

### LEVEL III

**Question:** 1  
**Topic:** Individual PM  
**Minutes:** 20

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#### Reading References:

10. “Managing Individual Investor Portfolios,” Ch. 2, *Managing Investment Portfolios: A Dynamic Process*, 3rd edition, James W. Bronson, Matthew H. Scanlan, and Jan R. Squires (CFA Institute, 2007).

#### LOS: 2013-III-4-10-j-m

10. “Managing Individual Investor Portfolios”  
The candidate should be able to:
- a) discuss how source of wealth, measure of wealth, and stage of life affect an individual investor’s risk tolerance;
  - b) explain the role of situational and psychological profiling in understanding an individual investor;
  - c) compare the traditional finance and behavioral finance models of investor decision making;
  - d) explain the influence of investor psychology on risk tolerance and investment choices;
  - e) explain the use of a personality typing questionnaire for identifying an investor’s personality type;
  - f) compare risk attitudes and decision-making styles among distinct investor personality types, including cautious, methodical, spontaneous, and individualistic investors;
  - g) explain the potential benefits, for both clients and investment advisers, of having a formal investment policy statement;
  - h) explain the process involved in creating an investment policy statement;
  - i) distinguish between required return and desired return and explain the impact these have on the individual investor’s investment policy;
  - j) explain how to set risk and return objectives for individual investor portfolios and discuss the impact that ability and willingness to take risk have on risk tolerance;**
  - k) discuss each of the major constraint categories included in an individual investor’s investment policy statement;**
  - l) formulate and justify an investment policy statement for an individual investor;**
  - m) determine the strategic asset allocation that is most appropriate for an individual investor’s specific investment objectives and constraints;**
  - n) compare Monte Carlo and traditional deterministic approaches to retirement planning and explain the advantages of a Monte Carlo approach.

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#### Guideline Answer:

##### Part A

#### Required After-tax Rate of Return Calculation

| Cash Need Next Year                                     |         |
|---|---------|
| Total expenses last year                                | 300,000 |
| x (1 + Inflation rate)                                  | 1.025   |
| Total expenses next year                                | 307,500 |
| Less after-tax retirement income [125,000 x (1 – 0.30)] | 87,500  |
| Net cash need in coming year                            | 220,000 |

#### Investable Assets

|                              |            |
|------------------------------|------------|
| Net from Sale of Business    |            |
| Gross proceeds from sale     | 10,000,000 |
| Tax rate due on sale         | 15%        |
| Net from sale of business    | 8,500,000  |
| Current Investment Portfolio | 2,500,000  |
| Total Investable Assets      | 11,000,000 |

#### Required After-tax Rate of Return

|  |            |
|--|------------|
| Cash Need                              | 220,000    |
| Investable Assets                      | 11,000,000 |
| Real Required After-tax Rate of Return | 2.00%      |

Nominal Required After-tax Rate of Return (2.0% + Inflation of 2.5%) = 4.50%  
Or, geometric return of 4.55% ( $1.02 \times 1.025 - 1$ )

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#### ALTERNATE ANSWER

Remove the USD 250,000 cash reserve from the investable asset base, reducing the investable asset base to USD 10,750,000. This results in:

Real Required After-tax Rate of Return  $(220,000 / 10,750,000) = 2.05\%$

Nominal Required After-tax Rate of Return  $(2.05\% + \text{Inflation of } 2.5\%) = 4.55\%$

Or, geometric return of 4.60%  $(1.0205 \times 1.025 - 1)$

#### **Part B**

Factors that indicate the Voorts' ability to assume risk is above average:

- They are relatively young and have a long time horizon, so they are likely to have time to recover from any unanticipated adverse financial event.
- They have a substantial asset base relative to their spending needs.
- The couple has relatively stable spending habits and does not expect any significant cash outflows in the future.
- They own a home and have no debt, so the home could be sold or borrowed against if cash is needed.
- They are relatively young and have the ability to seek employment if necessary.

#### **Part C**

The liquidity requirement for the Voorts in the coming year has two components: net cash needs for living expenses and an emergency reserve. Their annual expenses are estimated to increase by inflation of 2.5% (USD 300,000 last year  $\times 1.025 =$  USD 307,500). Retirement income is reduced by taxes of 30% (USD 125,000  $\times (1 - 0.30) =$  USD 87,500). The net cash need for expenses is thus USD 220,000. In addition, the Voorts want to establish and maintain a cash reserve of USD 250,000. Therefore, the Voorts' total liquidity requirement for the next year is USD 470,000 (USD 220,000 + USD 250,000).

#### **Part D**

The *most* appropriate portfolio for the Voorts must meet the following requirements:

1. Real after-tax return of 3.5% or more  $((\text{pre-tax return} \times (1 - \text{tax rate})) - \text{inflation rate})$
2. Shortfall risk of no lower than -10% in any one year (equal to nominal pre-tax expected return minus two times standard deviation)

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The following analysis shows whether each portfolio meets (pass/fail) the specified return and risk requirements:

#### Portfolio X

Return Objective:

$$\text{Real after-tax return: } 9.3\% \times (1 - 30\%) - 2.5\% = 4.0\% > 3.5\%; \text{ pass}$$

Shortfall risk constraint:

$$\text{Shortfall risk: } 9.3\% - (2 \times 11.0\%) = -12.7\% < -10.0\%; \text{ fail}$$

#### Portfolio Y

Return Objective:

$$\text{Real after-tax return: } 8.4\% \times (1 - 30\%) - 2.5\% = 3.4\% < 3.5\%; \text{ fail}$$

Shortfall risk constraint:

$$\text{Shortfall risk: } 8.4\% - (2 \times 8.7\%) = -9.0\% < -10.0\%; \text{ pass}$$

#### Portfolio Z

Return Objective:

$$\text{Real after-tax return: } 8.8\% \times (1 - 30\%) - 2.5 = 3.7 > 3.5; \text{ pass}$$

Shortfall risk constraint:

$$\text{Shortfall risk: } 8.8\% - (2 \times 9.3\%) = -9.8\% > -10.0\%; \text{ pass}$$

Portfolio X does not meet the shortfall risk constraint and Portfolio Y does not meet the return objective. Portfolio Z is the only one of the three proposed portfolios that meets both the return objective and the shortfall risk constraint.

