Assessing and Managing Risk in Corporations

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What is Risk?

Risk…

…**is the "effect of uncertainty on objectives"** *NP ISO31000*

…**is "the possibility that an event will occur and adversely affect the achievement of objectives"**
Enterprise Risk Management Framework – COSO (www.coso.org)

…**"is often expressed in terms of a combination of the consequences of an event (including changes in circumstances) and the associated likelihood of occurrence"**
ISO/IEC Guide 73 – Risk Management – Vocabulary - Guidelines

…**is "the chance that the actual return on an investment (or entrepreneurial initiative) will be different than expected"**
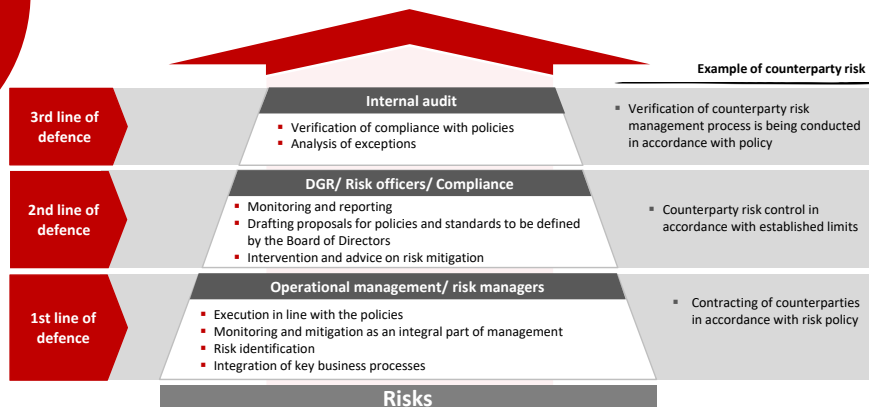*Investopedia, http//www.investopedia.com*

Risk is like the two sides of a coin

In Chinese

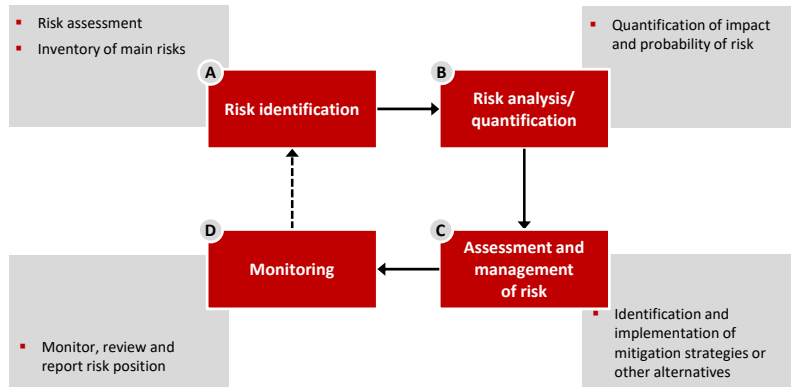|	Risk	
DANGER	危 机	**OPPORTUNITY**
	Negative Positive	
▪ a **negative** consequence for the objectives		▪ a **positive** consequence for the objectives

Risk is the effect of uncertainty, good or bad, in achieving results, and may result in lower or higher returns than expected

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Best practice of risk governance model is based on the 3 lines of defence
(The Institute of Internal Auditors)

Example of counterparty risk

3rd line of defence	**Internal audit** ▪ Verification of compliance with policies ▪ Analysis of exceptions	▪ Verification of counterparty risk management process is being conducted in accordance with policy
2nd line of defence	**DGR/ Risk officers/ Compliance** ▪ Monitoring and reporting ▪ Drafting proposals for policies and standards to be defined by the Board of Directors ▪ Intervention and advice on risk mitigation	▪ Counterparty risk control in accordance with established limits
1st line of defence	**Operational management/ risk managers** ▪ Execution in line with the policies ▪ Monitoring and mitigation as an integral part of management ▪ Risk identification ▪ Integration of key business processes	▪ Contracting of counterparties in accordance with risk policy
	Risks	

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The risk management process can be summarised in 4 stages

