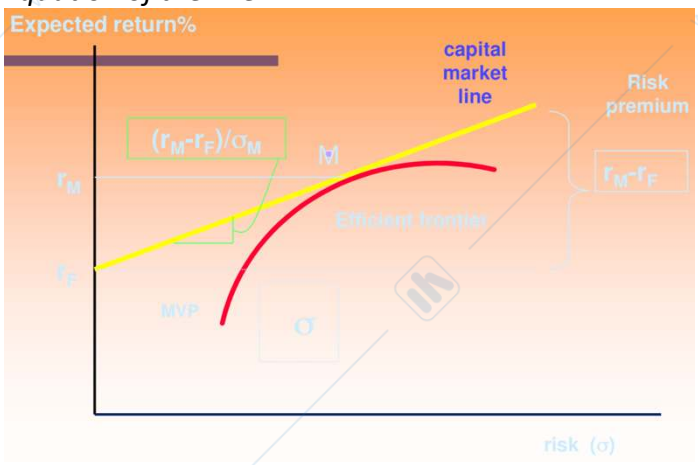
VIVIA MARCHI

Which is the equation of the capital market line? Y = a+bx. Where *a* is the intercept and *b* is the slope. The intercept depends on the risk -free long-term treasury bond. The slope depends on the positioning of the efficient frontier.



Whenever you go up on the right you increase the expected return but you also increase the risk. So, you have a higher proportion risky stocks and a lower proportion of safer bonds.
How do you move along the efficient frontier over on the capital market line? Just changing the weights within the portfolio.

Equation of the line



The difference between the market return and the risk-free rate of return (on the vertical axis – the increase of expected return). On the horizontal axis instead we have the increase in the expected risk.

So, the equation of the Capital Market line is:

$$r_p = r_f + \frac{r_m - r_f}{\sigma_m} * \sigma_p$$

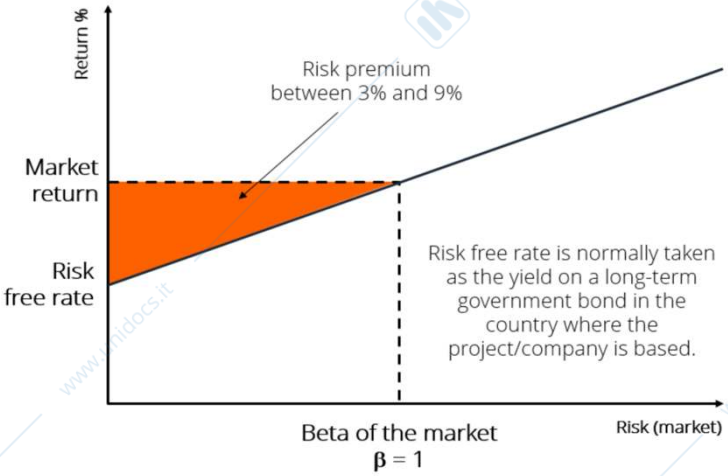
The last part of the formula is represented by the slope of the line. The expected return premium is the increase in the expected return due to the fact that I increase my risk. I have an additional return given by the difference between the market return and the risk-free rate. Why do have this additional return? Because I invest in risky assets. Then it is divided by the market risk. So, in the numerator I have additional return and then I divide it by the increasing market risk.

<u>Capital Asset Pricing Model</u>

What is it? It is a model that we use to determine a theoretically appropriate required rate of return of an asset, to make decisions about adding assets to a well-diversified portfolio. The CAPM studies the relationships and the trade-off between risk and return of stocks.
If I have a listed security, which is the appropriate return of that security considering its class of risk? Or, I am considering the expected return, which is the appropriate risk? (same question reversed considering the two factors).
In particular, CAPM wonders about which should be the equilibrium price (and so return) of a stock given its risk level. 'Price and so return', what does it mean? Which is the link between price and return? Expected return is the formula studied above $(P_1 – P_0)/ P_0$. We always consider returns, in percentages, but we always start from prices.

How can we pass from the capital market line to the CAPM– when diversification is completed (I replace the standard deviation with the beta coefficient).

We have a similar formulation: we replace standard deviation with beta. And we are going to have a further formulation of the line that is represented by the capital asset pricing model. So, the capital asset pricing model is the equation of the new line when I replace the standard deviation with the beta coefficient.



Why is the beta of the market corresponding to 1?

Beta of my asset compared to the market corresponds to the covariance between my asset and the market divided by the variance of the market – the sensitivity of my stock corresponds to the variance of the market. If the market is going to change, which is my sensitive change? Does the stock over-react or under-react in response to market changes (which is the volatility)?

Instead, if we have beta of the market with the market it corresponds to the covariance between the market and itself divided by the variance of the market. Since the covariance of the market and itself is represented by the variance, we have a situation where the beta of the market is 1.

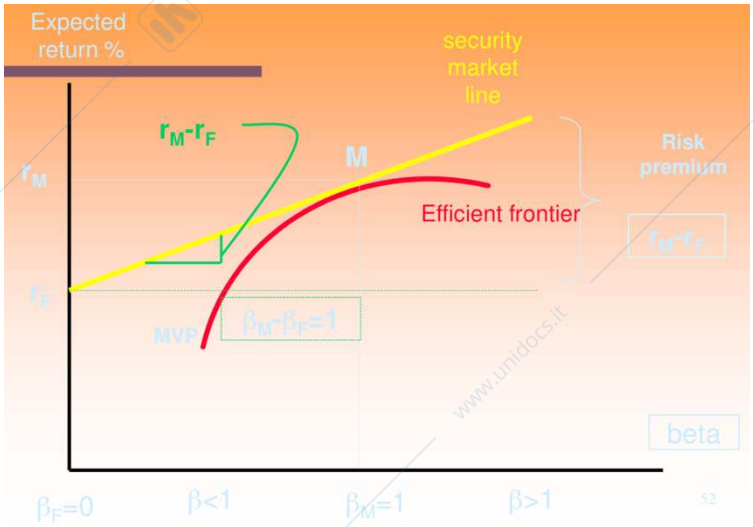
Hypothesis of the capital market pricing model – in order to derive this model, we have to say that:

1. All the investors are: risk averse (they don't like risk), they have a one-year investment horizon, they are rational and they select the portfolio considering just the risk/return patterns.
2. There are no taxes, transaction costs or other imperfections.
3. All stocks are negotiable.
4. There are no intermediaries strong enough to influence market prices. So, the market is efficient/strong.
5. Investors are perfectly informed and have homogeneous expectations on the normal distribution of the expected returns. Everybody is informed, we have no arbitrage situation. Also, we have normal distribution (bell shape).
6. There is a zero-risk stock and every investor can lend or borrow at the same interest rate with no limits. What would be the case on banks, if this were the case? Banks are not going to make money. What happens when you have a credit crunch (interest rates are very low)? This differential for banks is very limited, banks are not going to make a lot of money out of lending and borrowing from depositors. So, according to this hypothesis, we have a situation where banks are useless (do not exist) as we lend and borrow at the same rate.
7. Investors have strictly growing wealth utility functions.

→Even though these hypotheses are not realistic, we need to have these theoretical limitations to represent the basic model. Also, we can remove one after the other these limitations and the model is still going to keep its validity more or less.

VIVIA MARCHI

The capital asset pricing model says that in equilibrium stock prices must have a fair proportion between the expected return and the risk. Risk is represented by the beta coefficient because diversification is completed. We are going to use the CAPM to examine and investigate about which is the possible value of the cost of equity. Why? Because the CAPM concerns stocks, not bonds. I have an investment in stocks, which is the expected return considering the appropriate class of risk of that very stock? It depends on it capital asset pricing model formulation.



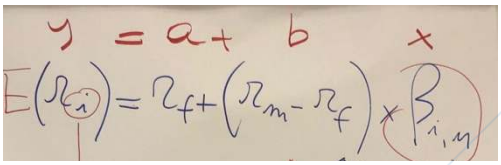
Here you have a situation similar to the capital market line. But, actually, we have the vertical axis showing the expected return and a horizontal axis representing the risk (where here risk is considered using the beta and not the standard deviation because the diversification process is complete). We have:

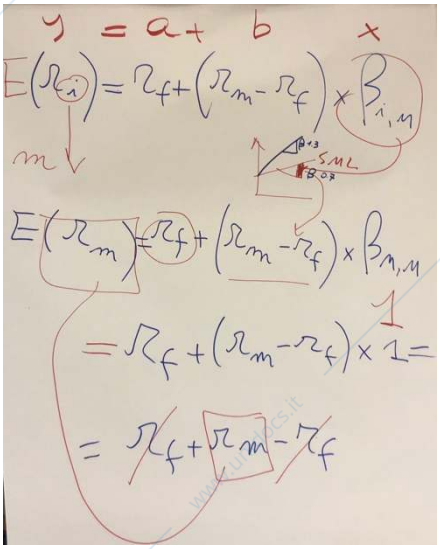
- The efficient frontier, with the minimum variance portfolio.
- The intercept represented by the risk-free rate (long-term).
- And we have a line that has its own function (its own algebraic representation). The equation of this line is the capital asset pricing model.

The equation

We replace the slope, as it is different. Since I have an incremental return, I also have an incremental risk that is given by the beta coefficient. The expected return of my asset is given by:

- The risk-free rate
- Market risk premium
- Beta coefficient (sensitivity of the stock i on the market m).





The difference with the formulation of the capital market line: the beta instead of the standard deviation. What happens when I replace my *i* with the market? Initially I invest in just one asset, whenever I improve my portfolio I go through a representation of a market (I buy more and more stocks and my portfolio is going to be a good replication of the market portfolio). If this is the case, which is the consequence? The expected return of the market (I replace i with m) is: the risk free-rate plus the difference between the expected return of the market and the risk-free rate plus the beta of the market with the market. What is the beta of the market with the market? 1. So, the final formulation: the return of the market corresponds to the return of the market.

VIVIA MARCHI

Conclusion: whenever the market corresponds to the market I have the same return. If I have my portfolio represented by i, which is the expected return of my portfolio? It corresponds to a risk-free and long-term of the government bond, plus the risk premium (incremental return given by the fact that I accept some risk investing in equity instead of bonds), and this risk premium is multiplied by a sensitivity factor.

Week 5:

LECTURE 13:

Looking at the balance sheet, we have assets, financial debt and equity. If we pay out a dividend equity is going to decrease. Consider an example where financial debt is 70 and equity 30 and assets are 100. If I pay out dividends of 15. Which is the leverage before and after the payment of divided? Before the payment of dividend, my leverage is going to be a bit greater than 2 (70/30). If I pay dividends of 15, so, after the dividend payout my leverage is going to increase (70/15). This example is to show that the dividend policy is going to affect the financial leverage. We cannot consider the financial structure of a company separately from the dividend policy.

Continue of RISK AND RETURN SLIDES

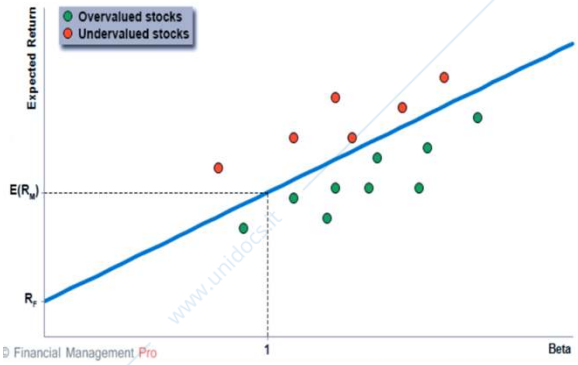
Starting from the Capital Asset Pricing Model, which just considers systematic risk because the diversification process is completed. Whenever the portfolio is well diversified, only systematic risk is considered. If we extend the diversification beyond the boundaries of a specific market we are going to have international portfolio diversification. When we have international portfolio diversification, there is a further risk reduction. This further reduction is going to leave out non-diversifiable international risk. Globalization of stock markets is increasing the 'bottom line' of non-diversifiable international risk. So, portfolio international diversification does reduce risk, but not too much because of globalization (and correlation is stock markets).

Security Market Line and Efficient Frontier

When we have a full diversification of a portfolio, we don't use standard deviation, but we use beta coefficient. On line 52 we have the security market line that is tangent to the efficient frontier, a market portfolio M that has a beta of one. All the portfolios that lie on the efficient frontier are efficient. The market portfolio is the only portfolio that is tangent to the security market line. Assuming I am in the Italian stock market and I buy and ETF (exchange traded funds). It is just the efficient market portfolio position. If I want to increase my returns, then I have to buy (change weights) riskier assets. This means that I have to buy a security with a beta greater than 1 – risk is increasing. Whereas, when my beta is less than 1, my portfolio is less risky and expect return is lower.

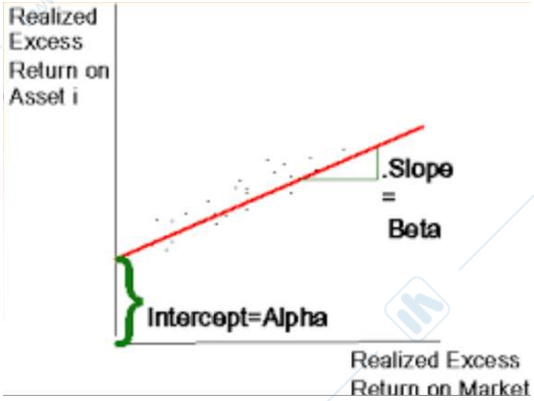
Security Market Line

In equilibrium we have an arbitrage. In case an asset is mispriced, it is going to go back to the equilibrium as soon as possible if the market is efficient. This figure represents a market that is not efficient.



There can be overvalued stocks and undervalued stocks. Above the security market line, I have undervalued stocks and below I have overvalued stocks. Why? Consider two dots, with the same beta: they have more or less the same risk but the orange one has a much higher return. Higher returns means

also lower initial price. If this (represented in the graph) is a photography of the market, I can have an arbitrage – everyone wants to sell the green and buy the orange and the price is going to converge to a common point represented by the security market line. When all the assets are positioned along the security market line, no arbitrage is possible. If the market is efficient (if it incorporates in real time big data and information) there is no room for arbitrage – there are no assets that are not positioned along the security market line or along the efficient market (if I consider even bonds). So, the graph above represents a market that is not efficient. If the market is efficient there is no miss-pricing. It is the possibility of a theoretical arbitrage that is going to make the market efficient. Ex. no police man if all drivers are good. Possible? No, we need discipline.
So, with an efficient market arbitrage is not possible but the chance of a potential arbitrage is what is going to make a market always efficient.
The situation of the graph is the same as many years ago, what changed is the information. Now, we have a better exchange of information which is going to affect the market: the way information is captured within the stock price. Now, it is very quick. In general, we all tend to go along the security market line represented by the beta as a risk factor coefficient.



The beta is the slope of the security market line. The intercept is going to be represented by the alpha coefficient.

This is another formulation of the capital asset pricing model (the expected return of the stock). It composed of a risk-free rate plus a risk premium. The part in brackets is an average risk premium: it is the difference between market return and the risk-free rate of return. Then you have a sensitivity factor. Is there any difference between the risk premium of two listed stocks in the Milano stock exchange? No, the components in the brackets (green) is the same for all the stocks, then you have a sensitivity of a specific stock to the market (beta – remember beta of the market= 1). So, the part in green is the general price of risk and the beta is the sensitivity of the general price of any stock related to a market.

$$E(R_i) = R_F + \beta_i[E(R_M) - R_F]$$

$$beta = \beta_i = \frac{\text{cov}(R_i, R_m)}{\text{var}(R_m)} = \frac{\sigma_{iM}}{\sigma_M^2}$$

$$\text{price of risk} = E(R_M - R_F)$$

We are going to use the capital asset pricing model in the denominator, including it in the discount factor. In the risk component (denom.) we are going to incorporate the CAPM.

The CAPM is going to represent the risk for who? The banks or the shareholders, or for both of them? It is going to be the risk concerning the equity or the financial debt or the whole raised capital? Be consistent between the numerator and the denominator. Which is the risk represented by the CAPM? The stock markets. Who invests in this stock market? Equity holders. So, which kind of cash flows I am going to consider? Net cash flow is going to be the numerator and the discount factor is going to consider, within the risk component, the CAPM.
If we consider in the numerator the operating cash flow, we have to use in the denominator a discount factor that represents the raised capital weighted (the weighted average cost of capital).

So, if we are going to put the operating cash flow in the numerator, are we still going to consider the CAPM in the denominator? Yes. If I have operating cash flow in the numerator, as a discount factor I am going to use the weighted average cost of capital. Looking at these two cases:

a. If you consider net cash flow (belonging to an equity holder/shareholder), then you consider the CAPM in the risk of the denominator.
b. Assuming in the numerator we have operating cash flow (belonging to both equity and debt holders). So, we refer to raised capital (equity + financial debt). Anyway, in this case you still have to consider the CAPM in the denominator. Do I also have to use WACC? Yes. The discount factor of operating cash flow is WACC, then why do I have to use the CAPM? This is because the value of CAPM is part of the formulation of WACC. The cost of equity is going to include the capital asset pricing model. So, if we consider the operating cash flow we use as a discount factor the WACC (the cost of equity and the cost of debt weighted). And the cost of equity includes the CAPM – it is not the formula; it is a part of the formula.

Cost of equity is going to be used alone if we have, in the numerator, the final cash flow (cash flow to equity). Or, it is going to be considered together with the cost of debt if we have the operating cash flow. In both cases, we need to calculate the cost of equity. The cost of equity is going to be proxied/represented by the CAPM. Why?

What does it mean cost of equity? Cost of the firm to collect equity. Going back to the example at the beginning of the lecture, which is the cost of the firm to collect 30 of equity? What is the cost of equity for the firm is the return to equity for investors. Assuming the cost of equity for a firm is 15%, which is going to be the return on equity of the investor? In order to collect and attract equity/shareholder the company has to pay 15% (to collect 30 of equity). This 15% is the cost of equity for the company. Which is the return of equity for the investor? The same amount: 15% if there are no transaction costs. So, the return on equity of the investor is similar to 15%. How can I calculate return on equity? Using the CAPM. Which is the return that I expect out of my equity in the market? The return is given by a basic risk free-rate plus a general market risk premium multiplied by the sensitivity of my stock towards the stock market.

