# MBA in Food & Agribusiness

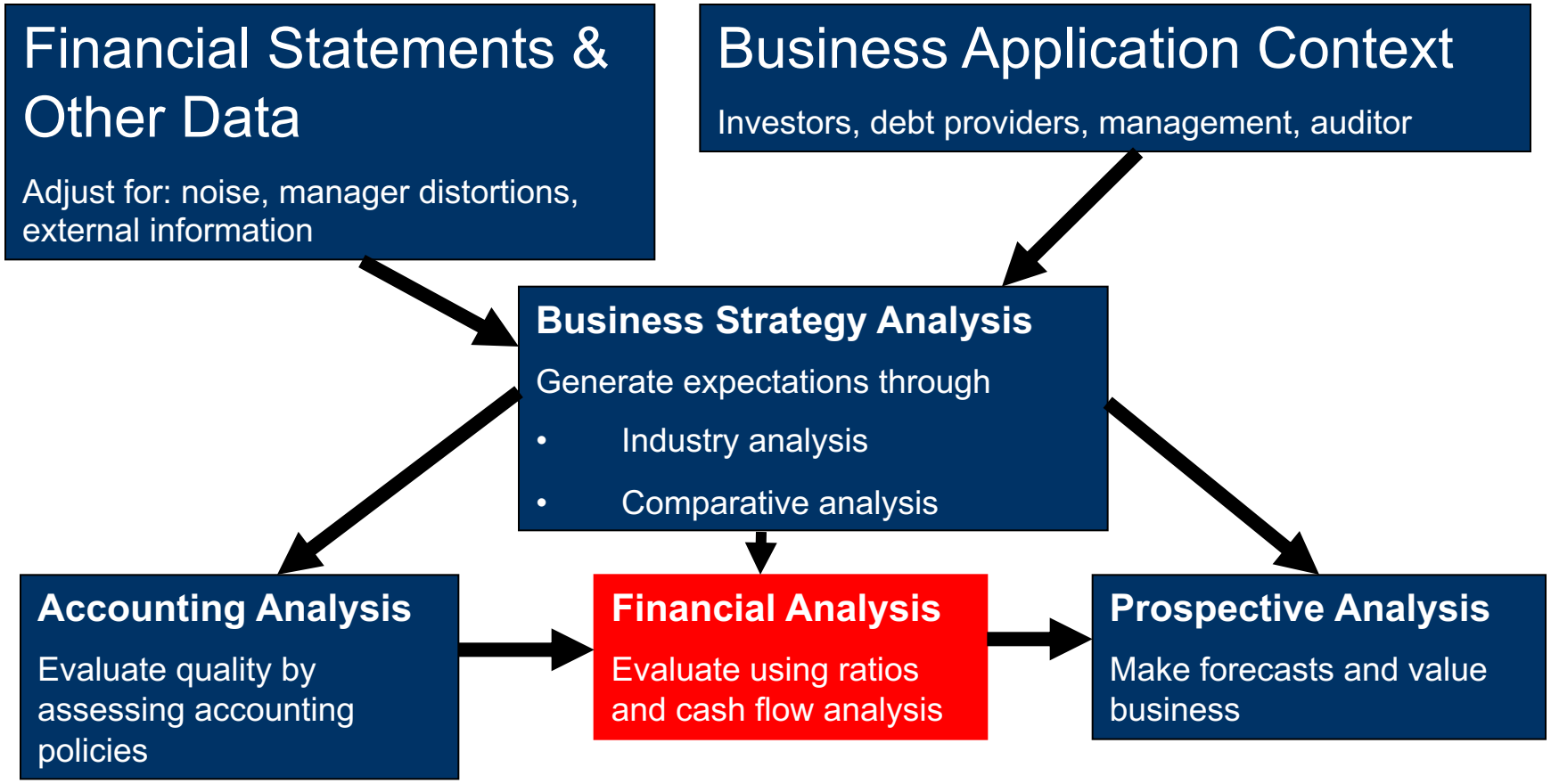
Financial Management

# *Revisiting Ratio Analysis using ROE definitions*

# Lecture Outline

- Basic overview of key financial ratios for forecasting purposes
- Return on Equity (ROE)
- Decomposition of ROE (traditional and alternative approaches)
- Definitions for prospective analysis
- Revisiting ratios from an alternative approach perspective

# Analysis using Financial Statements:



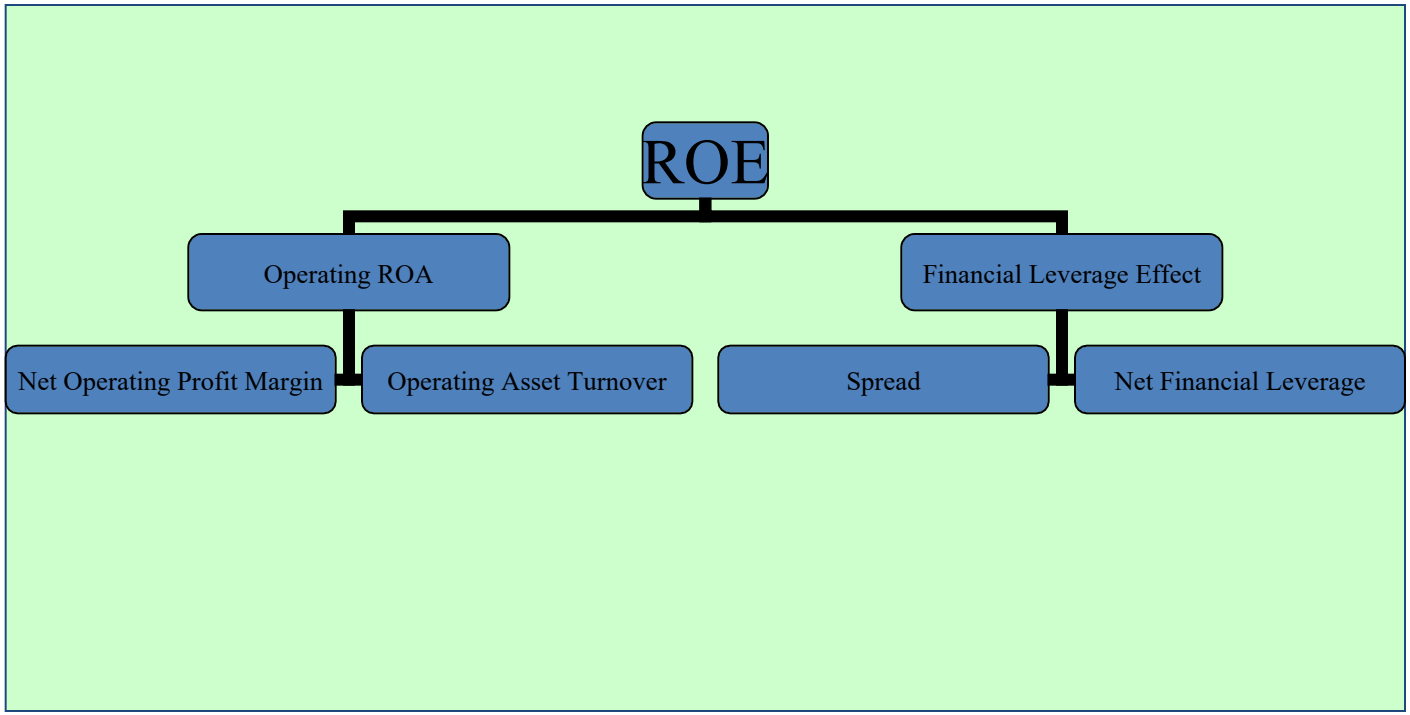
# Alternative Framework for Financial Ratio Analysis

**Operating ROA**

= NOPAT / Net Assets

**Net Operating Profit Margin** = NOPAT / Sales

**Operating Asset Turnover** = Sales / Net Assets




**Spread** = Operating ROA - Effective interest rate after tax

**Effective Interest Rate After Tax** = NIEAT / Net Debt

**Net Financial Leverage** = Net Debt / Equity

# Objectives of Financial Ratio Analysis (FRA)

Evaluate effectiveness of a firm's policies in:

- Operating management
- Investment management
- Financing strategy
- Dividend policies

