HEC PARIS

Corporate Finance

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1 Project valuation

1.1 Investment criteria

1.1.1 Net present value (NPV)

Also called discounted cash flow (DCF) model. Evaluate a project as a discounted sum of its future cash flows. "Net" because a negative cash flow is taken into account (first investment in the project).

$$NPV = -I_0 + \sum_{i=1}^{N} \frac{C_i}{(1+r)^i}$$

⚠In perfect financial markets, the action of financing has always a 0 NPV!
⚠Only projects with positive NPV are considered as profitable !
⚠If several projects are profitable, take the one with the highest NPV !

1.1.2 Internal rate of return (IRR)

Considering the NPV as a function of r, the IRR is the r that cancel(s) out the NPV.

$$-I_0 + \sum_{i=0}^{N} \frac{C_i}{(1+IRR)^i} = 0$$

⚠Only projects with an IRR superior to the hurdle rate (HR), a threshold set by the company and often equal to the project's cost of capital, are considered as profitable !
⚠If several projects are profitable, take the one with the highest IRR !
⚠IRR is scale-insensitive !
⚠IRR put excessive weights on early cash flow (irrespective of the discount rate) !
⚠IRR does not necessarily exist, or there can be multiple IRRs !

1.1.3 (Discounted) payback period

The basic payback period is the average time to recoup initial investment cost. The discounted payback period is the same, but considering discounted cash flows.

For the basic payback period :

$$\begin{aligned} k \quad \text{s.t.} \quad & \sum_{i=1}^{k} C_i \leq I_0 \text{ and } \sum_{i=1}^{k+1} C_i > I_0 \\ PBP \quad = \quad & k + \frac{I_0 - \sum_{i=1}^{k} C_i}{C_{k+1}} \end{aligned}$$

And for the discounted payback period :

$$\begin{aligned} k \quad \text{s.t.} \quad & \sum_{i=1}^{k} \frac{C_i}{(1+r)^i} \leq I_0 \text{ and } \sum_{i=1}^{k+1} \frac{C_i}{(1+r)^i} > I_0 \\ PBP \quad = \quad & k + \frac{I_0 - \sum_{i=1}^{k} \frac{C_i}{(1+r)^i}}{\frac{C_{k+1}}{(1+r)^{k+1}}} \end{aligned}$$

⚠Only projects whose BP is inferior to a maximal PBP set by the management are considered as profitable !
⚠If several projects are profitable, take the one with the shortest PBP !
⚠PBP ignores scale !
⚠PBP ignores the cash flows beyond the payback !

1.2 Investment criteria

1.2.1 Free cash flows (FCFs)

FCFs are incremental after-tax cash flows the project would generate on average if it had no debt.

$$FCF_i = (1-t) \times EBIT_i + Depreciation_i - CAPX_i - \Delta NWC_i$$

Where :
- t is the tax rate
- $EBIT$ are the earnings before interests and taxes or net operating profit
- $CAPX$ are capital expenditures
- $\Delta NWC = NWC_i - NWC_{i+1}$

And NWC is the net working capital :

$$NWC_i = Inventories_i + AR_i - AP_i$$

Where : $\begin{cases} AR \text{ are the accounts receivable} \\ AP \text{ are the accounts payable} \end{cases}$

⚠Note also that, without debts :

$$EBIT = \frac{NOPLAT}{1-t} = \text{Net income}$$

Where NOPLAT is the net operating profit less adjusted taxes.
⚠FCF does not reflect neither risk nor financing ! That is the role of the WACC (weighted aveerage cost of capital).

$$PV(FCF_i) = \frac{FCF}{(1+WACC)^i}$$

1.2.2 Terminal value

The value that can be recouped at the end of a project's life.

$$TV = (1-t) \times SV + t \times PPE_N + NWC_N$$

Where : $\begin{cases} SV \text{ is the salvage value of the assets (liquidation price minus liquidation costs)} \\ PPE \text{ are property plant and equipment} \end{cases}$
More precisely, PPE are :

$$PPE_i = \sum_{j=0}^{i} CAPX_i - Depreciation_i$$

2 Company valuation

2.1 The discounted cash flows (DCF) method

2.1.1 Forecast FCFs

- set a forecast period (before the steady state) : N years
- forecast sales and deduce the other items of the income statement using ratios
- compute FCF for each year within the period