The return for the shareholder is given/proxied by the CAPM formulation if the company is a listed one – a sort of return on equity. We did consider another kind of return on equity: ROE (ROE= net profit/average equity). Does this mean that the ROE should be consistent with the CAPM? The ROE is an accounting perspective: I consider the balance sheet and income statement of the company – it may not be listed. Use CAPM when I have a listed company. If I have a listed company, and if this listed company follows the CAPM (there is a proportion between risk and return), can I say that the CAPM has to be consistent with the ROE? Yes, there should be a similarity between market formulation and the accounting formulation. A company that has a good stock price it also has a good accounting ROE. Consider a company whose stock prices are going well, without a good accounting return on equity. It doesn't make sense – if the stock price is going well it means you have good fundamentals. This means that the accounting value are fully reflected in the stock market price. If there is a convergence between the accounting ROE and market CAPM, can we also say there is a convergence between ROI and WACC? Yes.

<u>CAPM</u>

If the capital asset pricing model works, there is a tendential equilibrium between expected returns and risk – there is a convergence. There are no stock prices that are not positioned along the security market line if the model works. It is true also in the real market/life? Remember: there are many hypotheses behind the CAPM. These are not the cases in real life, and also the model is not the case in real life. Is the model useless? No. The model does not work in real life, but it is mostly used to

estimate the cost of equity in the discount factor. Why do we use it for the estimation of cost of equity even if it is not a perfect model? There are no better alternatives. So, we will use CAPM for the estimation of the cost of equity. It is the full component of the discount factor if we have in the numerator the net cash flow, if instead in the numerator we have the operating cash flow we are going to still consider it weighted to the cost of debt. In any case, we have a risky component that is proxied by the CAPM.

BETA COEFFICIENT – DETERMINANTS

What is the beta of the asset 'i' against the market? The covariance between the asset and the market divided by the variance of the market. The beta is the slope of the security market line.

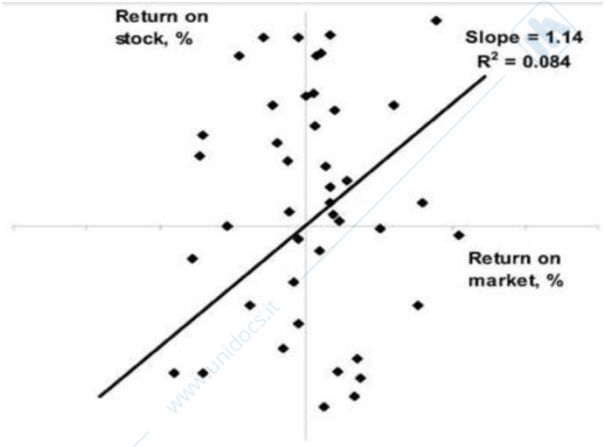
The beta of a stock depends on the characteristics of the company and the cyclical nature of revenues, on the operating leverage (scalability) and financial leverage. If revenues are very volatile, the beta is going to be higher. Compare two listed stocks: one has very volatile revenues and the other one has more constant revenues; the first one has higher beta. If I have a high operating leverage (scalability) the beta is going to go up. Also, considering the financial leverage: can I say that an asset with a high financial leverage has a higher beta? Maybe. So, equity risk depends on the beta, we will calculate together this beta. In order to assess if a particular stock firm listed in the exchange has a high or a low beta, we have to consider its characteristics:

- Cyclical nature of the revenues: look at income statements. Are the revenues very volatile or there is low volatility? It will affect the beta: if revenues are very volatile the asset is riskier; riskier than the market.
- Operating leverage (scalability): we start from the sales/revenues and we go to the EBIT/operating profit. We have a mix of fixed and variable costs. Can we say that a company with higher fixed costs is riskier than one with variable costs? Yes. Is a better to have a company with a lot of fixed or a lot of variable costs? Difficult to say, it depends also on the industry (ex. automobile will require me to have many fixed costs). But in some cases, it might be more convenient for me to have more variable costs.
- Financial leverage.

Within a company? Can you change the beta of the listed stock – make the beta safer? It is not possible. There is something you can do subdividing the issue in its components (the determinants of the beta). Can I have an impact on these determinants? We have to decompose the target to arrive to an assessment of the beta.

Revenues tend to follow the economic trend in cyclical companies; being β the standardized covariance between the return of a stock and the market return, cyclical stocks tend to have a high β. Look at the example, if the beta is 0.833 the stock is less volatile than the market as a whole. If beta is higher than 1 the stock is more volatile than the stock markets as a whole. Otherwise, if the beta is less than 0 it means that the stock is losing money while the market as a whole is gaining.

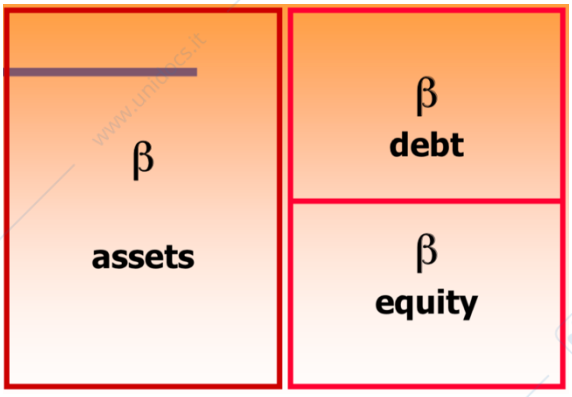
We can estimate the beta with a graphical representation. On the horizontal axis I have the market return and on the vertical I have the return on stock. The beta is the target so it is not included in the graph. I have to make a statistical comparison between the market return and the return of my stock. The beta is, from a statistical point of view, the slope of the line (in the example it is 1.14 meaning that the market is aggressive).



Which are the determinants of the beta?

- Company dimension has a high importance. Bigger companies are stables and less subject to non-market changes and present less volatile average beta.
- Industry cyclicity has a high importance. Companies in more cyclical sectors (ex. construction and automotive), tend to have a higher beta.
- Growth perspectives has a high importance. Growth stocks and/or operating in high tech industries have higher beta. If you want to build up a portfolio of listed shares, you can have a difference between what we call 'growth' and what we call 'value'. What does it mean? You can invest in either growth stocks (stocks that grow a lot) or in stocks that are more mature (they grow less but are more stable). The latter has a beta that is lower (stable companies).
- Degree of operating leverage has a medium importance. The higher the fixed costs, the higher the beta.
- Degree of internationalization. High cash flows in foreign currencies and foreign market exposure increases the beta. This has a medium importance. An example between two listed companies: one is only Italian (ex. Corriere della Sera) the other one is based in Italy but fully international (ex. Pirelli). The degree of internationalization depends also on the industry/products. If I have a more international approach I diversify my risk, yes, but you also have additional risk because if a foreign market is affected by macro-economic consequences you may not be able to offset it with your managerial strategies.
- Diversification. The higher the number of industries where the company operates, the higher the risk diversification and consequently the lower the beta.
- There is a low importance on the degree of financial leverage. The higher the leverage the higher the beta. This is true, but it is also has a very weak component. What does it mean? Compare two companies: Company A (with assets 100, equity 15 and financial debt 85), Company B (with assets 100, equity 50 and financial debt 50). These two companies have a different financial leverage. Do I have an impact or not on the Beta? The company with a higher financial leverage might have a higher beta, but this impact is low.

This is the correspondence between the accounting balance sheet and the market representation.



Beta of assets corresponds to the beta of debt and the beta of equity. Until now, we have considered the beta of the equity. Which is the average beta of equity/the market? 1. Which are the weights in this graphical representation? 100 assets, 50 debt and 50 equity. If debt is completely risk-free, which is the beta of debt is? Zero. If beta of equity is on average 1 and beta of debt is zero, and the proportion is 50/50. Which is the beta of the assets: the average is 0.5. Generically speaking, whenever the beta of equity is higher than the beta of debt, beta of equity is also higher (slightly) than beta of assets.

The evaluation of the portfolio's performance

It will evaluate risk and return in a 'compact' way – considering them all together. I have to compare my portfolio (or my stock) with the market portfolio. To see if my portfolio is better or worse than the market portfolio. What does portfolio mean? Portfolio can be a single asset/a single listed stock (I invest all my money in just one asset: diversification is very low). Or, I might invest my money in many assets, maybe replicating the market portfolio with an index fund (a fund that follows the index of the market). In this second case I have a higher diversification. Assuming I have a portfolio

composed of 3/4 assets and I want to compare it with the market. The comparison must take place in a risk and return scenario. I compare my risk and my return with the market. And sensitivity is represented by the beta: the beta of my portfolio against the average beta (1) of the market.
Performance evaluation indexes allow to estimate the expected return of a portfolio considering its risk, and so risk-adjusted returns. There is so a discrimination between professional investors and those that make superior performances only because they undertake more risk (are lucky). We can use three different kinds of benchmarking:

1. The Jensen Index: uses as a benchmark the Security Market Line. The index is given by the difference between the portfolio expected return and the return of a portfolio lying on the SML. Look at the formulation: inside the brackets we have risk free rate plus the beta of the portfolio multiplied by the market risk premium. I compare the model retrun (the retun if the model works) with my real return. If the CAPM works perfectly, in this case the difference between expectations and the model is going to be zero.

$$J_p = E_{rP} - [r_F + (E_{rM} - r_F)\beta_P]$$

   If the model does not work perfectly, there is a difference given by the fact that my expected return is higher than my theoretical return. What does it mean? We have a portfolio of assets that has a positive Jensen index (the expected return is higher than the theoretical ones expected in the model). Will my portfolio be overvalued or undervalued? I am better than the market meaning that I am a 'red one'. If I am lower than the market I am a green one. (compare and combine slides 75 and 54). If the theoretical assumption of the CAPM is perfect, I have no arbitrage and all my portfolios lies on the security market line.
   If the expected return of my portfolio is higher than the CAPM, then the portfolio has a superior return, beating the market.
2. Sharpe Index: Another alternative performance comparison can be conducted with the CML (capital market line). Why should I use the CML instead of the SML? And when does it happen? If I use the CML the expected return is always the expected return and the risk is represented by the standard deviation (and not the beta). What does it mean? My diversification process is not completed. The formula shows the difference between the expected return and the risk-free rate, divided by the standard deviation. I can have positive or negative return.

$$S_P = \frac{E_{rP} - r_F}{\sigma_{rP}}$$

3. Treynor Index: It is similar to the Sharpe Index, as it considers the same numerator (my return premium: the difference between expected return and risk free), but the denominator is difference: I divide it by the beta, and not the standard deviation. In this case my diversification is complete and I have a situation where I can apply the CAPM – differently from the Sharpe index (standard deviation is used since diversification is not complete).

$$T_P = \frac{E_{rP} - r_F}{\beta_P}$$

In synthesis, Jensen and Treynor indexes use as a benchmark the SML and measure the ability of the investor to generate excess returns, whereas the Sharpe index uses as a benchmark the CML (in a context where diversification is not complete and the CAPM does not apply).

Rating

We have considered, until now, mainly two kind of stocks: risk free bonds, represented by government bonds and risky stocks (investments in equity). We can also have, in the middle, corporate bonds. These are bonds issued by corporations: their risk is not zero as they are riskier than treasury bonds, because the issuer is not the government, and they can go in default. But, why are corporate bonds safer than the stocks/equity investments? Because of the remuneration priority. What does it mean (in corporate finance)? That you form, within your company, cash flows and you use this cake (cake represented by cash flows) to pay first of all the banks and whatever is left, at the end, belongs to the equity holders. The cake is represented by operating cash flow (before debt service). Also, from a legal point of view, is it compulsory for a company to pay out dividends? No. But it is compulsory, for a company issuing bonds, to pay out interest rate coupons. This is another reason for why it is safer (a bit safer). How much safer? It depends on the rating.

What is a rating? If you are a good and sound issuer you have a good rating. Assume I (the firm) am issuing a bond, and I have a good rating, the cost of debt is going to be low. If I have a bad company, with bad rating: risk is increased and I have to offer more money to underwrite my issuing bonds. Ratings don't only work for corporate bonds, but also for countries. Triple A is the best rating. Consider Germany: it wants to collect money issuing debt (government bonds), to do so it has to pay a sort of premium. Which is the analogic premium paid by Italy? It is higher because Italy is riskier. Is rating a good instrument? It is really used, but is there any problem with rating? Yes. Before issuing a corporate bond, you need to have a rating. So, it is a good signal for the market if and only if the rating agencies are good/impartial. Is it really like this? No, the owners of the rating agencies are banks and these banks invest in the market (so they might alter the rating just to favor some investments rather than others). If we change the owner the of rating agencies the problem is not going to change. Anyway, the rating agencies are very important.

LECTURE 14:

Efficient-market Hypothesis

The big picture: We wonder if capital markets/stock markets are or not efficient concerning information – if they reflect immediately or very soon available information. If prices absorb all the available information then the stock market is efficient. There are many kinds of different news: available ones, public ones and private ones.

What is insider trading? You have inside information and you know that something is about to happen. If this is the case you might know before interesting and sensitive news about your company. EX. you are a US corporation, you know that there are going to be sanctions about foreign cheese, so you want to invest in your company because the stock prices are going to rise. You do it before. This is an example of information asymmetries. Information asymmetries are information's that are available to some people but not to everybody. When you have information asymmetries you may use them to make money. It is prohibited by the law and it is also persecuted.

If the market is very efficient, even in the strong form, there is no room for any type of information (public or private). Mostly, efficiency of markets is concerned with incorporation, in real time, of relevant news.

We don't have only news, we can also have fake news. Manipulating the market with distorted or fake news it is a serious problem. Which is the evident of the last years? There are less information asymmetries because with technology we can exchange information in real time. But, the likelihood of fake news is going to grow. These are the pros and cons of information.

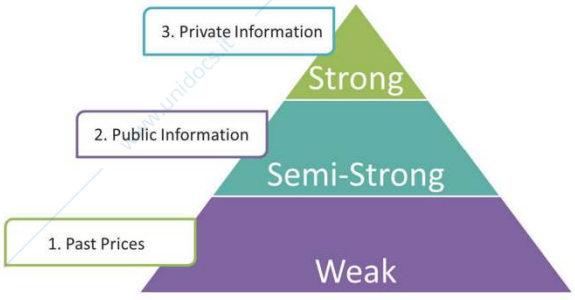
Another important topic is the impact of big data on market efficiency. Any information is in itself really small, when you collect them they get big making a comprehensive pattern.

VIVIA MARCHI

So, the main concern is the impact of information on stock prices. Stock prices are very sensitive to information because it is very easy to buy-sell and make-lose money. Which is the target of authorities? They want 'the game to be fair', they want to avoid distortions in the market. In other words, they want everyone to have the same information.

How are the securities market prices determined?
The major financial markets reflect all relevant information at a given point – the type and sources of information with which it is reflected in prices. All relevant information is incorporate in prices. In some cases, markets are not good at anticipating good or bad news. Markets can also be very volatile. EXAMPLE. There has been the double deep where you have a crisis in 2008, then a recovery, and then another crisis in 2011 (especially in Europe). Assuming we are positioned before any of the two crises, can we say that price of today is going to incorporate in a fair way all the information that concern this kind of asset/security? If it is so, if the information's are good, we can understand that the prospects are not nice and that everybody should sell before. What happens though, a lot of information is unexpected (you can have unexpected good or bad news). Who knows what is going to happen with BREXIT? Which is going to be the impact on stock prices on public news about the BREXIT? Is there any insider about what the UK parliament can decide? This is an example of inside trading: you know something in advance and you exploit this information asymmetry to make money. In general, you have a big impact of information on prices. Going back to the example of the double crisis, the market did not anticipate the bad news.
Whenever markets are volatile (you can have good volatility where prices go up and bad volatility when prices go down) there is a sort of asymmetries according to which bad news tend to outperform good ones (so negative volatility is even bigger).
Can we say that trends are predictable? Assuming that till the trend is that stock prices are going up. What is about to happen in the stock exchanges in the next month? Can we say that we have a trend – do we follow the same pattern? This is impossible in real life, you cannot have a market that goes up or down with no limit.

<u>The big question: Is there, or not, a trend in stock prices?</u>



You have three types of information: weak, semi-strong and strong.
I can use past prices, of the last year, to identify the past trend and forecast a similar trend in the future. This might happen when stock markets have a very poor efficiency form. Whenever the stock market is efficient, at least in the weak form, you cannot use past trends to predict future outcomes. So, whenever we have a weak form of efficiency we cannot say that this used to be the trend so the future trend is going to be the same one. his shows that you can have many volatile outcomes. *So, if markets are efficient, at least in the weak form, there is no gain to use past information to predict future patterns/prices.* But, expectation (what people think) are important. Since efficiency is given by the incorporation of information in the stock market, has efficiency improved in the last years? Yes, a lot. You can have a lot of past insider information that now are available on the web. In conclusion, we cannot use past patterns/prices to predict future events.
When there is an event, there is a reaction. What is over-reaction? You are reacting too much. Over-reaction can be an issue. Do investors over-reaction? Yes, it is very typical: they tend to sell more than expected. So, we have to consider both how information is transmitted from internal sources to the market/stock prices and the prices given by buy-sell of the people (behavior of people).

VIVIA MARCHI

Can artificial intelligence have an impact on stock markets? We can have a strong impact of machine learning and artificial intelligence on stock prices. Quantum computers are going to gather millions of data information in real time and are going to match them to decide whether to buy or sell.

Assume, that not only past prices, but also public information is available to the investors in real time (I inform the market about the prospects of my company). All the public information is absorbed by the price. If this is the case, the market is efficient at least in a semi-strong form.
Then, we have a last form: not only past prices, not only public information's but also private information's are reflected in the stock market prices. Is there room for insider trading? If the stock prices incorporate also private information, there is no room for insider trading. Whenever we have private information incorporated in the stock prices, the market is efficient even in a strong form.
Which is the efficiency form of Italy/Germany? A good stock market is between semi-strong and strong (closer to strong). Some other markets, London and New York, are going to be even closer to the very strong form of efficiency. And this kind of efficiency is going to reflect on stock prices.
This topic is complementary to the CAPM, because you can understand which is the form of efficiency that you are going to use.