- Key objective of analysis is to frame questions for **further probing**

# Measuring Overall Profitability

Starting point = **Return on Equity (ROE)**

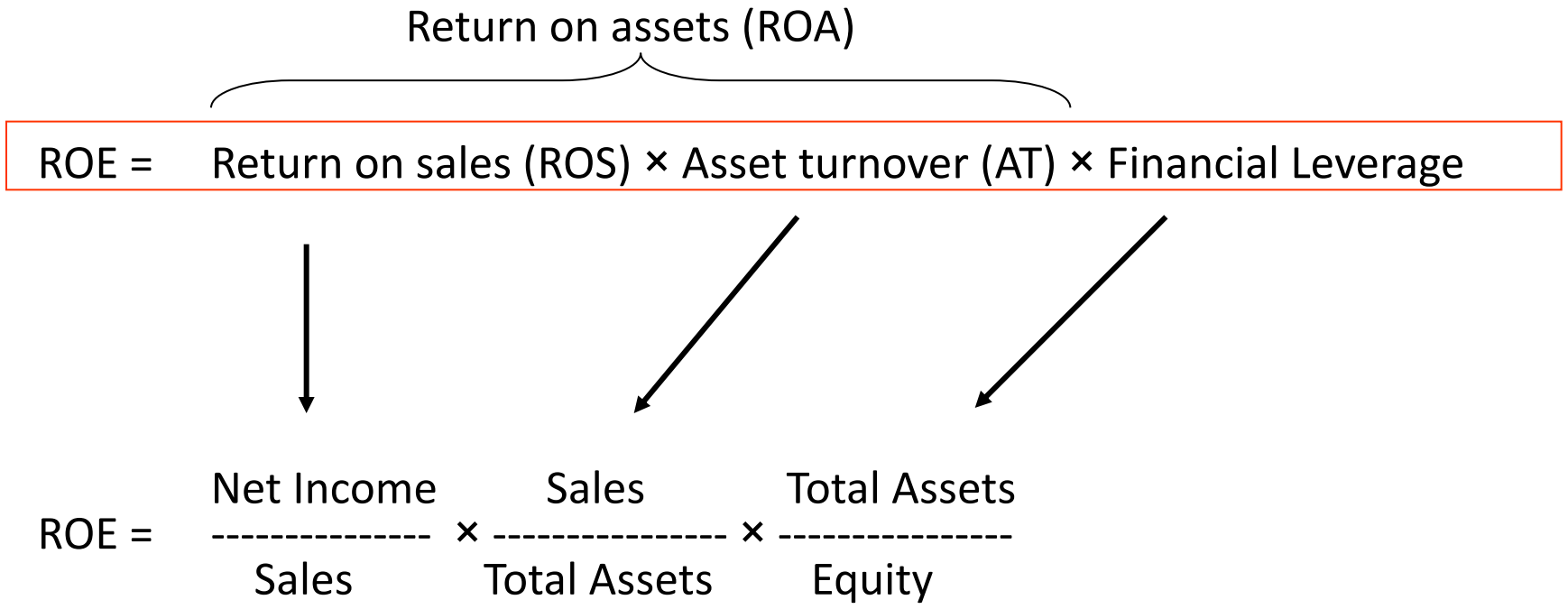
= Net Income/ Shareholders' equity

On average over long periods = 11-13% for large publicly traded firms in the US (10-12% for Europe)

Over the long term the value of a firm's equity is determined by the relationship between its ROE and its cost of equity capital

- ROE > Cost of Capital => MV > BV

# Decomposing ROE – Traditional approach (DuPont Decomposition)



# Decomposing Profitability – Alternative approach

## Limitations with traditional approach:

- ROA numerator (NI) only includes earnings **available to equity holders**

  Denominator includes assets claimed **by all providers of capital**

- Assets and net income are not split between operating and financing components

- Financial leverage ratio fails to recognise that cash and short term investments are, in essence, **'negative debt'**

  Can be used to pay down debt on a company's balance sheet *almost immediately*

# Reformulation of BS and IS to improve analysis

**Net interest expense after tax**

(Interest expense - Interest income) x (1 - Tax rate)

**Net operating profit after taxes** (NOPAT)

Net income + Net interest expense after tax

**Operating working capital** (OWC)

(CA – Cash and marketable securities) – (CL – Current debt and current portion of LTD)

**Net long term assets** (NLTA)

Total long term assets – non-interest bearing long term liabilities (e.g. deferred taxation)

**Net debt**

*Total interest bearing* Long term liabilities + Current debt and current portion of long term debt - cash and marketable securities

**Net (operating) assets** (OWC + NLTA)

**Net capital**

Net debt + shareholders' equity

# Re-formulated BS

| | $ |
|---|---|
| Net operating working capital | 1000 |
| Net long term assets | 5500 |
| **Net operating assets** | 6500 |
| | |
| Net debt | 2500 |
| Shareholders' equity | 4000 |
| **Net capital** | 6500 |

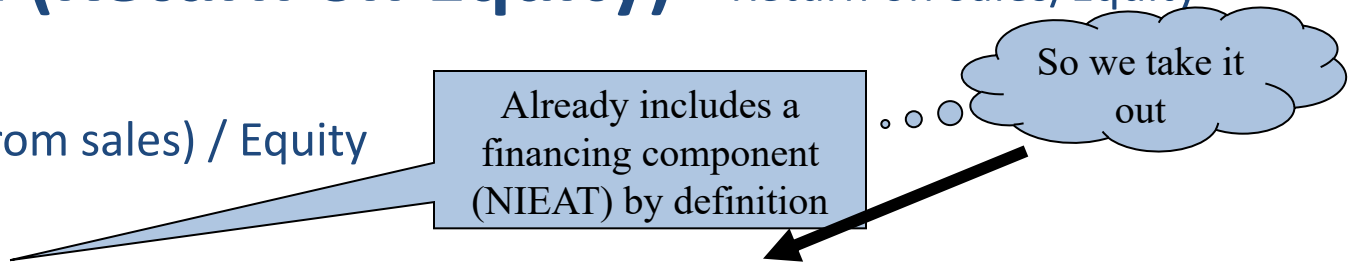
# Re-formulated IS

| | $ |
|---|---|
| Sales | 5000 |
| NOPAT | 450 |
| Net interest expense after tax | (150) |
| Net income | 300 |

# Decomposing Profitability – alternative approach

**ROE (Return on Equity)** = Return on Sales/Equity

= NI (from sales) / Equity




= NOPAT/Equity – (Net interest expense after tax)/Equity

= NOPAT/Net assets * Net assets/Equity - Net interest expense after tax/Net debt * Net Debt/Equity

= NOPAT/Net Assets * (Equity + Net debt)/Equity - Net interest expense after tax/Net debt * Net Debt/Equity

# Decomposing Profitability – alternative approach

= NOPAT/Net Assets * Equity/Equity + NOPAT/Net Assets * Net Debt/Equity – NIEAT/Net Debt * NET Debt/Equity

= NOPAT/Net Assets + (NOPAT/Net Assets - Net interest expense after tax/Net debt) * Net Debt/Equity

= Operating ROA + (Operating ROA – Effective interest rate after tax)
* Net financial leverage

= **Operating ROA + Spread * Net financial leverage**

- [Operating ROA = NOPAT/Net Assets]
- [Net financial leverage = Net Debt/Equity]
- Spread = (Operating ROA – Effective interest rate after tax)

