Topic 1: Forecasting Financial Statements

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Forecasting Financial Statements

- Pro forma statement analysis is the current tool for **forecasting future cash flows** and **financing needs** of a firm, since financial decisions are **inherently forward looking**
- Pro forma statements are 'make believe' **future projections** of income statements and balance sheets
- They are commonly prepared before major transactions or events, e.g. new projects, mergers or takeovers, capital restructuring, IPOs, etc.
- They help managers **formulate expectations** about the future based on current information

Pro Forma Statements

Assets	Liabilities + Equity
A	X
B	Y
C	Z

- Since A + B + C = X + Y + Z, in pro forma modelling a projected variable can be inferred if all other variables are directly projectable, i.e. Z = A + B + C - (X + Y)

Building a Pro Forma Statement

Step 1: Forecasting Sales

- Future sales depend on:
  - The economy
  - Industry and company prospects
  - New and existing projects
  - Marketing campaigns and customer preferences, etc.
- Inaccurate sales projection can lead to an **inability to meet demand** or **overexpansion** (excess capacity and debt, increased risk in cash flows)
- Forecasting sales growth rate:
  - Compound: $g = \left(\frac{sales_{t+n}}{sales_t}\right)^{\frac{1}{n}} - 1$
  - Arithmetic: $g = \frac{g_{t+1}+g_{t+2}+\cdots+g_{t+n}}{n}$
  - Log-level regression:

    3. Log-Level Regression: $Ln(sale_t) = \alpha \times t$

    $$\Rightarrow \frac{\partial Ln(sale)}{\partial t} = \alpha \Rightarrow \frac{\Delta sale}{sale} = \alpha \times \Delta t$$

    If $\Delta t = 1$, then $\hat{g} = \alpha$
- Once you have the growth rate g, you then forecast sales:
  - $Sales_{t+n} = Sales_t \times (1+g)^n$

Step 2: Forecasting Performance Ratios

- Pro forma statements are heavily reliant on **projected performance ratios**, since they are needed to forecast variables in the model based on projected sales
  - e.g. Projected COGS (aka COGS') = Sales' * COGS/Sales
- BUT:
  - Are historical ratios good representations of the future, i.e. can simple trends predict future ratios?
  - How do we revise ratios to reflect future operations and the economy, or adoption of new assets and technology?

Step 3: Building the Model

- We are assuming that **the most recent accounting ratios capture future expectations**
- Also we (usually) assume that **financial slack** (i.e. surplus cash or debt opportunities available to take up investment opportunities) will be used for short term investments - refer to 'the plug' later on
- Assume **financial deficit is raised with short term debt** (notes payable) - also refer to 'the plug' later on
- So, for example, given projections:
  - COGS' = Sales' * COGS/Sales, i.e. we assume that the ratio remains the same
  - Taxes' = Max(0, EBIT' * T)
  - Common Dividend Payout' = Max(0, Payout ratio * Net Income')
  - Increases in Retained profits' = Net income' - Common Div' - Pref Div'
- To calculate **projected depreciation expense:**

$$Deprec' = \frac{Deprec.}{Cost\ Prop\ Plant\ Equip} \times Cost\ Prop\ Plant\ Equip'$$

$$Cost\ of\ Prop\ Plant\ Equip' = sales' \times \frac{Net\ Prop\ Plant\ Equip}{Sales} + AccumDeprec'$$

$$AccumDeprec' = AccumDeprec + Deprec'$$

Solving for $Deprec'$ gives:

$$Deprec' = \frac{Deprec.}{Cost\ Prop\ Plant\ Equip} \times \frac{[Net\ PropPlantEquip' + AccumDeprec]}{\left[1 - \frac{Deprec.}{Cost\ Prop\ Plant\ Equip}\right]}$$

Financial Slack or Deficit: The Plug

- It is most likely that a pro forma balance sheet **will not balance**; either projected assets will be higher than projected liabilities + equity or vice versa
  - This is because greater projected sales can trigger **increases in projected investments**, resulting in a projected **financial deficit** (assets > L + E)
  - Alternatively, higher projected sales will **increase projected profits**, raising retained profits, resulting in a projected **financial surplus** (assets < L + E)
- Hence we introduce **the 'plug'** which is a financial policy variable used to close the model and balance the pro forma balance sheet

- Plug = Total assets - total liabilities - equity
- **If plug > 0**, projection is that the firm will **require external financing** of the amount equal to the plug (which our assumptions say is financed with short-term debt)
- **If plug < 0**, then the projection is that the firm will **have financial slack** (which our assumptions say is to be rolled into short-term investments)
  - e.g. a negative plug implies that the investments in operating assets required to sustain higher projected sales is more than offset by the greater earnings from this increase