- Risk assessment
- Inventory of main risks

- Quantification of impact and probability of risk

(A) Risk identification → **(B) Risk analysis/ quantification**

(D) Monitoring ← **(C) Assessment and management of risk**

- Monitor, review and report risk position

- Identification and implementation of mitigation strategies or other alternatives

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Types of risk based on the ability of interest of managing them

		Definition	Treatment of Risk
1 Unknown unknowns	Business risks ("black swan" events[1])	• **Unknown and unpredictable risks** • Translate into **very significant threats**	• **Difficult to mitigate** individually • The company must have **capacity and flexibility** to **support unexpected events** of great magnitude
2 Known unknowns	Strategic/business /financial risks	• **Risk with a degree of known uncertainty** • They usually have **downside and upside**	• The **company must manage** (not fully eliminate) these risks • The **ability to manage these risks** better than the competitors **creates value** for the company
3 Known and avoidable	Operational/ compliance risks	• **Operational errors** • These can expose the company to **significant losses**	• These **risks should be eliminated or fully mitigated** • **They cannot create value** for the organisation. They tend to destroy value

1. "Black swan" events are very unlikely events that have extremely adverse consequences

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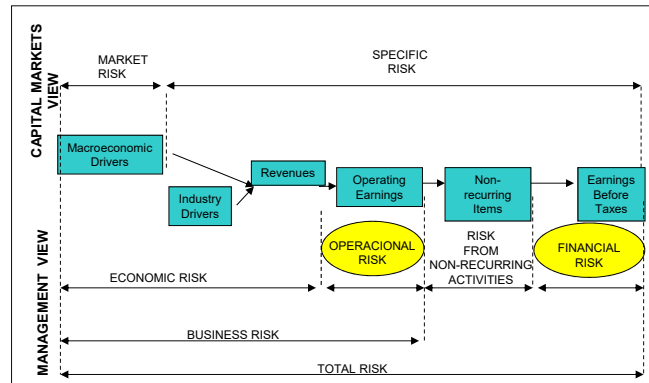# A taxonomy of risk adopted by some firms

Strategic	Business	Financial	Operational
▪ Risks associated with the business the environment and the strategic decisions	▪ Risks associated with the relevant business drivers, such as demand, prices, costs, competitors manoeuvres	▪ Risks associated with financial markets, liquidity and non-compliance by third parties with their obligations	▪ Risks related to the structure functioning and eventual damages caused by external or internal events

Strategic
- Environment (external)
- Strategy (internal)

Business
- Market behaviour
- Competitors
- ....

Financial
- Financial markets
- Liquidity/ solvency
- Credit
- Social liabilities

Operational
- Physical assets
- Processes
- HR (human resources)
- IS (information systems)
- Legal

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ASSESSING OPERATIONAL AND FINANCIAL RISK THROUGH THE INCOME STATEMENT

Risk analysis

Cost definitions

- ○ Operating Costs
  - • are expenses associated to a particular activity or business on a day-to-day basis.
- ○ Financial Expenses (or Financial Costs)
  - • Are associated with securing funds for a project or for the business as a whole. It may include interest payments, financing fees charged by intermediary financial institutions, and fees or salaries of any service required to complete the financing process.
  - • Financial expenses include interest expenses, banking fees and others related to financing
- ○ Recurring Items
  - • Recurring items are ongoing costs (i.e. losses) or revenues (i.e. gain)
- ○ Non-recurring items
  - • are unusual or infrequent items that are reported separately as part of income from continuing operations. Examples are gains or losses arising from i) Discontinued operations and the disposal of a portion of a business segment; ii) Extraordinary items; iii) Unusual or infrequent items; iv) Asset impairments

Cost definitions (cont..)