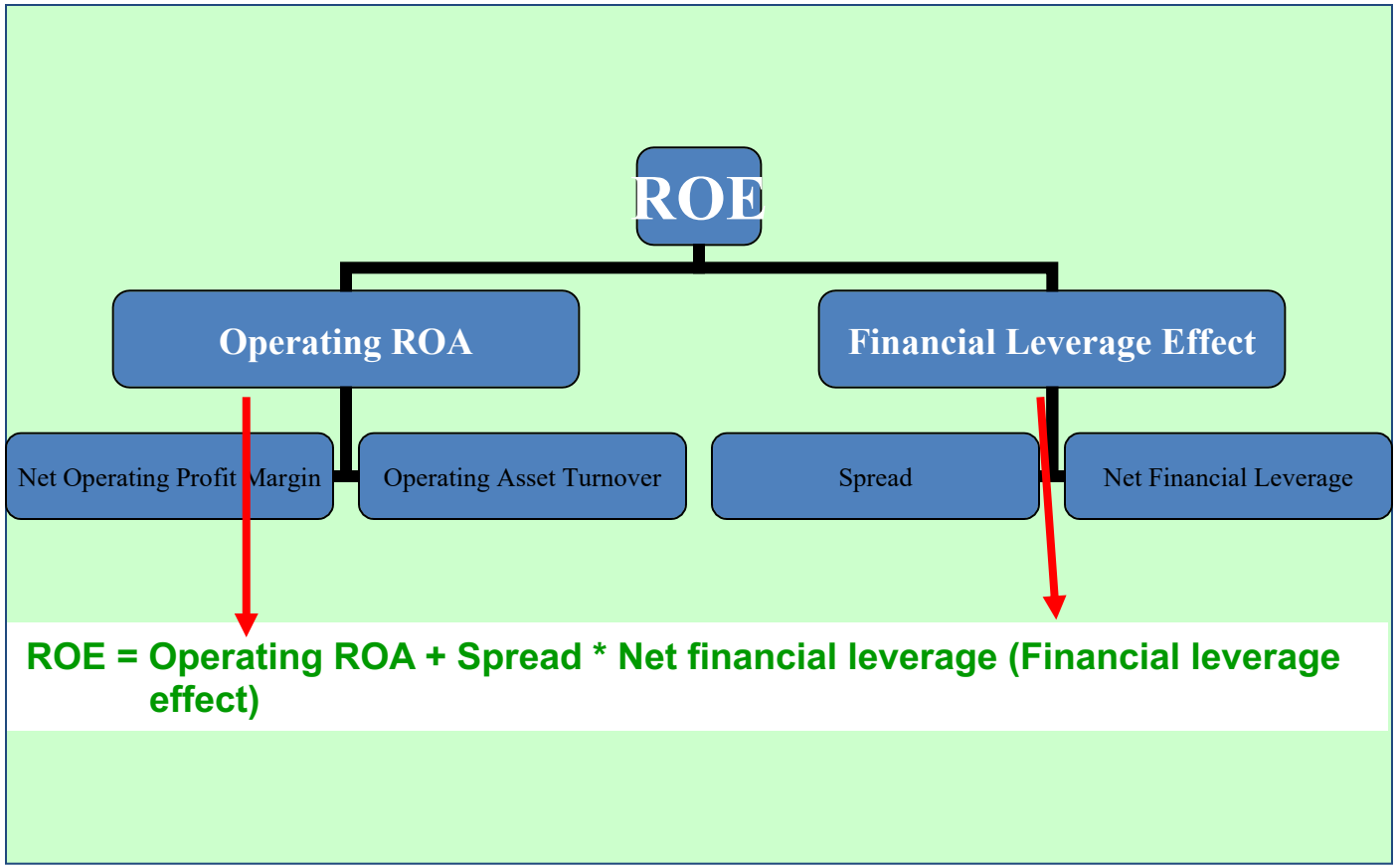
# Framework for Financial Ratio Analysis

**Net Operating Profit Margin** = NOPAT / Sales

**Operating Asset Turnover** = Sales / Net Assets

**Spread** = Operating ROA - Effective interest rate after tax

**Net Financial Leverage** = Net Debt / Equity



# Operating ROA Decomposed

**Operating ROA** = NOPAT/Net Assets

= NOPAT/Sales (NOPAT margin)

*

Sales/Net assets (Operating Asset Turnover)

- Appropriate benchmark for evaluating operating ROA is the *weighted average* cost of debt and equity capital (WACC)
- Average for US firms over long term is 9 to 11 per cent (8-10% for Europe)

# Financial Leverage Effect

Spread * Net financial leverage

- **Spread** = Operating ROA - Effective interest rate after tax
  = NOPAT/Net Assets - NIEAT/Net debt
- **Net Financial Leverage** = Net Debt / Equity

Net Interest Expense After Tax

This is a measure of the financial leverage gain (financial leverage effect) to the shareholders

# Assessing Operating Management

**Key profitability ratios:**

Gross Profit margins
EBITDA margin
Net Income margin
NOPAT margin

- Evaluate expenses to sales ratios

# Evaluating Investment Management

## Asset turnover

- Second driver of ROE
  - ❑ Working capital management
  - ❑ Management of long term assets

## For working capital we must distinguish:

1. **operating** components (accounts receivable, inventory, accounts payable)

and

2. **financing** components (cash, marketable securities, notes payable)

# Working Capital Management

**Operating Working Capital (OWC):**

= (Current assets – cash and marketable securities) – (Current liabilities –short term and current portion of long term debt)

- OWC to sales ratio
- OWC turnover
- Accounts receivable turnover
- Inventory turnover
- Accounts payable turnover
- Days' accounts receivable
- Days' inventory
- Days' accounts payable

# Long-Term Assets Management

## Net Long Term assets

= (Total long-term assets – Non-interest-bearing long-term liabilities)

Net long term asset turnover = Sales / Net long term assets

- This can be further decomposed into major asset classes related to sales

# Evaluating Financial Management: Financial Leverage (FL)

FL enables a firm to have an asset base larger than its equity

Increases a firm's ROE *as long as* the cost of the liabilities ***is less than*** the return from investing these funds

FL can therefore benefit shareholders but also increases the risk of financial distress

# Evaluating Financial Management: Financial Leverage (FL)

- Current liabilities and short-term liquidity
- Debt and long term solvency
  - Optimal capital structure determined primarily by business risk

# Assessing Sustainable Growth Rate

- **Sustainable Growth Rate:**
  - Rate at which a firm can grow while keeping its profitability and financial policies unchanged
  - ROE and dividend payout policy determine the pool of funds available for growth
  - Provides a benchmark against which a firm's growth plans can be evaluated

= ROE * (1 – Dividend payout ratio)

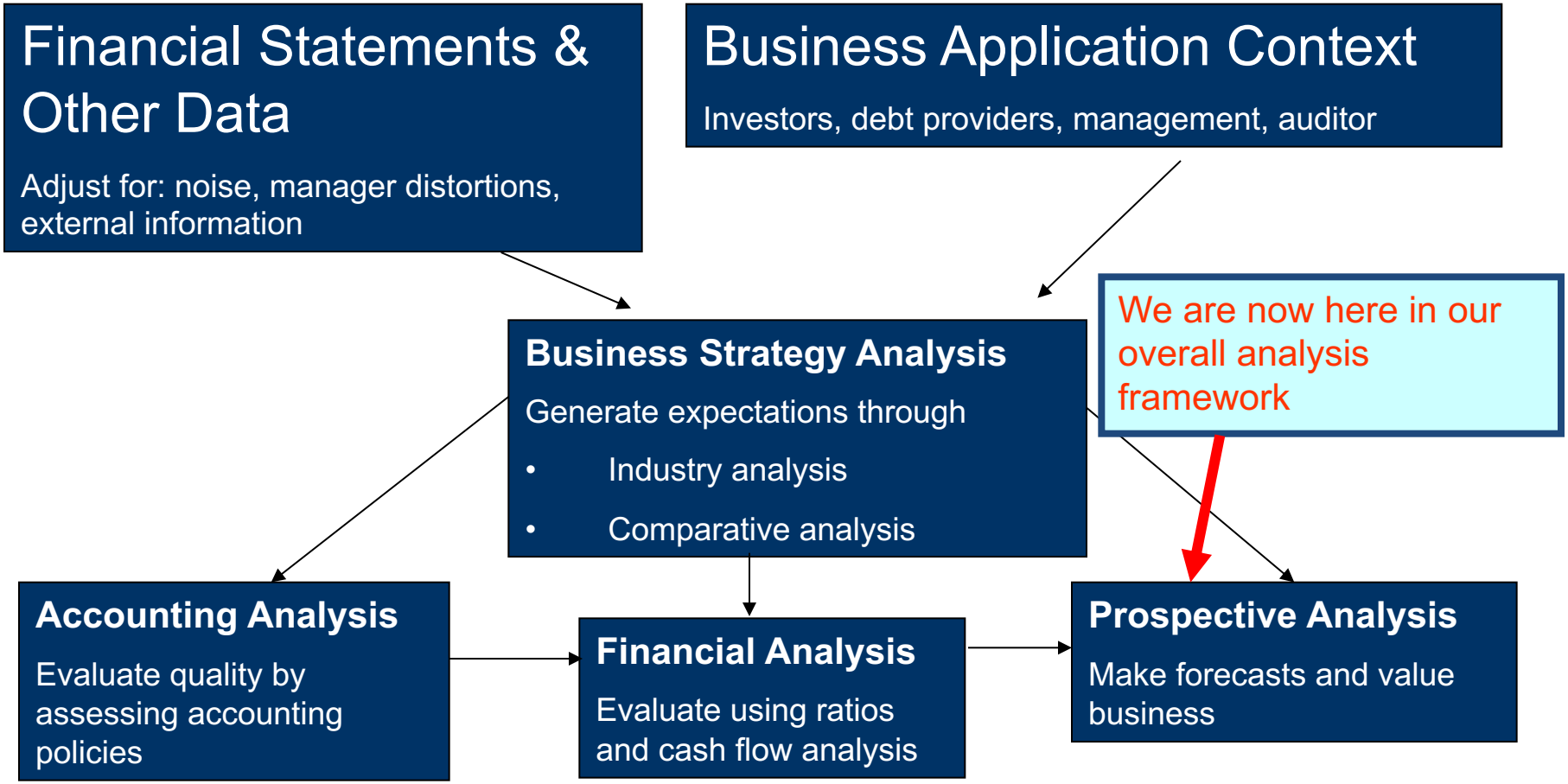
Dividend payout ratio = Cash dividends paid/Net Income

