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Case 1: Laurant Davidson

1. Solution: B.

The correct assumption is that the variances of the regression residuals should be the same across all observations (homoskedasticity). The five main assumptions of multiple regression are as follows:

Linearity: The relationship between the dependent variable and the independent variables is linear.

Homoskedasticity: The variance of the regression residuals is the same for all observations.

Independence of errors: The observations are independent of one another. This implies the regression residuals are uncorrelated across observations.

Normality: The regression residuals are normally distributed.

Independence of independent variables:

5a. Independent variables are not random.

5b. There is no exact linear relation between two or more of the independent variables or combinations of the independent variables.

2. Solution: C.

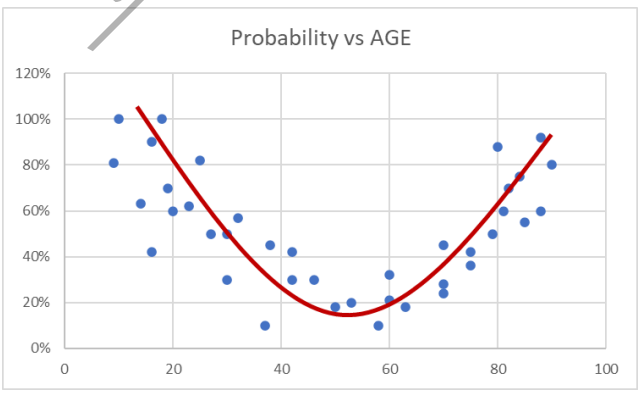
The slope coefficient for X_{ACT} is -0.04, where the minus sign implies a negative correlation.

A one unit increase in X_{AGE} results in Y_{PROB} increasing by 0.008 unit, holding individual's activity level constant.

The slope coefficient of X_{ACT} is -0.04 whereas the slope coefficient of X_{AGE} is 0.008. The magnitude of X_{ACT}'s slope coefficient is higher.

3. Solution: C.

The assumption of linearity is violated because X_{AGE} and Y_{PROB} do not have a linear relationship. The data points form a parabola:



4. Solution: C.

The data used for regression is cross-sectional data, thus, the serial correlation (violation of

independence of error) is not usually present. Serial correlation is more often present in time series and panel data.

The relationship between Y_{PROB} and X_{AGE} indicates the violation of linearity.

Based on the relationship between forecasted probability and residuals, homoskedasticity is violated, the variance of regression errors differs across observations.

Case 2: Abu Rock

1. Solution: B.

To determine whether the regression coefficients are significantly different from zero, formulate the null hypotheses that the coefficients are equal to zero. The alternative hypotheses are that the coefficients do not equal zero (two-tailed tests). The appropriate test statistics, t, are calculated by dividing the estimates of the coefficients by their respective standard error. For b_1, t=0.0006/0.0010=0.60.

For b_2, t=0.5984/0.30=1.9947.

The critical t value at 5% significance (two-tail test) = 1.96. The t-statistic for outside air temperature is less than 1.96, whereas the t-statistic for assembly line speed is greater than 1.96. Therefore, the null hypothesis for b_2 equal to zero is rejected, suggesting that the coefficient of assembly line speed is significantly different from zero.

2. Solution: B.

The R^2 indicates variations in the independent variables which explain 56.4% of the variation in the dependent variable. The F-statistic is highly significant. R^2 does not give the probability of a dependent variable prediction being correct.

3. Solution: A.

The R^2 does change when we add independent variables to the model. The R^2 increases, which would imply that the explanatory power is increasing, however this increase may not be meaningful since it could be due to an overfitting problem.

4. Solution: C.

When the model adds the third independent variable “average assembly time”, both AIC and BIC increased, therefore, based on the information from the Exhibit 2 only, the original model with only two independent variable “Outside air temperature” and “Assembly line speed” is better.

Case 3: Carol Smith

1. Solution: B.

The VIF values for both independent variables are below 5, indicating no multicollinearity. In addition, the pairwise correlation is low. For multicollinearity to occur in a regression there should be two (or more) independent variables, as is the case in this problem. Furthermore, the additional classic symptoms of multicollinearity (high R^2 and significant F-statistic, but not significant coefficients) are not present. Multicollinearity does not affect the consistency of coefficient estimates.

2. Solution: A.

The value of the Breusch-Godfrey F-statistic is given in Exhibit 1 as 3.4578. The critical value is given as 2.7561. The BG statistic value exceeds the critical-value, therefore, the BG test rejects the null hypothesis of no serial correlation.

3. Solution: C.

Conditional heteroskedasticity means that the variance of the error term is correlated with the values of the independent variables.

4. Solution: B.

Serial correlation in the error terms will affect the estimates for regression coefficient standard errors if one of the independent variables is a lagged value of the dependent variable. Positive serial correlation affects the validity of the statistical tests as F-statistic value and t-statistics values may be inflated.

Case 4: Alex Tang

1. Solution: C.

The control group (or base group) is the category that is not assigned a dummy variable. In this case, it is Group C.

2. Solution: B.

TYPB is an intercept dummy variable. When TYPB = 1, the coefficient for TYPB will be added to the intercept value.

A is correct because 0.724 is the slope coefficient for the independent variable GDP.

C is correct because VOLA_TYPB is a slope dummy variable (also called interaction term). When TYPB = 1, the coefficient for VOLA_TYPB will be added to the slope coefficient of VOLA.

3. Solution: C.

Generally, the monthly return on the CSI 500 is lower when market sentiment is neutral compared to when market sentiment is optimistic.

Ret = 0.036 + 0.052TYPA – 0.047TYPB – 0.235VOLA + 0.724GDP + 0.004VOLA_TYPA – 0.001VOLA_TYPB

When market sentiment is optimistic (TYPA = 1 and TYPB = 0):

Ret = 0.036 + 0.052(1) – 0 – 0.235VOLA + 0.724GDP + 0.004VOLA – 0

Ret = 0.088 – 0.231VOLA + 0.724GDP

When market sentiment is neutral (TYPA = 0 and TYPB = 1):

Ret = 0.036 + 0 – 0.047(1) – 0.235VOLA + 0.724GDP + 0 – 0.001VOLA

Ret = -0.011 – 0.236VOLA + 0.724GDP

For the same values for VOLA and GDP, the return when market sentiment is neutral will be lower than that of optimistic because the intercept is lower and slope coefficient for VOLA is lower, whereas the slope coefficient for GDP is the same for both.

A is a correct statement because in the situation that market sentiment is neutral and VOLA and GDP are zero, the regression equation would simplify as follows:

Ret = 0.036 + 0.052TYPA – 0.047TYPB – 0.235VOLA + 0.724GDP + 0.004VOLA_TYPA – 0.001VOLA_TYPB

Ret = 0.036 + 0 – 0.047(1) – 0.235VOLA + 0.724GDP + 0 – 0.001VOLA

Ret = (0.036 – 0.047) – 0.236VOLA + 0.724GDP

Ret = -0.011 – 0.236VOLA + 0.724GDP

Ret = -0.11 – 0 – 0 = -0.01

B is a correct statement because if market sentiment is optimistic, then the regression equation would simplify to the following:

Ret = 0.036 + 0.052TYPA – 0.047TYPB – 0.235VOLA + 0.724GDP + 0.004VOLA_TYPA – 0.001VOLA_TYPB

Ret = 0.036 + 0.052(1) – 0 – 0.235VOLA + 0.724GDP + 0.004VOLA – 0

Ret = 0.088 – 0.231VOLA + 0.724GDP

4. Solution: A.

To determine the outliers based on the studentized residuals, we must compare the studentized residual for each observation with the critical t-value, which is given as +/- 1.960. Observations 52 and 55 are the observations with a higher t-calc than t-crit, so they are considered outliers.

Case 5: Eduardo DeMolay

1. Solution: A.

If a time series is a random walk, "the best forecast of x_t that can be made in period t – 1 is x_{t-1}". So the best forecast of the next period's trailing P/E is the current period's trailing P/E.

2. Solution: B.

We can test whether a time series is ARCH by regressing the squared residuals from a previously estimated time series model on a constant and one lag of the squared residuals (as in Exhibit 2). If the estimate of the slope (c_1 in Exhibit 2) of the regression of the squared residuals on the lagged one period squared residuals is statistically significantly different from zero, the time series is ARCH(1).

3. Solution: C.

Select and justify the choice of a particular time series model from a group of models. "First, if ARCH exists, the standard errors for the regression parameters will not be correct. In case ARCH exists, we will need to use generalized least squares to modify the model.

4. Solution: B.

Dickey–Fuller test is a regression-based unit root test based on a transformed version of the AR(1) model $X_t=b_0+b_1X_{t-1}+\varepsilon_t$. Subtracting X_{t-1} from both sides of the AR(1) model produces $X_t-X_{t-1}=b_0+(b_1-1)X_{t-1}+\varepsilon_t$ or $X_t-X_{t-1}=b_0+g_1X_{t-1}+\varepsilon_t$, where $g_1= b_1-1$. If $b_1 = 1$, then $g_1 = 0$ and thus a test of $g_1=0$ is a test of $b_1=1$. If there is a unit root in the AR(1) model, then g_1 will be 0 in a regression where the dependent variable is the first difference of the time series and the independent variable is the first lag of the time series.

5. Solution: C.

If the two series each have a unit root, regression results will be consistent provided that the two series are cointegrated.

6. Solution: B.

Better input quality and providing a distribution of expected values (rather than a single point of estimate) are two advantages of simulations. However, simulations by themselves do not necessarily lead to better decisions.

Case 6: Vincent Holmes

1. Solution: C.

A logarithmic transformation of the dependent variable is the most appropriate transformation to apply when the variable grows at a constant rate over time:

ln(sales) = a* + b*t + e

The slope of this equation equals the nominal constant rate. The effective rate equals $e^{b^*} - 1$.

2. Solution: B.

Quarter 1 of 2021 is the 41st quarter (starting with Quarter 1 of 2011): sales = 6.2 + 9.8(41) = $408 million.

3. Solution: B.

The mean reverting value equals the intercept divided by 1 minus slope = 18/ (1—0.10) = 18 / 0.90 = $20 million. The last change was $15 million as shown in Exhibit 5 (405 - 390). Therefore, the AR(1) model predicts that the series will rise anytime the current value (the last quarter in 2020) is below the mean reverting value. The change in sales for the last quarter in 2020 was $15 million, which exceeds the mean reverting value. We could also have computed the forecasted change in sales for Quarter 1, 2021 as 18 + (0.1) x 15 = 19.5 (which is higher than the previous change of 15million).

4. Solution: C.

Seasonality refers to repeating patterns each year. Using quarterly data, tests of seasonality focus on the 4th lag (i.e., "same time last year"). The autocorrelation for the 4th lag is statistically significant. This can be observed by comparing the reported p-value (0.02), which is less than the level of significance (0.05).

5. Solution: A.

Autoregressive conditional heteroskedasticity refers to an autoregressive equation in which the variance of the errors terms is heteroskedastic (i.e., error variance is not constant). The presence of ARCH is tested with the following regression:

$$e_t^2 = \beta_1 + \beta_2 e_{t-1}^2 + v_t$$

which serves as a proxy for:

$$\text{var}(e_t) = \beta_1 + \beta_2 \text{var}(e_{t-1}) + v_t$$

Exhibit 4 indicates that the slope estimate in the ARCH equation is not significant (the t-statistic for the slope estimate of the ARCH equation is not significant). Therefore, the squared error does not depend on its lagged value (i.e., if the slope equals zero, then the error variance equals the constant

β1 which indicates no conditional heteroskedasticity in the AR model). ARCH is not present.

6. Solution: B.

The most recent change in sales reported in Exhibit 5 was $15 million (i.e., an increase from $390 million to $405 million). Therefore, the one-step-ahead forecast is 18 + 0.1(15) = $19.5 million and the two-step-ahead forecast is 18 + 0.1(19.5) = $19.95 million.

Case 7: Miller Yin

1. Solution: A.

Statement 1 is correct. Data exploration includes exploratory data analysis, feature selection, and feature engineering. Statement 2 is incorrect. Feature selection in preprocessing step needs clarification only from data administrators and basic intuition.

2. Solution: C.

Miller wants to minimize false positives (i.e., classifying companies that are not takeover targets as takeover targets), and hence, wants to minimize type I errors. An increase in a model's precision reduces its type I errors. A model's accuracy score generally minimizes overall type I and type II errors, and hence, is not the best answer choice.

3. Solution: C.

Precision (Model A) = 14 / (14 + 9) = 0.61

Precision (Model B) = 13 / (13 + 4) = 0.76

Accuracy (Model A) = (14 + 246) / (14 + 246 + 5 + 9) = 0.95

Accuracy (Model B) = (13 + 253) / (13 + 253 + 4 + 4) = 0.97

4. Solution: C.

The model B fits well to in-sample data indicates low bias error, and poor performance from validation dataset shows high variance error, this situation consistent with overfitting problem.

5. Solution: B.

The hyperparameter *k* in the k-means clustering algorithm refers to the number of buckets (50, in this case) used to create heterogeneous clusters of companies for analysis.

6. Solution: A.

Supervised learning is appropriate when a target variable is specified. This target variable is categorical (i.e., *takeover target* or *not a takeover target*).

Case 8: Alice Cohen

1. Solution: B.

Multicollinearity occurs when two or more independent variables (or combinations of independent variables) are highly (but not perfectly) correlated. Correlation between independent variables may be a reasonable indication of multicollinearity in cases in which the regression contains only two independent variables. In the regression model, the correlation between the FTSE100 and Interbank borrowing rate is only 0.29.

2. Solution: A.

The Breusch-Pagan (BP) test checks for heteroskedastic residuals in models. In this case, the p-value of the BP statistic is 0.3722, which is higher than the level of significance of 0.05. This means that the null hypothesis that there is no heteroskedasticity is not rejected. The residuals are therefore considered homoskedastic.

3. Solution: A.

The p value for the BG F-statistic (0.0406) is less than the significance level of 0.05, which means we can reject the null hypothesis that there is no serial correlation in the residuals; and conclude that serial correlation is present. Additionally, the DW statistic is not close to 2, which also indicates the presence of correlation in the residuals.

4. Solution: B.

The Durbin-Watson (DW) test is a measure of autocorrelation and compares the squared differences of successive residuals with the sum of the squared residuals.

$$DW = \frac{\sum_{t=2}^{T}(\hat{\boldsymbol{\varepsilon}}_{\boldsymbol{t}} - \hat{\boldsymbol{\varepsilon}}_{\boldsymbol{t-1}})^2}{\sum_{t=1}^{T}\hat{\varepsilon}_t^2} \approx 2(1-r)$$

The major drawback of the DW test is that it only applies to first-order serial correlation. The Breusch-Godfrey test is used instead, as it is more robust.

Case 9: Alex Johnson

1. Solution: A.

During the data preprocessing step, Alex created a new "Age" variable based on the firm's IPO date and then deleted the "IPO Date" variable from the dataset. He also created a new "Interest Coverage Ratio" variable equal to EBIT divided by interest expense. Extraction refers to a data transformation where a new variable is extracted from a current variable for ease of analyzing and using for training an ML model, such as creating an age variable from a date variable or a ratio variable. Alex also performed a selection transformation by deleting the IPO Date variable, which refers to deleting the data columns that are not needed for the project.

2. Solution: A.

"bedroom" and "kind" are tokens unaffected by lowercasing, stemming, and lemmatization and are not stop words, so they would both be added to the BOW.

B is incorrect. Stemming of "needing" would occur, resulting in the token "need" (which would have already been added from the first part of the applicant's statement); "really" would likely appear as a token.

C is incorrect. Since fully capitalized words and spelling mistakes are considered red flags in this ML application, the preprocessing must take this into account and preserve these types of words. A similar situation is indicated in the reading whereby numbers are normally reduced to the symbol "/number/" unless there is some need to preserve the actual value, and then annotation can be used. For both of these situations then, the word by itself would not be included but some means of identifying these flagged values would be substituted—for example, /AllCaps/ or /AllCaps/_HELP and /spellError/ or /spellError/_daughtter. Even without this important preprocessing, "HELP" would be lowercased and would be added to the BOW as "help."

3. Solution: A.

Punctuation, HTML tags, numbers, and white space are removed in the text preparation (or cleansing) stage. In the case of numbers, they should be replaced with an annotation, such as "/number/," to indicate the presence of a number without being concerned about its actual value. Stop words and lowercasing are part of the text wrangling (preprocessing stage).

B is incorrect. Stop words are removed in the text wrangling (preprocessing) stage.

C is incorrect. Lowercasing is carried out in the text wrangling (preprocessing) stage.

4. Solution: B.

The threshold p-value for Class 1 (default) is 0.65, which has not been met (p = 0.48); thus, the final ML model predicts that the applicant would be a non-defaulter (Class 0). The loan has been misclassified as not being likely to default when it defaulted. This is a Type II error (a false negative).

A is incorrect. A Type I error is a false positive: It would have arisen if the loan did not default but was predicted to do so.

C is incorrect. A misclassification has occurred, resulting in a Type II error.

Case 10: Max Porter

1. Solution: B.

To predict which stocks are likely to become acquisition targets, the ML model would need to be trained on categorical labelled data having the following two categories: "0" for "not acquisition target", and "1" for "acquisition target".

A is incorrect, because the target variable is categorical, not continuous.

C is incorrect, because the target variable is categorical, not ordinal (i.e., 1st, 2nd, 3rd, etc.).

2. Solution: B.

NNs and DL are well-suited for addressing highly complex machine learning tasks, such as image classification, face recognition, speech recognition and natural language processing. These complicated tasks are characterized by non-linearities and complex interactions between large numbers of feature inputs. The description of backward propagation is also correct.

A is incorrect, because NNs and DL are well-suited for addressing highly complex machine learning tasks, not simple single variable OLS regression models.

C is incorrect, because NNs and DL are not suited for simple single variable OLS regression models.

3. Solution: B.

Statement 2 is incorrect. TF at the sentence (not collection) level is multiplied by IDF to calculate TF–IDF. Both statement 1 and 3 are correct explanations for the terms.

4. Solution: C.

C is correct. Higher the AUC, better the model performance. For threshold p-value of 0.81, the AUC is 77.4% on the training dataset and 61.0% on the cross-validation dataset. This suggests the model cannot fit well under cross-validation data and seems to be overfitted.

A is incorrect, the AUC of training set and cross-validation dataset for *p*-value at 0.63 are both lower than AUC under other thresholds, indicates this *p* -value is not the best fitting model.

B is incorrect, least absolute shrinkage and selection operator (LASSO) regularization can be applied to the logistic regression to prevent overfitting of the models. AUC from training and cross-validation dataset at *p*-value 0.7 are very similar, so the model seems not be overfitted.

Case 11: Beena Sharma

1. Solution: B.

A one-unit change in PRICE will result in a 12% increase in the probability of bankruptcy, all other variables held constant.

Coefficient of PRICE (log odds) = -1.948

Odds ($e^{\text{log odds}}$) = 0.1426

Probability [Odds/(1 + Odds)] = 0.1426/1.1426 = 0.1248 = 12%.

0.534 represents the log odds, so the non-log odds are $e^{\text{log odds}} = e^{0.534} = 1.706$.

2. Solution: C.

Sharma should reject the null hypothesis because the calculated test statistic is larger than critical value.

Test statistic: LR = -2 (log likelihood restricted model – log likelihood unrestricted model) = -2 (-178.69 – -171.53) = 14.32

Critical value = 6.21

14.32 > 6.21

3. Solution: A.

The LR test is a joint test of restricted coefficients.

4. Solution: B.

Outliers and high-leverage points are problematic when they are distant from the regression line, because in that case they "tilt" the line.

If the extreme value is close to the line, then it does not significantly impact the regression analysis.

Economics

Case 1: Tremblay

1. **Solution: B.**

The mid-market for CAD/USD is (1.2138 + 1.2259)/2 = 1.21985. The mid-market forward premium (discount) is calculated as:

$$F_{P/B} - S_{P/B} = S_{P/B}\left[\frac{\frac{Actual}{360}}{1+i_B\frac{Actual}{360}}\right](i_P - i_B)$$

In this problem, we have:

$$F_{P/B} - S_{P/B} = 1.21985\left[\frac{\frac{90}{360}}{1+0.048\frac{90}{360}}\right](0.041-0.048) = 1.21985\times 0.2470356\times(-0.007) = -0.0021094$$

2. **Solution: B.**

The relative version of PPP states that the expected percentage change in the spot exchange rate will be completely determined by the difference between the foreign and domestic inflation rates. In this case, the difference in the inflation rates is 1.90%–2.30% =–0.4%. Subtracting 0.4% from the current bid gives the answer 1.2089. The calculation is 1.2138 – (0.004 × 1.2138) = 1.2089.

3. Solution: C.

It is cheaper to buy Canadian dollars indirectly through Brazilian reals than directly with U.S. dollars. This creates a triangular arbitrage opportunity:

US$1,000,000 × 2.3844 = BRL2,384,400

2,384,400 × 0.5250 = C$1,251,810

C$1,251,810/1.2259 = US$1,021,135

US$1,021,135 – US$1,000,000 = US$21,135 profit

4. Solution: B.

Baroque's comments describe the international Fisher effect. The international Fisher effect states that the foreign-domestic nominal yield spread will be solely determined by the foreign-domestic expected inflation differential.

Case 2: AnaKonda

1. **Solution: C.**

Medeva's comment is most accurate. The percentage change in stock market value equals the percentage change in GDP plus the percentage change in the share of earnings (profit) in GDP plus the percentage change in the price-to-earnings multiple. Over short to immediate horizons, all three of these factors contribute to appreciation or depreciation of the stock market. In the long run, however, the growth rate of GDP must dominate. As noted, the ratio of earnings to GDP cannot rise forever.

2. **Solution: B.**

Steady state of growth = $\Delta Y/Y = \theta/(1-\alpha) + n$,

Where

θ = growth rate of TFP (in this case, 2.25).

$(1-\alpha)$ = labor cost in total factor cost (in this case, 0.689).

n = labor force growth (in this case, 2%).

For Country X: $\Delta Y/Y = 2.25/0.689 + 2 = 5.27\%$.

3. **Solution: B.**

Using the labor productivity growth accounting equation, Country Z indicates the highest growth rate in potential GDP.

Growth rate in potential GDP = Long-term growth rate of labor force + Long-term growth rate in labor productivity.

Country	Long-Term Labor Force Growth (%)	Long-Term Growth Rate in Labor Productivity (%)	Growth Rate in Potential GDP (%)
X	2.00	0.80	2.80
Y	0.50	2.40	2.90
Z	1.25	1.75	3.00

4. **Solution: B.**

Rajan's conclusions pertaining to Country Y are most consistent with the neoclassical model. Because of diminishing marginal returns to capital, the only way to sustain growth in potential GDP per capita is through technological change or growth in total factor productivity. This change results in an upward shift in the production function—the economy produces more goods and services for any given mix of labor and capital inputs.

Case 3: Robert Williams

1. **Solution: B.**

Given low capital mobility, a restrictive monetary and fiscal policy should lead to domestic currency appreciation under the Mundell-Fleming model.

2. **Solution: B.**

Under the neoclassical growth theory, capital deepening affects the level of output but not the growth rate in the long run. Once an economy reaches steady-state growth, only further technological progress will increase the growth rate.

3. **Solution: A.**

The original 60-day forward contract calls for long GBP. So the all-in forward price FP= 2.0085. After 30 days, the contract would still have 30 days remaining to expiration. The new 30-day all-in forward price to sell GBP is 2.0086 + (7.6/10,000) = 2.00936. The relevant 30-day USD interest rate is 4%.

$$V_t = \frac{(FP_t - FP)(\text{contract size})}{1+R(\frac{days}{360})} = \frac{(2.00936-2.0085)(1,000,000)}{1+0.04(\frac{30}{360})} = \text{USD } 857.14$$

4. **Solution: B.**

Covered interest rate parity requires that

$$\frac{F}{S} = \frac{1+R_{\$}}{1+R_{BU}}$$

$$\frac{F}{S} = \frac{2.10}{2.00} = 1.05$$

$$\frac{1+R_{\$}}{1+R_{BU}} = \frac{1+0.05}{1+0.03} = 1.019$$

The BUN should appreciate by 1.9% per year. However, in the forward market, the BUN is trading at a premium of 5%. Therefore, the appropriate arbitrage strategy is to sell BUN in the forward market as below:

1. Borrow $1,000 at 5%. At the end of one year, Williams will be obligated to repay $1,000(1.05) = $1,050.
2. Convert the $1,000 to BUN at the spot rate, which yields $1,000 / ($2/BUN) = BUN 500.
3. Simultaneously enter into a 1-year forward contract to convert BUN to USD at the forward rate of $2.1000/BUN.
4. Invest BUN 500 at 3%. In one year, Williams will receive proceeds of BUN 500 (1.03) = BUN 515.
5. Convert the BUN 515 back to USD at the forward rate, which was locked in at the beginning of the year and yields BUN 515 ($2.1/BUN) = $1,081.50.

