CFA Notes

Arthur Li

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Contents

1 Tips and Tricks

1.1 Calculator Recommended Settings

Method 1.1.1.

i. *Reset calculator*: $\boxed{2ND}$ $\boxed{+|-}$

ii. *Increase to 9 decimal*: $\boxed{2ND}$ $\boxed{.}$ (FORMAT) $\boxed{9}$ $\boxed{\text{ENTER}}$

iii. *Set period to 1 year*: $\boxed{2ND}$ $\boxed{\text{I/Y}}$ (P/Y) $\boxed{1}$ $\boxed{\text{ENTER}}$

iv. *Set as AOS mode*: $\boxed{2ND}$ $\boxed{.}$ (FORMAT) $\boxed{\uparrow}$ $\boxed{2ND}$ $\boxed{\text{ENTER}}$

Method 1.1.2.

i. *Backspace button*: $\boxed{\rightarrow}$, i.e., pressing $\boxed{2}$ $\boxed{\times}$ $\boxed{3}$ $\boxed{\rightarrow}$ $\boxed{2}$ $\boxed{=}$ will give 4.

ii. *Clear previous entry*: $\boxed{CE|C}$

iii. *Clear everything*: $\boxed{CE|C}$ $\boxed{CE|C}$

iv. *Clear TVM worksheet*: $\boxed{2ND}$ $\boxed{FV}$ (CLR TVR)

Method 1.1.3.

i. *Store in memory*: $\boxed{STO}$ ($\boxed{0}$ to $\boxed{9}$)

ii. *Recall from memory*: $\boxed{RCL}$ ($\boxed{0}$ to $\boxed{9}$)

iii. *Recall last answer*: $\boxed{2ND}$ $\boxed{=}$

iv. *Clear all memory and store values*: $\boxed{2ND}$ $\boxed{0}$ $\boxed{2ND}$ $\boxed{CE|C}$

Method 1.1.4.

i. *Set up calculator for single variable statistics*: $\boxed{2ND}$ $\boxed{8}$, then $\boxed{2ND}$ $\boxed{\text{ENTER}}$ until we see 1-V on screen. Then clear contents $\boxed{CE|C}$.
Enter data setting and clear the data: $\boxed{2ND}$ $\boxed{7}$ $\boxed{2ND}$ $\boxed{CE|C}$.
Enter single-var data: [VALUE] $\boxed{\text{ENTER}}$ $\boxed{\downarrow}$ $\boxed{\downarrow}$, enter value in X (data), and leave Y as 1 (frequency).
Enter stats function and toggle $\boxed{\downarrow}$ to see mean, sample s.d., population s.d.
For weighted returns, use X as the return, and Y as the weights.

ii. *Covariance and correlation*: $\boxed{2ND}$ $\boxed{8}$, then $\boxed{2ND}$ $\boxed{\text{ENTER}}$ until we see [LIN] on screen. Then clear contents $\boxed{CE|C}$.
Enter data setting and clear the data: $\boxed{2ND}$ $\boxed{7}$ $\boxed{2ND}$ $\boxed{CE|C}$.
Enter data: [VALUE] $\boxed{\text{ENTER}}$ $\boxed{\downarrow}$ $\boxed{\downarrow}$, enter value in X and Y.
Enter stats function and toggle $\boxed{\downarrow}$ to see r, Sx and Sy, then compute covariance as $Sx \times S_y$.
Correlation is simply the value r computed earlier.

iii. *Time value of money*: Input values into all except one of these: $\boxed{\text{N}}$ $\boxed{I/Y}$ (%), $\boxed{\text{PV}}$, $\boxed{\text{PMT}}$, $\boxed{\text{FV}}$. Then use $\boxed{\text{CPT}}$ on the target variable to solve for the results.

iv. *Interest rate conversion*, i.e., convert nominal 10%, $m = 12$ payments per year into effective rate.
$\boxed{2ND}$ $\boxed{2}$ (ICONV) $\boxed{\uparrow}$ $\boxed{12}$ $\boxed{\text{ENTER}}$, $\boxed{\downarrow}$ $\boxed{10}$ $\boxed{\text{ENTER}}$, $\boxed{\downarrow}$ $\boxed{\text{CPT}}$ to get effective rate.

v. *Cash flow computation*: clear memory with [CF] [$2ND$] [$CE|C$], then input [VALUE] [ENTER] [$\downarrow$].
Enter interest rate with [NPV] [VALUE] [ENTER] [$\downarrow$], then [CPT] to get present value, PV.

vi. *Amortisation schedule*: i.e., \$1000 on 3-year loan, interest rate of 10%.
Check payment per year, make sure it is 1 (with [$2ND$] [I/Y]).
Input information with [3] [N] [10] [I/Y] [1000] [PV] [CPT] [PMT].
Before using amortisation worksheet, clear memory with [$2ND$] [PV] (AMORT) [$2ND$] [$CE|C$].
To see interest and principal repayment at each time period, set $P1$ as [t] for year t, then use [CPT] [$\downarrow$] to see the values at each time period.

1.2 Memorise for Exams

Definition 1.2.1. *Critical Z-values*

One-Tailed Test	Two-Tailed Test
–	68% (1.0)
–	90% (1.645)
95% (1.645)	95% (1.96)
97.5% (1.96)	–
99% (2.33)	99% (2.58)
99.5% (2.57)	–

2 Quantitative

2.1 Time Value of Money

Definition 2.1.1. *Expected Annual Rate*

$$\text{EAR} = (1 + \text{periodic rate})^m - 1$$
$$\text{EAR} = e^r - 1$$

Definition 2.1.2. *Continuous Compounding*

$$FV_N = PVe^{r_s N}$$

Definition 2.1.3. *Ordinary Annuity*: first cash flow one period from now.

$$FV_N = A\left[\frac{(1+r)^N - 1}{r}\right]$$

Definition 2.1.4. *Annuity Due*: first cash flow occurs from today.

$$FV_N = A\left[\frac{(1+r)^N - 1}{r}\right](1+r)$$

Definition 2.1.5. *Perpetuity*: never ending cash flows.

$$PV = \frac{A}{r}$$

2.2 Statistics

Definition 2.2.1. *Harmonic Mean*

$$\overline{X}_H = \frac{n}{\sum_{i=1}^{n} \frac{1}{X_i}}$$

Definition 2.2.2. *Mean Absolute Deviation*

$$\text{MAD} = \frac{\sum_{i=1}^{n} |X_i - \overline{X}|}{n}$$

Definition 2.2.3. *Semi-variance*: average squared deviation below mean

$$s^2 = \frac{\sum_{i=1}^{n} (X_i - \overline{X})^2}{n-1} \quad \forall X_i \leq \overline{X}$$

Definition 2.2.4. *Chebyshev Inequality*: proportion of observations within k standard deviation of arithmetic mean is at least $1 - \frac{1}{k^2}$

$$P(|X - \mu| \geq k\sigma) \leq \frac{1}{k^2}$$

Definition 2.2.5. *Coefficient of Variance* (CV): the lower the CV value the better; less risk per unit return.

$$CV = \frac{s}{\overline{X}}$$

Definition 2.2.6. *Skewness*:

i. Symmetric: mean = median = mode
ii. Positive skew: mode < median < mean
iii. Negative skew: mean < median < mode

Positive skewness is preferred.

Definition 2.2.7. *Excess Kurtosis*: characterises kurtosis relative to the normal distribution.

i. Normal, mesokurtic distribution: excess kurtosis = 0
ii. Leptokurtic distribution: excess kurtosis > 0
iii. Platykurtic distribution: excess kurtosis < 0

Definition 2.2.8. *Odds*:

i. Odds for event $E = \frac{P(E)}{1-P(E)}$
ii. Odds against event $E = \frac{1-P(E)}{P(E)}$

Definition 2.2.9.

i. Expected value: $E(X) = \sum_{i=1}^{n} P(X_i)X_i$
ii. Variance: $\sigma^2(X) = E[(X - E[X])^2] = \sum_{i=1}^{n} P(X_i)[X_i - E[X_i]]^2$
iii. Covariance: $\text{Cov}(R_i, R_j) = E[(R_i - E[R_i])(R_j - E[R_j])]$
iv. Correlation: $\rho(R_i, R_j) = \frac{\text{Cov}(R_i, R_j)}{\sigma(R_i)\sigma(R_j)}$

Definition 2.2.10.

i. Portfolio variance: $\sigma^2(X) = E[(R_p - E[R_p])^2] = \sum_{i=1}^{n} \sum_{j=1}^{n} w_i w_j \text{Cov}(R_i, R_j)$
ii. Joint distribution function: $\text{Cov}(R_A, R_B) = \sum_i \sum_j P(R_{A,i}, R_{B,j})(R_{A,i} - E[R_A])(R_{B_i} - E[R_B])$.
Sum all possible standard deviation cross-products, weighted by the appropriate joint probability.

Definition 2.2.11.

i. Labelling: of N objects with k different labels. Total combinations $= \frac{n!}{n_1!n_2!...n_k!}$

ii. Combination: $nCr = \frac{n!}{(n-r)!r!}$

iii. Permutations: $nPr = \frac{n!}{(n-r)!}$

Definition 2.2.12. *Measurement scales*

i. Nominal: categorises data, but do not have rank

ii. Ordinal: data is sorted $(<, >)$

iii. Interval: differences are meaningful $(<, >, +, -)$

iv. Ratio: true zero is origin $(<, >, +, -, 0)$

Definition 2.2.13.

i. Monte Carlo Simulation: provides distribution of possible solutions to complex functions

ii. Scenario analysis: shows changes in key financial quantities that result from given economic events

iii. Historical simulation: approach in back-testing data

Definition 2.2.14.

i. Empirical probability: estimated from data as relative frequency of occurrence

ii. Subjective probability: drawn on personal or subjective judgment

iii. Priori probability: Obtained based on logical analysis

Definition 2.2.15. *Probability Distributions*

Distribution	Notation	PMF or PDF	Mean	Variance
Binomial	$X \sim B(n,p)$	$P(X=x) = \binom{n}{x}p^x(1-p)^{n-x}$	np	$np(1-p)$
Normal	$X \sim N(\mu,\sigma^2)$	$f(x) = \frac{1}{\sigma\sqrt{2\pi}}\exp(-\frac{1}{2}(\frac{x-\mu}{\sigma})^2)$	μ	σ^2
Standard Normal	$X \sim N(0,1)$	Standardised with $Z = \frac{X-\mu}{\sigma}$	0	1
Log-Normal	$X \sim \text{Lgn}(\mu,\sigma^2)$	$\frac{1}{x\sigma\sqrt{2\pi}}\exp\left(-\frac{(\ln x-\mu)^2}{2\sigma^2}\right)$	$\exp(\mu+\frac{\sigma^2}{2})$	$[\exp(\sigma^2)-1]\exp(2\mu+\sigma^2)$
Student's t	$X \sim t_v$	–	0	$\frac{v}{v-2}$ for $v>2$, $v=n-1$

Definition 2.2.16. *Central Limit Theorem*
For any distribution, mean $\overline{X}$ approaches a normal distribution with mean μ and variance $\frac{\sigma^2}{N}$ as $N \to \infty$.

Definition 2.2.17. *Confidence Interval*

$$\text{Point Estimate} \pm \text{Reliability Factor} \times \text{Standard Error}$$

Definition 2.2.18. *Biases*:

i. Data Mining: Continually mixing and matching factors until two or more data series that are highly correlated are discovered.

ii. Sample Selection: Data availability leads to certain assets being excluded from analysis, i.e. non-response

iii. Survivorship: Studies on databases that have eliminated all companies that have ceased to exist.

iv. Look-ahead: Studies assume that fundamental info is available when it is not. Bias results up.

v. Time Period: Test design is based on a time period that may make results time-period specific.

vi. Data Snooping: Bias in inference drawn due to prying into empirical results of others to guide own analysis

2.3 Hypothesis Testing

Definition 2.3.1. *One-tailed and Two-tailed Tests of Single Mean*

i. Two-tailed test $H_0 : \theta = \theta_0$ against $H_\alpha : \theta \neq \theta_0$.
Reject H_0 if test statistic $z < -z_{\alpha/2}$ or $z > z_{\alpha/2}$.

ii. Right-tailed test $H_0 : \theta \leq \theta_0$ against $H_\alpha : \theta > \theta_0$.
Reject H_0 if test statistic $z > z_\alpha$.

iii. Left-tailed test $H_0 : \theta \geq \theta_0$ against $H_\alpha : \theta < \theta_0$.
Reject H_0 if test statistic $z < -z_\alpha$.

Definition 2.3.2. The *test statistic* is as follows:

$$\text{Test statistic} = \frac{\text{Sample statistic} - \text{Value of population parameter under } H_0}{\text{Standard error of sample statistic}}$$

Definition 2.3.3. *Type I and Type II Errors*

Decision	H_0 True	H_0 False
Do not reject H_0	Correct Decision	Type II Error
Reject H_0	Type I Error	Correct Decision

Definition 2.3.4.

i. *Significance Level*: probability of incorrectly rejecting the null hypothesis.

ii. *Power of Test*: Probability of correctly rejecting the null hypothesis (not committing a Type II error).

iii. *P-Value*: Smallest level of significance at which the null hypothesis can be rejected.

Definition 2.3.5. *One-tailed and Two-tailed Tests of Two Mean*

i. Two-tailed test $H_0 : \mu_1 - \mu_2 = 0$ against $H_\alpha : \mu_1 - \mu_2 \neq 0$.
Reject H_0 if test statistic $t > t_{\alpha/2}$ or if $t < t_{1-\alpha/2}$, with $df = v$.

ii. Right-tailed test $H_0 : \mu_1 - \mu_2 \leq 0$ against $H_\alpha : \mu_1 - \mu_2 > 0$.
Reject H_0 if test statistic $t > t_{1-\alpha}$, with $df = v$.

iii. Left-tailed test $H_0 : \mu_1 - \mu_2 \geq 0$ against $H_\alpha : \mu_1 - \mu_2 < 0$.
Reject H_0 if test statistic $t < t_\alpha$, with $df = v$.

Definition 2.3.6. *One-tailed and Two-tailed Tests of Single Variance*

i. Two-tailed test $H_0 : \sigma^2 = \sigma_0^2$ against $H_\alpha : \sigma^2 \neq \sigma_0^2$.
Reject H_0 if test statistic $> \chi^2_{\alpha/2}$ or if test statistic $< \chi^2_{1-\alpha/2}$, with $df = n - 1$.

ii. Right-tailed test $H_0 : \sigma^2 \leq \sigma_0^2$ against $H_\alpha : \sigma^2 > \sigma_0^2$.
Reject H_0 if test statistic $> \chi^2_\alpha$, with $df = n - 1$.

iii. Left-tailed test $H_0 : \sigma^2 \geq \sigma_0^2$ against $H_\alpha : \sigma^2 < \sigma_0^2$.
Reject H_0 if test statistic $< \chi^2_{1-\alpha}$, with $df = n - 1$.

Definition 2.3.7. *One-tailed and Two-tailed Tests of Two Variances*

i. Two-tailed test $H_0 : \sigma_1^2 = \sigma_2^2$ against $H_\alpha : \sigma_1^2 \neq \sigma_2^2$.
Reject H_0 if test statistic $> F_{\alpha/2}$.

ii. Right-tailed test $H_0 : \sigma_1^2 \leq \sigma_2^2$ against $H_\alpha : \sigma_1^2 > \sigma_2^2$.
Reject H_0 if test statistic $> F_\alpha$.

iii. Left-tailed test $H_0 : \sigma_1^2 \geq \sigma_2^2$ against $H_\alpha : \sigma_1^2 < \sigma_2^2$.
Reject H_0 if test statistic $< F_{1-\alpha}$.