### LEVEL III

**Question:** 2  
**Topic:** Individual PM  
**Minutes:** 15

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#### Reading References:

12. “Estate Planning in a Global Context,” Stephen M. Horan, CFA, and Thomas R. Robinson, CFA (CFA Institute, 2009).

**LOS:** 2013-III-4-12-a, b, d-g

12. “Estate Planning in a Global Context”  
The candidate should be able to
- a) **discuss the purpose of estate planning and explain the basic concepts of domestic estate planning, including estates, wills and probate;**
  - b) **explain the two principal forms of wealth transfer taxes and discuss the impact of important non-tax issues, such as legal system, forced heirship, and marital property regime;**
  - c) determine a family’s core capital and excess capital, based on mortality probabilities and Monte Carlo analysis;
  - d) **evaluate the relative after-tax value of lifetime gifts and testamentary bequests;**
  - e) **explain the estate planning benefit of making lifetime gifts when gift taxes are paid by the donor, rather than the recipient;**
  - f) **evaluate the after-tax benefits of basic estate planning strategies, including generation skipping, spousal exemptions, valuation discounts, and charitable gifts;**
  - g) **explain the basic structure of a trust and discuss the differences between revocable and irrevocable trusts;**
  - h) explain how life insurance can be a tax-efficient means of wealth transfer;
  - i) discuss the two principal systems (source jurisdiction and residence jurisdiction) for establishing a country’s tax jurisdiction;
  - j) discuss the possible income and estate tax consequences of foreign situated assets and foreign-sourced income;
  - k) 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;
  - l) discuss the impact of increasing international transparency and information exchange among tax authorities on international estate planning.

### LEVEL III

**Question:** 2  
**Topic:** Individual PM  
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#### Guideline Answer:

##### Part A

Puente's total estate is USD 26 million.

His current wife is entitled to receive either:

- a minimum of 25 percent of the total estate under forced heirship:  
 $\text{USD } 26 \text{ million} \times 0.25 = \text{USD } 6.5 \text{ million}$ ; or
- 50 percent of the increase in the value of the total estate during his current marriage under community property:  
 $(\text{USD } 26 \text{ million} - \text{USD } 12 \text{ million}) \times 0.50 = \text{USD } 7.0 \text{ million}$

Therefore, the minimum amount that Puente's current wife would receive, before estate taxes are considered, if Puente were to die today, is the *greater* of her share under forced heirship or community property; that is, USD 7.0 million.

##### Part B

A trust is an arrangement created by a settlor or grantor (in this case, Puente), who transfers assets to a trustee. The trustee holds and manages the assets for the benefit of the beneficiaries (Puente's current wife and his four children - three sons from his current marriage and one daughter from his previous marriage).

A trust would provide Puente the following benefits:

- Transfer of assets to his wife and children without the potential publicity associated with probate. Puente has expressed a need for privacy.
- Protection of the assets within the trust from claims against him or his wife and children, both now and in the future. Puente wants to secure their financial future and worries about claims from outside of the family.
- Avoids disputes within the family (among his wife and four children).
- Responsible stewardship of assets while his children are minors, and afterwards if they are unable to manage the assets themselves.

### LEVEL III

**Question:** 2  
**Topic:** Individual PM  
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#### Part C

Two reasons why tax considerations favor Puente making a current gift to his daughter rather than transferring wealth to her through a bequest upon his death:

- Because his daughter's income tax rate is lower than Puente's and their pre-tax returns are assumed to be the same, the future after-tax value of any gifted amount will be greater than if this amount stayed in Puente's estate.
- Because gift taxes are paid from Puente's estate, the size of his taxable estate is reduced. Because his daughter's estate will not be taxed, this lowers the ultimate estate tax that will be paid. The present value of this tax benefit is equal to the gift tax rate, multiplied by the estate tax rate, multiplied by the size of the gift.

#### Part D

Generation-skipping is a strategy for reducing taxes by transferring assets directly to the third generation (grandchild) from the first generation (Puente).

Transferring assets to the second generation (daughter) would incur transfer taxes. A second layer of taxes would be assessed when assets are transferred from his daughter to his grandchild. The generation-skipping strategy through a direct gift to his grandchild avoids this double layer of taxation, thereby reducing overall taxes.

### LEVEL III

**Question:** 3  
**Topic:** PM - Behavioral  
**Minutes:** 16

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#### Reading References:

7. “The Behavioral Finance Perspective,” Michael M. Pompian, CFA (CFA Institute, 2011)
9. “Behavioral Finance and Investment Processes,” Michael M. Pompian, CFA, Colin McLean, and Alistair Bryne, CFA (CFA Institute, 2011)

**LOS:** 2013-III-3-7-a, d

7. “The Behavioral Finance Perspective”

The candidate should be able to:

- a. **contrast traditional and behavioral finance perspectives on investor decision making;**
- b. contrast expected utility and prospect theories of investment decision making;
- c. discuss the effects of cognitive and knowledge capacity limitations on investment decision making;
- d. **compare traditional and behavioral finance perspectives on portfolio construction and the behavior of capital markets.**

**LOS:** 2013-III-3-9-c, d

9. “Behavioral Finance and Investment Processes”

The candidate should be able to:

- a. explain the uses and limitations of classifying investors into various types;
- b. discuss how behavioral factors affect adviser-client interactions;
- c. **discuss how behavioral factors influence portfolio construction;**
- d. **explain how behavioral finance can be applied to the process of portfolio construction;**
- e. discuss how behavioral factors affect analyst forecasts and recommend remedial actions for analyst biases;
- f. discuss how behavioral factors affect investment committee decision making and recommend techniques for mitigating their effects;
- g. describe how behavioral biases of investors can lead to market anomalies and observed market characteristics.



### LEVEL III

**Question:** 3  
**Topic:** PM - Behavioral  
**Minutes:** 16

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#### **Guideline Answer:**

##### **Part A**

Siosan has a risk-seeking (convex) utility function for gains and a risk-averse (concave) utility function for losses. This is consistent with a Friedman-Savage utility function characterized by an inflection point where the function turns from concave to convex. This type of function explains why people may take low-probability, high-payoff risks (e.g., out-of-the-money options) while at the same time insuring against low-probability, low-payoff risks (e.g., earthquake insurance). The concave portion of the utility function explains purchasing low-payoff insurance against low-probability losses, while the convex portion of the function explains risk taking with options.

Traditional finance theory assumes risk aversion (concave utility function) at all levels of wealth, which would lead to rejection of all gambles having a non-positive expected return.

