Part A

LOS 10i: Prepare and justify an investment policy statement for an individual investor.

Guideline Answer:

The return objective of the Jacksons is to grow their investment portfolio in real terms to meet the tuition fees of the children and their retirement needs in 18 years’ time.

Annual Income
Stephan and Lelia’s posttax salaries: \((\$225,000 + \$62,000) \times (1 – 0.3) = \$200,900\)

This will increase in line with inflation.

Expenses
Annual living expenses of $103,000, expected to increase in line with inflation

Annual saving into the portfolio = $200,900 – $103,000 = $97,900. Note that since both income and expenses are expected to increase with inflation, this annual saving will also increase in line with inflation, and will be constant in real terms.

Assets
Current investment portfolio $455,000.

Removing cost of improvements to home of $310,000 leaves a current investment portfolio of $145,000.

Note: Primary residence should not be included in investible assets.

The goal is to grow assets to meet the real tuition payment and retirement needs of $200,000 + $2,000,000 = $2,200,000.

Working in real terms:

\[
\begin{align*}
N &= 18 \\
PV &= -145,000 \\
PMT &= -97,900 \\
FV &= 2,200,000 \\
CPTI/Y &= 1.52\%
\end{align*}
\]

Since all inputs were real and posttax, this is the posttax real required rate of return of the portfolio.

Add inflation to get the posttax nominal required rate of return of the portfolio: \(1.52\% + 2\% = 3.52\%\).

Hence, pretax nominal required rate of return is approximately \(3.52\% / (1 – 0.3) = 5.03\%\).
Note: The geometric method would be acceptable, i.e., posttax nominal required rate of return of the portfolio = \((1.0152 \times 1.02) - 1\) = 3.55%.

Hence, pretax nominal required rate of return = \(3.52\% / (1 - 0.3)\) = 5.07%.

Scoring Guide:

- 2 points for stating the return objective
- 1 point for correct calculation of annual income
- 1 point for correct calculation of annual expenses
- 1 point for correct calculation of annual saving
- 1 point for correct calculation of investable assets
- 1 point for correct calculation of investment goal
- 1 point for correct TVM method
- 1 point for adjusting from real to nominal returns
- 1 point for adjusting from posttax to pretax returns

Note: Credit will be given for using the correct method, even if the numbers used are incorrect. For example, a delegate that completes all steps correctly but uses an incorrect number for annual saving will receive 9 points out of 10.

Part B

LOS 10h: Discuss the effects that ability and willingness to take risk have on risk tolerance.

Guideline Answer:

Any two of the following:

- The Jackson’s joint income easily covers their annual expenses; hence, there are no ongoing liquidity requirements from the portfolio.
- The Jacksons have a long time horizon of 18 years, meaning potential losses due to short-term volatility can be recovered over the longer term.
- The Jacksons have stable spending habits and do not expect any significant outflows in the future.
- The Jacksons have a relatively small mortgage outstanding against their primary residence. The equity in the property could be used to borrow funds if needed due to short-term volatility.
Lelia could increase household income by seeking reemployment as a higher-paid IT consultant should increased risk lead to losses.

Both Lelia and Stephan could continue to work past the age of 59 should they need to. This increases the ability to take risk in the investment portfolio.

**Scoring Guide:**

2 points for each correct factor stated (4 points)

**Part C**

**LOS 10k: Discuss how asset allocation policy may be influenced by the risk characteristics of human capital.**

**Guideline Answer:**

Human capital is the present value of future earnings. When considered as an asset of the portfolio of an investor, diversification benefits can be achieved by investing financial capital in assets that have a low correlation with human capital. Since Stephan has earnings that are highly correlated with equity markets, there would be diversification benefits from allocating financial assets to fixed income in the investment portfolio.

**Scoring Guide:**

1 point for correctly specifying Stephan
2 points for adequate justification

**Part D**

**LOS 10h: Discuss the effects that ability and willingness to take risk have on risk tolerance.**

**Guideline Answer:**

Time Horizon

The Jacksons’ time horizon was originally long and multistage. The first stage consisted of 18 years to retirement, and the second stage consisted of retirement, which could last 30 years or more.
The Jacksons’ time horizon is still long and multistage; however, the first stage consists of only 8 years to retirement, while the second stage consists of retirement.

The time horizon for the first stage has decreased from being long term (18 years) to medium term (8 years).

Liquidity Needs

The original liquidity needs of the Jacksons consisted of the payment for the house improvements of $310,000. As net savers, the Jacksons had no ongoing liquidity needs from the investment portfolio.

After 10 years, there are no immediate one-off liquidity needs; however, with Stephan reducing his earnings by becoming a schoolteacher, it is likely that posttax earnings may not cover expenses. In this case, the liquidity needs of the portfolio are likely to be higher.

Risk Tolerance

Both shorter time to retirement and higher liquidity needs imply that the Jacksons have a lower ability to take risk, hence a lower risk tolerance.