Method 2.3.8. *Statistical Test Summaries*

i. *Test of Single Mean*

Sample	Variance	Small Sample	Large Sample
Normal	Known	$z = \frac{\overline{X}-\mu_0}{\sigma/\sqrt{n}}$	$z = \frac{\overline{X}-\mu_0}{s/\sqrt{n}}$
Normal	Unknown	$t_{n-1} = \frac{\overline{X}-\mu_0}{s/\sqrt{n}}$	$t_{n-1} = \frac{\overline{X}-\mu_0}{s/\sqrt{n}}$ or $z = \frac{\overline{X}-\mu_0}{s/\sqrt{n}}$
Non-normal	Known	Not Available	$z = \frac{\overline{X}-\mu_0}{s/\sqrt{n}}$
Non-normal	Unknown	Not Available	$t_{n-1} = \frac{\overline{X}-\mu_0}{s/\sqrt{n}}$ or $z = \frac{\overline{X}-\mu_0}{s/\sqrt{n}}$

ii. *Test of Two Mean*

Sample	Variance	Test Statistics	Degrees of Freedom
Normal	Equal, Unknown	$t = \frac{(\overline{X}_1 - \overline{X}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{s_p^2}{n_1} + \frac{s_p^2}{n_2}}}$, where $s_p^2 = \frac{(n_1-1)s_1^2 + (n_2-1)s_2^2}{n_1+n_2-2}$ is pooled estimator of common variance	$df = n_1 + n_2 - 2$
Normal	Unequal, Unknown	$t = \frac{(\overline{X}_1 - \overline{X}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$	$df = \frac{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}{\frac{(s_1^2/n_1)^2}{n_1} + \frac{(s_2^2/n_2)^2}{n_2}}$
Normal	Paired, Unknown	$t = \frac{\overline{d} - \mu_{d0}}{s_{\overline{d}}}$, where $\overline{d} = \frac{1}{n}\sum_{i=1}^{n} d_i$, $s_{\overline{d}} = \frac{1}{\sqrt{n}}\frac{\sum_{i=1}^{n}(d_i - \overline{d})^2}{n-1}$	$df = n - 1$

iii. *Correlation Test*: Assess correlation strength of two variables, $H_0 : \rho = 0$ against $H_1 : \rho \neq 0$.
Test statistic is $t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}}$, where r is the sample correlation.
Degrees of freedom is $df = n - 2$.

iv. *Test of Single Variance Equality*: compare variance of population σ^2 against hypothesised value σ_0^2.
Test statistic is $\chi^2 = \frac{(n-1)s^2}{\sigma_0^2}$, where sample variance is $s^2 = \frac{\sum_{i=1}^{n}(X_i - \overline{X})^2}{n-1}$.
Degrees of freedom is $df = n - 1$.

v. *Test of Two Variance Equality*: for two populations with normal distribution.
Test statistic is $F = \frac{s_1^2}{s_2^2}$.
Degrees of freedom for numerator is $df_1 = n_1 - 1$, for denominator is $df_2 = n_2 - 1$.

vi. *Spearman Rank Test*: If the assumption that two variables are uncorrelated is not valid, use the test.

1. Rank observations on X from large to small. For ties, assign average of ranks. Do same for Y.
2. Calculate difference d_p, between the ranks of each pair of observations on X and Y.
3. With sample size n, test statistic is $r_s = 1 - \frac{\sum_{i=1}^{n} d_i^2}{n(n^2-1)}$.
   If $n > 30$, use t-test instead, where $t = \frac{(n-2)^{1/2} r_s}{(1-r_s^2)^{1/2}}$ with degrees of freedom $df = n - 2$.

vii. *Parametric vs Non-Parametric Tests*

	Parametric	Non-Parametric
Tests on single mean	t-test, z-test	Wilcoxon signed-rank test
Tests on differences between means	t-test, approx t-test	Mann-Whitney U test
Tests on mean differences (paired)	t-test	Wilcoxon signed-rank test, sign test

2.4 Regression

Definition 2.4.1. *Linear Regression Assumptions*

i. Linearity: $Y \sim a_i X_i$, where a_i is a constant, Y is dependent variable, X_i is independent variable.
ii. Homoscedasticity: Variance of residual $Var(Y - \hat{Y})$ is constant $\forall$ observations (Y is actual, $\hat{Y}$ is predicted).
iii. Independence: Residuals are uncorrelated across observations, $E[\epsilon_i \epsilon_j] = 0 \ \forall i \neq j$.
iv. Normality: Residual term is normally distributed.
v. Expected value of residual term is zero, $E[\epsilon] = 0$.
vi. Independent variable is uncorrelated with the residuals.

Definition 2.4.2. *Regression Performance Plots*:

i. Scatterplot (variable vs variable): for possible correlation between independent variables, identify outliers.
ii. Scatterplot (residual vs predicted): for possible correlation between residual and predict value.
iii. Normal Q-Q plot (theory vs empirical distribution): residual vs normal distribution. If residuals are along the diagonal, then it is good.

Definition 2.4.3. The estimated *slope coefficient* $\hat{b}_1$ is computed as $\hat{b}_1 = \frac{Cov(X,Y)}{\sigma_X^2}$.

Definition 2.4.4. The *standard error (SE)* is defined as $SE = \frac{\sigma}{\sqrt{n}}$.

Definition 2.4.5. The *regression coefficient confidence interval* is defined as $\hat{b}_1 \pm (t_\alpha + SE_{\hat{b}_1})$, where t_α is the critical two-tailed t-value for the confidence level α, with degrees of freedom $df = n - 2$.

Definition 2.4.6. *Test of Slope Coefficient Significance*
Two-tailed test $H_0 : b_1 = 0$ against $H_\alpha : b_1 \neq 0$.
Test statistic is $t = \frac{\hat{b}_1 - b_1}{SE_{\hat{b}_1}}$, with degrees of freedom $df = n - 2$.
Reject H_0 if $t > t_{\alpha/2}$ or $t < -t_{\alpha/2}$.

		Test of the Slope	Test of the Correlation
Step 1	State the hypotheses.	H_0: $b_1 \leq 0$ versus H_a: $b_1 > 0$	H_0: $\rho \leq 0$ versus H_a: $\rho > 0$
Step 2	Identify the appropriate test statistic.	$t = \frac{\hat{b}_1 - B_1}{s_{\hat{b}_1}}$ with 6 – 2 = 4 degrees of freedom.	$t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}}$. with 6 – 2 = 4 degrees of freedom.
Step 3	Specify the level of significance.	α = 5%.	α = 5%.
Step 4	State the decision rule.	Critical t-value = 2.132. Reject the null if the calculated t-statistic is greater than 2.132.	Critical t-value = 2.132. Reject the null if the calculated t-statistic is greater than 2.132.
Step 5	Calculate the test statistic.	$t = \frac{1.25 - 0}{0.312398} = 4.00131$	$t = \frac{0.8945\sqrt{4}}{\sqrt{1-0.8001}} = 4.00131$
Step 6	Make a decision.	Reject the null hypothesis. There is sufficient evidence to indicate that the slope is greater than zero.	Reject the null hypothesis. There is sufficient evidence to indicate that the correlation is greater than zero.

Figure 1: One-sided tests for slop and correlation, single regression

Definition 2.4.7. The *predicted values confidence interval* is defined as $\hat{Y} \pm (t_{\alpha/2} \times SE_f)$, where $t_{\alpha/2}$ is the critical two-tailed t-value for the confidence level α, with degrees of freedom $df = n-2$, and SE_f is the standard error of the forecast. Note that $SE_f^2 = SEE^2 \left[1 + \frac{1}{n} + \frac{(X-\overline{X})^2}{(n-1)\sigma_X^2}\right]$, where σ_X^2 is the variance of the independent variable, X is the value of the independent variable for which the forecast was made.

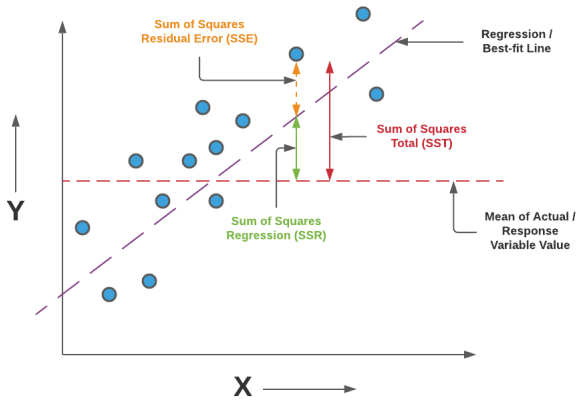

Figure 2: Regression Error Terms

Definition 2.4.8. *Error Terminology*

i. Sum of total squares (SST): measures total variation in dependent variable. Sum of squared differences between actual and mean value, $SST = \sum_{i=1}^{n}(Y_i - \overline{Y})^2$.

ii. Sum of squares regression (SSR): measures variation in dependent variable as explained by independent variable. Sum of square distances between predicted and mean value, $SSR = \sum_{i=1}^{n}(\hat{Y}_i - \overline{Y})^2$.

iii. Sum of squares residual error (SSE): measures unexplained variation in dependent variable. Sum of squared vertical distance between actual and predicted values. $SSE = \sum_{i=1}^{n}(Y_i - \hat{Y})^2$.

iv. Mean squares regression (MSR): $MSR = \frac{SSR}{k}$, where k is number of independent variables.

v. Mean squares error (MSE): $MSE = \frac{SSE}{n-k-1}$, where k is number of independent variables.

vi. Standard error of estimate (SEE): $SEE = \sqrt{\frac{\sum_{i=1}^{n}(Y_i - \hat{Y})}{n-2}} = \sqrt{MSE}$.

vii. Standard error of intercept: $SE_{\hat{b}_0} = \sqrt{\frac{1}{n} + \frac{\overline{X}^2}{\sum_{i=1}^{n}(X_i - \overline{X})^2}}$

Definition 2.4.9. *Test of Slope Intercept Significance*
Two-tailed test $H_0 : b_0 \leq B_0$ against $H_\alpha : b_0 > B_0$.
Test statistic is $t = \frac{\hat{b}_0 - B_0}{SE_{\hat{b}_0}}$, with degrees of freedom $df = n - 2$.
Reject H_0 if $t > t_\alpha$.

Step 1	State the hypotheses.	H_0: $b_0 \leq 3\%$ versus H_a: $b_0 > 3\%$
Step 2	Identify the appropriate test statistic.	$t_{intercept} = \frac{\hat{b}_0 - B_0}{s_{\hat{b}_0}}$ with 6 – 2 = 4 degrees of freedom.
Step 3	Specify the level of significance.	$\alpha = 5\%$.
Step 4	State the decision rule.	Critical t-value = 2.132. Reject the null if the calculated t-statistic is greater than 2.132.
Step 5	Calculate the test statistic.	$t_{intercept} = \frac{4.875 - 3.0}{\sqrt{\frac{1}{6} + \frac{6.1^2}{122.64}}} = \frac{1.875}{0.68562} = 2.73475$
Step 6	Make a decision.	Reject the null hypothesis. There is sufficient evidence to indicate that the intercept is greater than 3%.

Figure 3: Slope intercept test of regression

Definition 2.4.10. *Coefficient of determination, R^2*, measure goodness of fit of regression to data.

$$R^2 = \frac{SST - SSE}{SST} = \frac{SSR}{SST}$$

Note that R^2 do not allow us to know if coefficients are statistically significant. There is no info on bias in estimated coefficients and predicted values. There is no info if model fit is good as well.

Definition 2.4.11. *Adjusted R^2*, adjusts for degrees of freedom.

$$\overline{R}^2 = 1 - \left[\left(\frac{n-1}{n-k-1}(1-R^2)\right)\right]$$

where k is number of independent variables.

If we are adding new independent variable to the regression, if the coefficient t-statistics $> |1.0|$, then $\overline{R}^2$ will increase. If coefficient t-statistics $< |1.0|$, then $\overline{R}^2$ will decrease.

Definition 2.4.12. *Information Criterions*

i. *Akaike Information Criterion (AIC)*: evaluate model parsimony. Lower AIC means better fitting.

$$AIC = n\ln(\frac{SSE}{n}) + 2(k+1)$$

where n is the sample size, k is number of independent variables.

ii. *Bayesian Information Criterion (BIC)*: gives greater penalty than AIC if model has more parameters. Lower BIC means better fitting.

$$BIC = n\ln(\frac{SSE}{n}) + \ln(n)(k+1)$$

AIC is preferred if model is used for prediction. BIC is preferred if best goodness of fit is desired.

Definition 2.4.13. *Analysis of Variance (ANOVA)* analyses the total variability of the dependent variable:

3 Financial Statement Analysis

3.1 Financial Reporting

Remark 3.1.1. Role of Financial Statement Analysis

i. Role of financial reporting: provide information about company's financial position for use by internal and external parties.

ii. Role of financial analysis: evaluate company past, current, prospective financial position and performance for investment, credit, and similar decisions

Definition 3.1.2. *Financial Statements*

i. Balance sheet (BS): provides information on liquidity, solvency, financial position at a point of time.

$$\text{Assets} = \text{Liabilities} + \text{Owner's Equity}$$

ii. Income statement (IS): provides information on financial performance of activities over period of time on a consolidated basis

iii. Cash Flow Statement (CFS): discloses sources and use of cash. For liquidity, solvency, financial flexibility

iv. Statement of changes in equity: shows changes in owner's investment in the business over time, in order of liquidation and dividends

v. Financial footnotes: includes accounting methods (assumptions and estimates), and disclosure on fixed assets, inventory methods, income taxes, pensions, debt, contingencies etc.

vi. Supplementary schedules: includes additional info on assets and liabilities of company, but is unaudited

vii. Management commentary: includes specific issues on financial statements, current financial condition, liquidity, and planned capital expenditure (Capex). Not audited, for public companies only.

Remark 3.1.3. *Auditor Reports.* In accordance with GAAP, identify inconsistent principles.

i. Unqualified opinion: free of material misstatements (by GAAP). Fairly represented.

ii. Qualified opinion: 1 to 2 situations not compliant with GAAP, rest are fairly presented.

iii. Adverse opinion: materially misstated, generally do not comply with GAAP. Unreliable, inaccurate.

iv. Disclaimer of opinion: auditor could not form and refuses to present an opinion. Issued when auditor cannot complete work.

Remark 3.1.4. *Standard Setting Bodies.* These are private sector, self-regulated bodies.

i. IASB: Standard-setting body of IFRS Foundation. Deliberate, develop, issue international financial reporting standards.

ii. FASB: Issues new and revised standards to develop standards of financial reporting. US GAAP recognised by SEC, but SEC retains authority to establish standards.

Principles: To provide full, accurate, and timely disclosure of financial results, risks, and other information material to investor's decisions. High and internationally acceptable quality.

Remark 3.1.5. *Regulatory Bodies.* These have the legal authority to enforce financial reporting requirements, can overrule private-sector standard setting bodies.

i. IOSCO: Regulate world financial markets. Protect investors, ensure markets are fair, efficient, and transparent, and reduce systematic risk.

ii. SEC: Governs form and content of financial statements through securities act. Oversees PCAOB.

Remark 3.1.6. *Key Regulations*

i. Securities exchange act of 1934: Created SEC, give SEC authority over all aspects of securities industry, empower SEC to require periodic reporting.

ii. Securities act of 1993: Specified financial and other significant information that investors must receive when securities are sold, prohibits misrepresentations, requires initial registration of all public issuances of securities.

iii. Sarbanes-Oxley Act of 2002: Oversee auditors. Ensure auditor independence, corporate responsibility for financial reports, effectiveness of firm's internal control over financial reporting.

Financial Statement Analysis Process:

Step	Step Name	Input	Output
1	Articulate the purpose and context of the analysis	• The nature of the analyst's function and context of the analysis such as evaluating an equity or debt investment or issuing a credit rating. • Communication with client or supervisor on needs and concerns. • Institutional guidelines related to developing specific work product.	• Statement of the purpose or objective of the analysis. • A list (written or unwritten) of specific questions to be answered by the analysis. • Nature and content of the report to be provided. • Timetable and budgeted resources for completion.
2	Collect input data	• Financial statements, other financial data, questionnaires, and industry, economic data. • Discussions with management, suppliers, customers, and competitors. • Company site visits (e.g., to production facilities or retail stores).	• Organised financial statements. • Financial data tables. • Completed questionnaires, if applicable.
3	Process data	• Data from previous phase.	• Adjusted financial statements. • Common-size statements. • Ratios and graphs. • Forecasts
4	Analyse and interpret the processed data	• Input data as well as processed data.	• Analytical results.
5	Develop and communicate conclusions and recommendations (e.g., with an analysis report).	• Analytical results and previous reports. • Institutional guidelines for published reports.	• Analytical report answering questions posed in Phase 1. • Recommendation regarding the purpose of the analysis, such as whether to make an investment or grant credit.
6	Follow up	• Information gathered by periodically repeating above steps as necessary to determine whether changes to holdings or recommendations are necessary.	• Updated reports and recommendations.

