

Financial Accounting & Valuation Principles

The Insurance Case

*GAS Verzekeringen
KULeuven*

Fabian Suarez – May 2008

www.actuarisk.be



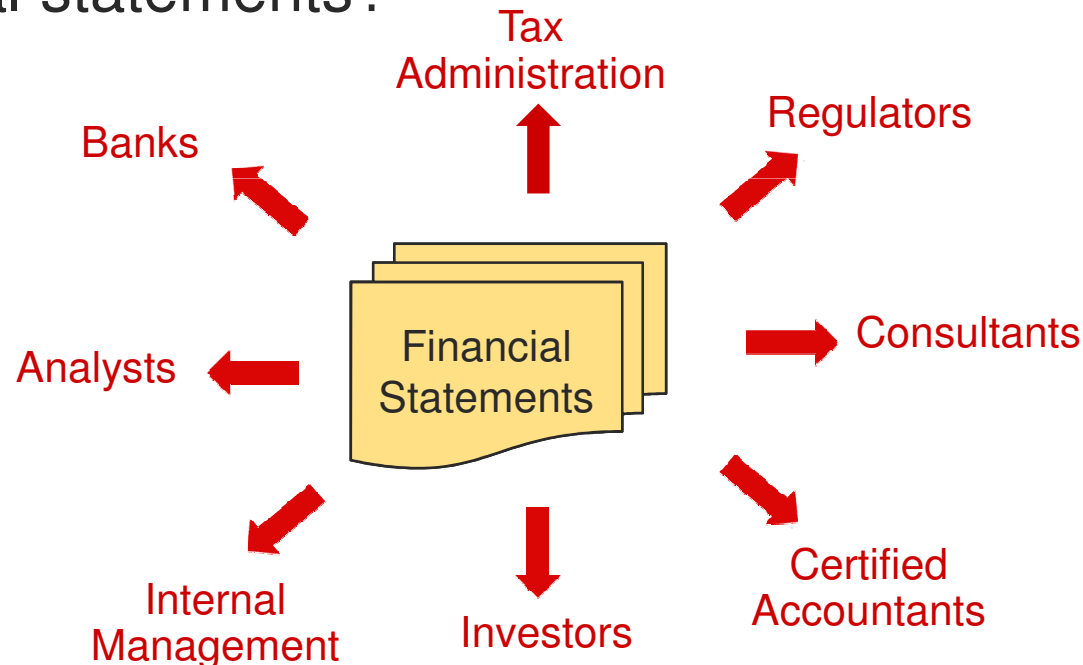
Agenda

1. Overview of Financial Statements
2. Ratio Analysis
3. Valuation Principles
4. Valuing Insurance Companies
5. Assessing Risks
6. Profit Testing

1. Overview of Financial Statements

Introduction

- Why financial statements are important?
- Who is interested by the information contained in financial statements?



- Which type of information is provided in financial statements?

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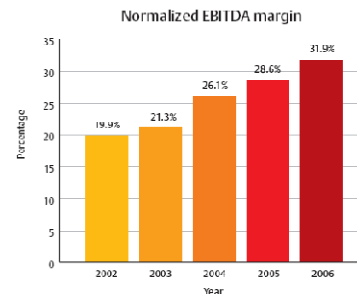
Introduction (cont'd)

Some examples of the use of financial statements:

- Beginning 2006, InBev management announced a new plan to reduce costs: Zero-Based Budgeting (ZBB)



Delivering on our commitment to a
30% EBITDA margin target



(Extract from the InBev 2006 Annual Report)

- Bank and insurance solvability requirements:

Placating regulators over Tier 1 cushion

By Jane Croft and Kate Burgess

Published: April 18 2008 23:14 | Last updated: April 18 2008 23:14



RBS set for £12bn rights issue

By Peter Thal Larsen and Lina Saigol

Published: April 21 2008 22:38 | Last updated: April 22 2008 08:56

Royal Bank of Scotland is on Tuesday expected to unveil the largest rights issue in Europe when it announces plans to rebuild its capital ratios by raising about £12bn from shareholders.

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The nature of accounting

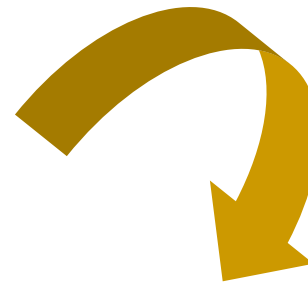
- Accounting organises and summarises economic information so decision makers can use it
- Accountants present this information in reports called **FINANCIAL STATEMENTS**
- Accounting as an aid to decision making:



- Financial accounting focuses on the specific needs of decision makers external to the organisation, such as stockholders, suppliers, analysts, governments agencies, regulators, etc

The nature of accounting (cont'd)

- The primary questions concerning a firm's financial success that decision makers want to answer are:
 - *What is the financial picture of the organisation on a given day?*
 - *How well did the organisation do during a given period?*
- Accountants answer these questions with three major financial statements:
 1. Balance sheet
 2. Income statement
 3. Statement of cash flows



Balance sheet



**Income statement
Statement of cash flows**

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The balance sheet

- It shows the financial status of the company at a particular instant in time
- It has two counterbalancing sections.
- The balance sheet equation:

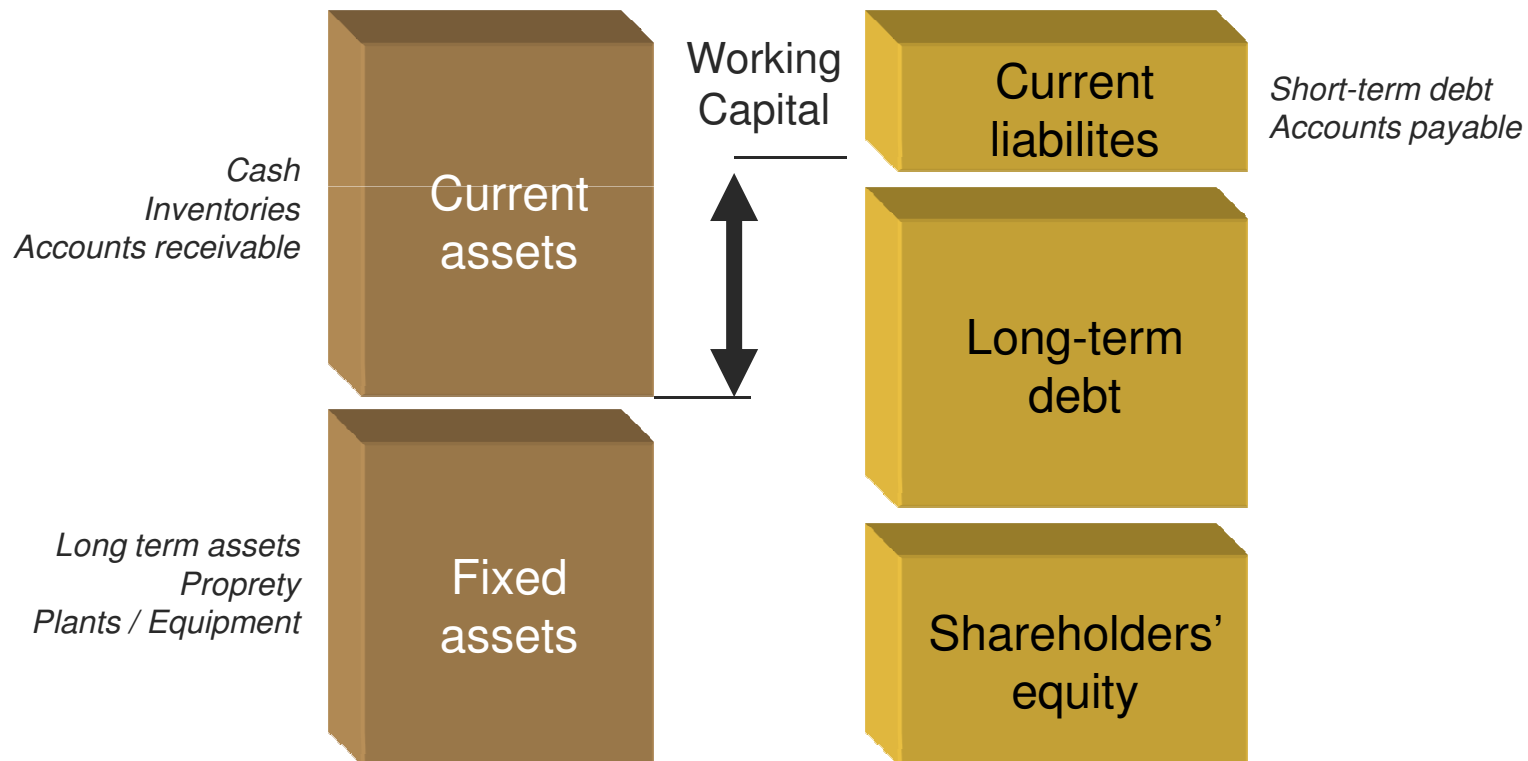
$$\text{Assets} = \text{Liabilities} + \text{Owners' equity}$$

1. **Assets** *are economic resources that the company expects to help generate future cash inflows or reduce or prevent future cash outflows*
2. **Liabilities** *are economic obligations of the organisation to outsiders, or claims against its assets by outsiders*
3. **Owners' equity** *is the owners' claim on the organisation's assets*

The balance sheet (cont'd)

- Overview of the balance sheet items:

Balance sheet



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The income statement

- Measuring income is important to everyone, from individuals to businesses, because we all need to know how well we are doing economically
- Most people regard income as a measure of the increase in the “wealth” of an entity over a period of time
- Accountants have agreed on a common set of rules for measuring income and wealth that all companies are supposed to apply (**comparability of company performances**)
- The fiscal year is the time period for measuring income and profits (e.g.: calendar year, from 01/07/XX → 30/06/XX+1, etc)

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The income statement (cont'd)

- Some definitions:

- **Revenues**

Increases in owners' equity arising from increases in assets received in exchange for the delivery of goods or services to customers

- **Expenses**

Decreases in owners' equity that arise because a company delivers goods or services to customers

- **Income (profits, earnings)**

The excess of revenues over expenses

- **Retained earnings (retained income)**

Total cumulative owners' equity generated by income or profits

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The income statement (cont'd)

■ The matching principle

The recording of expenses in the same time period that we recognise the related revenues

■ Applying matching: important application!

Depreciation (amortisation) is the systematic allocation of the acquisition cost of fixed assets (intangible assets) to the expense accounts of particular periods that benefit from the use of the assets.