Scoring Guide:

2 points for describing how time horizon has changed
1 point for stating impact of change in time horizon on risk objective
2 points for describing how liquidity needs have changed
1 point for stating impact of change in liquidity needs on risk objective
Part A

Exhibit 1

LOS 12c: Determine a family’s core capital and excess capital, based on mortality probabilities and Monte Carlo analysis.

Guideline Answer:

The net spending need of the Coopers is ($85,000 – $15,000 – $30,000) = $40,000 per year

For each year, the joint probability that either George or Enid will survive is:

\[ p(\text{at least one survives}) = p(\text{George survives}) + p(\text{Enid survives}) - p(\text{George survives}) \cdot p(\text{Enid survives}) \]

Hence:

\[ p(\text{at least one survives one year}) = 0.9245 + 0.9888 - (0.9245 \times 0.9888) = 0.99915 \]
\[ p(\text{at least one survives two years}) = 0.8367 + 0.9443 - (0.8367 \times 0.9443) = 0.9909 \]

The core capital for the first two years will be the discounted value of the expected spending. The relevant discount rate is the nominal risk-free rate (2% + 2%), since spending is fixed in nominal terms, and the spending is unrelated to market risk.

\[ \text{Core capital (first two years)} = \frac{40,000 \times 0.99915}{1.04} + \frac{40,000 \times 0.9909}{1.04^2} = \$75,075 \]

Scoring Guide:

1 point for correctly calculating net spending needs
1 point for correct calculation of probabilities
1 point specifying/using correct discount rate
1 point for correctly calculating present value
**Part B**

**LOS 12g:** Explain the basic structure of a trust and discuss the differences between revocable and irrevocable trusts.

**Guideline Answer:**

<table>
<thead>
<tr>
<th>Determine which of the following types of trust structure would be <em>more likely</em> to meet Cooper’s planning needs. (Circle one)</th>
<th>Justify your choice with <em>two</em> reasons for each choice.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revocable trust</td>
<td>Cooper is keen to protect his estate from future claims by his ex-wives. An irrevocable trust generally provides greater asset protection from future claims against Cooper than a revocable trust since assets are no longer deemed to be owned by Cooper. Cooper wishes to benefit from establishing the trust in a favorable tax environment. Under an irrevocable trust, Cooper will no longer be deemed the owner of the assets and the trustee will be responsible for paying taxes. Under a revocable trust structure, Cooper will continue to be deemed the owner of the assets for tax purposes, and hence will not benefit from the favorable tax environment of the trust.</td>
</tr>
<tr>
<td>Irrevocable trust</td>
<td></td>
</tr>
<tr>
<td>Fixed trust</td>
<td></td>
</tr>
<tr>
<td>Discretionary trust</td>
<td>Cooper wishes for the assets of the trust to be distributed according in the most tax-efficient manner given the circumstances of the grandchildren at the time. A discretionary trust, which can make distribution decisions in the future depending on the future tax circumstances of the grandchildren, is better able to meet this objective, since a fixed trust’s distribution would need to be specified today. Cooper is keen that assets are protected should the grandchildren experience any claims against their assets from future ex-spouses. Under a discretionary trust, the grandchildren will have no legal right to the assets of the trust; hence, the assets are protected from claims against the grandchildren’s estate.</td>
</tr>
</tbody>
</table>
Part C

LOS 12f: Evaluate the after-tax benefits of basic estate planning strategies, including generation skipping, spousal exemptions, valuation discounts, and charitable gifts.

Guideline Answer:

George Cooper does not trust the children, Lelia and Stephan, to provide responsible stewardship of the bequeathed assets. A generation-skipping strategy will ensure the assets can be transferred directly to the grandchildren without Lelia and Stephan being involved.

Cooper wants to transfer his estate in the most tax-efficient manner. A generation-skipping strategy will be subject to gift taxes only once, whereas a strategy that did not skip generations would be transferred twice, thereby incurring gift taxes twice.

The Coopers paying the gift taxes is tax-efficient since paying the tax liability from the donor’s taxable estate decreases the size of the taxable estate and hence the ultimate estate tax.

Scoring Guide:

1 point for stating each reason (3 points)
1 point for explaining the reason clearly (3 points)

Part D

LOS 12k: Evaluate a client’s tax liability under each of three basic methods (credit, exemption, and deduction) that a country may use to provide relief from double taxation.

Guideline Answer:

Under the exemption method of double taxation relief, the residence country imposes no tax on foreign-source income. Hence, the grandchildren will be subject to source taxes of only 10% on distributions from the trust.