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**Question:** 3  
**Topic:** PM - Behavioral  
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#### Part B

#### Template for Question 3-B

| <b>Behavioral bias</b> | <b>Discuss how Siosan's behavior reflects <i>each</i> bias.</b>  | <b>Explain how a rational economic individual in traditional finance would behave differently with respect to <i>each</i> bias.</b>  |
|------------------------|--|--|
| i. self-control        | Siosan exhibits a self-control bias by spending all of her current salary income and half her bonus income on current consumption, pursuing short-term satisfaction to the detriment of long-term financial security.  | A rational economic individual uses self-control to pursue long-term goals rather than short-term satisfaction, achieving an optimal consumption plan that maximizes expected utility over his or her lifetime.  |
| ii. mental accounting  | Siosan is engaging in mental accounting by classifying her sources of wealth into three accounts: current income, currently-owned assets, and the present value of future income. Her consumption and savings decisions are based on the source of her wealth. She spends her salary and one-half of her bonus income, does not spend currently-owned assets (retirement accounts), and does not consume based on expectations of future income (her only debt is a small mortgage on her home despite expectations of high future earnings). Siosan is also engaging in mental accounting by considering her investments separately based on their purposes. Her retirement account is for long-term financial security and her options trading account is for short-term gains when they are exercised in-the-money. | A rational economic individual: <ul style="list-style-type: none"><li>• does not use mental accounts, but treats money and wealth as fungible;</li><li>• optimizes spending and investment decisions regardless of the source of wealth; and</li><li>• does not segregate investments based on their purposes, but views all assets in a portfolio context, considering correlations between assets to construct an optimal portfolio.</li></ul> |

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### Part C

Murray is correct that Siosan's retirement portfolio allocation is consistent with Behavioral Portfolio Theory (BPT) and not consistent with a mean-variance framework (MVF). A BPT investor maximizes expected wealth subject to a safety constraint. As a result, the optimal portfolio of a BPT investor is a combination of bonds or riskless assets and highly speculative assets. Siosan's portfolio is consistent with BPT and is constructed in layers, which may be the result of mental accounting.

An MVF investor constructs portfolios in a comprehensive manner. MVF portfolios are mean-variance efficient and take into account the investor's risk tolerance, investment objectives and constraints, and circumstances. Siosan's portfolio is not mean-variance efficient because it appears that no consideration has been given to the covariance of returns between different assets, and there is no evidence that Siosan has considered her risk tolerance, investment objectives and constraints, or circumstances.

## LEVEL III

**Question:** 4  
**Topic:** Equity  
**Minutes:** 17

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### Reading References:

27. “Equity Portfolio Management,” Ch. 7, *Managing Investment Portfolios: A Dynamic Process*, 3rd edition, Gary Gastineau, Andrew R. Olma, and Robert G. Zielinski (CFA Institute, 2007).
29. “International Equity Benchmarks,” Ch. 10, *Benchmarks and Investment Management*, Laurence B. Siegel (The Research Foundation of AIMR, 2003).

### LOS: 2013-III-11-27-j

27. “Equity Portfolio Management”  
The candidate should be able to:
- a) discuss the role of equities in the overall portfolio;
  - b) discuss the rationales for passive, active, and semiactive (enhanced index) equity investment approaches and distinguish among those approaches with respect to expected active return and tracking risk;
  - c) recommend an equity investment approach when given an investor’s investment policy statement and beliefs concerning market efficiency;
  - d) distinguish among the predominant weighting schemes used in the construction of major equity share indices and evaluate the biases of each;
  - e) compare alternative methods for establishing passive exposure to an equity market, including indexed separate or pooled accounts, index mutual funds, exchange-traded funds, equity index futures, and equity total return swaps;
  - f) compare full replication, stratified sampling, and optimization as approaches to constructing an indexed portfolio and recommend an approach when given a description of the investment vehicle and the index to be tracked;
  - g) explain and justify the use of equity investment–style classifications and discuss the difficulties in applying style definitions consistently;
  - h) explain the rationales and primary concerns of value investors and growth investors and discuss the key risks of each investment style;
  - i) compare techniques for identifying investment styles and characterize the style of an investor when given a description of the investor’s security selection method, details on the investor’s security holdings, or the results of a returns-based style analysis;
  - j) compare the methodologies used to construct equity style indices;**
  - k) interpret the results of an equity style box analysis and discuss the consequences of style drift;
  - l) distinguish between positive and negative screens involving socially responsible investing criteria and discuss their potential effects on a portfolio’s style characteristics;
  - m) compare long–short and long-only investment strategies, including their risks and potential alphas, and explain why greater pricing inefficiency may exist on the short side of the market;
  - n) explain how a market-neutral portfolio can be “equitized” to gain equity market exposure and compare equitized market-neutral and short-extension portfolios;

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**Question:** 4  
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- o) compare the sell disciplines of active investors;
- p) contrast derivatives-based and stock-based enhanced indexing strategies and justify enhanced indexing on the basis of risk control and the information ratio;
- q) recommend and justify, in a risk–return framework, the optimal portfolio allocations to a group of investment managers;
- r) explain the core-satellite approach to portfolio construction and discuss the advantages and disadvantages of adding a completeness fund to control overall risk exposures;
- s) distinguish among the components of total active return (“true” active return and “misfit” active return) and their associated risk measures and explain their relevance for evaluating a portfolio of managers;
- t) explain alpha and beta separation as an approach to active management and demonstrate the use of portable alpha;
- u) describe the process of identifying, selecting, and contracting with equity managers;
- v) contrast the top-down and bottom-up approaches to equity research.