- ○ Fixed Cost (FC)
  - • That cost which does not vary based on production volume. Includes building, insurance, fixed overhead (e.g. Engineering staff), equipment recovery cost, information systems, etc.
- ○ Variable Cost (VC)
  - • that cost which varies (assumption: proportionally) as production volume varies. Includes direct labour, materials, warranty, utilities (power consumption), marketing, etc.
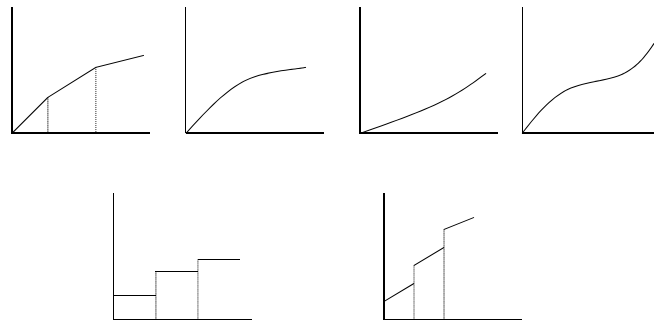
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Behaviour of costs

€

Total Cost

Variable Cost

Fixed Cost

Production, Volume, Revenues (Q or €)
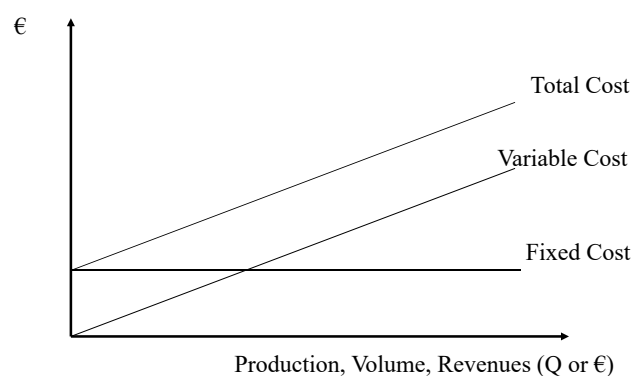
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Typical behaviour of costs

The relevance range

o The relevance range is the level of activity for which the assumed behaviour of cost is valid

o Models always have their limitations. In this case the assumptions:
  - Linear relationship for variable costs
  - Fixed cost remains constant

o Above or below the relevance range the behaviour of costs can vary differently from the assumptions

o Within the relevance range the assumptions of cost behaviour are a good approximation to the real costs behaviour

Managerial Income statement
Direct costing

Sales Revenues (S)
- Operational Variable Cost (VC)
= **Contribution Margin (CM)**
- Operational Fixed Costs (FC)
= **Operational Profit or Loss (OP)**
- Financial Expenses (FE)
= **Recurring Profit or Losses (RP)**
+ Gains and Losses from Non-Recurrent activities (CP)
= **Profit or Loss Before Taxes (PBT)**
- Income taxes (T)
= **Net Profit or Losses (NP)**

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Approaches for estimating variable and fixed costs

- Managerial Accounting using the Direct Costing Method would be the best approach
- Regression Analysis Approach if time series is available
- Maximum-Minimum Approach if time series is limited
- Scatter-Graph Approach if time series is limited
- Subjective approach the most used in practice

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Account Analysis: It is a subjective classification of cost behaviour

1. The best method for classifying variable and fixed costs would be to rely on variable costing **managerial accounting**. However, in general, the most common managerial accounting approach is total costing.
2. **You may also use statistic methods** – for example regression between inputs (costs) and outputs (production or sales)
3. **Account Analysis is not the best method, but is the most common used.** It is a subjective analysis – individual or group
   o After classification:
     • You calculate the total variable costs and total fixed costs
     • And you may calculate ratios such as:
       o Variable costs to Sales
       o Contribution margin to Sales

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Regression Approach

   o Regression analysis is the statistical method that uses the least squares method
   o It is therefore superior to the maximum and minimum method.
   o The slope is the variable cost and the intercept point is the fixed cost
   o Example in Excel – Digital Equipment SA

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High-Low Method

○ Uses periodical data of activities and costs with scatter-grapth visual and develops a line using the maximum and minimum points of activity or costs.
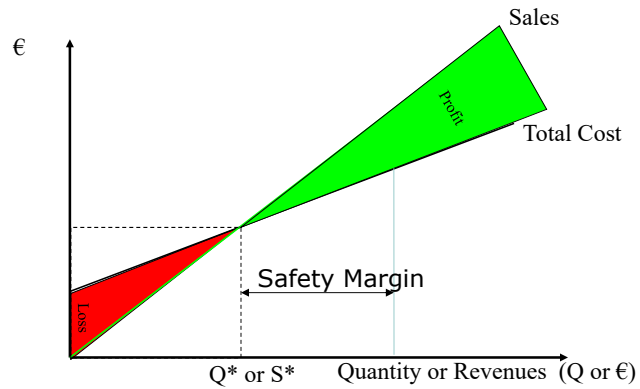
$$v = \frac{HC - LC}{HV - LV}$$

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Método gráfico

○ This technique uses the costs and the volume of activity for a certain number of periods.