Random Walk

Random walk refers to when prices do not have a precise pattern/direction/trend, they follow a 'random walk'. If this is the case, then the market is efficient. It means that the market is not using past information (it is already incorporated in prices), but, it is using today's second after second information. Whenever you are a big corporation, and you have breaking news, you usually wait until the end of the day (when the markets are close) because you have to give time to everyone to react to the news.
Connect market efficiency with systematic risk: we have an information, is it going to be local or global? What is happening in Chile for now is local, but it could become global.
→ the impact that news has on the market is a big issue. You have to consider the impact of information on stock prices/cash flow analysis/business plan, etc.

Aswath Damodaran

If markets are efficient, the market price is the best estimate of value. There is a difference between market prices and estimated values. Which is the difference between value and price? Value is what we estimate while price is the real exchanged value. Ex. In my opinion I estimate that the value of the remoter, if I sell it, is 2 euros. Then I go to the market to sell it – there is a match between supply and demand. Assuming the final value is more than expected: 3 euros. This shows that there is a difference between value and price. Value is the estimated price. Are estimates good? I can have over-estimation and under-estimation. If I am a financial analyst, I consider a stock market price of an asset (ex. Amazon) and I make a comparison between the stock market price and my personal value evaluation (according too fundamental analysis – analysis of public information such as balance sheet, forecast). Assuming that today the stock market price of the company is 100, my guess is that in the next 3 months the price is going to go up, so I want to buy it now. If I suppose the price is over-valued I am going to sell (I am going to do short-selling). So, fundamental analysis is the study of a company considering issues such as balance sheet, income statement, operating leverage, corporate profitability, the cash flows, the discounted cash flows, etc. In order words, we investigate with public and available information, and we make a sort of summary according to us. Then we compare our analysis with the stock market price of today and we say if the price is overvalued (I sell) or undervalued (I buy). There are two types of financial analysts, one is active (studies and then either buys or sells) the other is passive (follows the market). Who is going to have a better performance? Active investors are more expensive, so they offer a superior performance.

VIVIA MARCHI

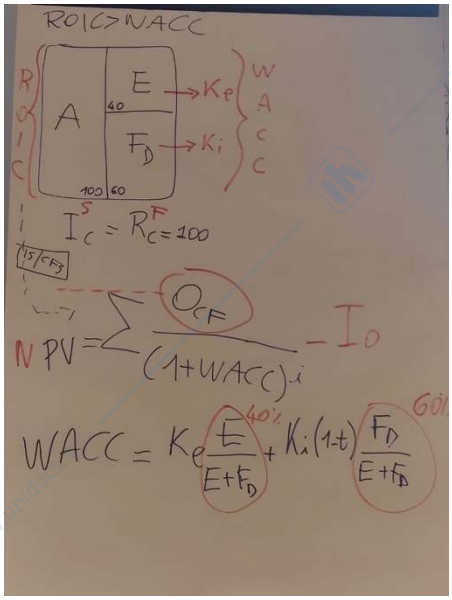
Do I have any gain if I use fundamental analysis? Yes, if the market has weak form of efficiency, no if the efficiency is at least semi-strong. From fundamental analysis I can derive intrinsic value and this is going to be compared with stock market prices. Summary: it is the comparison between the value that I calculate and the price.
So, market efficiency is something that we get to improve out estimates: future stock prices, cash flows, discount rate, comprehensive analysis of cash flows with risk.

Based on the discounted cash flow formula, a risky one. How can you match this consideration with market efficiency?
Discounted cash flow is the sum of cash flows, in this case operating cash flows, divided by the discount factor. In the case of operating cash flows, which is the discount factor? WACC.
Remember that WACC is the sum of cost of debt and cost of equity. Do we affect cost of debt with market efficiency? No, because market efficiency is the efficiency of the stock market. The real link is between the market efficiency and what is inside the cost of equity. If the market is efficient, even in the strong form, then we have a good application of CAPM? (the CAPM works if the market is efficient?) Also, can we say that if the market is efficient, then we little/no room for arbitrage? Yes. If there is no room for arbitrage, the CAPM holds and there is a sort of risk-return equilibrium within the market, because the market is efficient. So, if the market is efficient my risk pricing, within the discounted cash flow formulation, might improve (I have a better assessment of risk).
In the denominator I consider the risk that the real outcome might be different than the expected one. If there is a big difference between real outcome and expectations the cash flows are going to be very volatile. So, there is a statistical difference between expectations and reality, if the difference is big I have to increase my discount factor (because I am forced to incorporate a higher risk in my formulation). If the market is efficient I can have some reduction in the forecast risk.
Some questions done in class

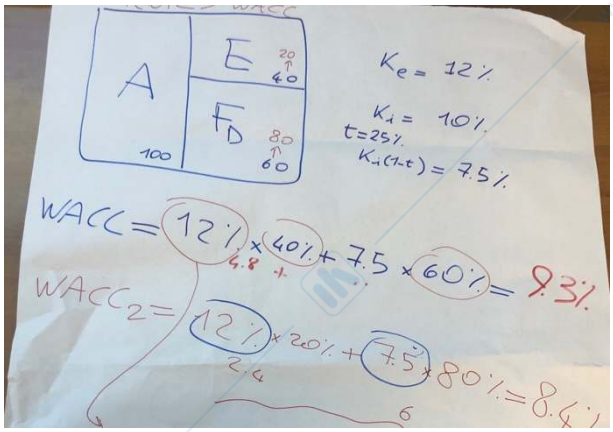
- Can we say that all relevant information is incorporate in our discounted cash flows?
- Think about which can be the information for your discounted cash flows. You are going to forecast case flows, for the next 3-5 years, and you have to collect small data, that it will become big, from the market.
- What is important: the application of theoretical concepts to what we have already seen: which is the implication of market efficiency on CAPM? On discounted cash flows? On the comparison between intrinsic/fundamental analysis and real stock market prices (comparison between value of price)?

LECTURE 15:

DISCOUNTED CASH FLOWS AND THE COST OF CAPITAL:
We have to link present value to capital budgeting, it becomes net present value because I subtract, from the sum of the cash flows the initial investment.
If we look inside the formulation, we have a specific formulation for the weighted average cost of capital (WACC). The weighted average cost of capital is the cost of equity and the cost of debt. Assuming equity is 40, financial debt is 60 and total assets is 100. The proportion of equity is 40% and the proportion of financial debt is 60%. Only for now, we are not considering taxation. Whenever we consider weighted average cost of capital, you have weights. This means you are going to consider the photography of



VIVIA MARCHI



the balance sheet with the percentages of raised capital (divided in equity and financial debt). If you modify the financial structure, increasing financial leverage (for now it is 60/40=1.5), are the weights going to change? Yes, even if you do not consider taxation. If we change the composition of the raised capital it is going to affect the WACC. Ex. we have assets that are 100, equity 40 and financial debt is 60. Let's say that cost of debt is 10%, the taxation rate is 25%. So, cost of debt, net of taxation, is 7.5% (Ki(1-t) =cost of debt). Then, we have the cost of equity that is 12%. To calculate WACC we have 12%*40% +7.5%*60% and the result: 9.3%. Assume we increase leverage by borrowing money from banks in order to pay dividends: my equity becomes 20 and my financial debt becomes 80 (the total is still 100). Assume that the cost of debt and the cost of equity remain the same (this might not always be the case – they usually change). Now, the WACC is 12%*20%+7.5%*80% =8.4%. The answer is different, it is smaller. We reduced the WACC because weights are changing. The change of weights, if we keep unchanged the cost of capital and the cost of debt, is going to modify the overall value of the WACC. We have to consider two things:

- We might always have ROIC > WACC. I have a good capital budgeting investment. I have a good investment profile. If we invest we can have a consequence on the numerator (operating or net cash flows).
- Also, can we say that if we change the financial leverage, the proportion of the equity and financial debt, then the WACC changes? Yes. When I pay a divided I decrease my equity and if my financial debt stays the same, leverage is going to increase. Equity goes from 40 to 20 and financial debt is steady at 60, the leverage before was 1.5 and now it doubles to 3. So, the ratio between financial debt and equity is going to affect the WACC. Dividend policy is going to affect the financial structure (financial debt/equity) and so it is also going to affect the WACC.

Remember that the cost of equity (12%) can be proxied in two ways: one way is with the CAPM and other one is the Dividend Discount Model.

The Modigliani and Miller I says that the value of the company is given by the sum of operating cash flows discounted using the WACC, then you compare this with financial leverage. The value of a company, based on Modigliani and Miller I which implies a lot of simplifications, just depends on the OPC discounted by the WACC. It says that if I change the financial leverage, the value of the WACC does not change – nothing happens. But before we have seen the opposite. Why? Before we have seen that, if I change the weights and I don't change the cost of debt/equity the result (WACC) is going to change – the formula is sensitive to this change. So, which is the solution compliant with Modigliani and Miller? To have the same result, meaning that the WACC does not change, we have to change accordingly the cost of debt and the cost of equity. If I have a compensating change, also the cost of debt/equity change, in this very case I might get a steady/constant WACC.

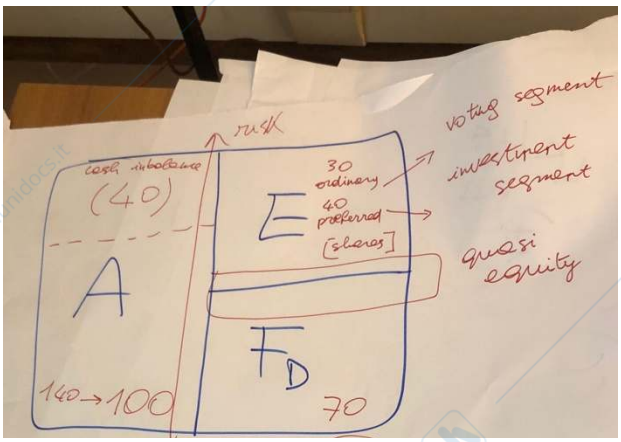
Discounted Cash Flows and the Cost of Capital

First of all, we have to consider the value of the firm with the cash flows. I have value of financial debt and value of equity (the proportion is financial leverage) then I have uses (CAPEX and Operating Net Working Capital). I have my operating free cash flow, from it I have to subtract the cash flow to creditors (financial debt underwriters) and all the rest is the cash flow dedicated to shareholders (this follows an absolute propriety rule: first pay back banks and taxation, what is left belongs to the shareholders).

VIVIA MARCHI

The cost of capital is manly used to discount risky cash flows. There is an opportunity cost of capital. What does it mean? I am a potential investor, I have 1.000 dollars, and I want to invest them in a company, so I compare companies – I want to invest where I have the best return. There are three types of cost of capital:

1. Cost of Equity. We can divide cost of equity in two components: ordinary and preferred shares. I want to collect money from shareholders. I can divide equity in ordinary and preferred shares. What is the difference? The value of a share depends on two main characteristics: voting segment and investment segments. With preferred shares I can vote only in special shareholders meetings, in most of the cases voting rights belong to ordinary shareholders. But since preferred shareholders don't have voting rights they have a propriety in dividends and liquidation (when the company is closed up). Assuming that cash in 100, financial debt is 70, ordinary shareholders are 30 and preferred is 40. There is a cash imbalance of 40. I have a nominal value of cash that is 100 because I had 140 value of an asset and when I sell it to obtain liquidity I don't sell it at full value as I get a discount. With my 100 I pay first my 70 of financial debt, then I have 30 left. With this amount I pay first preferred shareholders (and not even all), while ordinary shareholders don't get anything.



Cost of ordinary equity is 12%, which is the cost of equity of preferred shares? Higher or lower? Preferred stocks are risker or safer than ordinary? Safer, because they receive a prior payment, so the cost of equity is lower (ex.11%). This is going to affect the overall WACC (if I have a difference between ordinary and preferred cost of equity). If I underwrite ordinary shares I expect a higher return. Why? Assume there is hostile takeover of the company – I want to get control of the company (I want to get control of the voting rights). If this is the case, the price of ordinary shares is going to go up. Also, the price of preferred shares is not going to be affected by this external operation. So, whenever we have the case of preferred share we add a modification inside the WACC: I add a third component with the weights of the preferred shares and the ordinary one to obtain the cost of equity. (This is going to give a slightly smaller cost of equity compared to traditional riskier ordinary shares).
2. Cost of Debt
3. Weighted Average Cost of Capital

<u>QUASI EQUITY</u>

Equity is a risky capital, you don't have any rights for a fixed remuneration. All the money left is for the shareholders, but if there is no money left you don't get anything, you don't have any legal claim out of it. If there is money is will be used mainly to satisfy the debt underwriters.

Though, there are some elements that is difficult to understand whether they belong to equity or financial debt. Can I have something between financial debts and equity? Yes, convertible bonds. In this case, I start being a debtholder but I can stop being a debtholder and become an equity holder. From a legal point of view, until the conversion they are bondholders and they belong to the financial debt part of the balance sheet. From a financial point of view, if they are likely are they are about to convert their bonds in ordinary shares, they are in the middle between debt and equity and for this reason there is a part of the balance sheet that is called 'quasi equity'.

I am a convertible bondholder, the bond is about to expire and the company is going well, so I accept to convert my bond in ordinary shares. This is a financial saving for the company: it does not cash back the nominal value, but it is using this money to increase capital. So, there is a decrease in debt and an increase in equity. This conversion form debt to equity, is it going to affect the financial leverage? Yes, financial leverage is going down. This will also have a consequence on the WACC.
You always have to consider the raised capital in a comprehensive way with invested capital.
If you are underwriter of convertible bonds, you are a debtholder but you can participate to gains if the company goes well, so you might like also a risky company. This is because you can decide in 3 years' time, when you have a better idea on how the company is going, whether to convert the bond in shares or not. If this is the case I can accept to finance also a riskier company.
Now consider an issue from the point of view of a company. You are a very innovative firm, so, you have difficulties in collecting debt from banks, this is because you don't have, or you have little, collateral (physical guarantee) to offer to the banks. So, I try to raise capital with equity and I might issue also some convertible bonds.

The Cost of Equity

There are two alternative/complementary ways to estimate the cost of equity:

1. Using a risk/return model (the CAPM).
2. Employing the Dividend Discount Model.

The Divided Discount Model

It is a model to discount future dividends. A divided is a cash flow – so, it is a discounted cash model. I again have assets, equity and financial debt (balance sheet). My target is to collect equity, which, compared to financial debt, is risky capital as there is no compulsory payback and no compulsory remuneration. If I am an ordinary shareholder I have a 'right' to receive dividends, in the future, if the company goes well. Does this right last forever? Formally no, companies expire according to the by-laws. But, in practice, companies do not expire. This is why, when we consider the CAPM, we have to estimate long-term equity returns by using as a benchmark very long-term treasury bonds. So, as I am an ordinary shareholder I have the right to cash in dividends forever.
The divided discounted model shows the price and the expected value of my ordinary share. It is given by a future stream of limitless dividends, discounted.
Looking at the formulation of the DDM: P_0 is the price of today, then I have D_0 and a growth rate (g). Assume that today I have an initial dividend of 100 and the growth rate (g) is 2%. After one year the dividend is 102 – D_0 plus a growth rate gives D_1. Then I have to consider a discount rate (r): the cost of equity (risky rate to discount this risky investment). Is g normally constant in real life? No, you cannot grow forever. Which is a standard growth rate of dividends with no time limit? It can also be a growth rate of 20%, but it will not last forever. I usually have a perpetual growth rate of 2%.

$$P_o = \frac{D_o(1+g)}{r-g} = \frac{D_1}{r-g}$$

Next dividend
Discount rate
Growing at (growth)

Considering the second formula: standard dividend in year one divided by the cost of equity (r) minus the growth rate. What happens is r and g are the same? The difference is zero. If the denominator is zero, the price tends to infinity (but the formula is not worth). Can I have g that is higher than the cost of equity (r)? Can I have negative divided? No. From a mathematical point of view, these two events are possible, but if this is the case the formula does not hold – it does not have any meaning in financial terms. In economic terms, the r (discount rate) has to be

higher/greater than g. I can always expect to have a discount rate r that is higher than the growth rate. This formulation, DDM, is a proxy for the cost of equity of the firm, alternative to CAPM.

If you are an ordinary equity holder, what do you expect from the company? Each year to receive a dividend. Do you also expect, at the very end, to receive a payback? Assume today you invest 100 and expect a divided of 2 each year. Also, at the end you expect to get 100 back from your initial investment (it can be higher, a capital gain, or the same value). Why do we consider a formulation where we just have a dividend stream, and we don't consider the final payback? This is because the final payback, in mathematical terms, brought to the present is discounted by infinity, with solution equal to zero. The final payback is formally there but its present value is approaching zero. So, the value of your investment depends on the stream of expected dividends.
What is the formulation of the cost of equity (r)? The ratio between D_1 divided by Price plus growth factor. What is dividend divided by price? What we call the divided yield/return. The dividend yield based on the example is 2/100=2%. Then you have to add up the growth rate. If the growth rate is 1% then the cost of equity is 3%.