Scoring Guide:

2 points for correct calculation
**Part A**

**LOS 8c: Identify and evaluate an individual’s behavioral biases.**

**Guideline Answer:**

<table>
<thead>
<tr>
<th>Behavioral Bias</th>
<th>Identify the comment that best illustrates each of the behavioral biases suspected by Murphy. (Circle the comment number from Exhibit 1.)</th>
<th>Justify each response with one reason.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Endowment</strong></td>
<td>1, 2, 3, 4</td>
<td>Endowment bias occurs when investors value an asset more when they hold it. Lelia could be demonstrating endowment bias through preferring securities with which she is already familiar over new securities not currently in her portfolio.</td>
</tr>
<tr>
<td><strong>Mental accounting</strong></td>
<td>1, 2, 3, 4</td>
<td>Mental accounting occurs when different parts of the portfolio are treated differently. Stephan is engaging in mental accounting when he states that he will take risk with only one part of the portfolio, while the other part is invested in safer assets in order to meet critical goals.</td>
</tr>
<tr>
<td><strong>Availability</strong></td>
<td>1, 2, 3, 4</td>
<td>Availability bias occurs when judgments are affected by how easily an outcome comes to mind. In this case, Stephan is investing in stocks with the most press coverage that are most available to him.</td>
</tr>
</tbody>
</table>

**Scoring Guide:**

1 point for selecting each correct comment (3 points)
2 points for adequate justification (6 points)
Part B

LOS 8d: Evaluate how behavioral biases affect investment policy and asset allocation decisions and recommend approaches to mitigate their effects.

Guideline Answer:

Murphy should attempt to moderate Stephan’s biases because they are cognitive (availability and mental accounting), not emotional biases, so he can be educated to avoid these biases. Also, because of Murphy’s concern that the Jacksons may fail to meet their investment goals, the standard-of-living risk is high. Adapting to his biases could prevent the Jacksons from achieving their investment goals.

Scoring Guide:

1 point for recommending moderation
2 points for each justification (4 points)
Part A

LOS 15c: Evaluate pension fund risk tolerance when risk is considered from the perspective of the 1) plan surplus, 2) sponsor financial status and profitability, 3) sponsor and pension fund common risk exposures, 4) plan features, and 5) workforce characteristics.

Guideline Answer:

LPP has less flexibility around early retirement for plan participants. This will increase the duration of plan liabilities and remove the need for unexpected liquidity. This allows the plan to invest in longer-duration assets and take more risk.

The employees of Larette are younger than the average CAC 40 company. This increases the average time to retirement, increasing the time horizon and allowing the plan to invest in longer-duration assets.

LPP has a lower ratio of retired to active lives. This means the plan has relatively fewer participants drawing pensions so the call on liquidity is lower and the plan can take more risk with longer-dated and less liquid assets.

The LPP is fully funded compared to the average fund, which is facing a deficit. Those in deficit are forced to take a more conservative position, as they cannot run the risk of moving further into deficit.

Larette has a lower debt-to-equity ratio, which means that the business is less exposed to financial risk. Thus, it is better positioned to take risk in the pension fund as the lower leverage means it is more likely to be able to contribute to the fund in times of poor business performance. By contrast, a highly geared company is inherently at higher risk of failure so is less likely to be in a position to make top-up payments to the pension fund in times of financial strain.

Note that the higher correlation is not a reason for higher risk tolerance, nor is the higher percentage invested in government bonds.

Scoring Guide:

1 point for stating each factor (4 points)
1 point for explaining why factor impacts on risk tolerance (4 points)
Part B

LOS 15b: Discuss investment objectives and constraints for defined benefit plans.

Guideline Answer:

The required return is set by the trustees as 0.5% above the minimum required return. In order to meet liabilities, the fund must grow at the discount rate of 5%. Therefore, the required return is $5\% + 0.5\% = 5.5\%$.

The directors’ higher desired return is not appropriate, as it is the trustees who are legally responsible for the fund and managing it prudently for the beneficiaries. The Larette directors are looking to minimize the contributions from the company, but this may involve the fund taking too much risk.

Scoring Guide:

1 point for using discount rate
1 point for using 0.5% target of trustees
1 point for combining the above in the correct calculation

Part C

LOS 15d: Prepare an investment policy statement for a defined benefit plan.

Guideline Answer:

<table>
<thead>
<tr>
<th>Constraint</th>
<th>Formulate the following two constraints for the Larette pension plan (LPP). Support each answer with two reasons from the scenario.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquidity</td>
<td>LPP has low liquidity requirements:</td>
</tr>
<tr>
<td></td>
<td>The workforce is relatively young, on average 22 years from retirement. This is lower than the average for CAC 40 companies, and means that the fund is unlikely to be making large benefit payments in the near future.</td>
</tr>
<tr>
<td></td>
<td>The fund does not have flexible early retirement provisions, reducing the unexpected calls on liquidity that early retirement would cause.</td>
</tr>
<tr>
<td></td>
<td>The ratio of retired to active lives is high so the fund has less of a proportional outflow due to paying out to retirement members.</td>
</tr>
<tr>
<td>Time horizon</td>
<td>LPP has a long single-stage time horizon.</td>
</tr>
<tr>
<td></td>
<td>The employees are relatively young, with, on average, 22 years to retirement,</td>
</tr>
<tr>
<td></td>
<td>There is no early retirement provision.</td>
</tr>
<tr>
<td></td>
<td>The plan is closed to new participants; hence, it only exists as long as the longest living member draws a pension, which is a finite period of time but will be many years.</td>
</tr>
</tbody>
</table>
Scoring Guide:

1 point for stating low liquidity needs
1 point for each reason for low liquidity needs (2 points)
1 point for stating time horizon
1 point for each reason for time horizon (2 points)

Part D

LOS 15c: Evaluate pension fund risk tolerance when risk is considered from the perspective of the
1) plan surplus, 2) sponsor financial status and profitability, 3) sponsor and pension fund common
risk exposures, 4) plan features, and 5) workforce characteristics.