2.1.2 Compute the terminal value (TV)

- Here we have several choices :
  - Assume FCFs grow at a constant rate g beyond the forecast period (growing perpetuity) :
    $$TV = \frac{(1+g)FCF_N}{WACC - g}$$
    ⚠This formula is not very robust (what does g really require in terms of investment ? What are the consequences for the future FCFs ?)
  - Assume ROIC [1] is stable beyond the forecast period :
    $$\begin{aligned} TV &= \frac{(1+g)}{WACC-g} \times EBIT_N \times (1-t) \times \left(1 - \frac{g}{(1+g) \times ROIC_N}\right) \\ &= \frac{(1+g) \times \left(EBIT_N \times (1-t) - \frac{g \times NA}{1+g}\right)}{WACC-g} \\ TV &\simeq \frac{(1+g) \times EBIT_N \times (1-t) \times \left(1 - \frac{g}{ROIC_N}\right)}{WACC-g} \end{aligned}$$
    ⚠This formula assumes away economies or diseconomies of scale : roughly, faster growth creates value only if ROIC > WACC.
  - Assume a flat perpetuity : beyond the forecast period, ROIC = WACC :
    $$TV \simeq \frac{(1+g) \times EBIT_N \times (1-t)}{WACC}$$
  - Assume the company is liquidated at the end of the forecast period :
    $$TV = (1-t) \times SV + t \times PPE_N + NWC_N$$
  - Use multiples, which means taking the average $\left(\frac{EV}{EBITDA}\right)_{peers}$ ratio of several peer groups on computing :
    $$TV = \left(\frac{EV}{EBITDA}\right)_{peers} \times EBITDA_N$$
    ⚠do not use a $\frac{P}{E}$ ratio !

  ⚠In all cases, the terminal value must be discounted N times to obtain its present value.

[1] $ROIC = \frac{EBIT \times (1-t)}{NA} = \frac{EBIT \times (1-t)}{PPE+NWC}$

2.1.3 Compute EV, FV, Equity and VPS

- The enterprise value (EV) is the value of the operating assets

$$EV = \sum_{i=1}^{N} \frac{FCF_i}{(1+WACC)^i} + \frac{TV}{(1+WACC)^N}$$

- The firm value (FV) is the enterprise plus the operating assets (cash and cash equivalents) :

$$FV = EV + Cash$$

- The equity value is the firm value minus the net debt (use book debt as an approximation) :

$$Equity = FV - NetDebt$$

⚠Debt must exclude accounts payable (already counted in FCFs) !

- The equity per share (EPS) is the equity divided by the number of shares :

$$EPS = \frac{Equity}{\#shares}$$

⚠The number of shares is not always straightforward : indeed there may be other existing items that may become shares, such as stock options, call warrants and convertible bonds !

2.1.4 Sensitivity analysis

- Build a data table with respect to discount rate r and perpetuity growth rate g.

2.2 Multiples

2.2.1 The price-earnings ratio (PER)

- Select publicly traded peers (industry, size ...)
- For each peer, compute :

$$\begin{aligned} EPS &= \frac{\text{Net income}}{\#shares} \\ PER &= \frac{\text{Stock price}}{\text{EPS}} \end{aligned}$$

- Average the peers' ratios :

$$PER_{peers} = \frac{1}{\#peers} \sum_{peer\ i} PER_i$$

- Compute an approximation of your firm's value per share :

$$VPS_{firm} = PER_{peers} \times EPS_{firm}$$

2.2.2 Enterprise value to EBITDA ratio

- Select publicly traded peers
- For each peer, compute :

$$EV = \text{Market Cap} + \text{Net Debt}$$

- Averagethe peers' ratios :

$$(EV/EBITDA)_{peers} = \frac{1}{\#peers} \sum_{peer\ i} \frac{EV_i}{EBITDA_i}$$

- Comput an approximation of your firm's enterprise value, equity value, and finally value per share :

$$\begin{aligned} EV_{firm} &= (EV/EBITDA)_{peers} \times EBITDA_{firm} \\ Equity_{firm} &= EV_{firm} - \text{Net Debt}_{firm} \\ VPS_{firm} &= \frac{Equity_{firm}}{\#shares} \end{aligned}$$

⚠Do not use peers with negative earnings or EBITDA !
⚠If your firm has negative earnings or EBITDA, you cannot use multiples !

3 Mergers and acquisitions

3.1 Presentation

3.1.1 Frinedly vs hostile

Mergers can be :

- Friendly : terms are negotiated with the target's management, financial and legal advisors hired by the board make a due diligence and give a fairness opinion, shareholders vote.
- Hostile : unsolicited bid, two methods.
  - Buy a controlling stake (tender offer to shareholders ...)
  - Proxy fight, where the acquirer persuades existing shareholders to vote out company management so that the company will be easier to take over (majority on the board ...).