# *Prospective Analysis: Introduction to Forecasting*

# Lecture Outline

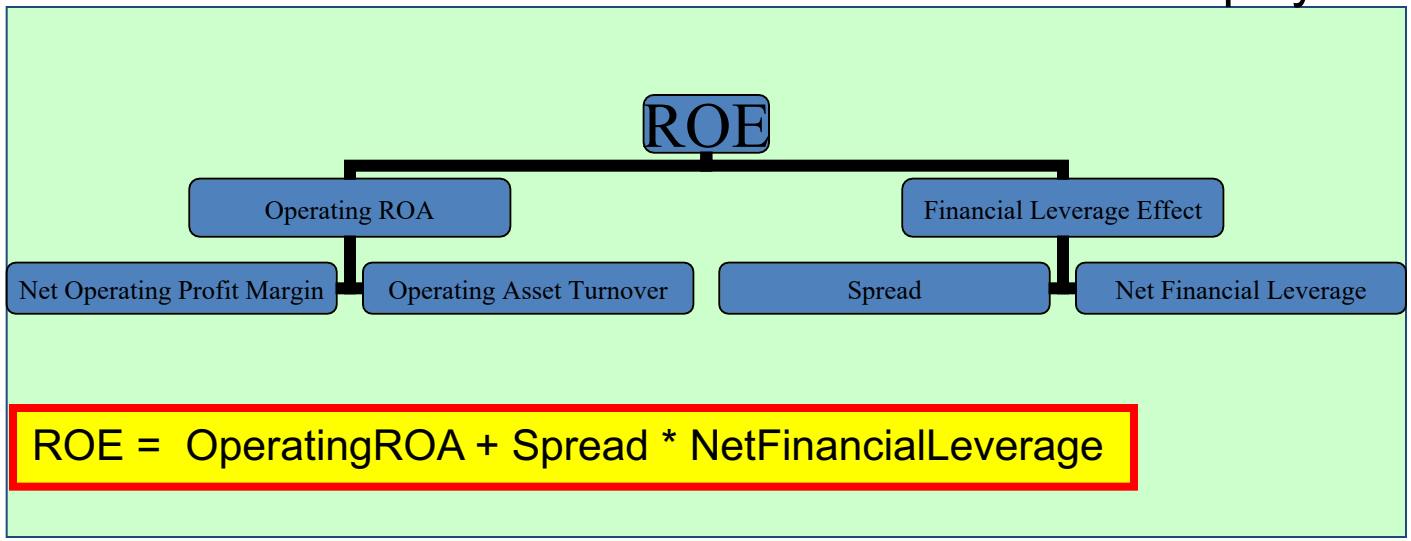
- Forecasting basics
- Forecasting process

# Analysis using Financial Statements:



# Framework for Financial Ratio Analysis

$$\text{Dupont ROE} = \frac{\text{Net Income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total Assets}} \times \frac{\text{Total Assets}}{\text{Equity}}$$

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# Forecasting

- Summarises what has been learned from business strategy analysis, accounting analysis and financial analysis

- The forecast is no better than the preceding three forms of analysis

# Techniques of Forecasting

Comprehensive approach involves many forecasts:

- Linked to a few ‘key’ drivers:
- Sales forecasts
- Profit margins
- Asset turnovers and major expenses often track sales and so can be linked to sales forecasts

- Helps avoid internal inconsistencies and unrealistic implicit assumptions

# Projecting ‘Condensed’ Financial Statements

- Involves relatively small set of assumptions about the future of the firm
- Analysis and decision making often only need condensed statements

# Recall: Re-formulated BS

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| Net operating working capital | 1000 |
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# Recall: Re-formulated IS

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# Reformulation of BS and IS to improve analysis

**Net interest expense after tax**

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**Net debt**

*Total interest bearing* Long term liabilities + Current debt and current portion of long term debt - cash and marketable securities

**Net (operating) assets** (OWC + NLTA)

**Net capital**

Net debt + shareholders' equity

# Forecasting Process

- Commence forecast with a balance sheet at the **beginning** of the forecast period
- Assumptions will lead to an income statement **for** the forecasting period
- Assumptions about *investment in working capital and long term assets* **and** *how we finance these assets* results in a balance sheet **at the end** of the forecasting period

# Forecasting *Condensed* IS

- Assumption about next period's sales
- NOPAT margin
- Interest rate on beginning debt
- Tax rate

# Forecasting *Condensed* BS

- Ratio of operating working capital (OWC) to the sales estimate
- Ratio of net operating long term assets (NLTA)
  to following year's sales
- Ratio of net debt to capital

# Before forecasting …

Consider how key financial statistics behave on average

- **Sales** growth
  - Mean revert to a 'normal' level (6 to 9%) within 3 to 10 years

- **Earnings** growth
  - Follows a random walk
  - Useful to start forecast by looking at **last year's** earnings
    - » the average level of earnings over several prior years is *not useful*

# Before forecasting …

Consider how key financial statistics behave on average

- Return on Equity (ROE)
  - ‘Mean reverting’
  - Firms with above-average or below-average rates of return tend to revert over time to a ‘normal’ level within no more than 10 years
    - » In the range of 10 to 12% for European firms

# Before forecasting

Consider how key financial statistics behave on average

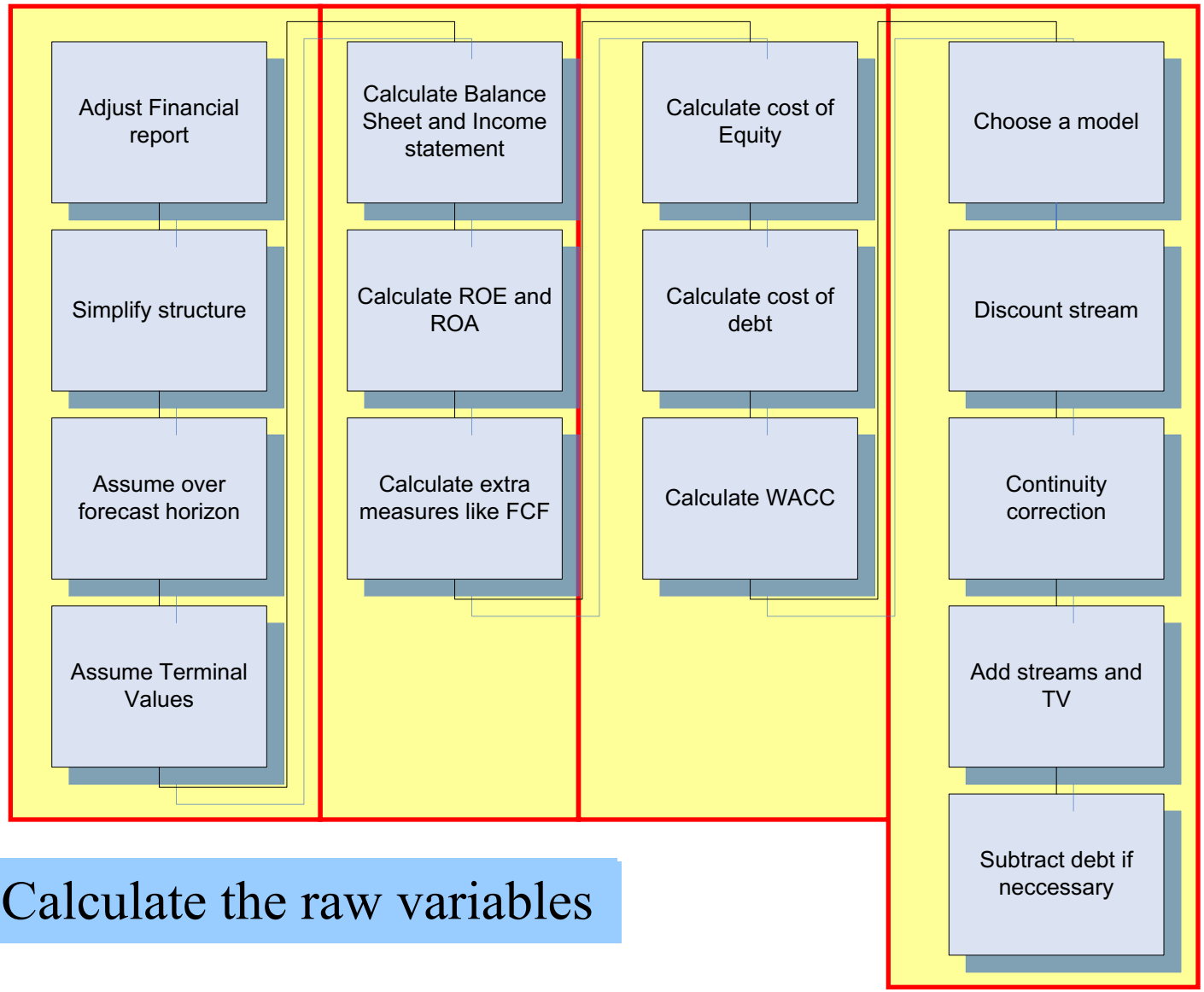
ROE = OperatingROA + Spread * NetFinancialLeverage