**LOS:** 2013-III-12-29-b,c

29. “International Equity Benchmarks”

The candidate should be able to:

- a) discuss the need for float adjustment in the construction of international equity benchmarks;
- b) **discuss trade-offs involved in constructing international indices, including (1) breadth versus investability, (2) liquidity and crossing opportunities versus index reconstitution effects, (3) precise float adjustment versus transactions costs from rebalancing, and (4) objectivity and transparency versus judgment;**
- c) **discuss the effect that a country’s classification as either a developed or an emerging market can have on market indices and on investment in the country’s capital markets.**

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**Question:** 4  
**Topic:** Equity  
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#### Guideline Answer:

#### Part A

#### Template for Question 4-A

| <b>Index construction criterion</b>                     | <b>Determine if <i>each</i> of Kimi Capital's index construction criteria in Exhibit 1 will <i>most likely</i> result in lower, no difference in, or higher transaction costs relative to <i>each</i> of the criteria of its main competitor. (circle one)</b> | <b>Justify <i>each</i> response with <i>one</i> reason.</b>  |
|---|--|--|
| Index breadth as percent of total market capitalization | lower<br><br>no difference<br><br><u>higher</u>  | Greater index breadth would mean including less-liquid equities in the index, which would increase transaction costs.  |
| Float adjustment  | <u>lower</u><br><br>no difference<br><br>higher  | Use of float bands reduces the number of rebalancing transactions compared with single-point float adjustments, and thus lowers transaction costs.   |
| Selection of index constituents                         | <u>lower</u><br><br>no difference<br><br>higher  | Use of objective, clearly stated rules enables index funds to predict which firms will be in the benchmark, and as a result to trade more efficiently in anticipation of changes in benchmark constituents. This lowers transaction costs. |

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#### Part B

##### Badaar's Equity Market

Inclusion in the larger Developed Market Index should provide benefits to Badaar's national equity market. All else equal, it would likely promote capital inflows into Badaar's capital markets because more assets are committed internationally to developed market investments than emerging market investments. As a result, it is generally preferable for a country to have a small weighting in a developed market index rather than a large weighting in an emerging market index.

##### Index Funds Tracking the Emerging Market Index

While Badaar is a good fit for the Emerging Market Index in some ways, its total market capitalization is large compared to that of the entire Emerging Market Index. It would become 35% of the total Emerging Market Index, considerably changing the overall index and requiring significant turnover (resulting in higher transaction costs) upon its inclusion for index funds tracking the Emerging Market Index.

#### Part C

##### Aspects of Kimi Capital's Style Index Construction Likely to Increase Turnover:

- No overlap between categories – stocks are assigned to one or the other category with no overlap or splitting between categories. This tends to create more reassignments of a stock from one category to the other, which increases the number of rebalancing transactions.
- No buffering – buffering would help avoid frequent changes of classification on stocks that have some characteristics of each style.
- Exclusion of holding companies – because holding companies' classifications are more stable over time, excluding holding companies would result in higher turnover.

Note:

- The use of multiple variables to define each category is more likely to reduce turnover, as styles defined by multiple characteristics should be more stable than those defined by a single characteristic.

### LEVEL III

**Question:** 5  
**Topic:** Economics  
**Minutes:** 20

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#### Reading References:

19. "Equity Market Valuation," Peter C. Stimes, CFA and Stephen E. Wilcox, CFA (CFA Institute, 2010)
20. "Dreaming With BRICs: The Path to 2050," Dominic Wilson and Roopa Purushothaman, Global Economics Paper No. 99 (Goldman Sachs, 2003).

**LOS:** 2013-III-7-19-a,f,g

19. "Equity Market Valuation"  
The candidate should be able to:
  - a) **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;**
  - b) evaluate the relative importance of growth in total factor productivity, in capital stock, and in labor input given relevant historical data;
  - c) demonstrate the use of the Cobb-Douglas production function in obtaining a discounted dividend model estimate of the intrinsic value of an equity market;
  - d) critique the use of discounted dividend models and macroeconomic forecasts to estimate the intrinsic value of an equity market;
  - e) contrast top-down and bottom-up approaches to forecasting the earnings per share of an equity market index;
  - f) **discuss the strengths and limitations of relative valuation models;**
  - g) **judge whether an equity market is under-, fairly, or over-valued using a relative equity valuation model.**

**LOS:** 2013-III-7-20-c

20. "Dreaming With BRICs: The Path to 2050"  
Note: This reading is presented as an example of how economic analysis can serve as the basis for building an emerging markets investment strategy; the inclusion of this reading does not represent an endorsement of the authors' specific conclusions.

The candidate should be able to:

- a) compare the economic potential of emerging markets such as Brazil, Russia, India, and China (BRICs) to that of developed markets, in terms of economic size and growth, demographics and per capita income, growth in global spending, and trends in real exchange rates;
- b) explain why certain developing economies may have high returns on capital, rising productivity, and appreciating currencies;
- c) **explain the importance of technological progress, employment growth, and growth in capital stock in estimating the economic potential of an emerging market;**
- d) discuss the conditions necessary for sustained economic growth, including the core factors of macroeconomic stability, institutional efficiency, open trade, and worker education;



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- e) evaluate the investment rationale for allocating part of a well-diversified portfolio to emerging markets in countries with above average economic potential.

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#### Guideline Answers:

##### Part A

The basic form of the Cobb-Douglas production function is set forth as:

$$Y = AK^{\alpha}L^{\beta}$$

Where

Y = total real economic output

A = total factor productivity (TFP)

K = capital stock

$\alpha$  = output elasticity of capital (K)

L = labor input

$\beta$  = output elasticity of labor (L)

Under the assumption of constant returns to scale, the output elasticity of labor =  $(1 - \text{output elasticity of capital})$  or  $\beta = (1 - \alpha)$ .

An approximation of the percentage change in real economic output (GDP) is:

$$\frac{\Delta Y}{Y} \approx \frac{\Delta A}{A} + \alpha \frac{\Delta K}{K} + (1 - \alpha) \frac{\Delta L}{L}$$

Or:

Estimated percentage change in real GDP = % growth in total factor productivity  
+ (output elasticity of capital) x (% growth in capital stock)  
+ (output elasticity of labor) x (% growth in labor input)

The estimated change in real GDP is 5.9%, calculated as:

$$\frac{\Delta Y}{Y} \approx \frac{\Delta A}{A} + \alpha \frac{\Delta K}{K} + (1 - \alpha) \frac{\Delta L}{L} = 1.3\% + [0.7 \times 5.5\%] + [0.3 \times 2.5\%] = 5.9\%$$