Guideline Answer:

An increase in the discount rate would reduce the present value of the liabilities, but would not affect the
value of the assets. Therefore, it would improve the funded status of the plan. All else being equal, this
would give the plan a higher ability to take risk.

Scoring Guide:

1 point for stating funded status will improve
1 point for explaining that higher funded status means higher ability to take risk
Part A

LOS 15j: Discuss the factors that determine investment policy for pension funds, foundation endowments, life and non-life insurance companies, and banks.

Guideline Answer:

The leverage-adjusted duration gap is calculated as $D_A - kD_L$,
where
$D_A$ is the duration of assets
$D_L$ is the duration of liabilities
$k$ is the ratio of the market value of liabilities to the market value of assets.

On the asset side, there has been a rotation from long-maturity personal loans and residential mortgages to shorter-maturity commercial loans and mortgages. This will lower the duration of the assets of the bank, $D_A$.

On the liability side, there has been a rotation from short-maturity demand deposits to longer-maturity time deposits. This will increase the duration of the liabilities of the bank, $D_L$.

The bank has expanded in size, but the ratio of assets to liabilities has remained fairly constant.

Hence, the leverage-adjusted duration gap will most likely have fallen. This is consistent with the view that interest rates are less likely to keep falling since a lower duration gives less exposure to falling interest rates.

(Note: Technically, $k$ should be based on market values rather than book values. Full credit will be given for referencing this point; however, the net result is that the duration gap is still most likely to fall overall.)

Scoring Guide:

1 point for stating duration of assets will fall
1 point for stating duration of liabilities will rise
1 point for stating that the asset/liability ratio has remained constant
1 point for concluding the leverage adjusted duration gap will most likely have fallen
1 point for explaining that this is consistent with interest rate view of the bank
LOS 15j: Discuss the factors that determine investment policy for pension funds, foundation endowments, life and non-life insurance companies, and banks.

Guideline Answer:

<table>
<thead>
<tr>
<th>Management Comment</th>
<th>Evaluate the effect (higher, lower, unchanged) of each of the management comments in Exhibit 2 on the ability to take risk in the bank’s securities portfolio. (Circle one)</th>
<th>Justify each response with one reason.</th>
</tr>
</thead>
<tbody>
<tr>
<td>“We have greatly increased the use of collateralized debt obligations and asset-backed securities in recent years, which has markedly improved our ability to divest loans from the balance sheet.”</td>
<td>Higher Lower Unchanged</td>
<td>The ability to securitize loans improves the liquidity of the loan book and reduces the need for liquidity from the securities portfolio.</td>
</tr>
<tr>
<td>“Due to the interest rate and competitive environments, the opportunities that we are seeing in our loan business will involve making loans to borrowers of lower credit quality in the future.”</td>
<td>Higher Lower Unchanged</td>
<td>In order that the overall risk levels of the bank remain unchanged, higher credit risk in the loan book needs to be offset with lower credit risk in the securities portfolio.</td>
</tr>
<tr>
<td>“Regulatory conditions continue to tighten, with pledging requirements increasing for all depositary institutions.”</td>
<td>Higher Lower Unchanged</td>
<td>The securities portfolio of the bank is used to hold government securities against the uninsured portion of deposits. An increase in pledging requirements will increase the number of safe assets the securities portfolio needs to hold for regulatory reasons. In order that the overall risk of the securities portfolio remain unchanged, the bank will hold riskier securities outside of the pledged collateral. Overall ability to take risk in the securities portfolio has not changed.</td>
</tr>
</tbody>
</table>
### Management Comment

Evaluate the effect (higher, lower, unchanged) of each of the management comments in Exhibit 2 on the ability to take risk in the bank’s securities portfolio. (Circle one)

<table>
<thead>
<tr>
<th>Management Comment</th>
<th>Justify each response with one reason.</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Loan demand has been increasing due to a robust economy, and we expect this trend to continue. Expected returns on new loans exceed returns in the securities portfolio.”</td>
<td>Higher loan demand will increase the liquidity needs of the securities portfolio, since the securities portfolio is a source of funds to make new loans. This is particularly the case when new loans have higher expected returns than the securities portfolio.</td>
</tr>
</tbody>
</table>

### Scoring Guide:

1 point for each correct higher/lower/unchanged effect selection (4 points)

1 point for each adequate justification (4 points)
**Part A**

**LOS 16c:** Demonstrate the application of formal tools for setting capital market expectations, including statistical tools, discounted cash flow models, the risk premium approach, and financial equilibrium models.