= NOPATmargin * OperatingAssetTurnover + Spread * NetFinancialLeverage

= NOPAT/Sales * Sales/NetAssets + (OperatingROA - NIEAT/NetDebt) * NetDebt/Equity

- Operating asset turnover
  - » Tends to be rather stable – function of the technology of the industry
- Net financial leverage
  - » Tends to be rather stable – management policies on capital structure aren't often changed
- NOPAT margin and Spread
  - » Most variable components of ROE
  - » Forces of competition drive abnormal ROEs towards more normal levels.
  - » Change most likely to arrive in the form of changes in profit margins and the spread
  - – *Be wary, this is **average** behaviour*

# The Plan:




Calculate the raw variables

# Structure of Beginning BS and IS

| | |
|---|---|
| ***Year*** | |
| *(in $ Million)* | |
| ***Beginning of the Year Balance Sheet*** | |
| Beg Net (Operating) Working Capital | |
| Beg Net Operating Long-Term Assets | |
| **Net Operating Assets** | |
| | |
| Beg. Net Debt | |
| Beg. Shareholders Equity | |
| **Total Net Capital** | |
| | |
| ***Income Statement for the Year*** | |
| Sales | |
| Net operating profits after tax | |
| Net interest after tax | |
| **Net income** | |
| | |
| ***Operating ROA*** | NOPAT/NetOperatingAssets |
| ***ROE*** | OperatingROA + Spread * NetFinancialLeverage |

# *Prospective Analysis: Fundamental Valuation Models – Part 1*

# Lecture Outline

- Introduction to Valuation Models
- Discounted dividend model
- Abnormal Earnings model

# Fundamental Valuation Models

Two types:

1. Future stream
2. Starting value + abnormal stream

$$Equity\_Value = \frac{DIV_1}{(1+r_e)} + \frac{DIV_2}{(1+r_e)^2} + \frac{DIV_3}{(1+r_e)^3} + \ldots$$

$$Equity\_value = BVE_0 + \frac{NI_1 - r_e \times BVE_0}{(1+r_e)} + \frac{NI_2 - r_e \times BVE_1}{(1+r_e)^2} + \ldots\ldots$$

Opening book value of equity

Residual income

Cost of equity

# Value of the firm and Discounted Dividends

To derive the abnormal earnings model from the dividend discount model, consider the following two-period valuation:

$$\text{Equity value} = \frac{DIV_1}{(1+r_e)} + \frac{DIV_2}{(1+r_e)^2}$$

With clean surplus accounting, dividends ($DIV$) can be expressed as a function of net profit ($NP$) and the book value of equity ($BVE$):

$$DIV_t = NP_t + BVE_{t-1} - BVE_t$$

Clean Surplus: BVEt=BVEt-1+NPt-DIVt

Substituting this expression into the dividend discount model yields the following:

$$\text{Equity value} = \frac{NP_1 + BVE_0 - BVE_1}{(1+r_e)} + \frac{NP_2 + BVE_1 - BVE_2}{(1+r_e)^2}$$

To achieve the transformation add and subtract r*BVEo

This can be rewritten as follows:

$$\text{Equity value} = \frac{NP_1 - r_e BVE_0 + (1+r_e)BVE_0 - BVE_1}{(1+r_e)} + \frac{NP_2 - r_e BVE_1 + (1+r_e)BVE_1 - BVE_2}{(1+r_e)^2}$$

$$= BVE_0 + \frac{NP_1 - r_e BVE_0}{(1+r_e)} + \frac{NP_2 - r_e BVE_1}{(1+r_e)^2} + \frac{BVE_2}{(1+r_e)^2}$$

The value of equity is therefore the current book value plus the present value of future abnormal earnings. As the forecast horizon expands, the final term (the present value of liquidating book value) becomes inconsequential under the assumption that the long-term growth in the book value of equity is less than the cost of equity.

# The Discounted Abnormal Earnings Valuation Method

**Equity value =**

**(Opening) Book value of equity + PV (present value) of expected future abnormal earnings**

Abnormal earnings (AE) = net income adjusted for a capital charge (equity cost of capital * opening book value of equity)

# The Discounted Abnormal Earnings Valuation Formula

$$Equity\_value = BVE_0 + \frac{NI_1 - r_e \times BVE_0}{(1+r_e)} + \frac{NI_2 - r_e \times BVE_1}{(1+r_e)^2} + .....$$

- Deviation of a firm's market value from its book value depends on its ability to generate "abnormal earnings"
- Research indicates that the model is a better predictor of value than traditional multiples based approaches

$$TV_t = [\frac{Number}{Something} Discounted 2Y_0] = \frac{E[RI_{t-1}]}{(r_e - g)} x \frac{(1+g)}{(1+r_e)^5}$$

# Shortcut form of abnormal earnings (growth) valuation model

- Given the value of *AE* in perpetuity with a constant growth rate *g* => Equity Value equals $AE/(r_e - g)$

- If forecasted $AE_1 = \beta \times AE_0$, than the formula simplifies to:

$$Equity\_value = BVE_0 + \frac{\beta \times AE_0}{r_e - g}$$

- where $g = \beta - 1$ is the expected long-term growth rate in AE in all future periods

# Backing out embedded growth rate

$$Equity\ Value = BVEo + \frac{\beta AEo}{r - g} = BVEo + \frac{\beta AEo}{r - (\beta - 1)}$$

$$Po = BVPSo + \frac{\beta AEPSo}{r - (\beta - 1)}$$

$$(Po - BVPSo)(r - \beta + 1) = \beta AEPSo$$

$$(Po - BVPSo)r - (Po - BVPSo)\beta + (Po - BVPSo) = \beta AEPSo$$

$$(Po - BVPSo)(r + 1) = \beta(AEPSo + Po - BVPSo)$$

$$\beta = \frac{(Po - BVPSo)(r + 1)}{AEPSo + Po - BVPSo}$$

$AEPS_0$ can be calculated as: $EPS_0 - r*BVPS_{-1}$

# *Prospective Analysis: Cost of Equity capital*

# Lecture Outline

- Introduction to discounting factors
- Cost of Equity Capital (COE)
- Weighted Average Cost of Capital (WACC)

# Cost of Capital

- Cost of Equity:

$$r_e = r_f + \beta\left[E(r_m) - r_f\right]$$

- After Tax Cost of debt:

$$r_d = r_{debt} \cdot (1 - T)$$

- WACC:

$$WACC = \frac{V_d}{V_d + V_e} r_d (1 - T) + \frac{V_e}{V_d + V_e} r_e$$

$V_d$ = MV of debt

$V_e$ = MV of equity

$r_d$ = cost of debt

$r_e$ = cost of equity capital

T = the tax rate

# Cost of Equity Capital

$$r_e = r_f + \beta\left[E(r_m) - r_f\right]$$

Careful!!! Different $\beta$ than the forecasted AE coefficient

- $r_f$: Risk free rate
- Stock beta
  - A quantitative measure of the volatility of a given stock, mutual fund, or portfolio, relative to the overall market, usually the S&P 500.
    - The performance the stock, fund or portfolio has experienced in the last 5 years as the S&P moved 1% up or down.
  - A beta above 1 is more volatile than the overall market, while a beta below 1 is less volatile
- Market premium: Expected Market rate ($r_m$)- Risk free rate ($r_f$)

# A Criticism

- 'A minority of estimates fall within a range around reported earnings considered acceptable to many professional investors

- These findings question the use of finely calibrated earnings forecasts that are integral to the most common valuation models and indirectly question the valuation methods themselves'.