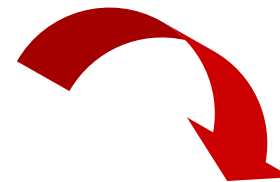
- **Fixed assets:** *tangible assets such as buildings, equipment, furniture, etc*
- **Intangible assets:** *these assets are not physical items, but instead are right or claims to expected benefits that are often contractual in nature.*

The income statement (cont'd)

■ Applying matching: Example 1 – Depreciation

- On January 1, a company bought equipment for 41.000 €:

	Amounts
Total acquisition cost on January 1	41.000 €
Estimated residual value	1.000 €
Estimated useful life	4 years



Straight-line depreciation

$$\text{Depreciation expense} = \frac{(\text{Acquisition cost} - \text{Estimated residual value})}{\text{Years of estimated useful life}}$$

	Annual Depreciation	Book Value
At acquisition		41.000 €
Year 1	10.000 €	31.000 €
Year 2	10.000 €	21.000 €
Year 3	10.000 €	11.000 €
Year 4	10.000 €	1.000 €



The income statement (cont'd)

■ Applying matching: Example 2 – Amortisation

- Your company issues bonds with the following characteristics:

Maturity 5
 Coupon 10%
 Issued Amount € 1.000.000,00
 Reduction € 100.000,00



Yield to Maturity (at inception) 12,83%

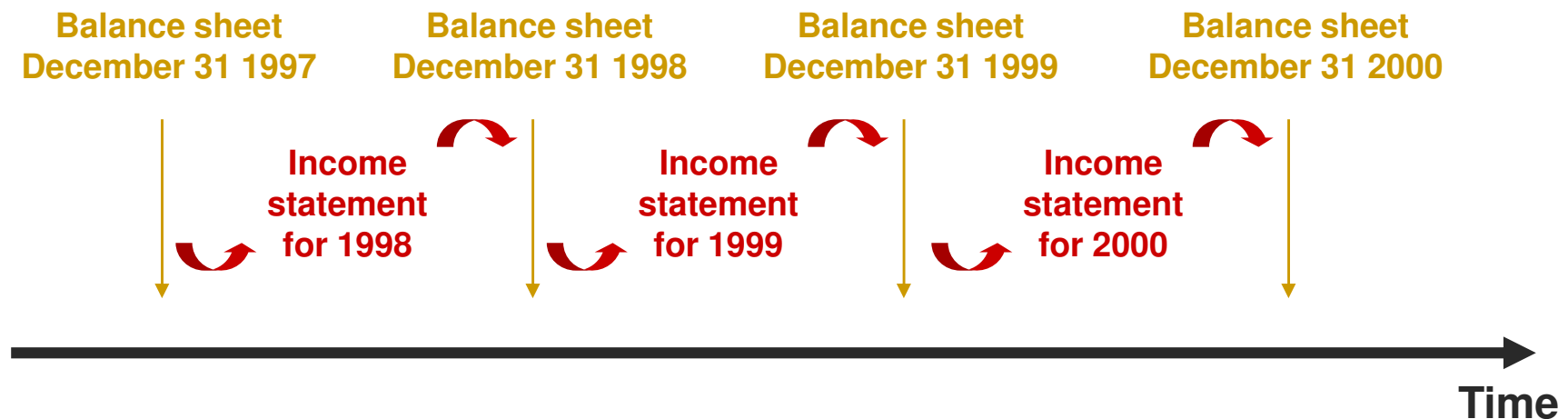
Year	Interest Expense	Nominal Interest Expense	Discount Amortised	Ending Unamortised Discount	Bond Book Value
0				€ 100.000,00	€ 900.000,00
1	€ 115.483,17	€ 100.000,00	€ 15.483,17	€ 84.516,83	€ 915.483,17
2	€ 117.469,88	€ 100.000,00	€ 17.469,88	€ 67.046,95	€ 932.953,05
3	€ 119.711,53	€ 100.000,00	€ 19.711,53	€ 47.335,42	€ 952.664,58
4	€ 122.240,80	€ 100.000,00	€ 22.240,80	€ 25.094,62	€ 974.905,38
5	€ 125.094,62	€ 100.000,00	€ 25.094,62	€ 0,00	€ 1.000.000,00



The income statement (cont'd)

Relationship between income statement and balance sheet:

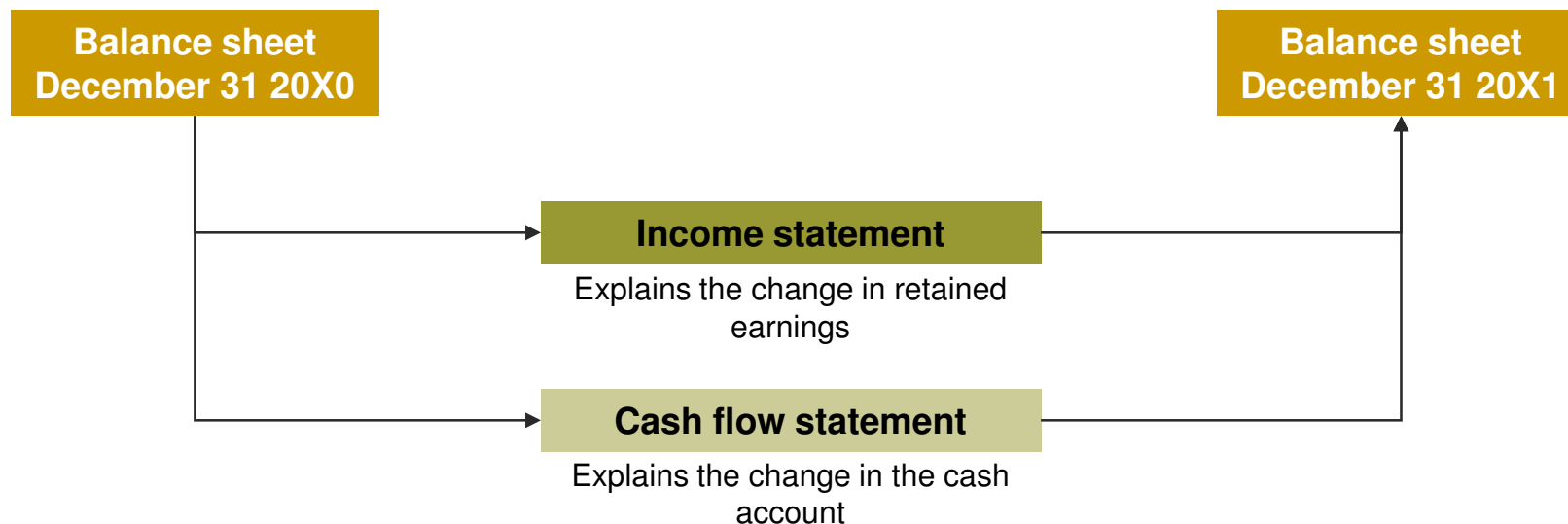
- The income statement is the major link between two balance sheets



- The balance sheets show the financial position of a company at discrete points in time
- The income statements explain the changes that have taken place between those points

Cash flow statement

- The cash flow statement reports the cash receipts and cash payments of an entity during a particular period and classifies them as financing, investing, and operating flows
- The statement of cash flows details the changes in one balance sheet account, the cash account



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Cash flow statement (cont'd)

- Why do managers and investors use a statement of cash flows?
 - It helps them to understand the relationship of net income to changes in cash balances: cash balances can decline despite positive net income and vice versa
 - It reports past cash flows as an aid to:
 - a) Predicting future cash flows
 - b) Evaluating how management generates and uses cash
 - c) Determining a company's ability to pay interest, dividends, and debts when they are due
 - It identifies specific increases and decreases in a firm's productive assets

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Cash flow statement (cont'd)

Types of activities affecting cash:

- Operating activities
 - Transactions that affect the purchase processing, and selling of a company's products or services
- Investing activities
 - Transactions that acquire or dispose of long-lived assets, i.e. assets that the company expects to provide services for more than a year
- Financing activities
 - Transactions that obtain resources as borrower or issuer of securities or repay creditors and owners

Free cash flow (FCF) is generally defined as:

FCF = CF from operating activities – CF from investing activities

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Cash flow statement (cont'd)

Typical operating, investing and financing activities:

Cash Inflows

Operating activities

Collections from customers
Interest and dividends collected

Investing activities

Sale of property, plant and equipment
Sale of securities that are not cash equivalent

Receipt of loan repayments

Financing activities

Borrowing cash from creditors
Issuing equity securities
Issuing debt securities

Cash Outflows

Cash payments to supplier
Cash payments to employees
Interest and taxes paid

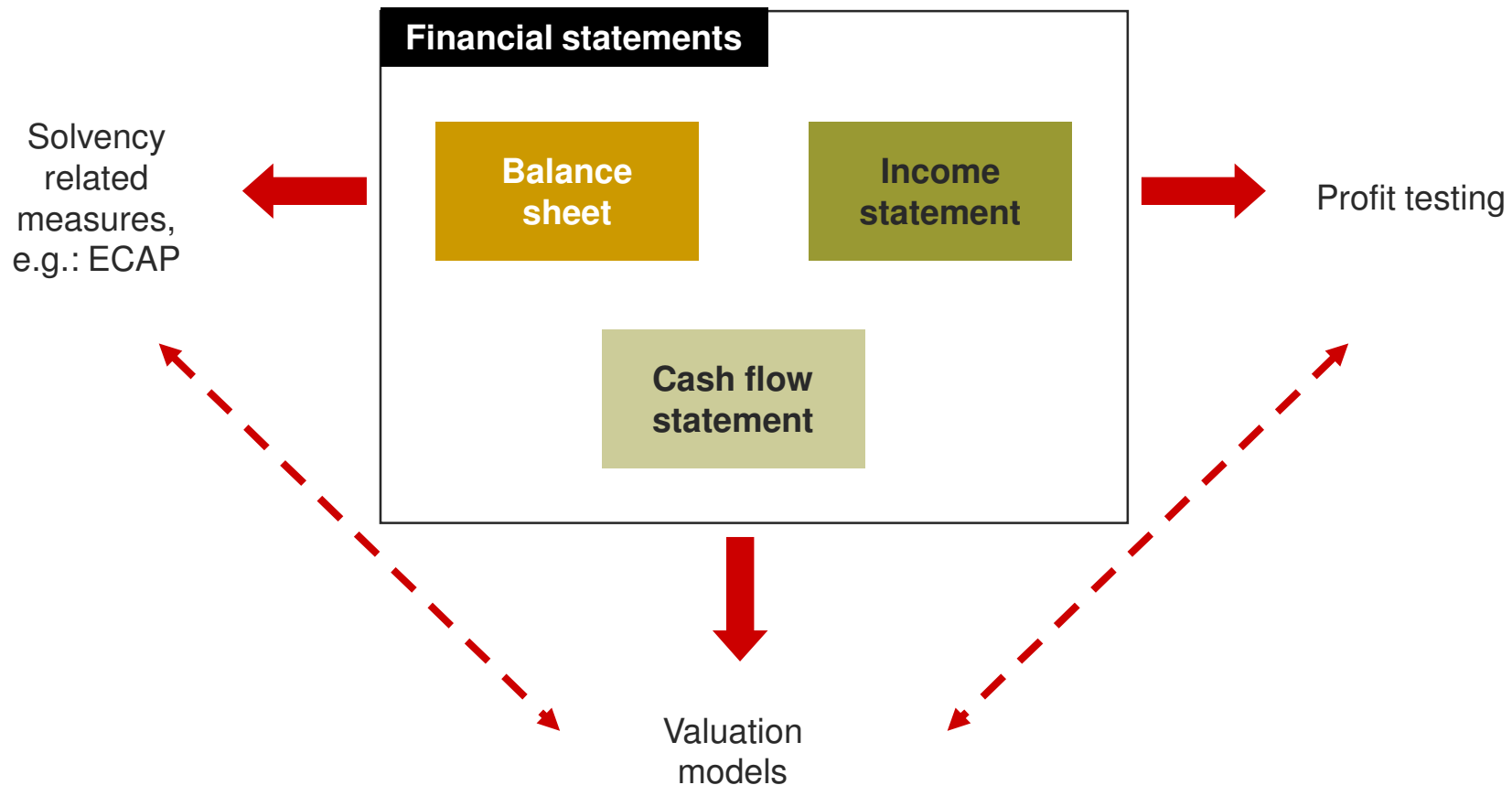
Purchase of property, plant and equipment
Purchase of securities that are not cash equivalent

Making loans

Repayment of amounts borrowed
Repurchase of equity shares
Payment of dividends

Financial statements in practice

- Link between financial statements and other financial analyses:



A simple exercise...