**Guideline Answer:**

<table>
<thead>
<tr>
<th>Forecast</th>
<th>Determine which component of the Grinold Kroner Model (income, earnings growth, or repricing) is most likely to be affected by each forecast.</th>
<th>State how the component is most likely to change (higher or lower).</th>
<th>Justify each response with one reason.</th>
</tr>
</thead>
<tbody>
<tr>
<td>“A slowdown in emerging markets is likely to lead to consumer prices remaining subdued and maybe even a period of deflation.”</td>
<td>Expected nominal earnings growth return</td>
<td>Higher/Lower</td>
<td>The nominal earnings growth return component consists of the expected inflation rate plus the expected real total earnings growth rate. With inflation expected to be lower or prices falling in a period of deflation, the expected inflation rate will be lower; hence, the nominal earnings growth return component is likely to be lower.</td>
</tr>
<tr>
<td>“Recent turbulence in credit markets has led to companies turning to equity markets to bolster their balance sheets. As this turbulence subsides, we expect the rate of issuance of shares to decrease.”</td>
<td>Expected income return</td>
<td>Higher/Lower</td>
<td>The expected income return consists of the expected dividend yield minus the expected percentage change in shares outstanding. If share issuances are expected to be lower in the future, then the expected change in shares outstanding will be expected to fall. This in turn increases the expected income return component.</td>
</tr>
</tbody>
</table>
Determine which component of the Grinold Kroner Model (income, earnings growth, or repricing) is most likely to be affected by each forecast. State how the component is most likely to change (higher or lower).

<table>
<thead>
<tr>
<th>Forecast</th>
<th>Determine which component of the Grinold Kroner Model (income, earnings growth, or repricing) is most likely to be affected by each forecast.</th>
<th>State how the component is most likely to change (higher or lower).</th>
<th>Justify each response with one reason.</th>
</tr>
</thead>
<tbody>
<tr>
<td>“The central bank will continue to do whatever it takes to support asset prices as we deem this to be a central pillar to market confidence. As such, asset buying programs will be expanded and will be extended for the first time to the equity market, with the open intention of raising stock market prices.”</td>
<td>Expected repricing return</td>
<td>Higher/Lower <strong>Higher</strong></td>
<td>The expected repricing return consists of the expected change in price-to-earnings (PE) ratios. Given the explicit aim of the central bank to raise stock prices, this will most likely lead to higher valuations and an increase in PE ratios.</td>
</tr>
</tbody>
</table>

**Scoring Guide:**

1 point for determining each correct component (3 points)
1 point for stating each correct change (higher/lower) (3 points)
1 point for each adequate justification (3 points)
Part B

LOS 17a: Explain the terms of the Cobb-Douglas production function and demonstrate how the function can be used to model growth in real output under the assumption of constant returns to scale.

Guideline Answer:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Determine whether each of Alef’s statements is correct or incorrect. (Circle one.)</th>
<th>Justify each response with one reason.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statement 1</td>
<td>Correct/Incorrect</td>
<td>The assumption of constant returns to scale means that a given increase in capital stock and labor input results in an equal percentage increase in output. It is not true if a single input increases individually due to the decreased marginal returns of increasing an individual input.</td>
</tr>
<tr>
<td>Statement 2</td>
<td>Correct/Incorrect</td>
<td>The change in demographic implies an increase in the aggregate labor force as stay-at-home spouses return to the workforce. This implies the labor force will grow at a rate faster than that of the growth rate of the overall population, and total economic production will therefore increase at a higher rate.</td>
</tr>
</tbody>
</table>

Scoring Guide:

1 point for selecting each correct/incorrect appropriately (2 points)
2 points for each adequate justification (4 points)
Part C

LOS 17g: Judge whether an equity market is under-, fairly, or overvalued using a relative equity valuation model.

Guideline Answer:

The Yardini model assumes that the market is fairly valued when the justified forward earnings yield is equal to current forward earnings yield of the equity market.

The Yardini model calculates the justified forward earnings yield as the long-term corporate bond rate minus the weighted long-term earnings growth rate, which in this case equals $5.46\% - (0.05 \times 8.5\%) = 5.035\%$.

Given that the expected forward earning yield of the market is $7.25\%$, the market is undervalued, as it is yielding more than the justified forward earnings yield.

Scoring Guide:

2 point for correctly calculating the justified forward earnings yield
1 point for stating the market is undervalued
**Part A**

LOS 31e: Calculate and interpret value at risk (VAR) and explain its role in measuring overall and individual position market risk.

**Guideline Answer:**

Weekly historic return = 0.028% × 5 = 0.14%

Weekly historic risk = 0.9% × \( \sqrt{5} \) = 2.012%

Using the one-tailed 95% Z score, the weekly historic VaR is

\[
(0.14\% - 1.65 \times 2.012\%) \times £750 \text{ million} = -£23.854 \text{ million}
\]

Therefore there is a 5% chance of the portfolio losing more than £23.854 million in a one-week period.