Dreman and Berry (Financial Analysts Journal, 1995)

# A Refutation

- 'Analysts' forecasts are significantly more accurate than forecasts made by either naive or sophisticated time-series models

- the investment community pays too little attention to how analysts' earnings forecasts are formulated … the community could benefit by using this knowledge to devise profitable trading rules'.

Brown (Financial Analysts Journal, 1996)

# *Fundamental Valuation Models – Part 2*

# Lecture Outline

Continue the broad theoretical appreciation of simple models of fundamental valuation started in our last meeting together

- Price Multiples
- Abnormal Earnings Valuing a firm's Assets
- Discounted Cash Flows

# Valuation Introduction

**Corporate valuation** involves ***estimating*** the worth or the **intrinsic value** of a:

- company
- one of its operating units
- ownership shares

# Fundamental Valuation

Equity investors, lenders, and analysts often use:

- **fundamental analysis** to ***estimate*** the value of a company
  - Fundamental analysis of a business involves analyzing its income statement, financial statements and health, its management and competitive advantages, and its competitors and markets.
  - The analysis is performed on historical and present data, but with the goal to make financial projections. There are several possible objectives:
    - » to conduct a company stock valuation and predict its probable price evolution,
    - » to make projection on its business performance,
    - » to evaluate its management and make internal business decisions,
    - » to calculate its credit risk.

# Fundamental Valuation

This valuation approach uses basic accounting measures or fundamentals

These assess the:

- amount,
- timing, and
- uncertainty

of a firm's **future** operating cash flows or earnings

# An Alternative Valuation using Price Multiples

Widely used as it is simple to execute:

1. Select a measure of performance or value
   - Earnings, sales, cash flows, book equity, book assets

2. Estimate price multiples for comparable firms using the measure of performance or value

3. Apply the comparable firm multiple to the performance or value measure of the firm being analysed

# The Method of Comparables:

An Example for Biotechnology Firms

| | Market Value | Price/book | Revenue | R&D | Net Inc. |
|---|---|---|---|---|---|
| Amgen | 8,096.71 | 5.6 | 1571.0 | 307.0 | 406.0 |
| Biogen | 1,379.00 | 3.6 | 152.0 | 101.0 | 15.0 |
| Chiron | 2,233.60 | 4.6 | 413.0 | 158.0 | 28.0 |
| Genetics Institute | 925.00 | 2.5 | 138.0 | 109.0 | -7.0 |
| Immunex | 588.53 | 4.5 | 151.0 | 81.0 | -34.0 |
| Genentech | ? | ? | 795.4 | 314.3 | 124.4 |

Genentech book value is 1,348.78

# The Method of Comparables:

## An Example for Biotechnology Firms

Apply multiples to Genentech:

| | Firm Mean | | Genentech Value $M |
|---|---|---|---|
| P/B | 4.16 | P/B = 4.16 => P=4.16x1348.78 | 5,610.9 |
| E/P | 0.0245 | E/P = 0.0245 => P=124.4/0.0245 | 5,077.6 |
| (P-B)/R&D | 10.66 | (P-B)/R&D = 10.66 => P=10.66x314.3+1348.78 | 4,699.2 |
| P/Revenue | 6.05 | P/Revenue = 6.05 => P=6.05x795.4 | 4,809.0 |
| **Mean over all values** | | | **5,049.2** |

# Basic Steps in Fundamental Valuation

**Valuation** involves **three** basic steps:

1. **Forecasting future values** of some **financial attributes:**
   - **distributable or free cash flows**
   - **accounting earnings**
   - **balance sheet book values**

# Basic Steps in Fundamental Valuation

2. Determining the **risk** or **uncertainty** *associated* with the **attribute's** forecasted future value.

3. Determining the **discounted present value** of the **expected future values** of the **value-relevant attribute**

- **the discount rate** reflects the **risk or uncertainty** inherent in the **value attribute** of interest.

# Common Fundamental Valuation Methods

1. Discounted dividends
    - Value of equity = present value (PV) of forecasted future dividends

2. Discounted abnormal earnings (residual income)
    - Value of equity = sum of equity book value and discounted forecasts of abnormal earnings

3. Discounted cash flow analysis
    - Value of equity = PV of multiple year forecasts of free cash flows to equity claim holders

# The Dividend Discount Model

**Equity Value** = PV of future dividends (including liquidating dividend)

$$Equity\_Value = \frac{DIV_1}{(1+r_e)} + \frac{DIV_2}{(1+r_e)^2} + \frac{DIV_3}{(1+r_e)^3} + \ldots$$

Assuming **constant** dividend growth rate *indefinitely*:

$$Equity\_Value = \frac{DIV_1}{(r_e - g_d)}$$

# Cost of Capital

- Cost of Equity

$$r_e = r_f + \beta\left[E(r_m) - r_f\right]$$

- After Tax Cost of debt

$$r_d = r_{debt} \cdot (1 - T)$$

- WACC

$$WACC = \frac{V_d}{V_d + V_e} r_d (1 - T) + \frac{V_e}{V_d + V_e} r_e$$

$V_d$ = MV of debt

$V_e$ = MV of equity

$r_d$ = cost of debt

$r_e$ = cost of equity capital

T = the tax rate

# Dividend Discount Analysis:

## Advantages and Disadvantages

**Advantages:**

*Easy concept:* dividends are what shareholders get, so forecast them

*Predictability:* dividends are usually fairly stable in the short run so dividends are easy to forecast (in the short run)

**Disadvantages:**

*Relevance:* dividends payout is not related to value, at least in the short run; dividend forecasts ignore the capital gain component of payoffs.

*Forecast horizons:* typically requires forecasts for long periods; terminal values for shorter periods are hard to calculate with any reliability

# The Discounted Abnormal Earnings Valuation Method

– Assuming 'clean surplus accounting'

- all equity effects (other than capital transactions) flow through the income statement:

$$DIV_1 = NI_1 + BVE_0 - BVE_1$$

$BVE_1$ = Expected book value of equity for **existing** shareholders at the **end** of the year
$DIV_1$ = Expected dividends
$NI_1$ = Expected net income available to shareholders
$BVE_0$ =Book value of equity at the **beginning** of the year

# The Discounted Abnormal Earnings Valuation Method

Substitute above into the Dividend Discount Model and stock value is re-written as follows:

- **Equity value =**
- **(Opening) Book value of equity + PV of expected future abnormal earnings**

Abnormal earnings (AE) = net income adjusted for a capital charge (equity cost of capital * opening book value of equity)

# The Discounted Abnormal Earnings Valuation Formula

$$Equity\_value = BVE_0 + \frac{NI_1 - r_e \times BVE_0}{(1+r_e)} + \frac{NI_2 - r_e \times BVE_1}{(1+r_e)^2} + .....$$

Deviation of a firm's market value from its book value depends on its ability to generate "abnormal earnings"

Research indicates that the model is a better predictor of value than traditional multiples based approaches outlined earlier (see Bradshaw (2004))

# Value of the firm and Discounted Dividends

To derive the abnormal earnings model from the dividend discount model, consider the following two-period valuation:

$$\text{Equity value} = \frac{DIV_1}{(1+r_e)} + \frac{DIV_2}{(1+r_e)^2}$$

With clean surplus accounting, dividends ($DIV$) can be expressed as a function of net profit ($NP$) and the book value of equity ($BVE$):

$$DIV_t = NP_t + BVE_{t-1} - BVE_t$$

Substituting this expression into the dividend discount model yields the following:

$$\text{Equity value} = \frac{NP_1 + BVE_0 - BVE_1}{(1+r_e)} + \frac{NP_2 + BVE_1 - BVE_2}{(1+r_e)^2}$$

This can be rewritten as follows:

$$\text{Equity value} = \frac{NP_1 - r_e BVE_0 + (1+r_e)BVE_0 - BVE_1}{(1+r_e)} + \frac{NP_2 - r_e BVE_1 + (1+r_e)BVE_1 - BVE_2}{(1+r_e)^2}$$

$$= BVE_0 + \frac{NP_1 - r_e BVE_0}{(1+r_e)} + \frac{NP_2 - r_e BVE_1}{(1+r_e)^2} + \frac{BVE_2}{(1+r_e)^2}$$

To achieve the transformation add and subtract r*BVEo

The value of equity is therefore the current book value plus the present value of future abnormal earnings. As the forecast horizon expands, the final term (the present value of liquidating book value) becomes inconsequential under the assumption that the long-term growth in the book value of equity is less than the cost of equity.