Remark 3.1.7. *Types of Reports*

i. Registration statement: provides disclosure about securities offered for sale; relationship of new securities to other securities; informational provided in annual filings; recent audited financial statement; risk factors in the business.

ii. Forms 10-K, 20-F, 40-F: Forms 10-K are for US registrants, 40-F are for Canadian, and 20-F for other non-US registrations. This is a legal document with minimal marketing. Provides information on business, financial disclosures, legal proceedings, information related to management.

iii. Annual report: Not SEC requirement. Opportunity for company to present itself to stakeholders and other external parties. Highly polished marketing document. Overlap with 10-K.

iv. Proxy statements, Form DEF-14A: Provides information on litigation, executive compensation, related-party transactions. Proposals that require shareholder vote, security ownership by management and principal owners, director's biographic information.

v. Interim reports, Forms 10-Q, 6-K: Provided on a quarterly basis, less detailed than annual reports, unaudited statements and footnotes. If no-recurring events take place, included in 10-Q report.

vi. Forms 8-K: Announce major events such as acquisitions, disposal of corporate assets, changes in securities and trading markets, matters related to accountants and financial statements, corporate governance and management changes, regulation FD disclosures.

vii. Forms 3, 4, 5: Report beneficial ownership of securities for any owners greater than 10% per class of securities. Form 3 is initial statement, Form 4 is changes, Form 5 is annual report.

viii. Form 155: Notice of proposed sale of restricted securities or securities held by affiliate of the issuer.

ix. Form 11-K: Annual report of employee stock purchase, savings, etc.

Definition 3.1.8. *Financial Reporting Recognition Principles*

i. *Probable*: economic outcome has high probability of occurrence.

ii. *Measurable*: economic outcome measured exactly with reliability.

Definition 3.1.9. *Financial Reporting Fundamental Qualitative Factors*

i. *Relevance*: potential to affect or make difference in user's decisions. Predictive, confirmatory value.

ii. *Materiality*: omission or misstatement can influence user decisions

iii. *Faithful Representation*: complete, neutral, free from error

Definition 3.1.10. *Financial Reporting Enhancing Qualitative Factors*
Comparable and consistent, verifiable, timeliness, and understandable.

As it takes time to get reliable information, will need to get balance between relevance and reliability.

Definition 3.1.11. *Accounting Assumptions*: on an accrual basis, going concern principle.

Definition 3.1.12. *Types of Costs*

i. *Historical Cost*: recorded at value paid at time of acquisition for assets, and liabilities proceeds in return for obligation.

ii. *Amortised Cost*: historical cost adjusted for amortisation, depreciation, or depletion/impairment.

iii. *Current Cost*: cash or cash equivalents if asset is paid for or liability required to settle obligation currently.

Definition 3.1.13. *Types of Value*

i. *Realisable Value*: cash or cash equivalents if assets sold in an orderly disposal, and liability at settlement.

ii. *Present Value*: assets at present value (PV) discounted of future cash flows. Liabilities at PV discounted of future net cash flows required to settle.

iii. *Fair Value*: amount which an asset could be exchanged, or liability settled between willing parties.

Remark 3.1.14. *IFRS Reporting Requirements*

i. Required financial statements: balance sheet, income statement, statement of changes in equity, cash flow statement, notes.

ii. Required features: fair representation, going concern, accrual basis, consistency, materiality and aggregation, no offsetting. Annual frequency of reporting. Comparative information from previous periods.

iii. Structure and Content:

    1. Balance Sheet: disclose current and non-current assets and liabilities, unless if liquidity-based presentation is more reliable and relevant.
    2. Financial Statements: minimum line-item disclosures.
    3. Notes: disclosures on information.
    4. Comparative information: disclosed for previous period.

iv. Disclosure of accounting policies:

    1. Measurement bases used in preparing financial statements
    2. Significant accounting policies used
    3. Judgments made in applying accounting policies that have the most significant effect on the amounts recognised in the financial statements

v. Sources of estimation uncertainty: Key assumptions about the future and other key sources of estimation uncertainty that have a significant risk of causing material adjustment to the carrying amount of assets and liabilities within the next year

vi. Other Disclosures:

    1. Information about capital and about certain financial instruments classified as equity
    2. Dividends not recognised as a distribution during the period, including dividends declared before the financial statements were issued and any cumulative preference dividends
    3. Description of the entity, including its domicile, legal form, country of incorporation, and registered office or business address

4. Nature of operations and principal activities
5. Name of parent and ultimate parent

Effective financial reporting have the following characteristics: transparency, comprehensiveness, consistency

Remark 3.1.15. *Barriers to a single standard*:

i. Valuation approach: judgement is required
ii. Standard-setting approach: principles-based vs rule-based
iii. Measurement approach: what constitutes an asset and a liability. Use of matching principle

If new products are launched by a business, understand the business purposes, then evaluate potential effect on financial statements.

3.2 Basic Financial Statement Analysis

3.2.1 Income Statement Analysis

Remark 3.2.1. *Revenue Recognition*
Revenue is recognised even if cash is not collected until next accounting period.

Definition 3.2.2. *Common Income Statement Line Items*

i. Net Sales:
$$\text{Net Sales} = \text{Gross Sales} - \text{Sales returns and allowances} - \text{discounts}$$

ii. Gross Margin:
$$\text{Gross Margin} = \text{Net Sales} - \text{Cost of Goods Sold}$$

iii. Operating Expenses: expenses other than cost of goods sold (COGS), i.e. selling expenses, general and administrative expenses

iv. Operating Income:
$$\text{Operating Income} = \text{Gross Margin} - \text{Operating Expenses}$$

v. Earnings Before Interest and Taxes (EBIT): amount earned from all activities before income taxes.

vi. Net Income: gross margin.
$$\text{Net Income} = \text{EBIT} - \text{Income Tax}$$

Method 3.2.3. *B.A.S.E. Technique*

B: Beginning balance

A: Add cash payments and liability account ending balances

S: subtract asset accounting ending balances

E: equals ending balance

Definition 3.2.4. *Accrual Accounting*
Revenue is recognised when earned.
If revenue is on credit, it is on trade and accounts receivable account.
If revenue is earned in advance, there is liability account for unearned revenue.

Method 3.2.5. *Revenue Recognition*

1. Identify the contract with a customer
2. Identify distinct performance obligations in the contract
3. Determine contract transaction price
4. Allocate transaction price to obligations
5. Recognize revenue when obligation is satisfied.

Remark 3.2.6. *Revenue Recognition Conditions*

i. Completion of earnings process (no obligation for future services, i.e. warranty protection)

ii. Assurance of payment (quantified amount must be reliable)

Method 3.2.7. *Percentage of Completion Method*
$$\begin{aligned}\text{Percentage completed} &= \frac{\text{Costs incurred to date}}{\text{Most recent estimate of total costs}}\\ \text{Revenue to be recognised to-date} &= \text{Percent completed} \times \text{Estimated total revenue}\\ \text{Current period revenue} &= \text{Revenue to be recognised to-date} - \text{Revenue recognised prior}\end{aligned}$$

Method 3.2.8. *Completed Contract Method*
Used if there is no contract, or estimates are unreliable, or ability to collect revenue is uncertain.

Method 3.2.9. *Instalment Sales Method*
Used if COGS are known, but collectability of sale proceeds cannot be reasonably determined.

$$\text{Gross Profit Rate} = \frac{\text{Sales} - \text{COGS}}{\text{Sales}}$$
$$\text{Realised Gross Profit} = \text{Cash Collection} \times \text{Gross Profit Rate}$$

Method 3.2.10. *Cost Recovery Method*
More conservative than instalment sales. Used if COGS cannot be reasonably determined.
Sales recognised when cash is received but no gross profit is recognised until all of COGS collected. Profit recognised only when cash collections exceed total COGS.

Method 3.2.11. *Barter Transaction Recognition*
Revenue should be reported only if fair value of transaction is determined based on company's historical practice of receiving cash for similar transaction from buyers unrelated to the counterparty for the barter.

Method 3.2.12. *Reseller Revenue Recognition*

i. Gross reporting used if company has general inventory risk, can determine product price, can change supplier, bears credit risk.
ii. Net reporting if company is sales agent.

Definition 3.2.13. *Revenue Matching Principle*

i. Operating expenses only recognised when the work or product makes contribution to revenue.
ii. Expenses are to be grouped by either function or nature.
iii. Current period expenses to appear on Income Statement.
iv. Future period expenses are capitalised. When revenues are recognised, asset is converted to expenses in these periods.

Method 3.2.14. *Direct Write-Off Method*
Uncollectible accounts charged to expense in the period they are determined to be worthless.
Revenue matching principle is not adhered to.

Method 3.2.15. *Allowance Method*
Bad debt expense recorded in same period as sale.
Estimate on percentage-of-sales basis (on IS) or outstanding receivables (on BS) basis.

Method 3.2.16. *Warranty Recognition*
Recognize estimate warranty expense in period of the sale, and update expense indicated by experience over life of warranty.

3.3 Inter-Corporate Investments

	Financial Assets	Associates	Business Combi	Joint Ventures
Influence	Not significant	Significant	Controlling	Shared Control
Interest %	Usually $< 20\%$	Usually 20% to 50%	Usually $> 50\%$ or other indications of control	
Financial Reporting	Classified as • Fair value through profit or loss (FVPL) • Fair value through other comprehensive income (FVOCI) • Amortised Cost	Equity Method	Consolidation	IFRS: Equity Method
IFRS	IFRS 9	IAS 28	IAS 27, IFRS 3, IFRS 10	IFRS 11, IFRS 12, IAS 28
GAAP	FASB ASC Topic 320	FASB ASC Topic 323	FASB ASC Topics 805 and 810	FASB ASC Topic 323

i. IFRS 9 Financial Instruments; IAS 28 Investments in Associates; IAS 27 Separate Financial Statements; IFRS 3 Business Combinations; IFRS 10 Consolidated Financial Statements; IFRS 11 Joint Arrangements; IFRS 12, Disclosure of Interests in Other Entities.

ii. FASB ASC Topic 320 [Investments-Debt and Equity Securities]; FASB ASC Topic 323 [Investments- Equity Method and Joint Ventures]; FASB ASC Topics 805 [Business Combinations] and 810 [Consolidations].

3.3.1 Investment in Financial Assets: IFRS 9

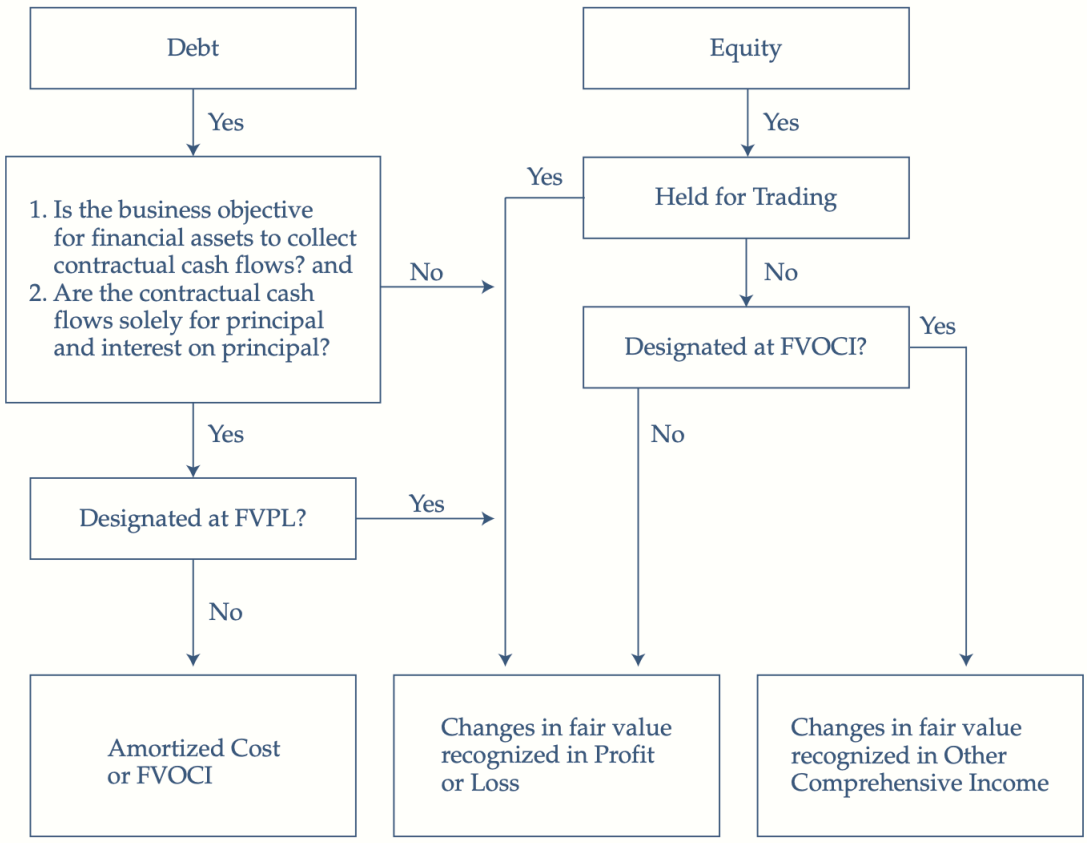

Figure 4: Financial Assets Classification and Measurement Model, IFRS9

Definition 3.3.1. *Investment in Financial Assets: IFRS 9*
IFRS 9 considers contractual characteristics of cash flow and management of financial assets.
For loan impairment, expected credit loss model will be used.

Method 3.3.2. *Amortised Cost Method - Debt Only*
Debt securities meeting following two criteria are accounted for using the amortised cost method:

i. Business Model Test: debt securities are being held to collect contractual cash flows
ii. Cash Flow Characteristics Test: the contractual cash flows are principal, or interest on principal, only.

These are reported on the balance sheet at amortised cost - the original cost of debt plus or minus any discount or premium that has been amortised to date.
Interest income (coupon cash flow adjusted for amortisation of premium or discount) is recognised in income statement; subsequent changes in fair value are ignored.

Method 3.3.3. *Fair Value through Profit or Loss - Debt and Equity*

i. Debt: classified as FVPL if held for trading, or if accounting for these securities at amortised cost results in accounting mismatch (inconsistency from different measurement bases for assets and liabilities)
ii. Equity: classified as FVPL if held for trading. Otherwise, may be classified as either FVPL or FVOCI, choice is irrevocable.
iii. Derivatives: classified as FVPL if not used for hedging. If asset has embedded derivative (i.e., convertible bonds), asset as a whole is valued at FVPL.

Securities are reported on balance sheet at fair value. Changes in fair value (realised and unrealised) are recognised in income statement with any dividend or interest income.

Method 3.3.4. *Fair Value through Other Comprehensive Income - Debt and Equity*
Securities are reported on balance sheet at fair value; any unrealised gain or loss is reported on OCI.
Realised gains or losses, dividends, interest income are reported on the income statement.

	Amortised Cost	FVPL	FVOCI
Balance Sheet	Amortised cost	Fair Value	Fair value, with unrealised gains and losses (GL) recognised in equity
Income Statement	Interest (including amortisation) Realised GL	Interest Dividends Realised GL Unrealised GL	Interest Dividends Realised GL

Method 3.3.5. *Reclassification under IFRS 9*

i. Debt: permitted only if business model has changed such that it significantly affects operations.
ii. Equity: not permitted, as initial designation is irrevocable.

Method 3.3.6. *Loan Impairment under IFRS 9*
Incurred loss model for loan impairment replaced by expected credit loss model. Require companies to evaluate current and historical information on loan performance (loan commitments and lease receivables), and also forward-looking information.
Results in earlier recognition of loan impairment (12 month expected losses for performing loans, lifetime expected losses for non-performing loans).