Prepare the balance sheet, the income statement and the statement of cash flows of AAA Ltd after the following transaction:

1. A new insurance company, AAA Ltd, is created and the owners have decided to invest €100.000: €50.000 are deposited in a cash account and €50.000 are used to buy a building
2. AAA Ltd sells products for €40.000: €10.000 has been received in cash and €30.000 will be paid later
3. With the premiums received, AAA Ltd creates policyholders reserves of €35.000
4. AAA Ltd depreciates its building for €20.000



A simple exercise... (cont'd)

Balance Sheet

	ASSETS			=	LIABILITIES		
	Cash +	Buildings +	Accounts Receivable		Equity +	Retained Earnings +	Policyholder Reserves
(1)	€50.000	€50.000			€100.000		
(2)	€10.000		€30.000			€40.000	
(3)						- €35.000	€35.000
(4)		- €20.000				- €20.000	
	€60.000	€30.000	€30.000		€100.000	- €15.000	€35.000



Income Statement

(2) Sales revenues: Premiums	€40.000
(3) <i>Increase in reserves</i>	- €35.000
(4) <i>Depreciation expense</i>	- €20.000
Net income	- €15.000

A simple exercise... (cont'd)

Statement of Cash Flows

Cash Provided by Operations

Net Income	- €15.000
Income charges not affecting cash	
Depreciation	€20.000
Increase in reserves	€35.000
Changes in some working capital components	
Increase in accounts receivable	- €30.000

Cash provided by operations	€10.000
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Cash Provided by Investing Activities

Purchase of building	-€50.000
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Cash provided by investing activities	-€50.000
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Cash Provided by Financing Activities

Proceeds from stock issuances	€100.000
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Cash provided by financing activities	€100.000
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Net increase in cash and equivalent	€60.000
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2. Ratio Analysis

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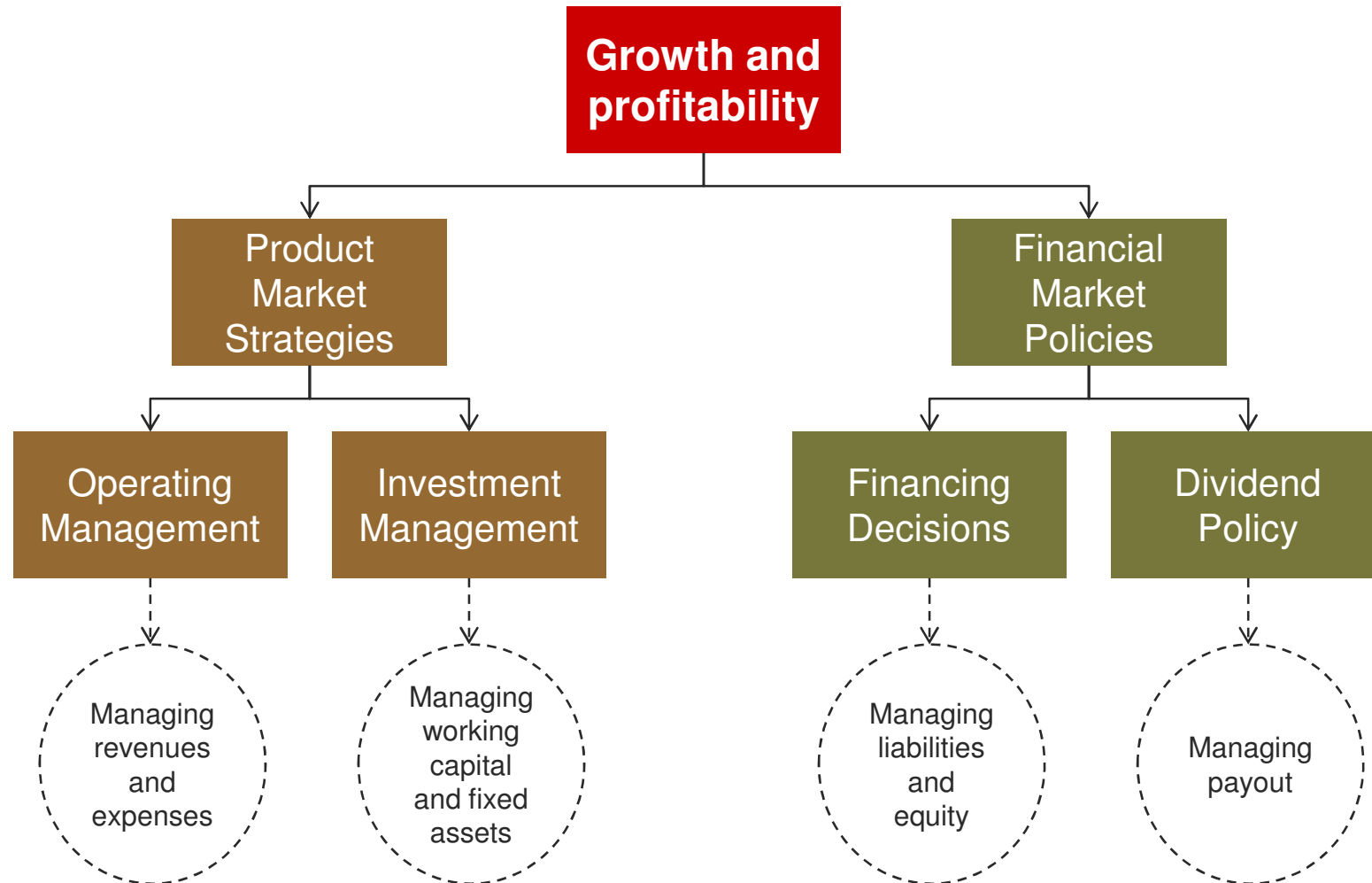
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Introduction

- The goal of financial analysis is to assess the performance of a firm in the context of its stated goals and strategy
- They are two principal tools of financial analysis: ratio analysis and cash flow analysis
 - Ratio analysis involves various line items in a firm's financial statements relate to one another
 - Cash flow analysis allows the analyst to examine the firm's liquidity, and how the firm is managing its operating, investment, and financing cash flows
- Ratio analysis of company's present and past performance provide the foundation of making forecasts of future performance
- For a multibusiness company, ratio analyses can be produced by individual business segments

Ratio Analysis: Overview

- The drivers of a firm's profitability and growth are:



Ratio Analysis: Profitability

- The starting point for a systematic analysis of a firm's performance is its return on equity (ROE), defined as

$$ROE = \frac{\text{Net Income}}{\text{Shareholder's Equity}}$$

- In the context of financial institutions, risk adjusted performance measures have been developed to take into consideration the actual risk shareholders face, e.g.:

$$RORAC = \frac{\text{Net Income}}{\text{Economic Capital}}$$

- Other ratios used by insurers:

$$\text{Non - Life} \rightarrow \frac{\text{Non - Life Profit}}{\text{Minimum Non - Life Solvability Margin}}$$

$$\text{Life} \rightarrow \frac{\text{Life Profit}}{\text{Minimum Life Solvability Margin}}$$

Ratio Analysis: Decomposing ROE

- Some definitions:

Net interest expense after tax = (Interest expense - interest income)(1 - Tax rate)

Net operating profit after tax
(NOPAT) = Net income + Net interest expense after tax

- The ROE decomposition:

$$\begin{aligned}
 ROE &= \frac{NOPAT}{Equity} - \frac{\text{Net interest expense after tax}}{Equity} \\
 &= \frac{NOPAT}{Assets} \frac{Assets}{Equity} - \frac{\text{Net interest expense after tax}}{Debt} \frac{Debt}{Equity} \\
 &= \frac{NOPAT}{Assets} \left(1 + \frac{Debt}{Equity} \right) - \frac{\text{Net interest expense after tax}}{Debt} \frac{Debt}{Equity} \\
 &= \text{Operating ROA} + (\text{Operating ROA} - \text{Effective interest rate after tax}) \times \text{Financial Leverage} \\
 &= \text{Operating ROA} + \text{Spread} \times \text{Financial Leverage}
 \end{aligned}$$

→ $\text{Operating ROA} = \frac{NOPAT}{Sales} \frac{Sales}{Assets}$

Ratio Analysis: Operating Management

- The key profitability ratios:

$$\text{Gross margin} = \frac{EBIT}{\text{Sales}}$$

$$\text{NOPAT margin} = \frac{NOPAT}{\text{Sales}}$$

$$\text{EBITDA margin} = \frac{EBITDA}{\text{Sales}}$$

$$\text{Net margin} = \frac{\text{Net Income}}{\text{Sales}}$$

EBIT stands for earnings before interest and taxes

EBITDA stands for earnings before interest, taxes, depreciation and amortisation

- An important ratio used by insurance companies:

$$\text{Combined ratio} = \text{Claims ratio} + \text{Expense ratio}$$

- The claims ratio is the sum of claims paid, change in the provisions for unpaid claims and claim adjustment expenses in relation to premiums earned
- The expense ratio is the sum of acquisition costs and other operating costs and expenses in relation to premiums earned

Ratio Analysis: Investment Management

- The main ratios used to evaluate the investment management are:

$$\text{Working capital turnover} = \frac{\text{Sales}}{\text{Working Capital}}$$

$$\text{Trade receivables turnover} = \frac{\text{Sales}}{\text{Trade receivables}}$$

$$\text{Inventories turnover} = \frac{\text{Sales}}{\text{Inventories}}$$

$$\text{Trade payables turnover} = \frac{\text{Sales}}{\text{Trade payables}}$$

$$\text{Non - current assets turnover} = \frac{\text{Sales}}{\text{Non - current assets}}$$

Ratio Analysis: Financial Management

- Current liabilities and short-term liquidity:

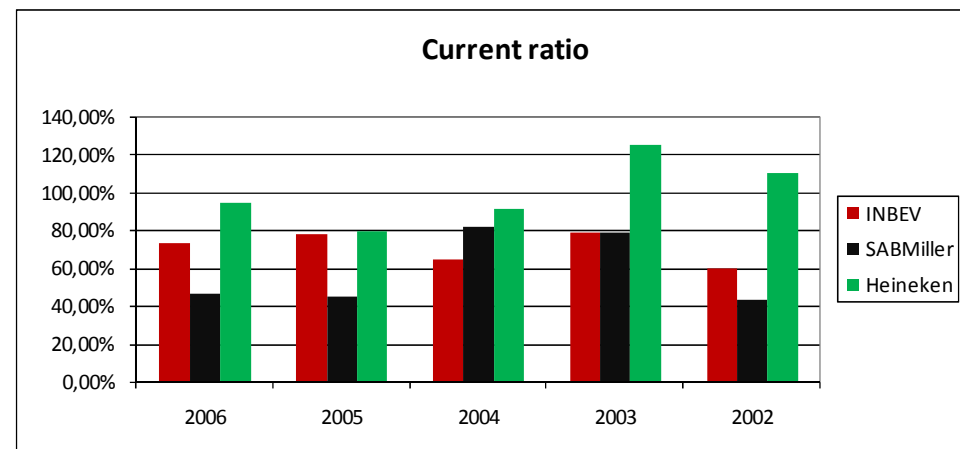
$$\text{Current ratio} = \frac{\text{Current assets}}{\text{Current liabilities}}$$

$$\text{Quick ratio} = \frac{\text{Cash and marketable securities} + \text{Trade receivables}}{\text{Current liabilities}}$$

$$\text{Cash ratio} = \frac{\text{Cash and marketable securities}}{\text{Current liabilities}}$$

$$\text{Operating cash flow ratio} = \frac{\text{Cash flow from operations}}{\text{Current liabilities}}$$

Short-term liquidity has not the same meaning depending on the industry
Example: the brewery industry



Ratio Analysis: Financial Management

- Debt and long-term solvency:

$$\text{Debt - to - equity ratio} = \frac{\text{Current debt} + \text{Non - current debt}}{\text{Shareholders' equity}}$$

This ratio provides an indication of how many euros of debt financing the firm is using for each euro invested by its shareholders.

