FINANCE COURSE

International Track

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Finance

1 Reminder

1.1 The place of cash balance in the liquidity payability approach

The goal of the liquidity payability approach is to assess the risks of insolvency and default of the firm.

- Insolvency: a firm is insolvent when the amount of it's debt is higher than the value of its assets
- Default (cessation des paiements): a firm is defaulting when it does not find the required cash to repay the debt on the maturity date.

Assets	100	Equity Debt	(200) 300
Total	100	Total	100

Such a firm has a negative equity because of accumulative losses

- A firm can be insolvent without defaulting: in spite of a negative equity a bank accepts to grant a loan in order to enable the firm to repay debt on the maturity date.

- Correlatively a solvent firm can be defaulting: in spite of a positive equity the banks refuse to grant the required credit to repay the debt on the maturity date.

- If a firm is defaulting, its CEO has to inform the President of the Trade Court that the firm is going bankrupt (Chapter 11). In more than 90% of the situations, the firm will be liquidated (all its assets are sold and the proceeds repay part of the debt). Then, in order to prevent bankruptcy, the CFO (Chief Financial Officer) tries to fine a financial equilibrium. This equilibrium might be the following one:

    - long term assets (which are supposed to remain for more than one year in the balance sheet) financed by long term resources;

    - short terms assets financed by short terms liabilities.

    Such equilibrium is a presumptive one, because some discrepancies from a cash balance point of view might occur (the firm is awaiting a cash inflow but the cash inflow does not occur):

    - clients ask the firm to pay it later, which the firm is obliged to accept so that these clients will not deal with competitors in the future;
    - inventories are accumulating as the pace of sales is decreasing;
    - suppliers are more demanding and ask the firm to pay its liabilities earlier.

    The firm must have a financial security margin in order to face these discrepancies without going bankrupt; the security margin is the working capital which corresponds to the difference between long term resources and long term assets.

1.2 The place of cash balance in the functional approach

The functional approach is focused on cash or on the cash balance

1.2.1 The cash balance approach

The accounting balance sheet is balanced when the value of its assets corresponds to net values.
The functional balance sheet presents the cash outflows corresponding to the purchase price of the assets; therefore the functional balance sheet includes only gross values. In order to have a balanced functional balance sheet a depreciation, amortization and provision fund has to be added in the stable resources

NB: depreciations relate to tangible assets whereas amortisations relate to intangible assets.

Accounting balance sheet

Fixed assets	Gross	Depr., amort. and provisions	Net	Equity	600
Intangible	100	20	80	Financial debt	300
Tangible	200	50	150	Payables	100
Financial	300	100	200	Other liabilities	100
Current assets					
Inventories	400	100	300		
Receivables	500	200	300		
Cash and cash equivalents	100	20	80		
Total	1 600	490	1 110		1 110

Calculation of the Working Capital(WC)

Equity	600	
Financial debt	300	
(overdraft)	(50)	
Amortization depreciation and provisions fund	490	
Stable ressources	**1 340**	
(Stable assets)	(600)	ie 100+200+300
WC	**740**	
Inventories	400	
Receivables	500	
Currents assets	**900**	
(payables)	(100)	
(other liabilities)	(110)	
(Current liabilities)	**(210)**	
WCR	**690**	**ie 900 - 210**

Cash balance = WC-WCR = 740-690 = 50

*Check: C*ash balance = cash equivalents – overdrafts = 100 – 50 = 50

1.2.2 The fundamental relationship in finance

Intangible assets Tangible assets Financial assets	Stable assets	Equity and liabilities Provisions for risk and charges Depreciation funds Financial debt except overdrafts	Stables resources
Inventories Receivables	Current assets	Payables to suppliers Payables to tax authorities	Current liabilities
Cash equivalents Cash		Overdraft	

The functional balance sheet is balanced. It means that:
Functional assets = Functional equity and liabilities

Then:

Stables assets (SA) + Current assets (CA) + Cash and Cash Equivalents (CCE) = Stable resources (SR) + Current liabilities (CL) + Overdraft

CCE - Overdraft = (SR-SA) - (CA-CL)

Cash balance = Working Capital – Working Capital Requirements

1.2.3 Calculation of a quarterly Working Capital Requirement (current assets - current liabilities)

Profit and loss account

Purchases	40	Sales	100
Staff costs	30	Change in inventories	0
Depreciations	20		
Profit	10		
Total	100		100

Seasonality of sales

Quarter	1	2	3	4	Total
Sales' season coefficients	30%	40%	10%	20%	100%

On the 1st of January, inventories = 50

Payment delay for clients: 3 months
Payment delay for suppliers: 3 months

Definitions

Inventories at the end of the period = Inventories at the begining of the period + Change in inventories

Change in inventories = Increases in inventories - Decreases in inventories

Increases in inventories = Full cost of the corresponding purchases ie Purchases + Other operating charges (staff cost and depreciations)

Decreases in inventories = Full cost of the goods sold

In other terms, the net margin is not included in inventories.