6. Arbitrage profits = $1,081.50 – $1,050 = $31.50.

Case 4: Teresa Young

1. **Solution: C.**

The real interest rate parity condition is the theory that real interest rates will converge to the same level across different markets. If real interest rate parity holds, then the level of real interest rates in one country will be identical to the level of real interest rates in a second country.

2. **Solution: C.**

Regulations are needed in the presence of externalities and informational frictions. One example of a friction is asymmetrical information, which allows one market participant to have an advantage over another.

3. **Solution: A.**

Allocation of education spending among primary, secondary, and post-secondary education can be an important determinant of growth. In developed countries like the United States and Japan, incremental spending on post-secondary education will encourage innovation and growth to a greater degree than will spending on primary and secondary education.

4. **Solution: A.**

Growth rate of output = (rate of technological change) + α(growth rate of capital) + (1 – α)(growth rate of labor)

(1 – α) = labor cost / total factor cost = 0.36 (given)

α = 1 − 0.36 = 0.64

Plugging the data given and solving for rate of technological change gives:

1.8% = (rate of technological change) + (0.64)(1.67%) + (0.36)(1.2%)

rate of technological change = 0.3%

Going forward, E(rate of technological change) = 0.3% - 0.1% = 0.2%.

E(growth in capital) = 1.67% + 0.1% = 1.77%

Growth in labor is expected to be unchanged at 1.2%.

Growth in potential GDP = E(GDP growth rate)

= E(technology growth) + α[E(growth in capital)] + (1-α) [E(growth in labor)]

= 0.2% + (0.64)(1.77%) + (0.36)(1.2%)

= 1.76%

Case 5: Summit Consulting

1. **Solution: C.**

We want to convert ¥ to NT$ (via USD). Since we are not given the starting ¥ position, we start with a hypothetical ¥1,000 contract size. The quotes given are $/¥ and $/NT$. To convert ¥ to $ (i.e., going "up the quote") use the bid price (and multiply). To convert from $ to NT$ we use the offer price (and divide).

Step 1: Convert 1,000 yen to USD at $0.008852 to obtain 1,000 × 0.008852 = $8.852.

Step 2: Convert $8.852 to NT$ at $0.02876 to get 8.852 / 0.02876 = NT$ 307.7886.

Now, we want NT$ 10 million or 10,000,000 / 307.7886 = 32,489.8323 ¥ contracts or ¥32,489,832.

Alternatively, we can calculate the NT$/Yen cross rate as 0.307789-0.308142.

To convert Yen to NT$ (going up the quote, use bid price and multiply):

Yen × 0.307789 = NT$ 10,000,000

Yen = 10,000,000 / 0.307789 = 32,489,790.

2. **Solution: A.**

Surratt is correct. Market conditions affect currency spreads such that the bid-ask spread on foreign currency quotations increases as exchange rate volatility (uncertainty) increases. In this example, an economic crisis in the Asian markets would create uncertainty, thereby impacting the $/¥ and $/NT$ exchange rates and increasing the bid-ask spread.

Castillo is incorrect. Bank and other currency dealer positions are not considered to directly impact the size of foreign currency spreads.

In this example, it is true that the dealer would likely reduce her yen ask (selling price) if she wanted to unload an excess inventory of yen. However, the dealer would also probably reduce her bid (buying price) so that she did not buy any additional yen. The result would be that the spread would remain relatively unchanged

3. **Solution: C.**

The 90-day USD and SF interest rates are 18% / 4 = 4.5% and 12% / 4 = 3% respectively.

Using CIRP, F = S (1+R) / (1+R) = 0.85 (1.045) / (1.03) = $0.8624 / SF, which is greater than the market forward price of $0.80/SF. This implies that SF is trading at a bargain price in the forward market—buy it!

At t=0	Cash Flow
Buy (i.e., long position in) SF in forward market at $0.80/SF	$0
Sell 1,176,471 SF in the spot at $0.85/SF	$1,000,000
	(1,176,471 SF)
Borrow 1,176,471 SF for 90 days @ 12% annual rate	1,176,471 SF
Invest $1 million for 90 days @ 18% annual rate	($1,000,000)

Total cash flows at t = 0	0

At t=90	Cash Flow
Receive USD with interest	$1,045,000
Convert USD 969,412* into SF at previously locked-in forward rate of $0.80/SF	($ 969,412)
	SF 1,211,765
Repay the SF loan taken at t = 0	(1,211,765)
Total cash flows at t =90	$75,588

**This is the amount needed to repay the SF loan (with interest) after conversion.*

4. **Solution: A.**

Only factor 3 is correct. Factor 1 incorrectly specifies the size of expected future deficits rather than size of initial current account deficit. Factor 2 incorrectly specifies influence on domestic prices in general rather than domestic prices of traded goods (i.e., imports/exports).

Case 6: Angela Bobo

1. **Solution：A**

Roberts prefers the debt sustainability channel as a means to assess the long-run equilibrium value of exchange rates. According to this mechanism, there should be some upper limit on the ability of countries to run persistently large current account deficits. If a country runs a large and persistent current account deficit over time, eventually it will experience an untenable rise in debt owed to foreign investors. If such investors believe that the deficit country's external debt is rising to unsustainable levels, they are likely to reason that a major depreciation of the deficit country's currency will be required at some point to ensure that the current account deficit narrows significantly and that the external debt stabilizes at a level deemed sustainable.

B is incorrect. The flow supply/demand channel mechanism focuses on the fact that purchases and sales of internationally traded goods and services require the exchange of domestic and foreign currencies in order to arrange payment for those goods and services. Such shifts in currency demand should exert upward pressure on the value of the surplus nation's currency and downward pressure on the value of the deficit nation's currency.

C is incorrect. The portfolio balance channel assumes that current account imbalances shift financial wealth from deficit nations to surplus nations. Countries with trade deficits will finance their trade with increased borrowing. This behavior may lead to shifts in global asset preferences, which in turn could influence the path of exchange rates.

2. **Solution：A**

Statement 3 is the most accurate. Inflation tends to be significantly higher in pre-crisis periods compared with tranquil periods.

C is incorrect. Statement 1 is inaccurate. The terms of trade often deteriorates before a crisis.

B is incorrect. Statement 2 is inaccurate. Real economic activity does not display a distinctive pattern ahead of a crisis but falls sharply in the aftermath of a crisis.

3. **Solution：C**

The Dornbusch modified monetary model relaxes the assumption that purchasing power parity holds in both the short and long term. Hence the Canadian government's action to loosen monetary policy will have differing implications on the CAD in the short and the long run. Because of relatively inflexible domestic prices in the short term, the overall price level increases less than the money supply, any increase in the nominal money supply would push down domestic interest rates, resulting in depreciation of the CAD and the exchange rate will even be lower than its eventual equilibrium level. But in the long run, the CAD will appreciate back to its equilibrium value.

4. **Solution：C**

Heightened immigration is a possible solution to the slowing labor force growth being experienced by many developed countries with low birth rates within the native population. With tightened immigration policy, the economic growth might be restricted due to the inadequate labor force.

Case 7: Vincent Lin

1. **Solution: B.**

Fang is correct in her classification of FINRA as a SRO and the definition of regulatory capture theory – that regulation often arises to enhance the interests of the regulated.

2. **Solution: B.**

U.S. firms were most likely to be concerned due to early timing of the application of new more rigorous regulations in U.S. than in other G-20 countries. With more stringent regulations, some business may have flown to less stringent regulatory environments or jurisdictions.

3. **Solution: C.**

Globalization is likely to result in increased concerns about contagion and regulatory competition. It is easier for a financial shock to spread. Governments may use their regulatory environment to attract entities from around the world.

4. **Solution: A.**

Regulators view some costs associated with regulation as "unintended"; two types of such costs are implementation costs that were unanticipated, and indirect costs because of unintended consequences.

Case 8: Daltonia

1. **Solution: C.**

The components of growth can be determined using Solow's growth accounting equation:

$\Delta Y/Y = \Delta A/A + \alpha\Delta K/K + (1 - \alpha)\Delta L/L$

where:

$\Delta Y/Y$ = GDP percentage growth

$\Delta A/A$ = percentage growth from total factor productivity (TFP)

$\Delta K/K$ = percentage growth in capital

$\Delta L/L$ = percentage growth in labor

α = share of income paid to capital factor

$1 - \alpha$ = share of income paid to labor factor, also the elasticity of output with respect to labor

TFP = Labor productivity growth – Growth in capital deepening = 1.7 – 2.3 = –0.6, which is given in Exhibit 1. Also given, $1 - \alpha = 0.65$ and $\alpha = 0.35$

GDP growth = $\Delta Y/Y$ = 3.75	Arising from the total of components below:
$\Delta A/A$ = growth due to TFP	−0.6
$\alpha\Delta K/K$ = growth due to capital	+ 2.13 = (0.35) × 6.1
$(1 - \alpha)\Delta L/L$ = growth due to labor	+ 2.21 = (0.65) × 3.4
	3.74 GDP growth

Growth due to labor of 2.21% is greater than the growth due to capital or TFP.

2. **Solution: B.**

Pamuk's conclusion is consistent with the endogenous growth model. In the endogenous growth model, the economy does not reach a steady growth rate equal to the growth of labor plus an exogenous rate of labor productivity growth. Instead, saving and investment decisions can generate self-sustaining growth at a permanently higher rate. This situation is in sharp contrast to the neoclassical model, in which only a transitory increase in growth above the steady state is possible. The reason for this difference is because of the externalities on R&D, diminishing marginal returns to capital do not set in.

3. **Solution: C.**

Birol's statement regarding the Mundell–Fleming model is inaccurate because restrictive (not expansionary) fiscal policy, along with expansionary monetary policy, would lead to capital outflows and cause the currency to depreciate assuming high capital mobility

4. **Solution: B.**

Calculate the interbank implied cross rate for (DRN/EUR). Invert the (EUR/USD) quotes. The 0.8045 bid becomes 1/0.8045 = 1.243 offer for (USD/EUR). The 0.8065 offer becomes 1/0.8065 = 1.240 bid for (USD/EUR).

Determine the interbank implied cross currency quotes for (DRN/EUR) as follows:

Bid: 1.205(DRN/USD) × 1.24 (USD/EUR) = 1.4942 (DRN/EUR)

Offer: 1.210 (DRN/USD) × 1.243 (USD/EUR) = 1.504 (DNR/EUR).

The offer on the interbank is less than the bid by the dealer. A hedge fund can by EUR (sell DRN) in the interbank market for DRN 1.504 and sell EUR (buy DRN) to the Daltonian dealer for a higher price of DRN 1.514.

Case 9: Warren Buffett

1. **Solution: A.**

Munger's justification describes "club convergence." Convergence is consistent with the neoclassical growth model.

2. **Solution: A.**

EM countries are better able to influence their exchange rates because their reserve levels as a ratio of average daily FX turnover are generally much greater than those of DM countries. This means that EM central banks are in a better position to affect currency supply and demand than DM countries, where the ratio is negligible. EM policymakers use their foreign exchange reserves as a kind of insurance to defend their currencies, as needed.

3. **Solution: A.**

Munger's description of growth in the banking sector coupled with short-term funding denominated in foreign currency can lead to a currency crisis. Countries with fixed or partially fixed exchange rates are more susceptible. Broad measures of money such as M2 are likely to be rising (not falling) just prior to a crisis. The higher terms of trade are favorable for the country.

4. **Solution: C.**

Using the Grinold-Kroner framework, equity market returns can be attributed to (1) dividend yield, (2) expansion/contraction of the price-to-earnings ratio, (3) nominal GDP growth, and (4) change in shares outstanding.

Case 10: Charlie Munger

1. **Solution: B.**

In case of Ukraine, the actual GDP growth is below the potential GDP growth rate (3.4% versus 4.0%). This puts downward pressure on inflation which puts corresponding pressure on nominal interest rates and bond prices.

2. **Solution: A.**

Over time, the dividend yield has been found to be fairly stable and a significant contributor to equity market returns

3. **Solution: B.**

Labor is a key input which impacts potential economic growth of an economy. Factors such as population growth, labor force participation rate, net migration and average hours worked can impact the labor force. In the case of Russia, the net emigration of its professionals and intelligentsia and the deaths of many youths reduces the quality and the working age of the labor force. All else equal, one can expect a lower potential GDP growth for Russia.

Ukraine's women welfare program could lead to greater female participation in the labor force. Further the unconditional amnesty granted to the rebel youth groups may increase the labor supply. Therefore, all things being equal we expect Ukraine to experience higher potential GDP growth rates.

4. **Solution: B.**

Earnings growth per share is the primary channel through which economic growth can impact equity returns. Earnings growth per share can be expressed as a function of inflation, real economic growth, and change in the number of shares traded in the market.

Case 11: Yao Ming

1. **Solution: B**

A is incorrect because country A has a very high capital-to-labor ratio; attracting more foreign investment is unlikely to increase the growth rate substantially unless it embodies improved technology.

B is correct because relative to Country B, Country A is a developed country, as it has a much higher per capita GDP and much lower GDP growth rate than Country B.

C is incorrect because most developed countries like Country A already have well developed financial markets and intermediaries.

2. **Solution: B**

The growth accounting equation is as follows:

$\Delta Y/Y=\Delta A/A+\alpha\Delta K/K+(1-\alpha)\Delta L/L$

where

$\Delta Y/Y$ is the growth rate of output

$\Delta A/A$ is the rate of technological change(or total factor productivity)

α is the elasticity of output to capital

$(1-\alpha)$ is the elasticity of output to labour

$\Delta K/K$ is the growth rate of capital

$\Delta L/L$ is the growth rate of labour

Potential GDP growth = $(0.2 \times 2) + (0.8 \times 3) + 2 = 0.4 + 2.4 + 2 = 4.8\%$.

The growth accounting equation states that the growth rate of output equals the rate of technological change plus α times the growth rate of capital plus (1 − α) multiplied by the growth rate of labor. Because a 1% increase in capital leads to an α% increase in output, α is the elasticity of output with respect to capital. Similarly, (1 − α) is the elasticity of output with respect to labor. Thus, in the Cobb–Douglas production function, the exponents α and (1 − α) play dual roles as both output elasticities and the shares of income paid to each factor. Note that the impact of any unspecified inputs (e.g., natural resources) is subsumed into the TFP component.

3. **Solution: B**

A is incorrect because a scale effect relates to exploitation of economies of scale. In this case, the relevant context is the consequence of adoption of a more open trade policy by Country C, which will lead to a selection effect.

B is correct because a selection effect refers to the increased competition from foreign companies, which forces less efficient domestic companies to exit and more efficient ones to inno-vate and raises the efficiency of the overall national economy. If Country C were to adopt a more open trade policy, it would give rise to increased competition from foreign companies, and force the less

efficient domestic companies in Country C to exit, while the more efficient ones would innovate and raise the efficiency of the overall national economy of Country C.

C is incorrect because a backwardness effect relates to the catching up of developing sectors and economies with more developed sectors and economies through knowledge spillovers. In this case, the relevant context is the consequence of adoption of a more open trade policy by Country C, which will lead to a selection effect.

4. **Solution: C**

A is incorrect because club convergence restricts the concept of convergence to a select group of rich and middle income countries. Countries D and E do not belong to the club of rich and middle income countries of the world. Hence, club convergence is not the most appropriate response.

B is incorrect because absolute convergence means that convergence between developing and developed countries is a given, regardless of their particular characteristics. In this case, Yao believes that Countries D and E will eventually converge because of similarity in some of their characteristics.

C is correct because conditional convergence means that convergence is conditional on the countries having the same saving rate, population growth rate and production function, which is the very basis for Yao to believe that Countries D and E will eventually converge.

Financial Statement Analysis

Case 1: AdOre

1. Solution: B.

In 2011, although Glace had less than 20% ownership interest in AdOre, it was considered to have significant influence, which required the equity method.

2. Solution: A.

The minority insterest = AdOre net-income2012 * (1-owned%) = 30,000 *(1-50%)=15,000.

3. Solution: C.

	Equity Method (Joint Control)	**Consolidation (Control)**	**Comparison**
Net income (NI)	Includes 50% of AdOre's net income as investment income	Once non-controlling interest is deducted, the net effect is that 50% of AdOre's net income is included	Same
Revenues	Includes only Cupernico's	Includes 100% of AdOre's plus Cupernico's	Lower under equity
Netprofit margin = NI/Revenues			Higher under equity method because of lower revenues (after the change)
Equity	Includes only Cupernico's	Includes Cupernico's plus the non-controlling interest of AdOre	Lower under equity
ROE = NI/Equity			Higher under equity method because of lower equity
Total assets	Includes 50% of net assets of AdOre as Investment	Includes 100% of AdOre's assets added to Cupernico's	Lower under equity
ROA = NI/Assets			Higher under equity method because of lower assets

4. Solution: A.

Partial goodwill: 50,000-80% × 60,000 =2,000

Full goodwill: 50,000/80%-60,000=2,500

Difference = 2,500-2,000=500

Case 2: Engineered Packaging, Inc.

1. Solution: C.

Total assets, liabilities, revenues, and expenses are higher under proportionate consolidation as compared to the equity method. However, net income and stockholders' equity are the same under either method. Accordingly, profit margin and return on assets are typically lower under proportionate consolidation than under the equity method. Return on equity will be same under either method.

The following financial statements are provided for informational purposes only. The numbers in the acquisition method are derived as EPI + EP/BM LLC, except for the equity items.

In Millions, Year-End 2018	EPI	EP/BM LLC	Acquisition Method
Revenue	$3,115	$421	$3,536
Cost of goods sold	$2,580	$295	$2,875
SG&A	$316	$50	$366
EBIT	$219	$76	$295
Interest expense	$47	$8	$55
Equity in earnings of EP/BM	$22		-
Pretax income	$194	$68	$240
Income tax	$60	$24	$84
(-) Noncontrolling interest			$22 *
Net income	$134	$44	$134
In Millions, December 31, 2018			
Assets			
Cash	$118	$13	$131
Accounts receivable	$390	$50	$440
Inventory	$314	$41	$355
Property	$1,007	$131	$1,138
Investment	$38		-
Total	$1,867	$235	$2,064
Liabilities and Equity			
Accounts payable	$274	$35	$309
Long-term debt	$719	$125	$844
Equity	$874	$75	$911 **
Total	$1,867	$235	$2,064

*50% of EP/BM LLC's net income of $44

**$874 + noncontrolling interest (50% of EP/LLC's equity of $75)

2. Solution: A.

Under Equity Method:

Long-term debt to equity ratio = 719 / 874 = 0.82

Under Acquisition Method:

Long-term debt to equity ratio = 844 / 911 = 0.93

3. Solution: B.

Regardless of the upstream/downstream sale, the net income would be identical under equity method and under acquisition method. All assets (including inventory) would be higher under

acquisition method, regardless of upstream/downstream sale.

4. Solution: C.

Net income will be the same under the acquisition method (partial or full goodwill) and proportionate consolidation. Stockholders' equity will be higher under the acquisition method due to minority interest; thus, ROE will be higher under proportionate consolidation relative to the acquisition method.

Case 3: Jim Loris

1. Solution: B

Loris's response about the past service costs is most accurate. Past service costs arise because of the enrichment of the pension benefit to be received under the plan. Under US GAAP, any past service costs will be reported in other comprehensive income and are amortized on the profit and loss statement over the average service lives of the employees. Under IFRS, the past service costs are recognized as an expense in the income statement.

2. Solution: C

Determination of annual unit credit (benefit)

Estimated final salary (Exhibit 1): $71,261

Estimated annual payment in retirement: $71,261× 1.75% × 2 = $2,494.135

Present value of estimated future payments as of the start of retirement (keystrokes using a financial calculator): (N = 25, I = 7.5, PMT = 2,494.135, Mode: End; PV =?) = $27,801.98781

the estimated defined-benefit obligation: $\frac{27801.98781}{1.075^4} = 20818.1432$

3. Solution: B

The yield on high quality corporate bonds is the appropriate discount rate that should be used to calculate the present value of the future benefits because it represents the rate at which the defined-benefit obligation could be effectively settled.

4. Solution: C

The current service cost will decrease, not increase. A higher discount rate means that the present value of the future benefits earned in retirement will be lower and thus the annual unit credit will be lower. Therefore, the current service cost will decrease.

Case 4: GF Co. Ltd

1. Solution: A.

The amount recognized as operating expense is the share-based compensation expense, which is the product of 2,315,799 RSUs vested with a per-share grant-date fair value of USD 18.25 less forfeitures of 895,147 with a per-share grant-date fair value of USD 21.45. (2,315,799 x 18.25) – (895,147 x 21.45) = 23,062,429.

2. Solution: B.

Settlement of RSUs increases basic shares outstanding. The number of RSUs settled in 20X3 is 2,315,799. Forfeit RSUs are not deducted, as these are RSUs, not common shares.

3. Solution: B.

Tax shortfall related to share-based compensation is recognized as loss directly in equity under IFRS, not as increase in income tax expense on the P&L under US GAAP.

4. Solution: B.

The calculation, based on treasury stock method, is as follows:

Basic Shares outstanding	251,000,000
Plus: Unvested RSUs	12,471,789
Minus: Average unrecognized share-based compensation expense of (165.3 + 252.1 million)/2 = 208.7 million / average share price of 17.5	11,925,714
Diluted shares outstanding	251,546,075

5. Solution: C

Share-based compensation expense is estimated to be USD 465 million x 0.15 = USD 69.75 million. The expense is recognized upon vesting (which for RSUs is coincident with settlement). The number of shares issued and therefore increasing basic shares outstanding is USD 69.75 million / USD 32.33 = 2.16 million shares.

Case 5: Foster Corporation

1. **Solution: A**

A is correct. First, we calculate the aggregate fair value by taking the product of the options granted and the grant-date fair value.

Aggregate fair value of option grants = Options granted x Option fair value

Aggregate fair value of option grants = 15 million x EUR 125

Aggregate fair value of option grants = EUR 1,875 million

The vesting period is three years. Hence, Foster will recognize one-third of the aggregate fair value that vests on the income statement.

2. **Solution: B**

B is correct. The offsetting entry is made to share-based compensation reserve in equity on the balance sheet.

3. **Solution: C**

C is correct. If the share price remains below AED 500, the options are out of the money so the grantees will not exercise them. There is no financial statement impact.

3. **Solution: B**

B is correct. Upon exercise of the options, Foster will recognize a cash inflow in financing activities for the receipt of strike price multiplied by the number of options exercised.

Case 6: WMC

1. Solution: C.

Because YTC operates independently and makes its own financing decisions, the local currency (AUD) should be the functional currency. Current rate method should be used. Under the current rate method, all of the income statement items are translated using the average rate for the year.

2015 translated net income = 25 / 1.30 = 19.23

2016 translated net income = 12 / 1.45 = 8.28

Growth in net income = (8.28 / 19-23) - 1 = -56.94%

2. Solution: B.

Under the temporal method, the nonmonetary assets and liabilities are remeasured at historical rates. Thus, only the monetary assets and liabilities are exposed to changing exchange rates.

Since YTC has net monetary liability, WMC exposed to loss when the foreign currency (AUD) is appreciating.