- The ease with which a firm can meet its interest payments is an indication of the degree of risk associated with its debt policy:

$$\text{Interest coverage ratio} = \frac{\text{Net Income} + \text{Interest expense} + \text{Tax expense}}{\text{Interest expense}}$$

This ratio indicates the euros of earnings available for each euro of required interest payment. A coverage ratio of one implies that the firm is barely covering its interest expense through its operating activities, which is a very risky situation. The larger the coverage ratio, the greater the cushion the firm has to meet interest obligations.

Ratio Analysis: Financial Management

■ Non-life solvency ratio:

$$\text{Non - life solvency ratio} = \frac{\text{Claims provisions}}{\text{Earned premiums}}$$

- This ratio is calculated by product (car insurance: 200%-400% / material damage: 30%)
- The longer the claim settlements are, the higher the ratio is

■ Minimum solvability margin:

○ Non-life

$$\text{Max} \left[\begin{array}{l} 16\% \times \text{Written premium} \times \text{Max}(50\%, \text{non - reinsured rate}), \\ 23\% \times \text{Average claims} \times \text{Max}(50\%, \text{non - reinsured rate}) \end{array} \right]$$

○ Life

$$4\% \times \text{Gross life provisions} \times \text{Max} \left(85\%, \frac{\text{Net life provisions}}{\text{Gross life provisions}} \right)$$

Ratio Analysis: Dividend Policy

- Analysts often use the concept of sustainable growth as a way to evaluate a firm's in comprehensive manner

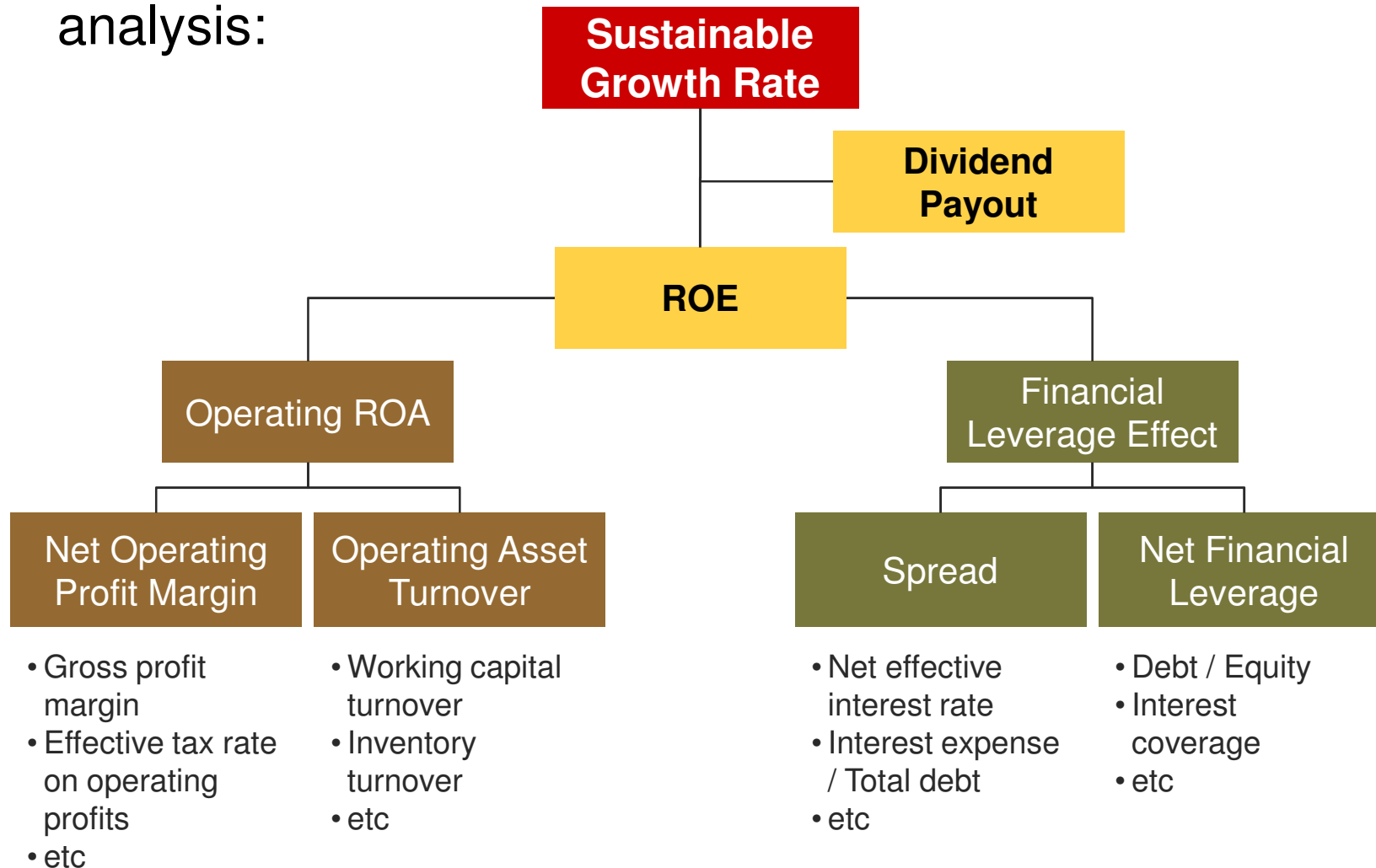
$$\text{Sustainable growth} = ROE \times (1 - \text{Dividend payout ratio})$$

$$\text{Dividend payout ratio} = \frac{\text{Cash dividends paid}}{\text{Net income}}$$

- A firm's dividend payout ratio is a measure of its dividend policy – Firms pay dividend for several reasons:
 - Dividends are a way for the firm to return to its shareholders any cash generated in excess of its operating and investment needs
 - Dividend payments can serve as a signal to shareholders about manager's expectation of the firm's future prospects
 - Firms may also use dividends to attract a certain type of shareholder base.

Ratio Analysis: Summary

- Sustainable growth rate framework for financial ratio analysis:



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Ratio Analysis: Example

Balance Sheet

	Structure 1	Structure 2
Current Assets	€ 90.000,00	€ 90.000,00
<i>Account Receivables</i>	€ 10.000,00	€ 10.000,00
<i>Inventories</i>	€ 50.000,00	€ 50.000,00
<i>Cash and assimilated</i>	€ 30.000,00	€ 30.000,00
Fixed Assets	€ 100.000,00	€ 100.000,00
Total Assets	€ 190.000,00	€ 190.000,00
Current Liabilities	€ 45.000,00	€ 45.000,00
<i>Account Payables</i>	€ 30.000,00	€ 30.000,00
<i>Short-Term Debt</i>	€ 15.000,00	€ 15.000,00
Long Term Debts	€ 90.000,00	€ 35.000,00
Shareholder Equity	€ 55.000,00	€ 110.000,00
Total Liabilities	€ 190.000,00	€ 190.000,00

Income Statement

	Structure 1	Structure 2
Revenues	€ 200.000,00	€ 200.000,00
Expenses	(€ 50.000,00)	(€ 50.000,00)
Amortisation	(€ 30.000,00)	(€ 30.000,00)
Provisioning	(€ 35.000,00)	(€ 35.000,00)
EBIT	€ 85.000,00	€ 85.000,00
Interest	(€ 20.000,00)	(€ 7.777,78)
Tax	(€ 22.750,00)	(€ 27.027,78)
Net Income	€ 42.250,00	€ 50.194,44

Tax rate	35,00%	35,00%
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Ratios

	Structure 1	Structure 2
NOPAT	€ 55.250,00	€ 55.250,00
Operating ROA	38,10%	38,10%
Spread	23,66%	23,66%
Financial Leverage	163,64%	31,82%
ROE	76,8%	45,6%
<i>Check</i>	<i>TRUE</i>	<i>TRUE</i>
Gross Margin	42,50%	42,50%
Net Margin	21,13%	25,10%
Current ratio	200,00%	200,00%
Quick ratio	88,89%	88,89%

3. Valuation Principles

The cost of Equity Capital

- From a firm's perspective, its expected return is the cost of equity capital
- Under the Capital Asset Pricing Model (CAPM), the expected return on the stock is:

$$r_e = r_f + \beta_e \times (r_m - r_f)$$

where

r_f is the risk - free rate

$r_m - r_f$ is the market - risk premium

β_e is the company β

- The beta of a stock is defined as

$$\beta_e = \frac{\text{Cov}(r_e, r_m)}{\text{Var}(r_m)} = \frac{\sigma_{i,m}}{\sigma_m^2}$$

The cost of Capital with Debt

- The cost of debt is the firm's borrowing rate r_d
- If a firm uses both debt and equity, the cost of capital is a weighted average of each
- Interest is tax deductible at the corporate level

$$r_{WACC} = \left(\frac{E}{E + D} \right) \times r_e + \left(\frac{D}{E + D} \right) \times r_d \times (1 - T_c)$$

where

r_{WACC} is the weighted average cost of capital

$\left(\frac{E}{E + D} \right)$ is the proportion of total value represented by the equity

$\left(\frac{D}{E + D} \right)$ is the proportion of total value represented by the debt

T_c is the corporation's tax rate

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The Discounted Cash Flow Model

- In finance, a popular approach used to value a firm is known as the Free Cash Flow (FCF) model
- FCF is the amount of cash left over for the shareholders, if we assume:
 - The company does not use external financing
 - The company does not accumulate cash
- Therefore the value of the firm is given by:

$$\text{Value of the firm} = \sum_t \frac{FCF_t}{(1 + r_{WACC})^t}$$

3. Valuing Insurance Companies

Fair value of balance sheet items

Fair Value of Balance Sheet Items

Does a market exist?

YES

Mark to market

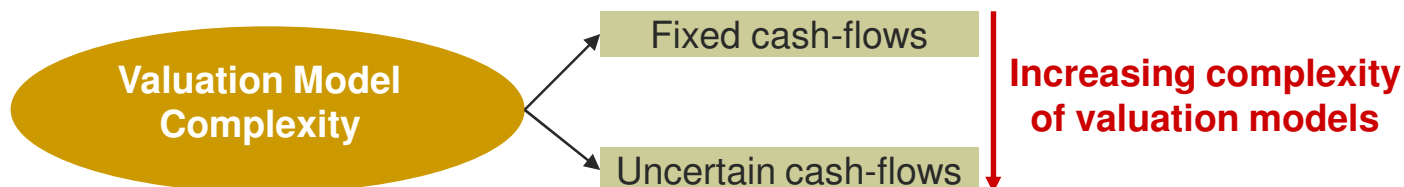
Price observed in the market
(e.g. equities, bonds, etc).

NO

Mark to model

Present value of future cash
flows (e.g. mortgages, loans
life provisions, etc).