Calculation of the quarterly WCR

Quarter	1	2	3	4	Total
Coefficients	30%	40%	10%	20%	100%
Sales	30	40	10	20	100
Inventories					
Beginning of the period	50,0	45,5	32,0	45,5	
Increase	22,5	22,5	22,5	22,5	90,0
Decrease	-27,0	-36,0	-9,0	-18,0	-90,0
End of the period	45,5	32,0	45,5	50,0	
Receivables	30,0	40,0	10,0	20,0	100,0
Current assets	75,5	72,0	55,5	70,0	
Suppliers payables = Current liabilities	-10,0	-10,0	-10,0	-10,0	-40,0
WCR	**65,5**	**62,0**	**45,5**	**60,0**	

Given the delay of payment for clients (3 months) the sales of a given quarter will be paid during the next quarter; therefore a receivable corresponding to the amount of the sales has to be booked every quarter.

2. Cash management

2.1 Cash planning

2.1.2 Purpose of financial planning

It consists in calculating the cash inflows and cash outflows in order to get the cash balance and estimate the cash needs

2.1.3. Building cash projections

(1) Accounting balance sheet

Assets			*Equity and liabilities*
Fixed assets	300	Equity	800
Inventories	200	Financial debt	200
Receivables	600	Liabilities towards suppliers	100
Cash & cash equivalents	400	Other liabilities	
		. Corporate tax	200
		. Dividends	200
TOTAL	1 500	TOTAL	1 500

(2) 50 % of the clients pay within 1 month
50 % of the clients pay within 2 months
(3) 50 % of the suppliers are paid within 3 months
50 % of the suppliers are paid in cash
(4) The financial debt includes an overdraft for a consideration of 50
(5) Short term debt to be repaid in November : 100
(6) 25 % of the corporate tax of the year is paid every 15th of the last month of the quarter
(7) The dividends are paid at the end of June
(8) Other information

Quarter	*1*	*2*	*3*	*4*
Sales	100	200	300	400
Purchases	300	200	500	100
Capex	100	100	100	100

Notations and preliminary formulas

I_n = Cash inflow of the quarter *n*
S_n = Sales of the quarter *n*

$In = ½(2/3S_n+1/3\ S_{n-1})+1/2(1/3S_n+2/3S_{n-1})$
$In = ½.S_n + ½.S_{n-1}$

During the first quarter, only the sales of January and February are paid during the quarter as the sales of March will be paid during the next quarter (ie: payment during the quarter: 2/3 of S_n). But in January, there is also a cash inflow corresponding to the sales of December (ie: payment during the quarter: 1/3 of S_{n-1}).

O_n = Cash outflow on purchases of the quarter *n*
P_n = Purchase of the quarter *n*

$O_n = ½.P_{n-1} + ½.P_n$

Quarter	1	2	3	4
1/2 S_n	50	100	150	200
+1/2 S_{n-1}	200	50	100	150
I_n (1)	**250**	**150**	**250**	**350**
1/2P_n	-150	-100	-250	-50
+1/2P_{n-1}	-50	-150	-100	-250
O_n	-200	-250	-350	-300
Capex	-100	-100	-100	-100
Repayment of short term debt				-100
Corporate tax	-50	-50	-50	-50
Dividends		-200		
Total outflows (2)	**-350**	**-600**	**-500**	**-550**
Change in cash balance (1)-(2)	**-100**	**-450**	**-250**	**-200**

Based on the Balance sheet (B/S) and the note Nr4 :

Cash and cash equivalents	400
(Overdrafts)	(50)
Cash balance on the 1st of January	350

Quarter	1	2	3	4
Cash balance at the beginning of the quarter	350	250	-200	-450
Change in cash balance	-100	-450	-250	-200
Cash balance at the end of the quarter	250	-200	-450	-650

From the second quarter onwards, the cash balance is negative.

As Cash balance = WC – WCR = (SR – SA) – WCR it can be increased via 2 routes:

- Increase in working capital:
    - Increase in stable resources
        - ✓ Capital increase;
        - ✓ Subsidy;
        - ✓ Increase of long term debt (overdraft turned into long term debt)
    - Decrease in stable assets ie sale of assets
- Decrease in the working capital requirement
    - Clients' acceptance to pay sooner;
    - Suppliers' acceptance to be paid later.

2.2 Short term borrowing

2.2.1 Discount

If a receivable is represented by a draft (*traite*) the firm can discount it. Then, the amount of the receivables is lent to the firm. The bank is in charge of the debt collection. But if the client of the firm is defaulting, the banking account of the firm is debited; therefore the default of the credit risk is supported by the firm.

2.2.2 Factoring

In that case the receivables are sold to the bank, which therefore supports the credit risk.

2.3 Drawing a parallel between various costs of financing

2.3.1 Proportional cost

To calculate monthly or quarterly payments the nominal rate which is a yearly rate can not be used. A monthly rate, a quarterly rate or half yearly has to be calculated:

Monthly rate = nominal rate / 12

Quarterly rate = nominal rate / 4

Halfly rate = nominal rate /2

The rate which is used in the calculation is therefore proportional to the nominal rate.

More generally, if *n* payments have to occur during the year, the proportional rate to the *i* nominal rate is *i/n.*

2.3.2 Yield to maturity = *taux actuariel*

The *r* yield to maturity enables to compare different credit conditions with various periodicities of payments. It corresponds to the nominal rate which would have been announced for yearly payments.