- Our assumptions stated that financial deficit is financed with short term debt, hence:
  - Notes payable' = Notes payable + plug **(if plug > 0)**
- Alternatively financial surpluses are rolled into short term investments, hence:
  - Short term investments' = Short term investments + |plug| **(if plug < 0)**

Additional Funds Needed (AFN)

- It is a 'back of envelope' calculation especially useful if **performance ratios are constant** to easily work out **how much extra debt needs to be financed** (or **how much financial slack** will be available)

$$\begin{matrix} Additional \\ Funds \\ Needed (AFN) \end{matrix} = \begin{matrix} Required \\ Increase \\ in\ Assets \end{matrix} - \begin{matrix} Increase\ in \\ Spontaneous \\ Liabilities \end{matrix} - \begin{matrix} Increase\ in \\ Retained \\ Earnings \end{matrix}$$

$$\begin{matrix} Required \\ Increase \\ in\ Assets \end{matrix} = sale \times g \times \left(\frac{Cash}{Sale} + \frac{Acc. Receiv.}{Sale} + \frac{Inv.}{Sale} + \frac{NetPPE}{Sale} \right)$$

$$\begin{matrix} Increase\ in \\ Spontaneous \\ Liabilities \end{matrix} = sale \times g \times \left(\frac{Acc. Pay.}{Sale} + \frac{Accruals}{Sale} \right)$$

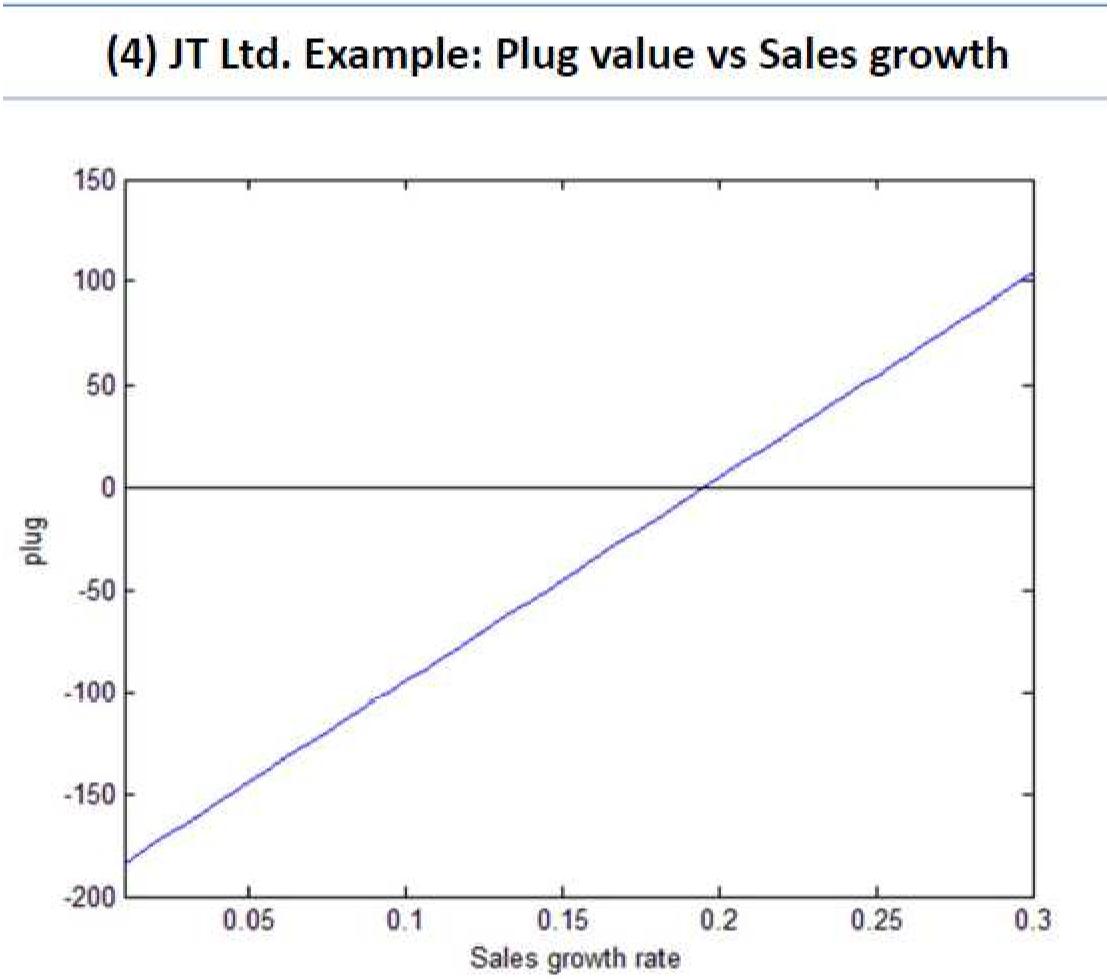
$$\begin{matrix} Increase\ in \\ Retained \\ Earnings \end{matrix} = sale \times (1+g) \times \left(\frac{Net\ Income}{Sale} \right) \times (1 - payout) - Pref.Div$$