3.3.2 Investment in Associates: Equity Method

Remark 3.3.7. *Signs of Significant Influence*

i. Investment ownership between 20% and 50%
ii. Representation on board of directors
iii. Participation in the policy-making process
iv. Material transactions between investor and investee
v. Interchange of managerial personnel
vi. Technological dependency

Method 3.3.8. *Equity Method*

i. Initial investment recorded at cost as non-current asset on BS.

ii. Carrying amount of investment adjusted to recognise proportionate share of Profit and Loss (PnL); the PnL are recorded on IS.

iii. Dividends and other distributions from investee is return of capital, reduce carrying amount of investment on BS, but not reported in investor PnL on IS.

iv. On investee loss, investor will receive proportionate share of the loss, reducing the investment account, lower earnings in investor IS.

v. If investment value reduced to zero, equity method is discontinued; further losses will not be recorded. If investee subsequently reports profits, equity method is resumed after investor's share of profit exceed the share of losses not recognised during the suspension period.

Remark 3.3.9. *Fair Value Option*

i. GAAP: allows investments to be recorded at fair value.

ii. IFRS: fair value option only available to VC, mutual funds, unit trusts, ILPs etc.

Decision to use fair value option is irrevocable; any changes in value (with dividends) are recorded in IS.
Investor investment account on BS do not reflect proportionate share of PnL, dividends or other distributions.
Excess of cost over fair value of investee identifiable net assets is not amortised, nor is goodwill created.

Remark 3.3.10. *Excess of Purchase Price over Book Value Acquired*

i. At acquisition, the difference is first allocated to specific assets and liabilities (AnL) of assets using fair values, accounted in manner consistent with accounting treatment for the specific AnL to which it is assigned. Amounts allocated to AnL which are expensed or depreciated to be similarly treated.
Initially the BS records the cost in the investment account.

ii. The difference is then amortised to proportionate share of investee PnL over economic lives of the assets (whose fair value exceeds book value).
On the BS, as the differences are amortised, the balance in investment account will converge to proportionate share of book value of net assets of the associate.
Investor record these adjustments by reducing carrying amount of investment on BS and reducing investee profit recognised on its IS.

iii. The goodwill is reviewed for impairment on regular basis. This is included in carrying amount of the investment on the investor BS.

Method 3.3.11. *Investor Balance Sheet Impact: Equity Method*

$$\text{Purchase Price} - \%\text{ share of net asset BV} = \text{Excess of purchase price}$$
$$\text{Excess of purchase price} - \%\text{ share of (FV} - \text{BV) of PPE} = \text{Goodwill}$$
$$\text{Investor }\%\text{ share of investee net income} - \text{Depreciation of }\%\text{ share of excess PPE} = \text{Equity income}$$
$$\text{Investment balance beginning} + \text{Equity income} - \%\text{ share of dividends} = \text{Investment balance end}$$

Method 3.3.12. *Investor Income Statement Impact: Equity Method*

$$\text{Impact} = \text{Equity income} - \%\text{ share of unrealised profit from downstream and upstream sale}$$

Remark 3.3.13. *Treatment of PPE Depreciation on Investor*

i. IFRS: PPE is to be carried at either historical cost or fair value (less accumulated depreciation)

ii. GAAP: PPE is to be carried at historical cost (less accumulated depreciation) only

Method 3.3.14. *Impairment of Investments*
IFRS and GAAP require periodic reviews for impairment. If fair value of investment is less than carrying value permanently, impairment loss is recognised.

i. IFRS: require objective evidence due to one or more loss events that occur after initial recognition, and the loss event has impact on future CF reliably estimated.
Entire carrying amount tested by comparing recoverable amount with carrying amount.
Impairment loss recognised on IS; carrying amount on BS reduced directly or through allowance account.
Reversal of impairment loss allowed to extent that recoverable amount of net investment increases.

ii. GAAP: treat impairment as permanent.
Impairment loss recognised on IS; carrying value of investment on BS reduced to fair value.
Prohibit reversal of impairment loss even if fair value later increases.

Remark 3.3.15. *Transactions with Associates*
Investor can influence terms and timing of transactions with associates. Profits from such transactions cannot be realised until confirmed through use or sale to third parties.
Investor share of unrealised profit deferred by reducing amount recorded under equity method. When deferred profit is confirmed, added this to equity income based on recorded values in associate's accounts.

i. Upstream (investee to investor): profit recorded on investee IS as PnL. Investor's share of unrealised profit is thus included in equity income on investor IS.
However, for profit that is unconfirmed (goods not been used or sold by investor), investor must eliminate proportionate share of profit from equity income of investee.

ii. Downstream (investor to investee): profit recorded on investor IS. Investor must eliminate proportionate share of profit that is unconfirmed. Adjust equity income on investor's IS by deducting on share percent.

Remark 3.3.16. *Disclosures from Transactions with Associates*
Investee results are included in investor's accounts with time lag (not more than one quarter). Dividends from investee are not included in investor income.
In consolidated BS, book value of shareholdings in investee is increased by investor's share of associate net income, reduced by amortisation of surplus values and amount of dividends received.

Remark 3.3.17. *Analytical Issues of Equity Method*

i. Degree of control of investor on investee may not be proportional to shareholdings.

ii. Significant AnL of investee are not reflected on investor BS, which affect debt ratios. Net margin ratios may be overstated as income for investee is included in investor net income, but not in sales.

When analysing associates, consider quality of equity method earnings, potential restriction on dividend CF.

3.3.3 Business Combinations: Consolidation

Definition 3.3.18. *Types of Business Combinations*

i. *Merger*: Target 100% absorbed. Net assets of Company B transferred to Company B.

$$\text{Company } A + \text{Company } B = \text{Company } A$$

ii. *Acquisition*: Companies connected by parent-subsidiary relationship. May acquire less than 50% and still exert control. May acquire less than 100%, and non-controlling (minority) shareholder interest reported on consolidated financial statements.

$$\text{Company } A + \text{Company } B = (\text{Company } A + \text{Company } B)$$

iii. *Consolidation*: New legal entity formed, take over net assets of both companies.

$$\text{Company } A + \text{Company } B = \text{Company } C$$

IFRS: no distinction made among business combinations.
GAAP: classified as merger, acquisition, or consolidation.

Method 3.3.19. *Pooling-of-Interests Method (IFRS Defunct)*
Ownership interest of two firms combined, participants viewed as equals.

i. Two firms asset and liabilities combined using historical book values

ii. Operating results for prior periods restated as though the two firms were always combined

iii. Ownership interests continue, former accounting bases are maintained

Method 3.3.20. *Acquisition Method: Recognition and Measurement*
Fair value of target includes acquisition-date fair value of any contingent consideration. Direct costs of business combination are expensed. Recognition and measurement of:

i. Identifiable assets and liabilities: measure at fair value at date of acquisition, including intangible assets

ii. Contingent liabilities (CL): measure if it is a present obligation from past events, can be measured reliably.

    1. IFRS: includes CL if fair values can be reliably measured.

2. GAAP: only includes CL that are probable and can be reasonably measured.

iii. Indemnification assets (IA): recognise IA if seller contractually indemnifies acquirer for outcome of a contingency or uncertainty related to all or part of a specific asset or liability of the seller. Seller may also indemnify acquirer against losses above a specified amount on a liability arising from a particular contingency. Acquirer will recognise the IA at the acquisition date fair value.

iv. Financial assets and liabilities: identifiable AnL are classified according to IFRS and GAAP standards. Acquirer reclassifies financial AnL based on contractual terms, economic conditions, acquirer's operation and accounting policies.

v. Goodwill: GAAP requires full goodwill. IFRS prefers partial goodwill; full can be used. IFRS allows recognition on transaction-by-transaction basis.

1. Partial Goodwill: acquisition price less acquirer's share of fair value of all tangible and intangible AnL, CL acquired.

$$\begin{aligned}\text{Partial Goodwill} &= \text{Acquisition Price} - \%\text{ share of fair value of net identifiable assets}\\ \text{Partial Goodwill} &= \text{Acquirer }\%\text{ share of equity} \times \text{Full Goodwill}\\ \text{Non-Controlling Interest} &= \%\text{ share of NCI} \times \text{Acquiree fair value of identifiable net assets}\end{aligned}$$

2. Full Goodwill: fair value of entity less fair value of all tangible and intangible AnL, CL

$$\begin{aligned}\text{Full Goodwill} &= \text{Fair value of combined entity} - \text{fair value of net identifiable assets}\\ \text{Non-Controlling Interest} &= \%\text{ share of NCI} \times \text{Fair value of entity}\end{aligned}$$

vi. Bargain purchase: when acquisition price is less than fair value. Difference to be recognised immediately in PnL on IS. Any contingent consideration is measured and recognised at fair value; subsequent changes in value are recognised in PnL.

Remark 3.3.21. *Full Goodwill vs Partial Goodwill*
Full goodwill results in higher total assets and higher total equity than partial goodwill.
ROA and ROE will be lower if full goodwill method is used.

Method 3.3.22. *Investor Balance Sheet Impact: Acquisition Method*

$$\begin{aligned}\text{End current assets} &= \text{Beginning current assets} + \text{acquiree current assets} - \text{acquisition cash fee}\\ \text{End current liabilities} &= \text{Beginning current liabilities} + \text{acquiree current liabilities}\\ \text{Minority Interest in Equity} &= \%\text{ share of NCI} \times \text{Subsidiary equity}\end{aligned}$$

Method 3.3.23. *Investor Income Statement Impact: Acquisition Method*

$$\begin{aligned}\text{End revenue} &= \text{Beginning revenue} + \text{acquiree revenue}\\ \text{End expenses} &= \text{Beginning expenses} + \text{acquiree expenses}\\ \text{Minority Interest} &= -\%\text{ share of NCI} \times \text{acquiree net income}\end{aligned}$$

Acquisition method results in higher revenue and expenses, but net income is the same.

Method 3.3.24. *Goodwill Impairment*

i. IFRS: At acquisition, total goodwill recognised is allocated to each of acquirer's cash generating units (lowest level within combined entity monitored for impairment purposes) that will benefit from expected synergies due to the combination with the target.
Impairment testing under one-step approach: If recoverable amount $<$ carrying value of cash-generating unit, then impairment loss is recognised.

$$\text{Impairment Loss} = \text{Carrying value of unit} - \text{Recoverable amount of unit}$$

Impairment loss is first applied to goodwill allocated to cash-generating unit; if reduced to zero, remaining amount allocated to other non-cash assets in the unit on pro-rata basis.

ii. GAAP: At acquisition, total goodwill allocated to each of acquirer's reporting units (operating segment or component of operating segment that is one level below operating segment as a whole).
Impairment testing under two-step approach:

1. If fair value $<$ carrying value of reporting unit (with goodwill), potential impairment identified.

$$\text{Implied goodwill} = \text{Fair value of unit} - \text{Fair value of unit identifiable net assets}$$

2. Impairment loss is difference between carrying value of goodwill and implied fair value of goodwill.

$$\text{Impairment loss} = \text{Carrying value of goodwill} - \text{Implied goodwill}$$

Impairment loss then applied to goodwill allocated to reporting unit; if reduced to zero, no other adjustment made to carrying value of any of reporting unit's other AnL. Prudent to test other asset values for recoverability and possible impairment.

IFRS and GAAP: impairment loss is recorded as separate line item in IS.

3.3.4 Joint Ventures: Equity Method, Consolidation Method

Remark 3.3.25. *Purpose of Joint Ventures (JV)*
For entering foreign markets, conduct specialised activities, engage in risky projects.
May be primarily contractual relationships or common ownership of assets.
Can be partnerships, LLCs (corps) or other legal forms (unincorporated associations).
IFRS identify the characteristic of JVs as follows: a contractual agreement exists between two or more venturers, and the contract establishes joint control.

Method 3.3.26. *Equity Method vs Consolidation Method*

i. Proportional consolidation: require venturer's share of assets, liabilities, income, expenses of JV to be combined or show on line-by-line basis with similar items under its sole control.
ii. Equity method: line item 'equity in income of JV' on IS, line item 'investment in JV' on BS.

Proportionate consolidation results in higher AnL, but stockholder's equity and net assets is the same. Proportionate consolidation also results in higher revenues and expenses, but net income is the same.

3.3.5 Special Purpose Entities, Variable Purpose Entities

Remark 3.3.27. *Purpose of Special Purpose Entities (SPEs)*
Sponsor transfers assets to SPE, obtains right to use assets held by SPE, or perform services for the SPEs. Third party provide funding to the SPE.
Third party interest may take form of debt, equity, participation right, or residual interest in a lease. Sponsor retains significant beneficial interest, even if it may own little or none of SPE's voting equity.
For segregation of certain activities, hence reduce risk and lower cost of financing.
Typically structured such that sponsor has control over SPE finances or operating activities, and third parties have controlling interest in SPE equity.

Remark 3.3.28. *IFRS Sponsor Control of SPEs*
IFRS require consolidation if there is sponsor control, where:

i. Investor has ability to exert influence on financial and operating policy of entity.
ii. Investor is exposed, or has rights to variable returns from involvement with entity.

SPEs involved in structured financial transaction will require evaluation of the purpose, design and risks.

Definition 3.3.29. *Primary Beneficiary*
The party that will absorb the majority of SPE expected losses, receive the majority of SPE expected residual returns, or both.

Remark 3.3.30. *GAAP Classification of SPE as VIE*
VIE includes other entities besides SPEs. Classifies SPE as VIE if one of the conditions is met:

i. Total equity at risk insufficient to finance activities without financial support from other parties; or
ii. Equity investors lack one of the following:
    1. Ability to make decisions
    2. Obligation to absorb losses
    3. Right to receive returns

Method 3.3.31. *GAAP Consolidation for SPEs and VIEs*

i. SPEs: Require primarily beneficiary to consolidate the SPE regardless of its voting interest in the SPE, or its decision-making authority.
Two-component consolidation: variable interest component and voting interest (control) component.

ii. VIEs: Primary beneficiary of VIE must consolidate it as subsidiary regardless of how much equity the beneficiary has in VIE. The entity absorbing majority of losses must consolidate the VIE if another entity receive majority of VIE's expected residual returns. Entities must disclose relationship with VIE even if not the primary beneficiary.
Non-controlling interests in the VIE must be shown on the consolidated BS and IS of primary beneficiary.

3.3.6 Issues that Impair Comparability

Remark 3.3.32. *Contingent Assets and Liabilities*

i. IFRS: contingent assets are never recognised.
Contingent liabilities whose fair value can be measured reliably are recognised at time of acquisition. Subsequently, contingent liabilities measured at the higher of value initially recognised or best estimate of amount needed to settle.

ii. GAAP: Contractual contingent AnL recorded at fair value at date of acquisition. Non-contractual contingent AnL also recorded if 'more likely than not' they meet the definition of an asset or liability.
Subsequently, contingent liabilities are measured at higher of amount initially recognised, or best estimate of amount of the loss. Contingent assets are measured at lower of acquisition date fair value or best estimate of the future settlement amount.

Remark 3.3.33. *Contingent Consideration*
If terms of acquisition involve contingent consideration, this is recognised at fair value under both IFRS and GAAP as an asset, liability, or equity.
Subsequent changes in fair value are recognised in income statement, unless value was originally classified in equity (any changes settle within equity and not on IS).

Remark 3.3.34. *In-Process R&D*
In-Process R&D is capitalised as separate intangible asset, measured at fair value (if can be measured reliably). In subsequent periods, this is subject to amortisation if fully completed, or impairment if no product results or if product is not technically and/or financially viable.

Remark 3.3.35. *Restructuring Costs*
IFRS and GAAP do not recognise restructuring costs. This is recognised as an expense in the periods the restructuring costs are incurred.

Remark 3.3.36. *Choice of Accounting Method on BS and IS Items*

i. Net Income: same for all three methods

ii. Equity: Equity method and proportionate consolidate has same equity. Acquisition method equity will be higher by amount of minority interest.

iii. Assets and Liabilities: highest under acquisition method, lowest under equity method.

iv. Revenues and Expenses: highest under acquisition method, lowest under equity method.