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#### Part B

#### Template for Question 5-B

| Policy   | Determine whether <i>each</i> proposed policy will <i>most likely</i> decrease, have no effect on, or increase the long-run Cobb-Douglas growth projection for Westria. (circle one) | Justify <i>each</i> response with <i>one</i> reason.  |
|--|--|---|
| Policy 1:<br><br>Offer incentives to limit the average number of children per family.                | <div><div>decrease</div><div>no effect</div><div>increase</div></div>  | Incentives to limit the average number of children per family will most likely limit population growth, and therefore reduce the growth rate of the labor input ( $\Delta L/L$ ) in the long run. Reducing the growth rate of the labor input, holding all else constant, will decrease the long-run growth projection.   |
| Policy 2:<br><br>Increase the maximum allowable annual contribution to tax-free retirement accounts. | <div><div>decrease</div><div>no effect</div><div>increase</div></div>  | <p>Increasing the maximum allowable annual contribution to tax-free retirement accounts:</p> <ul style="list-style-type: none"><li>• will most likely increase the rate of savings and investment, and therefore increase the growth rate of the capital stock (<math>\Delta K/K</math>). Increasing the growth rate of capital stock, holding all else constant, will increase the long-run growth projection.</li><li>• could increase the total factor productivity (TFP) due to a) an improvement in the level of technology, or b) a reduction in taxes. Increasing the growth rate of TFP, holding all else constant, will increase the long-run growth projection.</li></ul> |

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#### Part C

#### Template for Question 5-C

| Model             | Determine whether Westria's stock market (using the broad equity index as a proxy) is undervalued, fairly valued, or overvalued using <i>each</i> model. (circle one) | Justify <i>each</i> response with <i>one</i> reason.  |
|-------------------|---|---|
| i. Fed model      | <div>undervalued</div> <div>fairly valued</div> <div><div>overvalued</div></div>  | <p>The Fed model hypothesizes that, in equilibrium, the yield on long-term government bonds should be equal to the forward earnings yield on a broad equity index (defined as forward operating earnings divided by index level). Differences in these yields identify an overpriced or underpriced equity market.</p> <p>Based on the data in Exhibit 2, the forward earnings yield = <math>(35.00 \times 1.07) / 800 = 4.68\%</math>. Therefore, Westria's stock market is overvalued because the forward earnings yield is lower than the 10-year government bond yield, i.e., <math>4.68\% &lt; 5.10\%</math>.</p>  |
| ii. Yardeni model | <div><div>undervalued</div></div> <div>fairly valued</div> <div>overvalued</div>  | <p>The Yardeni model is similar to the Fed model, but addresses some of the criticisms of the Fed model. The Yardeni model uses the yield on risky debt (thus incorporating a risk premium) and a projected long-term earnings growth rate to calculate a justified forward earnings yield. Differences between that yield and the forward earnings yield on a broad equity index identify an overpriced or underpriced equity market.</p> <p>Based on the data in Exhibit 2, the forward earnings yield = <math>(35.00 \times 1.07) / 800 = 4.68\%</math> and the Yardeni justified forward earnings yield = <math>[10\text{-year A-rated corporate bond yield} - (\text{Yardeni weighting factor} \times \text{Projected long-term earnings growth rate})] = [0.059 - (0.2 \times 0.07)] = 4.50\%</math>. Therefore, Westria's stock market is undervalued because the forward earnings yield is higher than the Yardeni justified forward earnings yield, i.e., <math>4.68\% &gt; 4.50\%</math>.</p> |

### LEVEL III

**Question:** 5  
**Topic:** Economics  
**Minutes:** 20

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#### Part D

- i. The Fed model uses only the yield on long-term government bonds to estimate equity valuations. Consequently, substituting the yield on BB-rated corporate bonds for A-rated corporate bonds would have no effect on the fair value estimate of Westria's stock market as implied by the Fed model.
- ii. One of the improvements of the Yardeni model over the Fed model is that it includes a risk premium by using the yield on risky debt. Therefore, substituting the yield on BB-rated corporate bonds for A-rated corporate bonds would further increase the Yardeni justified earnings yield and thus reduce the fair value estimate, making the stock market of Westria appear less undervalued, or possibly overvalued.

### LEVEL III

**Question:** 6  
**Topic:** Institutional PM  
**Minutes:** 18

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#### Reading References:

15. “Managing Institutional Investor Portfolios,” Ch. 3, *Managing Investment Portfolios: A Dynamic Process*, 3rd edition, R. Charles Tschampion, Laurence B. Siegel, Dean J. Takahashi, and John L. Maginn (CFA Institute, 2007).

#### LOS: 2013-III-5-15-j, 1

15. “Managing Institutional Investor Portfolios”  
The candidate should be able to:
- a) contrast a defined-benefit plan to a defined-contribution plan, from the perspective of the employee and employer and discuss the advantages and disadvantages of each;
  - b) discuss investment objectives and constraints for defined-benefit plans;
  - c) 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;
  - d) prepare an investment policy statement for a defined-benefit plan;
  - e) evaluate the risk management considerations in investing pension plan assets;
  - f) prepare an investment policy statement for a defined-contribution plan;
  - g) discuss hybrid pension plans (e.g., cash balance plans) and employee stock ownership plans;
  - h) distinguish among various types of foundations, with respect to their description, purpose, source of funds, and annual spending requirements;
  - i) compare the investment objectives and constraints of foundations, endowments, insurance companies, and banks;
  - j) prepare an investment policy statement for a foundation, an endowment, an insurance company, and a bank;**
  - k) contrast investment companies, commodity pools, and hedge funds to other types of institutional investors;
  - l) discuss the factors that determine investment policy for pension funds, foundations, endowments, life and nonlife insurance companies, and banks;**
  - m) compare the asset/liability management needs of pension funds, foundations, endowments, insurance companies, and banks;
  - n) compare the investment objectives and constraints of institutional investors given relevant data, such as descriptions of their financial circumstances and attitudes toward risk.

## LEVEL III

**Question:** 6  
**Topic:** Institutional PM  
**Minutes:** 18

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### Guideline Answer:

#### Part A

Factors that support Smith's conclusion that the Pearce Foundation's risk tolerance is above average:

- The Pearce Foundation has a perpetual time horizon, which allows it opportunities to make up for losses sustained by the portfolio.
- The Pearce Foundation expects to receive ongoing annual contributions.
- The Pearce Foundation does not have a contractually-defined liability stream. Its 6% annual spending requirement is not a contractual obligation.

#### Part B

The elements of the nominal return requirement from Year 2 onwards are:

- A 6% annual spending requirement.
- Cost of managing the fund is 0.40% per annum.
- An inflation rate for the college of 3.5%.

