Financial management

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Contents

Long term financial management

Definition

Long term financial management concerns the planning of the activities of a business over a relatively long time span (4 to 6 years). This planning is translated into several major documents that will be used as a road map for the business over time:
- o The operating budget
- o The cash budget
- o The pro-forma balance sheet

Example of a long term financial forecast of the activities of a business from 2010 to 2014

Royal Hotel: Balance Sheet on 31.12.2009

	31.12.2009
Current assets	
Liquid assets	180'000
Accounts receivables	175'000
Beverage inventory	15'600
Food inventory	17'800
Fixed / capital assets	
Land	2'648'000
Building	6'360'000
Furniture & equipment	1'000'000
Other assets	467'600
ASSETS	**10'864'000**
Short term liabilities	
Accounts payables - beverage	20'500
Accounts payables - food	19'500
Accrued expenses	
- Other operating expenses	13'750
- Maintenance	16'000
- Social charges:	
- F&B personnel	84'800
-Rooms personnel	56'800
- Administrative personnel	22'300
- HR personnel	8'250
- Marketing personnel	9'350
Dividends payable	265'900
Income taxes payable	98'000
Long term liabilities	
Mortgage I	3'980'000
Mortgage II	2'000'000
Other LTL	500'000
Equity	
Share capital	3'500'000
General reserve	268'850
Retained earnings	-
LIABILITIES & EQUITY	**10'864'000**

Royal hotel: Forecasted information

1st year budgeted	**2010**	
Days open	365	

Revenues

Food revenue

Number of seats	90	
Average sales per occupied seat	65.00	
Annual increase in average sales / seat from 2011 onwards	1%	
Seat occupancy	2010	63%
	2011	63%
	2012	64%
	2013	64%
	2014	64%

Beverage revenue

Number of seats	90	
Average sales per occupied seat	30.00	
Annual increase in average sales / seat from 2011 onwards	1%	

Room revenue

Number of rooms	80	
Occupancy rate	2010	51%
	2011	51%
	2012	52%
	2013	52%
	2014	52%
Average room rate	200.00	
Annual increase in average rate from 2011 onwards	1.00%	

Operating expenses

Cost of goods sold

Beverage cost (in % of beverage sales)	30%
Food cost (in % of food sales)	35%

F&B personnel

Number of employees	24
Average monthly salary	3'400.00
Annual increase from 2011 on	1.00%
Number of months	12
Social charges (employer's contribution)	18.00%
Social charges (employee's contribution)	18.00%

Other F & B expenses (in % of F&B sales)	4%
Paid within the year	

Rooms personnel

Number of employees	16
Average monthly salary	3'400.00
Annual increase from 2011 on	1.00%
Number of months	12

Other expenses Rooms (in % of room revenue, paid within the year)	6%

Other operating expenses *(in % of revenue)*   2%

Administrative personnel

Number of employees	5
Average monthly salary	4'500.00
Annual increase from 2011 on	1.00%
Number of months	12

Other administrative expenses

Annual expense	35'000.00
Annual increase % from 2011 on	1.00%

HR personnel

Number of employees	2
Average monthly salary	4'300.00
Annual increase from 2011 on	1.00%
Number of months	12

Other HR expenses

Annual expense (paid within the year)	15'000.00
Annual increase from 2011 on	1.00%

Marketing personnel

Number of employees	2
Average monthly salary	4'600.00
Annual increase from 2011 on	1.00%
Number of months	12

Other marketing expenses

Annual expense (paid within the year)	18'000.00
Annual increase from 2011 on	1.00%

Property taxes and insurance

(In % of insurance value of building & furniture = CHF 9 million)	1.00%

Maintenance and Energy   5,00%
(in % of revenue)

Depreciation

Building depreciation	linear	2%
Furniture & equipment depreciation	linear	10%
Other assets	linear	12.5%

Income tax (payable in the following year)   25%

Long term financing

	Mortgage I	Mortgage II
Rate	4,00%	5,00%
Fixed annuity	230'164.00	
Annual reimbursement		80'000.00

Other LTL: rate 7.00%, fixed annual reimbursement of 62'500

Replacement investments

Years	Building	Furniture & equipment
2010	125'000	45'000
2011	125'000	45'000
2012	125'000	45'000
2013	125'000	45'000
2014	125'000	45'000

Required return on Equity   8%
(payable in the following year)

Other information

	In days
Accounts receivable payment delay	15
Beverage inventory turnover	30
Food inventory turnover	15
Account payables - beverage payment delay	45
Accounts payables - food payment delay	15
Other operating expenses payment delay	30
Maintenance expenses payment delay	30
Social charges payment delay	90

Required: Prepare the long term budget for the Royal Hotel until 2014

Building and investments

Years	Value to be depreciated	Invest.	Depreciation	Accumulated depreciation	Balance Sheet value
2010	6'485'000	125'000	129'700	129'700	6'355'300
2011	6'610'000	125'000	132'200	261'900	6'348'100
2012					
2013					
2014					

Furniture & equipment investments

Year	Value to be depreciated	Invest.	Depreciation	Accumulated depreciation	Balance Sheet value
2010	1'045'000	45'000	104'500	104'500	940'500
2011	1'090'000	45'000	109'000	213'500	876'500
2012					
2013					
2014					

Other asset

Year	Value to be depreciated	Invest.	Depreciation	Accumulated depreciation	Balance Sheet value
2010	467'600	-	58'450	58'450	409'150
2011	467'600	-	58'450	116'900	350'700
2012					
2013					
2014					

Mortgage I

Years	Debt	Interest	Reimbursement	Annuity
2010	3'980'000	159'200	70'964	230'164
2011	3'909'036	156'361	73'803	230'164
2012	3'835'233			
2013				
2014				
2015				

Mortgage II

Years	Debt	Interest	Reimbursement	Annuity
2010	2'000'000	100'000	80'000	180'000
2011	1'920'000	96'000	80'000	176'000
2012	1'840'000			
2013				
2014				
2015				

Other LTL

Years	Debt	Interest	Reimbursement	Annuity
2010	500'000	35'000	62'500	97'500
2011	437'500	30'625	62'500	93'125
2012	375'000			
2013				
2014				
2015				

Operating budget

	2010	2011	2012-2014
Food revenue	1'345'208	1'358'660	
Beverage revenue	620'865	627'074	
Room revenue	2'978'400	3'008'184	
Total revenue	**4'944'473**	**4'993'917**	
Food cost	470'823	475'531	
Beverage cost	186'260	188'122	
F&B personnel	1'155'456	1'167'011	
Other F& B expenses	78'643	79'429	
Rooms personnel	770'304	778'007	
Other rooms expenses	178'704	180'491	
Other operating expenses	98'889	99'878	
Total operating expenses	**2'939'078**	**2'968'469**	
Operating profit	**2'005'394**	**2'025'448**	
Administration	353'600	357'136	
Human resources	136'776	138'144	
Marketing	148'272	149'755	
Maintenance & Energy	247'224	249'696	
Total functional expenses	**885'872**	**894'730**	
Gross operating profit (GOP)	**1'119'522**	**1'130'718**	
Property taxes and insurance	90'000	90'000	
Earnings before interest, tax & depreciation	**1'029'522**	**1'040'718**	
Building depreciation	129'700	132'200	
Furniture & equipment depreciation	104'500	109'000	
Other asset depreciation	58'450	58'450	
Earnings before interest & tax (EBIT)	**736'872**	**741'068**	
Mortgage interest I	159'200	156'361	
Mortgage interest II	100'000	96'000	
Other LTL interest	35'000	30'625	
Earnings before tax (EBT)	**442'672**	**458'082**	
Income tax	110'668	114'520	
Net profit	**332'004**	**343'561**	

Pro-forma Balance Sheets

	31.12.2009	31.12.2010	31.12.2011	2012-2014
Current assets				
Liquid assets	180'000	145'837	105'296	
Accounts receivables	175'000	203'198	205'229	
Beverage inventory	15'600	15'309	15'462	
Food inventory	17'800	19'349	19'542	
Fixed assets				
Land	2'648'000	2'648'000	2'648'000	
Buildings	6'360'000	6'355'300	6'348'100	
Furniture & equipment	1'000'000	940'500	876'500	
Other assets	467'600	409'150	350'700	
ASSETS	**10'864'000**	**10'736'642**	**10'568'829**	
Liabilities				
Accounts payables bev	20'500	22'928	23'212	
Accounts payables food	19'500	19'413	19'550	
Accrued expenses:				
Other operating expenses	13'750	8'128	8'209	
Maintenance	16'000	20'320	20'523	
Social charges	181'500	187'796	189'674	
Dividends payable	265'900	301'508	303'948	
Taxes payable	98'000	110'668	114'520	
Mortgage I	3'980'000	3'909'036	3'835'233	
Mortgage II	2'000'000	1'920'000	1'840'000	
Other LTL	500'000	437'500	375'000	
Equity				
Share capital	3'500'000	3'500'000	3'500'000	
General reserve	268'850	268'850	268'850	
Retained earnings	-	30'496	70'110	
LIABILITIES & EQUITY	**10'864'000**	**10'736'642**	**10'568'829**	

Cash Budget (Statement of Cash flow): variant I

	2010	2011	2012-2014
Depreciation	292'650	299'650	
Profit	332'004	343'561	
(Internally generated funds - IGF	**624'654**	**643'211**	
Accounts receivables	-28'198	-2'032	
Beverage Inventory	291	-153	
Food inventory	-1'549	-193	
Accounts payable beverage	2'428	284	
Accounts payables food	-87	138	
Accrued expenses	4'993	2'162	
Income taxes payable	12'668	3'852	
Operating cash flow (IGF+/- Δ WCR)	**615'201**	**647'269**	
Building	-125'000	-125'000	
Furniture & equipment	-45'000	-45'000	
Other assets	-	-	
Cash flows from investing activities	**-170'000**	**-170'000**	
LT debt reimbursement	-213'464	-216'303	
Dividends	-265'900	- 301'508	
Cash flows from financing activities	**-479'364**	**-517'811**	
Cash variance	**-34'163**	**-40'541**	
Liquid asset balance (including opening balance on 1.1.2010)	**145'837**	**105'296**	

Cash Budget: variant II

	2010	2011	2012-2014
Cash receipts	**4'916'275**	**4'991'885**	
Cash expenditures - beverage	183'541	187'991	
Cash expenditures - food	472'459	475'587	
F&B personnel	1'153'335	1'166'141	
Other F& B expenses	78'643	79'429	
Rooms personnel	769'157	777'428	
Other expenses rooms	178'704	180'491	
Other operating expenditures	104'512	99'797	
Administrative personnel	316'933	321'546	
Other administrative expenditures	35'000	35'350	
HR personnel	120'865	122'902	
Other HR expenditures	15'000	15'150	
Marketing personnel	129'822	131'477	
Other marketing expenditures	18'000	18'180	
Maintenance & Energy	242'904	249'493	
Property taxes and insurance	90'000	90'000	
Mortgage I	230'164	230'164	
Mortgage II	180'000	176'000	
Other LTL	97'500	93'125	
Building investments	125'000	125'000	
Furniture & equipment investments	45'000	45'000	
Other asset investments	-	-	
Taxes paid	98'000	110'668	
Dividends paid	265'900	301'508	
Total expenditures	**4'950'438**	**5'032'426**	
Cash variance	**-34'163**	**-40'541**	
Liquid asset balance (including opening balance on 1.1.2010)	**145'837**	**105'296**	

The Fundamental Balance Sheet Equation (FBSE)

Three fundamental concepts can be taken from the Balance Sheet:

- o The working capital (WC)
- o The working capital requirement (WCR)
- o The net cash position (NCP)

FBSE: Static version

$$NCP = WC - WCR$$

This relationship is more commonly used in its dynamic version (rather than the static version) where the variances rather than the absolute values are taken into consideration.