**Scoring Guide:**

1 point for calculating weekly historic return
1 point for calculating weekly historic risk
2 points for correct application of VaR formula

**Part B**

LOS 31f: Compare the analytical (variance-covariance), historical, and Monte Carlo methods for estimating VAR and discuss the advantages and disadvantages of each.

**Guideline Answer:**

One drawback is that the calculation relies on historic figures to give a forward-looking forecast of risk. There is no reason to believe that the future will closely mirror the past.

Another issue is that the calculation relies heavily on the assumption of normality in returns. Even though there is no skew, there may be kurtosis (fat tails). This is particularly a concern if recent years have been stable, as the measured volatility will be low; however, the market may experience unpredictable large movements.

**Scoring Guide:**

1 point for calculating weekly historic return
1 point for calculating weekly historic risk
2 points for correct application of VaR formula
Part C

LOS 31k: Demonstrate the use of exposure limits, marking to market, collateral, netting arrangements, credit standards, and credit derivatives to manage credit risk.

Guideline Answer:

Choose two from:

Choose OTC contracts that will be marked to market.

Use exchange-traded derivatives to benefit from the margin system.

Require collateral to be posted.

Use payment netting.

Employ minimum credit standards.

Scoring Guide:

1 point for each method (2 points)

Part D

LOS 31f: Compare the analytical (variance-covariance), historical, and Monte Carlo methods for estimating VAR and discuss the advantages and disadvantages of each.

Guideline Answer:

Zombub should use the Monte-Carlo method of estimating VaR.

The portfolio contains MBSs. These vary in prices according to many variables and exhibit path dependency as regards interest rates. Therefore, they should be modeled using Monte Carlo to capture the complexity. Historic price movements do not capture the complexity and risk of MBSs.

OR

Bond values do not follow a normal distribution of returns. Duration is used to measure bond risk rather than standard deviation. Therefore, the normal distribution assumption behind variance-covariance would not be appropriate.

OR
Interest rates are the main driver of bond prices. Recent low interest rates imply low volatility. However, it would be more prudent to consider possible future interest rate paths and model the resulting price volatility than to look at the recent past and draw conclusions. Even though the fund manager believes low stable interest rates will continue, Zombub should look forward at possible alternative scenarios.

Scoring Guide:

- 1 point for suggesting the Monte Carlo method
- 2 points for each reason (4 points)
Part A

LOS 19m: Recommend and justify an asset allocation using a goals-based approach.

Guideline Answer:

Goal 1:
From the description in Exhibit 1, Goal 1 is a need, and as such is allocated a required probability of success of 95% according to Cote’s system.

Using the data in Exhibit 2, the module with the highest annualized minimum expected return for the time horizon of 15 years with required success of 95% is module D with a return of 4.6%.

Present value of $15 million in 15 years’ time discounted at this minimum expected return gives an allocation of $15,000,000/(1.046)^{15} = $7,640,398.

Goal 2:
From the description in Exhibit 1, Goal 2 is a desire, and as such is allocated a required probability of success of 75% according to Cote’s system.

Using the data in Exhibit 2, the module with the highest annualized minimum expected return for the time horizon of 15 years with required success of 75% is module D with a return of 6.9%.

Present value of $5 million in 15 years’ time discounted at this minimum expected return gives an allocation of $5,000,000/(1.069)^{15} = $1,837,826.

Total allocation to module D = $7,460,398 + $1,837,826 = $9,298,224, which represents an allocation of $9,298,224/$20,000,000 = 46%.

Cote has stated that the excess capital in the portfolio not required to meet Goals 1 and 2 should be held in module C.

Hence optimal allocation is:

Module A: 0%
Module B: 0%
Module C: 54%
Module D: 46%

Scoring Guide:

1 point for identifying module D as the optimal module for goal 1
1 point for correctly calculating capital allocated to goal 1
1 point for identifying module D as the optimal module for goal 2
1 point for correctly calculating capital allocated to goal 2
2 points for correctly specifying overall portfolio module allocation
Part B

LOS 19a: Describe and critique the use of mean–variance optimization in asset allocation.

Guideline Answer:

Any two of the following would be acceptable:

- MVO output asset allocations are highly sensitive to small changes in the inputs.
- MVO asset allocations tend to be highly concentrated.
- Many investors have concerns outside those of simply mean and variance, which are ignored by MVO.
- Although asset allocations may appear diversified across assets, the source of risk may not be diversified.
- MVO is an asset-only approach and does not consider the nature of any potential liabilities.
- MVO is a single-period framework that does not account for trading/rebalancing issues.

Scoring Guide:

1 point for each criticism (2 points)
Part C

LOS 19n: Describe and critique heuristic and other approaches to asset allocation.