Assuming:

- i is the nominal rate (which is necessarily a yearly rate) for n payments within a year ;
- *M* is the amount which is invested

It must be equivalent to invest *M* for a year :

- using the *r* rate, the interests being paid once at the end of the year;
- using the *i* rate, the interests being paid *n* times within the year and capitalized. Each interest is then calculated using the *i/n* proportional rate.

Then :

$$M(1+r) = M(1+\frac{i}{n})^n$$

and:

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

Example

Determination of the best banking conditions for a corporate loan

The yield to maturity of each bank enables to choose the most interesting conditions.

Assuming r_x is the yield to maturity of the bank *x* :

- $1+r_A = (1+\frac{5{,}03\%}{12})^{12} \Leftrightarrow r_A = (1+\frac{5{,}03\%}{12})^{12} - 1 = 0{,}05148 = 5{,}148\%$
- $1+r_B = (1+\frac{5{,}05\%}{4})^{4} \Leftrightarrow r_B = (1+\frac{5{,}05\%}{4})^{4} - 1 = 0{,}05146 = 5{,}146\%$

and, r_C =5,10%

Finally *:* $r_C < r_B < r_A$

Therefore, C which offers the cheapest banking conditions, has to be chosen.

2.3.3. Example of a debt repayment

Assumptions

Outstanding loan:	100 000 €
Duration of the credit:	3 years
Periodicity of payments:	Quarterly
Nominal rate:	11%
Administrative fee:	1%
Credit insurance	0,66%

a. Quarterly rate

Assuming *i* is the quarterly rate, used for 4 payments per year; $i = \frac{11\%}{4} = 2{,}75\%$

b. Quarterly payments

Assuming *a* is the flat quarterly payment, V_0 the outstanding loan and *n* the total number of payments of 3 years:

$$a = \frac{V_\circ . i}{1-(1+i)^{-n}}$$

$$a = \frac{100.000 x 2{,}75\%}{1-(1+2{,}75\%)^{-(4x3)}} = 9\ 897\ €$$

c. First columns of the amortisation table

Quarter	Outstanding debt	Interests	Repayments	Quarterly payments excl. Insurance
1	100 000	2 750	7 147	9 897
2	92 853	2 553	7 343	9 897
3	85 510	2 352	7 545	9 897
4	77 964	2 144	7 753	9 897
5	70 212	1 931	7 966	9 897
6	62 245	1 712	8 185	9 897
7	54 060	1 487	8 410	9 897
8	45 650	1 255	8 641	9 897
9	37 009	1 018	8 879	9 897
10	28 130	774	9 123	9 897
11	19 006	523	9 374	9 897
12	9 632	265	9 632	9 897
TOTAL		18 762	100 000	118 762

d. Administrative fees

Based on a 1% rate, the administrative fees are worth 1% x 100 000 = 1 000 €. This amount is immediately deducted from the amount which can be used by the borrower.

Then, the amount which can be used by the borrower is :

100 000 – 1 000 = 99 000 €

e. Credit insurance

Its amount is calculated, every quarter, based on the quarterly insurance rate and on the outstanding loan for the quarter which is taken into account.

The insurance rate which is announced by the bank (0,66%) is a nominal rate and therefore a yearly rate. The *j* quarterly rate is so that:

$$j = \frac{0{,}66\%}{4} = 0{,}165\%$$

Then, the amortisation table can be filled in:

Quarter	Outstanding debt	Interests	Repayments	Quarterly payments excl. Insurance	Insurance	Quarterly payments incl. Insurance
1	100 000	2 750	7 147	9 897	165	10 062
2	92 853	2 553	7 343	9 897	153	10 050
3	85 510	2 352	7 545	9 897	141	10 038
4	77 964	2 144	7 753	9 897	129	10 026
5	70 212	1 931	7 966	9 897	116	10 013
6	62 245	1 712	8 185	9 897	103	10 000
7	54 060	1 487	8 410	9 897	89	9 986
8	45 650	1 255	8 641	9 897	75	9 972
9	37 009	1 018	8 879	9 897	61	9 958
10	28 130	774	9 123	9 897	46	9 943
11	19 006	523	9 374	9 897	31	9 928
12	9 632	265	9 632	9 897	16	9 913
TOTAL		18 762	100 000	118 762	1 126	119 888

f. Effective global rate

This rate corresponds to the effective cost of the credit in %. Assuming *i'* is such a rate, *i'* enables to equalize:

- On the one hand, the amount which can be used by the borrower (ie: 99 000 €);

- On the other hand, the sum of the discounted payments including credit insurance. In that case:

$$99.000 = \frac{10.062}{(1+i')^1} + \frac{10.050}{(1+i')^2} + ... + \frac{9.913}{(1+i')^{12}}$$

It can be checked that *i'* = 3,08%.

i', which is calculated based on quarterly payments, is therefore a quarterly rate. In order to get the *r* rate to maturity, the following formula has to be used:

$1 + r = \left(1 + \frac{i'}{n}\right)^n$ where *n* is the number of payments per year and *i'* is the nominal rate. As *n*=4, $\frac{i'}{n}$ is a quarterly rate

Here: $\frac{i'}{n} = 3,08\%$

Then: $1 + r = (1 + 3,08\%)^4$ donc : $r = (1,0308)^4 - 1 = 12,9\%$

2.4. Short term investment facilities

2.41. Negotiable instruments

2.411. The main instruments: CPs, CDs, T Bills

It's possible for a corporate to borrow some money for a short time period (less than 2 years) without asking a bank. In that case, the corporate issues a commercial paper (CP). This security is not listed but its price is determined based on a market methodology and it can be negotiated so that its owner can sell it before its maturity date.

