**Aalto University**
**School of Science**

# FORMULAS

**Department of Industrial Management and Engineering**
**TU-A1100 Industrial Management and Engineering 1**

## CASH FLOW STATEMENT

(for a financial year – formulated with the help of the opening and ending balance plus income statement)

EBITDA
\+ Working capital beginning of financial y.
\- Working capital end of financial year
\- Interests
\- Taxes
= **OPERATING CASH FLOW**

SHARE CAPITAL END OF F.Y.
\- Share capital beg. of financial y.
\- Dividends paid out during financial y.
\+ Loans outstanding end of period
\- Loans outstanding beginning of period
= **FINANCING CASH FLOW**

FIXED ASSETS BEGINNING OF F.Y.
\- Fixed assets end of financial year
\- Depreciations
= **CASH FLOW FOR INVESTMENTS**
(i.e. investments during the financial year)

OPERATING CASH FLOW
\+ CASH FLOW FOR INVESTMENTS
\+ CASH FLOW FOR FINANCING
= **CHANGE IN CASH AND EQUIVAL.**
\+ Cash and equiv. in the beginning of f.y.
= Cash and equiv. in the end of financ. year

## FREE CASH FLOW AND THE PROFITABILITY OF AN INVESTMENT

(Free cash flow is calculated for each period – the net present value of an investment is determined by discounting the free cash flows using the weighted average cost of capital as rate)

EBIT × $(1 - \tau)$ [i.e. Unlevered Net Income]
\+ Depreciations
\+ Working capital beginning of financial y.
\- Working capital end of financial year
\+ Cash flow for investments
= **FREE CASH FLOW ($FCF_i$)**

$$NPV = \sum_{i=0}^{\infty} \frac{FCF_i}{(1 + WACC)^i}, \text{ where}$$

NPV = **NET PRESENT VALUE OF THE FREE CASH FLOWS**

WACC = Weighted Average Cost of Capital, that is defined as follows:

$$WACC = \left[\frac{E_{TOT_i}}{A_{TOT_i}} \cdot r_E + \frac{D_{TOT_i}}{A_{TOT_i}} \cdot r_D \cdot (1 - \tau)\right] \cdot 100\%,$$

where $A_{TOT_i}$ = Total Assets,
$D_{TOT_i}$ = Total Liabilities (Debts),
$E_{TOT_i}$ = Total Equity,
$\tau$ = corporate tax rate,
$r_E$ = required yield for equity and
$r_D$ = average interest rate for debts.

## COST–PROFIT–VOLYME–ANALYSIS

On a certain time perspective, costs are either variable or fixed. This relation can be analysed.

CRITICAL SALES PRICE ($P_k$)
(as the volyme (i.e. quantity) remains constant)

$$P_k = \frac{F}{Q} + C$$

CRITICAL SALES QUANTITY ($Q_k$)
(as the sales price remains constant)

$$Q_k = \frac{F}{P - C}, \text{ where}$$

P = Sales price per unit
C = Variable cost per unit
F = Total fixed costs.

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## BALANCE EQUATION: ASSETS = EQUITY + LIABILITIES

(Balance sheet describes the moment between financial years. The balance ending f.y. *i* opens the f.y. *i+1*)

**ASSETS**

NON-CURRENT ASSETS
- Fixed assets

NON-CURRENT ASSETS TOTAL

CURRENT ASSETS
- Inventories
  - Raw materials and consumables
  - Work in progress (WIP)
  - Finished goods for sale
- Total inventories
- Current financial assets
  - Accounts receivables
  - Cash and equivalents
- Current financial assets total

CURRENT ASSETS TOTAL

**ASSETS TOTAL**

**EQUITY AND LIABILITIES**

EQUITY
- Shareholder's capital
- Retained earnings
- Profit for the financial year

TOTAL EQUITY

LIABILITIES
- Non-current liabilities
  - Loans from fin. inst. (long-term)
- Non-current liabilities total
- Current liabilities
  - Loans from fin. inst. (short-term)
  - Accounts payable
- Current liabilities total

LIABILITIES TOTAL

**EQUITY AND LIABILITIES TOTAL**

## WORKING CAPITAL (on a single moment)

TOTAL INVENTORIES
+ Accounts receivables
- Accounts payable
= **WORKING CAPITAL TOTAL**

## RETAINED EARNIGS AND DIVIDENDS

(Profit for f.y. *i-1* is added to retained earnings f.y. *i*)

RETAINED EARNINGS on opening balan.
+ Profit for previous f.y. on opening balance
- Dividends paid out during financial year
= RETAINED EARNINGS on ending balan.

## INCOME STATEMENT (for a financial year)

**REVENUE**
- Cost of Goods Sold (CoGS)

GROSS MARGIN
- Other operating expenses

EBITDA
- Depreciations

EBIT
- Interests

EBT
- Taxes

**PROFIT FOR THE FINANCIAL YEAR**

$$\text{Gross margin-\%} = \frac{\text{GROSS MARGIN}}{\text{REVENUE}}$$

$$\text{EBITDA-\%} = \frac{\text{EBITDA}}{\text{REVENUE}}$$

**Balance sheet items** (e.g. accounts payable) and also both **Revenue** and **pure cost items** (e.g. depreciations) are always considered as **absolute values**. Should there be a "–"sign before such an item in a calculation, it means that the item in question is indeed negative. An item **combined** by subtracting one of the previously mentioned items from another such item, **can become negative in itself**. When such a