FBSE: Dynamic version

$$\Delta\ NCP = \Delta\ WC - \Delta\ WCR$$

The following comments can be made about the FBSE:

The liquidity of a business is the result of:

- o Its strategic decisions (long term)
- o And its operational decisions (short term)

Liquidity is a direct consequence of strategic decisions made concerning the working capital (WC),

- o Investments and divestments
- o Share issue and capital reductions
- o Long term borrowing and reimbursements of LT debt
- o Decisions made concerning dividend policy, which has an impact on auto financing

as well as the decisions affecting the working capital requirement, meaning operational decisions such as

- o The level of inventory
- o Customer payments
- o Supplier payments

Operational managers in domains such as purchases, production, sales etc have considerable influence on the firm's liquidity on a daily basis.

Strategic decisions influence :	Operational decisions influence :
THE WORKING CAPITAL (WC)	THE WORKING CAPITAL REQUIREMENT (WCR)
NET CASH POSITION (NCP)	

WORKING CAPITAL

Positive working capital

A positive WC means that there is financing available for the operational cycle after having financed the net fixed (or capital) assets.

The WC does not change on a daily basis. If the WC is calculated using the current assets less the short term liabilities, it gives the impression that the WC is affected by day-to-day operations, which is not the case.

A positive WC says: how much do I contribute to the operating cycle?

The WC depends only on the strategy of the firm with respect to its long term decisions.

WC = Permanent capital – Net fixed assets
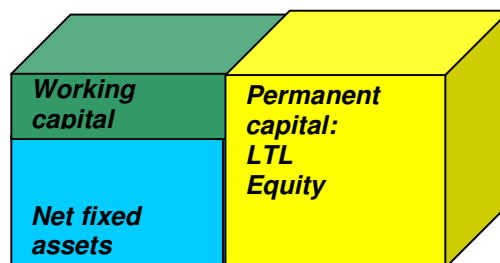
Negative working capital

If the permanent capital is smaller than the net fixed assets, it means that a part of the net fixed assets are financed by short term items.
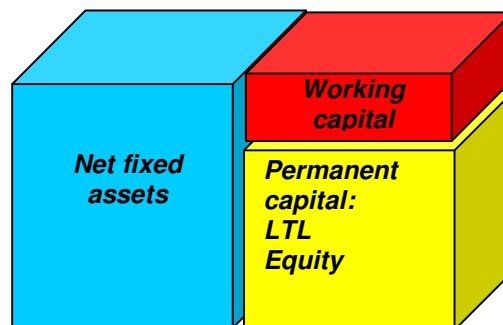
Royal Hotel: Determining the WC (to be completed until 2014)

	31.12.2009	2010	2011	2012 - 2014
Mortgage I	3'980'000	3'909'036	3'835'233	
Mortgage II	2'000'000	1'920'000	1'840'000	
Other LTL	500'000	437'500	375'000	
Share capital	3'500'000	3'500'000	3'500'000	
General reserve	268'850	268'850	268'850	
Retained earnings	-	30'496	70'110	
Total permanent capital	**10'248'850**	**10'065'883**	**9'889'193**	
Land	2'648'000	2'648'000	2'648'000	
Buildings	6'360'000	6'355'300	6'348'100	
Furniture & equipment	1'000'000	940'500	876'500	
Other assets	467'600	409'150	350'700	
Total fixed assets	**10'475'600**	**10'352'950**	**10'223'300**	
Working capital	**-226'750**	**-287'067**	**-334'107**	
Variance of working capital		**-60'317**	**-47'039**	

However, it is not necessarily the level of WC on its own that is important, but rather its relationship to the working capital requirement (WCR).

A company with a highly positive WC can be in financial distress if its working capital requirement is also highly positive.

On the other hand, a company with a low or negative working capital may be in a good financial position if its working capital requirement is lower (more negative) than its working capital.

The Working Capital Requirement (WCR)

The working capital requirement is the difference between the current assets and the short term liabilities that are exclusively linked to the operating cycle of a business (purchases – storage – production – sales – payments).
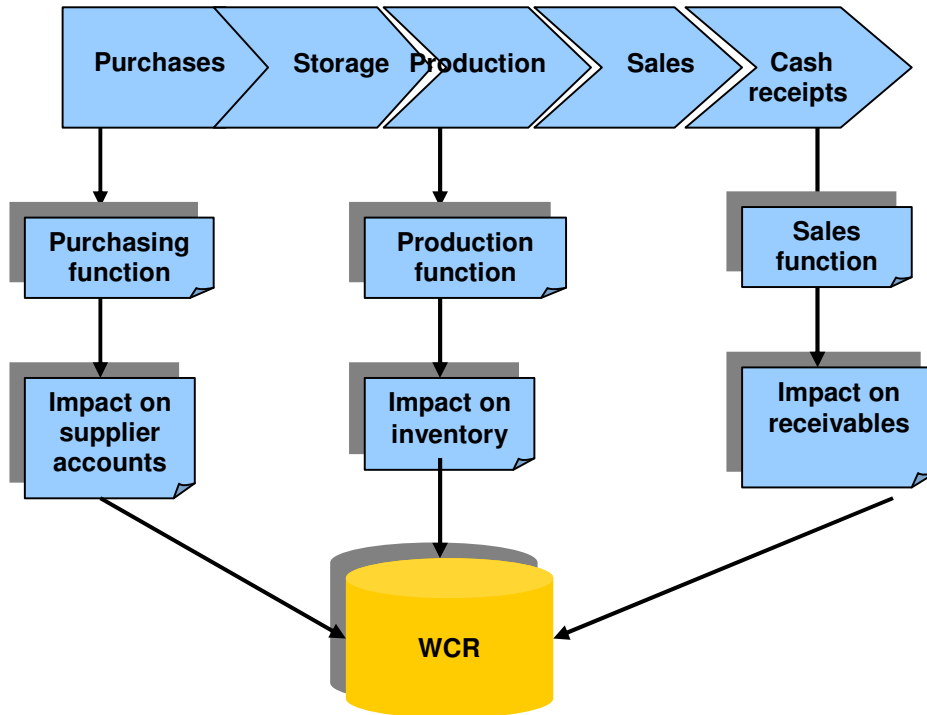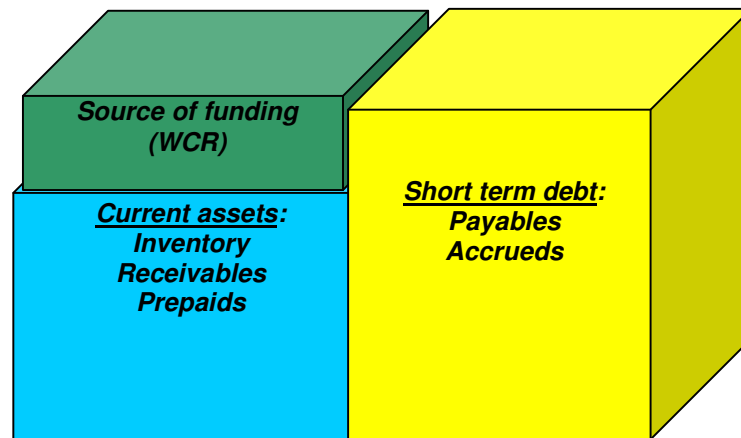

A positive WCR

A positive WCR means that a company has a net funding requirement. In other words, it represents the amount required by the firm to fund its day-to-day activities.
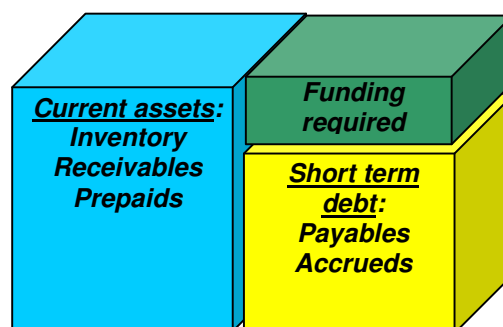
A negative WCR

A negative WCR means a short term source of funding for the firm.

Royal Hotel: Determining the WCR (positive)

	31.12.2009	2010	2011	2012 - 2014
Accounts receivables	175'000	203'198	205'229	
Inventory	33'400	34'658	35'004	
CA	**208'400**	**237'855**	**240'234**	
Accounts payables	40'000	42'340	42'762	
Accrued expenses	211'250	216'243	218'406	
Dividends payable	265'900	301'508	303'948	
Taxes payable	98'000	110'668	114'520	
STL	**615'150**	**670'760**	**679'636**	
WCR	**-406'750**	**-432'904**	**-439'402**	
WCR variance	**-**	**-26'154**	**-6'498**	

The WCR increases if the company's sales increase, even if the following items remain unchanged:

- o   Inventory turnover
- o   Accounts receivable payment delay
- o   Accounts payables payment delay

A company that is in a period of growth must expect an increase in its WCR.