For their short term financing, banks can also issue negotiable instruments. Then, they issue certificates of deposit (CDs). The French State also issues such instruments. In that case, it issues Treasury Bills (T-Bills).

2.412. Interest rate risk exposure

An investor wants to save 1 M€ for 3 months. He decides to subscribe to a commercial paper with the following features:

- Nominal value: 1 M€
- Nominal rate: 5%
- Duration: 3 months

a. Calculation of the amount which will be paid by issuer to the holder of the CP at the end of the 3-month period

Assuming V_n is the amount which will be paid at the end of such a period. V_n corresponds to the sum of debt repayment (1 M€) and interests based on a 5% nominal rate. Then:

$$V_n = 1000000.\left(1+\frac{5\%x90}{360}\right) = 1\ 012\ 500\ €$$

b. Calculation of the price of the instrument at the end of the 1st month, assuming a 6% reference rate on the monetary market

Assuming *P* is the corresponding price, P is determined so that the yield of the investment for a buyer of the security on the secondary market is the same as the one he would obtain on the primary market (ie: 6%). Taking into account the 2-month period (till the maturity date) of the saving of the new investor, P is so that:

$$P.\left(1+\frac{6\%x60}{360}\right) = 1\ 012\ 500.$$

$$\text{Then : } P = \frac{1012500}{1+\frac{6\%x60}{360}} = 1\ 002\ 475\ €$$

c. Calculation of yield of the subscriber

The subscriber has eventually saved 1 000 000 € for 30 days and got 1 002 475 € when he sold his CP. Assuming *i* is his yield ; *i* is so that :

$$1000000(1+\frac{30i}{360}) = 1\ 002\ 475$$

$$\text{Then: } i = \frac{360}{30}(\frac{1002475}{1000000}-1) = 2{,}97\%.$$

The rate increase on the market has boiled down to a decrease in the 5% awaited yield.

But, if the reference rate was 4%, the *P'* price of the CP would be:

$$P'x\left(1+\frac{4\%x60}{360}\right) = 1\ 012\ 500.$$

$$\text{Then : } P' = \frac{1012500}{1+\frac{6\%x60}{360}} = 1\ 005\ 795\ €$$

With a *i'* effective yield, *i'* would be so that: $1000000(1+\frac{30i}{360}) = 1\ 005\ 795$

$$\text{Donc : } i' = \frac{360}{30}(\frac{1005795}{1000000}-1) = 6{,}95\%.$$

Then, the subscriber benefits from the decrease in the reference rate.

2.42. Funds under management

2.421. Introduction to asset management

An investor can go directly on the stock exchange or buy shares of a fund under management. Then his money is invested by the asset manager of the fund.

2.422. Return of a fund under management (FUM)

An individual wants to save 1 M€. In that case, he decides to buy shares of a FUM the liquidative value of which is 97 852 €.

a. Calculation of the number of shares to be purchased

The N number of shares is: $N = \frac{1000000}{97852}$ = 10,22 rounded to 10 shares.

b. Calculation of the yield of the saving assuming that, at the end of the 75th day, the investor has to sell his shares. Then, the liquidative value is supposed to be 101 243 €.

The individual invests only 10 x 97 852 = 978 520 € in the FUM. Therefore, the following amount can not be invested: 1 000 000 – 978 520 = 21 480 €

Assuming is the yield over the 75-day period:

$$i = \frac{(10x101243) + 21480 - 1000000}{1000000} = \frac{(10x101243) + 21480}{1000000} - 1 = 3{,}39\%$$

c. Calculation of the yield to maturity

Assuming r is the yield to maturity, r is so that:

$1 + r = (1 + 3{,}39\%)^{\frac{365}{75}}$. Then: $r = (1{,}0339)^{\frac{365}{75}}$ -1 = 17,6%.

2.43. Options

2.43.1. Definition

An option is a right to buy (call) or to sell (put) an underlying asset, on the maturity date (European option) or during a given period (American option) at a price which is known in advance (Strike price). The value of the option is the premium

2.43.2. Breakdown of the premium

The premium has to components:

- Intrinsic value (IV):
    - For a call: IV = max(0;S-E)
        - E= strike price : 100€; S = Spot price of the underlying asset : 120€; IV=120-100 = 20€
        - E=100€; S=90€; IV = 0
    - For a put: IV = max(0;E-S)
        - E= strike price : 100€; S = Spot price of the underlying asset : 120€; IV = 0€
        - E=100€; S=90€; IV = 100 – 90 = 10€
- Time value (TV) which is the additional amount, beyond the IV, the trader is ready to pay given his expectations regarding the price of the underlying asset until the maturity date of the option