- If AFN is positive, **required assets > required L + E** = financial deficit
  - If negative, **required assets < required L + E** = financial surplus
- Ideally, a pro forma statement is more accurate and in-depth as it **forecasts the entire financial statement**
  - It offers more information and is more flexible for **changing ratios** allowing **more realistic market conditions**

Step 4: Analysing the Model

- Once the initial projection is finished, it needs to be analysed for correctness, performance, robustness, sensitivity, risk, etc.
- **Robustness (correctness) checks:**
  - Models are prone to errors and are only as good as the assumptions made
  - Analysing helps identify these errors and minimising the impacts of these errors
- **Sensitivity analysis:**

- Investigation of the model in relation to a model input, i.e. how sensitive is the plug if we change specific ratios or, more importantly, sales growth
- This can be extrapolated to work out the sensitivity of short term debt or financial slack to the sales growth rate



- In example above, we see that if sales growth is less than 19.5%, the plug is negative and therefore there is a projected financial surplus
  - If sales growth is greater than 19.5% the plug is positive which means there is a projected financial deficit

- **What-if analysis:** can be done on any other input or assumption of the model
- **Scenario analysis:** can be done on any set of inputs or assumptions (what-if analysis only changes one input)
- Plug can be remodelled with changes to dividend payout policy, borrowing rates, capital restructuring, etc.

Topic 2: Cost of Capital

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Defining the Cost of Capital

- **Investors provide capital** to the firm (through bonds or shares) in exchange for **financial gains**
  - The manager is responsible for delivering these gains
- The cost of capital is the return which **adequately compensates the investors** for investing in the company's securities
- If the **actual return exceeds the cost of capital**, then the manager has succeeded in delivering adequate returns and has **created firm value**
- Two main meanings in corporate finance:
  - **Hurdle rate:** Minimum rate of return on a **specific project** given its **market risk**, i.e. discount rate used to calculate NPV
  - Company's **overall cost of capital:** composite return required from the **firm's assets** given overall systematic risk
    - AKA **Weighted Average Cost of Capital (WACC):** return demanded by investors given overall amount of systematic risk in the firm's securities
- Since a company can be seen as a **portfolio of real assets** or a **portfolio of financial securities**
  - The operating risk of the firm is equal to the portfolio risk of the financial securities of the firm
  - The return required from real assets = return required from financial securities
  - Therefore **cost of capital = market determined required return on portfolio of firm's securities**
- We then calculate the WACC based off the three main sources of capital for a firm; **debt, preferred equity** and **common equity**
- Other considerations of long term capital for WACC calculation
  - **Accruals:** e.g. accounts payable, deferred taxes, are accounted for by free cash flows (remember net working capital) in project analysis and **should not affect cost of capital**
  - **Retained earnings:** treated as part of equity capital
  - **Taxes:** accounted for by cost of capital, i.e. $r_D(1-T_c)$
- Companies are subject to **prevailing market conditions** when capital is raised
  - Since market conditions are constantly changing, **cost of capital must change** to reflect **required returns on new capital** even if the firm does not plan on raising capital
  - Implication is that when making corporate decisions, historical cost of capital is not important

Cost of Debt, r_D

- To determine the cost of debt, need to know prevailing yield in the bond market
- If the company's bonds are **private,** use the **market yield** on bonds with a **similar credit rating**
- **Taxes:** ATO allows interest expense to be a cost of running a business, hence they are **tax deductible**, reducing the overall tax burden of the company:
  - **After tax cost of debt** = $r_D \times (1 - T_c)$
- (Yield to maturity is the rate of return that investors in the market are pricing to value the bond - same equation as FINS1613)
- Raising new debt capital will also incur **flotation costs**, so the new price of bonds is:

$$B \times (1 - f_D) = C \times \left[\frac{1 - \frac{1}{(1+ytm)^T}}{ytm}\right] + F \times \frac{1}{(1+ytm)^T}$$