Therefore:

Nominal return requirement =  $(1 + 0.06) \times (1 + 0.004) \times (1 + 0.035) - 1 = 10.15\%$   
(multiplicative method)

OR

Nominal return requirement =  $6.0\% + 0.4\% + 3.5\% = 9.9\%$  (additive method)

OR

Nominal return requirement =  $(1 + 0.06 + 0.035) \times 1.004 - 1 = 9.94\%$  (calculation method, reflecting exact timing of cash flows)

#### Part C

At the beginning of Year 1, USD 3 million is withdrawn from the portfolio, leaving USD 97 million to be invested.

The portfolio value at the end of Year 1 is USD 105,730,000 ( $\text{USD } 97,000,000 \times 1.09$ ).

In Year 2, the Pearce Foundation's liquidity requirement equals:

- 6% spending requirement =  $\text{USD } 105,730,000 \times 0.06 = \text{USD } 6,343,800$
- Management fees =  $\text{USD } 105,730,000 \times 0.004 = \text{USD } 422,920$
- Less: USD 2,000,000 contribution received at the beginning of Year 2.

Total liquidity requirement in Year 2 is  $6,343,800 + 422,920 - 2,000,000 = \text{USD } 4,766,720$ .

### LEVEL III

**Question:** 6  
**Topic:** Institutional PM  
**Minutes:** 18

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#### Part D

##### Template for Question 6-D

| IPS component         | Determine the effect (decrease, no change, increase) of these changed circumstances on the Foundation's return objective and liquidity requirement. (circle one) | Justify <i>each</i> response with <i>one</i> reason.   |
|-----------------------|--|--|
| Return objective      | decrease<br><input checked="" type="radio"/> no change<br>increase   | The Foundation still needs to preserve the real value of its investment portfolio and meet its spending requirement. |
| Liquidity requirement | decrease<br>no change<br><input checked="" type="radio"/> increase   | The Foundation will no longer receive ongoing contributions from Pearce.   |



### LEVEL III

**Question:** 7  
**Topic:** Institutional PM  
**Minutes:** 14

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#### Reading References:

16. “Linking Pension Liabilities to Assets,” Aaron Meder and Renato Staub (UBS Global Asset Management, 2006).
17. “Allocating Shareholder Capital to Pension Plans,” Robert C. Merton, *Journal of Applied Corporate Finance* (Morgan Stanley, vol. 18, Winter 2006).

#### LOS: 2013-III-5-16-a

16. “Linking Pension Liabilities to Assets”  
The candidate should be able to:
  - a) **contrast the assumptions concerning pension liability risk in asset-only and liability-relative approaches to asset allocation;**
  - b) discuss the fundamental and economic exposures of pension liabilities and identify asset types that mimic these liability exposures;
  - c) compare pension portfolios built from a traditional asset-only perspective to portfolios designed relative to liabilities and discuss why corporations may choose not to implement fully the liability mimicking portfolio.

#### LOS: 2013-III-5-17-a-c

17. “Allocating Shareholder Capital to Pension Plans”  
The candidate should be able to:
  - a) **compare funding shortfall and asset/liability mismatch as sources of risk faced by pension plan sponsors;**
  - b) **explain how the weighted average cost of capital for a corporation can be adjusted to incorporate pension risk and discuss the potential consequences of not making this adjustment;**
  - c) **explain, in an expanded balance sheet framework, the effects of different pension asset allocations on total asset betas, the equity capital needed to maintain equity beta at a desired level, and the debt-to-equity ratio.**

## LEVEL III

**Question:** 7  
**Topic:** Institutional PM  
**Minutes:** 14

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### Guideline Answer:

#### Part A

- i. Vermillion's smaller asset/liability risk mismatch contributes to a lower shortfall risk relative to Shire, all else equal.

Vermillion's defined benefit pension plan has a fixed income allocation of 70% of plan assets while Shire has an allocation of 40%. Given that both firms match the duration of fixed income investments with the duration of pension liabilities, the firm with the highest allocation to fixed income in the defined benefit plan rather than equities (which have a higher volatility of expected returns) would have the smallest asset/liability risk mismatch.

- ii. Vermillion's lower defined benefit plan surplus as a percentage of plan assets contributes to a higher shortfall risk relative to Shire, all else equal.

Vermillion has a lower relative funding surplus of EUR 50 million (10% of total plan assets) when compared to Shire's funding surplus of EUR 30 million (15% of plan assets).

#### Part B

Structured Product X should be chosen, as it has the highest correlation (0.92) with the pension plan liabilities.

If the company were to change from an asset-only approach to a liability-relative approach, the key aspect of any suitable investment product would be its expected performance relative to that of the liabilities of the pension plan. If the returns and volatilities of investment products are similar, a higher correlation between a product's return and a company's pension liabilities implies a lower shortfall risk, and thus a higher probability of a company meeting its pension obligations.

#### Part C

Using a full economic balance sheet rather than a standard balance sheet when making capital budgeting decisions would most likely lead to a higher future firm value for Shire.

When estimating the weighted average cost of capital (WACC), the inclusion of the pension assets and liabilities in the full economic balance sheet provides a better measure of operating or project risk. For purposes of project valuation and capital budgeting, the relevant risk measure to be used in the calculation of WACC is an operating asset beta of 0.42 (under the full economic balance sheet) versus 0.71 (under the standard balance sheet). Thus, the inclusion of the pension

### LEVEL III

**Question:** 7  
**Topic:** Institutional PM  
**Minutes:** 14

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plan assets and liabilities leads to a lower estimate of WACC relative to a standard balance sheet approach.

A lower WACC in capital allocation decisions leads to a lower hurdle rate applied during project evaluation (net present value approach) and the acceptance of more projects that would increase the value of the firm.

#### Part D

While using a full economic balance sheet, shifting 20% of the pension plan's portfolio from equity into fixed income would most likely lower Shire's cost of equity capital.

When a company alters the mix of its pension assets between fixed income and equities, it changes the risk of its pension plan and the equity of the overall firm.

If Shire were to lower its pension allocation of equities from 60% to 40%, the pension asset beta would decrease from 0.60 to 0.40, causing the firm's total asset beta to decrease, and thus the beta of the firm's equity would also decrease. Investors would require a lower return on Shire's equity based on this decrease in risk.

## LEVEL III

**Question:** 8  
**Topic:** Fixed Income  
**Minutes:** 17

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### Reading References:

23. “Fixed-Income Portfolio Management-Part I,” Ch. 6, sections 1–4 (pp. 1–40) *Managing Investment Portfolios: A Dynamic Process*, 3rd edition, H. Gifford Fong and Larry D. Guin (CFA Institute, 2007).