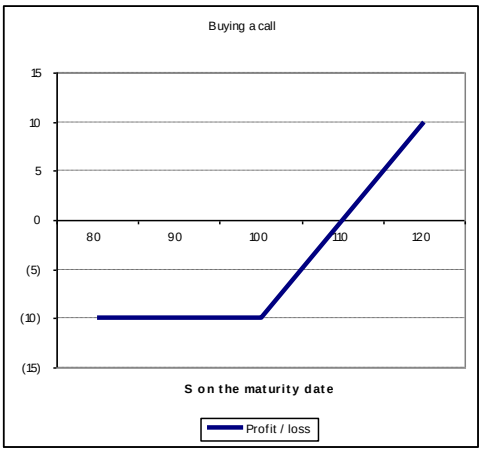
2.43.3. Speculative strategies

2.43.3.1. Buying a call

Assumptions:

- Strike price: 100 €
- Premium: 10 €

S on the maturity date	80	90	100	110	120
Premium paid	(10)	(10)	(10)	(10)	(10)
Intrinsic Value	0	0	0	10	20
Profit / loss	(10)	(10)	(10)	0	10



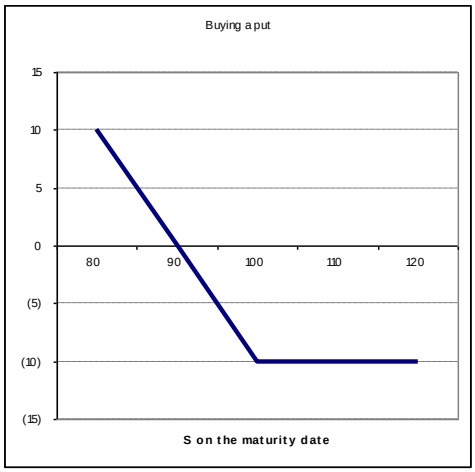
The potential losses are limited to the premium which has been paid, whereas the gains are the more important as the price of the underlying asset is high. It's a strategy based on expectations on the increase in the value of the underlying asset.

2.43.3.2. Buying a put

Assumptions:

- Strike price: 100 €
- Premium: 10 €

S on the maturity date	80	90	100	110	120
Premium paid	(10)	(10)	(10)	(10)	(10)
Intrinsic Value	20	10	0	0	0
Profit / loss	10	0	(10)	(10)	(10)



The potential losses are limited to the premium which has been paid whereas the gains are the more important as the spot price of the underlying asset is low. This speculative strategy corresponds to expectations on the decrease in the spot price of the underlying asset.

2.43.3.3. Selling a call

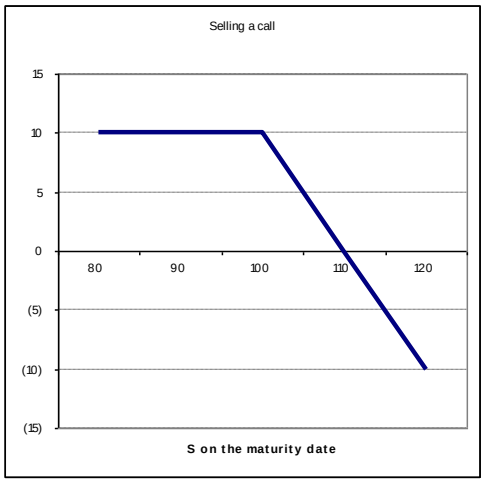
Assumptions:

- Strike price: 100 €
- Premium: 10 €

Selling a call					
S on the maturity date	80	90	100	110	120
Premium received	10	10	10	10	10
Financing of the intrinsic value	0	0	0	(10)	(20)
Profit / loss	10	10	10	0	(10)

If the spot price of the underlying asset is 110€, the call with a strike price of 100€ is interesting; therefore the owner of such a call decides to exercise it, but as a trader on options, the seller of the call does not own the underlying asset: he has to buy it on the stock market for a consideration

corresponding to its market price (110€); then he sells it to his counterpart for 100€ and books a 10€ capital loss.



The gains are limited to the premium which has been received (10€) whereas the losses are the more important as the spot price of the underlying asset is high. It is a strategy coressponding to expectations on the decrease in the price of the underlying asset. This strategy is more risky and has lower profitable prospects than the purchase of a put. The sale of a call is however achieved by the trader who speculates on the decrease of the underlying asset while refusing to pay a premium.

2.43.3.4. Selling a put

Assumptions:

- Strike price: 100 €
- Premium: 10 €

S on the maturity date	80	90	100	110	120
Premium received	10	10	10	10	10
Financing of the intrinsic value	(20)	(10)	0	0	0
Profit / loss	(10)	0	10	10	10

If the spot price of the underlying asset is 80€, the put with the strike price of 100€ is interresting; then its owner decides to exercise it and asks the seller of the put to buy the underlying asset. Then, the counterpart of the seller of the put sells the underlying assets to the seller of the put for a consideration of 100€. As the seller of the put can not keep the underlying asset in his securities portfolio, he has to sell it on the stock market for a consideration of 80€ and books a 20€ capital loss.

The gains are limited to the premium which has been received (10€) whereas the losses are the more important as the spot price of the underlying asset is low; then it is a strategy based on expectations on the increase of the price of the underlying asset.