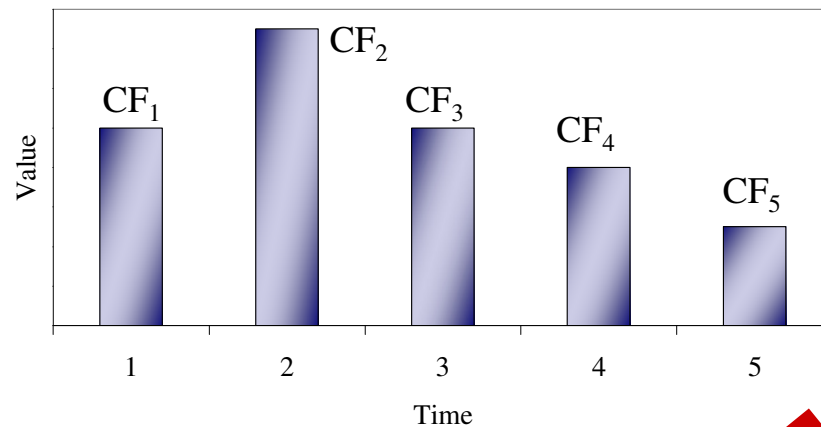
- Asset valuation is straightforward since most assets can be marked to market, items such as mortgages are valued discounting future cash values and their corresponding prepayment options
- The liability valuation is more complicated and requires specific valuation models



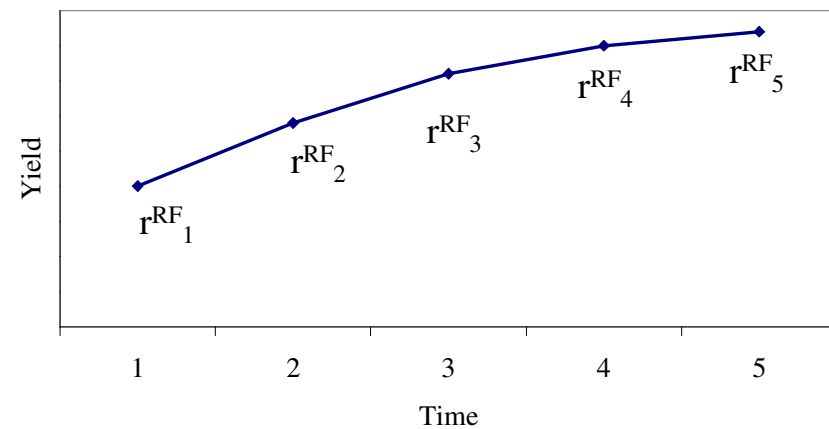
Fixed cash flows

- Fixed, guaranteed cash flows are discounted using simply the risk free yield curve

Projected Fixed Cash Flows



Risk-Free Curve



$$FV = \sum_t \frac{CF_t}{(1 + r_t^{RF})^t}$$

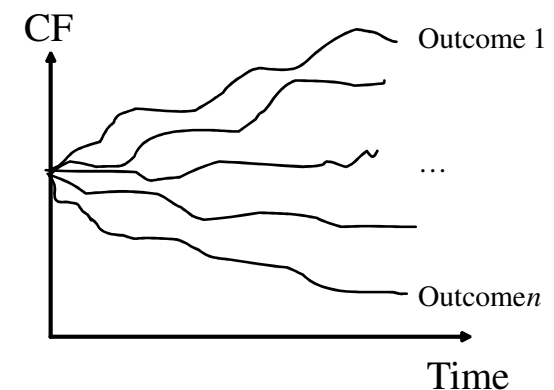
Uncertain Cash Flows

- In most cases, insurance liabilities are not actively traded on a free and liquid market therefore the market consistent value can not be determined directly from capital markets
- Their market values must therefore be explicitly calculated using market consistent valuation techniques:
 - One way to assign a market value to a series of cash flows is to construct a replicating portfolio or hedge portfolio of assets
 - In the absence of arbitrage, and if the liability cash flows could be matched exactly, the market consistent value of the liabilities will exactly equal the market value of the replicating portfolio



In absence of analytical solutions, simulation techniques are used adopting a risk-neutral valuation approach!

$$FV = \frac{1}{\# \text{simulation}} \sum_{j=1} \sum_{t=1} \left(\frac{CF_{j,t}^{\text{risk free}}}{(1 + r_{j,t}^{\text{risk free}})^t} \right)$$



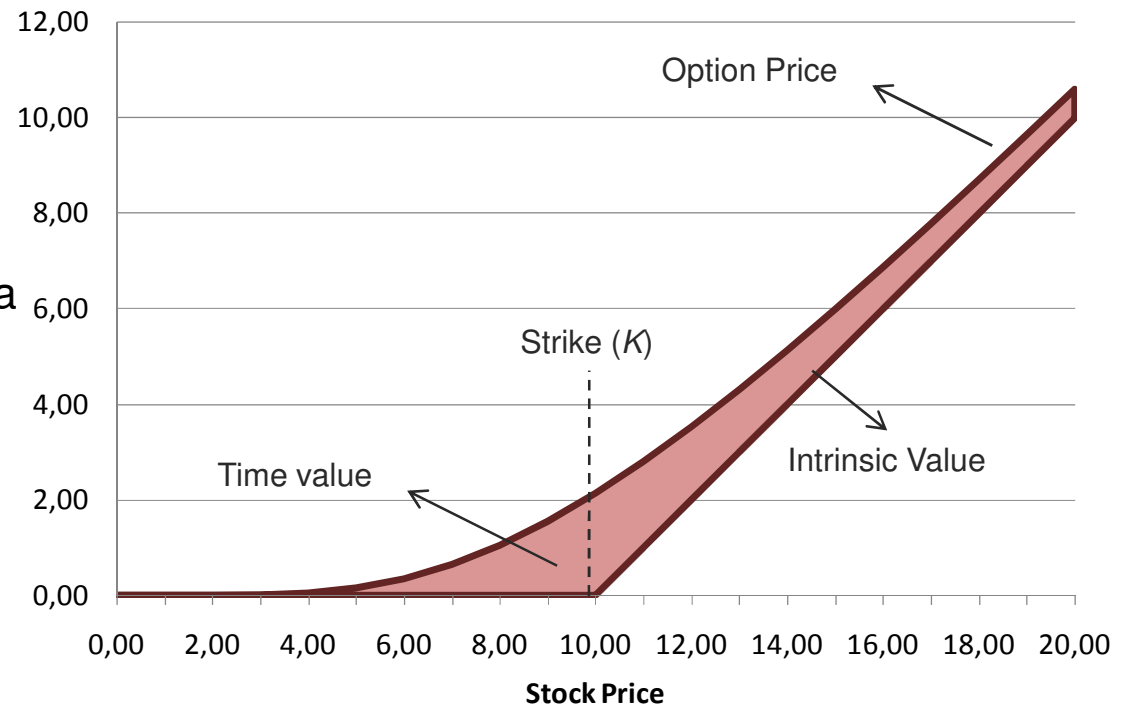
The Time Value of Options

- The case of a European call option:

Intrinsic Value = $Max(S - K, 0)$

Option Price → Black - Scholes formula

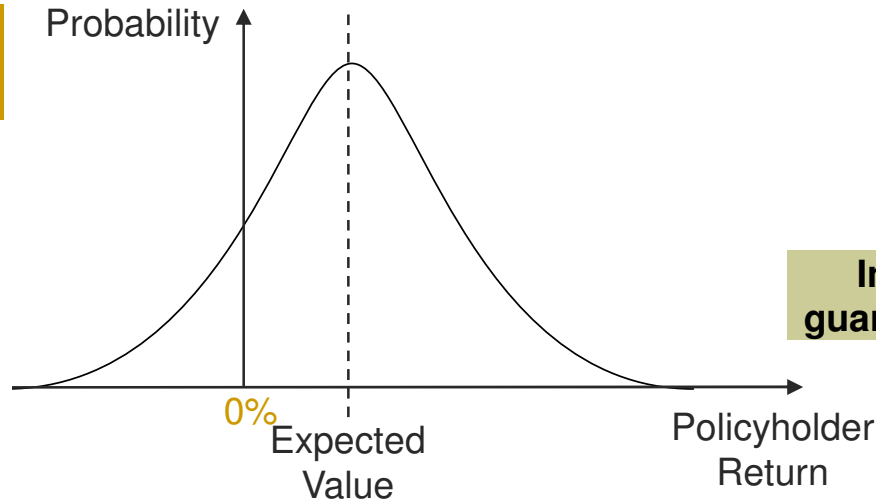
Time Value =
Option Price - Intrinsic Value



- Insurance products contain embedded options (profit sharing) – Therefore, it is necessary to assess the Cost of Financial Options and Guarantees (CFOG)

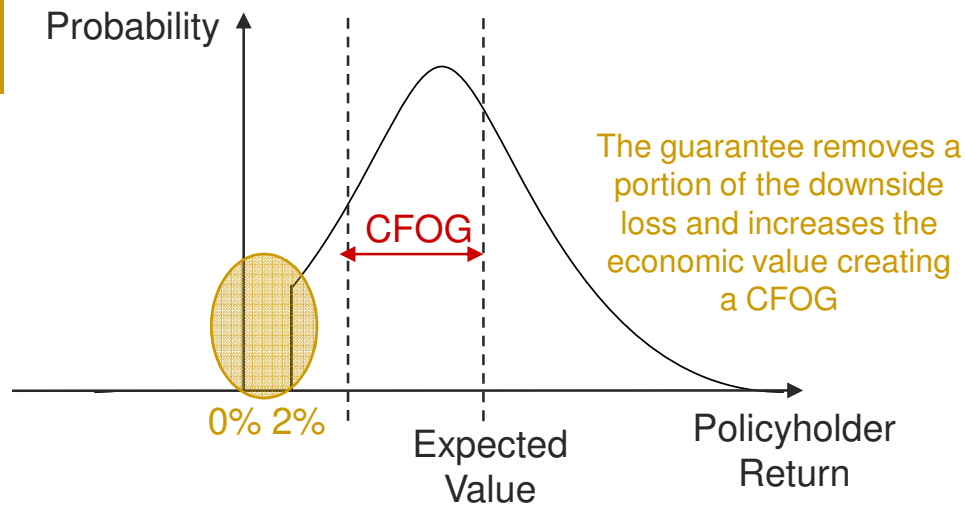
Overview of the CFOG

UL product
(no guarantee, no options)



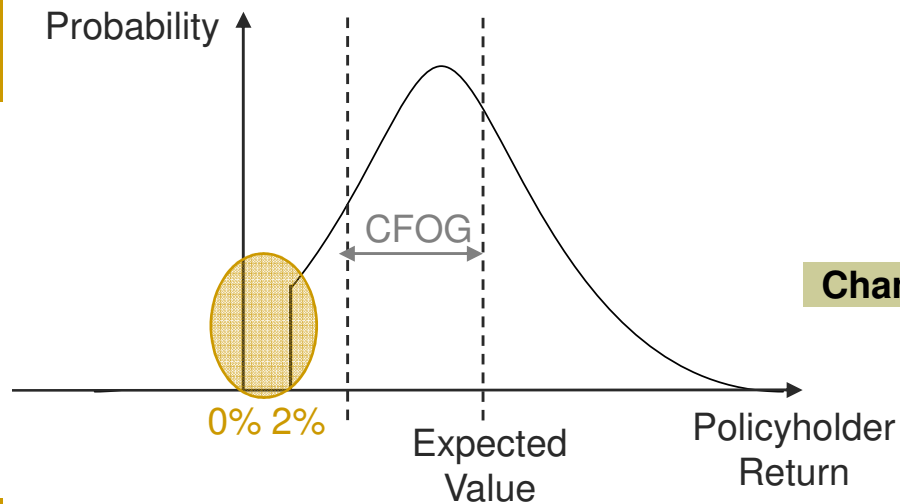
Introduction of a guarantee and options

Product
(with guarantee and options)