The investment required for the expected increase in the WCR must be considered as a part of the investment plan of the company. Any project concerning expansion requiring capital expenditures (CAPEX) must take this increase into consideration in the budgeting process.

If the WC represents the funds available for the operating cycle of the firm after having financed the fixed assets, and the WCR measures the funds required to finance the operating cycle, then the Balance Sheet can be seen as a dialogue between the WC and the WCR.

The WC says: <u>how much do I contribute</u> to the operating cycle?

The WCR answers: <u>how much do I need</u> for the operating cycle?

The WCR concept is essential to the firm:

- Controlling its <u>level</u> and
- its <u>fluctuations</u> over time
- is vital for the <u>liquidity</u> of the firm.

The Net Cash Position (NCP)

The difference between the WC and the WCR is the net cash position.

The NCP is:

$$\textbf{NCP = WC– WCR}$$

Liquid assets: cash +short term or temporary investments – short term borrowing (bank overdraft)

If **WC > WCR**: we have a positive NCP

If **WC < WCR**: we have a negative NCP (short term funding requirement)

NCP variance:

$$\Delta\textbf{NCP} = \Delta\textbf{WC} - \Delta\textbf{WCR}$$

Royal Hotel: Fundamental Balance Sheet Equation (to be completed until 2013)

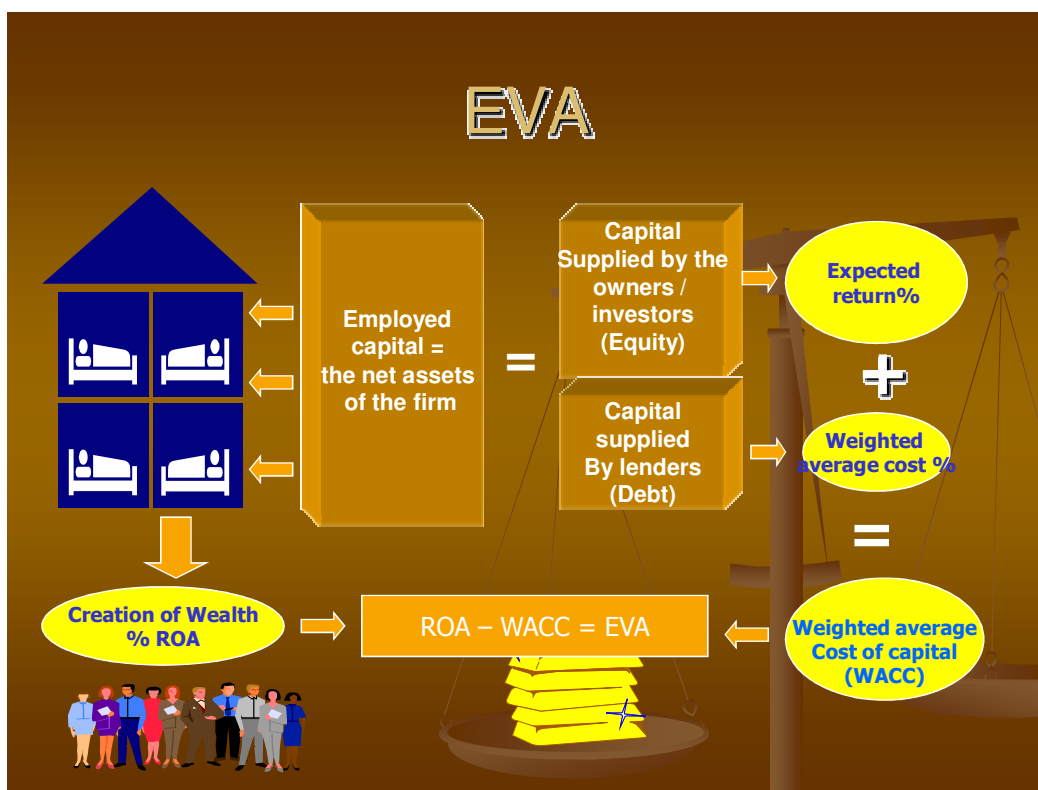|	31.12.2009	2010	2011	2012 - 2014
WC	-226'750	-287'067	-334'107	
Δ**WC**		-60'317	-47'039	
WCR	-406'750	-432'904	-439'402	
Δ**WCR**		-26'154	-6'498	
NCP = WC – WCR	180'000	145'837	105'296	
Δ **NCP = Δ WC - Δ WCR**		-34'163	-40'541	

The two main measures of value creation

There are two main measures of value creation that we work with:

- o The **EVA** (Economic Value Added)
- o The **NPV** (Net Present Value)

EVA = (ROA – WACC) x Net assets

ROIC: Return on Assets (or ROCE: Return on Capital Employed)

WACC: Weighted Average Cost of Capital

Calculating the EVA

Step 1: Royal Hotel: preparing condensed Balance Sheets (to be completed until 2014)

	31.12.2009	2010	2011	2012 - 2014
Working capital	(226'750)	(287'067)	(334'107)	
Land	2'648'000	2'648'000	2'648'000	
Building	6'360'000	6'355'300	6'348'100	
Furniture & equipment	1'000'000	940'500	876'500	
Other assets	467'600	409'150	350'700	
Net assets	**10'248'850**	**10'065'883**	**9'889'193**	
Mortgage I	3'980'000	3'909'036	3'835'233	
Mortgage II	2'000'000	1'920'000	1'840'000	
Other LTL	500'000	437'500	375'000	
Total LTL	**6'480'000**	**6'266'536**	**6'050'233**	
Share capital	3'500'000	3'500'000	3'500'000	
General reserve	268'850	268'850	268'850	
Retained earnings	0	30'496	70'110	
Total Equity	**3'768'850**	**3'799'346**	**3'838'960**	
Liabilities & Equity	**10'248'850**	**10'065'883**	**9'889'193**	

Step II: Royal Hotel: calculating EVA (to be completed until 2014) (accounting approach)

	2010	2011	2012 - 2014
Earnings before interest & tax (EBIT)	736'872	741'068	
- Mortgage I interest (Revenue for lenders)	159'200	156'361	
- Mortgage II interest (Revenue for lenders)	100'000	96'000	
- Interest on other LTL	35'000	30'625	
- Income tax (Revenue for state)	110'668	114'520	
= Net profit	332'004	343'561	
- Dividends (Revenue for shareholders)	301'508	303'948	
= EVA	**30'496**	**39'614**	
EVA / Beginning net assets	**0.30%**	**0.39%**	

Comments

o For a company quoted on the stock market, the condensed Balance Sheet would be prepared using the market values for long term liabilities and Equity (market capitalization). In the case of the Royal Hotel, we use the accounting values.

Another method of calculating EVA: EVA = (ROA − WACC) x Net assets

- **ROA**

$$\frac{(EBIT - Tax)}{(Beginning \cdot net\ assets)} \bullet 100$$

- **WACC**

$$K_e \bullet \frac{(Equity)}{(Beginning\ net\ assets)} + K_d \bullet \frac{LTL}{(Beginning\ net\ assets)}$$

- **K$_e$**   Cost of Equity in %

- **K$_d$**   Cost of long term liabilities in %

Royal Hotel: Calculating ROA (to be completed until 2014)

	2010	**2011**	**2012 - 2014**
EBIT	736'872	741'068	
- Tax on EBIT	-184'218	-185'267	
EBIT after tax	552'654	555'801	
Beginning net assets	10'248'850	10'065'883	
ROA = EBIT-Tax / Beginning net assets	5.392354%	5.521629%	

Calculating WACC

K$_e$ Suppose that the annual return expected by the Royal Hotel's shareholders is 8% annual and that this rate corresponds to market expectations.

K$_d$ 4 %   Mortgage I
         5 %   Mortgage II
         7%   Other LTL
Tax rate   25 %   (T = 0,25)

$$K_d = [(4\% \bullet \frac{Mortgage \cdot I}{Total\ LTL}) + (5\% \bullet \frac{Mortgage \cdot II}{Total\ LTL}) + (7\% \bullet \frac{Other\ LTL}{Total\ LTL})] \bullet (1 - T)$$

Royal Hotel: Calculating the net cost of debt (K$_d$ x (1-T)) (to be completed until 2014)

	31.12.2009	2010	2011-2014
Mortgage I 4%	3'980'000	3'909'036	
Mortgage II 5 %	2'000'000	1'920'000	
Other LTL 7%	500'000	437'500	
LTL	6'480'000	6'266'536	
Tax rate		25 %	
Net weighted average cost of debt		3.405093%	

Royal Hotel: Calculating WACC (to be completed until 2014)

	31.12.2009	2010	2011-2014
Expected return on Equity	8.00 %	8.00 %	
Weighted average cost of LTL	3.405093%	3.386876%	
WACC	5.094796%	5.128090%	

Royal Hotel: Calculating EVA (to be completed until 2014)

	2010	2011	2012-2014
Beginning net assets	10'248'850	10'065'883	
ROA	5.392354%	5.521629%	
WACC	5.094796%	5.128090%	
EVA = (ROA - WACC) x Net assets	**30'496**	**39'614**	

Royal Hotel: Calculating EVA using the accounting approach (to be completed until 2014)

	2010	2011	2012-2014
Economic profit = ROA x Beginning net assets	552'654	555'801	
- Revenues for lenders and shareholders = WACC x Net assets	522'158	516'188	
EVA	**30'496**	**39'613**	

FINANCIAL MATHEMATICS

1 Future value (FV)

- **General formula: FV = PV $(1+i)^n$**

PV	present value / starting value
FV	future value / final value
n	duration in years
i	annual interest rate
$(1+i)^n$	capitalisation factor

n	$(1,02)^n$	
0	1	$= (1,02)^0$
1	1,02	$= (1,02)^1$
2	1,0404	$= (1,02)^2$
3	1,061208	$= (1,02)^3$
4	1,08243216	$= (1,02)^4$

- **Problem 1**

Solution 1

An individual invests CHF 5 million in a bank account. What will the value of the investment be in 4 years time if the interest rate is 2% annual?

FV = 5'000'000 · 1,08243216 = CHF 5'412'160,80

Solution 2 (with a financial calculator)

PV: 5 million CHF
n: 4
i%:   2 %
FV = CHF 5'412'160,80

The capitalization factor of **$[1+i)^n]$** can also be found using a table or a financial calculator with a **$[y^x]$** function.