○ It serves to obtain a graphical view of the relationship between costs and activity and to decide on the respective classification

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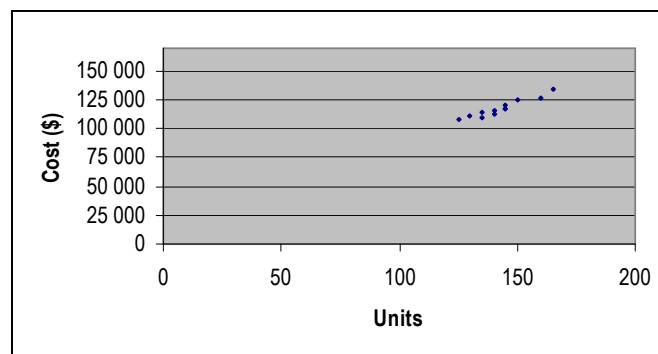
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Break-even analysis graph

* Means the revenues or quantity to break-even

Formulas: Operating Break Even & Operating Safety Margin

OPERATING BREAK-EVEN IN UNITS: **IN EUROS:**

$$Q_{Op}^* = \frac{FC}{P - v}$$

$$S_{Op}^* = \frac{FC}{\frac{S - VC}{S}}$$

OPERATING SAFETY MARGIN

$$SM_{Op} = \frac{S - S^*}{S}$$

FC – Operating fixed costs
P – Selling price per unit
v – Variable cost per unit
m – Contribution margin/Revenues
S – Revenues
S_{Op}* - Operating break even in euros
Q_{Op}* - Operating break even in units

Formulas: Break Even & Safety Margin

BREAK-EVEN IN QUANTITY:

$$Q^* = \frac{FC + FExp}{P - v}$$

EM VALOR:

$$S^* = \frac{FC + FExp}{\frac{S - VC}{S}}$$

OPERATING SAFETY MARGIN

$$SM = \frac{S - S^*}{S}$$

FC – Operating fixed costs
P – Selling price per unit
v – Variable cost per unit
m – Contribution margin/Revenues
S – Sales and other Operational Revenues
S_{Op}^* - Operating break even in euros
Q_{Op}^* - Operating break even in units

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Using the model to atain a certain goal of Recurring Earnings

In Units: $Q^* = \dfrac{FC + FExp + x}{m_u}$

In Euros: $S^* = \dfrac{FC + FExp + x}{\frac{S - VC}{S}} = \dfrac{FC + FExp + x}{m\%}$

x = objective to achieve a specific amount of Recurring Earnings

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Multi-product Break-even of Revenues

○ The formula in Euros
○ And:
- If the contribution margin ratio used is the same as previous year, than it is assumed the profitability of each product is similar of previous year and the same for the product-mix
- If it is expected a change of product mix and or margin of all or some of the products than the contribution margin ratio must be recalculated:

$$m\% = m_1 \cdot w_1 + m_2 \cdot w_2 + ... + m_n \cdot w_n$$

m_i – the contribution margin ratio of product i
w_i - weight of product i in the total revenues of the company

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Goal seek and What-if analysis

○ When a financial modeling is developed with the drivers of net profit (selling prices, product-mix, unit costs, operating fixed costs, financing costs, income tax rate) the management can do sensitivity analysis using : "goal seek" e "What If analyses" of Excel.
○ This analysis is based on the observation of the output from specific potential action. For example:

- What is the impact in the net profit (or the ROE) if the fixed cost increases X euros and the variable unit cost reduces in Y euros?