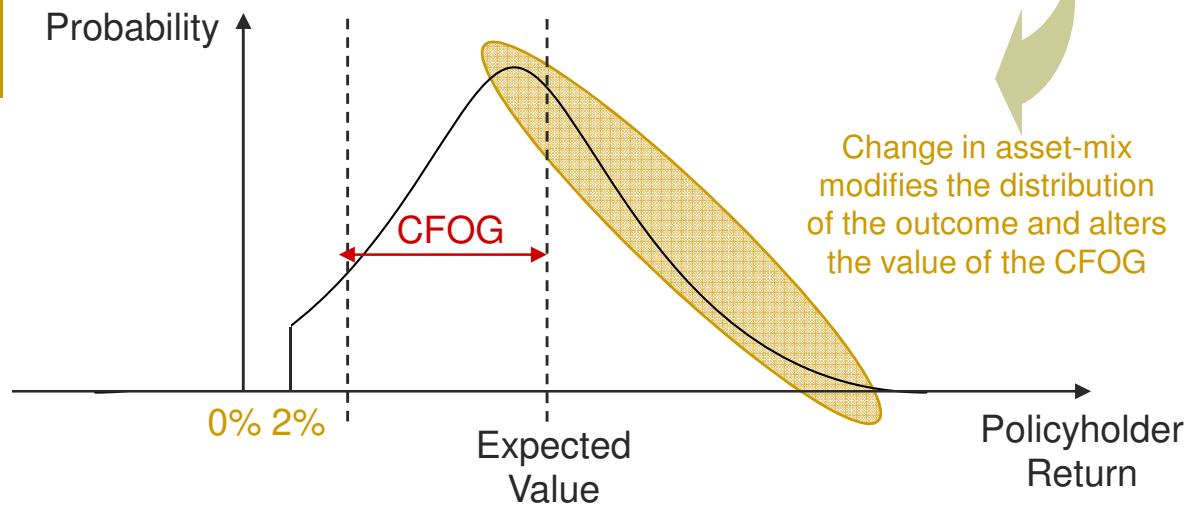
Overview of the CFOG (cont'd)

Product
(with guarantee and options)



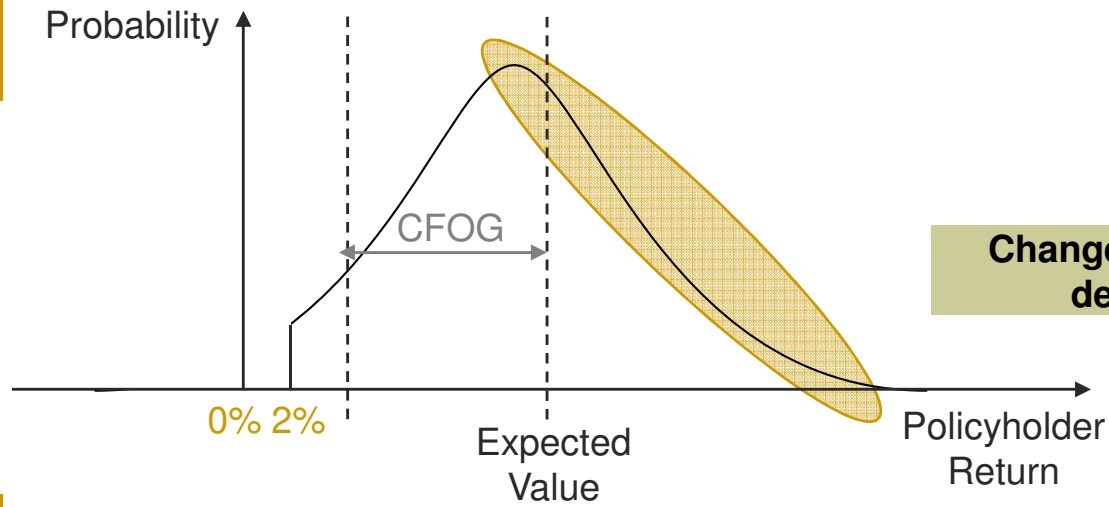
Change in asset-mix

Product
(with guarantee and options)

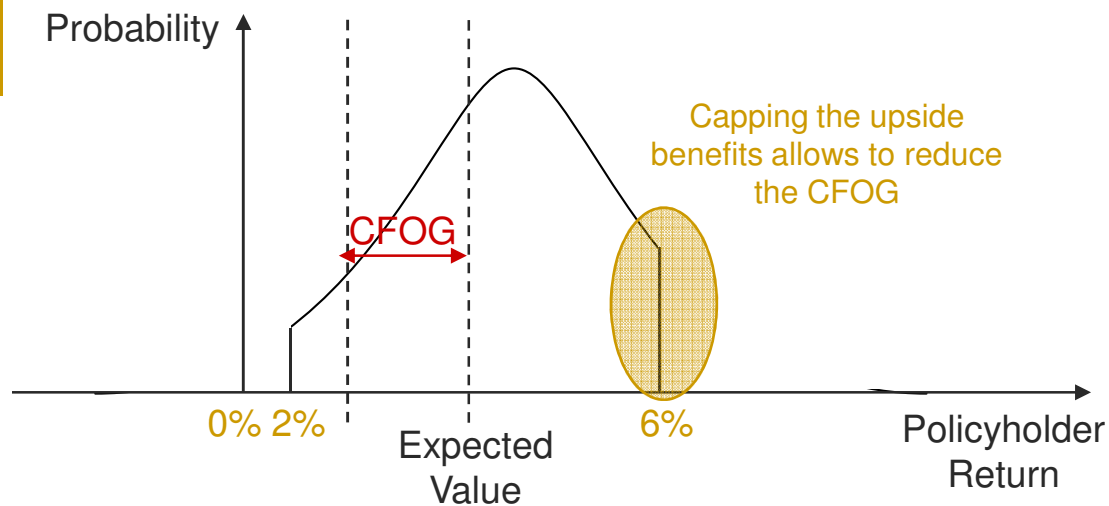


Overview of the CFOG (cont'd)

Product
(with guarantee and options)



Product
(with guarantee and options)



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Modelling non-Financial Risk

- The FV of liabilities is derived from the cost of managing the risks underlying the business on an ongoing basis. It consists of:
 1. The expected present value of future liability cash flows, and
 2. An additional, explicit cost of risk for non-hedgeable risks (the MVM for non-hedgeable risks)

$$\begin{aligned} & \text{FV Liabilities} \\ & = \\ & \text{Expected PV of future liability cash flows} \\ & + \\ & \text{Market Value Margin (MVM)} \end{aligned}$$

- The MVM is estimated by the present value of the cost of future capital requirements for non-hedgeable risks.

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Wrap up

Market consistent value =

PV of expected future cash flows

+

MVM hedgeable financial risks

+


MVM hedgeable non-financial risks

+

MVM non-hedgeable financial risks

+

MVM non-hedgeable non-financial risks


$$FV = \frac{1}{\# \text{simulations}} \sum_{j=1} \sum_{t=1} \left(\frac{CF_{j,t}^{\text{risk free}}}{\left(1 + \left(r_{j,t}^{\text{risk free}} + \varepsilon_{j,t}\right)\right)^t} \right)$$

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Reports Produced by Insurers

- Standard financial statements, but also...
- Some examples of Market Consistent Embedded Value (MCEV) reports:
 - http://www.fortis.be/FR/Actionnaires/presentations_embedded_value_2007.asp
 - http://www.ing.com/cms/idc.cgi_isapi.dll?IdcService=GET_FILE&dDocName=202685_EN&RevisionSelectionMethod=latestReleased
 - https://kbc-pdf.kbc.be/ng/published/KBCCOM/POWERPOINT/com_TBO_embedded_value_27-04-06_0900dfde801b2f61.ppt
 - http://www.axa.com/lib/en/uploads/pr/group/2007/AXA_PR_20070410b.pdf

FORTIS



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MCEV Approach

- Traditional accounting leaves key questions unanswered and cannot cope very well with the long term nature of life insurance business

- Key questions addressed by EV Reporting:
 - How much value is locked up in the company?
 - Is the company selling new business profitably?
 - Is the company profiting from existing business?
 - Have any of our assumptions about the future changed and if so how does this affect the value?
 - How sensitive is the value to changes in the key assumptions?
 - How much did the value change because of improvements in modelling, how much due to movements in the markets and how much due to direct action by management?

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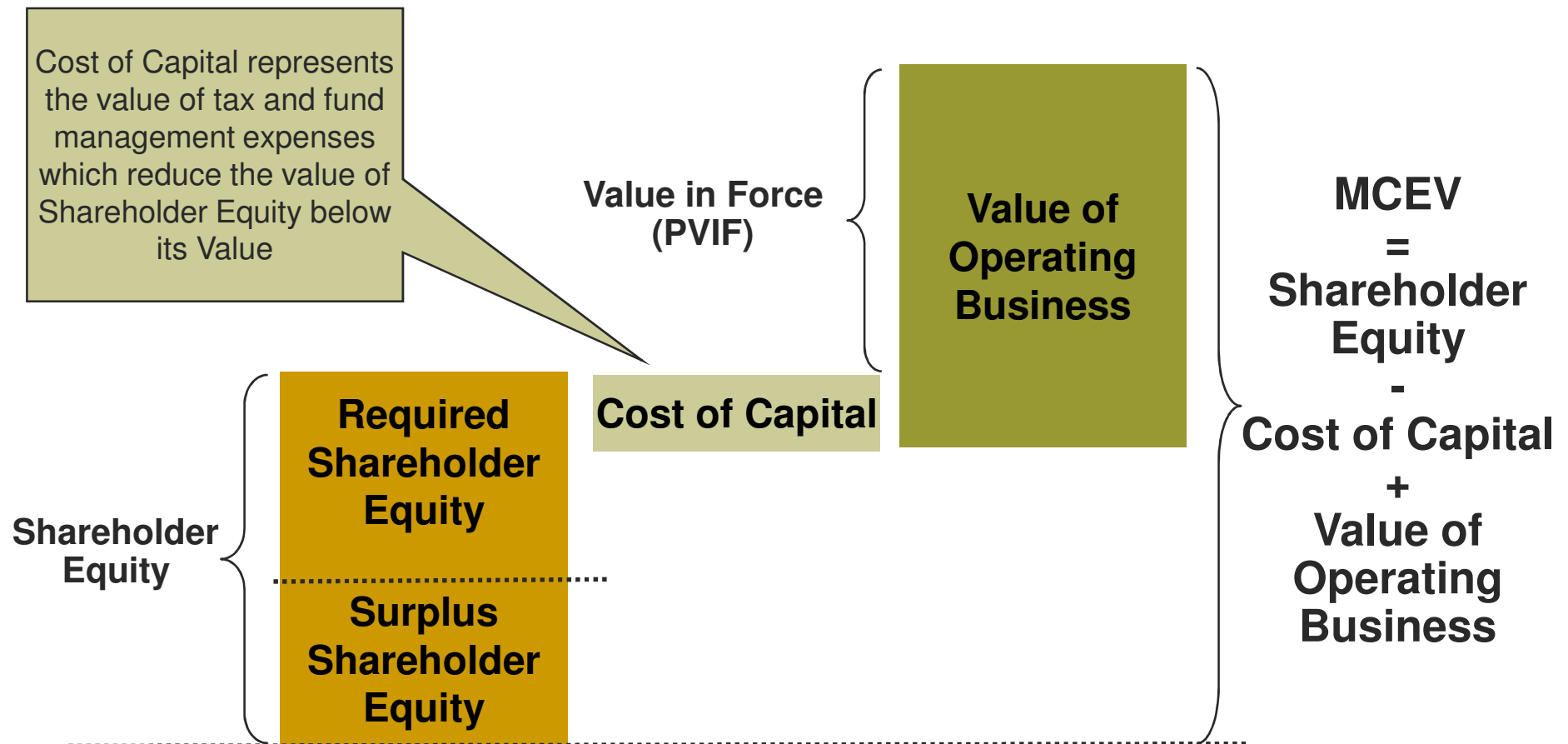
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MCEV Reporting