Solution 3 (with Excel)

FV function (future value)

Rate .02
Nper 4
PMT   Payment value: 0
PV   Present value: 5 million CHF
FV   Future value: **CHF 5'412'160,80**

2   Present value (PV)

- **General formula** $PV = FV(1+i)^{-n}$

  PV   present value   **n**   duration
  FV   future value   **i**   annual rate of interest
  (1+i)⁻ⁿ   discount factor

n	$(1{,}018)^{-n}$	
0	1.00000000	$(1{,}018)^{-0}$
1	0.982318271	$(1{,}018)^{-1}$
2	0.964949185	$(1{,}018)^{-2}$
3	0.947887215	$(1{,}018)^{-3}$
4	0.931126931	$(1{,}018)^{-4}$

- **Problem 2**

Solution 1

An investment made four years ago is worth CHF 8 million today. What was the initial investment if the annual interest rate is 1.8%?

PV = 8 million CHF · 0,931126931 = CHF 7'449'015,448

Solution 2 (with a financial calculator)

FV =   CHF 8 million
n =   4
i % =   1,8 %
PV =   **CHF 7'449'015,449**

Solution 3 : (With Excel)

PV function (present value)

Rate   .018
Nper   4
PMT   Value of payment: 0
FV Future value: 8 million CHF
PV Present value: **CHF 7'449'015,448**

Discounting (determining the PV) is the opposite of capitalizing (determining the FV), as the example below demonstrates.

N	FV = $(1,018)^n$		PV = $(1,018)^{-n}$	PV . FV = $(1,018)^n \cdot (1,018)^{-n} = 1,0$
0	1,000000	Multiplied by	1,000000	1,000000
1	1,040000		0.982318271	1,000000
2	1,081600		0.964949185	1,000000
3	1,124864		0.947887215	1,000000
4	1,169859		0.931126931	1,000000

The discount factor can be found by means of a table, or by using a financial calculator with the $\dfrac{1}{y^x}$ function (or the inverse of the y^x function).

3   **Determining « n »**

■   **General formula**

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

■   **Problem 3**

An investment of CHF 3 million invested at 4% is worth 3.4 million today. Determine how long the sum has been invested for.

Solution 1 linear extrapolation of the capitalization factors

$(1,04)^n$ = 3.4 / 3.0 = 1,133333

N	$(1,04)^n$	Difference between 3 and n	Difference between 3 and 4
1	1,040000		
2	1,081600		
3	1,124864		
N	1,133333	0,008469333	
4	1,169859		0,044995

$$n = 3 + \frac{0.008469333}{0.044995} = 3,188228321$$

Verification using the [y^x] function

FV = 3'000'000 · $(1,04)^{3.188228321}$ = **CHF 3,4 million**

<u>Solution 2</u> Using logarithms (base 10)

Using logarithms allows you to determine the mathematical duration in years, which is therefore a more exact result than the extrapolation process allows.

Base 10 logarithms

Base 10 logarithms are no more than 10 to the power of a number. They can be determined by using a table or a calculator that has the [log] function. The result obtained represents the power which was applied to the number 10.

Series:	$(10)^0$	$(10)^1$	$(10)^2$	$(10)^3$	$(10)^4$
Solution :	1	10	100	1000	10'000

log of 1   =   0

log of 10   =   1

log of 100   =   2

log of 1000   =   3

log of 10'000   =   4

$(1{,}04)^n$ = 1,133333

$n \log 1{,}04$ = log 1,133333

n = log 1,133333 / log 1,04

n = 3,191243574 years

Verification using the [y^x] function

FV = 3'000'000 · $(1{,}04)^{3{,}191243574}$ = **CHF 3,4 million**

Solution 3: with a financial calculator

PV =   -3.0

FV =   3.4

I% =   4.00%

N =   3.191251073

Solution 4 : with Excel

<u>Function Nper</u> *(Number of periods)*

Rate .   04

PMT   Value of payment: 0

FV   Future value: 3.4

PV   Present value: - 3

Nper   3.191251074

4   Finding the rate

■   **Problem 4**

A sum of CHF 5 million was invested 3 years ago and is worth CHF 5.7 million today. At what rate was the sum invested?

■   **General formula** $(1+i)^n = \dfrac{FV}{PV}$

$(1+i)^3$	=	5,7 / 5.0
$(1+i)^3$	=	1,14

Solution 1 by linear extrapolation of capitalization factors

n	4 %	5 %
0	1,000000	1,000000
1	1,040000	1,050000
2	1,081600	1,102500
3	1,124864	1,157625
4	1,169859	1,215506

		4 to x	4 to 5
4 %	1,124864		
x %	1,14	0,015136	
5 %	1,157625		0,032761

$$Taux = 4\% + \frac{0,015136}{0,032761} = 4,462\%$$

Verification using the [y^x] function

FV = 5,0 · (1,04462)^3 = **CHF 5,7 million**

Solution 2 using base 10 logs

$(1+i)^3$	=	1,14
3 log (1 + i)	=	log 1,14
log (1 + i)	=	log 1,14 / 3
log (1 + i)	=	0,056904851 / 3
log)1 + i)	=	0,018968283
(1 + i)	=	$10^{0,018968283}$
(1 + i)	=	1,044643927
Rate of		**4,464 %**

Verification using the [y^x] function

$$FV = 5.0 \cdot (1.04464)^3 = \textbf{CHF 5.7 million}$$

Solution 3 (Using a financial calculator)

PV = 5,0
FV = 5,7
n=   3
i% = 4,464 %

5   Future value (FV) of n annuities one year after the last payment (an annuity stream)

■   **Formula** $$FV \equiv \frac{PMT \bullet r(r^n - 1)}{i}$$

PMT   annuity
r   (1+i)

■   **Problem 5**

Find the value of the payment of 3 annuities of Fr 30'000.- each one year after the payment of the last annuity. Interest rate: 4%.

Solution 1
$$FV = \frac{30'000 \cdot (1.04)\,(1.04^3 - 1)}{0.04} = \text{CHF } \textbf{97'393.92}$$

Solution 2 Using a financial calculator

PMT   -30'000,0
n   3
i%   4 %
PV   0
MODE   BGN
***COMP* FV 97'393.92**

Solution 3 Using the FV function in Excel (Future value)

Rate: 4%
Nper: 3
PMT: 30000
PV: 0
Type: 1 (payment made at the beginning of each year)
FV: **CHF 97'393.92**

6   Future value (FV) of n annuities at the last payment (annuity stream)

■   **Formula**

$$FV \equiv \frac{PMT(r^n - 1)}{i}$$

■   **Problem 6**

Find the value of an annuity stream of 3 annuities of Fr. 30'000.– at the moment of payment of the last annuity. Interest rate: 4 %

Solution 1

FV = $\dfrac{30'000 \cdot (1,04^3 - 1)}{0,04}$ = **CHF 93'648.–**

Solution 2 (With a financial calculator)

PMT   CHF 30'000,0
n   3
i%   4 %
PV   0
***COMP* FV CHF 93'648,0**

Solution 3 (With Excel)

FV Function (Future value)

Rate: 4%
Nper: 3
PMT: 30000
PV: 0
Type: 0 or nothing
FV: = **CHF 93'648,0**

7   Calculating the value of an annuity (PMT)

■   **Formula**   PMT = $\dfrac{FV}{\dfrac{r^n - 1)}{i}}$

■   **Problem 7**

We would like to constitute a capital of Fr. 100'000.– through the payment of 3 annuities. Calculate the value of each annuity to obtain a capital of Fr 100'000.- on payment of the last annuity. Interest rate: 5 %

Solution 1

PMT = CHF 100'000 / [(1,05³ − 1) / 0,05] = **CHF 31'720.86**

Solution 2 (With a financial calculator)

FV	**100'000**
n	**3**
i%	**5%**
PV	**0**
COMP PMT	**CHF 31'720,86**

Solution 3 (Excel)

PMT Function

Rate	5%	Nper	3
PV	0	FV	100000
Type	0 or nothing	PMT	**CHF 31'720,86**

8   Present value of an annuity stream

■   **Problem 8**

Calculate the present value of an annuity stream of 3 annuities of Fr. 65'000.- each at the moment of the first payment. Interest rate: 6 %

■   **Formula** $PV = \dfrac{PMT \cdot r(1 - r^{-n})}{i}$

Solution 1

$PV = \dfrac{65'000 \cdot (1,06)\,(1 - 1,06^{-3})}{0,06} =$ **CHF 184'170,52**

Solution 2 Using a financial calculator

FV	0
n	3
i%	6%
PMT	65000
COMP PV (BGN)	**CHF 184'170,52**

Solution 3 PV Function in Excel (present value)

Rate	6%	Nper	3
PMT	65000	FV	0
Type	1	PV	**CHF 184'170,52**

■ **Problem 9**

Calculate the present value of an annuity stream of three annuities of Fr 65'000.- each a year before the first payment is made. Interest rate: 6 %

■ **Formula PV =** $\dfrac{PMT \cdot (1 - r^{-n})}{i}$

Solution 1

PV = $\dfrac{65'000 \cdot (1 - 1{,}06^{-3})}{0{,}06}$ = **Fr. 173'745.78**

Solution 2 (with a financial calculator)

PMT	65'000
n	3
i%	6
FV	0
***COMP* PV**	**CHF 173'745,78**

Solution 3 PV function in Excel

Rate	6%	Nper	3
PMT	-65000	FV	0
Type	0	PV	**CHF 173'745.78**

Problem 10

An investor would like to create a capital sum of 5 million CHF in 5 years through the investment of equal annuities in order to purchase a building. The interest rate is 4.50%.

- What will the amount of each annuity be?
- If the payments were to be made on a monthly basis, how much would each payment be?

Problem 11

An investor borrows a sum of $ 100'000 at an annual interest rate of 10 % to be reimbursed by equal monthly payments over 30 years. What is the value of each monthly payment?

Problem 12

A pension fund would like to invest in one of two projects detailed below. Which project should the pension fund choose if their required rate of return is 10%, and why? Calculate all necessary information for the decision making process.

Real estate project Cedar Ridge

Years	2010	2011	2012	2013	2014	2015
Cash Flows	0	45000	45000	45000	45000	45000
Investment / Sale	-450000					425000

Real estate project Oak Glen

Years	2010	2011	2012	2013	2014	2015
Cash flows	-	40'000	40'000	40'000	40'000	40'000
Investment / Sale	-420'000					450'000

Problem 13

A lender proposes the following two options to a borrower:

- A loan of $ 100'000, interest rate 11 %, reimbursed over 30 years by constant annual payments.
- A loan of $ 100'000, interest rate 10 %, reimbursed over 30 years by constant annual payments. On obtaining the loan, the borrower must immediately pay the lender a fee of $4'000.-.