3. Solution: B.

Total asset turnover = revenue / total assets

Revenues are translated using the same average exchange rate in the temporal and current rate methods. Under the current rate method, assets are translated using the current rate. Under the temporal method, monetary assets are translated using the current rate, and nonmonetary assets are translated using the historical rate. Because the historical rate is lower than the current rate, the nonmonetary assets (and therefore total assets) will have a higher value under the temporal method. A higher asset value means a lower total asset turnover ratio under the temporal method. The calculation of the total asset turnover ratio using both methods is provided for reference below:

	Temporal		*Current Rate*	
Cash	20 / 1.50 =	13.33	20 / 1.50 =	13.33
Accounts receivable	460 / 1.50 =	306.67	460 / 1.50 =	306.67
Inventories	30 / 1.20 =	25.00	30 / 1.50 =	20.00
Prepaid expenses	25 / 1.20 =	20.83	25 / 1.50 =	16.67
Fixed assets	400 / 1.20 =	333.33	400 / 1.50 =	266.67
Total assets		699.16		623.34
Revenues	870 / 1.45 =	600.00	870 / 1.45 =	600.00
Total asset turnover	600.00 / 699.16 =	0.86	600.00 / 623.34 =	0.96

4. Solution: A.

AUD revenue growth rate = (870 / 765)1/2 - 1 = 6.64%

Revenues are translated at average rate:

2014 USD revenues = 765 / 1.40 = 546.43; 2016 USD revenues = 870 / 1.45 = 600 USD revenue growth rate = (600 / 546.43)1/2 — 1 = 4.79%

The USD revenue growth rate is 1.85% lower than the local currency (AUD) revenue growth rate.

5. Solution: C.

Under both the current rate and temporal methods, the revenues for the Ukrainian subsidiary would be translated using the average rate. Cost of goods sold (COGS) would be translated using the historical rate for the temporal method and the average rate for the current rate method. When a currency is depreciating, the COGS based on historical cost (temporal method) will be higher than

COGS translated at the average rate (current rate method) since the average rate will incorporate the historical exchange rate and the most recent (depreciated) exchange rate, decreasing the COGS. Since translated sales are the same under both methods, gross profit and the gross profit margin will be higher under the current rate method.

6. Solution: C.

U.S. accounting standards define a hyperinflationary economy as one in which the 3-year cumulative inflation rate exceeds 100%. The Indian economy can be characterized as hyperinflationary. The inflation rate over the past three years can be calculated as follows:

Year 1 inflation= [(1+ 0.3464) / (1 + 0.020)] -1= 32%

Year 2 inflation= [(1+ 0.2915) / (1 + 0.025)] -1= 26%

Year 3 inflation= [(1+ 0.2566) / (1 + 0.030)] - 1= 22%

Cumulative 3-year inflation = (1.32) (1.26) (1.22) - 1= 103%

U.S. accounting standards allow the use of the temporal method, with the functional currency being the parent's reporting currency, when a foreign subsidiary is operating in a hyperinflationary environment. IFRS accounting standards allow the parent to translate an inflation-adjusted value of the nonmonetary assets and liabilities of the foreign subsidiary at the current inflation rate, removing most of the effects of high inflation on the value of the nonmonetary assets and liabilities in the reporting currency. In a hyperinflationary environment, the parent company can reduce translation losses by reducing its net monetary assets or increasing its net monetary liabilities. In order to do this, the parent should issue debt denominated in the subsidiary's local currency and invest the proceeds in fixed assets for the subsidiary to use in its operations.

Case 7: Ali Saminder

1. Solution: C.

Rule 1 is incorrect because riskier assets are assigned a higher weighting. Risk-free assets such as cash are typically assigned a weighting of zero, because their risk-free nature means that they do not need to be supported by capital. Riskier assets require more capital funding, hence the higher weighting and risk adjust value.

Rule 2 is also incorrect because off-balance sheet assets also require capital funding and hence should be included using the same risk weighting approach.

2. Solution: A.

Risk-weighted assets	601,312
Common equity tier I capital	87,390
Additional tier I capital	+16,401
Tier 1 capital	=103,791
Tier 2 capital	25,447
Total regulatory capital	129,238

Tier 1 ratio=$\frac{103,791}{601,312}=17.3\%$

Total capital ratio=$\frac{129,238}{601,312}=21.5\%$

3. Solution: B.

Per Exhibit 1, convertible bonds are currently part of tier 2 capital. On conversion, they would become common stock and part of common tier 1 capital, hence tier 2 capital would decrease and common tier 1 capital would increase.

4. Solution: A.

	2015	2016	2017
High quality liquid assets	111,432	127,352	198,393
Net outflows	100,483	112,482	196,429
Liquidity coverage ratio=$\frac{high\ quality\ liquid\ assets}{net\ outflows}$	111%	113%	101%

The liquidity coverage ratio actually increased from 2015 to 2016, hence choice B is incorrect.

The net cash outflows are given for 30 days. An LCR ratio of 100% would mean JJK could withstand 30 days of stress-level outflows. To calculate the number of days JJK can withstand, multiply the LCR by 30.

	2015	2016	2017
Number of days of stress volume of cash outflows	30×1.11 33.3	30×1.13 34.0	30×1.01 30.3

Hence A is correct, the number of days decreased by 3 days from 33.3 to 30.3.

Available net stable funding excludes highly liquid assets, hence C is incorrect.

Case 8: Robert

1. Solution: B

Under IFRS 9, FVPL and FVOCI securities are carried at market value, whereas amortized cost securities are carried at historical cost. 56+74+100=230.

2. Solution: C.

If C had been classified as a FVPL security, its carrying value would have been the 110 fair value rather than the 100 historical cost.

3. Solution: A.

LA's cost of borrowing through the SPE is likely to decrease, because the SPE is bankruptcy remote from LA, and the lenders will have a direct claim on the receivables, thus allowing the SPE to borrow at preferred rates.

B is incorrect. LA's accounts receivable will decrease by €75M, while its cash will increase by €70M (€75M cash from the sale of receivables less €5M to set up the SPE). After consolidation, those changes are reversed and the consolidated balance sheet will be identical to the balance sheet under receivables borrowing.

C is incorrect because both IFRS and US GAAP will require the SPE to be consolidated into LA's balance sheet. The result is that the consolidated balance sheet will be identical to the balance sheet under receivables borrowing, and there will be no change in the ratios.

4. Solution: B.

Plan B is a defined contribution (DC) pension plan because the amount of future benefit is not defined and SKI has an obligation to make only agreed-upon contributions. The actual future benefits depend on the invest- ment performance of the individual's plan assets, and the employee bears the investment risk.

5. Solution: B

A higher volatility assumption increases the value of the stock option and thus the compensation expense, which, in turn, reduces net income. There is no associated liability for stock options.

6. Solution: C

A higher dividend yield reduces the value of the option and thus option expense. The lower expense results in higher earnings. Higher risk-free rates and expected lives result in higher call option values.

Case 9: John Wesley

1. Solution: A.

On SA's balance sheet, the cost included in the inventory account is the translation of ₣B27,000/ton into Norvoltian krone on the purchase date. SA could have paid this amount on the purchase date but chose to wait 45 days to settle the account. The inventory cost is determined using the ₣B/NVK exchange rate of 4.1779 on the purchase date of 1 June 2017.

₣B27,000/₣B4.1779/NVK = NVK6,462.58/ton.

The cash outflow is the amount exchanged from the Norvoltian krone to the Bindiar franc to pay the ₣B27,000/ton owed for the inventory 45 days after the transaction date. This payment uses the ₣B/NVK exchange rate of 4.1790 on the settlement date of 15 July 2017.

₣B 27,000/₣B4.1790 per NVK = NVK6,460.88/ton

Foreign exchange gain = Inventory cost – Cash payment

= NVK6,462.58 – NVK6,460.88

= NVK1.70/ton

Thus, SA's cash outflow is less than the cost included in the inventory account, and NVK1.70/ton is the realized foreign exchange gain relating to this transaction. By deferring payment for 45 days, and because the Bindiar franc decreased in value during this period, SA pays NVK1.70/ton less than the inventory cost on the purchase date of 1 June 2017. Thus, SA will report a foreign exchange gain in its 2017 net income.

2. Solution: B.

The consolidated income tax rate is calculated as income tax expense divided by profit before tax. Note 2 shows that SA's consolidated income tax rate decreases by 2.29%, from 34.94% (=94/269) in 2017 to 32.65% (=96/294) in 2018. The largest component of the decrease stems from the 1.42% change in the effect of tax rates in non-domestic jurisdictions, which lowers SA's consolidated income tax rate in 2017 by 3.34% (=9/269) and in 2018 by 4.76% (=14/294). The decrease in 2018 could indicate that SA's business mix shifted to countries with lower marginal tax rates, resulting in a lower consolidated income tax rate and more profit. (The change could also indicate that the marginal tax rates decreased in the countries in which SA earns profits.)

3. Solution: A

A is correct under IFRS. B is correct under US.GAAP.

4. Solution: B

The effect of foreign operations resulted in an increase in effective tax rate for Amco by 3.4% and a decrease for Bianco by 1.2%. Hence, Bianco benefit from its foreign operations in reducing its effective tax rate and tax expense.

Case 10: Ardy Smith

1. Solution: C

The risk of tangible assets of non-financial is less than the bank which predominately has financial asset. A is uncorrect.

Basel III requires banks to meet a minimum capital requirement, not a minimum liquidity requirement, as a ratio of equity to risk-weighted assets. B is uncorrect.

2. Solution: C

From the table below, we can tell that SL Bank's capital adequacy ratio increased in 2020, mainly due to a significant 11.1% decrease in risk-weighted assets in 2020.

The changes in components of the capital adequacy ratios			Changes
Details of capital ratios(in millions)	2020	2019	
Common equity tier 1 capital	216	217	-0.5%
Additional tier 1 capital	92	108	-2.2%
Tier 2 Capital	112	135	-17%
Total capital	420	450	-6.7%
Risk-weighted assets	4,000	4,500	-11.1%

3. Solution: C

SL Bank Japan has higher LCR, so Japan Bank has more liquidity assets.

In 2019 and 2020, Japan Bank's NSFR is less than 100%.

SL Bank USA has more NSFR than Bank Japan.

4. Solution: A

P&C contract has longer duration than L&H. Difference 1 is correct.

L&H has lower capital requirement since its liquidity is lower. Difference 2 is uncorrect.

Types	P&C	L&H
Contract Duration	Short Term	
Variability of claims	Claims are more variable	Claims are more predictable
Investment returns	Conservative	Seek higher returns
Liquidity	Higher degree	
Capitalization		Lower capital requirements

5. Solution: C

Underwriting expense ratio is used to measure the efficieny of obtaning new premium. Lower the value, the better for obtaning new premium.

loss and loss adjustment expense ratio measure of a company's ability to estimate its risk of underwriting. Lower the value, the better for estimation of risk.

Combined ratio = loss and loss adjustment expense ratio + underwriting expense ratio.

6. **Solution: B**

Conclusion 1 is correct. Loan loss provision is in I/S. And it is created for covering uncollected debt which bank made to borrowers.

Conclusion 2 is uncorrect. Since the larger of allowance for loan losses to net charge-off ratio, meaning that Judith Bank become more conservative in its allowance for loan losses.

Case 11: Timothée Chalamet

1. Solution: B.

The calculation for 2017 cost of sales under scenario 3 are given below:

Using Exhibits 1 & 2.

Metric	Calculation	Result
2017 gross margin =	2016 GM + 0.15% = 23.0/35.5 + 0.15% = 64.79% + 0.15% =	64.94%
2017 CoS/net sales =	100% – GM = 100% – 64.94% =	35.06%
2017 net sales =	2016 net sales x (1 + Nominal GDP – 0.75%) = 35.5 mil x (1 + 0.032 -0.0075) =	36.37 € millions
2017 cost of sales =	2017 net sales × CoS/net sales = 36.37 mil × 35.06% =	12.75 € millions

2. Solution: B

In forecasting financing costs the debt/equity structure of a company is a key determinant. Therefore, a method that recognizes the relationship between the income statement account (interest expense) and the balance sheet account (debt) would be a preferable method for forecasting interest expense than methods based solely on the income statement account. By using the effective interest rate (interest expense divided by average gross debt), Scenarios 1 & 3 take the debt/equity structure into account whereas Scenario 2 forecasts 2017 interest expense to be the same as 2016 interest expense hence it will not consider the balance sheet account.

3. Solution: C

A common way to forecast working capital accounts (i.e., inventory) would be by using efficiency ratios, such as inventory turnover. Projections for long-term assets and net debt, are not directly tied to income statement.

4. Solution: C

Overconfidence bias is a bias in which people demonstrate unwarranted faith in their own abilities. Analysts can mitigate this is by recording their forecasts and reviewing them regularly, identifying both the correct and incorrect forecasts they have made.

Confirmation bias is the tendency to look for and notice what confirms prior beliefs and to ignore or undervalue whatever contradicts them. Two approaches to mitigating confirmation bias in the forecasting process are to speak to or read research from analysts with a negative opinion on the security under scrutiny and to seek perspectives from colleagues who are not economically or psychologically invested in the subject security.

Illusion of control is a tendency to overestimate the ability to control what cannot be controlled and to take ultimately fruitless actions in pursuit of control. This can be mitigated by restricting modeling variables to those that are regularly disclosed by the company, focusing on the most important or impactful variables, and speaking only with those who are likely to have unique or significant perspectives.

Case 12: Samuel Warren

1. Solution: B.

	2017 vs. 2016	Calculation	2017
Sales	GDP + 2% = 6% increase	9,925 × 1.06	10,521
COGS	Percentage of sales, expected to decline 0.55% in 2017	[(5,955/9,925) – 0.0055)] × 10,521	6,255
Gross profit			4,266
Selling expenses	Stable percentage of sales	(2,084/9,925) × 10,521	2,209
G&A expenses	No change		350
D&A expenses	No change		300
Operating Profit			1,407
Interest expense	Rate on 2016 net debt = 98/1,640 = 6% Debt to decline by €140 million	1,500 × 0.06	90
EBT			1,317
Income taxes	34% tax rate	1,317 × 0.34	448
Net profit			**869**

2. Solution: B.

The combined cash tax rate will be 22.5% in the current year and then rebound in subsequent years. Only the rate for the current year will decline from a tax deferral; in subsequent years, the deferral for a given year will be offset by the addition of the amount postponed from the previous year. The combined cash tax rate beginning with the second year will decline over time.

Years (€ millions)	0	1	2	3
Profit before tax, Country X	200	200	200	200
Profit before tax Country Y	200	224	251	281
Combined profit before tax	400	424	451	481
Tax per income statement	140	144.8	150.2	156.2
Tax Payment Country X	50	50	50	50
Postponed tax payment, Country X		50	50	50
Tax Country Y 20%	40	44.8	50.2	56.2
Combined tax	90	144.8	150.2	156.2
Cash tax rate	**22.5 %**	**34.15%**	**33.3%**	**32.47%**
effective tax rate	**35%**	**34.15%**	**33.3 %**	**32.47%**

3. Solution: B.

The current favorable characteristics of the industry (high barriers to entry, low bargaining power of suppliers and strong brand loyalty) along with HWC's dominant market share position, will likely result in HWC's profit margins being at least equal to or greater than current levels over the forecast horizon.

4. Solution: B.

HWC's 2016 gross profit margin incorporating the industry-wide 7% inflation on cost of goods sold is calculated as follows:

Revenue growth = (1.04) × (0.98) – 1 = 1.92%

COGS increase = (1.07) × (0.98) – 1 = 4.86%
Forecasted revenue = Base revenue × Revenue growth increase
Forecasted revenue = 100 × 1.0192 = 101.92
Forecasted COGS = Base COGS × COGS increase
Forecasted COGS = 29 × 1.0486 = 30.41
Forecasted gross profit = 101.92 – 30.41 = 71.51
Forecasted gross profit margin = 71.51/101.92 = 70.16%.

Corporate Issuers

Case 1: Phillip Dunross

1. Solution: C

According to Jensen's free cash flow hypothesis, the management may have an incentive to squander free cash flow by overinvesting in negative NPV projects in order to pursue private objectives such as increasing its span of control. Therefore, in the absence of a firm's commitment to pay dividends, the management of Tetra Inc. may overinvest in projects that generate negative returns, thus eroding shareholder's value. Hence, the potential overinvestment problem causing share value erosion may be alleviated by distributing free cash flow as dividends which acts as a control mechanism for the management.

2. Solution: C

Galt's description of the tax structure fits the description of a split-rate tax system. This involves a lower tax rate for earnings distributed as dividends at the corporate level and a higher tax rate for earnings that are retained. At the individual level, dividends are taxed as ordinary income. While the individual is taxed twice similar to a double taxation system, the impact is mitigated to a certain extent due to the lower corporate tax rate..

3. Solution: A.

If Dunross's policy of a constant dividend payout ratio is implemented, based on Exhibit 1 Tetra Inc's total dividend payment next year would be:

Estimated dividend payment = Estimated earnings * Dividend payout ratio= 30 * 80% = USD 24 mn

Dividend per share (DPS) = Estimated dividend payment / Total number of shares outstanding

DPS =24/10 =USD 2.4.

4. Solution: B.

Share repurchases in general may be favored by management due to potential tax advantages arising when capital gains are taxed at a lower rate than dividends. Unlike dividend payments, share repurchases do not represent a firm's commitment to follow through with repurchasing shares, which grants them added flexibility. Share repurchases may also be used to modify a firm's capital structure. However, Galt is incorrect, a share repurchase leads to an increase and not a decrease in financial leverage.

Case 2: Barbara Carlyle

1. Solution: A

If analysts are correct that the change in sales is temporary, the company is most likely to declare a special dividend. Companies, particularly in cyclical industries, may choose to use special dividends to distribute more earnings during strong earning years.

B is incorrect because most companies strive to maintain or increase their dividends and will not increase the regular dividend unless they believe they can continue to pay at or above that level. Rather, they will pay an extra dividend at the end of the year when earnings are unusually good.

C is incorrect because a record of consistent or increasing dividends is widely interpreted as a signal of profitability, and most companies strive to not reduce dividends.

2. Solution: C

The increase in EPS was 25%, calculated as follows:

Steps	**Calculation**		**EPS**
EPS before the repurchase	from Exhibit 1		**$1.24**
Surplus cash available for repurchase		$836 million	
# shares outstanding before repurchase		100 million	
Share price at time of repurchase		$38.00	
Price premium for repurchase		10%	
Repurchase price per share	$38.00 × 110%	$41.80	
# shares repurchased	$836 million ÷ $41.80 per share	20 million	
# shares outstanding after repurchase	100 million – 20 million	80 million	
EPS after the repurchase	$124 million ÷ 80 million shares		**$1.55**
% increase in EPS	($1.55 – $1.24) ÷ $1.24		**25%**

A is incorrect because it applies the price premium (10%) to the EPS.

B is incorrect because it fails to include share premium.

Shares to purchase (in millions) = 836/38 = 22.

Shares outstanding after repurchase (in millions) = 100 – 22 = 78.

EPS after the repurchase = $124/78 = $1.59.

Change in EPS = 1.59/1.24 = 128% = 28.00% increase.

3. Solution: B

SpeedyPro offered a 10% premium over the current price. This is most consistent with a fixed-price tender offer, which normally requires a premium. Negotiated purchase agreements are almost as likely to take place at prices lower than market because they are at prices above market, particularly when shareholders are trying to meet liquidity needs. Open market purchases are market based and can be timed to avoid price impact.

4. Solution: A

The debt-financed repurchase increases the debt-to-equity ratio above the 35% threshold and thus violates the debt covenant.

Book value of equity (millions)	Exhibit 2	C$3,600
Cash available for purchase (millions)	Exhibit 2	C$155
Debt-to-equity ratio (D/E) before	Exhibit 2	30.0%
Book value of debt (millions)	30% × C$3,600	C$1,080
D/E with cash repurchase	C$1,080 ÷ (C$3,600 – C$155)	31.3%
D/E with debt-financed repurchase	(C$1,080 + C$155) ÷ (C$3,600 – C$155)	35.8%

Case 3: Carey Smith

1. **Solution: B**

B is correct. At current market price, number of shares repurchased will be = €20,000,000 / €40 = 500,000 shares.The company will have (20 million shares – 500,000 shares = 19,500,000 shares). Total earnings before the buyback = 20,000,000 x 3.00 = €60,000,000.

Total earnings after the buyback are the same because the company uses idle (nonearning) cash to purchase the shares, but the number of shares outstand-ing is reduced. EPS increases to €3.10 approx. (€60 million / 19.5 million shares = €3.08).

2. **Solution: C**

C is correct. The company's earnings yield (E/P) is USD3/USD40 = 0.075 = 7.5%. When the earnings yield is greater than the after-tax cost of borrowed funds (5.5%), EPS will increase if shares are repurchased using borrowed funds.

3. **Solution: B**

B is correct. LIN Inc. has been paying a regular dividend irrespective of the short-term volatility in earnings, based on the long-term forecast of sustainable earnings in line with the stable dividend policy. LIN Inc. does not pay a consistent dividend payout ratio. Hence A and C are incorrect.

Case 4: Ouse Inc.

1. Solution: C.

Ouse was initially a family-owned business, owned by Catherine Ferguson and her sister, which can make it difficult to attract quality talent for management positions. However, the implementation of a performance-based compensation plan two years ago would improve the motivation and rewards available to management and make it easier to attract quality talent.

A is incorrect. Family-owned businesses often suffer from a lack of transparency. The granting of some equity to senior management might not necessarily improve transparency because the Fergusons are still majority shareholders.

B is incorrect. Interlocking directorships can be a problem in family-owned businesses when there is a corporate group controlling several corporations. There is no mention here of other related companies.

2. Solution: C.

Ferguson asked about the possibility of a dual class share structure, which creates concentrated ownership and concentrated voting power. The controlling shareholders may be able to allocate resources to their own benefit at the expense of the minority shareholders. This situation is known as the principal–principal problem.

3. Solution: B.

The private equity fund is using proprietary methods to identify and assess ESG investments. Proprietary methods include analysts using their own judgement based on information available from corporate reports, industry organizations, news reports, and environmental groups.

4. Solution: B.

The new packaging initiative is expected to reduce costs associated with shipping, packaging, and handling. These savings should increase Ouse's operating margins and operating cash flows. The higher earnings should result in an increase in the fair value estimate of Ouse.

Case 5: Lewis Hamilton

1. Solution: C.

First using the financial calculator, compute semi-annual YTM.

PV=-950, PMT=30, n=14, FV=1000, CPT y = 3.46%.

Annualised YTM=3.46%*2=6.91%

After tax cost of debt = 6.91*(1-0.30) = 4.84%

2. Solution: B.

Cost of preferred equity = 65/870 = 7.47%.

3. Solution: A.

Firstly, the three estimates of the cost of common equity, based on the information given, are calculated as follows:

Palto's estimated cost of common equity using the CAPM is 6.77%, calculated as:

$r_e = r_f + \beta(ERP)$

$r_e = 0.025 + 0.95\ (0.045) = 0.0677$, or 6.77%.

Palto's estimated cost of common equity using the FF5 model is 8.04%, calculated as:

$r_e = r_f + \beta_1(ERP) + \beta_2\ SMB + \beta_3 HML + \beta_4 RMW + \beta_5 CMA$

$r_e = 0.025 + 0.95(0.045) + 0.35(0.015) + 0.13(0.0350) – 0.17(0.029) + 0.25(0.031) = 0.0804$, or 8.04%.

RedBull's estimated cost of common equity using the BYPRP model can be calculated by adding the estimated cost of debt of 6.91% and Lee's estimated premium of 3.5% earned by equity investors relative to long-term corporate bond yields:

$r_e = r_d + RP$

$r_e = 0.0691 + 0.035 = 0.1041$, or 10.4%

The cost of debt is 6.91% and the cost of preferred equity is 7.47%. Given that common shareholders have a residual claim on assets below that of preferred shareholders and debt holders, they will demand a higher required return on equity. Thus, the CAPM estimate of 6.77% does not appear to be realistic.

4. Solution: C.

From the perspective of a company operating in Country X, the relevant sovereign yield spread is 3.3% – 1.2% = 2.1%.

Adjusting this spread for the relative volatility of the equity and bond returns in the local market, the premium is CRP = 0.021× 0.037/0.023 = 3.38%

Adjusting this premium for the exposure that Indian Power has to Country Y, Premium = 0.35 × 0.0338 = 0.0118.

Therefore, when the analyst calculates the cost of equity for Indian Power, he should add a CRP of 1.18% to the cost of equity for the company.

Case 6: Fernando Alonso

1. Solutions: A

Civil law countries afford fewer protections to investors as compared to common law countries and hence investors in civil law jurisdictions like Country M may demand a higher risk premium. Countries with less-developed capital markets and highly volatile currencies would similarly call for a higher risk premium.

2. Solution: A

Aston Martin's interest coverage (IC) ratio = 3,421 / 814 = 4.20. Aston Martin's financial leverage (D/E) ratio = 8,671 / 17,342 = 0.50. Both values fall within the range for BBB classification; this indicates a 1.20% spread. After-tax cost of debt = $r_d(1 - T)$ = (2.30%+ 1.20%) × (1 – 0.34) = 2.31%.