	Equity	Prop Cosol	Acquisition
Net Profit Margin	Higher (sales lower, net income same)	In-Between	Lower
ROE	Higher (equity lower, net income same)	Same as equity method	Lower
ROA	Higher (net income same, assets lower)	In-Between	Lower

3.4 Employee Compensation

Category	Definition	Common Examples
Short-Term Benefits	Compensation expected to be paid within 12 months	• Salaries and wages • Annual bonuses • Non-monetary benefits i.e., medical care • Contributions to social security schemes • Paid leave
Long-Term Benefits	Compensation expected to be paid after 12 months	• Long-term paid leave i.e., sabbatical • Long-term disability benefits
Termination Benefits	Compensation paid during employee termination	• Severance • Continued access to medical and other non-monetary benefits • Career counselling, outplacement services
Share-Based Compensation	Compensation in form or, or in reference to, shares of employer stock	• Restricted stock • Stock options
Post-Employment Benefits	Compensation expected to be paid after employee retirement	• Pension and lump sum payments to retirees • Retiree life insurance, medical care

Remark 3.4.1. *Employee Compensation Underlying Principle*
Recognize compensation costs at fair value in the period that the employee provides services, typically the same period that compensation vests.

	Short-Term Benefits	Share-Based Compensation	Post-Employment Benefits
Typical Vesting Period	Days or weeks	Years	Years, decades
Form of Payment	Cash	Shares[1]	Cash
Amount Recognised Over Vesting Period	Undiscounted salary, wage, etc.	Fair value on grant date	Present value of estimated future benefits

1. Some companies pay share-based compensation settled in cash, which is accounted for like short-term benefits.

3.4.1 Short-Term Benefits Compensation

Method 3.4.2. *Short-Term Benefits Recognition*

i. Compensation expense and corresponding current liability recognised as compensation vests. At settlement, cash is paid (as outflow in CFO), liability de-recognised.

ii. If compensation expenses are capitalised as an asset (expense on IS deferred to when employee service is consumed), costs are capitalised to inventories, then later expensed as COGS.

Remark 3.4.3. *Short-Term Benefits*

i. Income Statement: Vesting period - 'general and administrative expense' with salary for the period

ii. Balance Sheet: Vesting period - 'accrued compensation' with salary for the period
Settlement date - 'accrued compensation' reverses with salary for the period (negative value)

iii. Cash Flow Statement: Settlement period - 'CFO' reverses with salary for the period (negative value)

Remark 3.4.4. *Short-Term Benefits Tied to Inventory*

i. Income Statement: Sale date - if good tied to salary sold, 'cost of sales' increase by salary

ii. Balance Sheet: Vesting period - 'inventory' and 'accrued compensation' both increase by salary
Settlement date - 'accrued compensation' decrease by salary
Sale date - 'inventories' decrease by salary

iii. Cash Flow Statement: Settlement period - 'CFO' decrease by salary

3.4.2 Share-Based Compensation

Method 3.4.5. *Share-Based Compensation Recognition*
Offsetting entry for compensation expense is equity on BS.
Single grant affects financial statements over period of vesting.
Fair value used as measurement on grant date.

Instrument	Other Names	Description
Restricted Stock	• Restricted stock awards • RSUs • Performance shares/units	Awards of shares or share-like units with sale and other restrictions that are lifted upon vesting.
Stock Options	• Share options	Awards of non-tradable call options, typically at the money, on the employer stock.
Stock Appreciation-Based	• Stock appreciation rights • Phantom shares	Awards of cash or shares based on performance of shares over a period
Stock Purchase-Based	• Employee stock purchase plan • Employee stock ownership plan	Permits employees to purchase a limited number of newly issued shares at a discount.

Definition 3.4.6. *Stock Options*
Non-tradable. Compensation expense based on fair value of option on grant date.

i. Income Statement: compensation expense amortised on straight line over vesting period.

ii. Balance Sheet: compensation expense decrease net income and retained earnings. Offsetting entry an increase in share-based compensation reserve (part of equity), hence no change to total equity.

Fair value of option based on observable market price of similar option. Else, may use an option-pricing model. Companies required to disclose assumptions used (i.e., grant date, stock price, maturity, exercise price, risk-free rate), and implied volatility of the option.

Definition 3.4.7. *Conditional Grants and Stock Grants*

i. Restricted stock: requirements that must be met before stock can be sold. May have:

   1. Service condition: specifies number of year years of employment needed before options or stock vest
   2. Performance condition: grant vests upon achievement of a specific target
   3. Market condition: target is based on a market metric.

$$\text{Stock Grant Value} = \text{Stock Value on Grant Date} \times \text{Number of Shares Granted}$$

   Performance shares are performance-based restricted stocks.

ii. Restricted stock units (RSUs): instruments that represent right to receive shares. No voting rights, dividends, not tradable. Preferred over stock options as hey accrue value if stock price is above zero, are simpler for individual tax calculations, and have no exercise price outlays.
For RSU, stock price is reduced by estimated present value of dividends expected during vesting period.

On settlement, value of stock transferred out of share-based compensation reserve, allocated to common stock and paid-in-capital. For option grants, on exercise, there is a cash inflow from strike price reported as cash inflow for financing activity in the cash flow statement.

Timing for share-based compensation tax:

	Financial Reporting	Tax Return Deduction
Timing	Over the vesting period	At settlement
Amount	Grant-date fair value	• RSUs: Share price on the settlement date • Options: Intrinsic value at exercise

Remark 3.4.8. *Share-Based Compensation for Tax Purposes*
Compensation expense based on stock price on grant date for both option and stock grants.
Tax deduction for stock-based compensation only allowed upon settlement.

$$\begin{aligned}\text{Tax deduction for stock grants} &= \text{share price on settlement date} \times \text{number of shares vested} \\ \text{Tax deduction for options} &= \text{intrinsic value on settlement date} \times \text{number of options vested} \\ &= (\text{stock price on settlement date} - \text{strike price}) \times \text{number of options}\end{aligned}$$

Remark 3.4.9. *Share-Based Compensation on Tax Rates*
Higher share price at settlement results in higher tax deduction than cumulative stock-based compensation expense, resulting in excess tax benefit.

i. IFRS: recognised in equity, hence have more stable effective tax rates

ii. GAAP: recognised in income tax expense on IS, results in volatility in effective tax rate. May cause large differences between issuer effective and statutory tax rates.

Condition	IFRS	GAAP
Share price on settlement date > grant date (excess tax benefit or tax windfall)	Gain recognised directly in shareholder equity	Decrease in income tax expense on income statement
Share price on settlement date < grant date (tax shortfall)	Loss recognised directly in shareholder equity	Increase in income tax expense on income statement

Method 3.4.10. *Treasury Stock Method*
Treasury stock method adds 'net' amount of potentially dilutive securities (i.e., unvested RSUs) to basic shares outstanding. Proceeds from exercise or conversion of potentially dilutive securities assumed to repurchase shares at the average share price for the reporting period.

$$\text{Basic shares outstanding} + \text{Shares from conversion} - \text{Number of treasury shares} = \text{Diluted shares outstanding}$$

Performance shares vested based on period of service are considered dilutive if stock price has not declined substantially. Expectations about vesting of shares based on other performance metrics is more subjective.
Unvested options that are in-the-money are considered dilutive.
RSUs and restricted stock grants are anti-dilutive only if current stock price is significantly less than price on grant date (unrecognised compensation expense per share higher than current market price).
Rapid increase in share price can result in more dilution.

$$\begin{aligned}
\text{Number of treasury shares} &= \frac{\text{Assumed proceeds}}{\text{Average share price during reporting period}} \\
\text{Assumed proceeds} &= \text{Cash proceeds} + \text{Average unrecognised share-based compensation expense} \\
\text{Cash proceeds} &= \text{Number of options} \times \text{Exercise price} \\
\text{Share-based compensation expense} &= \text{Unvested awards} \times \text{Grant-date fair value}
\end{aligned}$$

where 'Average unrecognised share-based compensation expense' is the average of last two period-end values of amortised amounts of share-based expense. Cash proceeds is zero for stock grants.
Method nets number of hypothetically repurchased shares against total number of potentially dilutive securities.
Diluted EPS cannot exceed basic EPS; companies that report net loss will report same basic and diluted shares.

Remark 3.4.11. *Anti-Dilutive Securities for Treasury Stock Method*
Two cases where anti-dilutive securities should be added to diluted shares outstanding for valuation:

i. Companies with net loss. As diluted EPS cannot exceed basic EPS, companies will report equal amount of basic and diluted shares outstanding. Be alert to unprofitable companies that use significant amounts of share-based compensation.
ii. Companies with large share price declines, or volatile share price.

Remark 3.4.12. *IFRS Share-Based Compensation Disclosures*

i. Nature and extent of compensation arrangement
ii. How the fair value of equity granted during the period was determined
iii. Effect on company's net income during the period and on financial position

Remark 3.4.13. *Forecasting Share-Based Compensation*

i. Income Statement: typically not a discrete line item.
If an operating expense item share drivers and/or includes some share-based compensation, then separation of compensation expenses is not required for forecasting purposes.
Else, first subtract amounts attributable to compensation from each relevant category, then forecast individual expenses as proportion of revenues (based on historical trends), finally forecast this separately.
Use historical data, management guidance, assumptions on reversion to industry mean to forecast.
ii. Cash Flow Statement: compensation to be added back to net income to arrive at CFO. Expected cash inflow from option exercise should be reflected in CFF.

Remark 3.4.14. *Forecasting Shares Outstanding*

i. Unvested Grants: use diluted number of shares outstanding as reported.
ii. Future grants: discount estimated value of equity by a dilution factor, or by estimating an increase in number of shares outstanding.
iii. Settlement of Awards: based on growth rates of historical values, or by assuming that a percentage of outstanding awards settles each period.

Basic $\text{shares}_{\text{Begin}}$ + RSU vested, options exercised + shares from secondaries, acquisitions − share repurchase = Basic $\text{shares}_{\text{End}}$

Diluted shares = Basic $\text{shares}_{\text{End}}$ + Number of diluted securities

Option exercises will affect CFS and BS, as cash is received from exercises. RSU vesting does not materially affect financial statements.

Remark 3.4.15. *Valuation Considerations*
Valuation model needs to be modified to account for effect of:

i. Dilution from outstanding but unvested share-based awards.
May use diluted shares outstanding to compute per-share value.
Alternatively, may use basic shares outstanding add gross amount of potentially dilutive securities (including share-based awards) as the share count instead.

ii. Dilution from future share-based awards.
In DCF valuation, to deduct share-based compensation from FCF.
Alternatively, reduce equity value by an estimation dilution factor or increasing share count by additional amount. Method is more time consuming, should deliver same result.

Remark 3.4.16. *Comparison of Companies with Compensation*
As share-based compensation is non-cash, companies with higher non-cash compensation will report higher FCF and any other CF measure.
Ratios using CF measures in relative valuation ma hence be misleading when there are significant differences in compensation structure across companies.

3.4.3 Post-Employment Compensation

Definition 3.4.17. Pension Arrangements

i. *Defined Contribution (DC)*: employer contributes certain sum each period to employee retirement account.
Contribution based on factors such as years of service, age, compensation, profitability, percentage of employee contribution.
No promises made to employee on future value of plan assets.
Investment decisions left to employee.

ii. *Defined Benefit (DB)*: employer promises lump sum or periodic payment to employee after retirement.
Periodic payment based on years of service, compensation at retirement.
As employee future benefit is predetermined, employer bears all investment risk.
Employers required to pre-fund DB plans by setting aside assets in a separate legal entity, and make contributions to plan assets to meet minimum funding levels or on discretionary basis.
Employer contributions are tax deductible; company may make contributions only in years when it has positive taxable income.

iii. *Other Post-Employment Benefits (OPEB)*: healthcare for retirees etc.

Benefit	Benefit Amount	Employer Obligation	Pre-Funding
DC	• Future benefit amount not defined • Actual future benefit depend on contributions and investment performance of plan assets • Investment and actuarial risks borne by employee	• Amount of obligation defined in each period • Contribution made on periodic basis with no future obligation	Not applicable
DB	• Amount of future benefit defined based on plan's formula • Investment and actuarial risks borne by employer	• Amount of future obligation based on plan formula, must be estimated in current period	• Funded by contributing funds to pension trust • Regulatory funding requirements vary by country
OPEB	• Amount of future benefit depends on plan specs, type of benefit • Investment and actuarial risks borne by employer	• Eventual benefits are specified • Amount of future obligation to be estimated now	• Typicall not funded

Method 3.4.18. *Defined Contribution Accounting Process*

i. Grant: estimate un-discounted value of plan contribution for the period

ii. Vesting: recognise plan contributions as compensation expense and accrued compensation liability over vesting period. Adjust or reverse entries if needed for changes in estimates

iii. Settlement: employer makes contribution to plan. Accrued compensation liability is disrecognised.

Method 3.4.19. *Defined Contribution on Financial Statements*

i. Balance Sheet: current liability for vested but not-yet-settled contributions

ii. Income Statement: plan contributions recognised within operating expense category

iii. Cash Flow Statement: cash outflow in CFO

Remark 3.4.20. *Pension Expense*
Pension expense does not include employer contributions to plan and settlement of benefits. It is non-cash accrual based on change in net pension liability/asset.

Definition 3.4.21.
The *Projected Benefit Obligation (PBO)* is the actuarial value (at assumed discount rate) of all future pension benefits earned to date, based on expected future salary increases.
Measures value of obligation, assuming going concern, and employee will work for firm until retirement.
Discount rate for present value computation is typically yield on investment-grade corporate bonds.

Definition 3.4.22. *Funded Status of Plan*
Funded status = Fair value of plan assets − PBO

i. Overfunded: if plan assets exceed pension obligation. Reported on BS as net pension asset.

ii. Underfunded: If pension obligation exceeds plan assets. Reported on BS as net pension liability.

Definition 3.4.23.
Current service cost is present value of benefits earned by employees during current period.
Represent increase in PBO that results from employees working one more period.
Income Statement: recognised 'above the line' (before EBIT).

Definition 3.4.24.
Past service cost is plan amendments made retroactively.
PBO immediately increased by present value of increased benefits already earned. Beginning PBO is understated by the amount of past service cost.

i. IFRS: past service costs are recognised in PnL immediately and not amortised

ii. GAAP: reported as part of OCI, amortised over average service life of affected employees

Definition 3.4.25. *Interest Costs*

i. IFRS: Net interest income/expense = (Beginning funded status − Past service cost) × Discount rate
Income Statement: recognised below operating income, with other financing costs.

ii. GAAP: Interest cost = (Beginning BPO + Past service cost) × Discount rate
Income Statement: recognised in interest expense below operating income line.

If resulting amount is negative (underfunded), expense is reported. If positive, report as net interest income.

Definition 3.4.26. *Expected Return on Plan Assets*
Employer contributes assets to a trust to satisfy pension obligation in the future.
Expected return on plan assets has no effect on PBO or fair value of plan assets; this is used as offset for computation of reported pension expense.

$$\text{Expected return on plan assets} = \text{Expected rate of return} \times \text{Fair value of plan assets at beginning of period}$$

Expected rates of return to be based on historical asset return and plan's asset allocation.
Difference between expected and actual return is combined with other items related to changes in actuarial assumptions into 'actuarial gains and losses' account.

i. GAAP: Expected return is offset in earnings.

ii. IFRS: Expected rate of return on plan assets is assumed to be same as discount rate, and is netted against interest cost and a net interest cost/income is reported.

Definition 3.4.27. *Actuarial Gains and Losses (GnL)/Re-measurements*
Two components within actuarial gains and losses:

i. Gains and losses due to decrease or increase in PBO caused by changes in actuarial assumptions

ii. Difference between actual and expected return on plan assets

Actuarial gains and losses are recognised in OCI.

i. IFRS: Actuarial gains and losses are never amortised

ii. GAAP: Actuarial gains and losses are amortised using corridor approach

Method 3.4.28. *GAAP: Corridor Approach*
Cumulative unrecognised actuarial gains and losses $> 10\% \times \max(\text{pension obligation, fair value of plan assets})$, then the excess amount is amortised over expected average remaining working lives of employees in the plan. Amortisation of actuarial gain reduces pension cost, while amortisation of a loss reduces pension cost.