Which solution is best for the borrower, and which one is more profitable for the lender?

Various problems

1. What would be the value of a deposit of $50 made today at a rate of 10% in 20 years time?

2. How much should be invested today to obtain a sum of $80 in 10 years time at an annual rate of 15%?

3. How much should be invested today at a rate of 15% to obtain $50 in one year and $60 in two years time?

4. How much should an investor pay each year (equal annuities) in order to obtain a capital of $100'000.- in 5 years time at a rate of 10% ?

5. How much would an investor have to invest at a rate of 15% in order to receive no payments for the next 10 years, then receive $300.- per year each year after for the next 10 years ?

6. What is the present value of $500.- received at the end of each of the next three years and then a sum of $1'000.- paid out at the end of the fourth year? Required rate of return = 15%.

7. What is the value of a constant annuity on a loan of € 1'500'000 at 10 to be reimbursed over 25 years?

8. A farmer wants to rent a plot of land for a period of 10 years. He proposes two possibilities to the owner of the land:
    - Pay a sum of $20'000 today
    - Pay an annuity of $3'200 at the end of each year for the next 10 years.

    Which solution should the owner choose if the required rate of return is a minimum of 10%?

9. An investor borrows a sum of $635'000 and accepts to reimburse a sum of $1'000'000 in 5 years. What is the cost of this loan?

10. An investor purchases a building for \$1'600'000. The financing of the purchase will consist of a personal contribution of \$600'000 and a mortgage of \$1'000'000 at a rate of 10.50 % to be reimbursed through 25 constant annuities. What is the amount of each annuity?

NPV: Net Present Value
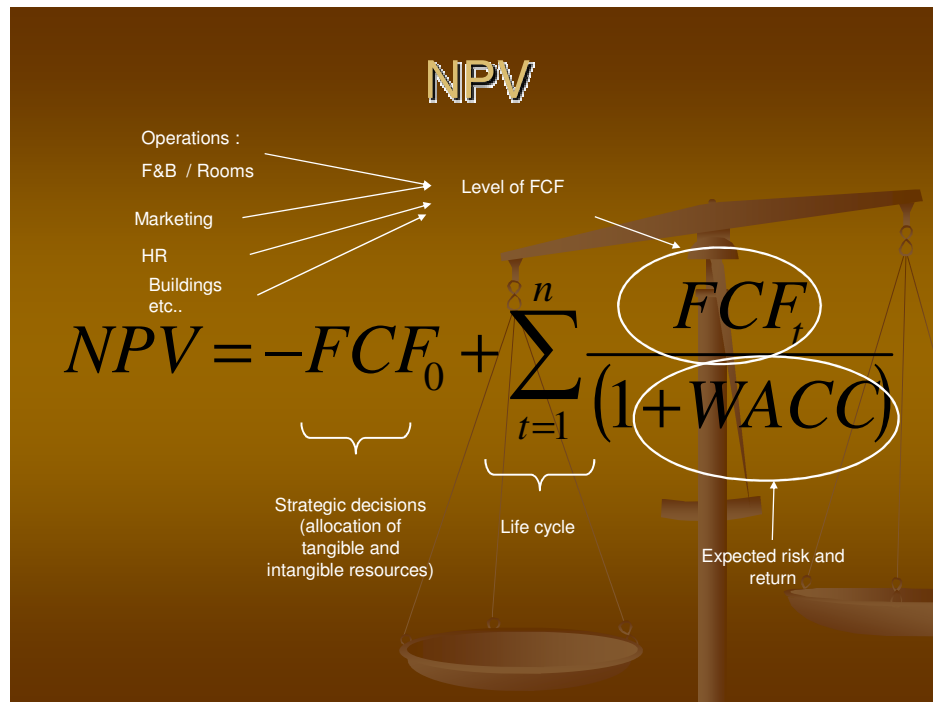
Explanations:

FCF: Free Cash Flows meaning cash flows available for long term lenders and the shareholders or owners of the business. Operations generate and influence these FCF.

-FCF: allocation of financial resources to finance tangible investment projects (such as expansion of the hotel, creation of a new hotel, etc) as well as intangible projects (new HR policies, new marketing strategies, image, etc)

WACC: as seen previously, this figure includes both the return for long term lenders and shareholders as well as a compensation for risk. It represents the minimum required rate of return.

Life cycle: is the period during which the firm estimates it can generate and maintain a positive NPV, or in other words, a competitive advantage. In a highly competitive market, the NPV will decline over time.

NPV: If the return on the project is superior to the WACC, a residual value appears (NPV). It is due to the fact that the firm outperforms the market.
.

Meaning of NPV

Cash available	1'000
Other assets	12'000
Project X	-
Total assets	**13'000**

The firm disposes of 1'000 in cash. It has the choice between:

- o Distributing the amount to shareholders or
- o Investing it in a project.

Let's suppose that the firm invests the 1'000 of cash available in a project.
WACC: 10 %. The FCF created by the project are the following:

	2010	2011	2012	2013	2014
FCF	-1'000	320	380	340	280

Excel Function: « NPV »

$$NPV = -1000 + \frac{320}{1,10^1} + \frac{380}{1,10^2} + \frac{340}{1,10^3} + \frac{280}{1,10^4} = 52$$

Cash available	**0**
Other assets	12'000
Value of project X	1'052
Total assets	**13'052**

This investment has generated an additional value of 52. Of course, this amount is based on forecasts. It suggests that the return of the project is superior to the WACC. In the interest of its shareholders, the firm should therefore proceed with this investment.

If the NPV had been 0, it would mean that the firm has swapped 1'000 in cash for a project worth 1'000. This implies a transfer of value but not a creation of value.

Calculating the return of the project

The rate of return of a project is calculated using the IRR (Internal Rate of Return). The IRR is the rate at which the NPV is 0 (discounted value of the FCF = investment).

Excel Function: « IRR »

$$-1000 + \frac{320}{(1+IRR)^1} + \frac{380}{(1+IRR)^2} + \frac{340}{(1+IRR)^3} + \frac{280}{(1+IRR)^4} = 0$$

IRR: 12,42 %

A positive IRR indicates that the FCF generated by the project plus its discounted terminal value allow the investors to get their investment back and obtain a mathematical annual return of 12.42% on those funds.

Meaning of IRR

1. I invest 1'000 at a rate of 12,42% instead of investing in the project. What sum will I obtain?

   Sum obtained : $1000(1,1242)^4 =$ **1597**

2. I decide to invest in the project and put the 4 FCF in the bank at an annual rate of 12.42%. What sum will I obtain?

   Sum obtained: $320(1,1242)^3 + 380(1,1242)^2 + 340(1,1242)^1 + 280(1,1242)^0 =$ **1597**

It can therefore be concluded that the interest rate is the rate of return on an invested capital and that the IRR is the rate of return on a physical capital (mean of production).

To choose an investment project, should I use IRR or NPV?

WACC: 10 %

Projects	FCF$_0$	FCF$_1$	FCF$_2$	FCF$_3$	IRR	NPV
A	- 10'000	5'000	7'000	8'000	40.42%	6'341
B	- 20'000	9'000	12'000	13'000	29.80%	7'866

If we choose our project by using the IRR, we would choose project A. However, if we use NPV, we would choose project B. Remember that what is important is to maximize the value created. We should therefore choose project B. The NPV is the tool that should be used to make an investment decision.

Graphic portrayal

Discount rate (WACC)	0.00%	10.00%	20%	30.00%	40.00%	50.00%
NPV - A	10'000	6'341	3'657	1'629	58	-1'185
NPV - B	14'000	7'866	3'356	-59	-2'711	-4'815
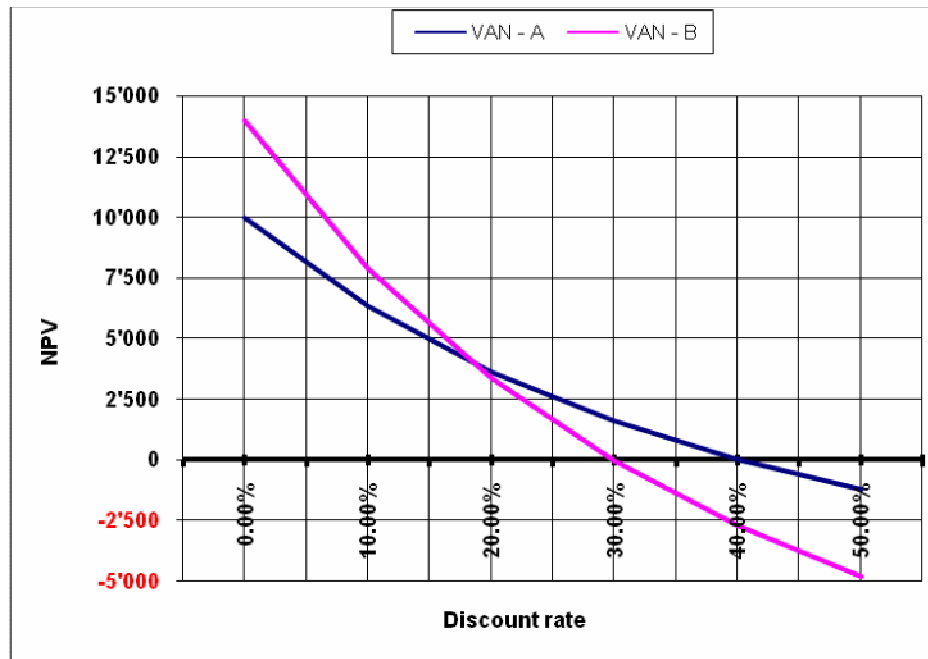
The graph shows us something extremely important: the choice of the discount rate. With a discount rate of 10%, project B allows us to create more value than project A. However, if a discount rate of 20% is used, the value created by project A is superior to that of project B. The choice of the discount rate is therefore of the highest importance.

Royal Hotel: determining the NPV

Using the NPV, determine whether the Royal Hotel has created value from 2010 to 2014.