⚠Anti-takeover provisions :

- Flip-in poison pill : existing shareholders, but not acquiring shareholders, are allowed to purchase shares in the target company at a discount. A flip-in poison pill takeover defense dilutes the value of the shares purchased by the acquiring company by flooding the market with new shares, while also allowing investors who purchase the new shares to profit instantaneously from the difference between the discounted purchase price and the market price.
- Staggered board of directors : board that is made up of different classes of directors. Usually, there are three classes, with each class serving for a different term length than the other. Terms of service for elected directors vary, but one-, three- and five-year terms are common. Thus only a fraction of the board is renewed each year.

3.1.2 The deal

The price must include a premium compared to recent stock price. The means of payment are :

- Cash
- Stock (with an exchange ratio)
- Earn-out [2]

[2]An earnout is a contractual provision stating that the seller of a business is to obtain additional compensation in the future if the business achieves certain financial goals, which are usually stated as a percentage of gross sales or earnings.

- Contingent value rights [3]

Some conditions have to be respected :

- No talk with other potential acquirer
- Break-up fee paid by the target if the deal does not go through

Advisory fees include financial fees (investment bank, specialized boutique, accounting firm...) and legal fees (specialized law firms).

3.2 M&A rationale

3.2.1 Good deal

Two reasons :

- Underpriced target
- Cheap means of payment (if your own stock is overpriced, pay with stock; if your interest rates are low, debt finance the deal !)

3.2.2 Value creation

Three reasons :

- Operating synergies : scale deals with overlapping assets, scope deals with complementary assets ...
- Financial synergies : improved access to finance, tax savings ...
- Better management : improve operating efficiency and capital structure (reduce WACC) ...

[3] Contingent Value Rights (CVR) are rights provided to shareholders of a company facing significant restructuring or of a company that has been acquired. These rights ensure that the shareholders receive additional benefits if a certain event occurs. These kinds of rights share similarities with options, as they frequently have an expiration date relating to the times that contingent events must occur.

3.3 M&A valuation

There exist different methods :

- Discounted cash flows (already seen)
- Trading multiples
- Transaction multiples
- Historical takeover premia

We will focus on the last two ones.

3.3.1 Transaction multiples

- Select recent M&A deals (same industry, same size ...)
- For each deal, compute :

$$\begin{aligned} EV_{deal} &= Payment + Debt_{deal's\ target} - Cash \\ (EV/EBITDA)_{deal} &= \frac{EV_{deal}}{EBITDA_{deals's\ target}} \end{aligned}$$

- Average deals' ratios :

$$(EV/EBITDA)_{deals} = \frac{1}{\#deals} \sum_{deal\ i} (EV/EBITDA)_i$$

- Compute your target enterprise value, equity, and value per share :

$$\begin{aligned} EV_{target} &= (EV/EBITDA)_{deals} \times EBITDA_{target} \\ Equity_{target} &= EV_{target} + Cash_{target} - Debt_{target} \\ VPS_{target} &= \frac{Equity_{target}}{\#shares} \end{aligned}$$

3.3.2 Historical takeover premia

- Select recent acquisitions of publicly traded companies
- For each past deal, compute :

$$Premium_{deal} = \frac{PPS_{deal} - PPS_{market}}{PPS_{market}}$$

  Where PPS is the price per share (paid by the acquirer : PPS_{deal} or given by the market : PPS_{market}).

- Average the deals' premia :

$$Premium_{deals} = \frac{1}{\#deals} \sum_{deal\ i} Premium_i$$

- Increase the target's price per share by the average deal premium :

$$PPS_{target's\ deal} = PPS_{target\ market} \times Premium_{deals}$$

4 Weighted average cost of capital (WACC)

4.1 The WACC formula

4.1.1 Definition

A company's weighted average cost of capital is defined by :

$$WACC = \ell \times (1-t) \times r_D + (1-\ell) \times r_E$$

Where : $\begin{cases} \ell \text{ is the leverage ratio, } \ell = \frac{D}{D+E} \\ D \text{ is th net debt, } D = Debt - Cash \\ E \text{ is the market cap, } E = Stock\ price \times \#shares \\ t \text{ is the corporate tax rate} \\ r_D \text{ is the cost of debt} \\ r_E \text{ is the cost of equity} \end{cases}$