Method 3.4.29. *Defined Benefits: Benefit Obligation*

$$\begin{aligned}\text{Periodic pension cost} &= \text{Employer contributions} - (\text{Ending funded stats} - \text{Beginning funded status}) \\ &= (\text{Current} - \text{Past service cost}) + \text{Interest expense} - \text{Asset actual return} + \text{Actuarial GnL} \\ \text{End benefit obligation} &= \text{Begin benefit obligation} + \text{Service and interest cost} - \text{Benefits paid} + \text{Actuarial GnL} \\ \text{End asset fair value} &= \text{Begin asset fair value} + \text{Asset actual return} + \text{Employer contribution} - \text{Benefits paid}\end{aligned}$$

Component	GAAP	IFRS
Current service cost	Income statement	Income statement
Past service cost	OCI, amortised over service life in subsequent years	Income statement
Interest cost	Income statement	Income statement[1]
Expected return	Income statement	Income statement[1]
Actuarial GnL	Amortised portion in income. Unamortised in OCI	All in OCI - not amortised

1. IFRS: expected rate of return on plan assets equals discount rate, and net interest expense/income is reported.

Method 3.4.30. *IFRS Periodic Pension Cost (Income Statement)*

$$\begin{aligned}\text{Periodic pension cost} &= (\text{Current} + \text{Past service cost}) + \text{Net interest expense or income} \\ \text{Net interest expense or income} &= \text{Discount rate} \times (\text{Beginning BPO} - \text{Beginning plan assets})\end{aligned}$$

Method 3.4.31. *GAAO Periodic Pension Cost (Income Statement)*

$$\begin{aligned}\text{Periodic pension cost} &= \text{Current service cost} + \text{Amortised past service cost} + \text{Interest expense} \\ &\quad - \text{Asset expected return} + \text{Amortised actuarial GnL} \\ \text{Interest expense} &= \text{Discount rate} \times \text{Beginning BPO} \\ \text{Asset expected return} &= \text{Expected rate of return} \times \text{Beginning plan assets}\end{aligned}$$

Definition 3.4.32. *IFRS Required Disclosures - IAS 19*
DC Plans: disclose amount recognised as expense in notes to financial statements as part of note titled 'Employee Compensation', 'Post-Employment Benefits' or similar.
DB Plans: required to make following disclosures:

i. disclose main characteristics of plan and risks involved,

ii. identify and explain the figures in financial statements arising from them

iii. describe the amount, timing, and uncertainty of future cash flows

Assumption	Net Pension Liability (Asset)	Periodic Pension Cost/Expense
Higher discount rate	Lower obligation	Pension cost and expense will both be lower because of lower opening obligation and lower service costs
Higher rate of compensation increase	Higher obligation	Higher service and interest cost will increase periodic costs and expense
Higher expected return on plan assets	No effect, as fair value of plan assets are used on BS	• IFRS: Not applicable • GAAP: No effect on cost, lower expense

Method 3.4.33. *Analysis of Post-Employment Benefits*
Compare the assumptions (in footnotes) over time and across firms to assess quality of earnings.

Aggressive accounting choices (reduce pension expense and PBO) include low life expectancy of plan beneficiaries, low future inflation, low salary growth rate, and high discount rate.
For GAAP, assuming higher expected rate of return on plan assets reduces reported pension expense, but does not affect the PBO or future value of plan assets.

Method 3.4.34. *DC Plans Financial Modelling*
Implicitly done by making operating expense forecasts.
Cash flows well matched with recognised expense.
Balance sheet limited to accrued liabilities already forecasted using working capital ratios.

Method 3.4.35. *DB, OPEB Plans Financial Modelling*
Model service cost, net interest expense/income, re-measurements, future contributions.
Valuation must account for 2 impacts:

i. Plan's funded status, either a net liability or net asset.
   For underfunded plan, the liability is included in debt, and to be deduced during EV calculation. Overfunded plan is ignored in valuation.

ii. Future service costs are not included in plan's funded status.
   However, to still deduct this cost from FCF in a DCF. Net interest expense/income not to be included in DCF as it represents unwinding of discounted pension obligation. Valuation is done on PV basis. The PV of underfunded pension is already considered by deducting the net pension liability from EV.

3.5 Multinational Operations

Remark 3.5.1. *Foreign Currency on MNC*

i. MNC may engage in business transactions denominated in foreign currency

ii. MNC may invest in subsidiaries that maintain their books and records in foreign currency

Definition 3.5.2. Currency Types

i. *Local Currency*: currency where the company operates.

ii. *Functional Currency*: currency of the primary economic environment in which the entity operates. The currency in which the entity generates and expends cash. May be in local currency or some other currency.

iii. *Presentation Currency*: currency in which the parent company prepares its financial statements.

Transaction	Type of Exposure	Foreign Curr Strengthen	Foreign Curr Weaken
Export sale	Asset (account receivable)	Gain	Loss
Import purchase	Liability (Account payable)	Loss	Gain

Remark 3.5.3. *Exposure to Transaction Exposure*
Transaction exposure are related to imports and exports:

i. Import Purchase: importer pay in foreign currency and allowed to defer payment. Exposed to risk that foreign currency appreciate, increasing functional currency amount required to acquire foreign currency.

ii. Export Sale: exporter paid in foreign currency and allowed payment to be deferred. Exposed to risk that foreign currency depreciate, decreasing functional currency which the foreign currency can be converted.

Definition 3.5.4. *Foreign Currency Risk*
Risk arises only when transaction date and payment date are different.
If balance sheet date occurs before transaction is settled, foreign currency gain and loss are recognised on IS. Subsequent gains and losses are recognised from BS date through the settlement date. Adding gain and losses for both accounting periods produces amount equal to actual realised gain or loss on foreign currency transaction.

Remark 3.5.5. *Disclosure of Transaction Gains and Losses*
IFRS, GAAP do not require disclosure of where such gains and losses would be recorded. Typically placed as:

i. a component of other operating income/expense; or

ii. a component of non-operating income/expense; or

iii. as part of net financing cost

Operating profit margin is then affected by where the gain and loss is placed.

3.5.1 Translation of Foreign Currency Financial Statements

Method 3.5.6. Methods to remeasure or translate financial statements are as follows:

i. *Re-measurement*: converting local currency into functional currency using temporal method

ii. *Translation*: converting functional currency into parent presentation currency with current rate method.

The method chosen is determined by functional currency relative to parent presentation currency.

Method 3.5.7. *IFRS on Deciding on Functional Currency*

i. Currency mainly influences sales prices for goods and services

ii. Currency of country whose competitive forces and regulations mainly determine the sales price of its goods and services

iii. Currency that mainly influences labour, material, and other costs of providing goods and services

iv. Currency in which funds from financing activities are generated

v. Currency in which receipts from operating activities are usually retained.

To determine in whether the foreign entity functional currency is same as parent functional currency:

i. If the activities of foreign operation are an extension of parent, or are autonomous

ii. If transactions with parent is large or small proportion of foreign entity activities

iii. If CF generated by foreign entity directly affect CF of parent and are available to be remitted to parent

iv. If operating CF generating by foreign operations are sufficient to service existing and normally expected debt; or whether the foreign entity will need funds from the parent to service its debt

Method 3.5.8. *Determining Appropriate Translation Method*

i. Current Rate Method: Functional Currency $\neq$ Presentation Currency.
Translation involves self-contained, independent subsidiaries whose operating, investing, and financing activities are decentralised from the parent.

ii. Temporal Method: Functional Currency = Presentation Currency.
Re-measurement occurs when subsidiary is well integrated with the parent.

iii. Monetary/Non-Monetary (Mixed) Method: Local Currency $\neq$ Functional Currency $\neq$ Presentation Currency.
Temporal method used to remeasure from local currency into functional currency, then current rate method used to translate functional currency into presentation currency.

iv. Hyper-inflationary Environment:

1. IFRS: subsidiary financial statements restated for inflation, translated using current exchange rate
2. GAAP: functional currency considered to be parent's presentation currency, temporal method used

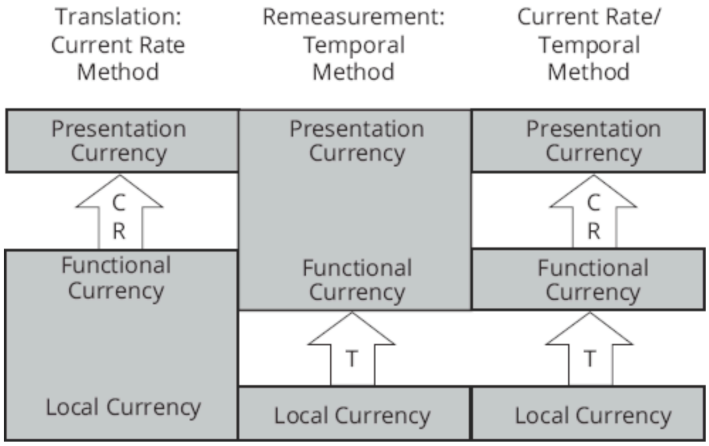

Figure 5: Translation and re-measurement methods

Definition 3.5.9.

i. *Current Rate*: exchange rate on balance sheet date

ii. *Average Rate*: average exchange rate over reporting period

iii. *Historical Rate*: actual rate in effect when original transaction occured

Remark 3.5.10. *Temporal Method on Inventory and COGS*

i. FIFO: ending inventory remeasured based on more recent rates. However, COGS consists of costs that are older; hence exchange rates used to remeasure COGS are older.

ii. LIFO: ending inventory remeasured based on older costs. However, COGS consists of costs from most recently purchased goods; hence COGS is remeasured based on more recent exchange rates.

iii. Weighted-Average: ending inventory and COGS remeasured with weight-average exchange rate

Remark 3.5.11. *Temporal Method Overview*
Translation adjustment needed to keep translated BS in balance is reported as gain or loss in net income (GAAP: re-measurement gains and losses).
Method results in either net asset or net liabilities (if exposed asset greater than or less than liabilities).

Remark 3.5.12. *Current Rate Method Overview*
Entire investment in foreign entity is exposed to translation gain or less. Hence all assets and liabilities must be revalued at each BS date. Net translation gain and loss is unrealised except when entity is sold; this is cumulated and deferred on BS as separate component of stockholder equity.
Method results in net asset BS exposure (as total assets greater than total liabilities).

Translation Item	Current Rate	Temporal
Assets		
Monetary (e.g., cash, receivables)	Current rate	Current rate
Non-monetary		
• measured at current value (marketable securities etc.)	Current rate	Current rate
• measured at historical costs (PPE, intangibles etc.)	Current rate	Historical rate
Liabilities		
Monetary (accounts payable, accrued expenses, LT debt, deferred income taxes)	Current rate	Current rate
Non-monetary		
• measured at current value	Current rate	Current rate
• Not measured at current value (e.g., deferred revenue)	Current rate	Historical rate
Equity		
Other than retained earnings	Historical rate	Historical rate
Retained earnings	Historical rate[1]	Historical rate[1]
Revenues and SG&A	Average rate	Average rate
Expenses		
Most expenses	Average rate	Average rate
Expenses related to assets translated at historical rates (i.e., COGS, depreciation, amortisation)	Average rate	Historical rate
Translation adjustment on parent financial statement	Equity[2]	Net Income GnL
Common Stock	Historical rate	Historical rate
Cost of Goods Sold	Average rate	Historical rate
Depreciation and Amortisation	Average rate	Historical rate
Net Income	Average rate	Mixed rate
Equity (as a whole)	Current rate	Mixed rate
Exposure	Net assets	Net monetary assets

1. Beginning balance plus translated net income less dividends translated at historical rate
2. Accumulated as separate component of equity

Remark 3.5.13. *Translation Adjustments*

BS Exposure	Local Currency Appreciates	Local Currency Depreciates
Net Assets	Positive	Negative
Net Liabilities	Negative	Positive

Cumulative translation adjustment is used to keep translated BS in balance; this is sum of translation adjustments over successive accounting periods.

Remark 3.5.14. *Exposure to Changing Exchange Rates*

i. Current Rate Method: exposure is the net asset position of subsidiary (if assets exceeds its liabilities).
If subsidiary has net asset exposure, and local currency is appreciating, a gain is recognised.
A net asset exposure in depreciating environment will result in a loss.
Firm with net liability position is unusual; most firm can't survive very long in this scenario.

ii. Temporal method: Only monetary assets and liabilities exposed to changing rates.
If monetary liabilities exceed monetary assets, firm has net monetary liability exposure. Net monetary liability exposure (NMLE) when foreign currency is appreciation results in a loss.
Net monetary liability exposure coupled with depreciating currency will result in a gain.
Firms may limit exposure by balancing monetary assets and monetary liabilities.

Method 3.5.15. *Translation of Retained Earnings*
At end of first year, foreign currency (FC) retained earnings (R/E) are translated into parent currency (PC):

Net income in FC	[Translated with method used to translate IS]	= Net income in PC
− Dividends in FC	× Exchange rates when dividends declared	= − Dividends in PC
R/E in FC		R/E in PC

Retained earnings in PC at end of first year become beginning retained earnings in PC for second year. The retained earnings in second and subsequent years are calculated as follows:

Beginning R/E in FC	[From last year's translation]	→ Beginning R/E in PC
+ Net income in FC	[Translated with method used to translate IS]	= + Net income in PC
− Dividends in FC	× Exchange rates when dividends declared	= − Dividends in PC
End R/E in FC		End R/E in PC

Remark 3.5.16. *Currency Exchange Rate Movement on Financial Statements*

	Temporal, NMLE	Temporal, NMAE	Current Rate
Foreign Appreciation	• ↑ Revenues • ↑ Assets • ↑ Liabilities • ↓ Net Income • ↓ Shareholder's equity • Translation loss	• ↑ Revenues • ↑ Assets • ↑ Liabilities • ↑ Net Income • ↑ Shareholder's equity • Translation gain	• ↑ Revenues • ↑ Assets • ↑ Liabilities • ↑ Net Income • ↑ Shareholder's equity • + Translation Adjust
Foreign Depreciation	• ↓ Revenues • ↓ Assets • ↓ Liabilities • ↑ Net Income • ↑ Shareholder's equity • Translation loss	• ↓ Revenues • ↓ Assets • ↓ Liabilities • ↓ Net Income • ↓ Shareholder's equity • Translation gain	• ↓ Revenues • ↓ Assets • ↓ Liabilities • ↓ Net Income • ↓ Shareholder's equity • − Translation Adjust

Remark 3.5.17. *Current Rate Method on Financial Ratios*
Let pure ratios be ratios consisting of components from a single financial statement, i.e., BS only, IS only.

i. Pure balance sheet and pure income statement ratios unaffected (local currency trends are preserved)

ii. If foreign currency is depreciating (appreciating), translated mixed ratios (with IS item in numerator, end-of-period BS item in denominator) will be larger (smaller) than original ratio.

Method 3.5.18. *Procedure for Analysis of Choice of Method on Ratio*

i. Determine whether the foreign currency is appreciating or depreciating

ii. Determine the rate (historical, average, or current) used to convert the numerator under both methods. Determine if the numerator of the ratio will be same, larger, or smaller under both methods.

iii. Determine the rate (historical, average, or current) used to convert the denominator under both methods. Determine if the denominator of the ratio will be same, larger, or smaller under both methods.

iv. Determine whether the ratio will increase, decrease, or stay the same based on direction of change in numerator and denominator.

3.5.2 Hyper-Inflationary Economy

Definition 3.5.19. *Hyper-Inflationary Environment*
Economy where cumulative inflation is approaching or is over 100% in three-year period.

Method 3.5.20. *Reporting in a Hyper-Inflationary Environment*

i. IFRS:

1. BS monetary assets and monetary liabilities not restated
2. BS non-monetary assets and non-monetary liabilities restated for inflation using price index. As non-monetary items are carried at historical cost, multiply original cost by change in price index for the period between acquisition date and balance sheet date.
3. BS components of shareholder's equity (other than retained earnings) restated by applying change in price index from beginning of period or date of contribution if later
4. BS retained earnings will be residual figure that balances the balance sheet
5. IS items restated by multiplying change in price index from the date the transactions occur
6. IS net purchasing power gain or loss recognised based on the net monetary asset or liability exposure.
   Holding monetary assets during inflation results in purchasing power loss.
   Holding monetary liabilities during inflation results in purchasing power gain.
   This forces net income to be same as net income that was residual in statement of retained earnings.

Once subsidiary's financial statements are adjusted for inflation, these are translated into parent reporting currency using current exchange rate.

ii. GAAP: Temporal method used. Require foreign entity financial statements to be remeasured as if functional currency were the reporting currency.