- What is the net profit (or the ROE) if the selling price declines λ% and demand increases s%?

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Resources might have a constrain

o If there is a constrain to a specific resource the optimization of profit is not the contribution margin per unit but the contribution margin of the scarce resource.

o Another more advanced model to optimize the process is using linear programming (Use the Excel: Tools, Solver).

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Questions

o Does the company have enough business to generate enough profits?

o What are the business risks and financial risks that can affect the company profitability?

o What can the company do to improve the profitability and reduce risk?

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Case Study:
Impulse Robotics and Malvey Aerospace

	Impulse Robotics	Malvey Aerospace
Revenues	$1,000,000	$1,000,000
Operating costs	700,000	750,000
Operating income	$300,000	$250,000
Financing expense	100,000	50,000
Net income	$200,000	$200,000

	Impulse Robotics	Malvey Aerospace
Number of units produced and sold	100,000	100,000
Sales price per unit	$10	$10
Variable cost per unit	$2	$6
Fixed operating cost	$500,000	$150,000
Fixed financing expense	$100,000	$50,000

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DEGREE OF LEVERAGE APPROACH: OPERATIONAL AND FINANCIAL DEGREE OF LEVERAGE

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Risk Analysis using the Degree of Leverage

○ Degree of Operational Leverage (DOL)

$$\frac{\text{Contribution Margin}}{\text{Operating Earnings}}$$

○ Degree of Financial Leverage (DFL)

$$\frac{\text{Operating Earnings}}{\text{Recurring Earnings}}$$
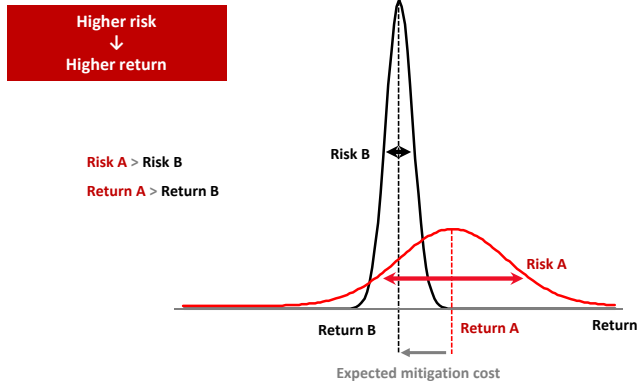
○ Degree of Combined Leverage (DCL)

$$DCL = \frac{\text{Contribution Margin}}{\text{Operating Earnings}} \times \frac{\text{Operating Earnings}}{\text{Recurring Earnings}}$$

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VALUE AT RISK

Trade-off / return risk

Higher risk
↓
Higher return

Risk A > **Risk B**

Return A > **Return B**

Risk B

Risk A

Return B   **Return A**   Return

Expected mitigation cost

Risk analysis

How to analyse the risk?

Impact	Quantitative	▪ Economic impact
	Qualitative	▪ Reputational impact ▪ Impact of damage on people ▪ Impact on the environment

Quantification

The aim is to calculate the distribution of losses; however, it depends on the information we have

1 **Indirect method**
▪ **Analyse the frequency** (or probability) and **impact** (medium and maximum), **to calculate the distribution of losses.** Interesting solution for discrete events (e.g. operational) and with limited or no historical information

2 **Direct method**
▪ **Directly analyse the distribution of losses**. Particularly useful if the risk factor is continuous and has a sufficiently long history, and when the series is representative of the future

Loss/ Result
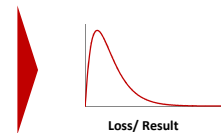
Market value at risk (MVR) or Cash-Flow at Risk (CFaR)

○ **Market Value at Risk (MVR):** expected reduction in the firm's value if that risk occurs

○ $MVR = \begin{bmatrix} \text{Reduction in the} \\ \text{firm's value if} \\ \text{the risk} \\ \text{occurs} \end{bmatrix} \times \begin{bmatrix} \text{Probability that} \\ \text{the risk will occur} \end{bmatrix}$

○ **Cash Flow Value at Risk (CFaR):** assess the probability that operating cash flows will drop below a pre-specified level

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