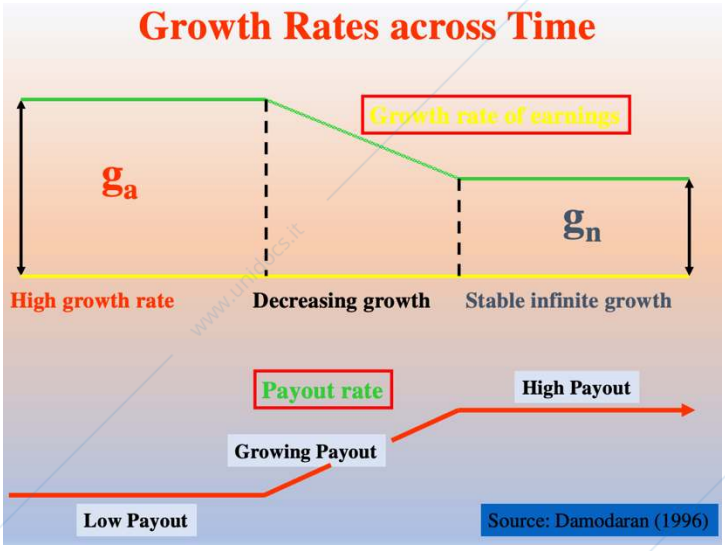
$$k_e = r = D_1 / P + g$$

The Big Picture: I can calculate/estimate the cost of equity in two complementary ways:

1. CAPM (capital asset pricing model).
2. The dividend yield adding up the constant growth rate of the dividend.

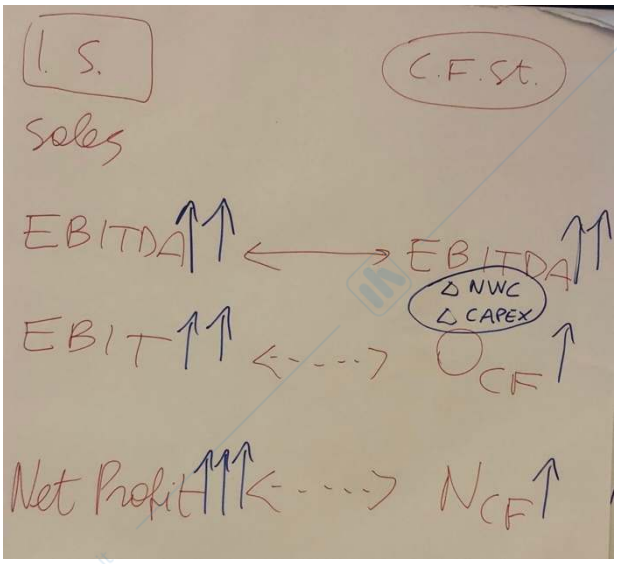
Growth Rates that Change Across Time

Assume now, that I have growth rates that change over time. Usually in the beginning I have a high growth rate, then a decrease in growth, until it reaches a stable growth rate. This is shown by the growth rate of earnings. But, what is the payout? When you grow a lot you pay small dividends, when you grow less you pay higher dividends. I payout a divided because I have a net profit in my income statement, I have money left for my equity. When I have a young firm that is growing a lot, I have a high growth rate of earnings, but I usually have limited, if any, cash.



I have a growing firm, where I start having positive net results. I have my income statement where I have sales, EBITDA, EBIT, and then Net Profit. Then I have the Cash Flow Statement. In the beginning I have a high growth rate, so, EBITDA and EBIT go up strongly, and I have even stronger net profit (because I have some scalability effect). If the EBITDA goes up, what happens in the financial part of the company (cash flow statement)? The EBITDA is the same, but then I have

something happening in the OCF (a less than proportional growth in operating and net cash flows). Why? What do I have between EBITDA and OCF? Differences in net working capital and delta in the capex. It is true that I have a 'nice' EBIT, but most of it is burned fueling my future growth. Even if I have a high growth rate, I might have a lower rate of financial marginality. This is why I might be able to pay less dividends. When you reach maturity, you have lower economic margin increases but higher cash flows. Ex. a high-tech company is going to use most of its resources to fuel innovation, and little, if any, money is left to pay dividends.



(week 6)

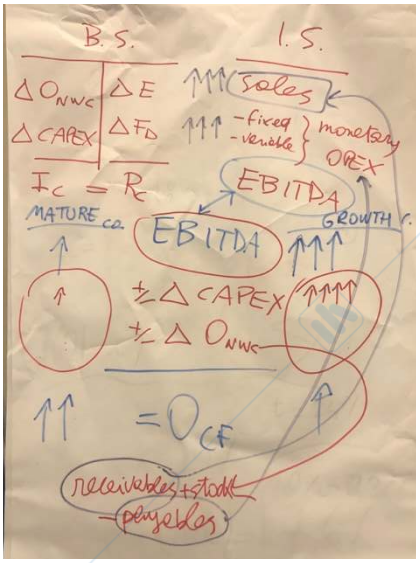
LECTURE 16:

RECAP FROM THE PREVIOUS LESSON: The cost of equity for a company is the return on equity of the investor. They are the same if there are no intermediation transaction costs. So, the cost of equity or the return on equity for the investor are proxied by a dividend return plus a small growth rate. This is an alternative way to calculate the cost of equity. To calculate the cost of equity we can use either the dividend discount model or that capital asset pricing model.

<u>Payout Capacity Depends on Cash Flows</u>

Growth companies with increasing EBITDA absorb cash for financing NWC and CAPEZ. They so have little extra liquidity for dividends. Mature companies, instead, are instead cash cows – you get dividends out of them. A growth company has a high EBITDA, it produces a lot of internal liquidity. But, most of this liquidity will be used to back/finance your investments.

EXAMPLE. In the balance sheet, on one side I have the difference in Operating Net Working Capital and difference in CAPEX (which represents the invested capital), on the other side, I have change in equity and change in financial debt (which represents the raised capital). Then we have to consider the income statement, where we have sales, a mix of fixed and variable costs (monetary OPEX) and we obtain EBITDA. How can I derive operating cash flows? Start from EBITDA and then add/subtract the changes in CAPEX and the changes in ONWC.



Comparison between a cash cow (a mature company) and a growing company (ex. start-ups). A growing company, by definition, has a big increase in the EBITDA. A mature one instead, has a small increase in the EBITDA. But, at the end, I have a greater growth in the mature company compared to the growing one, if I consider the operating cash flow (mature company on the right and growth company on the left). Why is it the case? Something happens with the CAPEX and ONWC – either in one of them or in both of them. A growth company is going to invest more, they have a higher CAPEX. More specifically, they invest more in risky businesses. So, the growing company typically has a higher risk compared to the mature one, leading to a higher the cost of capital in the

denominator. Do I make many investments in a mature company? Not so much. Now we have to analyze the relationship and what happens with the ONWC. Can I say that a growing company tends to generate a higher growth in ONWC than a mature company? When I have an increase in ONWC I have an absorption of cash/liquidity. Where do I generate the ONWC? In the income statement as its main components are: receivables + stock – payables. Receivables and stock are linked to sales and payables to monetary OPEX/purchases. If I have a growth company it means that the EBITDA is going to grow more than the average. This also means that I have a big increase in sales and a big increase in monetary OPEX. Why? Because if sales are increasing also receivables and stock increase. But, you also have to consider that if you have an increase in EBITDA, I have to fuel it using payables, which will also increase. This is going to decrease a bit the overall increase in the ONWC. So, there are two counterforces. But, do they grow at the same rate? Normally they don't. If I have an increase in sales, an increase in monetary OPEX and an increase in EBITDA it means that there is an economic marginality that is expanding. So, sales may grow more than proportionally if compared to monetary OPEX. It is quite normal that if you increase your EBITDA you have to pay something for the increase in the ONWC and in the CAPEX. What happens in the OCF? It depends.

Decompose the Discount Rate

Nominal interest rate 'k' can be split in three constituents:

1. Real interest rate of risk a risk-free bond
2. Expected inflation rate
3. Equity risk premium

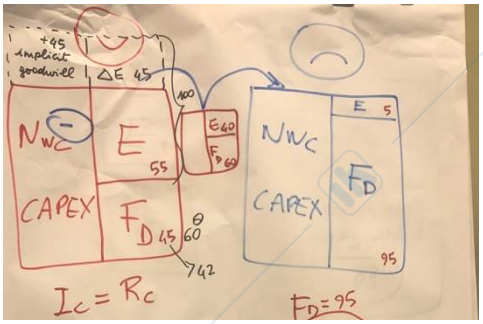
If we sum up points 1 and 2 we get the nominal rate of a risk-free bond.
If we consider the impact of the market interest rates on stocks, we can observe that growing rates tend to turn down stock prices, whose value depends on (riskier) DCF.
Also, we have to calculate the equity risk premium.

Cost of Debt

The cost of debt is going to measure the current cost of debt underwriting and it depends on three variables:

1. The current level of market interest rates (and their yield curve). If I have a risk-free world I just consider the current level of market interest rates.
2. But in the real world, I also have to consider insolvency risk of the firms and
3. Tax benefit associated to debt.

If we increase our leverage (the debt) the risk of default (bankruptcy probability) of the company is going up? Consider the balance sheet of two companies: company A has equity and financial debt of 55/45. In the second case (company B) financial debt is 95 and equity is 5. Consider also that the financial leverage is higher in company B. The second company, with a higher financial leverage, is riskier? Is it more difficult for them to pay back all the debt? How can I normally payback my debt? With liquidity/cash. Where do I get liquidity?



1. EBITDA (internally generated liquidity),
2. With higher debt – asking more money to the banks.
3. Asking money to equity holders.

The blue company has very little equity and a lot of debt: it has to generate a lot of liquidity to pay back the debts. If this is not the case, it does not generate enough internal liquidity (with EBITDA), it is riskier. If you have a cash burn out, meaning that you don't have enough cash to pay back your

debts, and the collateral value of your CAPEX is not big, you can try to ask other money to other banks. Though, they will not give it to you. What is the last final option if I am not able to generate enough money inside the company and I can't ask money to the banks? Shareholders. But, if the company is not going well they will not put additional risky money. They will do so only if they are convinced the company can overcome difficulties. If company A goes bankrupt it is a big issue for the shareholders. This is not the case of company B, they lose a lot less money. So, can I say that the insolvency risk of the firm is going to grow if debt is going up? Yes. So, if I increase the leverage, there is a higher probability growth of insolvency/bankruptcy.
BUT, there is also a positive aspect of increasing debt. If I start from the red company and go to the blue company, my debt is going up. The interest rate (related to debt) is a cost, a negative item in the income statement, but it is going to decrease my tax payments. When I increase my debt (going from the red to the blue company), I two consequences: firstly, I increase the tax savings, but secondly, I increase the probability of default. Which one of these consequences is more powerful? It depends on how you increase debt. Look at the small balance sheet in the middle, where I have a small increase in my leverage (financial debt is 60 and equity is 40). If the small increase in debt is sustainable I do have a proportional tax benefit associated to debt, but I also have a small increase in my default probability. So, if the increase in debt is manageable/sustainable I could have a positive effect in the increase of leverage (because for sure I have a tax benefit and a small increase in the bankruptcy probability). If my increase of debt is exaggerated, then I might encounter difficulties because it is not manageable.

- The Modigliani and Miller depicts a simple scenario, where there is no default risk and no taxation. If this is the case, the WACC is going to remain constant whatever the ratio of financial debt and equity is. In the real world, though, we do have default risk and taxation. So, we have an increase in the risk of debt, but also a benefit. Which one is good? It depends by the cases.

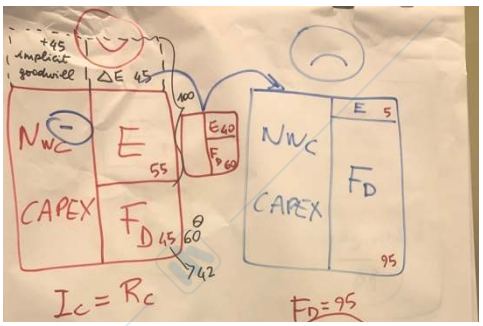
<u>Continue of Cost of Debt</u>

- To calculate the average cost of debt, we must weight its components.
- The average cost of debt has to be represented net of the tax effect. The cost of debt after taxes is the cost of debt before taxes * (1- corporate tax rate).
- The calculation of the tax shield is complicated when the tax base is negative, due to losses.

<u>In the WACC formulation, are the values of equity and financial debt consistent with the book value or the market value?</u>

All firms have a cost of capital: it is expensive to raise money. If it is a cost of capital for a company it is a return on capital for the investor. The investor is going to consider the real rate/market values. So, when I consider cost of capital I have to consider market rates and not book values.
If the book value of financial debt is 45 and the book value of equity is 55, which is going to be the market value? Is debt going to be listed in the stock market? It can be, sometimes corporations can issue corporate bonds. Considering the case of listed debt, can I say that the book value of my corporate bond is 40 and the market value is 45? Strange, but it can happen. Though, in most cases though debt is not listed and it has a nominal value. Consider the following example: the book value of debt, that is not listed, is 45, can I say that the market value is 60? The market value of debt is higher than the book value, which is the consequence? It means that the balance sheet is a fake one: you can't underestimate the market value of debt. The market value of debt cannot be higher than the book value. Considering another case: can I have a real market value of equity that is higher

than the book value? Yes, this is good news. EX. Book value is 55 and market value is 100. This could be the case where the implicit goodwill, that you can't record in the balance sheet, is 45.



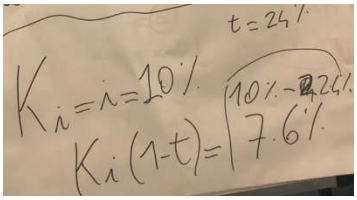
The real weights, in cost of capital, are always belonging to the market value section. Synthesis: in most cases, the book value of debt should be similar to the market value. If the book value (45) is higher than market value (42), can I say that the balance sheet is not a fake one? Yes, but in most cases, we tend to have a situation where the market value of debt corresponds to the book value. Now, let's consider the difference between book value of equity and market value of equity. It is normal that you have a reserve of value that you cannot properly record (implicit goodwill). So, the market value is usually higher than the book value. In conclusion, the present value of cash flows should proxy the market value and not the book value!!

Cost of Debt- formula

$$k_i (1-t)$$

Where, K_i is the negative interest/financial debts. And 't' represents the tax rate.

An example:

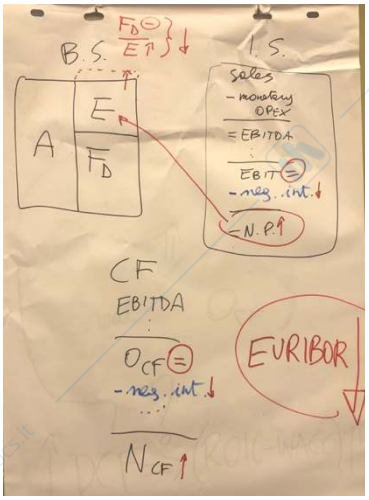


The tax rate changes from country to country. This example shows a saving: the original cost used to be 10%, because I have a tax saving I can reduce it to 7.6%. But, you have to generate a positive gross margin (taxable income) to benefit from this tax shield out of your debt.

Relationship between market interest rates of debt and stock market prices (of listed companies)

Consider the European Central Bank and the American FED.

Which is the trend of interest rates in Europe? They are not going up – interest rates are low. The FED, last year and this year have increased a bit interest rates, now they are going down again. Is there a real autonomy out of the political power? If Trump could decide, would he have interest rates high or low? Low, in order to stimulate business. Now, the interest rates, both in the EU and America are quite low. If interest rates are low or are decreasing, which is the reaction of the stock market prices? Is there any correlation between market interest rates and stock market prices? There an inverse relationship.



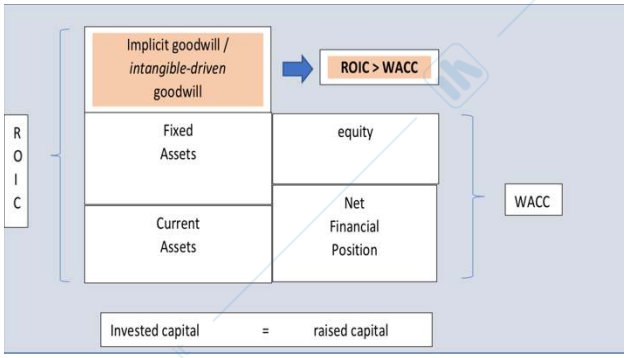
Assume you are a very big and powerful listed company. As a big/powerful company, can you influence the local central bank? If this is the case, it is dangerous. Normally this is not the case. Normally, market interest rates are an exogenous factor (you can't influence them). If this is the case: market interest rates go down and stock market prices go slightly up. Why? Firstly, if market interest rates go down, it will impact the accounting statements (balance sheet, income statement and cash flow statement). I have market interest rates from outside, for example the EURIBOR, that is going down. Which is going to be the impact? If the market rates decrease, also the negative interest rates go down. I have a benefit in my income statement, as my net profit increases. I also have a benefit in my cash flow: I pay out a smaller slice of the cash flow cake, so, net cash flow is going to increase. If my net profit is going up, will my equity grow? Yes, a bit. The

opposite happens if interest rates go up. Observe that the EBIT does not change and neither does the operating cash flow. Which is the impact of this on the financial leverage?

- If the net profit is higher, and you don't pay any dividends the equity is going to increase. So, the ratio between financial debt and equity is going to decrease, as financial debt stays the same and equity increases. This means that the company is slightly more profitable, net cash flows improve a bit. The riskiness of the company is going to decrease a bit. Are these good or bad news for the investor? Good news. As a consequence, the price of the shares goes up. Most of the companies, whenever interest rates go down, are happy because the cost of debt is cheaper. Though banks, are not happy: what for a company is negative interest, for the bank is positive interest (their revenues). Do the banks lend more? They have lower margins but they increase volumes – lending money is risky. So, this strategy might be very dangerous.

There is a second impact of interest rates on stock market prices. Assume you are an investor and you have to decide if you want to invest in bonds or stocks. Which one is better? It depends. Whenever interest rates go down, investors disinvest in bonds and invest more in stocks. This is because stocks are going to benefit, for accounting reasons, on this decrease of interest rates. The second reason is also that bonds are going to have lower returns – they are very linked to interest rates. So, you rebalance your portfolio, decreasing the weight of bonds and increasing that of stocks. This is going to impact on the cost of equity/cost of debt because we do consider market rates.

VALUE CREATION



I have a cost of collecting resources (a cost of raising capital): WACC. I get the resources from banks, investors and shareholders, I invest this capital and I get out some resources. Thus, I have fixed assets, current assets. The return that I have out of my invested capital, is it higher or not to the cost of capital? The difference between ROIC and WACC has to be positive, otherwise you destroy value. If, instead, the return on invest capital is greater than the weighted average cost of capital, it means that you are creating value. The book value of invested capital corresponds to the book value of raised capital. But the market value of invested capital should be higher than the market value of the raised capital. If this is the case ROIC>WACC (I have a positive implicit/intangible goodwill). So, I can use the WACC also in my comparison with return on invest capital, rather than using it only to discount factor in my discounted cash flow formulation.

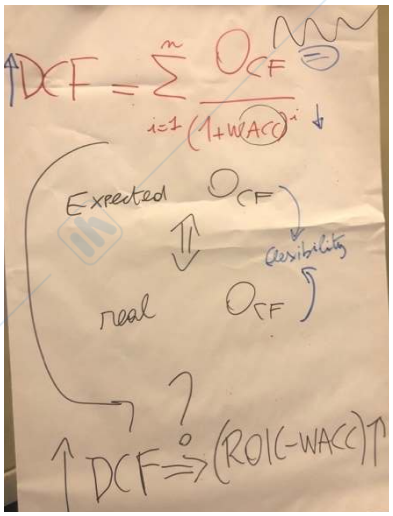
→look at the diagrams at the end of the slides for many complementary representations of Discounted Cash Flows.