Step 1: determining the FCF (to be completed until 2014)

Determining the FCF	2010	2011	2012-2014
Earnings before Interest and Tax (EBIT)	736'872	741'068	
Income tax	-110'668	-114'520	
Depreciation	292'650	299'650	
Capex (Capital Expenditure)	-170'000	-170'000	
Variance of WCR	26'154	6'498	
FCF	**775'009**	**762'695**	

Step 2: calculating the WACC in function of the financial structure on 31.12.2009

	31.12.2009
Mortgage I - 4 %	3'980'000
Mortgage II – 5 %	2'000'000
Other LTL 7%	500'000
LTL	6'480'000
Equity – 8 %	3'768'850
Total financing (= net assets)	10'248'850

WACC of Royal Hotel: ……………………

Step 3: calculating the terminal value (TV)

The TV does not exist for projects that continue for an undetermined period of time (hotels, industries, etc). The TV represents the amount that a business (or an investment project) will be worth at the end of a budgeted period (2014).

How do we determine the TV on 31.12.2014?

o   Accounting method

   Should we consider the accounting value of the assets on 31.12.2014? Obviously not, as this is a relatively poor method of evaluating a business.

o   DCF method

   A method that is commonly used to determine the TV is to use the FCF for the year 2015 and after. The main question here is, will those FCF remain constant or will they increase over time?

   a.   If the FCF from 2015 onwards remain constant (hypothesis we will use for the Royal Hotel), then the TV is the discounted value at the end of 2014 of a perpetuity.

$$TV = \frac{FCF_{2015}}{WACC}$$

   TV of the Royal Hotel: ……………………………..

b. If the FCF from 2015 onwards grow at a constant annual rate « g » :

$$TV = \frac{FCF_{2015}}{WACC - g}$$

Step 4: calculating the present value of the TV

$$PV \ of \ TV = TV(1 + WACC)^{-n}$$

PV of the TV of the Royal Hotel: …………………….

Step 5: calculating the PV of the FCF

$$PV \ of \ FCF = FCF_{2010}(1 + WACC)^{-1} + …….. + FCF_{2014}(1 + WACC)^{-5}$$

PV of the Royal Hotel:…………………..

Step 6: calculating the NPV (to be completed)

PV of the FCF + PV of TV (economic value of the business)	
- Net assets on 31.12.2009	
= **NPV**	

N.B. if the NPV is positive, it suggests that the IRR is higher than the WACC.

Important note concerning the TV

It must be clear here that the lower the WACC is, the higher the TV will be. In this case, will the figure obtained actually have any meaning?

Suppose that a new hotel is put on the market and that the investment was 10 million CHF. After 5 years, the TV (estimated value of the company) is calculated as a perpetuity and comes out as 13 million. The annual increase is therefore 5.39% (using the RATE function in Excel). Is this possible or realistic? The answer is no. To make this annual increase credible, you would need to research information concerning the major transactions (purchases & sales) of similar hotels, evaluate the evolution of real estate prices in hospitality etc.

Royal Hotel: determining the IRR

$$-10'248'850 + \frac{FCF_{2010}}{(1+IRR)^1} + \frac{FCF_{2011}}{(1+IRR)^2} + \frac{FCF_{2012}}{(1+IRR)^3} + \frac{FCF_{2013}}{(1+IRR)^4} + \frac{FCF_{2014}}{(1+IRR)^5} + \frac{TV_{2014}}{(1+IRR)^5} = 0$$

IRR: ……………………. %

There are three possible outcomes:

- o **IRR > WACC** :   Value creation
- o **IRR < WACC** :   Value destruction
- o **IRR = WACC** :   Transfer of value

We have determined the NPV created by the Royal Hotel for the years 2009 to 2013. This same procedure is used on any type of investment project.

A certain number of comments should be made concerning the concept of an investment.

Investments

In general, investing consists of an exchange between a future or current cash outflow versus future cash inflows (FCF).

The notion of an investment

The term "investment" covers certain notions that can be radically different depending on the point of view that is taken.

In a broad manner, we can distinguish between two main ideas:

o **From a macro economic perspective**, an investment represents the creation of a fixed sum of capital.

o **From a Financial perspective**, an investment is the decision to make an immediate expenditure with the purpose of generating a return over several successive periods. This concept of an investment concerns not only the constitution of a fixed capital sum, but also considers all expenditures that do not directly contribute to the functioning of the business: training personnel, research, etc.

Classification of investments

Depending on their nature, investments can be:

o **investments** in the form of **physical assets**
o **financial investments** in the form of shares or long term loans
o **intangible investments** that include all acquisitions of intangible assets (goodwill, patents, brands,..) as well as expenditures made for studies, research, training,…

Depending on their objective, investments can be:

o **expansion investments** where the objective is to expand the production and distribution capacity of the business in order to satisfy an increase in demand

o **a replacement investment** where the objective is to maintain the potential of the business

o **innovation or modernization investments**: often mistaken for replacement investments, however, their objective is to improve productivity

o **prestige investments** where the objective is the brand image of the business

o **social investments** which cover any investments made to improve the « quality of life » and that can not be directly measured (investments made to protect the environment, to reduce energy consumption, etc)

It is not always possible to precisely determine which category of investment is being made. An investment made for expansion could also be linked to modernization and innovation. A replacement investment may also contribute to modernizing the business.

The size of the investment is often an important criterion for classifying investments. One can not possibly look at an investment of 10 million francs in the same way as an investment of 50'000 Fr. The consequences on the future of the firm can not possibly be compared. Size is therefore intrinsically linked to the level of risk.

Means of financing investments

o **Expansion investments**

Their financing can be made by using internal (equity) and external (liability) funding

o **Replacement investments**

Should be financed using only internal financing (equity)

o **Innovation or modernization investments**

If they are not replacement investments, they can be financed using internal or external funding

Sources of financing for investments

o **Internal sources**

Investment made by owner(s) of the business, auto-financing, realization of fixed or current assets

o **External sources**

Construction loans

Construction loans finance construction projects. At the end of the construction period, the loan is consolidated, ie transformed into a mortgage.

Mortgages

Finances the purchase of buildings (building and land).

Bonds

A means of long term financing used mainly by large groups that are listed on the stock market.

Remarks concerning replacement investments

The impact of innovation and modernization investments is so considerable that they have been classified, incorrectly, as the only true type of investment. Most of the analysis techniques have been developed to study the impact of these two types of investments, whereas replacement investments, that are indispensable to maintaining the production capacity of the business, are much more common and are part of the day to day functioning of the firm. All too often, their analysis is neglected under the pretext that they do not create any supplementary profits for the firm.

Replacing a coffee machine may not create more sales for the business, but that is not a reason to neglect analyzing the investment. This type of investment should be analyzed from the cost perspective.

Some types of high-tech equipment (such as computers) can be purchased at lower and lower prices as time goes by. This translates itself into lower depreciation amounts, unless the depreciation period is reduced to cover obsolescence, as well as decreased maintenance costs compared to the equipment being replaced.

On the other hand, other types of equipment have increasing purchase prices. This often implies increased costs for the business that will need to be compensated by an increase in the level of activity or by controlling the other costs in a more efficient manner in order to reduce them.

To make the right decision, it is essential to compare several different offers, not only from the cost perspective, but also in terms of quality.

Conclusion

Is the NPV the only criteria to be used in an investment decision?

Other elements should be considered:

- o Security of the investment
- o No risk of change in overall fundamental policies
- o No risk of expropriation / nationalization
- o No obligation to partially reinvest profits locally
- o A diversified economy (less vulnerable)
- o Social stability
- o High level of employee training
- o Financial reputation, etc.

The importance of the investment decision

The investment decision is certainly one of the most important decisions that management has to make.

A business can only ensure its durability and attain its objectives through valid investment decisions.

The capital assets investment decision remains the most important for three main reasons:

- o Capital asset investments are generally irreversible due to the sums invested. Even if they are not totally irreversible, going back on such a decision or simply stopping the process is generally complex and extremely expensive.

- o Capital asset investments lack flexibility. Flexibility refers to the ability to quickly and easily change the initial destination of an investment. For example, it is easier to transform a hotel property into a housing property than to change the physical location of an oil refinery.

- o In capital asset investments, the cost of an error is extremely high. Just as trying to stop a train requires a certain braking distance, correcting or cancelling the effect of a poor decision takes time. A poor investment decision can even become a danger to the survival of a business as a whole.

Difficulty of the investment decision

It is very difficult to make the investment decision.

On one hand, the decision is based purely on quantitative forecasts. The difficulty of projecting and taking into consideration certain types of information about the future that are impossible to quantify, such as technological evolution or economic cycles, add to the difficulty of making an accurate quantitative forecast.

On the other hand, the decision must be perfectly coherent with the activities, objectives and general policies of the business. The manager must therefore clearly define both the general policy and the objectives of the firm so that the investment strategy remains coherent with the existing business.

Capital structure

Is there such a thing as an optimal capital structure, meaning a structure in which the **K$_e$** for shareholders is maximized?

Why maximize K$_e$ for shareholders? Because we want to keep them happy. After all, isn't that the fundamental objective of every business? How can we possibly expect to raise new funds from shareholders if we are not able to supply them with a return that covers the risk they have accepted to take in investing in the business? If we are unable to satisfy our shareholders, someone else in the market will be able to – so we might as well do it ourselves!