Guideline Answer:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Determine whether each of Cote’s statements is correct or incorrect. (Circle one.)</th>
<th>Justify, using one reason, any incorrect statements.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statement 1</td>
<td>Correct</td>
<td>Optimal weights under a risk-parity allocation would set the <em>absolute</em> contribution to risk of each asset class in the portfolio to be the same, not the marginal contribution to risk.</td>
</tr>
<tr>
<td>Statement 2</td>
<td>Correct</td>
<td>Incorrect</td>
</tr>
</tbody>
</table>

Scoring Guide:

1 point for selecting “Incorrect” for Statement 1
1 point for adequate justification of Statement 1 being incorrect
2 points for selecting “Correct” for Statement 2
Part A

LOS 24d: Formulate a portfolio positioning strategy given forward interest rates and an interest rate view.

Guideline Answer:

Guidwife should select Portfolio C.

Guidwife’s view is that the UK yield curve will steepen and become less curved.

Under both of these types of yield curve changes, a bullet portfolio will outperform a barbell portfolio since the bullet portfolio will have lower exposure to long-term rates, which will relatively increase under both a steepening and a falling of curvature.

Guidwife should therefore pick the portfolio with the highest exposure to mid-maturity rates and the lowest exposure to long- and short-term rates. The key rate durations displayed in Exhibit 1 show this to be Portfolio C.

Scoring Guide:

1 point for identifying that a bullet portfolio will outperform under the forecasted yield curve change
1 point for explaining why a bullet portfolio will outperform under the forecasted yield curve change
1 point for identifying Portfolio C as the best portfolio
Part B

LOS 24d: Formulate a portfolio positioning strategy given forward interest rates and an interest rate view.

LOS 24f: Evaluate a portfolio’s sensitivity to a change in curve slope using key rate durations of the portfolio and its benchmark.

Guideline Answer:

Since shorter-term rates have risen and longer-term rates have fallen, the yield curve has flattened. There has also been an increase in curvature since the average move in short- and long-term rates is negative compared to movements in mid-maturity rates.

Given a flattening of the yield curve and an increase in curvature, a barbell portfolio would outperform due to having more exposure to the relatively lower long-term rates. The most barbelled portfolio is Portfolio B since Exhibit 1 shows this portfolio has the highest exposure to short- and long-term rates; hence Guidwife was incorrect in picking Portfolio A.

Scoring Guide:

1 point for stating that the curve has flattened
1 point for stating that the curve has increased in curvature
1 point for stating a barbell portfolio would be preferred under this yield curve change
1 point for stating that Portfolio A was the incorrect choice, and that Portfolio B would have been a more appropriate choice.
Part C

LOS 24f: Evaluate a portfolio’s sensitivity to a change in curve slope using key rate durations of the portfolio and its benchmark.

Guideline Answer:

The predicted change using partial PVBPs is given by:

Predicted change = Portfolio par amount × Partial PVBP × (–Curve shift)

The portfolio par amount is £99 million.

The partial PVBP for Portfolio A at the 10-year maturity is given in Exhibit 1 as 0.0157. (Tutor’s note: Note that this is the GBP impact of a 1 basis point move in the 10-year rate on £100 par of the overall portfolio. This is why the par amount of the portfolio needs to be divided by £100 when we apply the PVBP in the following equation.)

The shift in rates at the 10-year maturity is +5 bps.

Hence predicted change = (£99,000,000/£100) × £0.0157 × (–5) = –£77,715.

Scoring Guide:

1 point for stating the correct formula
1 point for correctly specifying inputs to use in the formula
1 point for applying the formula to inputs correctly
Part D

LOS 24f: Evaluate a portfolio’s sensitivity to a change in curve slope using key rate durations of the portfolio and its benchmark.

To profit from a curve that is steepening and becoming less curved, Guidwife should create a butterfly portfolio through going long a bullet portfolio and short a barbell portfolio. This would involve buying Portfolio C and shorting Portfolios A and B.

Scoring Guide:

1 point for stating the correct butterfly positions
1 point for correctly specifying positions in portfolios
Part A

LOS 27c: Compare different approaches to passive equity investing.

Guideline Answer:

The independent variables for a returns-based style analysis should be mutually exclusive, exhaustive, and represent distinct source of risk.

The indices are mutually exclusive since no stock would be classified as both large cap and small cap, and no stock would be classified as both value and growth.

The indices are exhaustive since they cover the full market cap and style range of the U.S. domestic equity market. WAA has not invested outside of domestic U.S. equity markets.

The indices are distinct sources of risk since capitalization size and style will generate different types of investment return.

Scoring Guide:

1 point for each feature (3 points)
1 point for each statement as to how the indexes meet the features (3 points)

Part B

LOS 27c: Compare different approaches to passive equity investing.

Guideline Answer:

The $R^2$-squared of the fund is 0.91, which means that the proportion of the variation in fund returns coming from active stock selection is 9%. This indicates that there is some active management occurring at the fund; the product is not merely replicating the passive return of stock indices.

The fund has very low exposure to the two small-cap indices, which confirms that the fund is invested in large-cap securities.