3. Solution: B

Arithmetic mean is a good estimate of a one-period expected return, but does a poor job of estimating multiperiod return (which determines expected terminal wealth). A geometric mean gives lower weight to outliers and estimates the expected terminal wealth more accurately.
A weakness of the historical approach (and not forward looking estimates) is the assumption that the mean and variance of the returns are constant over time (i.e., the ERP time series is stationary). Historical estimates (not forward-looking estimates) may suffer from survivorship bias.

4. Solutions: C

Expected inflation = (1+ nominal $yield_{treasury}$) / (1 + $yield_{TIPS}$) -1

= (1.0267 / 1.0033)- 1 = 2.33%.

ERP = [DY + ΔP/E + i + G + ΔS] – E(rf) = [1.10% – 0.10% + 2.33% + 3% + 0]– 2.67% = 3.66%

Case 7: Titan.Inc

1. Solution: C.

The first step in the process is to calculate the multiples at which each company was acquired.

Relative Valuation Ratio	Maria	Rose	Sina	Mean
Acquisition price (€)	47.00	25.00	54.00	
P/E	18.43	14.29	17.65	16.79
P/CF	11.20	9.09	11.27	10.52
P/BV	2.90	3.21	4.57	3.56

Next apply the means to the valuation variables of Marley to get the estimated takeover value based on comparables.

Valuation Variables	Marley	Mean Multiples for Comparables	Estimated
Earnings/share	2.01	16.79	33.75
Cash flow/share	3.55	10.52	37.35
Book value/share	10.67	3.56	38.00
Estimated Stock Value			Mean = €36.37

2. Solution: B.

Rose was acquired at the highest takeover premium. The takeover premium for the three recent comparable takeovers is calculated as follows:

(47.00– 43.90)/43.90 = 7.1%.

(25 – 23.10)/23.10 = 8.2%.

(54.00 – 50.15)/50.15 = 7.7%.

3. Solution: A.

The calculation is as follows:

Peer Median EV/EBIDTA is 17x.

EBIDTA of Marley =€601 million/15=€40.07million.

Based on this the estimated enterprise value of Marley = €40.07million *17 = €681.19 million..

4. Solution: B.

The comparable company analysis provides an estimate of fair stock price, not the fair takeover price. Analysts must add an estimated takeover premium to estimate a fair takeover price.

Equity Valuation

Case 1: Arnaud Aims

1. Solution: A.

The justified P/S ratio based on the forward-looking sales margin is leading justified P/S

$$\text{Leading justified}\frac{\text{P}}{\text{S}} = \frac{P_0}{S_1} = \frac{\left(\frac{E_1}{S_1}\right)(1-b)}{r-g}$$

Based on the CAPM, the required rate of return is 4.5% + 1.2 × 6% = 11.7%.

$$1 - b = \frac{0.72}{1.2} = 0.6$$

g = ROE×b = 20%×(1-0.6) = 8%

$$\text{Leading justified}\frac{\text{P}}{\text{S}} = \frac{(10\%)(0.6)}{11.7\% - 8\%} = 1.6216$$

2. Solution: A.

Aims is correct about both ratios. For example, let's take the trailing P/E ratio, which is P_0/E_0. Multiplying by the net profit margin results in $P_0/E_0 \times E_0/S_0 = P_0/S_0$. The justified P/E is (1 - b) (1 + g) / (r - g), the justified P/S is (E_0/S_0) (1 - b)(l + g) / (r - g). Multiplying the leading P/E ratio by the ROE results in $P_0/E1 \times E1/B_0 = P_0/B_0$. If the justified P/E is (1 - b) / (r - g), the justified P/B is ROE (l - b) / (r - g). This becomes (ROE - b × ROE) / (r - g). Since b × ROE = g (from sustainable growth equation), the equation becomes (ROE - g) / (r - g).

3. Solution: A.

Both criteria are poorly applied by the associate. Generally, a lower PEG ratio is considered desirable, not a higher one. The difference in the trailing and leading P/E ratios could be due to transitory elements in the current year's income in the denominator of the trailing P/E. In a constant growth model (admittedly a strong assumption), the leading P/E will naturally be smaller than the trailing P/E because earnings are growing by g.

4. Solution: C.

Comment 1 about EBITDA ratios is incorrect. EBITDA is a pre-interest variable, so it is a flow available to all suppliers of capital, not just common shareholders. The comment about dividend yields is reasonable.

Case 2: Mendosa

1. Solution: C.

Using the PVGO and assuming that the company has no positive net present value (NPV) projects, the PVGO Model is:

$$V_0 = \frac{E_1}{r} + PVGO = \$70 = \frac{\$5.33 \times 1.15}{0.124} + PVGO$$

$70 = $49.43 + PVGO

PVGO = $70 - $49.43 = $20.57

2. Solution: B.

Using the two-stage discounted dividend model:

$D_0 = \$5.33 \times 0.60 = \$3.20$

Time	Value	Calculation	D_t or V_t	Present Value
1	D_1	3.2(1.15)	$3.68	$3.27
2	D_2	$3.2(1.15)^2$	$4.23	$3.35
3	D_3	$3.2(1.15)^3$	$4.87	$3.43
4	D_4	$3.2(1.15)^4$	$5.60	$3.51
5	D_5	$3.2(1.15)^5$	$6.44	$3.59
3	V_5	$3.2(1.15)^5(1.06)/(0.124-0.06)$	$106.60	$59.42
Total				$76.57

3. Solution: B.

Statement 3 by Raman is most accurate. The residual income model, also called the excess earnings method, does not have the same weakness as the FCFE approach, because it is an estimate of the profit of the company after deducting the cost of all capital: debt and equity. Further, it makes no assumptions about future earnings and dividend growth.

4. Solution: C.

Using a multi-stage residual income model and the data in Exhibit 2:

Equity charge = Equity capital × Cost of equity capital

= 20.97 × 0.124 = $2.60 million

Residual income of the more recent year = Net income – Equity charge

= 8.00 – 2.60 = $5.40 million

Raman's assumed growth rate during the forecast period of five years = 15%

Annual residual income during the no growth period (after Year 5) = $5.40 \times (1.15)^5$ = $10.86

Present value (PV) of the residual income from perpetual period, as at T = 5:

($10.86/0.124)=$87.58

PV of the perpetual period residual income at T = 0: 87.58/ $(1.124)^5$=$48.82

Case 3: Amy Liu

1. Solution: B.

Solution: B

Using the build-up approach, cost of equity = Risk-free rate + equity risk premium + small stock risk premium + industry risk premium + company-specific risk premium. Cost of equity = 4.7% + 7.0% + 2.0% + (-1.2%) + 1.0% = 13.5%.

WACC = 0.09 x (1-0.3) x 0.25 + 0.135 x 0.75 = 11.70%.

2. Solution: B.

Capitalization rate = WACC – long-term growth rate = 12.3% – 6.0% = 6.3%.

3. Solution: C.

Statement 1 is incorrect because CCM is often used for valuing private companies, such as Silk Inc. Statement 2 is correct.

4. Solution: A.

Liu is correct in saying that the GTM uses a multiple that particularly relates to sales of entire companies. B is incorrect, because information not subject to public disclosure is limited.

Hence, the GTM approach is not readily acceptable by most appraisers. C is incorrect because current market values of debt may not be available. Hence, for companies that are highly leveraged or have volatile future expected performance, the valuation of equity by deducting the face value of debt from MVIC may not be appropriate.

Case 4: Cuyahoga River Navigators, Inc.

1. Solution: C.

The H-model is

$$V_0 = \frac{D_0(1+g_L) + D_0H(g_S - g_L)}{r - g_L}$$

Where

D0 = Dividend/Number of shares

D0 = \$48/\$50 = \$0.96

g_S = Initial short-term dividend growth rate = 20%

g_L = Normal long-term dividend growth rate = 6%

r = 11% + 2% = 13%

H = 4/2 = 2

$$\frac{D_0(1+g_L)}{r - g_L} = \frac{0.96(1.06)}{0.13 - 0.06} = 14.54$$

$$\frac{D_0H(g_S - g_L)}{r - g_L} = \frac{0.96 \times 2 \times (0.2 - 0.06)}{0.13 - 0.06} = \$3.84$$

V_0 = \$14.54 + \$3.84= \$18.38

2. Solution: C.

FCFF = EBITDA (1 – Tax rate) + Depreciation (Tax rate) – FCInv – WCInv FCFE

= FCFF – Interest (1 – Tax rate) + Net borrowing

(\$ millions)		
EBITDA (1 – Tax rate) a	275 (1 – 0.35)	\$178.75
Plus: Depreciation (Tax rate) a	82.5(0.35)	28.87
Less: Net investment in fixed capital		(165.3)
Less: Net increase in working capital b		1.8
Less: Interest (1 – Tax rate) a	16 (1 – 0.35)	(10.38)
Plus: Net borrowing	(157.5 + 20) – (150 + 15)	12.5
Free cash flow to equity		\$46.24
FCFE per share	46.24/50	\$0.92
a Jatin's tax rate = 35%, which is different from the original tax rate. b Net increase in Net Working Capital 2013 is less by \$1.80, so it is a positive number.		

3. Solution: B.

	2014	2015	2016	2017
FCFE per share for the year	\$0.96 (Jatin's est.)	\$0.96(1.2) = \$1.15	$\$0.96(1.2)^2$ = \$1.38	$\$0.96(1.2)^3$ = \$1.66

Present value (2013) of FCFE and total value2014	\$0.96/1.13 = \$0.85	\$1.15/1.13^2 = \$0.90	\$1.38/1.13^3 = \$0.96	$\frac{\$1.66}{1.13^4} = \$1.02$ $\frac{(\$1.66 \times 1.06)/(0.13 - 0.06)}{1.13^4}$ $= \$15.42$
V_0 as of 2013	\$0.85 + \$0.90 + \$0.96 + \$1.02 + \$15.42 = \$19.15			

4. Solution: B.

B is correct. Jatin is correct with respect to Statement 1 only. The H-model is a variant of the two-stage model in which growth begins at a high rate and declines linearly throughout the supernormal growth period until it reaches a normal growth rate at the end. A smoother transition to the mature phase growth rate would be more realistic than the erratic growth rate in dividends displayed by the data.

A is incorrect. With an increase in leverage, FCFE will increase in the year debt is issued, not decrease.

C is incorrect. The FCFE model explicitly recognizes the company's investment and financing policies as well as its dividend policy.

Case 5: Tom Pit

1. Solution: A.

Adjusted EV/EBITDA multiple = 6.7 x 1.20 = 8.04. EV = EBITDA2017 x Adjusted EV/EBITDA = 130 x 8.04 = 1,045.2 million. Value of equity = EV + Cash and short-term investments – Long-term debt = 1,045.2 + 62.5 – 37.5 -10 = $1,060.2 million.

2. Solution: B.

B is correct. Discount for lack of control DLOC = 1 – 1/1.25 = 20%

3. Solution: C.

Option-based approaches seek to quantify DLOMs using the right to sell shares as captured by a put option premium.

Case 6: Chan Mei Yee

1. Solution: B.

FCFF = NI + NCC + Int (1 - Tax Rate) - FCInv - WCInv Net income (given) = $626;

Interest Expense (given) = $186;

Tax rate = 294/920 = 32% Non-cash charges (depreciation) (given) = $243;

Fixed capital investment (given) = $535

WC Investment	2012 ($)	2011 ($)	Net increase($)
Current assets excluding cash	1,290 - 32 = 1,258	1,199 - 21 = 1,178	
Current liabilities	2,783	2,678	
Working capital	-1,525	-1,500	-25
FCFF = 626 + 243 + 186(1 - 0.32) - 535 -(-25) = 485.48 = $485 million			

2. Solution: B.

FCFE = FCFF - Interest (1 - T) + Net borrowing

Given: 2012 FCFF base case estimate = $500; Interest exp = $186; Tax rate = 32%

	2012	2011	Net increase
Long-term debt ($)	2,249	2,449	-200
FCFE = 500 - 186 × (1 - 0.32) + (-200) = $174 million			

3. Solution: C.

First it is necessary to estimate FCFE2013

FCFE = Net income - (1 - DR) (FCInv - Depreciation) - (1 - DR) (WCInv)

Where

DR = debt ratio, which is 40%

FCInv = investment in fixed capital

Which is 30% of EPS WCInv = investment in working capital

Which is 10% of EPS

On a per-share basis:

FCFE: (2013) = 1.80 - (1 - 0.40) (0.30 × 1.80) - (1 - 0.40) (0.10 × 1.80)

FCFEi (2013) = 1.80 - 0.324 - 0.108 = 1.368.

FCFE will grow at the same rate as net income, 6% annually.

$$\frac{FCFF_1}{r-g}=\frac{1.36}{0.12-0.06}=22.8$$

The value per share is $22.80.

4. Solution: A.

The three possible actions are: dividend increase = 110; share repurchase =60; and the debt repayment = 100. Reducing debt by $100 million reduces FCFE (the amount of cash available to equity holders) by that amount. The cash dividend and the share repurchase are uses of FCFE, and do not change the amount of cash available to equity holders. Therefore FCFE will decrease by $100 million.

Case 7: Tom Baker

1. Solution: C.

Transactions between the company and its shareholders (through cash dividends, share repurchases, and share issuances) do not affect free cash flow. However, leverage changes, such as the use of more debt financing, have some impact on free cash flow because they increase the interest tax shield (reduce corporate taxes because of the tax deductibility of interest) and reduce the cash flow available to equity.

2. Solution: A.

Cash flow from operations (CFO) already reflects changes in working capital items, therefore Paschel's first comment is correct. EBITDA has the non-cash charges of depreciation and amortization added back, so Covey's statement is incorrect, not all non-cash charges will need to be added back. Net borrowing is added back for FCFE not FCFF, so Paschel's second statement is incorrect.

B is incorrect. Depreciation has already been added back to EBITDA, though there may be other items that still need to be added back.

C is incorrect. Adjusting for net borrowing is not necessary for FCFF (just FCFE).

3. Solution: C.

FCFF is preferred over FCFE when a company is leveraged and expecting a change in capital structure. FCFF growth will reflect fundamentals more clearly because FCFE growth will reflect fluctuating amounts of net borrowing. Second, in a forward-looking context, the required return on equity might be expected to be more sensitive to changes in financial leverage than changes in the WACC.

A is incorrect. Statement 1 suggests that FCFE should be used, but this choice is inappropriate given the already levered balance sheet and coming increase in debt capital.

B is incorrect. Statement 3 suggests that the required return to equity should apply to both FCFE and FCFF, yet WACC is the proper discount rate to use in the FCFF method.

4. Solution: C.

C is correct. Paschel is incorrect with respect to incorporating a discount for lack of marketability. The change in investment objective is from control perspective i.e. from a synergistic acquisition to minority investment. Therefore, a discount for lack of control needs to be incorporated in the new valuation. Since the company is private, a discount for lack of marketability would be applied in both valuations.

Case 8: Edward Jenner

1. Solution: B.

Calculating a normalized EPS for Cerulean Plantations using the average EPS method involves averaging the recorded EPS over the 2008-2012 period, which is: (-1.43 + 2.34 - 0.86 + $2.89 + $1.56) ÷ 5 ≈0.9. Hence the trailing P/E based on this estimate is: 8.50/$0.9 = 9.4.

2. Solution: A.

Based on fundamentals, the justified P/E is positively related to the earnings growth rate and inversely related to the stocks required rate of return on equity. Miller expects Cerulean to record a higher future earnings growth rate relative to its peers which would likely result in a higher multiple. Further, Cerulean Plantations faces lower financial risk compared with its peers and hence investors would demand a lower required rate of return on equity which would justify a higher P/E multiple.

3. Solution: C.

The P/B multiple is preferred because the book value per share (BVPS) is a cumulative balance sheet amount and hence less likely to be negative even when earnings are negative. As a result, book values are relatively less volatile than earnings. However P/B may be misleading when the levels of assets used by companies under examination are different because of their different business models.

4. Solution: C.

The expression for the justified P/BV multiple based on the residual income valuation approach is:

P_0/B_0 = 1 + (Present value of expected future residual earnings/B_0)

The justified P/BV for Cerulean Plantations based on Miller's estimates would be:

P_0/B_0 = 1 + (30/10.4) = 3.885 ≈3.9.

5. Solution: C.

Most analysts would use a simple approximation for price to cash flow analysis. The Cash flow from operations (CFO) and earnings plus noncash charges are common approximations used in this regard. However free cash flow to firm (FCFF) is not a recommended proxy as it as it represents cash flow available to all investors, not just equity holders.

6. Solution: B.

The harmonic mean is sometimes used to reduce the impact of large outliers—which are typically the major concern in using the arithmetic mean multiple—but not the impact of small outliers (i.e., those close to zero). The harmonic mean may aggravate the impact of small outliers, but such

outliers are bounded by zero on the downside.

Case 9: Timothée Chalamet

1. Solution: A.

A is correct. Sources of perceived mispricing are: true mispricing (difference between true intrinsic value and market price), and error estimate (difference between valuation estimate and true intrinsic value). B & C are incorrect statements.

2. Solution: C.

C is correct. Miller is correct in his interpretation of asset-based valuation but incorrect in his explanation of the FCFF model. FCFF valuation is defined as discounting of cash flows before making debt payments to calculate intrinsic value, whereas, FCFE valuation is defined as discounting of cash flows net of payments to providers of debt to calculate equity value. Equity Valuation: Applications and Processes.

3. Solution: A.

A is correct. HQ Telecom is in the growth stage because it is expanding rapidly and enjoying the benefits of the a rapidly growing market. HQ Telecom has shown profit margins higher than its competitors and abnormally high earnings per share growth, reflecting that the company is in its growth phase.

4. Solution: B.

B is correct. Carter's note regarding the differences in the accounting method is correct, since an analyst need to adjust EPS for differences in accounting methods of companies that are being compared in order to make P/E multiples comparable. A and C are incorrect because an analyst must consider and make necessary adjustments for nonrecurring items and business cycle influences.

Fixed income

Case 1: Natalia Berg

1. **Solution: B.**

The exposure of each portfolio to changes in the 5- and 10-year rates are equal to the sum of the 5- and 10-year key rate durations:

Portfolio 1 exposure = 0.20 + 0.15 = 0.35

Portfolio 2 exposure = 0.40 + 4.00 = 4.40

Portfolio 2 has the largest exposure, and portfolio 1 has the smallest exposure. If the 5- and 10-year key rates increase, portfolio 1 will fall by the smallest amount and will experience the best price performance (i.e., the smallest decrease in value).

You can confirm this by doing the calculations for a 20 basis point increase:

% change in portfolio 1 = (-0.20 x 0.002 x 100) + (-0.15 x 0.002 x 100) = (-0.35 x 0.002 x 100) = -0.07%

% change in portfolio 2 = (-0.40 x 0.002 x 100) + (-4.00 x 0.002 x 100) = (-4.40 x 0.002 x 100) = -0.88%

2. Solution: A.

Statement 1 is correct. Swap markets tend to have more maturities with which to construct a yield curve as compared to government bond markets. Statement 2 is correct. Retail banks tend to have little exposure to swaps and hence are more likely to use the government spot curve as their benchmark.

3. Solution: C.

The value of a 3-year bond extendible by one year is equal to an otherwise identical 4-year bond that is puttable in three years. Accordingly, the value of bonds B and C should be the same.

4. Solution: C.

The steps in the process of calculating the effective duration of a callable bond using a binomial tree are as follows:

Step 1: Given assumptions about benchmark interest rates, interest rate volatility, and the call and/or put rule, calculate the OAS for the issue using the binomial model.

Step 2: Impose a small parallel shift in the on-the-run yield curve by an amount equal to +Ay.

Step 3: Build a new binomial interest rate tree using the new yield curve.

Step 4: Add the OAS to each of the 1 -year forward rates in the interest rate tree to get a "modified" tree. (We assume that the OAS does not change when interest rates change.)

Step 5: Compute BV_{+Ay} using this modified interest rate tree.

Step 6: Repeat steps 2 through 5 using a parallel rate shift of-Ay to estimate a value of BV_{Ay}.

There is no restriction on the relationship between the assumed change in the yield (Ay) and the OAS.

Case 2: Nicholas Lee

1. Solution: B.

B is correct. The present value of the bond is 100.65. Since the forward rates are assumed to be the future spot rates, the total realized return (coupon reinvestment and par) of the bond at the end of Year 4 is calculated as follows:

7(1.06)(1.08)(1.101) + 7(1.08)(1.101) + 7(1.101) +107 = 131.85.

The annualized realized return = (131.85 / 100.65) $^{1/4}$ – 1 = 6.98%.

2. Solution: C.

C is correct. The forward rate *f(2,1)* implied form investor's expectation is calclulated as:

$$\frac{(1+10.25\%)^2}{1+8.4\%}-1=12.13\%$$

For any bond which the expected future spot rates are higher than quoted forward rates for the same maturity (for example, the 8.0% one-year rate two years from now compared with investor's expected 12.13%), the bond is overvalued vs. its intrinsic value since the market is placing a lower discount rate on its cash flows.

3. Solution: B.

B is correct. Statement 3 relates to Z-spreads, which represent the constant basis point spread that would need to be added to the implied spot curve in order to determine the price of a bond which has credit risk.

A is incorrect. Statement 2 relates to The Libor–OIS. The Libor–OIS represents the difference between Libor and the overnight index swap rate. Since the Libor–OIS spread is affected by bank's lending rates for unsecured overnight loans, the Libor–OIS spread is a measure of risk in the money markets.

C is incorrect. Statement 1 relates to the TED spread. The TED spread represents the difference between the yield on treasury bills and Libor for a specific maturity date. Since the TED spread is affected by banks' analysis of default of interbank loans, the TED spread is a measure of counterparty risk.

4. Solution: A.

The yield curve flattens as long-term rates fall by more than short-term rates which is consistent with bullish flattening. Changing the portfolio from bullet to barbell will benefit from decreasing in long term rates. Since he holds the long position in bond portfolio, and the yield curves goes down, he will not get lose under this condition.

Case 3: William Rogers

1. Solution: C.

Statement 1 is correct. If the volatility of interest rates decreases, the call option is less valuable, which increases the value of the callable bond. Recall that $V_{calllable} = V_{noncallable} — V_{call}$. Statement 3 is also correct. The value of the noncallable bond increases by more than the callable bond because as yield falls, the value of the call goes up. As the call value increases, the callable value (noncall value - call option value) goes up by less than the noncall value.

2. **Solution: B.**

Statement 2 is incorrect because the noncallable bond value will be affected by a change in the level of interest rates.

Statement 4 is correct because higher interest rate volatility will increase the value of the embedded put option and increase the value of the puttable bond.

3. **Solution: B.**

The answer is 93.26. This value of the non-callable bond at node A is computed as follows:

$$value = \frac{[0.5 \times (V_{up} + \frac{coupon}{2})] + [V_{down} \times (100 + \frac{coupon}{2})]}{(1 + \frac{interest\ rate}{2})}$$

$$= \frac{[0.5 \times (91.73 + \frac{6}{2})] + [0.5 \times (96.17 + \frac{6}{2})]}{(1 + \frac{0.0791}{2})} = 93.26$$

4. **Solution: A.**

The correct value is 100.00. The computed value of the callable bond at node A is obtained as follows:

$$value = \frac{[0.5 \times (100 + \frac{6}{2})] + [0.5 \times (100 + \frac{6}{2})]}{(1 + \frac{0.0315}{2})}$$

However, when working with a callable bond, you have to remember that the value of the bond at any node is the lesser of (1) the bonds computed value or (2) the call price. So, we have:

$$value = Min[100, \frac{[0.5 \times (100 + \frac{6}{2})] + [0.5 \times (100 + \frac{6}{2})]}{(1 + \frac{0.0315}{2})}] = 100$$

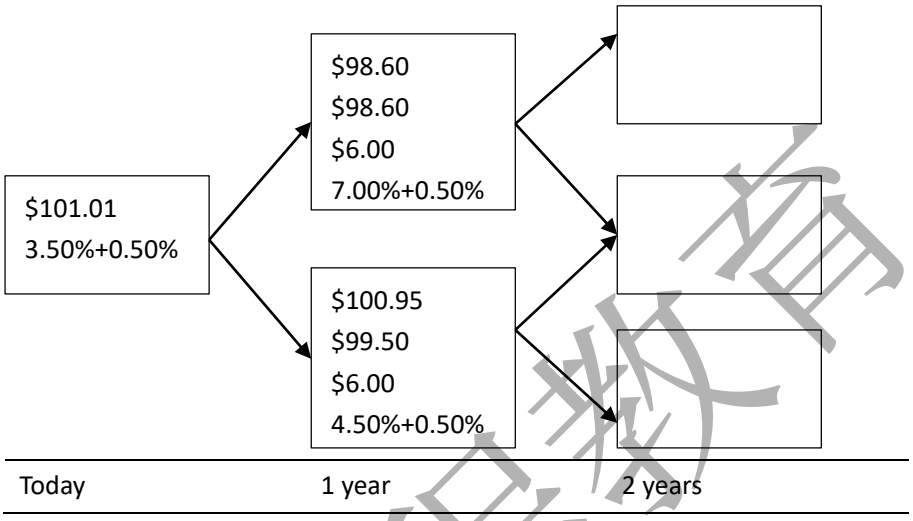
In this case, since the computed value (101.4) is greater than the call price (100), the nodal value is $100.