CAPITAL BUDGETING

When you do a business plans, it is essential to make comparisons between reality and history expectations. Usually business plans tend to be overoptimistic because a company needs to attract investors. But then you have another issue, is it possible to fix the business plan day after day? Can you adjust it to real life? Yes. Can you do it using Big Data? If this is the case we tend to have a competitive advantage; I am more reactive to the market.

EXAMPLE. We consider in our business plan, discounted operating cash flows. Discounted cash flows are given by the sum of operating cash flows, discounted using the WACC. Why do I have to incorporate risk in this denominator? Because in this denominator I not only have to consider the

time value of money, but I also have to compare expected cash flows with real cash flows. Today I forecast for the next five years, then I have, day after day, real outcomes. With big data I can get statistics in real time/each day. Is there any difference between expectations and reality? If I have a bigger difference between expected and real operating cash flows, expected cash flows are going to be more volatile. If the operating cash flows is really volatile, the risk factor inside the WACC is going to increase or decrease? Increase, to match riskier numerator you need to have a higher denominator (because you pay a higher risk premium). So, if each day I collect data of my sales I can change/adapt the business model day after day. If I use this strategy, the difference between expected and real outcome is going to shrink a bit. So, whenever you have better/quicker/smarter information, and so can incorporate big data to change the business model, you can reduce the difference between expected and real outcomes. This is going to decrease risk, and make the numerator (operating cash flow) less volatile.



If I have the same numerator and a decrease in the denominator. Which is the impact on the DCF? It is going to increase. So, I am making more money. This money initially belongs to banks and whatever is left to the shareholders. If you are good at crunching data in real time you have an economic advantage, if you don't you have an economic disadvantage.

Important words→Resilience: ability to cope with unexpected events. Flexibility is an issue. When you are flexible you tend to reduce the difference between expected and real outcomes. Real options are consistent with flexibility. With real options the model is likely to increase.

Capital Budgeting vs. Capital Rationing

Capital budgeting is a process used to determine whether a long-term investment, such as new machinery etc., are worth the founding of cash. So, it is the forecast of my CAPEX/long-term investments. This is consistent with the ROIC>WACC principle. One of the primary goals of capital budgeting investments is to increase the value of the firm to the shareholders: investing in projects with a better/improved discounted cash flow.

If discounted cash flows go up, the difference between ROIC and WACC increases? Why? If increase my discounted cash flows I have higher OCF. If I have higher OCF, do I have an improvement in the balance sheet? Eventually yes. → If discounted operating cash flows goes up, which is the impact on the difference between ROIC and WACC?

What is capital rationing? We have two worlds: the ideal one and the real one. In the ideal one we have no problems, no issues, no constraints, no taxes, no risk, no transaction costs. In this ideal world we can say that if I have an investment with a positive operating DCF I am always able to find someone that is willing to finance this investment. Which kind of investors? Banks and shareholders (because operating cash flow is the cash belonging to banks and then shareholders). In other words, I should never have any problems of capital rationing. What does capital rationing mean? There is not enough money. Can we have lack of money (capital rationing) even in presence of good investments? Yes, if the market is not perfect/efficient.

Summary: Capital budgeting is concerned about the assets, especially CAPEX. Capital rationing is how to combine assets with the raised capital. So, capital budgeting and capital rationing have to be considered together.

LECTURE 17:

→ Alpha exercise. Play with numbers and make comparisons. EX. What if the cost of equity, in the case without taxes, is not 22.2% but it is 12.12% (lower than the cost of equity). See what happens

with a decreasing cost of equity. If it so, you would have to also adjust also the income statement and balance sheet. In the excel file you see that the cost of debt is higher than the cost of equity, look at how things change if it were the opposite (cost of equity > cost of debt).

Capital Budgeting and Capital Rationing

Capital budgeting is the way to assess to make an investment appraisal of long-term investments, in order to calculate the expected cash flows and to detect if they are profitable (worth undertaking). We also have capital rationing. When you have an investment with a positive expected return you should always be able to find money to back it. In many cases this does not happen and there are capital rationing issues. There is a difference between capital rationing in different states of the world. Comparing cash cow companies and start-ups, which one is more likely to have capital rationing problems? The start-up because cash flows are not stable, they are very volatile. So, start-ups firms/growth companies/ companies with volatile business are more likely to have capital rationing issues and problems. Though, growth companies are more likely to have good results, so, there is no matching between expectations and money.

In 2019, do we have a lot of liquidity in the world? Yes. The world is overall growing in these years, so there is a lot of liquidity in the market. This is why stock markets are growing: people want to invest in assets. If there is liquidity around is it because central banks print money? If a CB prints a lot of money/cash than inflation is going up: if you have more money to spend prices go up and there is an increase in demand and supply. The target of inflation of the ECB is 2%, though it is currently lower than 1%. So, if ECB prints more money they increase inflation and they can also put additional money within the market. The monetary policy of the ECB is: put liquidity inside the European market. How? The ECB is going to buy treasury bills and treasury bonds from the governments and this is going to give liquidity to the states (the states sell a bond and get cash). They are also trying to have a discount rate that is very low with banks – they are transmitting money from the CE to bank intermediaries. Bank intermediaries should give this money to the corporations. If this monetary chain process works, money is transmitted from the CE to the real economy (corporations and consumers). If this is the case, we have a mitigation of capital rationing (we have more money available for investments). What happens in many cases? This chain does not work properly: money that is received by the banks stays there. What do we normally have in a bank's balance sheet asset side? Cash, accounts receivable/lent money (money that you lend), and investments in corporate bonds. Thus, banks get money from depositors/shareholders and instead of lending money to the people/corporations they buy government bonds. In this way, the circulation of the monetary policy is not optimal. If this is the case, there are capital rationing issues. Why do banks prefer to buy safe bonds rather than lending money? It is safer/less risky.

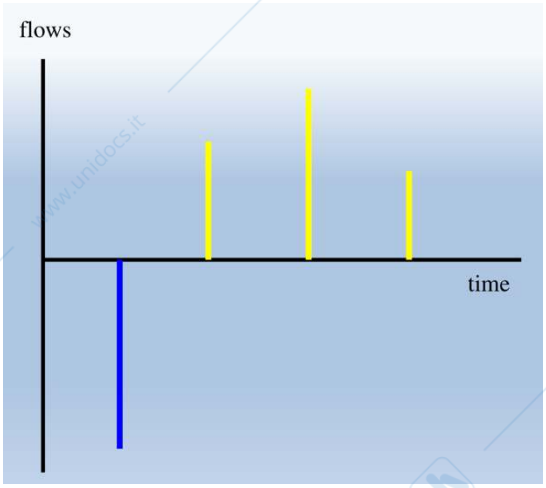
Consider the Italian Stock Exchange, it is strongly dependent on banks. Italian banks are full of government bonds. What happens if the Italian spread goes up? The value of the government bonds/price goes down. If it goes down, the balance sheet of the banks that have a lot of government bonds is going to be worse. If the balance sheet of the banks is worse, and they are listed in the stock exchange, the stock market prices go down. If the stock market price goes down, there might be a negative spiral. This can be dangerous, as it was during the Greek Crisis that could have affected Italy. But, Germany is much stronger than Greece and Italy, also Germans invested a lot in the Greek Banks. This example shows that markets are very connected: the balance sheet of the bank is connected to the government bond, which is connected to the stability and spread of a government, which is connected to the stock exchange. If you have a brank crisis, banks may be forced to cover the losses selling government bonds, if you sell them the prices go down. This shows a complicated scenario with a lot of chained events. This might bring up a capital rationing process.

VIVIA MARCHI

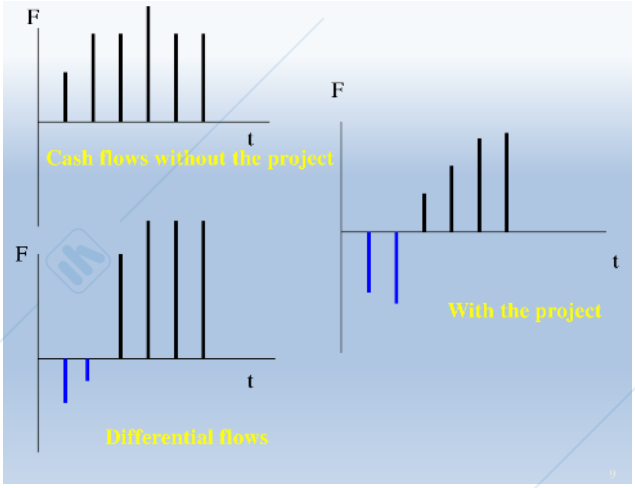
Another example. Consider Bolivia: assume that in Bolivia you have debt for companies (you need money for capital budgeting purposes). When the dollar gets stronger against the Bolivian currency, it might have capital rationing issues. Why? Because you have to pay back debt in a foreign currency that is going to appreciate against the local currency. When the dollar is weak, Bolivians are happy. This phenomenon is not strong in Europe, because there is a common currency: the Euro. But, when you have a local currency it might be easier or more difficult to pay back foreign money with a hard currency tax rate. This might start a process of capital rationing.
Think about capital rationing with an international perspective. These are two very different examples: Italian listed banks investing in government bonds and Bolivian company that is getting a loan in local currency/dollars. Another example is Turkey, which is a very strong economy, but it has some problems: Turkish banks are quite weak. When you have an infrastructure investment in Turkey, you go to the bank to ask for money. If it a local bank they might not have enough money, if you go to a foreign bank they have to change the Turkish currency against the euro or dollar, and if the exchange rate goes down it is an issue.
Bill Gates and Paul Allen are an example of two start-uppers that made a lot of money, but banks did not lend them money. This is an example of capital rationing.

Asset-based VS. Cash-flow based Guarantees

Assent-based guarantees follow the collateral value of assets (typically negligible with intangibles). Instead cash-flow based means that: assume I am a corporation, with normal balance sheet: assets (CAPEX with intangibles, ONWC and liquidity), equity and financial debt. The banks, when they lend money need to show that the corporation is able to generate, in the future, enough cash flows (operating cash flows) to pay back my debt (the principal and interest rates). If you demonstrate that you are able to generate enough cash flows, the banks will give you the loan.



In this representation we have a negative blue histogram and three positive yellow histograms. If you sum them up, the result will be positive or negative?
You have to discount the future. If the discount rate is a small, it is likely that the net cash flow is going to be positive.
Net Present Value: is the present value of the 'yellow cash flows' net of the initial investment. If the discount rate is limited, overall I have a positive net present value, but if it is very big (because I have a high risk) then I might have a net present value that is negative. The golden rule is to accept and investment whose net present value is positive and to reject it if the NPV is negative. So, we do not only have to consider the cash flows (numerator) but also the discount factors (denominator). Does the discount factor have a break-even? Is there any discount factor that is going to make the sum (NPV) corresponding to zero? EX. Is there any discount factor than makes the net present value corresponding to zero? If the discount factor is 5% the net present value is positive, if the discount factor is 40% the net present value is going to be negative. Is there a discount factor that makes the net present value corresponding to zero? Yes, the IRR. This is a discount rate that makes the NPV corresponding to zero. These are the two most common ways to assess a capital budgeting process.



If you add up the project, to the cash flows without the project, you obtain the differential flows. If you add up the project, you have an initial investment and then you have some maintenance costs.

Net Present Value

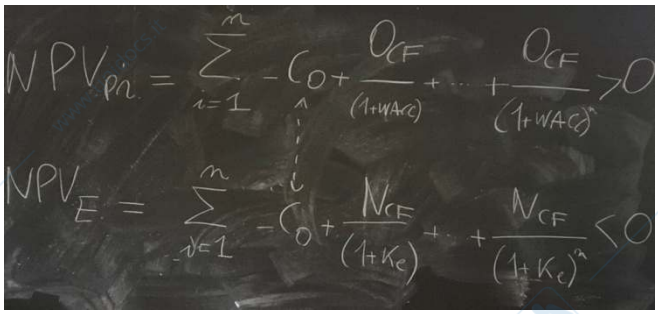
You initially have the initial cash flows (that is normally negative) and then you have cash flows in the numerator and a discount rate in the denominator, according to time.

$$NPV = C_0 + \frac{C_1}{(1+r)} + \frac{C_2}{(1+r)^2} + \cdots + \frac{C_t}{(1+r)^t}$$

Cash Flows — Discount Rate — Time

Which kind of cash flow do I have in the numerator? Operating cash flows or net cash flows? Both of them. You can have a Project Net Present Value or an Equity/Residual Net Present Value. First of all, you want to see if the project has a positive net present value concerning the overall firm (all the raised capital: banks, financial lenders and equity holders). As a second option, you might also need to know what belongs residually to the equity holders.

Is it possible to have an investment with a positive net present value of the project and a negative net present value of equity?



What happens in this case? Would you undertake this project? You generate enough cash flow to pay back the debt of the bank (there are enough operating cash flows, incorporating risk in the discount factor). Though, shareholders/ equity holders are not going to make money. So, can we say that even the banks are really going to be happy? The shareholders are those that are going to decide whether to undertake or not the project. The bank may say, if I am happy but shareholders are not it means that they are not going to undertake the project. Thus, I need both positive situations to really undertake the project.

→ *be able to justify, with numbers, this case. When does it happen to have this kind of difference?*

You can have two different kinds of net present value, for the project and for the equity. Can you also have two different IRR, of the project and of the equity? Yes, because they are break-even rate that makes the overall net present value corresponding to zero. Thus, we have an IRR of the project or of the equity.

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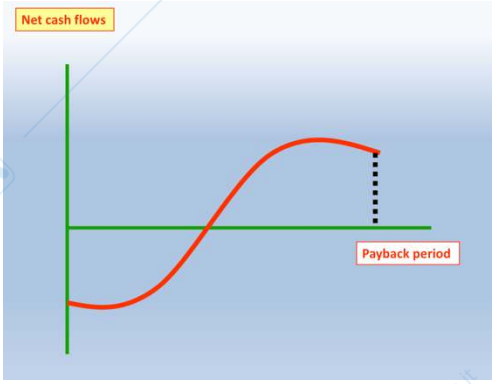
GOLDEN RULE: accept the project when the NPV is greater than zero or reject it when the NPV is negative. This is a general rule, but we have to have both (project and equity NPV) positive.

Net Present Value 'SWOT'

- "Cash flows are better than earnings." What does it mean? From an accounting perspective, is it really so? Not necessarily: cash flows may be even more volatile than earnings because they derive out of earnings (starting from EBITDA) but they you incorporate in the model even the changes in the NWC, CAPEX, debt service, etc. But, cash flows have a better informative power. Cash flows are more meaningful. This is why cash flows are better than earnings.
- "Other approached ignore cash flows beyond a certain date."
- "Fully incorporates the time value of money". But, also risk.

The Payback Period Method- complementary to the NPV or IRR

"How long does it take till I earn my money back?" You make an investment, you cash out 100. How much do I have to wait to get my money back? It is a sort of periodical break-even time. This methodology is going to also be used in a complementary way. I can accept the project if the payback period is lower than my benchmark, or reject it if it is greater than my benchmark. Also, I can have a graphical representation: to start up the investment I have negative cash flows, then I collect cash in, and then I have a payback period.



There are weaknesses with this methodology:

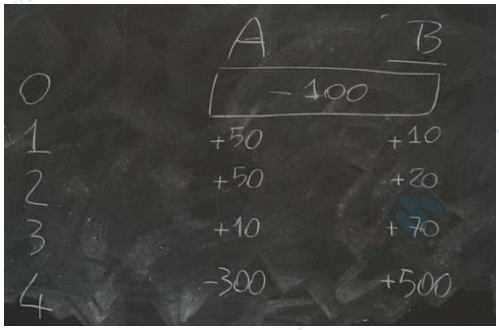
- Timing of cash flows might matter
- Payments after the payback are an issue
- There is an arbitrary standard for the payback period

There are also some strengths:

- Very small-scale investments.
- Firms with very strong capital rationing may be very interested in understanding how to assess the payback. If I have a capital rationing issue, the shorter the payback period the better it is.
- Exceptionally simple to understand.

Considering the EXAMPLE on the slides. There are two weaknesses: Firstly, with this method I don't consider what is happening after 'I earn my money back.' But, it could actually be meaningful. Secondly, it is likely that these values/figures are not discounted. If I discount future cash flows, the payback period is going to increase or shorten? If I discount the figures become smaller, and if they are smaller it means it will take me more time to reach break-even. The bigger the discount factor the longer the period to get my money back.

EX. We have two projects: A and B, through 4 years. We have a negative cash flow in the first year, that is the same for both projects. Assuming that the further values already incorporate the time value of money (so they are already discounted). I have two alternative investments: either I chose A or B.



We have the same negative initial investment (-100). Then we want to select the best project applying the best payback period, already discounted (the discount factor is incorporated in the cash flow). Which one do I choose according to the payback period? A, where you have a break-even point after 2 years. In B, you have a break-even point of 3 years. But, would you really choose project A? No, because in the B project it takes a bit longer to get to the break-even but then it is going to be very profitable. It is a negative side of the payback period method; you don't consider what happens after the break-even point. This is why, this methodology alone is not enough. There can be distortions if you just apply this kind of methodology.

Average Accounting Return Method

We can have the average accounting return considering the average net income (coming from the income statement) divided by the average investment. I can have a benchmark with a target return: ARR > target return: I accept, ARR < target return: I reject.

The Internal Rate of Return

In the numerator we have a cash flow. For now, we don't have a formal distinction between operating or net cash flow. Also, in this model I have to incorporate time value of money and risk.

Cash Outflow

$$0 = -C_0 + \frac{C_1}{1+\text{IRR}} + \frac{C_2}{(1+\text{IRR})^2} + \cdots + \frac{C_t}{(1+\text{IRR})^t}$$

There is always an exact percentage (interest rate) that makes the net present value of the overall investment exactly equal to zero. EX. If the discount rate is 2% I have a positive NPV, if the discount rate is 8% (with the same numerator/cash flow) I still have a positive, but much smaller NPV. If the discount rate is 10% I have a negative NPV. Thus, which is the IRR? A percentage that is higher than 8% and lower than 10%. The interest rate that makes the overall NPV corresponding to zero is the IRR. It can be referring to operating cash flows or net cash flows.