To answer these questions, we are going to work with the following equation and example case:

$$ROE = ROA + \frac{D}{E} \cdot \left[ROA - net\, K_d \right]$$

Explanation:

K$_e$ / ROE	Cost of Equity /Return On Equity
K$_d$	Cost of Debt
ROA / K$_a$	Return on Assets
D/E (ROA – K$_d$)	Leverage factor
E	Equity
D	Long term Debt
V	Value of Net Asset (V = D + E)
P	Net Profit

$$P = (ROA \cdot V) - (K_d \cdot D)$$
$$P = \left[ROA \cdot (D + E) \right] - \left[K_d \cdot D \right]$$
$$P = \left[ROA \cdot D + ROA \cdot E \right] - \left[K_d \cdot D \right]$$
$$\frac{P}{E} = \frac{ROA \cdot D}{E} + \frac{ROA \cdot E}{E} - \frac{K_d \cdot D}{E}$$
$$\frac{P}{E} = ROE = ROA \cdot \left[\frac{D}{E} + \frac{E}{E} \right] - K_d \cdot \frac{D}{E}$$
$$ROE = ROA \cdot \left[\frac{D}{E} + 1 \right] - K_d \cdot \frac{D}{E}$$
$$ROE = ROA \cdot \frac{D}{E} + ROA - K_d \cdot \frac{D}{E}$$
$$ROE = ROA + ROA \cdot \frac{D}{E} - K_d \cdot \frac{D}{E}$$
$$ROE = ROA + \frac{D}{E} \cdot (ROA - K_d)$$

Example:

Capital structures →	A	B	C	D	E	F	G
Debt (D)	-	135	225	315	405	495	585
Equity (E)	900	765	675	585	495	405	315
Total permanent capital (V)	900	900	900	900	900	900	900
EBIT - Tax	81	81	81	81	81	81	81
%Debt	0%	15%	25%	35%	45%	55%	65%
%Equity	100%	85%	75%	65%	55%	45%	35%
D/E ratio	-	0.18	0.33	0.54	0.82	1.22	1.86
K_d	2.00%	3.00%	4.00%	5.00%	6.00%	7.00%	8.00%
ROE	9.00%	10.06%	10.67%	11.15%	**11.45%**	11.44%	10.86%
Leverage factor	0.00%	1.06%	1.67%	2.15%	2.45%	2.44%	1.86%
ROA (K_a)	9.00%	9.00%	9.00%	9.00%	9.00%	9.00%	9.00%
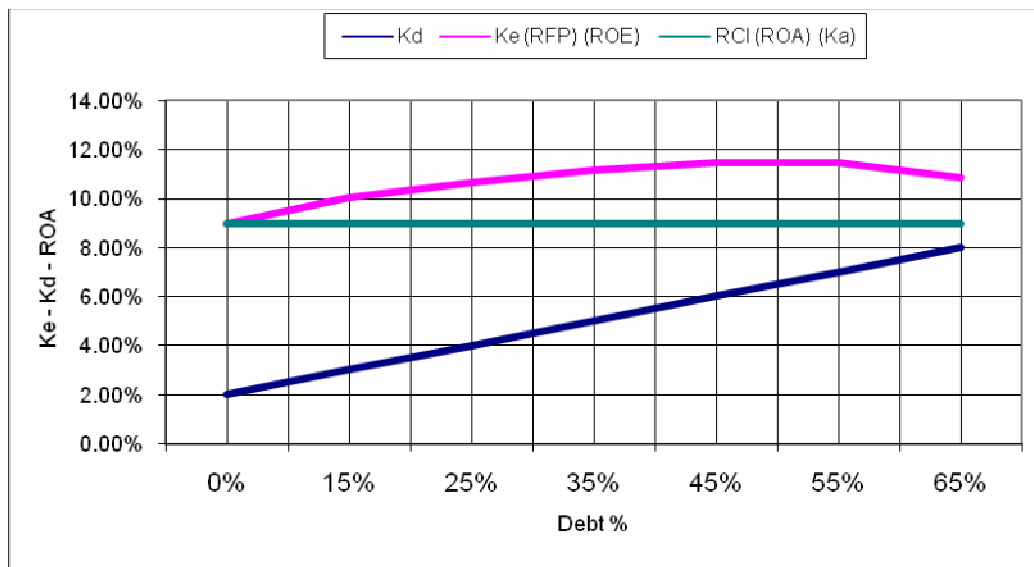
ROA   It is the fundamental measure of the efficiency with which the firm manages its assets. It is entirely independent of the capital structure (in other words, how the firm financed its assets). This ratio represents the firm's point of view.

$$ROA = \frac{EBIT - Tax\,on\,EBIT}{Net\ Assets}$$

If we want to make an international comparison, we would calculate the ROA before tax.
To analyze how the operating cycle affects the economic profitability of the firm, we can break the ROA down into the following elements:

ROA = Profit margin x Asset turnover

$$ROA = \frac{(EBIT - Tax)}{Sales} \bullet \frac{Sales}{Assets}$$

ROE   This ratio represents the shareholder's perspective. The ROE measures the efficiency with which the firm has employed the capital contributed by the shareholders. It is influenced by the way the firm finances its assets.

$$ROE = \frac{Net\ profit}{Equity}$$

To analyze how the operating cycle influences the ROE, we can decompose the ratio into three elements:

ROE = Profit margin x Asset turnover x Financial leverage

$$ROA = \frac{Net\ profit}{Sales} \bullet \frac{Sales}{Assets} \bullet \frac{Assets}{Equity}$$

Leverage factor:

The leverage factor is the expression of the consequence of the firm's capital structure, in other words, how it finances its assets.

$$\frac{D}{E} \cdot \left[ROA - net\ K_d \right]$$

ROE = ROA +/- leverage factor

The leverage factor is dependent on two elements:

- $(ROA - K_d)$
- D / E ratio (gearing ratio)

Several different cases can exist:

1. No debts: Leverage factor = 0 ➔ ROE = ROA
2. $ROA > K_d$:   Leverage factor > 0 ➔ the funds borrowed and invested have a rate of return that is higher than their cost ➔ adding more debt increases the return for shareholders.
3. $ROA = K_d$ Leverage factor = 0 ➔ ROA = ROE = K_d
4. $ROA < K_d$:   Leverage factor < 0 ➔ ROE decreases. The funds borrowed and invested have   a rate of return that is lower than their cost. The return for shareholders is   deteriorated by borrowing more funds.

Conclusion: in light of the example above, the best choice of capital structure is 45% debt and 55% equity. At this point, the ROE and the leverage factor are maximized.

Characteristics of debt and equity

Equity characteristics:

Equity holders are characterized by the following:

- They assume the risk of the firm (capital)
- They benefit from the profits
- They have no guarantee to recover their funds at any given date in time, they have no guarantee of returns at a fixed rate (paying a dividend is not mandatory)
- It gives the right to ownership and management of the business
- The sums invested are indefinitely at the disposal of the firm until the liquidation or closing down of the business.

Debt characteristics:

Debt holders are characterized by the following:

- They are based on a contract relationship (the creditor can demand the reimbursement of funds in accordance with the contract)
- They are paid by interest and do not benefit from the profits made by the firm
- They are generally not subject to the business risk, although in a bankruptcy in which the loss is superior to the amount of the equity, the creditors also have a risk of non-payment.

The creditors accept to take a limited amount of risk and are generally not inclined to finance projects over long periods that may have high risk factors.

They generally consider that the sums invested in equity represent a form of security. They will tend to invest when they can count on the equity as a form of guarantee of reimbursement of the sums invested.

Other elements to consider in choosing an optimal capital structure

The economic risk (Business risk) is associated with the nature of the business operations. The financial risk is generated through the choice of financing the firm uses to acquire its assets. It is, of course, quite dangerous to cumulate these two types of risk.

High business risk	Low business risk
Highly competitive environment	Monopolies
Low market entrance barriers	High market entrance barriers
High amount of possible substitute products	Low amount of possible substitute products
D/E ratio	**D/E ratio**
The D/E ratio should be low	The D/E ratio should be high
Conservative financial policy	Possibility of adding more debt to the capital structure

Royal Hotel: **Is the capital structure on 31.12.2009 (Debt 6'480'000, Equity: 3'768'850) the structure that maximizes shareholders' returns?**

Complete the following table:

%LTL	40%	50%	Current	70%
LTL			6'480'000	
Equity			3'768'850	
Total financing (= net assets)	10'248'850	10'248'850	10'248'850	10'248'850

Complete the following table and indicate the optimal capital structure (the one which maximizes ROE):

D / E ratio			**1.72**	
EBIT - Tax				
ROA				
Net K_d	2.50%	3.00%	3.41%	4.00%
(ROA - K_d)				
Leverage				
ROE				

N.B. The higher the debt, the higher the rate of interest required by lenders.

Can we influence the economic value of the firm?

<u>Distinctions to be made</u>:

Accounting value of the firm: (Capital + Reserves + Retained earnings) + LTL (poor measure)
Market value of the firm: (Market price x Number of shares) + LTL
The economic value of the firm is based on the DCF method.

Royal Hotel: EV (already calculated) = PV of the FCF + PV of the TV

$$EV = \frac{FCF_{2010}}{(1+WACC)^1} + \frac{FCF_{2011}}{(1+WACC)^2} + \frac{FCF_{2012}}{(1+WACC)^3} + \frac{FCF_{2013}}{(1+WACC)^4} + \frac{FCF_{2014}}{(1+WACC)^5} + \frac{\dfrac{FCF_{2015}}{(WACC-g)}}{(1+WACC)^5}$$

<u>We can attempt to increase the EV, and thereby the NPV (EV – Investment / net assets) by acting on</u>:

- o The FCF through the revenues and costs
- o The WACC by finding solutions that will minimize it: create competition between lenders so as to reduce K_d, test various capital structures (mix of debt and equity). However, caution is required: as K_e is higher than K_d, we would e tempted to maximize the firm's debts. The lenders may not agree with this idea. If they do agree, it may be at an extremely high cost. Moreover, a high level of debt can push the firm towards its insolvency level. As for K_e, it is rather difficult to reduce it as it depends mainly on the market's expectations.

$$WACC = K_e \bullet \frac{E}{V} + K_d.(1-T) \bullet \frac{D}{V}$$

Long term financing methods

The hierarchy or pecking order of long term financing methods, in terms of equity and debt is as follows:

1. Issuing shares, mortgage borrowing, issuing bonds
2. Reinvesting the profit (auto financing)
3. New loans (bonds, mortgages, others)
4. Issuing new shares (share capital increase) once the firm has overextended its debt capacity.

1. Issuing shares

Shares and their issue are a form of financing used both when the company is created and as well as during its operations. The minimum amount of shares required as well as the minimum number of shareholders is stipulated by law, but varies from one country to another.

The share capital is made up of a defined number of shares multiplied by their nominal (or par) value. New shares may only be issued at par or above.

The corporate status must contain information pertaining to:

- Corporate governance: the rules concerning the relationship between the shareholders, the board, the management team and the control bodies.
- The registered name and physical location of the business.
- The company's objective(s)
- The amount of the share capital and the nature of the investment (for example, minimum amount of capital)
- The amount, nominal value and type of shares issued (registered or bearer)
- The invitation to the annual meeting and the voting rights of shareholders
- The bodies officially named for the administration and auditing of the firm
- The form used for all publications made by the firm.

Returns expected by shareholders

In general, shareholders expect an annual return on their investment made up of dividends and capital gains.