Case 4: Susan Evermore

1. **Solution: B**.

The bond will be called in the lower node if the interest rate (including OAS) is 5.0% because the present value of the remaining cash flows ($100.95) is greater than the call price ($99.50). The bond will not be called if rates increase to 7.5% in the upper node because the value of the bond ($98.60) is less than the call price ($99.50). The value of the callable bond according to the model is 101.01:

$$v_0 = \frac{1}{2}\left[\frac{98.60+6.00}{1.04}+\frac{99.50+6.00}{1.04}\right]=101.01$$



2. **Solution: C**.

The benchmark securities used to create the tree are Treasury securities, so the OAS for each callable corporate bond reflects additional credit risk and liquidity risk relative to the benchmark. The bonds are overvalued if their OAS are smaller than the required OAS and undervalued if their OAS are larger than the required OAS. The required OAS for both bonds is the Z-spread over Treasuries on comparably rated securities with no embedded options. That required spread is not provided in the vignette. The BB-rated issue is overvalued because its OAS is less than zero, which means it must be less than the required OAS. Therefore, Evermore is correct in her analysis of the BB-rated issue.

The AA-rated issue has a positive OAS relative to the Treasury benchmark, but we don't know the required OAS on similar bonds, so we can't determine whether or not the AA-rated issue is over or undervalued based on the information given. Therefore, Evermore is incorrect to conclude that the issue is undervalued.

3. **Solution: A**.

Davenport has correctly outlined the appropriate methodology for using a binomial model to estimate effective duration and effective convexity. Evermore fails to adjust for the OAS and, instead, simply adds 100 basis points to every rate on the tree rather than shifting the yield curve upward and then recreating the entire tree using the same rate volatility assumption from the first step. Even if both use the same rate volatility assumption and the OAS is equal to zero, the two methodologies will generate significantly different duration and convexity estimates.

4. **Solution: B**.

The value of a callable convertible bond is equal to the value of an option-free bond plus the value of the conversion option on the stock minus the value of the call option on the bond.

A decrease in the volatility of High four's common stock returns will decrease the value of the conversion option on the stock. Consequently, the value of the convertible bond will also decrease. Evermore was correct in her analysis 1.

A decrease in the yield volatility will decrease the value of the embedded call option. The issuer has written the call option, so a decrease in the value of the call option will increase the value of the convertible bond. Evermore is incorrect in her analysis 2.

Case 5: John Steven

1. **Solution: A**.

Structural models require that the company's assets trade in a frictionless arbitrage free market.

2. Solution: B.

Under the structural model's debt option analogy, owning a company's debt is economically equivalent to owning a riskless bond that pays K dollars at time T, plus simultaneously selling a European put option on the assets of the company with maturity T and strike price K.

3. **Solution: A**.

Ratings tend to be stable over time, which reduces their correlation to default probabilities; hence, point 2 is incorrect.

4. Solution: A.

Market participants typically prefer to use the swap-rate curve as a benchmark (rather than a government bond yield curve) for the following reasons:

- The swap market is not regulated by any government, which makes swap rates in differernt countires more comparable. Government bond yield curves additionally reflect sovereign risk unique to each country.
- Swap rates reflect the credit risk of commercial banks rather than the credit risk of governments.
- The swap curve typically has yield quotes at many maturities, while the U.S government bond yield curve has on the run issues trading at only a small number of maturities.

Case 6: FutureTech

1. Solution: B.

GD. is part of the index CDS. FutureTech sold protection of $350 million over the 125 equally weighted entities, meaning that it has effective exposure of $350 million / 125 = $2.8 million

On the single-name GD. CDS, FutureTech purchased protection of $2.5 million, leaving a net notional exposure of 2.8 - 2.5 = $0.3 million.

2. Solution: B.

As the credit spread for ST. has widened and FutureTech has purchased protection, FutureTech will gain by selling protection at a higher premium.

3. Solution: C.

Typically, an LBO will result in an increase in the probability of default due to the large increase in debt levels. An investor would, therefore, seek to buy protection, as the premium would rise along with the probability of default. Due to the takeover premium that would result from the LBO, Eagen would also benefit by going long ST. stock.

4. Solution: C.

Both statements are incorrect because Eagen incorrectly describes both types of models. Equilibrium term structure models are factor models that seek to describe the dynamics of the term structure by using fundamental economic variables that are assumed to affect interest rates. Arbitrage-free term structure models use observed market prices of a reference set of financial instruments, assumed to be correctly priced, to model the market yield curve.

Case 7: Diane Muniz

1. **Solution: B.**

Statement 2 is incorrect. Both bondholder options and issuer options can be embedded in the same bond. For example, convertible bonds contain a conversion option that allows the bondholder to convert bonds to the issuer's common stock. At the same time, the convertible bond can have an embedded call option that allows the issuer to call the bond issue to take advantage of low interest rates or to force conversion.

A is incorrect. Statement 1 is correct. C is incorrect. Statement 3 is correct.

2. Solution: B.

B is correct, Gomaa is correct. The option-adjusted spread (OAS) is the constant spread that is added to all one-period forward rates on the interest rate tree and results in the present value of the bond's cash flows, or arbitrage-free value, equaling the bond's market price. Gomaa also correctly describes how to use OAS for relative valuation. For two bonds that have otherwise similar characteristics, the bond with the higher OAS is underpriced, or, alternatively, the bond with the lower OAS is overpriced.

3. Solution: B.

Muniz's comments on the effective duration of callable and putable bonds are incorrect. For callable bonds, when interest rates rise and are high compared to the bond's coupon rate, the call option is out of the money and the price of the callable bond and an otherwise identical straight bond are almost the same. Thus, the effect of an interest rate change on the price of a callable bond and the straight bond is similar— that is, the effective duration of the callable and straight bonds is similar. For putable bonds, when interest rates rise and are high compared to the bond's coupon rate, the put option is in the money and the price of the putable bond will not fall as much as the straight bond because the investor can put the bond. Thus, the effective duration of the putable bond is lower than the effective duration of the straight bond.

A is incorrect. Muniz's comments on the effective duration of callable and putable bonds are incorrect.

C is incorrect. Muniz's comments on the effective duration of callable and putable bonds are incorrect.

4. Solution: A.

A bond's sensitivity to changes in the shape of the yield curve, steepening or flattening, is captured by key rate duration. One-sided duration (up or down) is better than effective or two-sided duration at capturing the interest rate sensitivity of a callable or putable bond but only for a parallel shift in the yield curve, not for changes in the shape of the yield curve.

B is incorrect. A bond's sensitivity to changes in the shape of the yield curve, steepening or flattening, is captured by key rate duration. One-sided duration (up or down) is better than effective or two-sided duration at capturing the interest rate sensitivity of a callable or putable bond but only for a parallel shift in the yield curve, not for changes in the shape of the yield curve.
C is incorrect. A bond's sensitivity to changes in the shape of the yield curve, steepening or flattening, is captured by key rate duration. One-sided duration (up or down) is better than effective or two-sided duration at capturing the interest rate sensitivity of a callable or putable bond but only for a parallel shift in the yield curve, not for changes in the shape of the yield curve.

Case 8: Sandy Sherry

1. Solution: B.

The spot rate from Year 2 is determined as follows:

$$100 = \frac{1.50}{(1.011)^1} + \frac{101.5}{(1+S_2)^2} \quad S_2 = 1.503\%$$

2. Solution: A.

The value of the bond's cash flows using spot rates is $103.4816 and is determined as follows:

$$103.4816 = \frac{3.20}{(1.011)^1} + \frac{3.20}{(1.01503)^2} + \frac{103.20}{(1.02013)^3} = 3.1652 + 3.1059 + 97.2105$$

So, strips could be purchased for $103.4816 and reconstituted into the bond, which could be sold for $103.50, representing an arbitrage opportunity.

B is incorrect because reconstituting the bond requires valuing all the strips and comparing to the market price of the bond. There are no market prices for strips provided to make a comparison between the arbitrage-free value of each individual strip.

C is incorrect because incorrectly using the par rates instead of the spot rates, the bond's cash flows have a value of $103.519, producing an arbitrage opportunity to buy the bond, strip the cash flows, and sell them at a profit.

3. Solution: C.

Using a Monte Carlo simulation, the model will produce benchmark bond values equal to the market prices only by chance. A constant is added to all interest rates on all paths such that the average present value for each benchmark bond equals its market value.

A is incorrect because adjusting the volatility assumption will generate another random value not equal to the benchmark bond value. The benchmark bond is option-free, so its value should not be affected by interest rate volatility.

B is incorrect because increasing the model beyond 2000 paths will not lead to a different average value for the benchmark bond.

4. Solution: C.

The risk-return characteristics of a convertible bond depend on the market price of the issuer's common stock (underlying share price) relative to the bond's conversion price. When the underlying share price is well below the conversion price, the convertible bond exhibits mostly bond risk-return characteristics. In this case, the price of the convertible bond is mainly affected by interest rate movements and the issuer's credit spreads. In contrast, when the underlying share price is above the conversion price, the convertible bond exhibits mostly stock risk-return characteristics. In this case, the price of the convertible bond is mainly affected by the issuer's

common stock price movements. The underlying share price ($30) is lower than the conversion price of Bond 2 ($50). Thus, Bond 2 exhibits mostly bond risk-return characteristics and is least affected by Varlep's common stock price movements.

Case 9: Scarlett Johansson

1. Solution: B.

C is correct. An approximation for the upfront premium is (Credit spread – Fixed coupon rate) × Duration of the CDS. To buy 5-year CDS protection, Scarlett would have to pay an approximate upfront premium of 750bps [(350 – 100) × 3], or 7.5% of the notional.

2. Solution: C.

C is correct. the credit spread for ABC Co. widens by 150 basis points. The price change in CDS = Change in credit spread × Duration = 150 × 3 = 450bps or 4.5%.

3. Solution: B.

Yui is incorrect about single-name CDSs. The reference obligation is not the only instrument covered by the CDS. Any debt obligation issued by the borrower that is pari passu (ranked equivalently in priority of claims) or higher relative to the reference obligation is covered. Yui correctly describes index CDSs and tranche CDSs.

A is incorrect. Yui correctly describes an index CDS.

C is incorrect. Yui correctly describes an index CDS.

4. Solution: C.

A is incorrect. Scarlett correctly describes auto ABSs use portfolio approach; they are typically homogeneous in nature given eligibility requirements for loan obligations to be included in a specific asset pool.

B is incorrect. Yui's first comments on leveraged loan CLOs are most likely correct regarding the non-granularity of the pool and the loan-by-loan approach to credit analysis.

C is correct. Yui's second statements regarding CMBS is inaccurate with regard to statistical approach. Loan-by-loan analysis should be used for the heterogeneous nature and non-granular of the pools.

Case 10: Nicholas Tsao

1. Solution: A

In the United States, a restructuring, where there is a change in seniority of outstanding obligations, is not recognized as a credit event that triggers a payment by the protection seller. A restructuring is recognized as a credit event outside the United States. In the United States and elsewhere, bankruptcy and failure to pay are recognized credit events.

2. Solution: A

Upfront premium = (Credit spread – Fixed coupon) × CDS duration

= (1.94 – 1.0) × 4.57 = 4.2958.

Price of CDS per 100 par = 100 – Upfront premium= 100 – 4.2958 = 95.7042.

3. Solution:B

The appropriate long/short trade in this case is to take a long position by selling CDX NA HY and take a short position by buying CDX NA IG. Because high-yield spreads (120 bps) are expected to tighten by more than investment-grade spreads (7 bps), CDX NA HY will gain by more than CDX NA IG, resulting in a net gain on the trade.

C is incorrect. The trade to sell Company A CDSs (long) and buy Company B CDSs (short) may be appropriate if the US economy is expected to weaken. The coupon on Company A is 100 bps, indicating it is investment grade, whereas company B, with a 500 bp coupon, is high yield.

4. Solution: A

Ahuja is correct. For Company A, the expectation is for a flattening of the credit curve. Here the appropriate trade is to sell (go long) long-term (10-year tenor) CDSs and buy (go short) short-term (5-year tenor) CDSs. For Company B, the expectation is for a steepening credit curve, so the appropriate trade is to buy (go short) long-term (10-year tenor) CDSs and sell (go long) short-term (5-year tenor) CDSs.

Case 11: Tom Han

1. Solution: B

According to the consensus economic forecast interest rates will decrease. With interest rates decreasing, all bond prices should rise ignoring any price impact resulting from any embedded options. When interest rates fall, the call option in Bond Y (callable) becomes valuable, causing an opposing effect on price. The put option of putable bonds, by contrast, increases in value when interest rates rise rather than decline.

2. Solution: A

If interest rates are lowered, the yields on Bliss's bonds are likely to decrease and Bond Y (callable) may be called.

C is incorrect because if the equity market declines, Bliss's stock price will likely decrease and Bond S's (convertible) conversion option would likely not be exercised. Because Bond S is currently trading out of the money, it will likely trade further out of the money once the stock price decreases.

B is incorrect because Bond Z (putable) is not likely to be exercised in a decreasing interest rate environment.

3. Solution: B

The value is calculated using the interest rate tree, starting with final cash flow (par plus coupon payment) in Year 3.

Y_2: 104.5/1.0621=98.39(put at par), 104.5/1.046=99.9(put at par), 104.5/1.0341=101.05

Y_1: 104.5/1.0431=100.18, ((100+101.05)/2+4.5)/1.0319=101.78

Y_0: ((100.18+101.78)/2+4.5)/1.0211=103.3

4. Solution: B

An increase in interest rate volatility will cause the values of the put and call options in Bond Z and Bond Y to increase. Bond Z (putable) would likely experience a price increase due to the increased value of the put option whereas Bond Y (callable) would experience a price decrease because of the increased value of the call option. The price of Bond S should be minimally affected by changes in interest rate volatility.

Case 12: Connie Ye

1. Solution: C

With the change in estimates, the recovery rate = 30%x1.20 = 36%, and the probability of default = 1.25%x1.20 = 1.50%. The calculation of CVA is as follows:

Dt (1)	Exposure (2)	Recovery (3)	LGD (4)	POD (5)	POS (6)	Expected Loss (7) LGDxPOD	DF (8)	PV of Expected Loss (9) LGDxPODxDF
0								
1	$100/1.025^2$ = 95.1814	34.2653	60.9161	1.50%	1-0.015= 98.50%	0.9137	1/1.025 = 0.9756	0.8914
2	100/1.025 = 97.5610	35.1220	62.4390	1.5%(1-0.015)= 1.4775%	98.5%-1.4775% = 97.0225%	0.9225	$1/1.025^2$ = 0.9518	0.9225×0.9518= 0.8780
3	100	36.0000	64.0000	$1.5\%(1-0.015)^2$ = 1.4553%	97.0225%-1.4553% = 95.5672%	0.9314	$1/1.025^3$ = 0.9286	0.9314×0.9286= 0.8649
							CVA =	2.6343

There is no change in exposures. Changes in the hazard and recovery rates do not affect the value of the default free bond. So, the price of the default free 3-year zero-coupon bond is $=100/1.025^3$ = 92.86. The fair value of Bond X decreases to = 92.86 - 2.6343 = 90.2257.

2. **Solution: B**

The use of an actual default rate in the calculation overstates the observed value of the bond because it does not include a default risk premium associated with the timing uncertainty of possible default loss.

3. Solution: A

Hastings's comments regarding both credit scores and credit ratings are correct.

4. Solution: B

The necessary data are not always readily available. There are limitations in available data, such as debt that is not disclosed, making it difficult to measure the default barrier. Structural models also assume that the company's assets trade in markets and have observable market values, which is not a realistic assumption.

Case 13: Daniela Ibarra

1. Solution: B.

The following table shows that the credit valuation adjustment (CVA) for the bond is €36.49, the sum of the present values of expected loss. The steps taken to complete the table are as follows.

Step 1: Exposure at Date T is €1,000/ $(1+r)^{4-T,}$ where r is 3%. That is, exposure is computed by discounting the face value of the bond using the risk-free rate and the number of years until maturity.

Step 2: Recovery = Exposure × Recovery rate

Step 3: Loss given default (LGD) = Exposure – Recovery

Step 4: Probability of default (POD) on Date 1 is 1.50%, the assumed hazard rate. The probability of survival (POS) on Date 1 is 98.50%.

For subsequent dates, POD is calculated as the hazard rate multiplied by the previous date's POS. For example, to determine the Date 2 POD (1.4775%), the hazard rate of (1.50%) is multiplied by the Date 1 POS (98.50%).

Step 5: POS in Dates 2–4 = POS in the previous year – POD

(That is, POS in Year T = POS in year [T – 1] – POD in Year T.)

POS can also be determined by subtracting the hazard rate from 100% and raising it to the power of the number of years:

$(100\% - 1.5000\%)^1 = 98.5000\%$

$(100\% - 1.5000\%)^2 = 97.0225\%$

$(100\% - 1.5000\%)^3 = 95.5672\%$

$(100\% - 1.5000\%)^4 = 94.1337\%$

Step 6: Expected loss = LGD × POD

Step 7: Discount factor (DF) for Date T is $1/(1+r)^T$, where r is 3%.

Step 8: PV of expected loss = Expected loss × DF

Date	Exposure	Recovery	LGD	POD	POS	Expected Loss	DF	PV of Expected Loss
0								
1	915.14	274.54	640.60	1.5000%	98.5000%	9.61	0.970874	9.33
2	942.60	282.78	659.82	1.4775%	97.0225%	9.75	0.942596	9.19
3	970.87	291.26	679.61	1.4553%	95.5672%	9.89	0.915142	9.05
4	1,000.00	300.00	700.00	1.4335%	94.1337%	10.03	0.888487	8.92
							CVA =	€36.49

Value of the bond if the bond were default free would be 1,000 × DF for Date 4 = €888.49.

Fair value of the bond considering CVA = €888.49 – CVA = €888.49 – €36.49 = €852.00.

Because the market price of the bond (€875) is greater than the fair value of €852, B is correct.

2. Solution: B.

The recovery rate to be used now in the computation of fair value is 30% × 1.25 = 37.5%, whereas the hazard rate to be used is 1.50% × 1.25 = 1.875%.

Using the steps outlined in the solution to Question 1, the following table is prepared, which shows that the bond's CVA increases to 40.49. Thus, Koning concludes that a change in the probability of default has a greater effect on fair value than a similar change in the recovery rate. The steps taken to complete the table are the same as those in the previous problem. There are no changes in exposures and discount factors in this table.

Date	Exposure	Recovery	LGD	POD	POS	Expected Loss	DF	PV of Expected Loss
0								
1	915.14	343.18	571.96	1.8750%	98.1250%	10.72	0.970874	10.41
2	942.60	353.47	589.12	1.8398%	96.2852%	10.84	0.942596	10.22
3	970.87	364.08	606.80	1.8053%	94.4798%	10.95	0.915142	10.03
4	1,000.00	375.00	625.00	1.7715%	92.7083%	11.07	0.888487	9.84
							CVA =	40.49

Changes in the hazard and recovery rates do not affect the value of the default-free bond. So, it is the same as in the previous question: €888.49.

Fair value of the bond considering CVA = €888.49 – CVA = €888.49 – €40.49 = €848.00

3. Solution: A.

The changing probability of default will not affect the binomial tree. The Date 1 value remains unchanged, which is also the VND. The expected exposures, loss given default, and discount factors are also unaffected by the changing probability of default. The following is the completed credit valuation adjustment table.

Date	Exposure	LGD	POD	POS	Expected Loss	DF	PV of Expected Loss
0							
1	1,151.38	805.97	1.5000%	98.5000%	12.09	1.002506	€ 12.12
2	1,133.58	793.51	0.4925%	98.0075%	3.91	0.985093	€ 3.85
3	1,108.90	776.23	0.4900%	97.5175%	3.80	0.955848	€ 3.64
4	1,087.07	760.95	0.4876%	97.0299%	3.71	0.913225	€ 3.39
						CVA =	€ 22.99

Thus, CVA decreases to €22.99.

4. **Solution: C.**

The credit rating agencies typically make incremental changes as seen in a transition matrix provided in Exhibit 4 of the reading. Ibarra believes the bond to be undervalued, in that her assessment of the probability of default and the recovery rate is more optimistic than that of the agencies. Therefore, she most likely expects the credit rating agencies to put the issuer on a positive watch.

A is incorrect because the bond is perceived to be undervalued, not overvalued. Ibarra is not expecting a credit downgrade.

B is incorrect because it is not the most likely expectation. The rating agencies rarely jump an issuer all the way from BBB to AAA. In Exhibit 4, the probability of a BBB rated issuer going from BBB to AAA is 0.02%, whereas it is 4.80% to go from BBB to A.

Derivatives

Case 1: Ryan Parisi Case Scenario

1. **Solution: A.**

At inception the value of a forward contract is set to zero. That is:

$$V_0(0,T) = S_0 - \frac{F(0,T)}{(1+r)} = 0$$

2. **Solution: A.**

$$V_{30}(0,60) = (1450.82e^{-0.025(30/360)}) - (1403.22e^{-0.0392(30/360)}) = \$1,447.80 - \$1,398.64 = \$49.16$$

3. **Solution: B.**

PV of coupons = $25/(1.04)^{90/360} + 25/(1.04)^{270/360} = 24.7561 + 24.2753 = \$49.03$

$$F(0,360) = (1071.33 - 49.03)(1.04)^{360/360} = \$1,063.19$$

4. **Solution: C.**

$$FRA(0,90,360) = \left[\frac{1+0.045(\frac{450}{360})}{1+0.032(\frac{90}{360})} - 1\right](\frac{360}{360}) = 0.0479$$

Case 2: Bridget Moyle

1. Solution: B.

The futures price is calculated as follows:

FV(CI,0,T)=3,500(1.015)$^{(2/12)}$=$3,508.6958

AIT=100,000*(7%/2)*(2/6)=1,116.67

$$f_0(T)=\frac{B_0^C(T+Y)[1+r_0(T)]^T-FV(CI,0,T)-AI_T}{CF(T)}$$

$$f_0(T)=\frac{\$156,000[1.015]^{\frac{8}{12}}-\$3,508.6958-1166.67}{1.098}=\$139,239$$

2. Solution: A.

30-day holding period rate (r) = (1+3%)$^{1/12}$=025%

$$\pi=\frac{1+r-d}{u-d}=\frac{1+0.0025-0.96}{1.12-0.96}=0.2656$$

$$1-\pi=0.7344$$

p^{++} = Max[0, X – S^{++}] = Max[0, 590 – 765.06] = 0

p^{+-} = Max[0, X – S^{+-}] = Max[0, 590 – 655.76] = 0

p^{--} = Max[0, X – S^{--}] = Max[0, 590 – 562.08] = 27.92

S^{++} = 609.90 × 1.12 × 1.12 = 765.06

S^{+-} = 609.90 × 1.12 × 0.96 = 655.76

S^{--} = 609.90 × 0.96 × 0.96 = 562.08

$$p=\frac{\pi p^{+}+(1-\pi)p^{-}}{(1+r)}=\frac{0.2656\times 0+0.7344\times 20.45}{1.0025}=\$14.98$$

$$p^{-}=\frac{\pi p^{-+}+(1-\pi)p^{--}}{(1+r)}=\frac{0.2656\times 0+0.7344\times 27.92}{1.0025}=\$20.45$$

$$p^{+}=\frac{\pi p^{++}+(1-\pi)p^{+-}}{(1+r)}=\frac{0.2656\times 0+0.7344\times 0}{1.0025}=\$0$$

3. Solution: C.

Iacocca is incorrect about the risk-free rate. Higher risk-free rates result in higher call option prices and lower put option prices. She is correct about the impact of time to expiration and volatility on put and call option prices.