# The Discounted Abnormal Earnings Valuation Model - Valuing Firm Assets

– Used to value **assets**:

$$Asset\_Value = BVA_0 + \frac{NOPAT_1 - WACC * BVA_0}{(1+WACC)} + \frac{NOPAT_2 - WACC * BVA_1}{(1+WACC)^2} + \frac{NOPAT_2 - WACC * BVA_2}{(1+WACC)^3} + \ldots$$

BVA = book value of the firm's assets
NOPAT = net operating profit (before interest) after tax
WACC = weighted average cost of debt and equity

From the Asset Value above one can **deduct the market value of net debt** to generate an estimate of the value of equity

# Abnormal Earnings = Residual Income

- The above terminology is often used interchangeably
- Research papers by Bradshaw (2004), Lundholm (1995) and Dechow *et al.* (1999) all refer to and use the 'Residual Income' model in some way

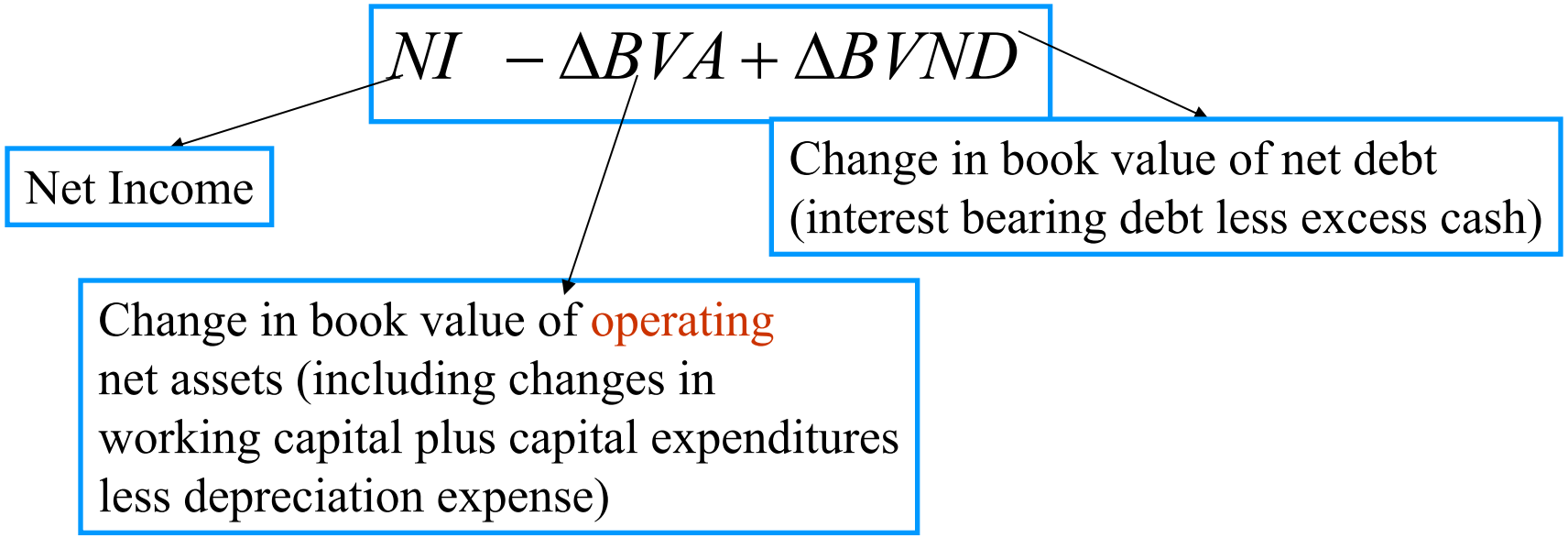
# The Discounted Cash Flow Model

- Also derived from Dividend Discount model
- Based on the insight that dividends can be recast as cash flows:

- Dividends (FCF) = operating cash flow – capital outlays + net cash flow from debt owners

# The Discounted Cash Flow Model

- The CFs available to equity holders are the CFs generated by the firm's net assets minus capital outlays adjusted for CFs from and to debt holders (interest payments, debt repayments, debt issues)
- Dividends = Operating Cash Flow – Capital outlays + Net Cash Flow from debt owners
  - OCF to equity holders = NI + Deprec. – ΔWorking Capital
  - Capital Outlays = CAPEX less Assets Sales
  - Net Cash Flow from debt owners = Issues of new debt – Debt retirements – NIEAT
- Dividends available to equity holders = ***Free cash flows*** to equity holders =



# The Discounted Cash Flow Model

$$Equity\_value = \frac{NI_1 - \Delta BVA_1 + \Delta BVND_1}{(1+r_e)} + \frac{NI_2 - \Delta BVA_2 + \Delta BVND_2}{(1+r_e)^2} + .....$$

NI = Net Income

$\Delta$ BVA = Change in book value of operating net assets

$\Delta$ BVND = Change in book value of net debt

# The Discounted Cash Flow Model

## (in the recasted / condensed / pro-forma Financial Statements)

- Value of Assets = Value of claims to net debt **and** equity

- Debt plus equity value = PV of free cash flows to net debt and equity claimholders

$$= \frac{NOPAT_1 - \Delta BVA_1}{(1+WACC)} + \frac{NOPAT_2 - \Delta BVA_2}{(1+WACC)^2} + \ldots$$

- To get equity value simply deduct market value of debt
- More widely used in practice

# *Issues on Valuation Implementation*

# Lecture Outline

Consider a number of valuation implementation issues relevant to the practical application of the valuation models discussed

- Comparing the Valuation Methods
- Terminal Value Issues
- Dealing with accounting distortions and negative book values

# Remember
# The Dividend Discount Model

Equity Value = PV of future dividends (including liquidating dividend)

$$Equity\_Value = \frac{DIV_1}{(1+r_e)} + \frac{DIV_2}{(1+r_e)^2} + \frac{DIV_3}{(1+r_e)^3} + \ldots$$

Assuming **constant** dividend growth rate *indefinitely*:

$$Equity\_Value = \frac{DIV_1}{(r_e - g_d)}$$

# The Discounted Abnormal Earnings (Residual Income) Valuation Model

$$Equity\_value = BVE_0 + \frac{NI_1 - r_e \times BVE_0}{(1+r_e)} + \frac{NI_2 - r_e \times BVE_1}{(1+r_e)^2} + .....$$

Deviation of a firm's market value from its book value depends on its ability to generate "abnormal earnings"

Research indicates that the model is a better predictor of value than traditional multiples based approaches (Bradshaw 2004).

# The Discounted Cash Flow Model

$$Equity\_value = \frac{NI_1 - \Delta BVA_1 + \Delta BVND_1}{(1+r_e)} + \frac{NI_2 - \Delta BVA_2 + \Delta BVND_2}{(1+r_e)^2} + .....$$

$\mathrm{NI} = \text{Net Income}$

$\Delta\mathrm{BVA} = \text{Change in book value of operating net assets}$

$\Delta\mathrm{BVND} = \text{Change in book value of net debt}$

# 1. How do the valuation methods compare?

- As long as analysts make the same assumptions about firm fundamentals, value estimates under all four methods will be **identical**

- However, important differences between the models do exist:
  - They focus attention on different issues (earnings – ROE, dividends, CFs)
  - Differences in required structure (pro-forma statements, forecasted dividends, changes in working capital and LT assets)
  - Differences in terminal value (TV) implications

# Differences in terminal value implications

- Abnormal earnings (AE) method has **smaller** TV estimates as a fraction of value than the discounted CF or dividends methods.
- Is this apparent advantage of the AE model real?
- Answer depends on how well value is ***already*** reflected in the accountant's book value

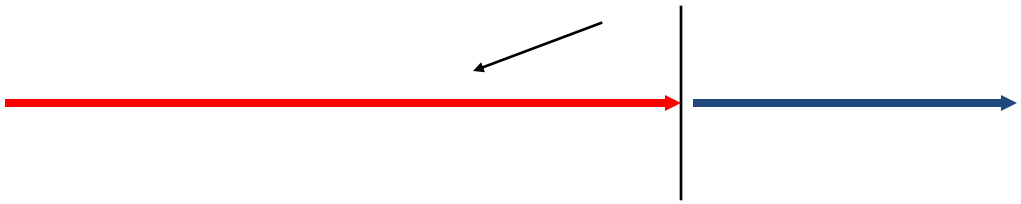
# Differences in terminal value implications