Remark 3.5.21. *Inflation Method vs Temporal Method*

i. Under temporal method, monetary assets and liabilities are exposed to changing exchange rates.
In inflation method, the monetary assets and liabilities are exposed to risk of inflation.

ii. Purchasing power GnL analogous to exchange rate GnL when foreign currency is depreciating.

iii. Re-measurement GnL is recognised in IS, as is net purchasing power GnL from inflation.

3.5.3 Disclosures for Multinational Operations

Remark 3.5.22. *Disclosures on Translation Method*
IFRS and GAAP require two types of disclosures:

i. amount of exchange differences recognised in net income; and

ii. amount of cumulative translation adjustment classified in a separate component of equity, along with reconciliation of amount of cumulative translation adjustment at the beginning and end of the period.

GAAP specifically also requires disclosure of amount of translation adjustment transferred from stockholder equity and included in current income from disposal of foreign entity.
The amount of exchange differences recognised in net income consists of:

i. foreign currency translation gains and losses, and

ii. translation gains and losses resulting from application of temporal method.

Definition 3.5.23.

i. *Clean Surplus Accounting*: all non-owner changes in equity equity, such as translation adjustments are included in determination of net income.

ii. *Dirty Surplus Accounting*: some income items are reported as part of shareholder's equity, rather than as gains and losses on income statement

Definition 3.5.24.

i. *Effective tax rate*: tax expense divided by pretax profit, in income statement

ii. *Statutory tax rate*: tax rate by the home country

iii. *US Tax Regime*: MNC owes taxes on foreign income only to extent that the US corporate tax exceeds foreign rate of tax on that income. Foreign income earned by US MNC is not taxed until it is repatriated.

Entity with operations in multiple countries may aim to set transfer prices such that higher portion of its profit is allocated to lower tax jurisdictions.

Remark 3.5.25. *Disclosures on Tax Implications*
Accounting standards require companies to provide reconciliation between effective and statutory tax rate. The reconciliation disclosure can be used to project future tax expense.

Remark 3.5.26. Changes in effective tax rate on account of foreign operations can be due to:

i. Changes in mix of profits from different countries with varying tax rates

ii. Changes in the tax rates

Remark 3.5.27. *Disclosures Related to Sales Growth*
Foreign currency effects on sales are disclosed in MD&A section of annual reports.
Growth in sales due to changes in volume, price is more sustainable than those from changes in exchange rates.

Remark 3.5.28. *Disclosures Related to Major Sources of Foreign Exchange Risk*
Disclosures in MD&A include sensitivity analysis, with information on major sources of foreign exchange risk given its country of operations, and disclosure of profit impact of a given change in exchange rates.

3.6 Analysis of Financial Institutions

Remark 3.6.1. *Financial Institutions Characteristics*

i. Systematic Importance: necessary for smooth functioning and overall health of the economy. As an intermediary between providers and users of capital, this creates inter-dependences that will introduce a system-wide failure if one institution fails (contagion effect). Bank deposits are insured up to a certain limit by the government to avoid financial contagion and reduce the risk of bank runs.

ii. Regulated: financial institutions are highly regulated, with minimum capital requirements, minimum liquidity requirements, and limits on risk-taking.

iii. Assets: assets are financial assets such as loans and securities that are usually reported at fair value.

Remark 3.6.2. *Basel III Framework*:

i. Minimum required capital for a bank based on risk of bank's assets. The riskier the bank assets, the higher the required capital.

ii. Minimum liquid assets to meet demands under a 30-day liquidity stress scenario.

iii. Require stable funding relative to bank's liquidity needs over a one-year time horizon. Stability in funding is proportional to tenor of bank's deposits; longer-term deposits are more stable than shorter-term deposits. Stability also depends on the type of deposit.

Basel III prompted banks to focus on asset quality, hold capital against other types of risk (i.e, operational risk), develop risk assessment processes.

3.6.1 CAMELS Approach

Definition 3.6.3. *Bank Capital Tiers*

i. Tier 1 Capital

   1. Common Tier 1 Capital: common stock, additional paid-in capital, issuance surplus related to common stock, retained earnings, OCI less intangibles and deferred tax assets.
   2. Other Tier 1 Capital: subordinated instruments with no specific maturity and no contractual dividends (i.e., preferred stock with discretionary dividends).

ii. Tier 2 Capital: subordinated instruments with original (when issued) maturity of more than five years.

Tier 1 plus Tier 2 capital makes up total capital of the bank.

Definition 3.6.4. *Capital Adequacy*
Proportion of bank assets funded with capital, adjusted based on risk (riskier assets have heavier weighting). Risk weighting specified by individual country regulators with Basel III.
Basel III guidelines specify the following:

i. Common Tier 1 Capital $\geq 4.5\%$ of risk-weighted assets

ii. Total Tier 1 Capital $\geq 6.0\%$ of risk-weighted assets

iii. Total Capital (Tier 1 + Tier 2) $\geq 8.0\%$ of risk-weighted assets

Definition 3.6.5. *Asset Quality*
Assess amount of existing and potential credit risk associated with bank assets, focusing on financial assets. Loans asset quality depends on creditworthiness of borrowers and corresponding adequacy of adjustments for expected loan losses. Measured at amortised cost, shown on BS net of allowances for loan losses.

	Equity	Debt
IFRS	• Fair value through OCI • Fair value through PnL	• Amortised cost • FVOCI • Fair value through PnL
GAAP	• Fair value through PnL	• Amortised cost (held-to-maturity) • FVOCI (available for sale) • Fair value through PnL (trading)

Remark 3.6.6. *Asset Quality: Credit Risk*

i. Off-balance sheet trading activities create exposure to counterparty credit risk.

ii. Off-balance sheet obligations such as guarantees, unused committed credit lines, LOC create credit risk.

Remark 3.6.7. *Asset Quality: Loan Loss Provisions*
'Allowance for Loan Losses' is a contra asset account to loans, the result of 'Provision for Loan Losses', an expense subject to management discretion. To evaluate bank policy of setting aside adequate provisions relative to actual loan performance. Actual losses are then written off these provisions.
Useful ratios for evaluation (that compares discretionary metric to more objective measure) are:

i. Ratio of allowance for loan losses to nonperforming loans
ii. Ratio of allowance for loan losses to net loan charge-offs
iii. Ratio of provision for loan losses to net loan charget-offs

Definition 3.6.8. *Management Capabilities*
Risk management and internal control is critical for banks.
To look out for strong governance structure, sound internal controls, transparent management communication, financial reporting quality. Management should be able to identify and control risk, including credit risk, market risk, operating risk, legal risk, and other risks.

Definition 3.6.9. *Earnings*
Financial institutions should provide adequate return on capital, reward stockholders through capital appreciation and/or distribution of earnings. Look for high quality earnings from sustainable items.
Earnings estimates are based on the following:

i. Loan impairment allowances: assessments on likelihood of borrower default or bankruptcy, value of the collateral. Sensitive to risk factors such as economic and credit conditions across geographies.
ii. Financial assets and liabilities valuation with fair value hierarchy.
iii. Other areas common with non-financial companies, such as goodwill impairment, deferred tax asset, liability to recognise in connection with contingencies.

Examine composition of earnings, which comprise of net interest income, service income, trading income (by most to least sustainable). Highly volatile net interest income may indicate excessive interest rate risk exposure.

Definition 3.6.10. *Fair Value Hierarchy*

i. Level 1: quoted prices for identical financial assets and liabilities in active markets
ii. Level 2: quoted prices for similar financial instruments in active markets, quoted prices for identical financial instruments in non-active markets, observable data such as interest rates, yield curves, credit spreads, implied volatility. Used to model fair value of financial instrument.
iii. Level 3: fair value based on model and unobservable inputs. More subjective.

Definition 3.6.11. *Maturity Transformation*
Banks create value by borrowing money on shorter terms than terms for lending to customers. May destroy value if markets for short-term funding has a dislocation, or yield curve unexpectedly inverts.

Definition 3.6.12. *Liquidity Position*
Adequate liquidity is crucial for a bank. Basel III has two minimum liquidity standards:

i. Liquidity Coverage Ratio (LCR):

$$\text{LCR} = \frac{\text{Highly Liquid Assets}}{\text{Expected Cash Outflows}} \geq 100\%$$

Highly liquid assets are those that are easily convertible into cash.
Expected cash flows are the estimated one-month liquidity needs in a stress scenario.

ii. Net Stable Funding Ratio (NSFR):

$$\text{NSR} = \frac{\text{Available Stable Funding}}{\text{Required Stable Funding}} \geq 100\%$$

Available stable funding (ASF) is a function of the composition and maturity distribution of bank funding sources (i.e., capital, deposits, and other liabilities).
Required stable funding is a function of the composition and maturity distribution of bank asset base.
NSFR relates liquidity needs of bank assets to liquidity provided by bank liabilities (i.e., funding sources).

Other liquidity monitoring metrics recommended by Basel III includes:

i. Concentration of Funding: proportion of funding obtained from single source. Lack of diversification may pose a problem when the sources withdraw funding, resulting in heightened liquidity risk for the bank.

ii. Maturity Mismatch: when asset maturities differ materially from maturity of liabilities. The higher the mismatch, the higher the liquidity risk for the bank, which may expose the bank to a liquidity crunch if it is unable to roll over its borrowings at reasonable rates.

Funding Component of ASF	ASF Factor
• Total regulatory capital (exclude Tier 2 instruments maturing in a year) • Other capital instruments and liabilities with residual maturity > 1 year	100%
• Stable demand deposits and term deposits with residual maturity < 1 year from retail and small business customers	95%
• Less stable demand deposits and term deposits with residual maturity < 1 year from retail and small business owners	90%
• Funding from non-financial corporate customers, sovereign, public sector, multilateral, national development banks with residual maturity < 1 year • Operational deposits • Other funding with residual maturity > 6 months and < 1 year not included in above categories, including funding from central banks and financial institutions	50%
• All other liabilities not included in above categories, including liabilities without stated maturity (specific treatment for deferred tax liabilities, minority interests) • NSFR derivative liabilities net of NSFR derivative assets (if NSFR derivative liabilities $>$ NSFR derivative assets) • 'Trade date' payables from purchase of fin instruments, foreign currencies, commodities	0%

Definition 3.6.13. *Sensitivity to Market Risk*
Exposure to changes in interest rates, exchange rates, equity prices, or commodity prices.
Mismatches in maturity, repricing frequency, reference rates, or currency of bank loans and deposits create exposure to market movements.
Value at risk (VaR may be used to measure and monitor market risk.

3.6.2 Non-CAMELS Factors

Remark 3.6.14. *Government Support*
Larger banks have higher probability of implicit government support due to risk of contagion effect.
Government agencies will close banks that might fail, or arrange mergers with healthy ones to absorb them.
Factors include size of bank, status of country's banking system (capacity to absorb single bank failure).

Remark 3.6.15. *Government Ownership*
Public ownership increases faith of implicit government backing in a bank.
Governments may aid financial development of banks, leading to broad economic growth.

Remark 3.6.16. *Mission of Banking Entity*
Community banks may by guided by community development in their lending decisions.
If community dependent on primary industry, may lead to concentration of risk in bank asset portfolio.

Remark 3.6.17. *Risk Factors*
Fill gaps on legal and regulatory issues, present in annual filing.

Remark 3.6.18. *Basel III Disclosures*
Provide regulatory information on consistent, comparable basis

Remark 3.6.19. *Corporate Culture*
Culture evaluation can be conducted by a review of:

i. Diversity of bank assets. If losses generated due to narrow investment strategy, then bank is too aggressive.

ii. Accounting restatements due to failures of internal controls indicate unethical culture.

iii. Excessive management compensation tied to bank stock performance may lead to excessive risk-taking.

iv. Speed with which bank adjust loan loss provisions relative to actual loss behaviour. Slower response rate indicates aggressive accounting practices and a risk-taking culture.

General factors relevant to analysis includes:

i. Competitive environment: global banks may take excessive risks to outdo large rivals.

ii. Off-balance-sheet assets and/or liabilities may be opaque. Look for VIEs and SPEs.

Remark 3.6.20. *Segment Information*
Segment information provide insights into different lines of business and geographies.
Help investor decide whether capital is being allocated well within bank's internally competing operations.

Remark 3.6.21. *Currency Exposure*
Significant for large, global banks trading in currencies or holding significant assets or liabilities in different currencies whose values fluctuate. Volatility in currency values may have significant impact on bank earnings.

Remark 3.6.22. *Risk Factors*
Fill gaps on legal and regulatory issues, present in annual filing.

Remark 3.6.23. *Basel III Disclosures*
Provide regulatory information on consistent, comparable basis

3.6.3 Insurance Companies

Insurance has smaller proportion of cross-broader business. Insurance foreign branch required to hold assets in jurisdiction that are adequate to cover policy liabilities.
Insurance earn revenues from premium and from investment income earned on float.

Remark 3.6.24. *Properties of P&C Insurance Companies*
Premium income is the highest source of income. To diversity risk, insurers will reinsure some risks.
Policy period is very short, with premiums received at beginning of period and invested during float period.
Claim events are clearly defined, but may take a long time to emerge.
Property insurance covers protection on auto, homes, and specific assets. Casualty insurance protects against a legal liability due to occurrence of a covered event. Multiple peril policy covers both property and casualty.

Remark 3.6.25. *P&C Insurer Profitability*
Business is cyclical and price-sensitive. Price cutting drive out profitability, competition lessens and underwriting standards tighten (hard pricing period), premiums rise and insurers return to more reasonable levels of profitability (soft pricing period), attracting more entrants; cycle repeats.
Expenses include claim expense, and expense of obtaining new policy business. Direct-to-customer model has fixed cost of staffing, and agency model has variable commissions.

Remark 3.6.26. *P&C Insurer Combined Ratio*
Soft or hard pricing is driven by industry combined ratio. When ratio is low (high), it is a hard (soft) market.

$$\begin{aligned}\text{Combined Ratio} &= \frac{\text{Insurance Expenses}}{\text{Net Premiums Earned}} \\ &= \text{Underwriting Loss Ratio} + \text{Underwriting Expense Ratio}\end{aligned}$$

For single insurer, combined ratio $> 100\%$ indicates an underwriting loss.
The combined ratio is the sum of underwriting loss ratio and expense ratio.

$$\text{Underwriting Loss Ratio} = \frac{\text{Claims paid} + \Delta\text{Loss reserves}}{\text{Net premiums earned}}$$

$$\text{Underwriting Expense Ratio} = \frac{\text{Underwriting expenses including commissions}}{\text{Net premium written}}$$

Underwriting loss ratio measures relative efficiency of company's underwriting standards (if policies are priced appropriately relative to risks borne). Lower is better.
Underwriting expense ratio measures efficiency of company operations. Lower is better.
Loss reserve is an estimated value of unpaid claims, subject to management discretion in management. Downward revisions indicate conservative loss estimation. Upward revision indicates aggressive profit booking.

Remark 3.6.27. *P&C Insurer Other Profitability and Cost Ratios*

i. Loss and loss adjustment expense ratio: measure success in estimation of risk insured. Lower is better.

$$\text{Loss and loss adjustment expense ratio} = \frac{\text{Loss expense} + \text{Loss adjustment expense}}{\text{Net premiums earned}}$$

ii. Dividends to policyholders (shareholders) ratio: liquidity measure of cash outflow on account of dividends relative to premium income

$$\text{Dividends to policyholders ratio} = \frac{\text{Dividends to policyholders (shareholders)}}{\text{Net premiums earned}}$$

iii. Combined ratio after dividends (CRAD) measures total efficiency, takes into account cash satisfaction of policyholders or shareholders after consideration of total underwriting efforts.

$$\text{Combined ratio} = \text{Loss and loss adjustment expense ratio} + \text{Underwriting expense ratio}$$
$$\text{CRAD} = \text{Combined ratio} + \text{Dividends to policyholders ratio}$$

iv. Industry specific cost ratios include:

$$\frac{\text{Total benefits paid}}{\text{Net premiums written and deposits}}$$
$$\frac{\text{Commissions and expenses}}{\text{Net premiums written and deposits}}$$

Remark 3.6.28. *P&C Insurer Investment Characteristics*
Investment preferred in steady-return, low-risk assets. Low-liquid assets shunned.
Concentration of assets by type, maturity, credit quality, industry, or geographical location or within single issuers should be evaluated.

$$\text{Total investment return ratio} = \frac{\text{Total investment income}}{\text{Invested assets}}$$

Computing the ratio after excluding unrealised capital gains from income provides information on importance of unrealised gains and losses to insurer's total income.