Furthermore, you accept the investment if the IRR is greater than the target return, you reject it is IRR < target return. Consider the NPV of the project and the IRR of the project. The benchmark are operating cash flows that are discounted using the WACC. I have NPV of my project that is corresponds to: minus the initial investment plus the sum of operating cash flows divided by WACC. Then, I have another case: I just increase the WACC while the initial investment and the stream of operating cash flows remain the same. If the WACC goes up then I have a break-even WACC when the NPV corresponds to zero. Can I say that if this is the case, WACC corresponds to IRR? Yes. If the discount rate (WACC) corresponds to the IRR then I have an overall NPV that is corresponding to zero. If instead, I have a positive NPV it means that the WACC is lower than IRR. Why is the benchmark of the IRR, that is the rate that makes NPV corresponding to zero, so important? Because I have to make a final comparison with my WACC (if I consider operating cash flows) or cost of equity (if I consider net cash flows). In all of these cases we say that if WACC < IRR I always have an investment with a positive NPV. The WACC is the cost of collecting capital in the market, if this cost is lower than IRR the NPV is positive and the investment is a good one.

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LECTURE 18:

Is it possible to have a company where the EBIT and the operating cash flow are positive and the net result and net cash flow is negative? Yes, if we have something in the middle whose sum is negative (I pay back a lot of debt).

BANKABILITY. In theory, any project with a positive NPV should be undertaken. Unless I have a capital rationing issue. In some real cases, even if the project is in theory a good one (with a positive NPV) banks say no. Why? You have to convince banks, because they might have their own problems ex. they might have invested too much in a specific industry. You have to create an elastic/flexible model where you can incorporate big data daily. To convince banks you have to have good capital budgeting, smart business planning, you have to back all the numbers you calculated, you have to do some sensitivity analysis. If the model you are going to create flexible or not? Can you incorporate big data in the model?

IRR – internal rate of return

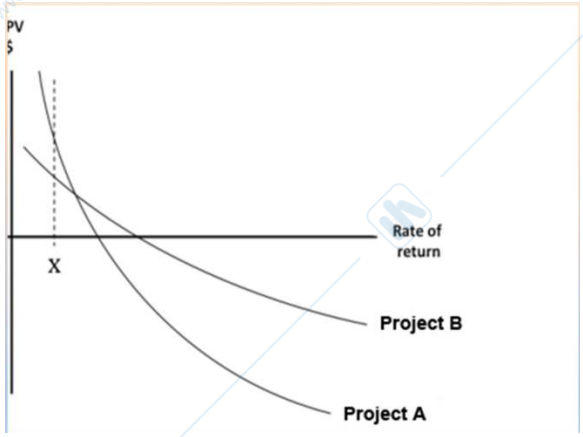
The IRR is a sort of break-even rate. I accept the project if the IRR is greater than target return expressed by either the WACC or Cost of equity. I have a cash outflow at time 0 of -200. The following three years I have a cash inflow of 100. Is the NPV positive? It depends on the discount factor. When we talk about the cost of capital we have to compare it to the opportunity cost of capital. I am an external investor, either I invest in project A or in project B (I don't have money for both). The investment has an internal rate of return of return of 40% instead of 23%. Which one do I undertake? The one with the greatest IRR. If the IRR is high it means that also the NPV is growing because you need a higher rate to make it corresponding to zero. When you have two investments the IRR is a performance indicator. Is it normal to have an IRR of 23%? If you compare it to market interest rates it would not (20% is too much if you compare it to normal bank rates). But if in the investment you incorporate risk, ex. you invest in a start-up, an IRR above 20% is normal. Because you incorporate a higher risk. Why is the IRR so big? Because of the investments you undertake not all are going to be successful. So, when you consider investment you don't only compare it with the external cost of capital, but also with opportunity alternative investments.

Why a high IRR is good? Because if the IRR is very high (ex.40%) then any cost of capital under 40% gives a positive NPV. Example. To calculate the NPV I have a discount factor and I compare it with the IRR. If the IRR is 40%, even with a rate of 30% I have a positive NPV. If the discount rate is lower than the IRR then I have a positive NPV. If the discount factor is going down the NPV goes up. EX.

Discount Factor	NPV
40%	0
30%	+1,500
20%	+2,500

- If the IRR > WACC I create value, if the IRR < WACC I destroy value. Value is not created nor destroyed if the IRR = WACC.

Two alternative projects/investments with different IRR: which one would you undertake?



Project B has a higher IRR compared to A. I cannot undertake both because I don't have enough money. I either have to undertake project A or project B. Initially, I might say that I prefer B because it has a higher IRR. What does it mean? The discount factor in the denominator that makes the project equal to zero is bigger, so, it is easier to find external money at a cost that is lower than the IRR.
Consider also the slope of the two curves. If the cost of capital is going to be low (at point X) I prefer project A, because even if the IRR is lower the NPV is greater for low discount factors.
This shows that the IRR can have some "issues/side-effects".

REAL OPTIONS (slides):
Sensitivity Analysis and Scenario Analysis
Sensitivity refers to the fact that only one parameter at a time changes at a time. EX. I have NPV and only the discount rate OR the cash flow changes, one at a time. It is really used in business planning because whenever you have a business plan you usually prepare the best scenario and the worst scenario: I can have average case, best case and then the worst case.
I have scenario analysis when I change more than one parameter at a time simultaneously – it might be difficult to model. The scenario analysis takes in consideration the fact that life is uncertain; there is a big difference between expectations and reality.

QUESTION:
Which is more volatile in the present value formula (the numerator or the denominator)? Cash flows are very volatile, this is why we might use decision trees or binomial trees to mentor the future possible outcomes of cash flows. The numerator can be very volatile. What happens to the denominator? The denominator is the discount factor that I need to use to model the volatility of the numerator. Can I say that if the cash flows are more volatile I have to increase the discount factor in the denominator? Yes, there is a risk and return proportionality. In the real life, when I have a very volatile in the numerator I have to be consistent in the denominator with a similar volatility in the discount factor.

Real Options:
Consider the formula of the NPV. Assume I have already prepared my business plan, but in year 2 something is happening. If I understand that something is happening, am I able to change the future cash flows to re-adjust my business plan? Can I readjust my cash flows after time?
If you prepare a static business plan you can be misplaced by reality. You have to be flexible.
Which one is better? Top-down or bottom-up? If we merge a bit top-down and bottom-up it should be the most efficient solution – it is going to improve our information set. We can reduce the distance between expected cash flows and real cash flows; we can readjust our forecast.

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(week 7)

LECTURE 19:

OPTIMAL CAPITAL STRUCUTRE: According to M&M the value of a company depends on discounted cash flows. Since we consider the value of the whole raised capital, these cash flows are going to be operating cash flows. So, the value of the company corresponds to the sum of the operating cash flows, discounted with the WACC. If we change the financial leverage, do we have an impact on the discounted cash flow? According to Modigliani and Miller the composition of financial leverage does not affect the discounted cash flow. The numerator of the discounted cash flow is not affected by a change in the financial leverage. But does a change in the financial leverage impact the WACC?
Can I create or not value/money in a financial way?

Risk is higher if leverage is higher? Not always true. If I increase financial leverage do I also increase risk? EXAMPLES. I have a company (A) that only has a patent in the assets side (100), equity is 50 and financial debt is 50. Then I have another company (B) where in my assets I only have cash (100) and then I have equity (5) and financial debt (95). In company B I have cash to payback my debt – the patent is riskier than cash.

Can we affect the value of a corporation just changing the financial leverage?
If I have a change in the financial leverage is it going to affect the discounted cash flows?

QUESTION A. Do I affect the market value of a company, just changing the financial leverage of the company?
QUESTION B. If I pay more or less dividends (changing the dividend policy), do I affect the market value of a company?

What is the difference between WACC and ROIC? They might be the same. We have a standard corporation with equity, financial debt and assets where invested capital corresponds to raised capital. Out of my assets I have return on invested capital. WACC instead comes from equity and financial debt. When ROIC is greater than WACC I create value, otherwise I destroy value.

HOW CAN WE IMPROVE EBITDA? With scalability, etc.
How can you improve discounted cash flow?

- You can improve denominator and keep constant the numerator.
- You can improve the numerator and keep constant the denominator.
- Or, you can increase the numerator and decrease the denominator.

When I increase my financial leverage, I have a tax benefit but I also have a penalty for a higher probability of default. The taxable amount has to be positive, otherwise you have a benefit that you cannot exploit.

Invest money and build up a company, but do not have enough managerial competences. What happens here? You have to establish a relationship: you cannot run the company without them and they need you. You have to reach an agreement. But there is a conflict of interest between principal and agents – unless you settle it, it is going to be a problem.
Conflict of interest that might arise in the real life, outside the M&M theory. If we increase too much the leverage, banks are not going to be happy. Assume that you a manager, do you prefer to invest in risky assets or safe ones? Safe (less likely the company is going on default). This is what you call the underinvestment problem. Is there any form of alliance between shareholders and banks? Do they have a similar target? Who is going to run the company? The managers.

LECTURE 20:

According to *Modigliani and Miller proposition I* we are in a situation where we do not pay taxes, we have no conflict of interest, no bankruptcy cost, no agency costs, etc. In this case, according to M&MI, value is given by the discounted sum of operating cash flows. According to this proposition, we can say that the capital structure (ratio between financial debt and equity – financial leverage) does not have any influence on the market value of the company. You cannot increase or decrease the value of the company by just changing the proportion between financial debt and equity.

EXAMPLE: COMPANY A has assets that are 100, equity that is 50 and financial debt that is 50. COMPANY B has assets 100, financial debt 80 and equity 20. In the case of company A, the financial leverage (financial debt/equity) is 1, in Company B it is 4. So, it goes from 1 to 4. Which is the impact on the operating cash flow and on the WACC? We have to link these different financial structures to the operating cash flow: Start from EBITDA plus or minus the change in ONWC plus or minus the change in CAPEX resulting in Operating cash flow, then I have the debt services and eventually I have the Net cash flow. Any change in the proportion between financial debt and equity is not going to affect operating cash flow, because this change is going to affect what we find below the operating cash flow (it affects the net cash flow). This explanation relates to the numerator. What about the denominator? It also does not change, because whenever I increase financial leverage I proportionally increase the cost of debt but I decrease the cost of equity. So, in weighted terms they might remain the same. If this is the case then we might say that any change in the financial structure is not going to affect discounted operating cash flows. In other words, the value of the company is not affected by corporate finance decisions about the proportion between financial debt and equity represented by the financial leverage.
Modigliani and Miller II instead refers to the profitability equation.

What happens when we include *taxation*? The value of a leveled company corresponds to the basic value – starting point – of an unlevered company and we add up a benefit out of taxation (what we call tax shield). The leveled company is worth more than the unleveled company thanks to the tax shield, only if we do not consider any agency cost of debt such as bankruptcy cost. These agency costs grow together with leverage.

What if we introduce the *financial theory of agency*? According to this theory there is a conflict of interest between shareholders and debt holders because they have a different kind of interest, they have different targets. There are implications of this cost on the WACC (the cost of debt and the cost of equity). The formula of the WACC= $K_e * \frac{E}{E+D} + K_i (1-t) * \frac{D}{E+D}$. Are we going to have a change/an impact on the WACC given by the conflict of interest between shareholders, debtholders and managers? If in the company there is a strong disagreement there has to be an impact on the cost of capital (on the WACC). In M&M we don't have this issue, it is a perfect world with no agency costs. But when we are in the real life, we have to consider agency costs. Conflicts of interest are going to increase the WACC formula, which is the denominator of our discounted cash flow. So, as the denominator increases the DCF decreases – they destroy value. Though, how can we measure and understand the exact consequence of conflicts of interest within the company? If you are a very troubled company and you go to the bank they may ask for a higher spread (compared to a quite company). This can be a comparable benchmark between a safe and troubled company. But, it is not easy to give a full measure of the conflict of interest. The best way is to prevent it having corporate governance rules, to put them in force and to monitor them.

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The *Optimal Capital Structure* is the structure that maximizes the overall firm value, incorporating agency costs, or, that minimizes the WACC considering these implicit costs. There is an Agent-Principal theory, an agent performs a role and gets a payment/a reward. There might be some information asymmetries. Who incorporates the information asymmetries? In most cases it is the manager, the one that runs the company every day – the shareholder may be distant. The shareholder delegates the management to a manager/an agent – the agent knows about the company as he is there every day. So, there might be an asymmetry. In some peculiar cases, it might be a shareholder, ex. they might know in advance if there will be an equity increase, the shareholder might want to sell the business and does not tell the manager, the shareholder wants to fire the manager and the manager does not know.
It is important to understand how to minimize conflicts? How to prevent problems? Problems are given by information asymmetries. Can we reduce information asymmetries thanks to digitalization/technology? In principal yes, but other problems might be generated such as fake news – we solve some problems but we might have additional ones.
Assume someone is appointed as an agent (a manager of a company), it has a fixed payroll and a bonus (premium) that is linked to the results of the company. If the result of the company is good, it is difficult to understand if they depend on the agent's effort or are due to external circumstances. Lack of information (information asymmetries) generate inefficiencies in the exchange mechanism. We have incentives that are linked to performance.

- Pay for performance/Results based financing. Is it effective? Does it work to given an incentive to the manager to perform in an efficient way? We always need incentives, they are very important. Pay for performance can work, if you are successful in your program then you might have huge savings. Pay for performance means that if you reach a target then you get an incentive. If we use this kind of remuneration, maybe you can reduce conflicts of interest and can monitor in a better way the outcome of projects. You will also convince managers to send out information. The main question: if you use Pay for Performance, are you going to reduce the cost of capital, since you have a better use of resources? The answer should be yes but it is not easy to have a measurement of this effect.

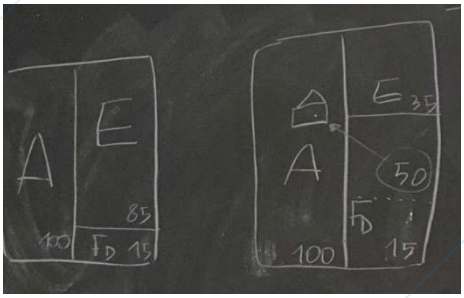
Assume there is an information asymmetry, and I am the insider manager of the company. Do I have an incentive or not to communicate the ongoing of the company to the shareholders and the outside world? Yes and No. You might not want to give to the competitors a clue of your strategies. But also, assume you have a relationship with the shareholder (not the outside world) you may be reluctant to give information (as a manager) because you don't want to be monitored – give an information and be checked on the outcome. But this might be a problem, because if the manager does not give feedback the shareholder can decide to not put money in the company. Mangers and shareholder need to find a compromise. If they don't, managers are not getting any money to run the company as shareholders are not going to trust them. So, within a company, information asymmetries have to decrease. It is important to link these concepts to two parameters: operating cash flow (numerator) and cost of capital (WACC in the denominator). Can we say that if we reduce information asymmetries, the company is about to become safer, and so can decrease its cost of capital? Yes, in general terms but it depends on the context.

We can also have conflict of interest between shareholders and creditors, not only between shareholders and managers. Between shareholders and creditors, conflicts of interest may arise when the former that through the shareholders meeting appoint the board of directors, make decisions that may harm creditors.

- Maximization of pay-out to shareholders, distributing generous dividends. I pay out a lot cash to shareholders and I leave little if any cash to run the company and to serve properly debt.

- Increase leverage.
- Sell out sale assets
- Increase compensation or fringe benefits to the directors (that often are shareholders).
- I can get risky investments. EX. invest 100% of my assets in a patent, that may work or many not work.
- Renounce to profitable investments (if the proceeds go only to creditors).
- In-taking of new privileged debt after unsecured debt.

EXAMPLE of the last point. I have a company with no debt, the raised capital is only equity. Is it easy to raise debt? It might be easy, so I get on some debt. If it is small it can also be unsecured (no guarantees). Assume that then I want to increase my leverage, I start from a situation of assets (100), financial debt (15) and equity (85) and I increase it becoming 65 (financial debt) and 35 (equity). Since I underwrite new debt, the new underwriters may say that they want a specific guarantee on the company's assets. So, I split the financial debt in two parts: 50 and 15. The 50 represents the new financial debt. My assets are 100, but in order to convince the new banks to underwrite the new debt I can say that this additional 50 will be secured with a guarantee on my real estate property. Which is the consequence on the first debt underwriters? There is a double damage because in the beginning they were the only underwriters of debt and leverage was very low, but then debt is going up consistently (from 15% to 65%) and the new debt is going to be secured.



In the first case the company was going to use the 100 of assets to pay back debt (it was a small proportion). In the second case, instead debt has increased and you pay with the bulk of the assets the secured debt, if and only if you pay the unsecured debt. To prevent this kind of occurrence, you may introduce a debt covenant: preventing the company from issuing new debt if the former creditor does not agree.

Is it more expensive (riskier) to collect unsecured 15 or secured 50? The unsecured 15 is riskier. So, since I have to consider cost of debt in the WACC, when I have two costs of debt (example: one is 10% and the other is 14%) then I have to consider a weighted average. This shows that I can have a difference even within the cost of debt – it is due because I might intake new provided debt after unsecured debt.

In synthesis (slide 37), companies with higher discretionary assets (riskier assets) should minimize leverage and shorten their debt maturity. What does it mean? If my assets are very volatile I have to balance always considering in a joint way my assets and my liabilities. Is your leverage too high too much? You have to consider not only the financial leverage (financial debt/equity) but also the composition and the quality of the assets. Example: company with small equity, big debt but all the assets represented by cash (safe assets). So, the composition of the assets is also important. And the degree of risk can be very different. Can I say that long-term debt has a higher cost of capital? It depends on the yield curve. If we have a situation where the yield curve is positively sloped the return are going to increase according to time – the longer the distance the higher the return rate promised. For the cost of debt, as we differentiated between junior (unsecured) and senior (secured) debt we also have to distinguish between short- term and long-term maturity. The longer the maturity, the higher the risk. If risk is high we have to incorporate it in the discounted cash flow. Assume I want to match long-term investment (CAPEX) with long-term debt. I have to prepare forecasts of my business plan and the cash flow statement analysis, then an equilibrium between cash inflows and cash outflows. I have to be able to match cash inflows and cash outflows, also on the long-run, in order to keep an equilibrium.