4. Solution: B.

The specific assumptions of the BSM model are as follows:

- The underlying follows geometric Brownian motion, which implies that the continuously compounded return (log return) is normally distributed.

- The price of underlying instrument does not jump from one value to another.
- The underlying instrument is liquid, meaning that it can be easily bought and sold.
- Continuous trading is available, meaning that in the strictest sense one must be able to trade at every instant.
- Short selling of the underlying instrument with full use of the proceeds is permitted.
- There are no market frictions, such as transaction costs, regulatory constraints, or taxes.
- No arbitrage opportunities are available in the marketplace.
- The options are European-style, meaning that early exercise is not allowed.
- The continuously compounded risk-free interest rate is known and constant; borrowing and lending is allowed at the risk-free rate.
- The volatility of the return on the underlying is known and constant.
- If the underlying instrument pays a yield, it is expressed as a continuous known and constant yield at an annualized rate.

Case 3: Shirley Nolte

1. Solution: A.

Nolte is long in the underlying stock, so she should short call options, and she can use any of the options to delta hedge. The hedge ratio (the number of calls per share) is (1 / delta), so any of these four short call positions will hedge her long position in the stock:

(1/0.54) x 5000=9259 1-month call options

(1/0.58) x 5000=8621 3-month call options

(1/0.61) x 5000=8197 6-month call options

(1/0.63) x 5000=7937 9-month call options

2. Solution: A.

The hedge must be continually rebalanced, even in the unlikely event that the stock price doesn't change, because the option's delta changes as time passes and the option approaches maturity. If she simultaneously buys an equivalent amount of put options, the overall position (including the calls, the puts, and 5,000 shares of Pioneer) will no longer be delta hedged.

3. Solution: B.

Both the 3-month and the 9-month put options are correctly priced according to put- call parity. Note that you are given the continuously compounded risk-free rate, so you have to use the continuous version of put-call parity.

$$P_0 = C_0 - S_0 + \frac{X}{e^{R_f^c \times T}}$$

$$P(3-\text{month}) = \$5 + \frac{\$40}{e^{0.05\times 0.25}} - \$40 = \$4.50$$

$$P(9-\text{month}) = \$8.81 + \frac{\$40}{e^{0.05\times 0.75}} - \$40 = \$7.34$$

Therefore, she's correct that the 3-month put is not mispriced, but incorrect in her conclusion that the 9-month put is mispriced.

4. Solution: C.

S_0=\$60, S^+=60(1.15)=\$69, S^-=60(0.85)=\$51, X=\$60.

C^+=69-60=\$9, C^-=0.

$$h = \frac{C^+ - C^-}{S^+ - S^-} = \frac{9-0}{69-51} = 0.5$$

$$C_0 = hS_0 + \frac{-hS^+ + C^+}{1+R_f} = 0.5(60) + \frac{(-0.5)(69)+9}{(1.05)} = \$5.71$$

Because the current call price of \$6.90 is higher than the no-arbitrage price, an arbitrage profit can

be earned by writing calls and buying 0.5 shares per call written.

Case 4: Michelle Norris

1. Solution: A.

The futures price can be calculated by growing the spot price at the difference between the continuously compounded risk-free rate and the dividend yield as a continuously compounded rate. The continuously compounded risk-free rate is ln(l.040811) = 4%, so the futures price for a 240-day future is:

$FP = S_0e^{(r-d)t} = 1{,}050e^{(0.04-0.02)(240/365)} = 1{,}064$

2. Solution: C.

The futures price for a given contract maturity must converge to the spot price as the contract moves toward expiration. Otherwise, arbitrage opportunities would exist.

3. Solution: B.

First, calculate the continuously compounded risk-free rate as ln(l.040811) = 4% and
then calculate the theoretically correct futures price as follows:

FP = S0e(r-d)t = 1,015e(4.0%-2.0%)(180/365) = 1,025

Then, compare the theoretical price to the observed market price: 1,035 — 1,025 = 10. The futures contract is overpriced. To take advantage of the arbitrage opportunity, the investor should sell the (overpriced) futures contract and buy the underlying asset (the equity index) using borrowed funds. Norris has suggested the opposite.

4. Solution: B.

An increase in the growth rate in dividends for stocks would increase the spot price of the equity index. As the spot price increases, the futures price for a given maturity also increases (holding interest rates constant). Higher dividends during the short period of time until maturity of the futures contract would have only a minimal negative impact on the futures price.

5. Solution: A.

Given the decrease in the index level, the value of the short party's position in a forward contract should be positive. Because the futures contracts are marked to market, the value to the short (or long) party only reflects the change in futures price since the last mark to market. Hence, the value of the futures contract should be lower than the value of the forward contract.

6. Solution: A.

Based on the exchange rate at initiation, the notional principals were €1,000,000 and SF 1,120,000. Sixty days after initiation, the remaining settlement days are 30,120,210, and 300 days into the future. The value of the Swiss franc position (per 1 SF notional) is calculated as: (0.0096 / 4) x

(0.9996 + 0.9978 + 0.9961 + 0.9932) + 1 x 0.9932 = SF 1.0028. For the notional principal of SF 1,120,000, the value is SF 1,123,136. Based on the current exchange rate, this translates into (1,123,136 / 1.10) euros or €1,021,033.

The euro position value is given as €1.0014 per €1 notional. For €1 million notional, this translates into a value of €1,001,400. Because Witkowski's client paid the euro notional at initiation, they will receive the euros and have a value of €1,001,400 - €1,021,033 = - €19,633.

Case 5: Mafadi

1. Solution: B.

B is correct. Fourie's second comment to Jacob regarding marking to market is incorrect. Futures contracts are marked to market each day, whereas forward contracts are not. Comments 1 and 3 are accurate.

A is incorrect. Fourie's first comment is accurate. Because futures contracts are marked to market daily, profits are paid out and the value is reset to zero. As a result if you are long a contract and the price has risen, the forward contract will likely have a higher value than the futures contract.

C is incorrect. Fourie's last comment is accurate. The market value of both futures and forward contracts at initiation is zero.

2. Solution: B.

B is correct. Fourie's fundamental rules for arbitrageurs are correct. The two fundamental rules of the arbitrageur are (a) do not use your own money and (b) do not take any price risk. The arbitrageur does not spend proceeds from short selling transactions but invests them at the risk-free rate. The arbitrageur does not take market price risk, even though each step of the transaction may individually involve price risk. Because the steps are undertaken simultaneously, however, the price risk is offset.

A is incorrect. The arbitrageur does not use their own money. Also, they do not spend proceeds from short selling transactions but invests them at the risk-free rate.

C is incorrect. The arbitrageur does not take market price risk but component transactions may individually involve price risk.

3. Solution: C.

C is correct.

Calculate the sum of PV = 0.9802 + 0.9560 + 0.9311 = 2.8673.

Calculate the fixed swap rate = (1 – 0.9311)/2.8673 = 0.0240.

Calculate swap value per ZAR = (0.0300 – 0.0240) 2.8673 = 0.0172.

Thus, total swap value = 0.01720 × ZAR20,000,000 = ZAR344,076.

B is incorrect. B uses wrong PV factor for Fixed swap rate (1 – 0.9311)/2.8673 = 0.6905 = (0.0300 – 0.006905) × 2.8673 = 0.066219 × 20,000,000 = 1,324,380.

A is incorrect. A does not subtract Fixed Swap rate in step 3 so = (0.0300) × 2.8673 = 0.0860 × 20,000,000 = 1,720,380.

4. Solution: A.

A is correct. If the ZAR/NZD forward rate is less than the spot rate, then the carry arbitrage model indicates the South African interest rate will be lower than the New Zealand rate. This dynamic

occurs because when interest rates fall, forward prices decline.

B is incorrect. If the forward and spot rates are different it indicates a difference in interest rates under the carry arbitrage model.

C is incorrect. The rates should be higher not lower per the carry arbitrage model.

5. Solution: C.

C is correct. The formula for calculating the forward price (F0[T]), where S denotes the spot market price, γ (gamma) denotes carry benefits such as dividends or interest payments, and θ (theta) denotes carry costs, is: $F0(T) = FV0,T(S0 + \theta0 - \gamma0) = FV0,T(S0) + FV0,T(\theta0) - FV0,T(\gamma0) = 60.5(1 + 0.325)3/12 + 0 - 3.00 = ZAR57.99$. The dividend received is a carry benefit that decreases the cost of the forward price.

B is incorrect. This answer results from failing to account that the 3.25 percent interest is on an annualized basis: $60.5(1 + 0.325) + 0 - 3.00 = ZAR59.47$.

A is incorrect. This answer results from adding the 3.00 dividend instead of subtracting it: $60.5(1 + 0.325)3/12 + 0 + 3.00 = ZAR63.99$.

6. Solution: A.

A is correct. The quarterly interest rate is calculated as $[(1 + 3.2\%)(1/4)] - 1 = 0.0079$, so the fixed cash flow Ndlovu receives is ZAR5,000,000 × 0.0079 = ZAR39,528.77. The return of the equity is negative, so Ndlovu will also receive ZAR5,000,000 × 0.0360 = ZAR180,000.00 from the Zulu return. Therefore, the net cash flow to Ndlovu is ZAR219,528.77 (39,528.77 + 180,000.00).

B is incorrect. This answer results from subtracting the ZAR180,000 equity related return instead of adding it.

C is incorrect. This answer results from using the annual fixed rate of 0.0320 for the quarter resulting in a fixed payment of ZAR160,000 plus the equity returns of ZAR180,000.

Case 6: Nils

1. Solution: B.

Characteristic 2 is incorrect. The conversion factor in a futures contract does not apply to accrued interest. It is a mathematical adjustment to the amount required when settling a futures contract that is supposed to make all eligible bonds equal the same amount—for example, adjust each bond to an equivalent 6% coupon bond. When multiple bonds can be delivered for a particular maturity of a futures contract, a cheapest-to-deliver bond typically emerges after adjusting for the conversion factor.

A is incorrect because Characteristic 1 is correct.

C is incorrect because Characteristic 3 is correct.

2. Solution: B.

We first find the PV factors and then solve for the fixed swap rates. Based on the data given, we construct the following present value data table. The calculations are shown to the sixth decimal place in an effort to minimize rounding error. Rounding differences may occur in the solutions.

Days to Maturity	A$ Spot Interest Rates(%)	Present Value(A$1)	US$ Spot Interest Rates(%)	Present Value(US$1)
90	2.50	0.993789	0.10	0.999750
180	2.60	0.987167	0.15	0.999251
270	2.70	0.980152	0.20	0.998502
360	2.80	0.972763	0.25	0.997506
	Sum:	3.933870	Sum:	3.995009

Therefore, the Australian dollar periodic rate is

$$C_{AUD} = \frac{1 - PV_4}{\sum_{i=1}^{4} PV_i} = \frac{1 - 0.972763}{3.933870} = 0.692381\%$$

and the US dollar periodic rate is

$$C_{USD} = \frac{1 - PV_4}{\sum_{i=1}^{4} PV_i} = \frac{1 - 0.997506}{3.995009} = 0.062422\%$$

The annualized rate is simply (360/90) times the period results: 2.7695% for Australian dollars and 0.2497% for US dollars.

3. Solution: A.

The US dollar notional amount is calculated as A$100 million divided by the current spot exchange rate at which US$1 dollar trades for A$1.1400. This exchange is equal to US$87,719,298 (= A$100,000,000/1.14).

4. Solution: A.

The current five-year swap rate is not used as a discount rate with swaptions. The swaption time to expiration is 0.25, not the life of the swap.

Case 7: Allen Powell

1. Solution: A.

The hedge ratio requires the underlying stock and call option values for the up move and down move. $S^+ = 56$, and $S^- = 46$. $c^+ = \text{Max}(0, S^+ - X) = \text{Max}(0, 56 - 50) = 6$, and $c^- = \text{Max}(0, S^- - X) = \text{Max}(0, 46 - 50) = 0$. The hedge ratio is

$$h = delta = \frac{\Delta c}{\Delta S} = \frac{c^+ - c^-}{S^+ - S^-} = \frac{6}{10} = 0.6$$

2. Solution: A.

The call option can be estimated using the no-arbitrage approach or the expectations approach. With the no-arbitrage approach, the value of the call option is

$c = hS + PV(-hS^- + c^-)$.

$h = (c^+ - c^-)/(S^+ - S^-) = (6 - 0)/(56 - 46) = 0.60$.

$c = (0.60 \times 50) + (1/1.05) \times [(-0.60 \times 46) + 0]$.

$c = 30 - [(1/1.05) \times 27.6] = 30 - 26.286 = 3.714$.

Using the expectations approach, the risk-free rate is $r = 0.05$, the up factor is $u = S^+/S = 56/50 = 1.12$, and the down factor is $d = S^-/S = 46/50 = 0.92$. The value of the call option is

$c = PV \times [\pi c^+ + (1 - \pi)c^-]$.

$\pi = [FV(1) - d]/(u - d) = (1.05 - 0.92)/(1.12 - 0.92) = 0.65$.

$c = (1/1.05) \times [0.65(6) + (1 - 0.65)(0)] = (1/1.05)(3.9) = 3.714$.

3. Solution: B.

Recall Black's model for call options can be expressed as $c = e^{-rT}[F_0(T)N(d_1) - XN(d_2)]$.

4. Solution: B.

In using the Black model, a forward or futures price is used as the underlying. This approach is unlike the BSM model in which a spot price is used as the underlying.

Case 8: Laura Carter

1. Solution: C.

The risk neutral probability (P(RN)) of a down move is calculated as: $\pi_u = (1+R_f-d)/(u-d) = (1.05-0.8) / (1.25-0.8) = 0.56$.

The risk neutral probability of an up move is calculated as: $\pi_d = 1 - \pi_u = 0.44$

2. Solution: B.

The American call option' value is influenced by the early exercise option. As indicated in the figure below, the call option's value after an up move at year 1 is USD 17.2143. Using the RN probability of 0.56 for an up move and discount rate of 5%, the binomial option valuation process is as follows:

The stock value at Time 1 is calculated by subtracting the present value of dividends from the current value (S_0 = USD 30) of the stock. Present value of dividends at Time 0 = 1.5/1.05 = USD 1.4286. Therefore, stock value at Time 1 = S^+ = [(30-1.4286) X 1.25] = 35.7143.

The early exercise value assumes the option is exercised right before the stock goes ex-dividend and the investor receives the dividend. If the call is not exercised, the call buyer will not receive this dividend. Hence, the early exercise value is 35.7143 + 1.5 – 20 = USD 17.2143.

Time 0		Time 1		Time 2	
				Underlying	44.6429
		Underlying	35.7143	C_1^{++}	24.6429
		C_1^+(Expectation approach)	~~16.7347~~		
Underlying	30	$Call_{Div}$	17.2143	Underlying	28.5714
C_0	11.0966			C_1^{+-}	8.5714
D_0	1.4286	Underlying	22.8571		
		C_1^- (Expectation approach)	4.5714	Underlying	18.2857
		$Call_{Div}$	~~4.3571~~	C_1^{--}	0.0000

3. Solution: C.

The hedge ratio is calculated as $(c^+-c^-)/ (S^+-S^-)=(8.5714 – 0) / (28.5714-18.2857) = 0.8333$

4. Solution: B.

The option's current value is USD 11.0966.

Note: The calculation of the call option's value was shown in the solution to the previous question.

5. Solution: C.

Because the European option would not have the choice of an early exercise, its value would be lower than the American option.

Case 9: Caroline Saunby

1. Solution: B.

The binomial interest rate tree shows one-year spot rates. 2.65% is a one-year spot rate from year 2 to year 3.

2. Solution: B.

At year 2, the possible option values are:

c^{++} = Max(0, 0.0265-0.015) = 0.0115

c^{+-}= Max(0, 0.0185-0.015) = 0.0035

c^{--}= Max(0, 0.0135-0.015) = 0

At year 1, the possible option values are:

c^{+}= 0.9794(0.5 x 0.0115 + 0.5 x 0.0035) = 0.0073

c^{-}= 0.9867(0.5 x 0.0035 + 0.5 x 0) = 0.0017

At year 0, the call option value is:

c_0 = 0.9843 (0.5 x 0.0073 + 0.5 x 0.0017) = 0.0044

0.0044 x £3,000,000 =£13,200

Case 10: Alice Zhen

1. Solution: C.

C is correct. With respect to a call option, Madisox is incorrect with respect to his comment to simultaneously borrow an amount $e^{-rT}xN(-d_2)$. To create a leveraged position in a stock, the correct components are to purchase N(d1) shares by borrowing an amount $e^{-rT}xN(d_2)$. The term $e^{-rT}xN(-d_2)$ represents the amount lent when purchasing a put option.

A is incorrect. Madisox's statement that the purchase of N(d1) shares is correct in terms of replicating a call option.

B is incorrect. Madisox's statement that a call option can be viewed as a leveraged position in a stock is correct.

2. Solution: A.

A is correct. Jeffinsin's statement regarding vega is not correct. Vega measures the effect of changes in implied volatility on the price of an option, holding all other factors constant. Vega is high whenever an option trades "near or at the money." Vega is lower whenever an option is trading "out of the money."

B is incorrect. Jeffinsin's statement with respect to theta is correct. Theta measures the effect of time erosion of an option, holding all other factors constant.

C is incorrect. Jeffinsin's statement with respect to delta and gamma is correct. Delta and gamma measure the effect of a change in the stock price on an option, holding all other factors constant.

3. Solution: A.

A is correct. Madisox's statement is correct. For very small changes in the stock, the delta approximation and the delta-plus-gamma approximations are fairly accurate. To be fully hedged against a small change in the stock price, the proper strategy to construct the hedge is to use call option delta and add the call option gamma to arrive at the number of shares required. The number of shares required is 0.606, based on the option delta of 0.587 plus the option gamma of 0.019.

B is incorrect. To be fully hedged against a small change in the stock price, the proper strategy to construct the hedge is to use call option delta and add the call option gamma to arrive at the number of shares required.

C is incorrect. You need to add, not subtract, option gamma to the option delta.

4. Solution: B.

B is correct. Madisox's statement is correct. Implied volatility is a measure of future estimated volatility, which varies across both exercise price and time to expiration for various options. Accordingly, implied volatility is a measure of the market price of risk.

A is incorrect. Zhen's statement is incorrect. Implied volatility is a component of an option pricing

model and is not directly calculated on the basis of historical volatility. Instead, implied volatility is a metric derived from the current price of market-traded options. It represents the market's view of the likelihood of changes in a given security's price and is forward-looking. In contrast, historical volatility measures the amount of variation in a security's price over time based on past market prices, which is backward-looking. A more accurate statement would be: "Implied volatility is a measure derived from the current market prices of options, reflecting the market's expectations for future volatility of the stock price."

C is incorrect. Jeffinsin's statement is incorrect. Volatility skew tends to steepen whenever the market price of hedging is rising, which causes its shape to be different from the volatility smile.

Case 11: Ellen Advisors Inc

1. Solution: A.

A is correct. Szillat is incorrect in his method of replicating the call option. It can be replicated by purchasing the amount of the underlying shares designated by the hedge ratio and then borrowing (not lending) an amount equal to the present value of (hedge ratio × S^- + C^-) or (1/1.03) × [(0.5671 × 648) + 0] = 356.79.

B and C are incorrect. Szillat is correct about using the one-year interest rate and purchasing 0.5697 index units.

2. Solution: A.

A is correct. An arbitrage opportunity does exist. The underlying index has fallen 10% to 648, and the exercise value of the American-style index option with a strike price of EUR750 is EUR102 (750 – 648). If the option costs less than EUR102, the holder has an arbitrage opportunity by purchasing and exercising the option and simultaneously purchasing the underlying for a net positive cash flow of 10.

B is incorrect. The exercise value is the criteria to judge whether there is an arbitrage opportunity.

C is incorrect. The price of the put is only 92, which is still less than 102.

3. Solution: C.

C is correct. Assumption 3 is not consistent with the BSM model. The BSM model assumes that the continuously compounded return (or the logarithmic return), not the annualized return, is normally distributed.

A is incorrect. Assumption 1 is a part of the BSM model.

B is incorrect. Assumption 2 is a part of the BSM model.

4. Solution: C.

C is correct. Gamma is the change in an instrument's delta, which is the rate at which an instrument's price changes as the price of the underlying asset changes.

A is incorrect. Delta is the option price's rate of change for a change in the underlying.

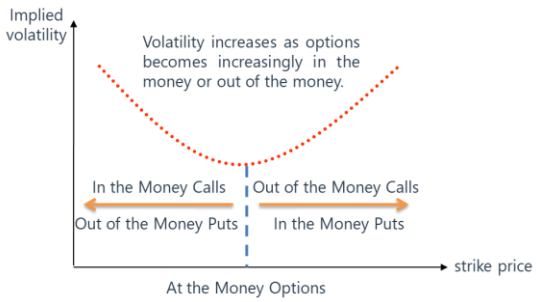
B is incorrect. Vega is the change in the option's volatility for a change in the underlying.

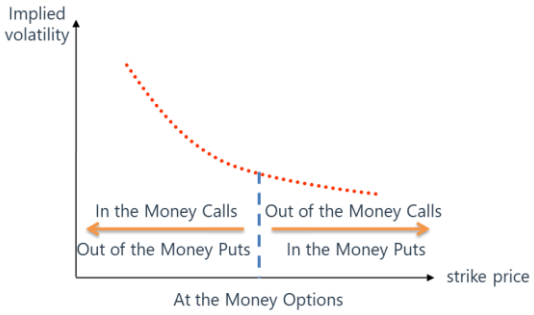
5. Solution: B.

B is correct. Implied volatility is higher for lower strike prices than for higher strike prices; therefore, out-of-the-money put options will generally be more expensive than out-of-the-money call options. Implied volatilities of options with lower strike prices are higher than those with higher strike prices.

A is incorrect. This is only the case if implied volatility is higher for out-of-the-money options than for at-the-money, as in a normal skew (volatility smile).

C is incorrect. Implied volatility is higher for lower strike prices than for higher strike prices; therefore, out-of-the-money put options will generally be more expensive than out-of-the-money call options. Implied volatilities of options with lower strike prices are higher than those with higher strike prices.





Alternative Investment

Case 1: Wanda Maximoff

1. Solution: A.

The description of the hedge fund strategy for Client 1 best fits a global macro strategy. This strategy employs high leverage and returns can be volatile. Managed futures strategies tend to use systematic trading. Dedicated short-selling strategies tend to use bottom-up analysis.

2. Solution: A.

Proceeds from short selling 75,000 CA shares = 75,000 × CHF46 = CHF3,450,000 Cost of buying 225,000 DA shares = 225,000 × CHF15 = CHF3,375,000

Net spread if the deal reaches a successful conclusion = CHF3,450,000 – CHF3,375,000 = CHF75,000

3. Solution: B.

Multi-manager funds have generally outperformed funds-of-funds over time. The higher fees associated with funds-of-funds create a drag on their performance.

4. Solution: A.

VIX index futures are exchange-traded and are very liquid. OTC contracts offer longer maturities but are subject to illiquidity and counterparty risk.

5. Solution: A.

For equity-related strategies, Clinet 5 considers low volatility to be more important than negative correlation. Short-biased strategies have return goals that are typically less than those for most other hedge fund strategies but with a negative correlation benefit. In addition, they are more volatile than a typical long/short equity hedge fund because of their short beta exposure. As a result, Maximoff should avoid short-biased strategies.

6. Solution: B.

Based on the Client 6's requirements, allocating 10% of portfolio asset s to the global macro hedge fund strategy is most suitable for the Foundation. Such an allocation would result in a decrease in standard deviation (volatility) and significant increases in the combined portfolio's Sharpe and Sortino ratios (these are the highest such ratios among the strategies presented). In addition, the lower maximum drawdown (15.0%) indicates less downside risk in the combined portfolio than with any of the other strategy choices.