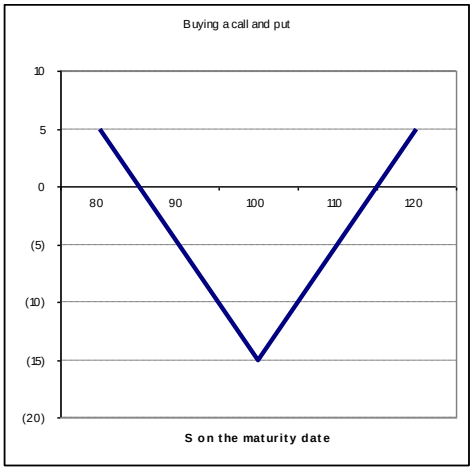
2.43.3.5. Straddles

2.43.3.5.1. Buying a call and a put with the same strike price

Assumptions:

- Strike price: 100 €
- Premium:
    - Call: 10 €
    - Put: 5 €

S on the maturity date	80	90	100	110	120
Premiums paid	(15)	(15)	(15)	(15)	(15)
Intrinsic Value of the call	0	0	0	10	20
Intrinsic Value of the put	20	10	0	0	0
Profit / loss	5	(5)	(15)	(5)	5



The highest loss occurs when the spot price of the underlying asset equals the strike price of the option; this maximum loss corresponds to the premiums which have been initially paid.

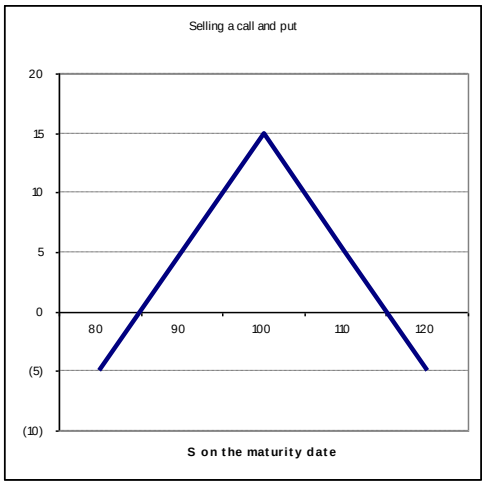
The gains are the more important as the increase or the decrease is significant; this strategy corresponds to an expectation on volatility of the underlying asset.

2.43.3.5.2. Selling a call and a put with the same strike price

Assumptions:

- Strike price: 100 €
- Premium:
    - Call: 10 €
    - Put: 5 €

S on the maturity date	80	90	100	110	120
Premiums received	15	15	15	15	15
Financing of the intrinsic value of the call	0	0	0	(10)	(20)
Financing of the intrinsic value of the put	(20)	(10)	0	0	0
Profit / loss	(5)	5	15	5	(5)



The maximum gain (15€) occurs when the spot price of the underlying asset equals the strike price; this gain corresponds to the premium which has been received.

The losses are the more important as the volatility is high; therefore this strategy corresponds to expectations on stability of the underlying asset.

3. Capital budgeting (decision d'investissement)

3.1 Cash flow calculation

Cashflow = variation de tresorerie

The cash flow can be calculated based on the net profit but the depreciations, amortisations and provisions which have been booked are charges with no cash impact; therefore these charges have to be neutralised. Then:

Cash flow = Net profit + depreciations, amortisations and provisions.

In the net profit, some products will be paid later and have to be neutralized in the cash flow calculation; but the P&L account does not enable to distinguish a product which has been paid from a product which will be paid later. The counterpart of such a product in the balance sheet can be taken into account. It corresponds to an increase in the clients receivables which has to be neutralized.

Some charges which have reduced the net profit have not been paid yet because a delay of payment has been granted by a supplier; therefore, in order to neutralise the charges which have not been paid yet, it is possible to neutralize their counterparts in the balance sheet which correspond to the increase in suppliers payable.

Moreover the net profit includes some production which has not been sold yet and which corresponds to inventories. Such a production has no cash impact yet and has to be neutralized. Its counterpart in the balance sheet ie the increase in inventories can also be neutralized. Finally the restatements of the net profit to get the cashflow are :

- Δ in receivables + Δ in accounts payable – Δ in inventories
= -(Δ in inventories + Δ in receivables – Δ in accounts payable)
= -(Δ in current assets - Δ in current liabilities)
= - Δ in WCR

Then:

CashFlow = net profit + depreciations, amortizations and provisions – ΔWCR – Capex

NB: Capex = capital expenditure = investissement operationnel

Simple example

Firm	**1**	**2**	**3**
EBITDA	100	100	100
(Depreciations)	0	-50	-100
EBIT	100	50	0
(Corporate tax)	-34	-17	0
Net profit	66	33	0
Depreciations	0	50	100
CF	66	83	100

The firm Nr3 has the highest cash flow (100 €) whereas its net profit is the lowest one; the reason is that the firm Nr3 has booked a depreciation for a consideration of 100 € which boils down to an EBIT the value of which is zero. The firm Nr3 has therefore no taxable profit; then the difference between its cash flow and the cash flow of the firm Nr1 (34 €) corresponds to the difference between the corporate taxes of both firms.