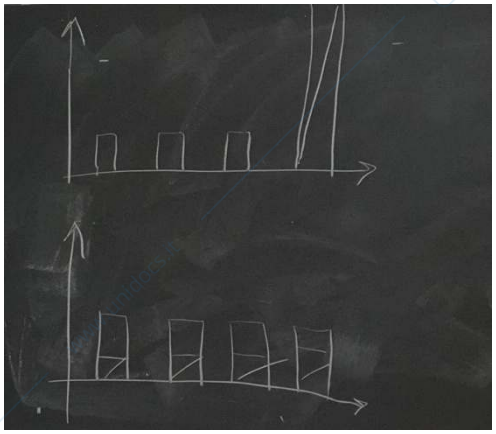
VIVIA MARCHI

Complex financial contracts as a solution to agency problems

If the conflict of interest among stakeholders are complex to deal, I have to introduce sophisticated financial contracts to put them in force and to monitor them continuously. In some cases, to reduce conflicts, companies may issue hybrid debt (convertible bonds or cum warrants) or stock options, so that creditors can participate to value sharing if things go well. What does it mean? Example: a big investment in assets with very small equity. Assume investment can go to 5000, 80, or zero. There is a scenario of 1/3 for each kind of option. To convince the banks and other financial creditors to underwrite the borrowing, I must give them a stake (in the company, in the returns) in case the business goes well. Which is the problem of bankers? They don't have a real risk-and-return profit (risk can be shared with equity holders but if things go well they don't get nay bonus). This is why I might issue convertible bonds. So, this issue of convertible bonds can shorten or eliminate conflicts.

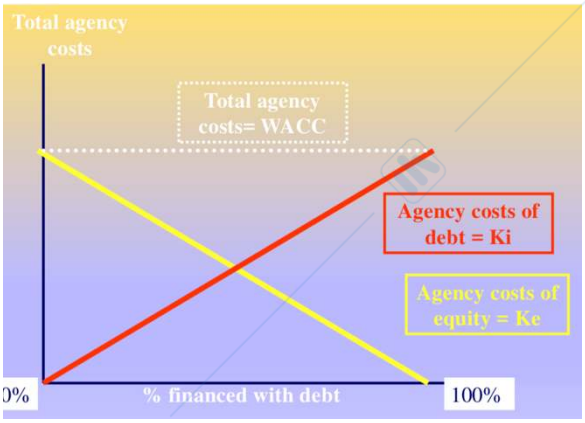
According to Jensen & Meckling Model rational investors are aware of the conflict interests of the debtholders and so debt is going to fully discount this conflict of interest. If I have a strong information asymmetry between the managers and creditors it is a problem – the cost of capital is going to increase, reducing the discounted value of the company. In order to soften this issue we can disclose, as managers, some information to the market or at least to the debtholders and shareholders.

There are conflicts even between short- and long-term creditors: when the equity is negative and shareholders do not recapitalize the company (do not underwrite new equity), short term creditors can continue to finance the company, so avoiding bankruptcy, if their debt is periodically paid back. Also, to avoid these problems, long term debt may have a repayment schedule where capital is paid back at regular installments, avoiding a bullet final payment.

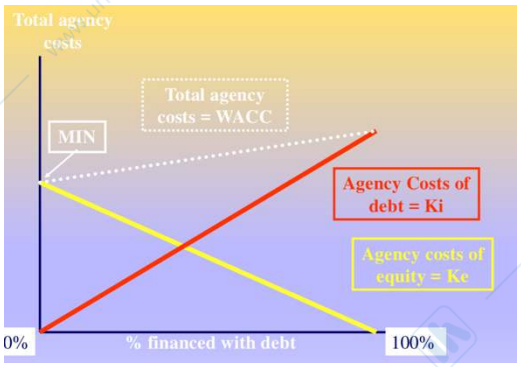


Which is the best solution/safest for the banks? And for the company? Normally corporations prefer the first one. Assume I am making a big investment now and I can cash in the proceeds after 3 years and a half (when I have the money to pay back by bullet loan). With the second pattern, I don't have enough money before the real start-up of the investment. Can I design the structure of my debt according to the necessities of my assets? Yes. The raised capital has to balance the assets. Which is the best way to finance your operations? A bullet repayment at the end or a balanced structure. In the first case (a bullet repayment) it is going to be riskier for the banks, also because the duration of these cash flows is higher. This first case is more sensitive to changes in market interest rates. This is why we have to compensate this riskier situation with additional guarantees.

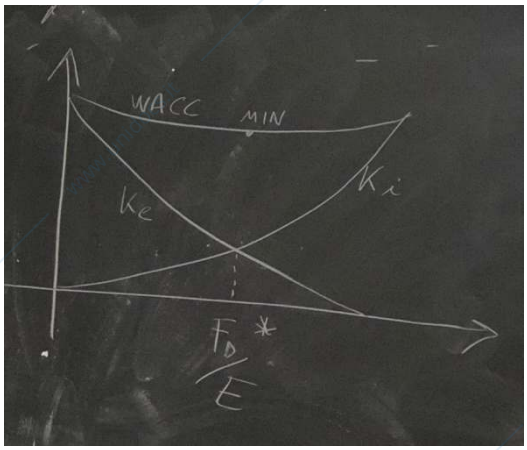
STANDARD SITUATION- consistent with a Modigliani and Miller world, where I can change the balance of my equity and financial debt (horizontal axis) and the weighted average cost of capital (represented by the dotted line) does not change. The final target is to show that the overall WACC does not change, but we can/do have changes internally that are compensated. Modigliani and Miller proposition I says that when we increase debt we transfer risk from the equity holder (yellow line) to the debt holders. If this is the case the denominator of the discounted cash flow is not going to be affected by the financial structure of the company. So, financial structure does not have any positive or negative impact on the overall market value of the company.



SECOND SITUATION- not a Modigliani and Miller ideal context. Marginal cost associate to the issue of debt and equity are variable. Marginal cost of equity < marginal cost of debt (debt is riskier than equity). If this is the case companies might have an incentive in having a completely unleveraged company because the corner (MIN) is where we can minimize the WACC. The corner (MIN) is a situation that shows that WACC is only composed of cost of equity. If I have this situation, which are the consequences? Cost of equity corresponds to WACC. Is there any difference between operating and net cash flows? No. in the income statement is there any difference between the EBIT and the Net profit? No. There is nothing left for bondholders are they are not there – everything belongs to the equity holders.



THIRD SITUATION – is there an optimal capital structure? Is there a point that is going to minimize the WACC? In the case of the Modigliani and Miller graph no, in the second case (with no debt) yes and also in this case yes. If you are able to find a particular mix of debt and equity that is going to minimize the WACC you should choose this one, since you have a lower denominator and so a higher market value of your discounted cash flows. If this is the case, it is good because you can have in your NPV the sum of operating cash flows divided by a WACC that is going to be minimized (the minimum denominator possible).



EXAMPLE (a paradox case): assume you have a case where assets are 100 and they are very risky, equity is 1 and financial debt is 99. If you combine this situation to the graph you are in a situation where the cost of equity is close to zero. Is it so in the real life? Yes, because if the company goes on default and you just invested 1 you don't care, you don't have much to lose. But, there is an incredible potential value in this 1 of equity, because just in case the market value of the assets is going to explode positively, all the gains are for the shareholder. When I have assets that are higher than financial debt, all the surplus belongs to the equity holder that does not depend on the initial stake/investment.

VIVIA MARCHI

REMEMBER: cost of raised capital has to be consistent with assets. You collect money from banks and shareholders in order to invest in particular assets. But also, you need another consistency between the numerator and the denominator of the discounted cash flows. What is the denominator about? You have to discount accounting cash flows in the numerator according to the risk profile.

Financial Flexibility

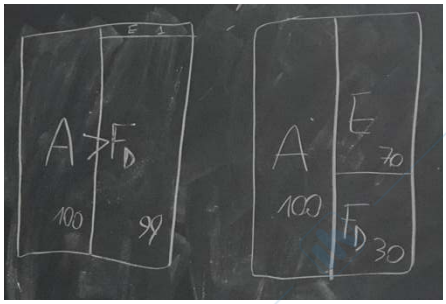
Financial flexibility is what we might call a sort of real option. A consequence of the conflicts of interest between shareholders and creditors is the introduction of debt covenants (introduce a lot of controls) that reduce the flexibility of corporations for their decisions about investments, financing and dividends. If you have many controls, you are going to miss some opportunities to get some real options.

Getting indebted, companies reduce their flexibility that can allow to front unforeseen events or grasp unexpected opportunities.

Flexibility protects managers from monitoring that accompanies debt.

EX. Comparison between two companies.

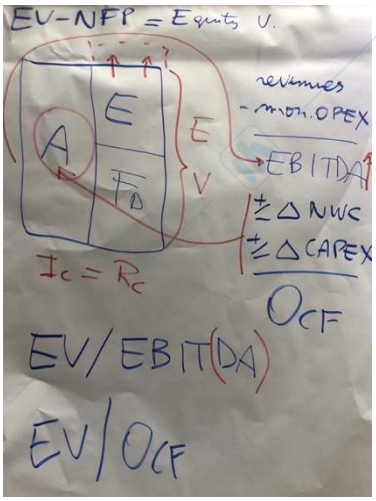
- COMPANY A has a very big leverage.
- COMPANY B has equity 70 and financial debt 30.



These two companies are competing and there is a third competitor that is for sale. What happens here? I might get opportunities to get some extra debt. If this is the case company B has the financial to get additional loans. Company A is out of the game, debt is already too big. Also, banks are going to monitor or not these companies? They have a very strong monitoring towards company A as debt is very high in a proportion of raised capital. In the case of company B, monitoring is less binding because it is not so important. So, I have an opportunity to increase it.

LECTURE 21:

Now a days, start-ups have a 'smaller' CAPEX because of the trend of the economy. Before, start-ups had to make many initial investments (CAPX) now they can rent platforms, such as software's, allowing them to reduce the initial capital investments and allowing them to reduce the amount of debt they ask for. So, this does affect both financial leverage and scalability.



What does the ration *EV/EBITDA* mean? We have a balance sheet with assets, equity and financial debt. Assets represent the invested capital and financial debt plus equity represent the raised capital. Equity and financial debt represent the EV (enterprise value). If we have Enterprise Value minus the net financial position (financial debt less of net liquidity) we obtain the Equity Value.

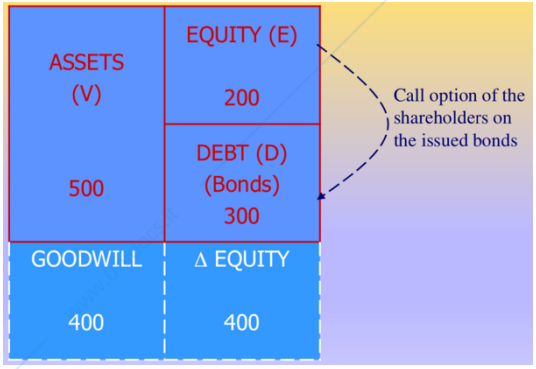
We have to compare enterprise value (EV) with EBITDA. EBITDA comes from Revenues minus monetary OPEX. Using all our raised capital (EV) we have Assets (invested capital). Out of our assets we can produce EBITDA. In some cases, it is really important to compare EV to EBITDA. If EBITDA is good, then you can have a multiplier and you have a better value, especially of Equity. Can we say that if EBITDA is going up, also financial debt is growing? Maybe, we might need more raised capital to finance the growth. But especially, when EBITDA is going up we are going to improve our equity (that is part

of the Enterprise Value). So, if EBITDA goes up I expect to have an impact especially on the equity side. Then there is another ratio: *EV/EBIT*. So, you consider also amortization and depreciation. A third ratio compares the *Enterprise Value/operating cash flows*. If start from EBITDA, plus or minus ONWC, plus or minus the CAPEX you obtain the operating cash flows.

Gross income before interests and taxes	1.000	1.000
Interests paid to bondholders	0	80
Taxable income	1.000	920
Corporate Tax rate 24%	240	220.8
Shareholders' income	760	699.2
Income for bondholders and shareholders	0+670	80+699.2
Tax saving (0.24*interessi) – corporate tax	0	22

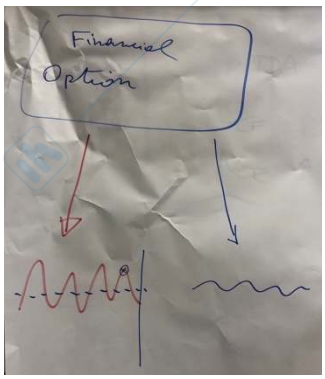
Example taken from *slide 53*:
The two companies have the same gross income before taxes (1,000). The difference is that the blue company is debt free, it does not pay any interest to the bondholders. The red one instead has an interest paid to shareholders of 80. So, the taxable income in the blue company is higher than the taxable income in the red company. The rule is that the tax-deductible interest raises the income that has to paid out to bondholders and shareholders.

<u>Financial structure in terms of options</u>
What is an option? I have an option to buy a bottle in 2 months' time for the price of 0.50 cents. Now I pay just a small premium. If I don't exercise the option the premium is lost. If I exercise the option the premium is incorporated in the price.
How can we give an interpretation of the financial structure of companies in terms of options?
The Black e Scholes model (1973) for the evaluation of financial options (not real options) can support the thesis of the lower debt capacity in presence of risky assets, due to the creditor's lack of confidence.
There are assets against raised capital (equity and debt, which is represented by bonds). After 3 years, bonds expire – I have to pay them back. Equity holders have an implicit option: they can either payback completely the bonds (if this is the case the raised capital is going to correspond entirely to equity – going from leveled to unleveled company) or they can issue new bonds. So, they can either renew the debt of pay it back completely and eliminate it. What do the shareholders chose? They have an implicit financial option. If the value of the company is increasing, it has an implicit goodwill and an increased equity corresponding to the implicit goodwill (of 400). This is higher than the value of debt, they might decide to replace bonds with equity. Otherwise they might try to renew the debt.



When the bond expires, if the value of the company (V) exceeds the nominal value of the bonds, shareholders will call the option paying the nominal value (D), shareholders will call the option paying the nominal value D and earning the difference V-D.
If V<D, shareholders lack any incentive to serve debt and will not exercise the call option.

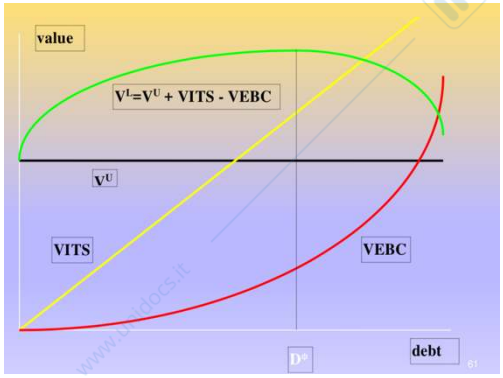
The value of an option depends on the value of the underlined asset, in this case the underlined asset is the value of the firm. In other cases, the value of the underlying asset (on which the financial option is built) can be very volatile. I have two assets, one is very volatile and the second one has a much lower volatility. Which option is more valuable? The volatile one. Why? Assume I have the right to buy a bottle of water for 50 cents in 2 months' time, which is going to be the market price in 2 months' time? If the market price is 1 euro it is convenient for me to pay less for it. If the market price goes to 30 cents I don't buy it, I though away my option I buy it in another way. So, I have a convenience, when I am an option underwriter, to consider very volatile underlined asset – the value of the option depends on the underlined.



Assume, in the graph at the right, that I have an American option, and that my exercise price is the dotted line, the straight line instead is maturity. I am one week before (circle), is it convenient to exercise the option? Yes, because it is convenient – you pay an amount (the exercise price of the option is the dotted line) for something that is worth a higher amount (the market price is on the red line). But which is the problem? You don't know what it is going to happen. If it is a European option, you cannot exercise before maturity. So, the value of an option is a function of the underlined asset, of time to maturity, of interest rates, etc.

This paper (Black and Sholes Model) is important because for the first time they produced a model for the calculation of financial options. Also, in the final part of the paper they explain the capital structure in terms of financial option.

Bankruptcy Cost



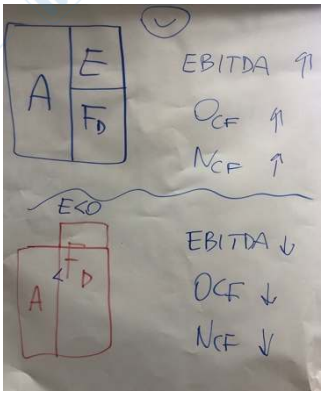
Here we have a comparison between a leveled and an unleveled firm. The value of a leveled firm corresponds to the value of an unleveled firm plus the positive value of tax shield (tax savings) minus the negative value of bankruptcy cost. An unleveled company is represented by the black line. As soon as I increase my debt, I have an increase in value of my tax shield – because the higher the debt the more money I save (if I have a positive taxable base). If the company does not have a positive taxable base, then I do not consider tax savings. Also, the red line represents bankruptcy costs- they tend to be low in the beginning but then they tend to grow exponentially at a higher marginal rate. So, if debt is really high the bankruptcy cost is going to have an exponential growth that is going to be higher than the linear growth of tax savings. If I combine all these factors in the leveled company, I have the value of the firm: $V^L = V^U$ + VITS – VEBC (green line). This shows that if you increase leverage a bit you can have a small increase in the value of the company, if you exaggerate, values will get lower and eventually decline. From the optimal point of leverage onwards (D*), you are going to destroy value.

Direct and Indirect Bankruptcy Costs

Direct costs: expenditures directly linked to the procedure. Indirect costs are cots that derive form insolvency without depending on the procedure (include the time spent by management of procedure, the loss of the most qualified HR, etc.).

Which is the problem with bankruptcy? Which is the difference between cash burn-out and equity burn-out? I have a cash burn-out when my liquidity becomes equal to zero and eventually negative.