**Equity Valuation of Porsche**

| Equity Value: | Beginning Book Value | Value from forecasts from 2006-2015 (Forecast Horizon) | Value from forecasts beyond 2015 (Terminal Value) | Total Value |
|---|---|---|---|---|
| Abnormal Earnings | 3,412.1 | 3.424,3 | 26.766.1 | 33.602,5 |
| Free Cash Flows to Equity Holders | N/A | 3.276,8 | 30.325,7 | 33.602,5 |

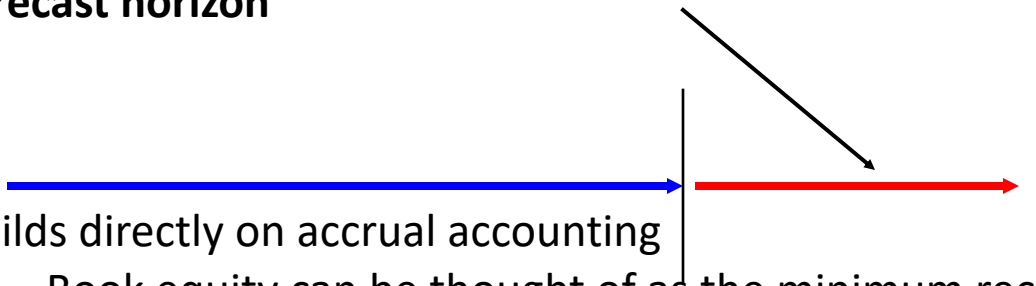
# Differences in terminal value implications

- AE valuation merely *reframes* the discounted cash flow (DCF) terminal value problem
- DCF terminal values – PV of **ALL** expected cash flows beyond the forecast horizon
- AE terminal values:
  - Breaks value into **two** parts:
    - PV of **normal** earnings and **abnormal** earnings beyond the terminal year
    - TV in the AE technique includes only abnormal (and not normal) earnings
    - PV of **normal** earnings is already reflected in **book value** or growth in book value over the **forecast horizon**



# Differences in terminal value implications

- AE approach:
  - Recognition that current book value and earnings over the **forecast horizon already** reflect many of the cash flows expected to arrive ***after*** the **forecast horizon**



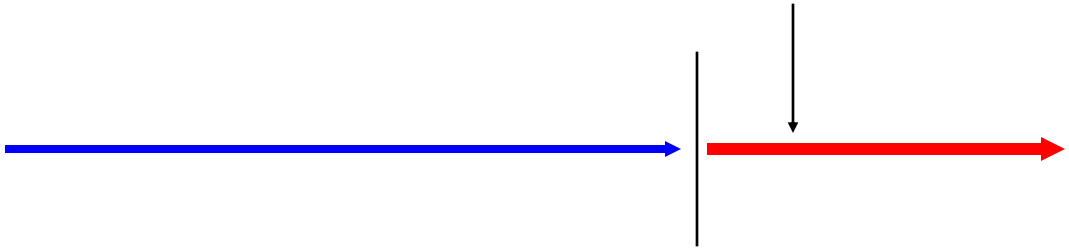
  - Builds directly on accrual accounting
    - Book equity can be thought of as the minimum recoverable future benefits attributable to firm's net assets.
    - Revenues are realised when earned and not when cash is received
  - AE valuation recognises that the accrual process may already have performed **a portion** of the valuation task
  - DCF approach moves back to the primitive cash flows underlying the accruals

# Differences in terminal value implications

- Usefulness of AE approach hinges on how well the accrual process reflects *future* cash flows
  - Okay when the accrual process is **unbiased**
  - Forecast horizon extends to where firm is expected to approach a *competitive equilibrium*
    - can only earn 'normal' earnings on its projects
    - subsequent abnormal earnings = zero **=>** TV = zero
    - **all** of firm's value reflected in forecast horizon (extreme case!)
    - but accounting rarely works so well
      - » e.g. R&D costs are expensed => not reflected in book values => however create abnormal earnings in the future even under stiff competition.
      - » AE remain >0 indefinitely and TV is a substantial fraction of total value

# 2. Terminal Values (TVs)

- Terminal Value:
  - Present value (PV) of abnormal earnings or free cash flows occurring *beyond* the terminal year (last year in forecast horizon)



- Estimates beyond terminal year are subject to error
- Does it matter?

# TVs with Competitive Equilibrium Assumption

- Competitive Equilibrium Assumption (CEA):
  - Competition constrains the ability to generate **supernormal** profits on **new additional** projects year after year
  - ROEs revert to **normal (mean)** levels over horizons of 5 to 10 years

# TVs with Competitive Equilibrium Assumption

- CEA:
  - Reasoning revolves around the **forces of competition**
  - Competition constrains a firm's ability to identify **growth** opportunities that generate supernormal profits *consistently*
  - Competition would drive a firm's return to a ***normal*** level
    - Each new project would generate a cash flow with a PV no greater than the cost of the investment – "zero net present value" project
    - **No** addition to the ***current value*** of the firm

# Key Lesson from CEA

- The *rate of growth* in sales beyond the forecast horizon is **NOT** a relevant consideration

***unless***

- the analyst believes that the growth can be achieved ***while generating supernormal (abnormal) margins***

  – Competition may make this difficult to achieve

# Alternative Version of CEA

- Assume abnormal earnings **forever** on sales *generated in the terminal year*
- **No** abnormal earnings on any *incremental sales* beyond that level
  - Hence, no addition to current value from incremental sales
- For valuation purposes, we can assume sales remain **constant** at the terminal year level
- Operating ROA, ROE, NOPAT, net income, free cash flow to debt and equity and free cash flow to equity will all remain constant at **terminal year level**

# Terminal Value with Persistent Abnormal Performance *and* Growth

- May assume defiance of competitive forces and abnormal returns earned on **new** projects for many years
- Could also project growth in abnormal earnings and cash flows at some constant rate
  - For example, the expected long run rate of inflation (say, 3.5%)
  - Beyond terminal year, sales growth remains constant at 3.5%
  - Abnormal earnings, free cash flows and book values of assets and equity also grow at constant 3.5% rate
  - All other performance ratios are held constant
  - Constant growth beyond terminal year enables simple discounting of flows by dividing flows in the first year by (r-g)

# Terminal Value based on a Price Multiple

- Apply a multiple to abnormal earnings, cash flows or book values **of the terminal period**
- Be wary of using too high a multiple
- Earnings or cash flow multiples may be high currently given immediate market expectations
- May however, fall to a normal level once anticipated growth is realised
- Use ‘normal’ multiple applicable to a stable firm in the TV calculation

# Selecting the Terminal Year

- Most firm should expect ROEs to revert to normal levels within 5 to 10 years

  - Ultimately depends on the **sustainability** of a firm's competitive advantage
  - 5-10 year forecast is sufficient for most firms
  - ***Exceptions*** include brands well insulated from competition and able to extend their investment base to **new** markets
    - e.g. Wrigley Company (confectionery industry – chewing gums)

# Reality Checks on Forecasts

- Always check your assumptions against time-series trends of performance ratios
  - Need to articulate the business and strategy reasons for making the assumptions
- For publicly traded firms compare value calculation(s) with market value
- Ascertain what valuation assumptions are required to arrive at the observed stock price
  - Like with Maxwell Shoe Company Case

# 3. Dealing with Accounting Distortions

- Abnormal earnings valuation method uses earnings and book value as key inputs to the valuation process
  - But these vary with accounting method choices
  - How can this valuation approach then deliver correct estimates?

# Dealing with Accounting Distortions

- Accounting choices **must** affect **both** earnings *and* book value

- Double entry bookkeeping is self correcting
  - All 'distortions' of accounting must ultimately reverse

- Hence, estimated values will **not** be affected by accounting choices

  - **As long as the analyst recognises the distortions!**

# Dealing with Accounting Distortions

- If distorted estimates are taken at face value, then estimated value of firm would be **higher**
  - Using either DCF or discounted abnormal earnings

- With biased accounting, the analyst has **two** choices:
  - Adjust current earnings and book values to eliminate biases
  - Adjust future forecast accordingly

- Higher accounting quality allows a higher proportion of a firm's value to be captured by **current** book value and the abnormal earnings **within the forecasting horizon**

# Dealing with Negative Book Values

1. Value firm's assets (using for example abnormal NOPAT)
   - Deduct estimate of value of firm's debt

2. Undo accountants' conservatism
   - Capitalise investment expenditures written off
   - Check first that they were value creating

3. Start from observed stock price and work backwards
   - Calculate average long term level of abnormal earnings needed to justify the observed stock price