3.2 Investment decision

3.2.1 Accounting approaches

3.2.1.1 Payback period

The payback period is the required time to get the cash flows corresponding to the amount of the Capex

n= Payback period (temps nécessaire a la récupération du montant de l'investissement sous forme de cash flow)

I_0 = Capex

The payback period is *n* so that $I_0 = \sum_{t=1}^{n} CF_t$

Decision: between two project the one which as the lowest payback period has to be choosen

Payback period

t	**1**	**2**	**3**
CFt(A)	50	50	1000
CFt(B)	100	10	2

Payback period of project A = 2 years (as 100 = 50+50)
Payback period of project B = 1 year

B has to be choosen based on the payback period, whereas the project A is far more profitable.

3.2.1.2 Average cash flow

It corresponds to the average of the forecasted cashflows without discounting them

3.2.2 Financial criteria

3.2.2.1 Net Present Value

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

Let's assume that $CF_0 = -I_0$. Then:

$$NPV = CF_0 + \sum_{t=1}^{n} \frac{CF_t}{(1+K)^t} = \frac{CF_0}{(1+K)^0} + \sum_{t=1}^{n} \frac{CF_t}{(1+K)^t}. \text{ Then : } \boxed{\text{NPV} = \sum_{t=0}^{n} \frac{CF_t}{(1+K)^t}}$$

Case Nr1

A firm contemplates a Capex for a consideration of 10 000€ corresponding to the purchase of a machine. This machine would be used and depreciated on a straight line basis for 5 years. This machine would generate a yearly 5000 € EBITDA.

At the end of the fifth year it should be possible to sell the machine. Based on the net present value and a 10% discount rate, do you recommend this Capex?

Cashflow = Net profit + depreciations = EBITDA – corporate tax

1. Yearly recurring cash flow

EBITDA	5 000
(Depreciations)	(2 000)
EBIT	3 000
(Corporate tax@ 34%)	(1 020)
Net profit	1 980
Depreciations	2 000
CF before exceptional transaction	3 980

2. Exceptional item ie sale of the machine

a. Net book value

At the end of the fifth year, the machine has been fully depreciated; then, its net book value is equal to 0

b. Capital gain

Selling price	1 000
(Net book value)	(0)
Capital gain	1 000

c. Tax on capital gain : 34% x 1 000 = 340 €

3. NPV calculation and conclusion

$$NPV = \text{-}10\,000 + \sum_{t=1}^{5} \frac{3980}{(1+10\%)^t} + \frac{1000-340}{(1+10\%)^5} = \text{-}10\,000 + 3\,980\,\frac{1-(1+10\%)^{-5}}{10\%} + \frac{660}{(1+10\%)^5}$$

NB: a Capex can be achieved if the NPV is positive; it has to be refused if the NPV is negative.

Finally, here: NPV = 5 497 € >0. Then, the Capex can be accepted.

Case Nr2

A firm contemplates the acquisition of a machine for a consideration of 8 000 €. This machine would generate the following EBITDAs:

- ***Year 1: 8 000 €***
- ***Year 2: 6 000 €***
- ***Year 3: 4 000 €***
- ***Year 4: 1 600 €***

The depreciations would be the following ones:

- ***Year 1: 3 000 €***
- ***Year 2: 1 880 €***
- ***Year 3: 1 560 €***
- ***Year 4: 1 560 €***

This machine can be either used for 4 years or replaced by a new one at the end of the second year.

The selling price of the machine is 5 000 € at the end of the second year and 1 000 € at the end of the 4th year. Based on a 10% discount rate and on the NPV, do you recommend to keep the machine for 4 years ot to replace it at the end of the second year ?

1St assumption: the machine is kept for 4 years

1. Yearly cash flow before taking exceptional transactions into account

Year	1	2	3	4
EBITDA	8 000	6 000	4 000	1 600
(Depreciations)	(3 000)	(1 880)	(1 560)	(1 560)
EBIT	5 000	4 120	2 440	40
(Corporate tax@ 34%)	(1 700)	(1 401)	(830)	(14)
Net profit	3 300	2 719	1 610	26
Depreciations	3 000	1 880	1 560	1 560
CF before exceptional transaction	6 300	4 599	3 170	1 586

2. Exceptional item ie sale of the machine

a. Net book value

At the end of the fifth year, the machine has been fully depreciated; then, its net book value is equal to 0

b. Capital gain

Selling price	1 000
(Net book value)	(0)
Capital gain	1 000

c. Tax on capital gain : 34% x 1 000 = 340 €

2. Exceptional item ie sale of the machine

$$NPV = -8\,000 + \frac{6.300}{(1+10\%)^1} + \frac{4.599}{(1+10\%)^1} + \frac{3.170}{(1+10\%)^1} + \frac{1.586+1.000-340}{(1+10\%)^1} = 5.445\ €$$

2nd assumption: the machine is replaced at the end of the 2nd year

1. Yearly cash flow before taking exceptional transactions into account

Year	1	2	3	4
CF_t	6300	4599	6300	4599
Machine	1st	1st	2nd	2nd
Age of the machine	1	2	1	2

2. Exceptional item ie sale of the machine

2.1. Net book value

Gross value	8 000
(Depreciations)	4 880
Net book value	3 120

2.2. Capital gain

Selling price	5 000
(Net book value)	(3120)
Capital gain	1 880

b3 tax on capital gain
34% x 1 880 = 639 €

3. NPV calculation and conclusion

$$NPV_2 = -8\,000 + \frac{6.300}{(1+10\%)^1} + \frac{4.599 + 5000 - 639 - 8000}{(1+10\%)} + \frac{6300}{(1+10\%)^1} + \frac{4599 + 5000 - 639}{(1+10\%)^1} =$$

9 374 €> 5 444€ = NPV_1

Based on the maximisation of the NPV, the renewal of the machine at the end of the second year has to be recommended

4. Calculation of the discount rate

4.1 the cost of debt

The value of the security is the sum of the discounted cash flows that will be received by the owner of the security.