The cost of debt can be given by the yield-to-maturity of debt with similar risk as the company's debt.
The cost of equity is given by the CAPM :

$$r_E = r_F + \beta_E \times (\mathbb{E}[r_M] - r_F)$$

Where : $\begin{cases} r_F \text{ can be given by the yield-to-maturity of the longest government bond} \\ \mathbb{E}[r_M] - r_F \text{ is called risk premium and is typially between 4 and 6\%} \end{cases}$
In most cases, we uses the company's WACC to estimate its projects' NPV.
⚠It is not OK to use the WACC if the firm is consdering a project in a very different industry, or if the firm has several different businesses.
⚠The WACC method is not practical when the leverage ratio is expected to vay substantially over time (for instance if it is far from the target leverage) !

4.2 WACC parameters

4.2.1 The leverage ratio (ℓ)

It must be the actual leverage ratio, at the time the valuation is conducted. D should be the net debt's market value, but using the net debt's book value remains a good approximation.
⚠Changing the leverage ratio, implies changing r_D and r_E !
⚠Do not use the leverage used to finance the project's or firm's acquisition !

4.2.2 The corporate tax rate (t)

Use the company's statutory tax rate.
⚠Sometimes tricky for international companies !

4.2.3 The cost of det capital (r_D)

- Simulate the rating of the firm's overall dbet from bond rating statistics.
- Look up the typical interest rate r charged currently for so-rated bonds.
- Because of the risk, we should have $r_D = r - \epsilon$, but if debt is not too risky, we can set $r_D \simeq r$.

4.2.4 The cost of equity capital (r_E)

- Determine the risk-free rate r_F, use for this the interest rate of the longest-maturity government bond.

- Find the firm's β, the correlation of the firm's stock returns with stock market returns (on Bloomberg, Google Finance etc.).
- Determine the market risk premium $\mathbb{E}[r_M] - r_F$ (not by yourself!).
- Compute r_E :

$$r_E \simeq \mathbb{E}[r_E] = r_F + \beta_E \times (\mathbb{E}[r_M] - r_F)$$

4.3 CAPM : quick review

$$Total\ risk = Systematic\ risk + Idiosyncratic\ risk$$

Systematic risk is external to the company, it cannot be eliminated through portfolio diversification. On the contrary, idiosyncratic risk is due to internal risk factors, and it can be mitigated through diversification.
⚠Stock prices and expected returns should only reflect systematic risk !
The firm's β measures the systematic risk, in other words the firm's sensitivity to market-wide forces. It is thus theaverage change in returns when the overall market return rises by 1%.

5 Unlevering and relevering

5.1 WACC for alternative leverage

It is the case where the actual leverage is very different from the target leverage.

5.1.1 WACC fallacy

⚠We cannot just change ℓ in the WACC formula all things being equal, because higher ℓ implies higher default risk and higher cost of debt (WACC fallacy) !
The Modigliani-Miller theorem tells us that if the financial markets are perfect, an increase of the leverage ratio increases the cost of equity so that the WACC remains constant.

5.1.2 Adjusting r_E

It means adjusting the firm's β_E used in the CAPM formula. In two steps.

- Unlevering : compute the "unlevered β", the equity β if there was no debt.

$$\beta_E^{unlevered} = \frac{\beta_E}{1 + \left(\frac{D}{E}\right)_{old}}$$

  ⚠Here we implicitely assume that the debt's beta is 0, and that is why we have $\frac{D}{E}$ instead of $\frac{D}{D+E}$. Note also that $\frac{D}{E} = \frac{\ell}{1-\ell}$

- Relevering : get the equity β reflecting the effect of the new leverage.

$$\beta_E \leftarrow \beta_E^{relevered} = \left(1 + \left(\frac{D}{E}\right)_{new}\right) \times \beta_E^{unlevered}$$

⚠Sometimes, the term $\frac{D}{E}$ is changed into $(1-t) \times \frac{D}{E}$ in the above formulas. Without the $(1-t)$ factor, we assume that the leverage ratio is stable. With the $(1-t)$ factor, we assume that the debt level itself is stable. Bu the difference between the two approaches is not that significant.

5.1.3 Business risk, financial risk

By adjusting β_E, we obtain :

$$\beta_E = \beta_E^{unlevered} + \left(\frac{D}{E}\right)_{new} \times \beta_E^{unlevered}$$

We call $\beta_E^{unlevered}$ the business risk or asset beta, since it captures the risk of the company's assets. We expect firms in the same industry to have the same $\beta_{unlevered}$.
We call $\left(\frac{D}{E}\right)_{new} \times \beta_E^{unlevered}$ the financial risk, since it captures the impact of leverage on the risk of stock return. Same-industry firms may differ in financial risks due to different leverage.