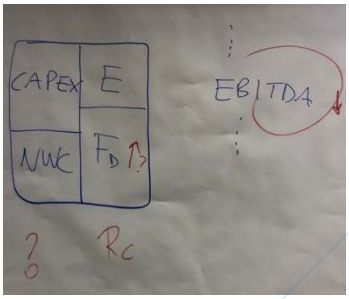
An equity burn-out is instead when the book value or market value of equity becomes zero (assets correspond to liability/debt) and then eventually negative.
When I have an insolvency what does it happen? Which is the main cause of bankruptcy? Bankruptcy is normally due to a lack of liquidity – I run out of cash as my liquidity becomes negative and I don't have any possibility to get money from banks and shareholders. Normally when I am burning cash, who can I ask money to? Financial debt or equity (banks or shareholders). Banks might lend money if the company is able demonstrate that you generate good liquidity – this is not the case. So, banks say no. Shareholders are underwriters with limited liability, if they think that the forecast of the company is not good they are not going to finance it anymore. If the company does not generate cash, it will soon die even if it has for a short period of time a positive equity. A good company is a company that has an increase in EBITDA, an increase in the Operating cash flow and an increase in the Net cash flow. Instead, in a bad company financial debt is higher than assets and equity is negative. Also, EBITDA is negative, Operating cash flow and Net cash flow is negative. In the second case I have a problem, but I also have an issue if I have a negative cash flow with a positive balance sheet (equity).



<u>The Pecking Order Hypothesis</u> – a model according to which firms prefer self-financing resources.
We have three kinds of financing resources:

1. Firms prefer self-financing resources (EBITDA). There is no cost in generating EBITDA.
2. Then, if we need more cash and EBITDA is not enough, I increase my debt. So, firms issue debt. There is a cost for raising debt.
3. And eventually, if it is still not enough, they use risky equity – they increase equity. There is a cost for raising equity, even higher than the one for equity.

Pecking is a sort of hierarchy order. How can I give an interpretation of the pecking order hypothesis when there is a recession? When I am in a recession I might get stuck, EBITDA is going down and it might also be negative. In order to compensate is should ask banks to help me, but are they willing to give me additional money? No because the company is risky and also because if there is a recession the CB will decrease the interest rates, reducing the remuneration for the banks as their margins are lower. Also, can I ask money to equity holders? I can try but it is difficult because they will not get dividends as my EBITDA is negative, and because they forecast of the company is not good. So, I have a problem with my raised capital. But I also have problems in my invested capital; during a recession I don't invest in CAPEX and NWC as I am not able to raise capital. The decrease in CAPEX and the decrease in NWC are a strong signal of an upcoming recession.



(week 8):

LECTURE 22:

SIGNALING EFFECT OF CAPITAL STRUCTURE: capital structure is about leverage (financial debt/equity). Assume there is a simultaneous press conference in two rooms. Both companies, that are competitors say, that their future is very bright (are very optimistic). Analysts do know that one company is saying the truth and the other one is cheating (not telling the truth). How can you understand which is the serious one and which is the fake one? If a company says they will have good profits in the future, and they will also increase the leverage, there is a signaling effect: I signal to the market that my leverage is about to increase in the future. If this is the case, it might be an indication that I am the good company. Why? Because if I am able to increase my leverage, and banks will lend money, it means that for this reason my company will be profitable (generate enough

cash in the future to properly serve debt). If the competitor is not able to make a similar promise, then you can discriminate with a signaling effect of the financial structure.

Leveraging value with intangibles: More guarantees with less collateral?

If you invest most of your assets, most of your CAPEX, in intangible assets they tend to have limited if any collateral value whenever the company goes on default. When the bank needs the money back it is difficult to sell the intangibles and cash them out, because they have a value within a going-concert context but when there is a default situation it is difficult to extract value. There is an issue: I am a company, I have a lot of intangibles and it is difficult for me to collect enough money from the banks because they do know that in case there are problems, then it is an issue to sell them. Intangibles are hard to sell within a break-up context. Which is the difference between a going-concern and a break-up context for intangibles? Let's consider a patent. If I have a patent and the company is not running anymore, can I sell it? Maybe yes. if instead of a patent I have internal know-how? This is very difficult to sell. Another example is goodwill, it has a value only if there is a going-concern context. For this reason, banks tend to be overcautious when you have a lot of intangibles in your assets (CAPEX). And you might face severe, capital rationing problems. On the other side though, who are the most profitable companies in the world? Companies that have a lot of intangibles (ex. Facebook, Amazon). Banks have to understand this trend. if they do not lend money to intangible companies there is an issue. How can we try to set this issue? READ THE ARTICLE.

This paper shows how intangibles can create scalable value, levered by debt and serviced by intangible-driven incremental EBITDA and cash flows. So, intangibles can create scalable value (scalability). This value is levered by debt because when you have debt you can level the difference ROIC less the cost of debt. What does the last part of the sentence mean? If you invest in intangibles they can help producing incremental economic and financial margins.

Intangibles intrinsically incorporate information asymmetries. Which is the value of the room? It may not be difficult to assess it. Which is the value of a strange patent? It is difficult to evaluate. So, intangibles do incorporate more information asymmetries.

Intangibles may so discourage debt, but are also a vital component of cash generating value, so representing a key factor for debt servicing, with paradoxical effects (more guarantees with less collateral?). What does it mean? The guarantee level of intangibles may be very limited but on a going-concern basis they strongly contribute to the production of EBITDA and cash flows (Economic and Financial margins). And, economic and financial margins are the basis for the payback of debt. So, if you are a bank you might say that you don't like companies with a lot of intangibles, because they do not have a good collateral value. But, in this situation you may avoid to give money to the most profitable companies. Complementary question: if my company does not have or has little intangibles, will it be able or not to generate enough economic and financial margins? It is important to understand in today's life. Most companies need to invest in intangibles, so, the attitude towards the financing of intangibles has to change.

Operating leverage is enhanced by scalability, an intrinsic characteristic of many intangibles, with a positive impact on cash generation and consequent debt servicing. If you generate cash then you can use it for debt servicing. Ability to improve cash flows emerges as a key feature of value enhancing intangibles, bypassing their lack of collateral value.

Assume we have to estimate the value of an intangible. We have an intangible in our assets (CAPEX). How can we assess the value of an intangible? When we have to assess valuation of an asset or an entire firm we look for accounting clues. Intangibles tend to be very tricky (they are difficult to account for). Why is it the case? According to IFRS, normally it is not allowed to capitalize intangible - you do have them in the income statement – only occasionally you can capitalize them and put them in the assets. Why? Because we need to be prudent. In case there is a bankruptcy, this

capitalize value is going to approach zero. It is never allowed to capitalize internal goodwill, only if you pay for it you can put it in the assets. In many cases, there are many strict rules that prevent you from capitalizing these costs. EX. assume we have research and development costs; can you capitalize them in the assets? Normally, the rule is that you can never capitalize research but you may capitalize development, but you have to assess and explain that it has a future value (maybe using discounted cash flows). So, it is very difficult to capitalize for intangible assets. This is an issue. EX. we have a software (Blackboard) running on our computer, which is the value of this software? How much time did it take to produce it? Which was the cost to develop this software? Also, software has a very particular legal issue: in Europe software is normally protected by copyright law, in the US by patent law, so it is difference and it might have a consequence also on valuation.
Then we can have cost-based methodology and income-based methodology. They are based on the estimate of past and future economic benefits. Also, I can use another type of methodology: assume that without intangibles the EBITDA is 100, if I also include intangibles my EBITDA becomes 150. Which is the value of the intangibles? It is given by the incremental income of 50 (150-100) and then this is going to be discounted over time. This is called incremental or differential value. There is also a relief from royalty methodology: assume I own a software, if instead of being the owner I decide to rent it. In case I rent the software, I normally have to pay a royalty. If I discount this figurative value (ex. 1 million euros), of relief from royalties, then I can assess the value of the software. You pay royalties normally for intangibles, it is a sort of rent that you pay to use it. Also, there is a new paradigm: you tend to rent much more now than in the past. For example, now we have software as a service: you don't physically buy it but you rent it.
You can have another method that is called the market methodology. You can evaluate an intangible comparing it with our assets. So, we have three kinds of capital valuation approaches: market approach, cost approach and an income approach.
The relief from royalties is a sort of price premium, with the income approach. If I use the intangible I can charge more. EX. branded shirt: the value of an Adidas shirt is 100, without the brand the value is 80; so, there is a 20 incremental value due to the brand. You have a difference between brand and unbranded. Is a brand important? A brand can also be a symbol of quality.

Dividend Policy

Dividend policy is strongly linked to capital structure: when we pay a dividend, I decrease equity and financial leverage goes up. There is always a link between capital structure and dividend policy.

We have different types of dividends: ordinary dividends, you can pay higher than normal dividends (if you underwrite preferred shares). To compensate the limited voting power of preferred shares in many cases you pay higher dividends.
You can have cash dividend payments and also the irrelevance of dividend policy (according to another model of M&M). According to M&M if a company pays dividends, the cash out from the company to the shareholders is not going to affect the market value of the company.
We can have a share repurchase. If a pay a dividend, from a financial point of view, it is money that goes from the firm to the shareholders. If I make a share repurchase, the company buys back from the shareholders some shares and gives them cash. Is it really the same thing? No, what is the difference? If I repurchase your shares you may still be a shareholder but with a lower amount of stock. If the sale is proportional though, there is no change. EXAMPLE. We have a balance sheet, where assets are 220, liabilities are 120 and equity is 100. Assume there are 10 shareholders: each one has a stake of 10%. Now assume that they will all sell 10% of their stake. So, after the sale their ownership will be 9%. The company, after the sale buys back 10. So, each of the shareholders sell proportionally to the company – the company should give to the shareholders all the same possibility (proportionally). So, is it the same having 10% before the sale repurchase and a 9% and

a stake in the company that owns its own 10%? Yes, before the buyback each shareholder has a 10%, after the buyback each shareholder has a 9% stake but also, they become co-owner of the 10% that is inside the company. A part of the value is not yours but it belongs to you because you participate to the owning of the repurchase agreement. If this is the case, I can show that a buyback is always a form of transferring money from the company to the shareholders (like dividends). So, if it is not going to alter the percentages of the company then it is similar to dividends.
Assume a different case, some shareholders decide to sell and other decide that they don't want to sell. In this case, the percentages, after the repurchase agreement, change. But, all shareholders have to have the same possibility (they have to decide if they want to sell or not).
Another example: assume that the current market price of a company is 100. The company announces to the market a buyback. In the next month the shareholders can sell a part of their shares back to the company. Who decides the buyback of the company? Internal managers. Internal managers have inside information compared to the shareholders. So, it is legal way to transform internal information to the outside. If the company says it wants to buy back some of their shares, is the outlook of the company positive or negative? Positive – it is a good message (this is a signaling effect), the company would not buy them if they were not going well. This is a transmission of a message from the inside of the company to the market. If I want to buy back my shares it means that internal mangers think that the shares are undervalued (there is an advantage for the company to buy back the shares). Also, if I buy back the shares it will concentrate shareholding and there are less shares outstanding.

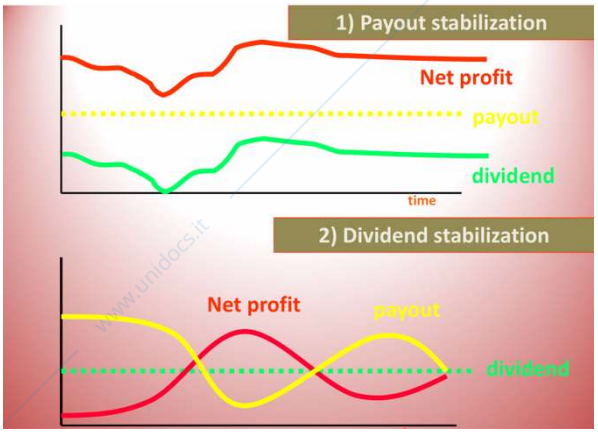
Fundamental question: Is dividend policy relevant? Can we change the value of the company just paying or not the dividends? Can we transfer value from the company to the shareholders just with cash? We have to make a comparison with Modigliani and Miller (financial structure theorem). The question was different: can we change the value of a company just changing the ratio of financial debt and equity? Here the question is complementary, can we have an impact on value paying out dividends? If I pay out a dividend and I don't change the financial debt, then the leverage is about to increase, because I decrease the denominator.
To pay out a dividend I need to have cash. I need to have retained earnings, if I don't have retained earning I cannot pay a dividend. Can I pay a dividend also if I have a loss? If I have a loss now, but I have enough retained earnings I can use past cumulated money to pay out a dividend. If a loss is a temporary one I can still afford to pay a dividend.
Another element to consider: I have enough equity to pay a dividend. You cannot pay a dividend with a negative equity but you also need to have enough liquidity/cash within the company. Assume that you don't have enough cash in the company, if you want to pay a dividend you have to borrow cash from banks or shareholders. Would you ask money to the shareholders? It does not make any sense! Should I ask money to banks? No, I borrow money from the banks that does not produce value. If I borrow money from the banks to pay dividends, this money immediately goes out as a dividend. Even the bank, if it lends you money, it wants you to use the money to produce internal money (to have positive cash flows) in order to pay back the debt. If I use the money to pay dividends, the money is gone forever. For this reason, banks don't like to lend money for an increase of capital. There is a formal consequence, when you need to pay a dividend, you must have:

1. A positive equity
2. You need to have enough liquidity stored in your assets.

Assume liquidity in the assets is 35, there is a limit to the payment of dividends connected to 35.
Also, the company is going to say: if I pay out a dividend is there any dividend covenant? If I pay out a dividend financial debt is not going to change (the bank is not going to intervene) but you will decrease equity – so leverage increases. The bank has to agree; you cannot increase leverage unless

the bank agrees. If the bank does not agree it will not lend you anymore money. So, in some cases there is a dividend covenant. What does it mean? When a bank gives money to the company, there might be a contract between the two based on the fact that the company has to follow some rules. The rule, for example, is that the company cannot pay too many dividends if the debt has to be still payed out. There is also a debt covenant, what does it mean? Use the example of a company that is completely unleveled (no debt, only equity). Then I issue some little debt. Then I will issue more debt. If I issue more debt, this second one might be guaranteed. If there is a guarantee then it is a damage for the first bank, because they were alone and leverage was very low. Now they are together with someone else: leverage is increasing, risk is increasing and also there is someone that has a guarantee that it is not yours. So, there can be debt covenant: the first underwriter of debt agrees to lend the company money, but in order to collect more money the company needs to get the banks permission. We have a twin problem of debt covenant and dividend covenant.

According to M&M when you pay a dividend, there is a signal that we transmit to the market. Investors hate a change in dividends over time. Assume an investor is used to receiving 100 dividends per year, then I immediately decrease the payout. Unless there is an extraordinary problem, investors are not happy about this and the stock market price is going down. So, when you increase a dividend you are supposed to increase the amount of dividend steady over time. EX. the normal dividends used to be 100, this year you pay 120. This is a signal that the company sends to the market: if I can afford to increase dividends it means that in the future I am likely to keep these higher dividends. This is good news transmitted from the company to the market. This is going to reduce information asymmetries. If a company is able to reduce information asymmetries, which is the impact on the cost of capital? Risk will be reduced, it goes down – you know more about the company. So, also the discount factor is going down.



You have to decide whether you want to stabilize the payout or the dividend. What is the payout? The percentage that you pay out as a dividend.
Assume you payout 50% of your net earnings as dividends. If your net earnings are 100, you pay out 50 as dividends. Can you stabilize simultaneously payout and dividend? No, only if you have a stable net profit that does not change over time. But it is impossible to have a stable net profit. If this is the case you have to stabilize which one to stabilize: either payout or dividends. If you stabilize the payout: assume you dedicate 50% of your net earnings to be payed out - whatever are the net earnings, I am going to pay out 50%. This is a strong message to the market. If the company is going very well, then the payout formally does not change (it will still be 50%) but you payout more (you pay 50% of something that is bigger). The second solution is to keep the dividend constant. If the dividend is constant I have to use the payout as a cushion. Can you pay out a dividend even if there is a loss? Yes, you can use past reserves. If you have a net profit that goes down and then up, if the profit is good I need less payout to get to the target dividend. When I have a bad profit, I have to increase my payout to compensate for the lower profit.
Which strategy is more relevant (which one would you use)? There are no clear solutions. If I am an investor I might prefer the second case, because dividends are constant. But this comes at a price: it is anti-cyclical. If there is a high net profit the payout is small: I could afford to pay out more dividends because the company is in a good shape but I pay less, in the case in which the net profit

is small it is the opposite: I use more money to compensate for the lower results. Though, there is no clear-cut solution to this question. There is a big trade-off between stabilization of either payout or dividends. Listed companies try to choose the second case.

Exercises relevant for the exam:

- Delta case
- Profitability equation
- Operating leverage
- Cash flow alpha
- Epsylon case
- Final case (maybe).

LECTURE 23:

I have an impact of my dividend policy on my balance sheet: if I pay put a dividend my leverage increases as my equity decreases. According to M&M dividend policy has no impact on the price of the shares.
It is impossible to stabilize both payout and dividends unless we have a stable net result (normally not the case).
"POLITICAL PARTIES": in the center we have M&M (the different dividend policies do not have an impact on the firm). According to the left side, any dividend increase decreases the value of the firm. For the right side, instead it is the opposite: dividend increase, increases the firm market value.
There is an issue to consider: if the company pays out bigger dividends am I going to increase the stock market price of the company (which is the impact of the dividend policy on the stock market prices?). Normally, there is no meaningful impact: we don't have a relative impact of dividend policy on stock market prices. So, M&M are not fully right, but are not also fully wrong- they are a good way to explain this relationship.
TAXATION IMPACT: from the income statement we have a net profit. We have profit before taxes, ex. 100, then we pay corporate taxes, ex. 24%, and then we get net profit. The net profit can be stored in the equity, if it is not payed out. But let's assume the payout is 50%, so, 38 is payed out as a dividend and the other 38 goes in the retained earnings (equity). This kind of dividend is subject to taxation within the household. When you get a dividend, you have to pay taxes, in Italy it is around 26%.

LECTURE 24:

We have always used financial debt, but we can adjust this value and use the net financial position. Within my assets I have cash. The net financial position is financial debt minus cash (ex. financial debt is 60 and cash is 20, so net financial position is 40). The real financial leverage, might always be considered net of the cash I have in my financial assets. Why don't we normally use financial leverage using financial debt position? Because companies usually do not have cash, or if they have it is really limited. If there is a consistent cash, you have to use the net financial position.

A business plan is a formal accounting statement which numerically describes a set of business goals, the reasons why they are believed attainable, and the strategic plan and managerial steps for reaching
You can improve your business plan with data.