**LOS:** 2013-III-9-23-i, j, l, m

23. “Fixed-Income Portfolio Management-Part I”

The candidate should be able to:

- a) compare, with respect to investment objectives, the use of liabilities as a benchmark and the use of a bond index as a benchmark;
- b) compare pure bond indexing, enhanced indexing, and active investing with respect to the objectives, advantages, disadvantages, and management of each;
- c) discuss the criteria for selecting a benchmark bond index and justify the selection of a specific index when given a description of an investor’s risk aversion, income needs, and liabilities;
- d) describe and evaluate techniques, such as duration matching and the use of key rate durations, by which an enhanced indexer may seek to align the risk exposures of the portfolio with those of the benchmark bond index;
- e) contrast and demonstrate the use of total return analysis and scenario analysis to assess the risk and return characteristics of a proposed trade.
- f) formulate a bond immunization strategy to ensure funding of a predetermined liability and evaluate the strategy under various interest rate scenarios;
- g) demonstrate the process of rebalancing a portfolio to re-establish a desired dollar duration;
- h) explain the importance of spread duration;
- i) **discuss the extensions that have been made to classical immunization theory, including the introduction of contingent immunization;**
- j) **explain the risks associated with managing a portfolio against a liability structure, including interest rate risk, contingent claim risk, and cap risk;**
- k) compare immunization strategies for a single liability, multiple liabilities, and general cash flows;
- l) **compare risk minimization with return maximization in immunized portfolios;**
- m) **demonstrate the use of cash flow matching to fund a fixed set of future liabilities and compare the advantages and disadvantages of cash flow matching to those of immunization strategies.**

### LEVEL III

**Question:** 8  
**Topic:** Fixed Income  
**Minutes:** 17

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#### **Guideline Answer:**

##### **Part A**

A cash flow matching strategy is unlikely to be more effective than a classical immunization strategy because of the following factors:

- The more uncertain, indeterminate, or highly variable the liability stream, the less effective cash flow matching will be compared to classical immunization. In this case, the liability portfolio is a pool of insurance claims that is subject to significant and unexpected variations in amount and timing.
- Transaction costs from forced, unanticipated trading necessary to adjust asset cash flows to match the frequently changing liability schedule would make cash flow matching less effective than classical immunization.
- Classical immunization requires less capital to fund liabilities. This is because a) a cash flow matching strategy usually requires a conservative return assumption for short-term cash balances (and such balances may at times be significant) while an immunized portfolio is essentially fully invested at the remaining horizon duration; and b) funds from a cash flow-matched portfolio must be available on or before each liability due date, which tends to reduce the assumed rate of return. A classically immunized portfolio needs to meet the target value only on the date of each liability, because funding is achieved by a rebalancing of the portfolio.

### LEVEL III

**Question:** 8  
**Topic:** Fixed Income  
**Minutes:** 17

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#### Part B

Because the manager is starting with EUR 400,000,000 and the required return is 2.75%, the required terminal value must equal  $P_1(1+s/2)^{2T}$ , where:

$P_1$  = initial portfolio value

$s$  = safety net rate of return

$T$  = years in the investment horizon

$$(400,000,000) \times (1+0.0275/2)^{(3 \times 2)} = \text{EUR } 434,155,388$$

At time 0, the portfolio can be immunized at a 3.80% rate of return, so the required initial portfolio amount is equal to the present value of the required terminal value for the indicated time horizon, discounted at the immunized rate of return:

Required initial portfolio value = (Required terminal value) /  $(1+i/2)^{2T}$  where  $i$  is the immunized rate of return

$$= 434,155,388 / (1 + 0.038/2)^{2 \times 3}$$

$$= \text{EUR } 387,793,112$$

The manager therefore has an initial safety margin of EUR 400,000,000 – EUR 387,793,112 = EUR 12,206,888.

#### Part C

Contingent immunization provides for a degree of flexibility in pursuing active management when a portfolio is in a surplus position due to the available immunized rate of return exceeding the required rate of return. Because Bergen is allocating 20% of the portfolio to corporate bonds – securities which are exposed to credit risk – a widening of credit spreads in this scenario would cause the market value of the portfolio to decline. If the drop in value were substantial enough to erase the surplus, then Bergen must immunize the portfolio immediately.

#### Part D

The portfolio's economic surplus is defined as the market value of assets less the present value of liabilities. Changes in the value of the assets and liabilities are a function of both duration and convexity. Because the duration of the assets equals the duration of the liabilities, changes in value due to duration will be equal. As a result of the yield curve shift, there is no change in economic surplus due to duration effects.

In this case, however, the convexity of the liabilities is less than the convexity of the assets. Therefore, the decline in value of the liabilities as a result of the yield curve shift will be greater than the decline in value of the assets, thus increasing economic surplus.

### LEVEL III

**Question:** 9  
**Topic:** Fixed Income  
**Minutes:** 9

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#### Reading References:

24. “Relative-Value Methodologies for Global Credit Bond Portfolio Management,” Ch. 5, Jack Malvey, *Fixed Income Readings for the Chartered Financial Analyst® Program*, 2nd edition, Frank J. Fabozzi, editor (CFA Institute, 2005).

**LOS:** 2013-III-9-24-a, d, e

24. “Relative-Value Methodologies for Global Credit Bond Portfolio Management”  
The candidate should be able to:
- a) **explain classic relative-value analysis, based on top-down and bottom-up approaches to credit bond portfolio management;**
  - b) discuss the implications of cyclical supply and demand changes in the primary corporate bond market and the impact of secular changes in the market’s dominant product structures;
  - c) explain the influence of investors’ short- and long-term liquidity needs on portfolio management decisions;
  - d) **discuss common rationales for secondary market trading;**
  - e) **discuss corporate bond portfolio strategies that are based on relative value.**

### LEVEL III

**Question:** 9  
**Topic:** Fixed Income  
**Minutes:** 9

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#### **Guideline Answer:**

##### **Part A**

The two basic approaches to global credit bond portfolio management are top-down and bottom-up. The top-down approach used by the portfolio manager makes high-level allocations among a broad range of credit opportunities by reviewing macroeconomic data and industry developments, without evaluating company-specific information.

The bottom-up approach used by the credit analysts focuses on company-specific fundamentals such as ratings, revenues, earnings, cash flows, and new product developments. The bottom-up approach searches for undervalued securities and is sector neutral.