5.1.4 Adjusting r_D

A higher debt leads to a higher default risk, so the firm's debt rating will certainly be lower with a higher leverage. And the cost of debt will rise.

5.2 WACC for a private company

It is the case where there is no stock price and no stock returns. As a result, we are missing both ℓ and β_E.

5.2.1 Estimating β_E from peers

- Select publicly traded peers (same industry, pure players), and store their betas (β_{peer})
- For each peer, unlever the corresponding equity beta using the corresponding leverage :

$$\beta_{peer}^{unlevered} = \frac{\beta_{peer}}{\left(1 + \left(\frac{D}{E}\right)_{peer}\right)}$$

- Average the peers unlevered betas :

$$\beta_{peers}^{unlevered} = \frac{1}{\#peers} \sum_{peer\ i} \beta_i^{unlevered}$$

- Estimate the firm's relevered beta using the peers' unlevered average :

$$\beta_E \leftarrow \beta_{firm}^{relevered} = \left(1 + \left(\frac{D}{E}\right)_{firm}\right) \times \beta_{peers}^{unlevered}$$

- Estimate the firm's cost of equity using CAPM :

$$r_E = r_F + \beta_E \times (\mathbb{E}[r_M] - r_F)$$

6 Initial public offerings (IPO)

6.1 Presentation

6.1.1 Definition

An IPO occurs when a company decides to "go public" : its shares will start trading on the stock market. Some special cases of IPO :

- Secondary IPO : the company was once public but now private.

- Carve-out : a parent company IPOs a fully-owned subsidiary.
- Spin-off or "demerger" : a parent company and one of its subsidiaries decide to separate and create subsidiary shares distributed to existing shareholders.
- Foreign listing : the company IPOs on foreign stock market.
- Dual-listing or cross-listing : shares trade on several stock markets.

6.1.2 IPO Process

Investment banks assist the company with :

- Preparation : procedure, "clean-up" company structure ...
- Structure : number of shares, pricing ...
- Marketing : "equity story", "educating" investors, roadshow ...
- Selling : share allocation ...
- Post-IPO price support ...

The valuation schedule includes 4 steps :

- 6-8 months before IPO : fundamental valuation of enterprise value using the DCF method or trading multiples.
- 1-2 months before IPO : pre-marketing using analysts valuations and investors feedback (growing importance of trading multiples).
- 2 weeks before IPO : IPO price range using investors feedback and market environment (trading multiples and DCF).
- IPO : final price, within price range and based on orders in the book (price sensitivity depending on market conditions).

6.1.3 Pros and cons

There are three advantages in doing an IPO :

- Money for the company : new (primary) shares allow to fund investment, repay debt, and later, borrow money, make new acquisitions ...
- Money for the owners : the proceeds of the secondary (sale) shares go to owners, and later, the IPO eases stock sales, loans ...
- Good impact on the business : IPO as marketing (good for customers and suppliers), stock-based compensation for employees.

There are two main disadvantages in doing an IPO :

- The costs for "going public" : fees (listing, lawyers, underwriter, accountants ...), time (for the management), risk of underpricing ...
- The costs of "being public" : scrutiny (regulators, press, investors ...), public market pressure (risk of short-termism ...) loss of control, conflicts ...

6.2 IPO puzzle

6.2.1 Underpricing puzzle

The IPO first-day return is defined as /

$$FDR = \frac{End\ of\ day\ price - IPO\ price}{IPO\ price}$$

This FDR is very high in China (137 % on average), Brazil. It is moderate in Singapore, Germany and Italy, and low in Canada or Israel.
Why is that so ? Two explanations :

- Investment bank conflict : underwriting banks tend to underprice IPOsto give their favored clients (hedge funds and institutions) cheap access to a stock at the expense of the company's owners.
- The winner's curse : if some smart investors know the true value of the IPO, they will invest only in underpriced IPO and will capture all the profits.

We define the IPO proceeds as :

$$Proceeds = Offer\ price - Spread - Other\ expenses$$

6.2.2 long-run underperformance puzzle

An opportunity for profitable trading seems to exist in IPO. But in fact, investing in the shares of recent IPOs seems to generate lower returns than investing in shares of otherwise similar companies.