Case 2: EastCoast Associates

1. Solution: A.

A is correct. Hedge Fund 1 will be the most appropriate because it follows a fixed-income arbitrage strategy. A fixed-income arbitrage strategy attempts to exploit pricing inefficiencies by taking long and short positions across a range of debt securities, including sovereign and corporate bonds, bank loans, and consumer debt. Arbitrage opportunities between fixed-income instruments may develop because of variations in duration, credit quality, liquidity, and optionality. The most common types of fixed-income arbitrage strategies include yield curve trades and carry trades. Yield curve trades involve taking long and short positions at different points to profit from the relative mispricing of securities that may exist in a flattening or steepening curve. Perceptions and forecasts of macroeconomic conditions are the backdrops for these types of trades.

2. Solution: C.

C is correct. The fixed-income arbitrage strategies attempt to take advantage of mispricing in securities by taking long and short positions across a range of debt securities. Therefore the risks in fixed-income arbitrage strategies are interest rate risk, credit risk, sovereign risk, currency risk, liquidity risk, and pre-payment risk for mortgage-backed securities. The merger arbitrage strategy has market sensitivity and left-tail risk attributes. This strategy is analogous to selling insurance on the acquisition. Its payoff profile resembles that of a riskless bond and a short put option.

3. Solution: C.

C is correct. Based on the GreatCity portfolio's objectives, a 20% allocation to the fund-of-funds debt hedge fund strategy is the least suitable. Such an allocation offers slight improvements in the combined portfolio's Sharpe and Sortino ratios (to 0.63 and 1.15, respectively). The higher maximum drawdown (at 21.37%) indicates more downside risk in the combined portfolio. Portfolio liquidity may also be impaired due to two levels of redemption lock-ups and liquidity gates. Finally, given the FoF structure for this strategy allocation, there will be two layers of fees and fee netting risk that the IC does not desire. The convertible arbitrage fund has better Sharpe and Sortino ratios, though it has the highest downside risk, the fund structure does not involve redemption locks and layering of fees.

4. Solution: B.

B is correct. Both fund strategies typically have similar initial lock-up and redemption periods, but multi-strategy funds often impose investor-level or fund-level gates on maximum redemptions allowed per quarter. Therefore multi-strategy funds may present a more conservative liquidity option for their investors at times relative to FoFs.

Case 3: Sally Stone

1. Solution: A.

Adding equity real estate investments to a traditional portfolio will provide better diversification benefits than adding debt real estate investments such as Mortgage REITs or MBS. Debt investments in real estate, are similar to other fixed-income investments, such as bonds, and can be highly sensitive to changes in interest rates.

2. Solution: C.

Returns for real estate equity investors have two components: rent and appreciation of property value. They take on more risk and, therefore, expect a higher rate of return than debt investors.

3. Solution: A.

As each property is unique and the volume of real estate transactions is low, estimates of value or appraisals are used for price determination rather than transaction prices. This makes the real estate market less efficient as compared to the stock and bond markets. Investors who have superior information and skill at evaluating properties may have an advantage in exploiting market inefficiencies.

4. Solution: C.

Transaction-based indexes tend to lead appraisal-based indexes, but they can be noisy because statistical techniques are used to estimate the index. So, there may be random upward or downward movements in the index.

5. Solution: B.

There are no long-term leases on hotel rooms to protect hotel REITs' revenue streams from changes in demand. Hotel room demand fluctuates with economic activity and business and consumer confidence.

Case 4: Tim Zhou

1. Solution: A.

Wang is correct in that direct real estate investment will likely result in income and capital appreciation but incorrect regarding high correlation with existing investments which constitute of stocks and bonds. Real estate returns may provide diversification benefits because they are not highly correlated with other asset classes such as, stocks and bonds. Therefore, adding to a portfolio may lower the risk of the portfolio.

2. Solution: B.

Real estate operating companies (REOCs) generate cash flows from sales of developed or improved properties rather than from recurring lease or rental income.

3. Solution: C.

Population growth drives the demand for multi-family, storage and health care facilities. Hence the value of the multi-family REITs depends upon population growth. Retail REITs depend more upon retail sales growth and the value of office REITs is more likely driven by job creation.

4. Solution: B.

The value added by management is not included in NAVPS. A & B are correct statements.

5. Solution: B.

(US$ millions)

Next year's NOI estimate： 280 × 1.04=291.2

Capitalized value of operating real estate： 291.2 / 0.065=4,480

Other assets ：40 + 60 + 20 + 6=126

Minus liabilities：1,430 + 168=1,598

NAV： 4,480 + 126 – 1,598 = 3,008

NAVPS：3,008/60=$50.13

Capitalized value of operating real estate = NOI/Discount rate

Other assets = Cash and cash equivalents + Undeveloped land + Accounts receivable + Prepaids

Liabilities = Total debt + Other liabilities

NAV = Operating assets + Other assets – Liabilities

NAVPS = NAV / Number of common shares

Case 5: Christian Mathew

1. Solution: C.

A positive calendar spread shows futures markets in a state of backwardation, whereas a negative calendar spread in commodities indicates futures markets in a state of contango. Either individual prices or spreads can be traded.

2. Solution: B.

Total return on a commodity futures position is expressed as:

Total return = Price return + Roll return + Collateral return

The contracts is held for one year. Thus, price return of 4.5% is an annualized figure, and the roll return is also an annual 2.0%. Her collateral return equals 1.5% per year × 12% initial collateral investment = 0.18%. Total return (annualized) = 4.5% + 2.0% + 0.18% = 6.68%.

3. Solution: B.

To roll over the same level of total exposure USD16,500, the investor will need to do the following trades:

Sell:

USD16,500/USD5.5 per contract = 3,000 existing contracts

And replace this position by buying:

USD16,500/USD4.12 per contract = 4,004.85 or 4,005 existing contracts.

4. Solution: B.

"Historically, the roll return has had a relatively modest impact on overall commodity futures return in the short term, but can be meaningful over longer time periods." Roll return is very sector dependent, therefore sector diversification or concentration will impact an investor's overall roll return. Hence Mathew is correct with respect to comment 2, but incorrect with respect to comment 1.

Case 6: Paul Aimar

1. Solution: B.

Real estate investments generally appreciate slowly over time. They are also relatively illiquid, so short term gains are difficult to capitalize. Motivations to invest in real estate include current income, price appreciation, inflation hedge, diversification, and tax benefits.

2. Solution: C.

Aimar's comments regarding the disadvantages of both appraisal-based and transaction-based indexes are correct.

3. Solution: C.

Investment in Real estate involves high transaction costs compared to investments in stocks and bonds. A & B are characteristics of real estate investment that differentiate it from other asset classes.

4. Solution: B.

Real estate investments offer some inflation protection in the form of rent increases and higher real estate value when inflation is high. A & C are risk factors linked to investing in commercial real estate.

Case 7: Jeremy Grant

1. Solution: A

Real estate operating companies (REOCs) are ordinary taxable real estate ownership companies. They are often found in countries that do not have a tax-advantaged REIT regime. REOCs can also be companies that focus on development of real estate, often with the intent to sell. Their primary income source is sale of developed properties rather than rental income.

Option B is incorrect because REITs are companies or trusts that own, finance, and—to a limited extent—develop income-producing real estate property. Their primary source of income is through rental income.

Option C is incorrect because mortgage-backed securities are asset-backed securitized debt obligations that represent rights to receive cash flows from portfolios of mortgage loans—mortgage loans on commercial properties in the case of commercial mortgage-backed securities (CMBS) and mortgage loans on residential properties in the case of residential mortgage-backed securities (RMBS). Real Estate Investments.

2. Solution: B

The following are some considerations for a NAV-based approach to valuing public equity investments:

- The share price is often different than the NAVPS.
- Another factor to consider is that the NAV approach treats a company as an individual asset or static pool of assets. However, management teams can purchase and sell assets and these decisions can add or subtract value.
- NAV estimates become problematic when property markets are illiquid and the transaction data is limited.
- Although NAV is by its nature an absolute valuation metric, in practice it is often more useful as a relative valuation tool.

3. Solution: B.

Direct property owners have more control over property investment decisions than minority shareholders in a publicly traded REIT.

4. Solution: B.

Population demographics are a primary determinant of the demand for multi-family space.

Case 8: Wabash Trading Advisers

1. Solution: C

While equities represent financial assets, commodities are almost always physical assets (the exception being newer classes of commodities, such as electricity or weather).

A is incorrect because the statement is true. The standard financial instruments that are based on commodities are not financial assets, but derivative contracts with finite lifetimes. These contracts can and do have value, but they are contingent on other factors, such as the price of the underlying commodity.

B is incorrect because the statement is correct. Commodity valuation focuses on supply and demand; stock valuation focuses on discounted cash flows.

2. Solution: C

Given the sizable facilities in which metals are produced and their capital requirements, reducing capacity is difficult when demand slows. A is incorrect because of the time lag involved in responding to reduced demand conditions. B is incorrect because producers would face financial losses if they maintained maximum production levels when there is a decline in demand.

3. Solution: B.

Arbitrageurs have the ability to inventory physical commodities and can capitalize on mispricing between the commodity (along with storage and financing cost) and the futures price by purchasing the commodity in the spot market and holding it in storage until a future date.

A is incorrect because speculators trade commodities without ever taking physical possession.

C is incorrect because informed investors primarily keep commodity futures markets efficient by capitalizing on mispricing attributable to a lack of information in the marketplace. As with speculators, informed investors do not take physical possession of the commodity for storage until a future date.

4. Solution: C.

The Theory of Storage gives the futures price as:

Futures price = Spot price of the physical commodity + Direct storage costs (such as rent and insurance) – Convenience yield. The convenience yield is inversely related to inventories. If inventories are abundant, convenience yield is low and vice versa.

Portfolio Management

Case 1: Seva Wolff

1. Solution: B.

ETFs trade on both primary and secondary markets. Primary market trades occur between authorized participants and an ETF sponsor or manager. The ETF manager discloses a list of securities on a daily basis as part of the creation basket.

2. Solution: B.

Authorized participants pass on the creation/redemption costs in the form of bid-ask spreads, which means that only transacting shareholders pay these costs, unlike with mutual funds where all shareholders bear this cost. Similarly, unlike mutual funds, ETFs are tax fair because redemptions are in-kind and do not affect the nontransacting shareholders; hence, capital gains distributions tend to be lower for ETFs compared to traditional mutual funds.

3. Solution: B.

The covariance between a risk-averse investor's intertemporal rate of substitution and expected future price is negative.

4. Solution: B.

The breakeven inflation rate equals expected inflation plus a risk premium for inflation uncertainty.

5. Solution: C.

Wolff's description of ETF tracking error includes a reference to securities lending by the ETF portfolio manager. Many ETF portfolio managers lend a portion of their portfolio holdings to short sellers. Securities lending provides income for an ETF that offsets a portion of an ETF's administrative expenses.

A is incorrect. Trading costs are a source of tracking error but are not caused by operations with short sellers.

B is incorrect. Replication (lack of full replication) is a source of tracking error but is not caused by operations with short sellers.

6. Solution: C.

$Holding\ period\ cost$ (%)=$Round\ trip\ trade\ cost$(%)+$Management\ fee\ for\ period$ (%)

Round-trip trading cost (%) = Round trip commission % + Bid–ask spread % = 0.1% +0.15% = 0.25%

3-month holding period cost (%) = 0.25%+3/12×0.15% = 0.29%

12-month holding period cost (%) = 0.25%+12/12×0.15% = 0.40%

2-year holding period cost (%) = 0.25%+24/12×0.15% = 0.55%

Case 2: Pearl Asset Management

1. Solution: B.

Macroeconomic models are based on surprises in macroeconomic data. Principal component analysis is used to identify the factors of a statistical factor model, which cannot necessarily be described using conventional economic variables. Fundamental factor models use firm-specific valuation metrics such as PE with standardized sensitivities.

2. Solution: C.

Information ratio for Lincoln fund = IR = active return/active risk = (7.6% - 6.5%)/5% = 0.22 Sharpe ratio of benchmark = SR_B = (6.5%-3%) / 11% = 0.32 The optimal amount of active risk can be calculated as:

$$\sigma_A^* = (IR / SR_B) \times \sigma_B = (0.22 / 0.32) \times 11.0\% = 7.56\%$$

The weight of the active Lincoln portfolio should be 7.56% / 5.0% = 1.51, and the weight on the benchmark portfolio would be 1 -1.51 =-0.51.

3. Solution: B.

An asset whose value is negatively correlated to the investor's utility from future consumption provides a poor hedge against bad consumption outcomes. That is, the asset pays off more when the investor's utility is low. Such assets would command a higher risk premium.

4. Solution: B.

For countries with high expected economic growth rates, real rates will be high. Investors will be less concerned about the future, and the inter-temporal rate of substitution will be low. Also, investors will want to increase current consumption and, hence, will borrow more and save less.

Case 3: Millennium Investments

1. Solution: C.

E (R_p) = 0.6E (R_{WMB}) + 0.4E (R_{REL}) = 0.6(9%) + 0.4(10.8%) = 9.72%

2. Solution: B.

$$\beta_{P,INF} = 0.6\beta_{WMB,INF} + 0.4\beta_{REL,INF} = 0.6(-2.2) + 0.4(-1.0) = -1.72$$

3. Solution: A.

$$8 = E(R) + (-0.9 \times 0.5) + (1.2 \times 0.5) + (0.5)$$

E(R) = 7.35%

4. Solution: B.

Consider portfolio A comprising 50% portfolio X and 50% portfolio Z. Portfolio A will have an expected return of 12.5% and a factor sensitivity of 1.25. A long position in portfolio A and short position in portfolio Y will have an expected return of 0.5% with zero factor sensitivity.

5. Solution: B.

Active risk squared = active factor risk + active specific risk

6. Solution: C.

Credit spreads tighten during times of economic expansions. During such times, lower-rated bonds outperform higher-rated bonds.

Case 4: Halimah Yusuf

1. Solution: B.

Quek is incorrect in stating that APT specifies the number of factors in a multifactor model but is correct in stating that APT does not specify the identity of factors in a multifactor model. APT does not indicate the number of factors or their identity.

A is incorrect. Quek is incorrect in stating that APT specifies the number of factors in a multifactor model but correct in stating that APT does not specify the identity of factors in a multifactor model. APT does not indicate the number of factors or their identity.

C is incorrect. Quek is correct in stating that APT does not specify the identity of factors in a multifactor model. APT does not indicate the number of factors or their identity.

2. Solution: C.

In macroeconomic models, the factors are "surprises" (how much higher or lower than what was expected) in macroeconomic variables, not the level or value of macroeconomic variables.

A is incorrect. Statistical models are described accurately. Statistical factor models use factor analysis to produce factors that are portfolios of securities that best explain historical return covariences. Alternatively, they use principal component analysis to derive factors that are portfolios of securities that best explain historical return variances.

B is incorrect. Fundamental factor models are described correctly; the factors are company share attributes, such as price-to-earnings ratio and market capitalization.

3. Solution: C.

$E(R_p) = R_F + \beta_{p,1Market} + \beta_{p,2Small\text{-}Cap} + \beta_{p,3Value} + \beta_{p,4Momentum}$

$= 0.013 + 1.05 \times 0.035 + 0.5 \times 0.047 + (-0.6) \times (-0.045) + 0.5 \times 0.051$

$= 0.12575$, or 12.58%.

A is incorrect. This calculation incorrectly neglects to add the Market factor:

$0.0890 = 0.013 + 0.5 \times 0.047 + (-0.6) \times (-0.045) + 0.5 \times 0.051$

B is incorrect. This calculation incorrectly neglects to add the risk-free rate (1.3%):

$0.1128 = 1.05 \times 0.035 + 0.5 \times 0.047 + (-0.6) \times (-0.045) + 0.5 \times 0.051$

4. Solution: A.

Cerra is correct regarding the growth bias. The factor sensitivity for the Value factor is –0.6, which signifies a growth bias. Cerra is incorrect regarding a large-cap orientation and a contrarian strategy. The portfolio factor sensitivity for the Small-Cap factor is 0.5, indicating a small-cap orientation. For the Momentum factor, the factor sensitivity of 0.5 indicates a momentum bias, not a contrarian strategy, which would be true if the factor sensitivity for the Momentum factor were negative and not close to zero. B is incorrect. Cerra is incorrect with regard to the contrarian strategy. For the

Momentum factor, the factor sensitivity is 0.5, which indicates a momentum bias.

C is incorrect. Cerra is incorrect with regard to a large-cap orientation. The portfolio factor sensitivity for the Small-Cap factor is 0.5, indicating a small-cap orientation.

5. Solution: B.

Cerra is correct. To determine which factor contributes most to active return, note the following:

Active return = 6.755% + 1.5% = 8.255% = ∑[(Portfolio sensitivity) − (Benchmark sensitivity)] × (Factor return) + Security selection

Return from factor tilts = Sum of the absolute contribution to active return = ∑[(Portfolio sensitivity) − (Benchmark sensitivity)] × (Factor return)= 6.755%

The proportional contribution to active return for each factor = Return from factor tilts ÷ Active return.

The table below shows that the Value factor had the highest contribution to active return, 43.61% (3.6% ÷ 8.255%).

Factor Sensitivity			(1) – (2)	Factor	Contribution to Active Return	
Factor	Portfolio	Benchmark	Difference	Return	Absolute	Proportion
	(1)	(2)	(3)	(4)	(3) × (4)	
Market	1.05	1	0.05	3.5%	0.175%	2.12%
Small-Cap	0.5	0.3	0.2	4.7%	0.940%	11.39%
Value	–0.6	0.2	–0.8	–4.5%	3.600%	43.61%
Momentum	0.5	0.1	0.4	5.1%	2.040%	24.71%
/			Return from factor tilts		6.755%	81.83%
			Security selection		1.500%	18.17%
			Active return		8.255%	100.00%

A is incorrect. Quek is incorrect. The Value factor has the highest contribution to active return.

C is incorrect. Singh is incorrect. The Value factor has the highest contribution to active return.

6. Solution: C.

C is correct. Portfolio Z has the highest active factor risk exposures to the style factor.

Portfolio Z active style risk squared ÷ Active risk squared = 10 ÷ 16 = 62.5%.

Portfolio X active style risk squared ÷ Active risk squared = 28 ÷ 64 =43.75%.

Portfolio Y active style risk squared ÷ Active risk squared = 14.4 ÷ 36 = 40%.

A is incorrect. Portfolio X active style risk squared ÷ Active risk squared = 28 ÷ 64 = 43.75%.

B is incorrect. Portfolio Y active style risk squared ÷ Active risk squared = 14.4 ÷ 36 = 40%.

Case 5: Faster Analytics Capital Management

1. Solution: A.

The optimal combination of the CF and the benchmark portfolio will result in highest possible Sharpe ratio.

The Sharpe ratio for the optimal portfolio consisting of the benchmark and the CF can be calculated using the following equality: $SR_P^2 = SR_B^2 + IR^2$.

$$SR_P = \sqrt{SR_B^2 + IR_{CD}^2} = \sqrt{0.30^2 + 0.12^2} = 0.3231$$

2. Solution: B.

$$Optimal\ active\ risk = \sigma_{ZF}^* = \frac{IR_{ZF}}{SR_B}\sigma_B = \frac{0.25}{0.30}0.20 = 16.67\%$$

Expected excess return for ZF (active return):

$E(R_A) = IR \times \sigma_A = (0.25) \times (0.1667) = 4.17\%$

Benchmark excess return = (0.30) × (0.20) = 6%

Total excess return = 4.17% + 6% = 10.17%

3. Solution: B.

The equations for required rate of return using the CAPM and a 2-factor APT are respectively:

CAPM: $R_{EF} = RF + \beta_{EF}\,[E(R_M) - RF]$

2-factor APT: $R_{EF} = RF + \beta_{EF,1}(\lambda_1) + \beta_{EF,2}(\lambda_2)$

Using the data provided in Figures 2 and 3:

CAPM required rate of return = 0.04 + 0.80(0.08) = 0.104 = 10.4%

2-factor APT required rate of return = 0.04 + 1.5(0.05) + 2(0.02) = 0.155 = 15.5%

The expected return for the EF is 12%, which exceeds the CAPM required return. Therefore, Rodriguez predicts that the EF portfolio return will exceed its CAPM required return; a signal to continue investing in EF. However, the forecasted EF return of 12% is less than the 2-factor APT model required return of 15.5%; this is a signal to not invest in EF.

4. Solution: C.

The covariance between the uncertain future price of a default-risk-free bond and the investor's intertemporal rate of substitution is negative, resulting in a positive risk premium for a longer-term, default-risk-free bond.

5. Solution: A.

The difference between the actual and potential real GDP is known as the "output gap", when the output gap is positive, it implies that the economy is producing beyond its sustainable capacity. Other things being equal, when inflation is above (below) the targeted level, the policy rate should

be above (below) the neutral rate; and when the output gap is positive (negative), the policy rate should also be above (below) the neutral rate.

6. Solution: C.

The information ratio equals active return divided by active risk. Active return equals the average difference between the CF portfolio return and the benchmark return. Active risk equals the standard deviation of the CF return minus benchmark return. From the comments made by Rodriquez about the historical performance of the CF portfolio, we know that the numerator of the information ratio is positive and that the denominator is very close to zero. Therefore, the information ratio will be high.

The fund standard deviation is very close to that of its benchmark (since its returns were nearly always a constant percentage above the benchmark). The CF rose and fell with the benchmark (same risk as the benchmark) but always beat the benchmark (outperformed the benchmark). Therefore, tracking risk (which is also referred to as active risk) is low.

Case 6: Fireflies Investment Partners

1. Solution: B.

Scenario analysis does not need to rely on history, and in this way, it can be free of the volatility and correlation behavior of recent market history, which might not represent current market conditions. Scenarios can be tailored to model a portfolio's most concentrated positions to experience even greater price movements, allowing liquidity to be taken into account.

Scenarios can be tailored to expose a portfolio's most concentrated positions to experience even greater movements, allowing liquidity to be taken into account.

2. Solution: B.

CVaR (conditional value at risk) answers the question, How much can I expect to lose if VaR is exceeded? This measure is also referred to as "expected tail loss" and "expected shortfall." CVaR is best derived by using either the Monte Carlo or historical methods, in which returns beyond the VaR cutoff may be averaged.

A is incorrect. IVaR (incremental value at risk) measures how changes in the portfolio's composition affect the portfolio's VaR. Ex ante tracking error is measured by relative VaR.

C is incorrect. Relative VaR is a measure of the degree to which the performance of the portfolio might deviate from its benchmark. Relative VaR is also referred to as "ex ante tracking error."

3. Solution: A.

Lee's statement is correct. Risk measures for banks are typically focused on liquidity, solvency, and capital sufficiency, whereas risk measures for traditional asset managers are typically focused on investment performance. Ex ante tracking error correctly compares the current portfolio with its benchmark in attempting to measure future potential performance. Forward-looking beta is a current risk measure of a current portfolio and measures an equity portfolio's sensitivity to the broad equity market.

4. Solution: C.

Gamma is a second-order effect that measures the sensitivity of delta to price changes in the underlying. Delta measures an option's sensitivity to the price of the underlying security and ranges from –1 to +1. Vega is a first-order effect that measures the change in an option's value relative to the change in volatility of the underlying.

B is incorrect. Delta measures the sensitivity of an option to the price of the underlying security and ranges from –1 to +1, not –0.5 to +0.5.

A is incorrect. Vega is first-order effect that measures the change in the value of an option to the change in volatility of the underlying (not the change in the volatility of an option to the change in price of the underlying).

Case 7: Baker Street Asset Management

1. Solution: C.

Backtesting assumes that the past is likely to repeat itself, but this assumption may not always hold true. To get a more complete picture, analysts often use simulation analysis along with backtesting. Point-in-time data is the most complete data for any given time period and includes all companies that existed – the casualties as well as the survivors. Analysts use this data in backtesting to mitigate survivorship biase. However, using this data does not address the issue related to the assumption mentioned in the question.

2. Solution: B.

A common problem with backtesting is that an analyst may make an inference after looking at statistical results rather than testing a prior inference. The bias is called data snooping and occurs when an analyst selects data or performs analyses repeatedly until a significant result is found. This issue can be mitigated by setting a higher-than-typical hurdle rate and using cross validation (partitioning the data into training data and validation data).

3. Solution: C.

This process is known as bootstrapping. When performing historical simulations, the analyst applies their model to different time periods in the past, regardless of the order. The analyst needs to decide whether they will re-use these time periods in the simulation, i.e., sample randomly without replacement, or not. Since the number of simulations required is usually greater than the size of the historical dataset, random sampling with replacement (bootstrapping) is often used.