- EV is a method for valuing the contracts on the books (in-force business) from the shareholder perspective and analysing the evolution of value from one period to the next
- In-force business refers to the contracts we have on our books and so includes future premiums relating to these existing contracts but excludes new contracts that we may expect to write in the future
- Takes into account how we expect assets and liabilities to develop as the in-force contracts run off our books
- Used by insurers for external reporting for Life Insurance business and as an internal management tool

Key Terminology

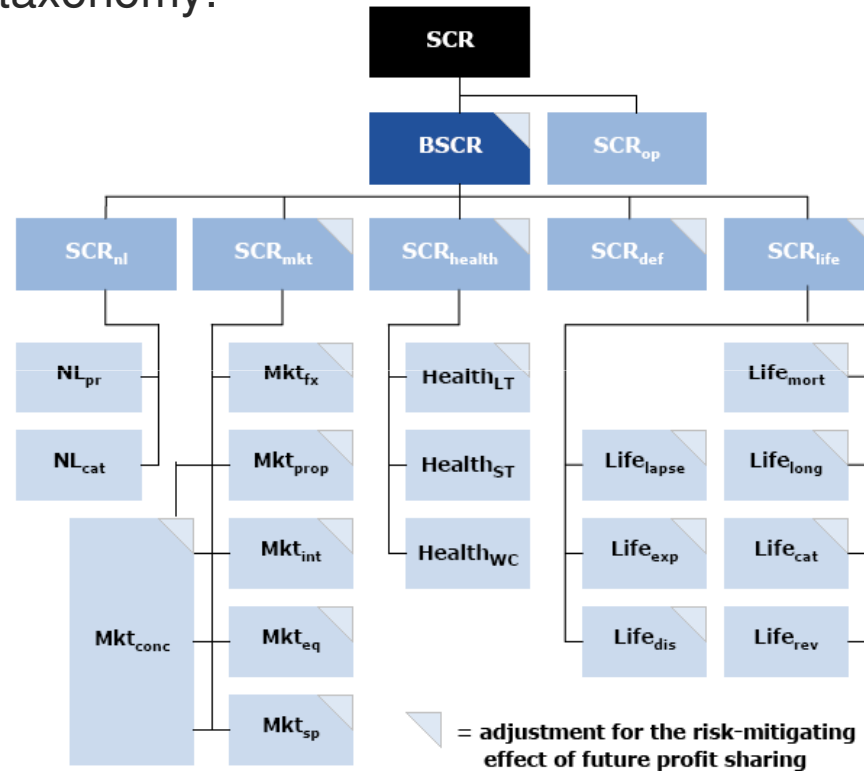
- The total MCEV can be decomposed in three parts:



4. Assessing Risks

The risks that Insurers Face

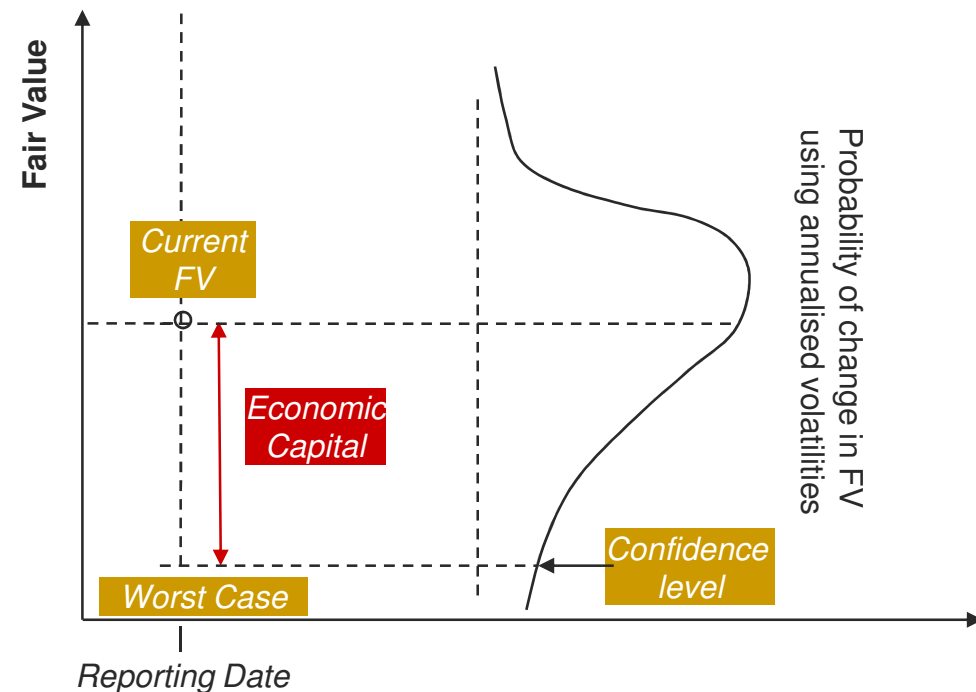
- The QIS4 risk taxonomy:



- Total risk is subdivided into a number of separate risk types, each one related to a separate cause of value volatility
- ECAP is the capital a business must hold to protect its policy/debt holders against the risk of economic insolvency at a certain confidence level over the coming year

The risks that Insurers Face (cont'd)

- For each risk type, an ECAP is calculated as the difference between the current FV and the Worst case loss
- ECAP is a measure of Risk and can be used for Solvency purposes



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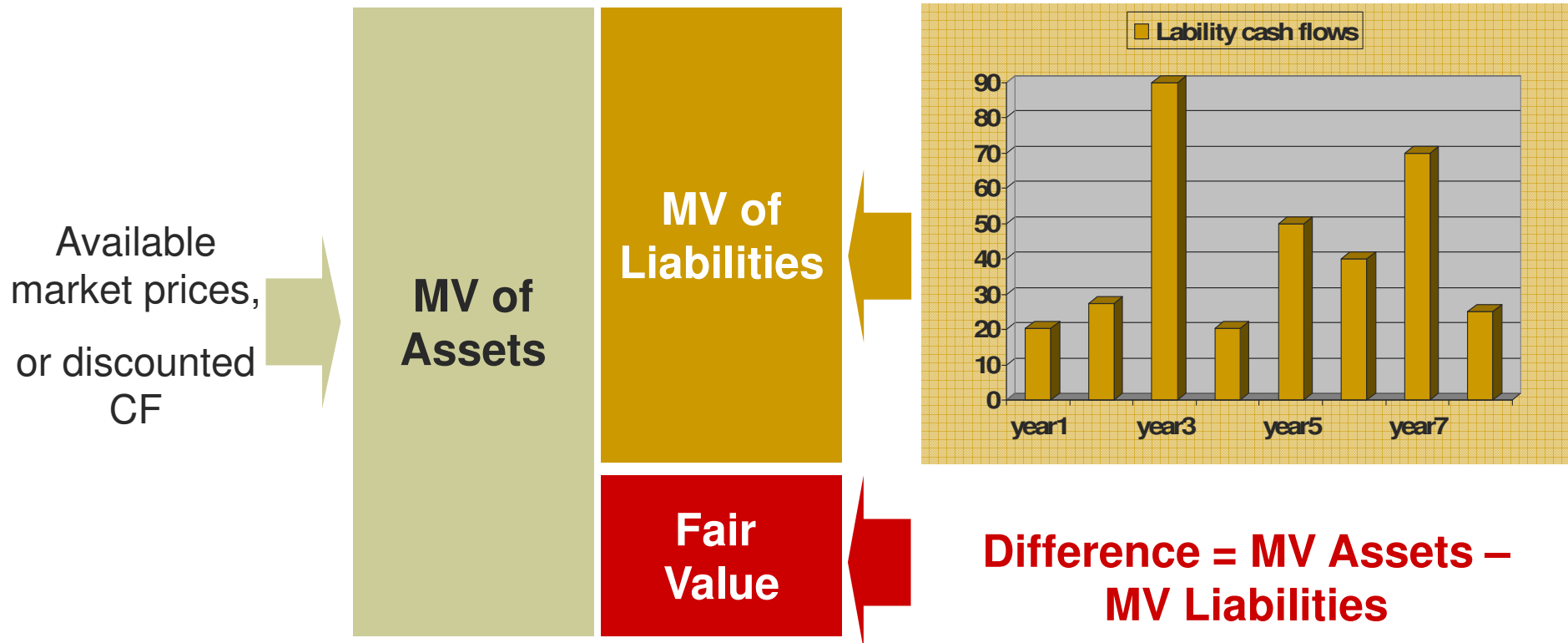
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ALM ECAP: Different Risk Factors

- Changes in market risk factors affect insurers fair value:
 - Interest rates
 - Share prices
 - Foreign exchange rates
 - Real estate prices
- In case of unfavorable changes in market risk factors, an Insurance Company can lose value
- How much fair value can an Insurance Company possibly lose in a worst-case shock (calibrated to 1-year volatility)?