- where f_D is the debt flotation cost as a percentage of funds raised

Cost of Preferred Equity, r_P

- Preferred equity is a form of equity which pays out a **fixed dividend**
  - In this way it is **similar to debt** interest repayments, however they are treated as equity and can be deferred
- **Dividend discount model:**
  - $P = \frac{Div_p}{r_p} \rightarrow r_p = \frac{Div_p}{P}$
- Preferred **flotation costs**, f_P, must be included if they are large
  - $r_p = \frac{Div_p}{P(1 - f_P)}$
- Empirical evidence shows that for some companies, $r_D > r_P$, which doesn't make sense since debt should have lower risk than equity
  - This could be explained by the fact that preferred equity dividend payments are not tax deductible (unlike debt payments), which means their after-tax cost of preferred shares is still higher than after-tax cost of debt

Cost of Equity, r_E

- Two sources of equity capital:
  - Issuance of **new shares**
  - Internal capital, i.e. **retained earnings**

Method A: Dividend discount model: $S_0 = \frac{D_1}{r_E - g}$

- $r_E = \frac{D_1}{S_0} + g$
- Adjusting for equity **flotation costs**, f_E:
  - $r_E = \frac{D_1}{S_0(1 - f_E)} + g$
- This method is useful if growth is expected to remain constant **and will resemble past growth rates**
  - To forecast dividend growth from historical data:

- compound growth rate:

$$div_{t+n} = (1+g)^n \times div_t$$

- Arithmetic growth rate:

$$g = \frac{g_{t+1} + g_{t+2} + \cdots + g_{t+n}}{n}$$

- Log-Level Regression:

$$Ln(div_t) = \alpha + g \times t$$

- **Earnings retention model:** $g = retention\ rate \times ROE$

Method B: CAPM Approach: $r_E = r_f + \beta_E(r_M - r_f)$

  - R_f: risk-free rate, i.e. forecast of yield on long-term government bonds
  - r_M: forecast of the return on the market portfolio, usually calculated with broad market indexes
  - r_M - r_f: forecast of the **market risk premium**

- If firm equity risk is expected to remain constant, equity beta can be estimated based off historical returns:
  - $\widehat{\beta_E} = \frac{Cov(r_E, r_M)}{Var(r_M)}$
    - When we calculate beta, we assume **equity risk is constant** and that we are able to **estimate using historical returns**
- For firms with **illiquid stocks,** e.g. nano-caps (firms with market capitalisation < $50 million) or younger firms, the stock price **trails market movements**, so a **lagged market risk premium** is added
  - **Dimson's correction:**

$$r_{E,t} = r_{f,t} + \beta_{E,1} \times (r_{M,t} - r_{f,t}) + \beta_{E,2} \times (r_{M,t-1} - r_{f,t-1})$$

$$\widehat{\beta_E} = \widehat{\beta_{E,1}} + \widehat{\beta_{E,2}}$$

- Adjusting for flotation costs:
  - Let r_E' be the cost of equity adjusted for flotation costs (see above)
  - The difference between r_e' and r_e is added to the CAPM model:

CAPM approach adjusted for flotation cost:

$$r_E = r_f + \beta_E \times (r_M - r_f) + \zeta$$

Forecasting the Equity Premium, r_M - r_f

- **Method A:** dividend discount model:

$\widehat{r_M} - r_f$: Forecasted equity risk premium
Div_{MKT} : current dividend from the market index
MKT : current level of the market index
$\frac{Div_{MKT}}{MKT}$: Current ividend yield of the market index
g_{MKT} : Div_{MKT} growth rate

Div_{MKT}, MKT are observable. g_{MKT} is forecasted by analysts or predicted from statistical models.

Then, applying the constant dividend growth model

$$MKT = \frac{Div_{MKT} \times (1 + g_{MKT})}{\widehat{r_M} - g_{MKT}}$$

Implies that a forecasted for the equity risk premium is

$$\Rightarrow \widehat{r_M} - r_f = \frac{Div_{MKT} \times (1 + g_{MKT})}{MKT} + g_{MKT} - r_f$$

- **Method B:** assume a reasonable equity premium
- **Method C:** rely on economic forecasts

WACC: Overall Cost of Capital

- **Weighted Average Cost of Capital:**
  - $WACC = w_D \times r_D \times (1 - T) + w_P \times r_P + w_E \times r_E$
- The firm's WACC is the correct cost of capital for a project if it has the **same amount of systematic risk as the rest of the firm**
- If systematic risk is different, there are three other ways to find cost of capital:
  - **Pure Play Method:** rely on the WACC of pure players, i.e. other firms or divisions who specialise in only that type of project
  - **Accounting Method:** calculate divisional beta by regressing historical ROA on the risk premium
  - **Risk-adjusted method:** simply add or subtract the WACC by a particular amount depending on the project's systematic risk