The fund has a high exposure of 30% to large-cap growth stocks, which suggests that the manager is not exclusively investing in large-cap value stocks.
The manager may more appropriately be labeled as an actively managed large-cap market-oriented portfolio with a value bias.

**Scoring Guide:**

1 point for stating and explaining that the fund is active  
1 point for stating and explaining that the fund is large cap  
1 point for stating and explaining that the fund is not exclusively growth stocks  
1 point for suggesting new label

**Part C**

**LOS 27c: Compare different approaches to passive equity investing.**

**Guideline Answer:**

The rolling style chart in Exhibit 2 demonstrates that the exposure to large-cap growth has been increasing steadily over time. Laidlaw should inquire with the manager why this style drift has been occurring and whether it is likely to continue.

The plot of $R$-squared over time in Exhibit 3 demonstrates that style fit has been increasing over time, suggesting that active management has been falling. Laidlaw should ask WAA why this is happening and whether this is likely to continue.

**Scoring Guide:**

2 points for each question (4 points)
Part D

LOS 27c: Compare different approaches to passive equity investing.

Guideline Answer:

Advantages of holdings-based style analysis: Any two of:

The method characterizes each position rather than looking only at the portfolio as a whole.

The method facilitates the comparison of individual positions.

The method is likely to capture changes in style more quickly.

Scoring Guide:

1 point for each advantage (2 points)
Part A

LOS 18i: Discuss strategic considerations in rebalancing asset allocations.

Guideline Answer:

Buy-and-hold should be recommended.

Markets are expected to be flat and volatile, ruling out a CPPI strategy.

Ibrahim’s risk tolerance increases with wealth more than a constant mix strategy since a constant mix strategy has risk tolerance that increases proportionately with wealth.

A buy-and-hold strategy will provide a floor equal to the initial balance held in cash.

Scoring Guide:

1 point for stating that flat and volatile markets rules out CPPI strategy
1 point for acknowledging how risk tolerance rules out constant mix
1 point for stating buy-and-hold strategy has a floor
1 point for recommending a buy-and-hold strategy

Part B

LOS 18i: Discuss strategic considerations in rebalancing asset allocations.

Guideline Answer:

The weight in domestic equity will be the same under the calendar method as the percent-of-portfolio method.

The calendar method would automatically rebalance domestic equity to the target weight of 35%.

The percent-of-portfolio method would also rebalance all asset classes to target weights on December 31 because the International Equity asset class lies outside its corridor of 25% +/- 3.75%.

Scoring Guide:

1 point for explaining the calendar methodology
1 point for explaining the percent-of-portfolio methodology
2 points for stating the weights will be the same under both methods
Part C

LOS 18g: Describe the use of global market portfolio as a baseline portfolio in asset allocation.

Guideline Answer:

<table>
<thead>
<tr>
<th>Factor</th>
<th>Determine the affect of increasing each factor used to establish corridor width for rebalancing a portfolio. (Circle one.)</th>
<th>Justify your response.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 1</td>
<td>Wider</td>
<td>A higher correlation of domestic equity versus other asset classes means that weights in the portfolio will be more stable as asset classes move together. This reduces the chance that weights could diverge quickly from target weights and jeopardize the goals of the investor. This lowers the benefit of rebalancing, which means corridor widths need to be wider in order that the benefits of rebalancing outweigh the costs.</td>
</tr>
<tr>
<td></td>
<td>Narrower</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unchanged</td>
<td></td>
</tr>
<tr>
<td>Factor 2</td>
<td>Wider</td>
<td>An increase in the volatility of other asset classes will cause an increase in the volatility of the weight of domestic equity in the portfolio. This means there will be a high chance of a large divergence from target weights; hence, the benefits of rebalancing are high and the corridor widths should be narrow.</td>
</tr>
<tr>
<td></td>
<td>Narrower</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unchanged</td>
<td></td>
</tr>
<tr>
<td>Factor 3</td>
<td>Wider</td>
<td>Higher risk tolerance means the investor will be comfortable with larger divergences in weights away from the target weights; hence, corridor widths will be wider.</td>
</tr>
<tr>
<td></td>
<td>Narrower</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unchanged</td>
<td></td>
</tr>
</tbody>
</table>
**Question:** 11  
**Topic:** Portfolio Management—Monitor/Rebalance/Execution  
**Minutes:** 16

<table>
<thead>
<tr>
<th>Factor</th>
<th>Determine the affect of increasing <em>each</em> factor used to establish corridor width for rebalancing a portfolio. (Circle one.)</th>
<th>Justify your response.</th>
</tr>
</thead>
</table>
| Factor 4 | Wider  
Narrower  
Unchanged | An increase in the volatility of domestic equity will cause an increase in the volatility of the weight of domestic equity in the portfolio. This means there will be a high chance of a large divergence from target weights; hence, the benefits of rebalancing are high and the corridor widths should be narrow. |

**Scoring Guide:**

1 point for each correct wider/narrower/unchanged selection (4 points)

1 point for each justification (4 points)