ALM ECAP: Fair Value @ Risk

- From fair value to ALM ECAP:



ALM ECAP = Volatility of Fair Value (1 yr horizon)

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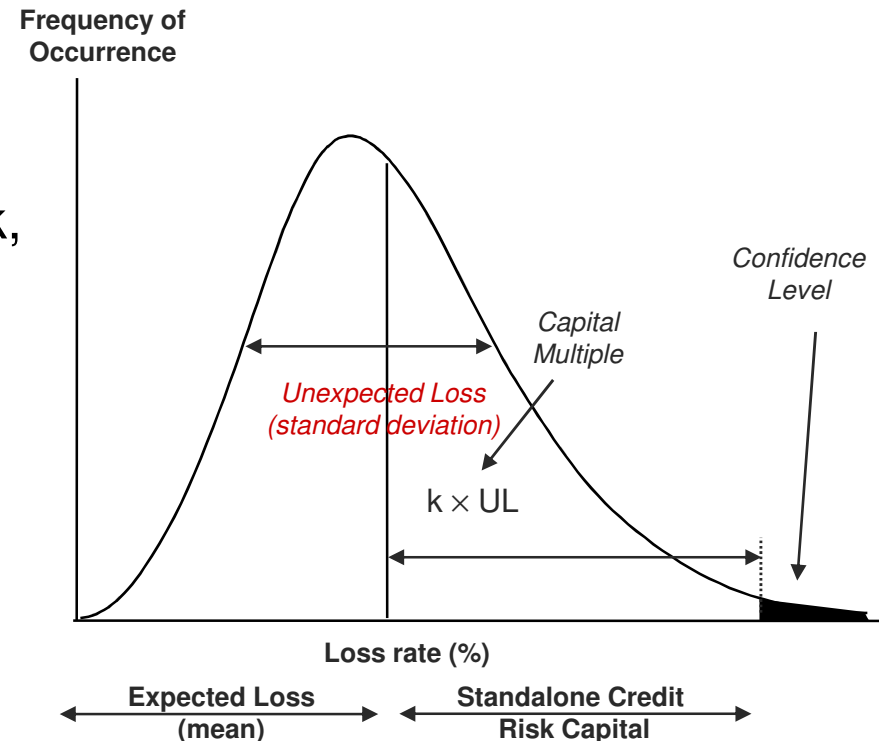
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Credit Risk ECAP

- Credit risk arises from the possibility that borrowers, bond issuers, and counterparties in derivatives transactions may default
- In the context of Basel II, banks can, with the approval from regulators, use their own estimates of default probabilities to determine the amount of capital they are required to keep
- This should be applicable to insurers in the context of Solvency II

Credit Risk ECAP: 2 Components

- Expected loss
Anticipated average annual loss rate
- Because Unexpected Loss is calculated as a standard unit of risk, the amount of capital needed is directly proportional to it
- The only other factor needed to determine the amount of capital required to cover credit risk is the appropriate capital multiple, which is dependent upon the bank's desired credit rating. The safer a bank wants to be (and thus the higher its target external debt rating), the more capital it needs per unit of risk
- This multiple which determines capital as a function of risk can be calculated from the statistical distribution of credit losses



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Credit Risk ECAP: Expected Loss

Definition

$$\text{Expected Loss (EL)} = \text{Probability of Default (PD)} \times \text{Severity of Loss (LGD)} \times \text{Exposure at Default}$$

Expected Default Frequency, or "PD"

The statistical probability that a counterparty will default

Loss Given Default, or "LGD"

The percentage of the debt that the Bank is likely to lose once a counterparty has defaulted

Exposure at Default

The debt of the counterparty to the Bank at the point of default

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Credit Risk ECAP : Unexpected Loss

- Estimating unexpected losses is a three stages process:

STANDALONE UL

- Calculate stand-alone unexpected loss (UL_{sa}) for each exposure in the portfolio

DEFAULT CORRELATION

- Estimate default correlation between each exposure
- Apply default correlation in portfolio aggregation

UL CONTRIBUTION

Calculate unexpected loss contribution (ULc) for each exposure

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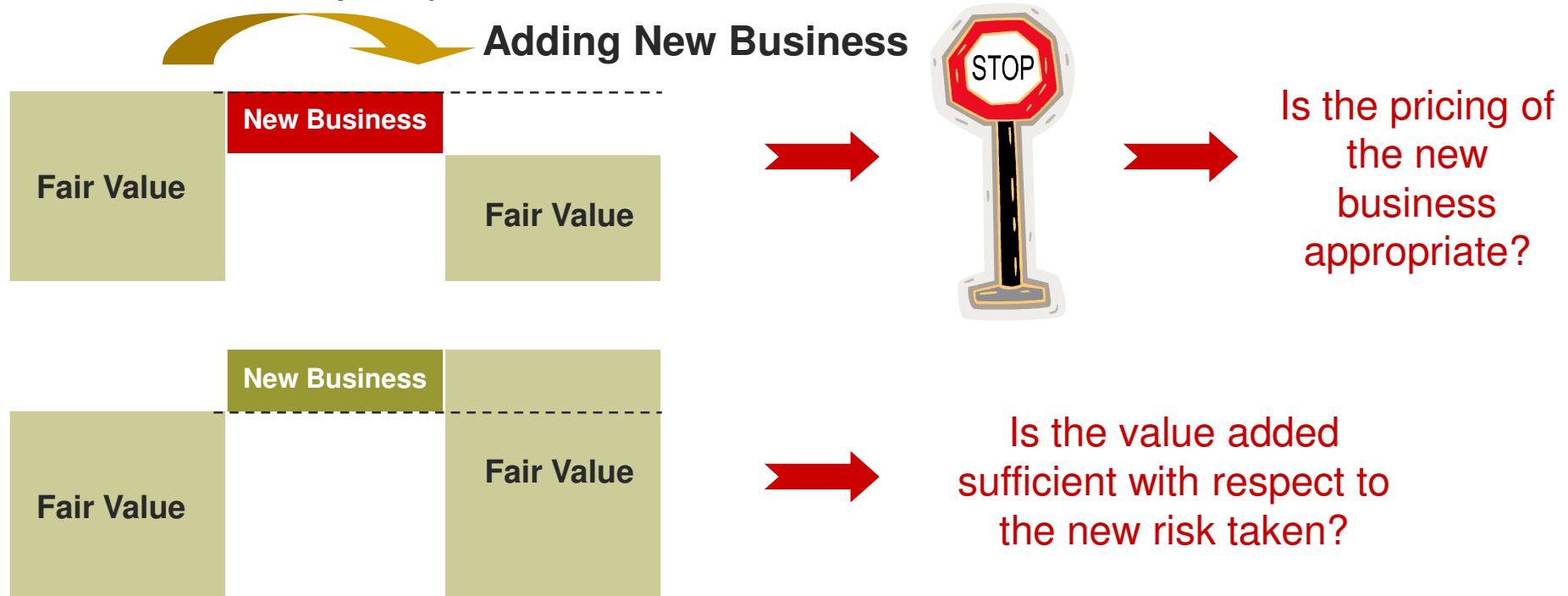
Credit Risk ECAP: Summary

- Credit risk consists of two components. Expected Loss (EL) which is the statistically anticipated, annual level of credit loss over time, and Unexpected Loss (UL) which can be thought of as the standard deviation of credit losses
- EL can be calculated as the product of its three components - Probability of Default (PD), Severity of Loss (LGD) and Exposure at default.
- The UL for a loan on a stand-alone basis can be derived statistically from EL, whilst calculating diversified UL requires an understanding of the correlation of default between loans within the portfolio
- Financial institutions hold two pools of funds to protect themselves against losses. Broadly, bad debt provisions provide against EL, while economic capital protects against UL

5. Profit Testing

Introduction

- From product subscribers, to shareholders going through senior management, everybody has to be concerned with **VALUE CREATION!**
- The purpose of adding new business is to create value to the company



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The Process

- Profit testing is used to help design and price future new business which may be written by a life assurance company
- It helps the actuary to determine the premium rates and benefits which can be afforded
- In general, a "profit test" is a cash flow projection of a single policy
- In this projection, probabilities are applied to the various events that can occur during the projection, for instance of the policyholder surrendering the policy, or dying

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Example - Assumptions

Yield Curve & Tax

Risk-free: flat	5%
Tax rate	0%

Assets

Type	Bond issued at par (-> no amortisation)
Maturity	5
DAC activation on t=0	20
DAC amortisation rate	20%

Insurance Liabilities

Mortality Rate: flat	3%
Time-to-maturity	5
Premium	50
Death Capital	400
Loadings (in % of premium)	5,0%
Other expenses (in % of premium)	15,0%
No Profit Sharing	

Only the saving premium is invested in bonds!

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Example - Scenario 1

P&L / CF Statement

Interest guaranteed	5,0%				
	1	2	3	4	5
Premiums (BoY)	50	50	50	50	50
Invest Rev (EoY)	2,50	4,34	6,25	8,22	10,26
Delta Res (EoY)	-38,74	-41,94	-45,39	-49,14	175,21
DAC Amortisation (EoY)	16,00	-4,00	-4,00	-4,00	-4,00
Benefits (EoY)	0,00	0,00	0,00	0,00	-228,40
Other Expenses (EoY)	-27,50	-7,50	-7,50	-7,50	-7,50
EBIT=NI (EoY)	2,26	0,91	-0,65	-2,42	-4,43
<u>Cash flow from operating activities</u>					
NI	2,26	0,91	-0,65	-2,42	-4,43
Delta Res (EoY)	38,74	41,94	45,39	49,14	-175,21
DAC Amortisation (EoY)	-16,00	4,00	4,00	4,00	4,00
OCF	25,00	46,84	48,75	50,72	-175,64
<u>Cash flow from investing activities</u>					
Purchase Bonds	36,90	38,09	39,39	40,80	42,31
Sell Bonds	0,00	0,00	0,00	0,00	-197,49
ICF	36,90	38,09	39,39	40,80	-155,18
"Free" Cash Flow = OCF - ICF	-11,90	8,75	9,36	9,92	-20,47

Fair Value -3,18

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Example - Scenario 2

P&L / CF Statement

Interest guaranteed	4,4%				
	1	2	3	4	5
Premiums (BoY)	50	50	50	50	50
Invest Rev (EoY)	2,50	4,34	6,25	8,21	10,25
Delta Res (EoY)	-38,50	-41,45	-44,63	-48,05	172,62
DAC Amortisation (EoY)	16,00	-4,00	-4,00	-4,00	-4,00
Benefits (EoY)	0,00	0,00	0,00	0,00	-224,34
Other Expenses (EoY)	-27,50	-7,50	-7,50	-7,50	-7,50
EBIT=NI (EoY)	2,50	1,39	0,12	-1,33	-2,98
<u>Cash flow from operating activities</u>					
NI	2,50	1,39	0,12	-1,33	-2,98
Delta Res (EoY)	38,50	41,45	44,63	48,05	-172,62
DAC Amortisation (EoY)	-16,00	4,00	4,00	4,00	4,00
<i>OCF</i>	<i>25,00</i>	<i>46,84</i>	<i>48,75</i>	<i>50,71</i>	<i>-171,60</i>
<u>Cash flow from investing activities</u>					
Purchase Bonds	36,86	38,05	39,34	40,72	42,20
Sell Bonds	0,00	0,00	0,00	0,00	-197,17
<i>ICF</i>	<i>36,86</i>	<i>38,05</i>	<i>39,34</i>	<i>40,72</i>	<i>-154,97</i>
"Free" Cash Flow = OCF - ICF	-11,86	8,79	9,41	10,00	-16,63

Fair Value
0,00

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Example - Scenario 3

P&L / CF Statement

Interest guaranteed	4,0%				
	1	2	3	4	5
Premiums (BoY)	50	50	50	50	50
Invest Rev (EoY)	2,50	4,34	6,24	8,21	10,24
Delta Res (EoY)	-38,31	-41,08	-44,04	-47,22	170,65
DAC Amortisation (EoY)	16,00	-4,00	-4,00	-4,00	-4,00
Benefits (EoY)	0,00	0,00	0,00	0,00	-221,27
Other Expenses (EoY)	-27,50	-7,50	-7,50	-7,50	-7,50
EBIT=NI (EoY)	2,69	1,77	0,70	-0,51	-1,89
<u>Cash flow from operating activities</u>					
NI	2,69	1,77	0,70	-0,51	-1,89
Delta Res (EoY)	38,31	41,08	44,04	47,22	-170,65
DAC Amortisation (EoY)	-16,00	4,00	4,00	4,00	4,00
OCF	25,00	46,84	48,74	50,71	-168,53
<u>Cash flow from investing activities</u>					
Purchase Bonds	36,84	38,02	39,29	40,66	42,12
Sell Bonds	0,00	0,00	0,00	0,00	-196,93
ICF	36,84	38,02	39,29	40,66	-154,81
"Free" Cash Flow = OCF - ICF	-11,84	8,82	9,45	10,05	-13,72

Fair Value
2,40

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