Assuming the debt of a company is represented by a bond with the following fetaures:

- nominal value: 1000 €;
- nominal rate: 4%;
- repayment at the end of the 3rd year (bullet) (remboursement infine),

the value of the bond is the sum of the discounted cashflows which will be received by the bond holder ie :

- interests = 4% x 1 000 = 40 €;
- debt repayment: 1 000 € at the end of the third year.

The day when the bond is issued, its value is : $1000 = \frac{40}{1+i} + \frac{40}{(1+i)^2} + \frac{1040}{(1+i)^3}$ if i = 4%

Then, the cost of debt is the discount rate (4%) which enables to equalize:

- on the one hand, the amount of the debt (1 000 €);
- on the other hand, the sum of the discounted cashflows (interest and debt repayment).

4.2 Cost of equity

The cost of equity is the discount rate which enables to equalize:

- on the one hand, the value of the share;
- on the other hand, the sum of the discounted cashflows which will be received by the share holders (dividends).

The Gordon and Shapino formula provides the cost of equity k:

$$k = \frac{D_1}{V_0} + g .$$

Where:

D_1 = next dividend to be paid (ie: to be paid next year)
V_0 = current share price
g = perpetuity growth rate (taux de croissance à l'infini)

Example:

Share price V_0 = 100€
Dividend to be paid next year: D_1 = 6€
g = 3%

$k = \frac{6}{100} + 3\% = 9\%$

Brokers and investment bankers calculate the cost of equity based on the Capital Assets Pricing Model
En francais: MEDAF Modele d'Evaluation (ou d'Equilibre) Des Actifs Financiers

In that context, the cost of equity for the firm corresponds to the awaited return by the shareholders.
$k = R_i = \alpha_i + \beta_i R_m + \varepsilon_i$

Where:

R_m= return on the market
β_i = volatility of the "i" share

If $\beta_i > 1$, then the share is aggressive: the changes in the return of the market are amplified regarding the changes in the return of the "i" share

If $\beta_i < 1$ the share is defensive

If $\beta_i = 1$ the share replicates the market.

It can be evidenced that:

$$R_i = R_f + \beta i\ (R_m - R_f)$$

Where :

R_f = risk free rate = return of T-Bonds (en français : taux de rendement des Obligations Assimilables du Trésor)

$R_m - R_f$ = market risk premium

Example

$\beta_i = 1{,}2$

$R_f = 3\%$

$R_m - R_f = 7\%$

The beta is higher than one; then the share is aggressive
The cost of equity is
k = 3% + (1,2 x 7%) = 11,4%

4.3. WACC

The discount rates corresponds to the Weighted Average Cost of Capital (WACC): K

$$K = k.\frac{E}{E+D} + i.(1-\tau).\frac{D}{E+D}$$

Where:

k = cost of equity

i = cost of debt

τ = corporate tax rate (34% in France)

E = equity

D = debt (ie: net financial debt)

The financial debt is found in the simplified financial balance sheet which is built based on the accounting balance sheet.

Accounting balance sheet

ASSETS	EQUITY AND LIABILITIES
Fixed assets Iinventories Receivables Cash and cash equivalents	Equity Financial Debt Payables Other liabilities

The restatements of the accounting balance sheet, in order to get the simplified financial balance sheet, are presented hereafter:

Simplified financial balance sheet

ASSETS	EQUITY AND LIABILITIES
Fixed Assets Current assets – Current liabilities *ie: WCR*	Equity Financial Debt – Cash and Cash equivalents *ie: Net financial debt to be used in the WACC calculation*

Example

Presentation of the simplified financial balance sheet based on the following accounting balance sheet and calculation of the WACC assuming a 5% cost of debt and a 11,4% cost of equity.

Accounting balance sheet

Fixed Assets	500	Equity	600
Inventories	400	Financial Debt	400
Receivables	300	Payables	300
Cash and cash equivalents	200	Other liabilities	100
TOTAL	1400	TOTAL	1400

Simplified financial balance sheet

Fiexed Assets	500	Equity	600
WCR	300	Net financial Debt	200
(curreny assets – current liabilities)		(400 – 200)	
(400+300) – (300+100)			
700-400			
	___		___
TOTAL	800	TOTAL	800

$$\text{WACC} = K = 11{,}4\%.\frac{400}{400+200} + 5\%.(1-34\%).\frac{200}{400+200} = 8{,}7\%$$

In a NPV calculation, such a firm would use a 8,7% discount rate.