Remark 3.6.29. *P&C Insurer Liquidity Considerations*
Liquidity is important for P&C insurers as they stand ready to meet claim obligations.
To gauge liquidity of investment portfolio, look at fair value hierarchy reporting.

Remark 3.6.30. *Properties of L&H Insurance Companies*
Premium income is the highest source of income. To diversity risk, insurers will reinsure some risks.
Life insurance policies can be basic term-life (insurer makes payment if death occurs during policy period).
Other policy types include investment products attached to pure life policies.

Remark 3.6.31. *L&H Insurer Profitability*
Proportion of income from premiums, investments, and fees can vary over time and among insurers. Diversification is desirable, and premium income tends to be more stable over time relative to other sources.
Actuarial assumptions affect value of future liabilities due to policyholders; current period claim expense includes claim payments and interest on estimated liability to policyholders.
L&H insurers capitalise cost of acquiring new and renewal policies and amortise it based on actual and estimated future profits from that business. Estimates influence amount amortised in any given period. Estimates also affect value of securities and investment returns.
Mismatches between valuation approaches for assets and liabilities can distort values when interest rate changes.

Remark 3.6.32. *L&H Insurer Investment Characteristics*
L&H insurers have longer float period, hence investment returns are key component to profitability.
Large portion of investment portfolio is LT debt; duration mismatch between assets and liabilities is of concern.
Similar to P&C insurers, total investment income ratio is used to evaluate investment performance.

Remark 3.6.33. *L&H Insurer Liquidity Considerations*
Policy surrenders can be unpredictable, but liquidity needs are fairly predictable.
Liquidity measure takes ratio of investment assets (adjusted based on ready convertibility to cash) to obligations (adjusted based on assumptions about withdrawals).
Ratio is estimated under both normal market conditions and under stress conditions.
Current ratio not directly applicable, as BS do not include such classifications.

Remark 3.6.34. *Insurer Capitalisation Regulations*
No global risk-based capital requirement standard for insurers.
EU has adopted Solvency II standards.
NAIC in United States has minimum capital levels based on size and risk.

3.7 Evaluating Quality of Financial Reports

Definition 3.7.1.

i. *Earnings Quality*: high-quality earnings quality refers to a high level of earnings and is sustainable. High-quality earnings increase the value of a company more than low-quality earnings.

ii. *Reporting Quality*: assessment of information disclosed in the financial reports. Low-quality reporting impedes assessment, while high-quality earnings enable it.

		Financial Reporting Quality	
		Low	**High**
Earnings (Results) Quality	High	LOW financial reporting quality impedes assessment of earnings quality and impedes valuation.	HIGH financial reporting quality enables assessment. HIGH earnings quality increases company value.
	Low		HIGH financial reporting quality enables assessment. LOW earnings quality decreases company value.

Figure 6: Relationship between reporting quality and earnings quality.

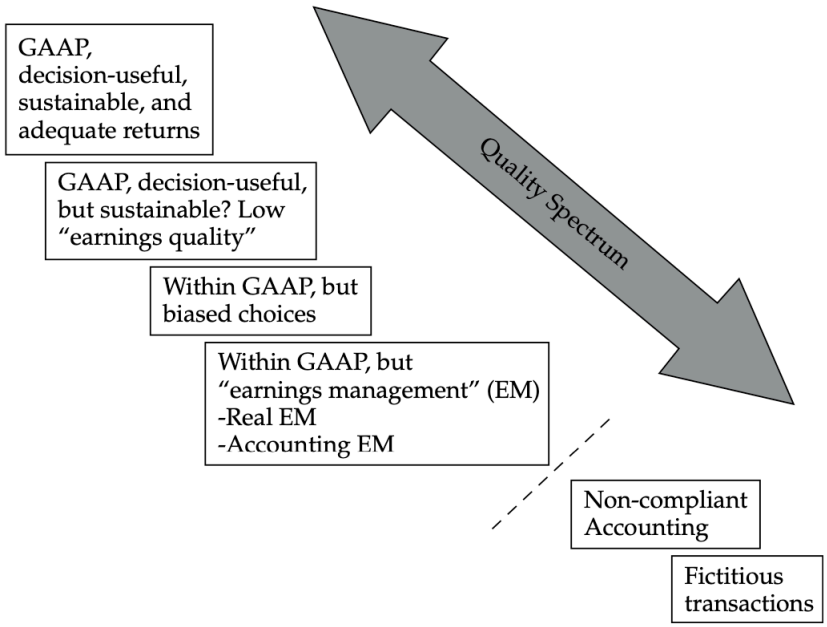

Figure 7: Quality spectrum of financial reports.

Remark 3.7.2. *Biased Accounting*
Biased accounting result in financial reports that don't faithfully represent economic phenomena. May be made in context of reported amounts and presented info.
Earnings management include smoothing of earnings to understate earnings volatility. Volatility decreased by understating earnings in well performing periods, overstated in struggling periods.

Accounting Warning Signs

Potential Issues	Possible Actions & Choices	Warning Signs
• Overstatement or non-sustainability of operating income, net income • Overstated or accelerated revenue recognition • Understated expenses • Misclassification of revenue, gains, expenses, or losses	• Contingent sales with right of return, "channel stuffing" (the practice of inducing customers to order products they would otherwise not order or order at a later date through generous terms), "bill and hold" sales (encouraging customers to order goods and retain them on seller's premises) • Fictitious (fraudulent) revenue • Capitalising expenditures as assets • Classifying non-operating income or gains as part of operations • Classifying ordinary expenses as non-recurring or non-operating • Reporting gains through net income and losses through other comprehensive income	• Growth in revenue higher than that of industry or peers • Increases in discounts to and returns from customers • Higher growth rate in receivables than revenue • Large proportion of revenue in final quarter of year for a non-seasonal business • Cash flow from operations is much lower than operating income • Inconsistency over time in the items included in operating revenues and operating expenses • Increases in operating margin • Aggressive accounting assumptions, i.e, long, depreciable lives • Losses in non-operating income or other comprehensive income and gains in operating income or net income • Compensation largely tied to financial results
• Misstatement of balance sheet items (may affect income statement) • Over- or understatement of assets • Over- or understatement of liabilities • Misclassification of assets and/or liabilities	• Choice of models and model inputs to measure fair value • Classification from current to non-current • Over- or understating reserves and allowances • Understating identifiable assets and overstating goodwill	• Models and model inputs that bias fair value measures • Inconsistency in model inputs when measuring fair value of assets com- pared with that of liabilities • Typical current assets, such as accounts receivable and inventory, included in non-current assets • Allowances and reserves that fluctuate over time or are not comparable with peers • High goodwill value relative to total assets • Use of special purpose vehicles • Large changes in deferred tax assets and liabilities • Significant off-balance-sheet liabilities
• Overstatement of cash flow from operations	• Managing activities to affect cash flow from operations • Misclassifying cash flows to positively affect cash flow from operations	• Increase in accounts payable and decrease in accounts receivable and inventory • Capitalised expenditures in investing activities • Sales and leaseback • Increases in bank overdrafts

Remark 3.7.3. *Acquisition Method Accounting*

i. Companies with decreasing cash-generating ability may acquire other companies to increase CFO; payment reported in CFI (if in cash), or not in cash flow statements if paid with equity. Consolidated CFO include CF from acquired company, concealing the acquirer's own CF issues, providing one-time boost to CFO.

ii. Acquirers making acquisition with equity may manipulate reported earnings prior to acquisition to inflate value of shares. Acquirer may also manipulate earnings upward after acquisition to positively influence opinion on the acquisition.

iii. Acquisitions may conceal previous accounting misstatements, by acquiring company that reduce comparability and consistency of financial statements, i.e., companies with less public info, less similar ops.

iv. Company may capitalise goodwill indefinitely, hence postpone recognition of an uneconomic acquisition.

Remark 3.7.4. *Compliant, but not Economic Reality*
Investor to adjust reported information to better reflect view on economic reality; if not possible as relevant data are not disclosed, may make qualitative assessment.

i. On restructuring charge, impairment charge, or combination of two, to consider whether similar events should be factored into estimated of permanent earnings (hence normalised by spreading current restructuring/impairment charges over past and current periods), or regarded as one-off items.

ii. Revisions to ongoing estimates, such as remaining economic lives of assets, may question if earlier change in estimate would have been more appropriate.

iii. Sudden increase to allowance and reserves, may question if prior estimates resulted in overstatements of prior period earnings.

iv. Large accruals for losses (i.e., environmental or litigation-related) suggest that prior periods earnings may be overstated due to failure to accrue losses earlier.

v. Significant order backlogs (disclosed in management commentary) may be used to adjust reported amounts and to prepare forecasts.

Also, to judge whether an item presented in OCI should be included in analysis as net income:

i. unrealised holding gains and losses on certain investments in equity securities,

ii. unrealised holding gains (and subsequent losses) on items of property and equipment for which the 'revaluation option' is elected (IFRS only),

iii. effects on owners' equity resulting from the translation of the foreign currency-denominated financial statements of a foreign operation to the reporting currency of the consolidated entity,

iv. certain changes to net pension liability or asset, and

v. gains and losses on derivative financial instruments (and certain foreign currency-denominated non-derivative financial instruments) accounted for as a hedge of future cash flows.

Method 3.7.5. *General Steps to Evaluate Quality of Financial Reports*

1. Develop understanding of company and its industry (economic activities, accounting principles), and assess if the accounting treatment is appropriate.
2. Evaluate company management, if any. Incentives to misreport. Review disclosures on compensation and insider transactions, related-party transactions.
3. Identify significant account areas which management judgment or unusual accounting rule is significant determinant of reported financial performance.
4. Make comparisons:
    i. Compare firm financial statement and significant disclosures in current year report with financial statements and significant disclosures in prior year report. Check for major differences in line items or in key disclosures (i.e., risk disclosures, segment disclosures, classification of specific expense, revenue items). Check if reasons for changes are apparent.
    ii. Compare firm accounting policies with closest competitors for significant differences, and direction effect of the differences.
    iii. Use ratio analysis, compare firm performance with closest competitors.
5. Check for warning sings of possible issues with quality of financial report:

i. Declining receivables turnover could suggest some revenues are fictitious, or recorded prematurely, or allowance for doubtful accounts is insufficient.
ii. Declining inventory turnover could suggest obsolescence problems
iii. Net income greater than cash provided by operations could suggest aggressive accrual accounting policies have shifted current expenses to later periods

6. Firms operating in multiple segments by geography or product (MNCs), consider if inventory, sales, and expenses have shifted to make it appear that the firm is positively exposed to a geographic region or product segment that investment community considers to be a desirable growth area. This shift may be occurring if the segment is showing strong performance while consolidated results remain static or worsen.
7. Use appropriate quantitative tools to assess likelihood of misreporting

3.7.1 Earnings Quality Analysis

Definition 3.7.6. *Beneish Model*
Probit regression model that estimate probability of earnings manipulation using eight independent variables. M-score determines the probability of earnings manipulation. Higher values indicate higher probabilities.

$$\begin{aligned}\text{M-Score} = &-4.84 + 0.920(\text{DSR}) + 0.528(\text{GMI}) + 0.404(\text{AQI}) + 0.892(\text{SGI}) \\ &+ 0.115(\text{DEPI}) - 0.172(\text{SGAI}) + 4.679(\text{Accruals}) - 0.327(\text{LEVI})\end{aligned}$$

where

i. DSR (Days Sales Receivable Index): changes in relationship between receivables and sales could indicate inappropriate revenue recognition.

$$\text{DSR} = \left(\frac{\text{Receivables}_t}{\text{Sales}_t}\right) \div \left(\frac{\text{Receivables}_{t-1}}{\text{Sales}_{t-1}}\right)$$

ii. GMI (Gross Margin Index): deterioration in margins could predispose companies to manipulate earnings.

$$\text{GMI} = \frac{\text{Gross Margin}_{t-1}}{\text{Gross Margin}_t}$$

iii. AQI (Asset Equality Index): change in percentage of assets other than in PPE and CA could indicate excessive expenditure capitalisation.

$$\text{AQI} = \left[1 - \frac{(\text{PPE}_t + \text{CA}_t)}{\text{TA}_t}\right] \div \left[1 - \frac{(\text{PPE}_{t-1} + \text{CA}_{t-1})}{\text{TA}_{t-1}}\right]$$

where PPE is property, plant, and equipment; CA is current assets; and TA is total assets.

iv. SGA (Sales Growth Index): managing perception of continuing growth and capital needs from actual growth could predispose companies to manipulate sales and earnings.

$$\text{SGA} = \frac{\text{Sales}_t}{\text{Sales}_{t-1}}$$

v. DEPI (Depreciation Index): declining depreciation rates could indicate understated depreciation as a means of manipulating earnings.

$$\begin{aligned}\text{DEPI} &= \frac{\text{Depreciation Rate}_{t-1}}{\text{Depreciation Rate}_t} \\ \text{Depreciation Rate} &= \frac{\text{Depreciation}}{\text{Depreciation} + \text{PPE}}\end{aligned}$$

vi. SGAI (Sales, General, and Administrative Expenses Index): increase in fixed SGA expenses suggests decreasing administrative & marketing efficiency, which could predispose companies to manipulate earnings.

$$\text{SGAI} = \left(\frac{\text{SGA}_t}{\text{Sales}_t}\right) \div \left(\frac{\text{SGA}_{t-1}}{\text{Sales}_{t-1}}\right)$$

vii. Accruals: higher accruals can indicate earnings manipulation.

$$\text{Accruals} = \frac{\text{Income Before Extraordinary Items} - \text{Cash from Operations}}{\text{Total Assets}}$$

viii. LEVI (Leverage Index): increasing leverage could predispose companies to manipulate earnings.

$$\text{LEVI} = \frac{\text{Leverage}_t}{\text{Leverage}_{t-1}}$$

M-score is a normally distributed random variable with mean 0 and standard deviation 1.
Probability of earnings manipulation is then cumulative probability for standard normal distribution based on the M-score. Likely cutoff is probability of earnings manipulation of 3.8% (M-score > -1.78).

Remark 3.7.7. *Limitations of Beneish Model*
Beneish model relies on accounting data, which may not reflect economic reality.
Deeper analysis of underlying relationships may be warranted to get a clearer picture.
As managers become aware of the use of specific quantitative tools, they may begin to game the measures used.

Remark 3.7.8. *Other Quantitative Models*
Other quantitative models may include variables such as accruals quality, deferred taxes, auditor change, market-to-book value, whether company is publicly listed and traded; growth rate differences between financial and non-financial variables (i.e., number of patents, employees, products); aspects of corporate governance and incentive comp.

Method 3.7.9. *Altman Model*
Model is able to assess the probability that a firm will file for bankruptcy.
Model relies on discriminant analysis to generate Z-score with five variables:

$$\frac{\text{Net Working Capital}}{\text{Total Assets}}, \frac{\text{Retained Earnings}}{\text{Total Assets}}, \frac{\text{Operating Profit}}{\text{Total Assets}}, \frac{\text{Market Value of Equity}}{\text{Book Value of Liabilities}}, \frac{\text{Sales}}{\text{Total Assets}}$$

Each variable is positively related to the Z-score, and a higher Z-score is better (less likelihood of bankruptcy). It is a single-period static model and does not capture change in key variables over time. Additionally, similar to the Beneish model, Altman's model mostly uses accounting data.

4 Portfolio Management

CFA Level 1 Materials

4.1 Fundamentals

Definition 4.1.1. *Safety-First Ratio*
Optimal portfolio minimises the probability that portfolio return R_p falls below the threshold level R_L.

$$\text{SF Ratio} = \frac{E[R_p] - R_L}{\sigma_p}$$

Note that $P(\text{Return} < R_L) = N(-\text{SF Ratio})$.

i. Calculate each portfolio's safety-first ratio.

ii. Choose the portfolio with maximum safety-first ratio.

5 Formula Sheet

5.1 Financial Ratios

References