The expected return depends on the market. It is not determined in function of the company's financial performance taken on its own (in opposite to the real return). In order to satisfy shareholders, the real return to shareholders must be the equivalent of the expected return.

Expressed as a %, the expected return is equal to the risk free rate (such as government bonds) that is then increased by a risk premium**:**

$$R_f + P$$

The market, in reality, can be defined as the environment in which the business operates: products that fulfill similar needs that can be acquired through the same distribution channels by the same clients. "A **market** is a niche or space in which a business has some industrial, commercial or service-oriented expertise. It is the arena in which the business competes."(www.vernimmen.com)

Real return (company quoted on stock market):

$$\frac{Dividend +/- Share \cdot price \cdot \text{var}iance}{Beginning \cdot market \cdot price}$$

Real return (company not quoted on stock market):

$$\frac{Dividend +/- Variance \cdot of \cdot Accounting \cdot Equity \cdot}{Beginning \cdot balance \cdot of \cdot Accounting \cdot Equity}$$

Despite the fact that this calculation is commonly used, it must be remembered that the accounting balance of equity does not correspond to the market value of the firm.

The empirical method of estimating the market value of a company that is not quoted on the stock market

Steps:

• Use the PER (Price-Earnings Ratio = Market rate / EPS) of a company that is quoted on the stock market that is in a similar market.

• Adjust the PER if necessary in order to take the risk factor(s) into consideration (a company that is not on the stock market is riskier than one that is). An adjustment of the PER of 25 – 40% is common.

• Determine the after tax profit of the firm that can be maintained in future years.

Market value of unquoted firm's equity = PER . After tax profit

N.B. There are different approaches that exist concerning this form of evaluating the market value of the firm. These approaches will be studied in the finance specialization in year 3.

2. **Mortgages**

A mortgage basically serves as a method of long term financing for the construction (or renovation, or acquisition) of buildings for either residential or business use. The building serves as collateral for the loan, but of course can not be "handed over" to the bank such as with a pawn broker! The use of the building as collateral must be registered at the appropriate government agency which is confirmed by a certificate that links the building to the loan (called a lien or deed of trust).

Mortgages allow the purchaser of real estate to acquire the building and / or land without having to use their own funds for the entire sum of the purchase. The loan that is granted is estimated in function of the material value of the property and the risk involved in making the loan.

In case of foreclosure, mortgages are always senior claims that must be reimbursed in priority to other unsecured loans. It therefore represents a relatively safe form of collateral for the bank.

Reimbursement of a mortgage

Depending on the type of contract, the borrower will reimburse the loan by either a fixed or a variable annuity (paid annually, per semester, per quarter or even monthly). The annuity includes both the interest and the amount reimbursed.

Interest rate:

Depending on the type of mortgage contract signed, the interest rate can be either fixed or variable.

- *Variable interest rate*: the interest rate is adjusted in function of the market throughout the duration of the loan.

- *Fixed interest rate*: the interest rate is fixed or locked in.

Example 1

Mortgage:	500'000
Reimbursement:	10 fixed annuities
Interest rate:	3.50%

Amount of the annuity?

Excel **PMT** function:

Rate	.035
Nper	10
Pv	500000
Fv	0
Type	0

PMT: 60'120.68

What is the situation of the loan after the 6th annuity payment of 60'120.68?

Excel **FV** function:

Rate	.035
Nper	6
Pmt	- 60'120.68
Pv	500000
Type	0

Fv: 220'828.03

Duration of the loan

Excel **Nper** function

Rate	.035
Pmt	- 60'120.68
Pv	500000
Fv	0
Type	0

Nper: 10 periods

Mortgage table

n	D	i	a	A
1	500'000.00	17'500.00	42'620.68	60'120.68
2	457'379.32	16'008.28	44'112.41	60'120.68
3	413'266.91	14'464.34	45'656.34	60'120.68
4	367'610.57	12'866.37	47'254.31	60'120.68
5	320'356.25	11'212.47	48'908.22	60'120.68
6	271'448.04	9'500.68	50'620.00	60'120.68
7	220'828.03	7'728.98	52'391.70	60'120.68
8	168'436.33	5'895.27	54'225.41	60'120.68
9	114'210.92	3'997.38	56'123.30	60'120.68
10	58'087.62	2'033.07	58'087.62	60'120.68
	Totals	**101'206.84**	**500'000.00**	**601'206.84**

Example 2

Mortgage:		500'000		
Fixed reimbursement:		over 10 years		
Fixed interest rate:		3.50 %		

n	D	i	a	A
1	500'000.00	17'500.00	50'000.00	67'500.00
2	450'000.00	15'750.00	50'000.00	65'750.00
3	400'000.00	14'000.00	50'000.00	64'000.00
4	350'000.00	12'250.00	50'000.00	62'250.00
5	300'000.00	10'500.00	50'000.00	60'500.00
6	250'000.00	8'750.00	50'000.00	58'750.00
7	200'000.00	7'000.00	50'000.00	57'000.00
8	150'000.00	5'250.00	50'000.00	55'250.00
9	100'000.00	3'500.00	50'000.00	53'500.00
10	50'000.00	1'750.00	50'000.00	51'750.00
	Totals	**96'250.00**	**500'000.00**	**596'250.00**

In this case, the reimbursement is linear, which makes it considerably easier to work out the duration of the loan as well as the situation of the debt at any given moment in time.

3. Bonds

Large companies have the possibility of obtaining long term funding (generally for periods of 8 to 15 years) through the issuing of bonds (long term liabilities for the issuer).

The bond issuance is generally prepared in collaboration with one or several different banks. These banks can:

- Acquire the entire bond issue and then resell the bonds to their own clients (called underwriting)

- Or simply act as an intermediary between the issuer and the customers, in which case the bank takes a commission on the bond sale.

Bonds are generally issued with a face value (or par value) of CHF 1'000, 5'000 or 10'000 denominations. Bonds that are openly traded on the market have a value that is indicated in % of the face value of the bond (excluding accrued interest on the bond).

The interest rate for the bond (also called coupon rate) is determined on the date of issuance and remains constant throughout the life of the bond. It is determined through a comparison with interest rates on other types of investments, as well as the rates on bonds issued by a similar category of company. The interest rate also corresponds to the risk category of the investment.

The interest on bonds is paid annually or semi-annually. The bond holder simply presents the coupon at a bank and is paid the interest due (less 35% tax if the bonds are Swiss). If a coupon is not presented at its due date, it remains valid for 5 years. At the end of this time period, the interest is considered as belonging to the bond issuer.

Bonds can be issued:

- *At par*: the issue price is equal to the face value of the bond

- *At a premium (or above par)*: the issue price is higher than the face value of the bond. This means that the issuer will receive a premium on the sale of the bond (which is generally used to cover the cost of issuing).

- At discount (or below par): the issue price is lower than the face value of the bond. This means that the issuer faces a theoretical loss on issuing the bond which becomes "real" when the bond matures (as the bond will be reimbursed at par value).

The date of reimbursement of principle is indicated at the bond's indenture. Certain bonds are reimbursed at a fixed date, whereas others are callable (ie can be reimbursed at a date of choice by the issuer, in function of market interest rate), yet others by series (called serial bonds). Serial bonds have the advantage for the issuer of reimbursing smaller amounts on an annual basis, rather than a large amount at one fixed date. Whether at maturity or at a call date, bonds are always reimbursed at their par value (at minimum). If a bond reimbursement is not claimed by its owner, the prescription period is 10 years. At the end of that period, the sum is considered as belonging to the issuer.

Bond return rates

Rate in %	Interest rate				
	4.00	**5.00**	**6.00**	**7.00**	**8.00**
80	5.00	6.25	7.50	8.75	10.00
84	4.76	5.95	7.14	8.33	9.52
88	4.55	5.68	6.82	7.95	9.09
92	4.35	5.43	6.52	7.61	8.70
96	4.17	5.21	6.25	7.29	8.33
100	4.00	5.00	6.00	7.00	8.00
104	3.85	4.81	5.77	6.73	7.69
108	3.70	4.63	5.56	6.48	7.41
112	3.57	4.46	5.36	6.25	7.14
116	3.45	4.31	5.17	6.03	6.90
120	3.33	4.17	5.00	5.83	6.67

When the market rates go down, the coupon rate on new bond issues must increase so that the return on the new bonds is at least equal to the return on bonds already present on the market.

Present value of a bond

Let's take the example of a Fr 1'000 bond, with an annual coupon rate of 5%, that will come to maturity in 10 years. Find the market price of the bond if the market rate is currently 6%.

1	2	3	4	5	6	7	8	9	10
50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	1'050.00

Present value of the bond: $50(1.06)^{-1} + ... + 1'050(1.06)^{-10} =$ **926.50** (market rate: 92,65 %)

N.B.: you can use the NPV function on Excel for this calculation.

Yield to Maturity

The yield to maturity of a bond is calculated by discounting the annual coupon interest and the reimbursement of the par value when the bond comes to maturity. The discounted amount must be equal to the current market value of the bond.

Example: the market value of a bond with a par value of 1'000.-. is 980.-. Interest rate: 4%. The bond is due in 8 years. Amount reimbursed at maturity: 1'000.-. Calculate the YTM of this bond.

0	1	2	3	4	5	6	7	8
-980.0	40.00	40.00	40.00	40.00	40.00	40.00	40.00	1'040.00

$$980 = 40(1+ YTM)^{-1} + ... + 1'040(1 + YTM)^{-8}$$

Using the IRR function on Excel, we obtain **4.30 %**

Calculate the YTM of the three bonds indicated below:

Date	Issuer	Symbol	ISIN	Rate	Coupon	Maturity
04.06.2010	Novartis	NOV08	CH0043089009	111.00%	3.625%	26.06.2015
04.06.2010	CH	E059	CH0023139816	106.00%	2.00%	09.11.2014
04.05.2010	BMW	EU159	XS0400017199	120.50%	8.875%	19.09.2013

Issue price of a bond

The issue price of a new bond issue is generally calculated in function of the YTM of other bonds currently listed on the market and that figure in the same risk category (rating) as the new issue.

Example:

A company issued bonds 4 years ago for a period of 10 years. The annual coupon rate is 4.5% and the current market rate is 103.5%.

The company plans to issue new bonds with an annual coupon rate of 3%. The bonds will mature in 8 years. At what price should the bonds be issued if the YTM of the new bonds must be at least equal to the YTM of the previous issue?