4. Solution: C.

Comment I is incorrect, because sensitivity analysis can be performed using a distribution that does account for skewness and fat tails, such as a multivariate skewed Student's t-distribution.

Comment II describes historical simulation analysis not sensitivity analysis. Sensitivity analysis is a technique for assessing how changes in input variables affect a target variable and risk profiles. It can be implemented to help managers better understand the potential risks and returns of their investment strategies.

Case 8: Linda Yang

1. Solution: C.

An increase in real GDP growth should lead to an increase in the real default-free rate of interest. Investors' willingness to substitute across time will fall, resulting in less saving and more borrowing, so that the real default-free interest rate increases.

GDP growth from one period to the next cannot be perfectly anticipated. Under these uncertain circumstances, the interest rates will still be positively related to the expected growth rate of GDP, but additionally it will be positively related to the expected volatility of GDP growth.

2. Solution: C.

The yield curves have three distinct characteristics. These characteristics are referred to as level, which indicates whether rates are high or low, on average; slope, which is an indicator of the steepness of the curve, or how quickly or slowly rates change with maturity; and curvature, an indicator of how much the curve is different from a straight line.

3. Solution: C.

The difference between the yield on a zero-coupon default-free nominal bond and on a zero-coupon default-free real bond of the same maturity is called the break-even inflation rate.

The breakeven inflation rate should incorporate investors' inflation expectations over the remaining maturity plus a risk premium for uncertainty about future inflation.

4. Solution: B.

The implied credit premium can be calculated as follows:

Y = (100 / 95.60) – (1 + 0.5% + 1.4% + 0.6%) = 2.1%

Case 9: Tamara Ogle

1. Solution: A.

$$E(R_A) = \sum w_{p,j} E(R_{p,j}) - \sum w_{B,j} E(R_{B,j}) = 11.07\% - 10.44\% = 0.63\%$$

2. Solution: C.

Both statements are correct. Information ratio, unlike the Sharpe ratio, is affected by an allocation to cash or by the use of leverage. For an unconstrained optimization, a change in aggressiveness in active weights changes both the active return and active risk proportionally, leaving the information ratio unchanged.

3. Solution: B.

IR(Dena) = IR(Orient)

$$(0.2) \times (0.99) \times \sqrt{12} = (0.25) \times (0.80) \times \sqrt{X}$$

$$\sqrt{X} = 3.429; X = 11.76$$

4. Solution: A.

Both statements are incorrect. The portfolio with the highest information ratio will have the highest Sharpe ratio. Recall that the Sharpe ratio of the portfolio is computed as $SR_p^2 = SR_B^2 + IR_p^2$. Given that benchmark Sharpe ratio (SR_B) is the same for all similar active portfolios, the active portfolio with the highest information ratio will also be the portfolio with the highest Sharpe ratio. The optimal active risk for a constrained portfolio=TC *optimal active risk for an unconstrained portfolio. Given that TC < 1 for constrained portfolio, the optimal active risk for a constrained portfolio will be lower than the optimal active risk for an unconstrained portfolio.

Case 10: Sally Sishek

1. Solution: C.

To calculate the daily VaR from an annual VaR, the mean and standard deviation must be adjusted using the 250 trading days described.

The mean has been correctly calculated as 9.4% / 250 = 0.0376%

The standard deviation, however, should be divided by$\sqrt{250}$: 14.2%/$\sqrt{250}$=0.898%

This would result in a 5% daily VaR = [0.0376% − (1.65 × 0.898%)] = –1.44%.

2. Solution: B.

Liquidating a position when losses exceed a certain amount is an example of a stop loss limit.

3. Solution: C.

Maximum drawdown is most commonly defined as the worst peak-to-trough decline in a portfolio's returns, or the worst-returning month or quarter for a portfolio. Maximum drawdown is an important risk measure for hedge funds.

Redemption risk is a measure for open-end funds of the percentage of a portfolio could be redeemed at peak times.

4. Solution: A.

Statement 1 is correct. Some ETF legal structures expose investors to counterparty risk: the invested amount could be lost in the event of counterparty failure.

Statement 2 is incorrect. Settlement risk is applicable for ETFs that use OTC derivative contracts, however ADRs are exchange-traded.

Case 11: Pari Patel

1. Solution: A.

Conditional VaR, also referred to as expected tail loss or expected shortfall, is used to determine the average loss that would be incurred if the VaR cutoff is exceeded.

B is incorrect. Incremental VaR is used to determine how VaR will change if a position size is changed relative to the remaining positions.

C is incorrect. Marginal VaR is similar to incremental VaR and measures the effect of an anticipated change to the portfolio.

2. Solution: A.

Because of the pro-cyclicality of economies and corporate profits, equities are not a good hedge against bad consumption outcomes, which is one of the reasons equity investors require a risk premium.

Observation 1 is correct. Given inferior consumption hedging properties, equity investors should demand a risk premium relative to fixed-income investors. Equity premiums tend to be highly correlated with corporate bond spreads.

3. Solution: A.

Two risk premia that are unique to real estate as an asset class are the risk premium for illiquidity and the risk premium for uncertainty in terminal value (similar to the qruity risk premium)

4. Solution: A.

Corporate bond spreads will be driven over time by the business cycle, but the impact of the economic environment on spreads will depend on issuers' industrial sector and rating.

Ethics

Case 1: JR and Associates

1. Solution: A.

A is correct. Jacobs is not in violation of the CFA Institute Code and Standards. According to Standard III (B): Duties to Clients – Fair Dealing, members and candidates may provide more personal, specialized, or in-depth service to clients who are willing to pay for premium services through higher management fees or higher levels of brokerage. The term "fair" implies that the member or candidate must take care not to discriminate against any clients when disseminating investment recommendations or taking investment action.

B is incorrect. JRA is not misrepresenting its fees, because some of its clients are paying the fees that are disclosed in its marketing brochure. In addition, the advertised fees represent the highest fees that clients would pay.

C is incorrect. Standard III(B)—Fair Dealing focuses on investment recommendations and taking investment action. The case provides no evidence that non-referred clients are being discriminated against or that referred clients are receiving preferential treatment, with respect to the dissemination of investment recommendations or the taking of investment action. Referred clients are simply receiving discounted fees.

2. Solution: A.

A is correct. Jacobs is in violation of Standard VI (C): Conflicts of Interest–Referral Fees, which states, "Members and candidates must disclose to their employers, clients, and prospective clients, as appropriate, any compensation, consideration, or benefit received from or paid to others for the recommendation of products or services…. Appropriate disclosure means that members and candidates must advise the client or prospective client, before entry into any formal agreement for services, of any benefit given or received from the recommendation of any services provided by the member or candidate." In this case, the disclosure does not occur until the time the individual signs the investment management agreement, which is too late.

B is incorrect. The case facts state that BP lawyers disclose the fee-sharing arrangement to the clients they refer to JRA. The case facts do not state whether the lawyers disclose the discount offered by JRA. The behavior of the BP lawyers, however, is not covered by the Code and Standards. Disclosures, or lack thereof, by BP lawyers do nothing to mitigate JRA's duties and responsibilities.

C is incorrect. The discount is disclosed to JRA clients at the time they sign the investment management agreement. According to the Standard VI (C), disclosure must occur before the client enters into a formal agreement.

3. Solution: A.

A is correct. By not disclosing the referral arrangement to clients who were referred to her by

Frontline Group, Parker has violated Standard VI (C): Conflicts of Interest–Referral Fees, which states, "Members and candidates must disclose to their employers, clients, and prospective clients, as appropriate, any compensation, consideration, or benefit received from or paid to others for the recommendation of products or services…. Appropriate disclosure means that members and candidates must advise the client or prospective client, before entry into any formal agreement for services, of any benefit given or received from the recommendation of any services provided by the member or candidate." In this case, there is no evidence to suggest Parker disclosed her referral arrangement with Frontline Group to prospective clients. By not doing so, Parker violated Standard VI (C).

B is incorrect. Regardless of whether Frontline provides "best price" and "best execution" or whether the execution of client trades remains unchanged by Frontline, Parker must still disclose the referral arrangement to her clients.

C is incorrect. Parker must still disclose the referral arrangement to her clients, regardless of the fact that all client trades continue to be executed by Frontline.

4. Solution: B.

B is correct. The donations made by Jacobs and Riccio give Carroll an incentive to refer potential clients to JRA and at the very least give the perception that Carroll's objectivity and independence have been compromised. Jacobs and Riccio are in violation of Standard I(B): Professionalism–Independence and Objectivity, which states, "Members and candidates must use reasonable care and judgement to achieve and maintain independence and objectivity in their professional activities. Members and candidates must not offer, solicit, or accept any gift, benefit, compensation, or consideration that reasonably could be expected to compromise their own or another's independence and objectivity."

A is incorrect. As already noted, donations made by Jacobs and Riccio give Carroll an incentive to refer potential clients to JRA. This at the very least gives the perception that Carroll's objectivity and independence have been compromised, and so Jacobs and Riccio are in violation of the Code and Standards, specifically Standard I(B): Professionalism–Independence and Objectivity.

C is incorrect. The donations were made to Carroll's charity and do not represent additional compensation to Carroll. Additional compensation is defined in Standard IV(B): Duties to Employers–Additional Compensation Arrangements as "gifts, benefits, or compensation, or consideration that competes with or might reasonably be expected to create a conflict of interest with their employer's interest." An additional compensation arrangement is one that creates a conflict of interest between the member or candidate and her employer.

Case 2: Nancy Bates

1. **Solution: A**

The training program is inadequate, as it is too narrowly focused on employee functions and internal risks. It is defective as it does not, in the case or senior operational staff, give sufficient prominence to or test for the required response to acquiring potentially material nonpublic information outside of the firm. Though it is partly her fault, Bates is left rather uncertain about what is expected of her in this situation.

There is no expectation in the Standards that a firm that comes into possession of material nonpublic information has an absolute obligation to publicly disclose. The Standards acknowledge that this may often be impossible. However, the maintenance of a restricted list of such securities is clearly recommended as part of an effective compliance program.

2. **Solution: A**

The information is nonpublic and, given the circumstances, there should be a strong presumption that it is material, thus violating the standard dealing with material nonpublic information.

Sharing nonpublic, material information violates the standard dealing with material nonpublic information. The purpose of the sharing does not have to be strictly for personal financial gain.

Dugan's access to information creates a presumption that his analysis is likely correct. Even knowledge of the negotiations could itself be material as it signals EUF's strategic initiative.

3. **Solution: A**

Bates has violated Standard IV(A): Duty to Employers – Loyalty. She has a duty to be familiar with and to follow the policies and procedures her firm has put in place to inform and direct the conduct of its employees. Though she ultimately rectified the error, she did not follow the directive to be familiar with all the compliance requirements of her employment. The firm itself was derelict in its duties under IV(C): Duties to Employers – Responsibility of Supervisors as it had an inadequate compliance training program.

Bates did not violate Standard I(C). She did not make any misrepresentations relating to investing analysis, recommendation, actions, or other professional activities.

Bates did not violate Standard II(A): Integrity of Capital Markets – Material Nonpublic Information. Knowledge of material nonpublic information is not in and of itself a violation. Trading on it or causing another to trade on such information is a violation.

4. **Solution: B**

Tamworth's actions inevitably begin with information that she is aware was misappropriated.

Her research and trading decisions were then predicated on possessing misappropriated information.

Case 3: Michael Pompeo

1. **Solution: A.**

Standard III(B): Fair Dealing requires members and candidates to deal fairly and objectively with all clients. Certain clients cannot be favored over other clients when their investment objectives and circumstances are similar. Therefore, the most appropriate way to handle the reallocation of an illiquid share is to reduce each client's proportion on a pro rata, or weighted basis.

2. **Solution: B.**

Bush's actions do not violate Standard IV (A) – Duties to Employers. Bush does not use company time to make arrangements for his new venture, nor does he misappropriate any information (financial models or client contacts) from his former employer. All of Bush's actions are permissible under Standard IV (A).

3. **Solution: B.**

Pompeo has not violated Standard III(E)–Preservation of Confidentiality, which involves information about former, current, and prospective clients.

4. **Solution: C.**

The records created by Pompeo supporting the research model he developed are the property of former employer. Taking the documents with him to Atlantic without former employer's permission violates Standard V(C)-Record retention and IV(A)-Loyalty to employer. To use the model in the future, Pompeo must re-create the records supporting his model at the new firm.

Case 4: Cheryl LaPoint

1. **Solution: C**

LaPoint could only have violated Standard II(A): Integrity of Capital Markets – Material Nonpublic Information if she revealed the information about the layoffs before it became public. As it was already on the national news channels roughly two hours prior to the opening of the market, she has not revealed nonpublic information to Saltzman. Similarly, she has not revealed confidential information in breach of her duty of loyalty to her employer (Standard IV(A): Duties to Employers – Loyalty).

In different circumstances, had the information proved less newsworthy (i.e., if it wasn't big enough news to immediately become a national story), she may well have violated Standard II(A): Integrity of Capital Markets – Material Nonpublic Information for not allowing sufficient time for the information to spread through the investment community.

2. **Solution: A**

LaPoint's handling of her social media accounts complied with the Standards, and her maintenance of separate personal and professional accounts is exemplary.

It would be unreasonable to assume that the less active members of her professional networks would be aware of her change in status in such a short timeframe. Not immediately deleting her professional account, by itself, does not automatically form the basis of a solicitation violation.

The automatic update only conveys information that her former clients would have already received directly from TCP itself or via news reports.

3. **Solution: A**

While LaPoint's actions were not intentional, she has violated Standard IV(A): Duties to Employers – Loyalty by keeping proprietary company data without the knowledge or permission of her former employer.

Keeping the drive but not restoring her former employer's data would turn an inadvertent violation into a conscious one.

LaPoint has a duty to return company data to her former employer. She can request permission to keep the drive but she cannot on her own decide to keep the drive.

4. **Solution: B**

TCP does have a minor retail presence, and this would put LaPoint in direct violation of her contractual obligations to TCP and Standard IV(A): Duties to Employers – Loyalty.

Although LaPoint's experience is in commercial real estate and the temporary offer deals with the residential market, it should not be the principal consideration in her decision making. A conflict with her obligations to TCP is still possible.

The assurances given LaPoint are inherently unreliable and should not be the principal consideration in her decision making. When LaPoint is assigned as a broker representing the buyer or seller in any particular real estate deal, it would be impossible for her to avoid being confronted at some point with a counterparty represented by a TCP real estate broker. Simply operating in the same market creates a conflict with her obligations to TCP and Standard IV(A) Duties to Employers – Loyalty.

Case 5: Fiona O'Connor

1. **Solution: B.**

Jensen should adhere to Swiss regulations. Standard I(A): Knowledge of the Law requires members and candidates to adhere to the stricter of any applicable legislation or regulations and the CFA Institute Standards of Professional Conduct. Therefore, when providing investment advice to her Swiss pension clients, Jensen should most likely adhere to the stricter Swiss regulations requiring ESG assessments prior to the pension funds making an investment. Jensen would not likely be required to adhere to Irish legislation, because she is not directly associated with the Fund nor are her clients based in Ireland. In this instance, the CFA Institute Standards are less strict than Swiss regulations, because they do not require members to undertake ESG assessments prior to taking investment action or making an investment recommendation.

2. **Solution: A.**

Because there is no indication O'Connor violated Standard III(A): Loyalty, Prudence, and Care or Standard V(B): Communication with Clients and Prospective Clients. With regard to Standard III(A), investors in this type of social impact fund are likely looking to achieve high levels of social impact as well as to obtain somewhat competitive investment returns. Consequently, returns may not be the primary focus so the Fund can still meet its fiduciary duty to clients. As long as this strategy is clearly indicated in the prospectus prior to entry into the Fund, O'Connor would not be in violation of Standard III(A). In addition, with regard to Standard V(B), since the investment strategy is clearly stated in detail in the prospectus and notifications of changes are sent to clients prior to changes being made, O'Connor, as part of the senior management team, would not be in violation of Standard V(B).

3. **Solution: A.**

O'Connor has not violated any CFA Institute Standards relating to the firm's bonus pool or its part-time policy. With regard to the year-end bonus pool, Standard VI(A): Disclosure of Conflicts is not violated, because the participation in the bonus pool is not structured to provide immediate compensation or give returns based on short-term investment action with little or no long-term value creation. In compliance with Standard III(A): Loyalty, Prudence, and Care recommendations, the firm discloses all forms of management compensation arrangements. With regard to the part-time policy, O'Connor has also not violated any CFA Institute Standards. The Standards do not prohibit independent contractors. Standard VI(A): Disclosure of Conflicts is being upheld in that the firm discloses the part-time relationship with its clients and potential clients.

4. **Solution: C.**

During Jensen's client meeting, she made at least two inappropriate comments related to Standard

III(C): Suitability. Jensen has a duty to judge the suitability of an investment in the context of the client's total portfolio. However, Jensen has not undertaken a proper due diligence assessment on the Fund; she attended an introductory meeting lasting about one hour, which would not be considered in-depth due diligence of the Step Up Fund. The due diligence trip to Zimbabwe pertained only to one single investment within the Fund and thus would not be considered a fund due diligence evaluation. Consequently, at this point in time, she would not be able to determine whether the fund was suitable for her client's portfolio without undertaking further analysis. Jensen also has a duty under Standard III(C): Suitability to determine whether an investment is suitable to the client's financial situation and consistent with the client's written objectives, mandates, and constraints before making an investment recommendation or taking investment actions. Jensen has recommended her client invest a minimum of EUR5 million in the Step Up Fund. Because her clients are small pension funds with low risk profiles, investing 25% of the portfolio in the Step Up Fund would not likely be appropriate.

A and B are incorrect because Jensen has made at least two violations of Standard III(C): Suitability by not performing proper due diligence on the Step Up Fund and by recommending an inappropriate asset allocation (25%) to a low-risk pension fund. Under Standard III(C): Suitability, members and candidates have a responsibility to judge the suitability of an investment in the context of the client's total portfolio and to determine whether an investment is suitable to the client's financial situation and consistent with the client's written objectives, mandates, and constraints.

Case 6: Lauren Li

1. **Solution: B.**

Proxy voting is part of Standard III(A): Loyalty, Prudence, and Care. Part of a member's or candidate's duty of loyalty includes voting proxies in an informed and responsible manner. Proxies have economic value to a client, and CFA members and candidates must ensure that they properly safeguard and maximize this value.

2. **Solution: C.**

This is part of Standard VI(B): Priority of Transactions. All of the recommended procedures for compliance conform to the Standards.

3. **Solution: C.**

Administrative sanction is not listed as one of the actions the CFA Institute Professional Conduct staff can recommend.

4. **Solution: B.**

Confidentiality is part of Standard III(E): Preservation of Confidentiality. CFA members and candidates must keep information about current, former and prospective clients confidential. Statement 2 complies with the Standards.

Case 7: John Wickerstead

1. **Solution: B**

As the guidance on Standard VI – Conflicts of Interest makes clear, the position of director of a corporation has numerous potential conflicts. In this particular case, Wickerstead's first loyalty is to the beneficiaries of the NPCs.

Wickerstead does have a duty of loyalty, prudence, and care to the NPCs but this does not supersede his duties to the ultimate beneficiaries.

Wickerstead has no specific duties to the religious organizations which sponsor the NPCs outside of any provisions spelled out in their governing.

2. **Solution: C**

Under Standard III(A): Duties to Clients – Loyalty, Prudence, and Care, Wickerstead owes a duty of loyalty, prudence, and care to both the shareholders and the clients of CHC.

Wickerstead owes a duty of loyalty to his employer (Standard IV(A): Duty to Employers – Loyalty), but it is subordinate to his duties to the clients and the shareholders.

Wickerstead owes a duty of loyalty, prudence, and care to the shareholders but also to the clients of CHC.

3. **Solution: A**

As the guidance on Standard VI(A): Conflicts of Interest – Disclosure of Conflicts points out, one of the inherent potential conflicts faced by a director is between the interests of the shareholders and the interests of the clients.

Wickerstead acknowledges that there will be little direct competition; he is focused on the purpose of the legislation and pursues the best interests of the NPCs beneficiaries and future CHC at-need clients. His allusion to the "spirit of the legislation" is a gentle reminder to his colleagues about their duties under Standard I(A): Professionalism – Knowledge of the Law.

Wickerstead has a persuasive analysis of the competitive landscape.

It would be unethical and contrary to pursue a path that would result in harm to needy families.

4. **Solution: A**

Wickerstead appears to have analyzed and balanced the competing demands for his loyalty. His position is grounded on his ethical duties and those of CHC and the NPCs.

Any opinion about future events is inherently speculative. He has already identified an unethical element in CHC's plan. A low probability of being detected is no excuse for pursuing unethical acts. If exposed, the adverse consequences of this behavior are highly predictable.

Both the shareholders and clients of CHC have compelling claims on Wickerstead's loyalty. Here he is siding with fair and ethical treatment of all clients versus the possibility of a short-term increase

in profitability. Set against this is the likelihood that this policy will harm the firm and its shareholders.

Case 8: Lauren Lester

1. **Solution: B**

Not reporting his findings to his supervisor would be a violation of the Standards. This would be a misrepresentation of performance, and Orton should elevate the issue to his supervisor for further remediation.

2. **Solution: C**

The identified portfolio may not be included in any composite because it is non- discretionary. A non–fee-paying account may be included in a composite, so long as it is discretionary and segregated.

3. **Solution: B**

By relying solely on positive reports from colleagues, Walton did not conduct sufficient, reasonable, and diligent efforts to determine that the research was sound. Third-party research can be relied upon, as long as due diligence is undertaken to ensure that it is objective and reasonably based.

4. **Solution: C**

Walton violated the Standards by mentioning specifically an area of the exam (interest-rate swaps) that was covered on the exam. General comments about how easy or tricky he thought parts of the exam were would not be considered a violation.

Case 9: Tim Trent

1. **Solution: A**

Members and candidates may show past performance of funds managed at a prior firm as part of a performance track record. It is required that the necessary disclosures are made, outlining where the performance took place and the person's specific role in achieving that performance.

2. **Solution: A**

Trent's recap of the regional bank investment's outperformance is not a violation of the Standards. Trent applied the Mosaic Theory to reach the conclusion that the stock may outperform. Expert networks can be relied upon as part of the research process. Furthermore, management commentary would not be considered material non-public information, since a TV interview would likely not be considered non-public and commenting on the favorability of the macroeconomic environment would not be considered material.

3. **Solution: C**

Trent's table showing the outperformance may be considered a violation of the Standards. Highlighting a short-term period (quarterly) of outperformance that occurred two years ago when the stock has more recently underperformed the benchmark for a longer horizon is an example of presenting out-of-date information. Presenting in a manner that distorts the genuine returns of the strategy is deceptive.

4. **Solution: A**

Trent's approach to allocating shares is a violation because he is treating his friend's accounts differently by initially withholding allocating to them. As fee-paying clients, they are entitled to the same treatment as any other client.

Case 10: Eagle Investment Partners

1. **Solution：A**

Pigeon is not in violation of the CFA Institute Code and Standards. The incentive fee does not have to be disclosed to clients because it is not a referral fee, The incentive fee Pigeon received from Eagle for each client they brought is not a referral fee because the 20% of the management fee is being paid by the employer (Eagle) to the employee/outside contractor (Pigeon) for services provided. This amount is regular compensation paid by the firm.

2. **Solution: C**

Standard IV(B) Additional Compensation Arrangements requires members and candidates to obtain permission from their employer before accepting compensation or other benefits from third parties for the services rendered to the employer or for any services that might create a conflict with their employer's interest. Through gaining approval before accepting the shares in ChipMaster and reimbursement for attending at ChipMaster's board meetings, Wade sought to avoid any potential conflicts of interest between ChipMaster and Eagle.

3. **Solution: A**

Since Eagle does not require employees to sign non-compete agreements, Lucas is not prohibited form soliciting former colleagues once he has left firm.Adam recreates the valuation model rather than directly copy and take with him, this is not a violation of Standard IV(A) Duties to Employers–Loyalty.

4. **Solution: A**

Standard I(B) Independence and Objectivity states that receiving a gift, benefit, or consideration from a client can be distinguished from gifts given by entities seeking to influence a member or candidate to the detriment of other clients. A gift from a client could be considered supplementary compensation and would not impair Lucas' independence and objectivity.
Since Eagle does not require employees to sign non-compete agreements, Lucas is not prohibited form contacting clients of their previous firm once he has left firm.