##### **Part B**

The most significant risk associated with Trade 1 is that while spreads are tightening, long-term interest rates could increase (the yield curve could shift upwards). Thus, the price increase from spread tightening could be offset by the price decrease from the yield curve shift. This yield curve effect is magnified because the 30-year bond has a longer duration than the 3-year bond.

##### **Part C**

Trade 2 will decrease the liquidity of the portfolio because on-the-run issues (newly-issued) have greater liquidity than off-the-run issues.



## LEVEL III

**Question:** 10  
**Topic:** Risk Management  
**Minutes:** 18

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### Reading References:

34. “Risk Management,” Ch. 9, *Managing Investment Portfolios: A Dynamic Process*, 3rd edition, Don M. Chance, Kenneth Grant, and John Marsland, (CFA Institute, 2007).

**LOS:** 2013-III-14-34-b, c, e-h

34. “Risk Management”

The candidate should be able to:

- a) discuss the main features of the risk management process, risk governance, risk reduction, and an enterprise risk management system;
- b) evaluate the strengths and weaknesses of a company’s risk management process;**
- c) describe the characteristics of an effective risk management system;**
- d) evaluate a company’s or a portfolio’s exposures to financial and nonfinancial risk factors;
- e) calculate and interpret value at risk (VAR) and explain its role in measuring overall and individual position market risk;**
- f) compare the analytical (variance–covariance), historical, and Monte Carlo methods for estimating VAR and discuss the advantages and disadvantages of each;**
- g) discuss the advantages and limitations of VAR and its extensions, including cash flow at risk, earnings at risk, and tail value at risk;**
- h) compare alternative types of stress testing and discuss the advantages and disadvantages of each;**
- i) evaluate the credit risk of an investment position, including forward contract, swap, and option positions;
- j) demonstrate the use of risk budgeting, position limits, and other methods for managing market risk;
- k) demonstrate the use of exposure limits, marking to market, collateral, netting arrangements, credit standards, and credit derivatives to manage credit risk;
- l) discuss the Sharpe ratio, risk-adjusted return on capital, return over maximum drawdown, and the Sortino ratio as measures of risk-adjusted performance;
- m) demonstrate the use of VAR and stress testing in setting capital requirements.

### LEVEL III

**Question:** 10  
**Topic:** Risk Management  
**Minutes:** 18

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#### Guideline Answer:

#### Part A

#### Template for Question 10-A

| <b>Identify <i>three</i> weaknesses in Capital Cubed's enterprise risk management (ERM).</b> | <b>Describe, for <i>each</i> weakness, <i>one</i> method to improve Capital Cubed's ERM.</b>  |
|--|---|
| 1. The head trader on each team is also in charge of monitoring risk.                        | Good ERM practice requires that an individual or group that is independent of the trading function monitor and independently value the positions taken by the traders. So, in order to improve the ERM, individuals who are independent of the trading function should be responsible for risk management. This function should be removed from the head traders. |
| 2. Watson adds the three VAR estimates together to calculate Capital Cubed's VAR.            | Simply adding the three VAR estimates together overlooks any diversification effects that may be present, unless the returns of the three teams are perfectly positively correlated. So, in order to improve the ERM, Watson needs to account for the effect of the covariances of returns between the three teams when calculating Capital Cubed's VAR.          |
| 3. The manager of each back office reports jointly to his head trader and to Watson.         | Effective risk governance requires that the back office be fully independent from the front office, so as to provide a check on the accuracy of information and to prevent collusion. So, in order to improve the ERM, the managers of the three back offices should no longer report (jointly) to their head traders.  |

Note that the integration of the data warehouses is not a weakness. Effective ERM systems always feature centralized data warehouses and store all pertinent risk information in a technologically efficient manner. Further, the reporting lines of the heads of business development may or may not be ideal, but they are not an ERM issue.

## LEVEL III

**Question:** 10  
**Topic:** Risk Management  
**Minutes:** 18

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### Part B

Excerpt 1 is incorrect. The statement should be either:

There is a 1% probability that Capital 10 will lose *at least* GBP 1.2 million in a single week, or:  
There is a 99% probability that the team will lose *at most* GBP 1.2 million in a single week.

Excerpt 4 is incorrect. The statement should be:

The client should expect losses greater than GBP 0.8 million as often as 8 weeks every three years [calculated as  $0.05 \times 3 \text{ years} \times 52 \text{ weeks per year} = 7.8$ ].

Note:

- Excerpt 2 is correct. A VAR at 1% will give a higher value or “more conservative measure” than a VAR at 5% because it relates to losses than can be expected less frequently.
- Excerpt 3 is correct because the variance-covariance method of calculating VAR will *not* adequately capture Capital 30’s risk exposure. Capital 30 trades options on UK equities. Capital 30’s variance-covariance VAR assumes the distribution of returns is adequately described by the mean and variance/covariance of the assets. However, the return distributions of option portfolios are often not symmetrical. A symmetric distribution has similar upside and downside, but return distributions on call and put options are highly skewed.

### Part C

Scenario 3 – “GBP moves relative to USD by  $\pm 15\%$ ” – will most likely result in the largest loss to Capital 10.

Capital 10 does not hedge its currency exposure so an adverse move (USD weakens by 15% against GBP) would reduce GBP returns by 15%, all else equal.

Note:

- A  $\pm 10\%$  move in US equities (Scenario 1) would likely lead to at most a 10% decrease in Capital 10’s holdings (i.e., a smaller loss than if USD weakens by 15% against GBP), as large-cap equities are likely to have a beta less than or close to 1.0.
- Implied volatility *falling* by 15% (Scenario 2) would primarily concern option holders rather than long-only equity holders, and is usually associated with increases in equity values.

## LEVEL III

**Question:** 11  
**Topic:** Performance Evaluation  
**Minutes:** 16

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### Reading References:

41. “Evaluating Portfolio Performance,” Ch. 12, *Managing Investment Portfolios: A Dynamic Process*, 3rd edition, Jeffrey V. Bailey, Thomas M. Richards, and David E. Tierney (CFA Institute, 2007).

**LOS:** 2013-III-17-41-e, p-t

41. “Evaluating Portfolio Performance”

The candidate should be able to:

- a) demonstrate the importance of performance evaluation from the perspective of fund sponsors and the perspective of investment managers;
- b) explain the following components of portfolio evaluation: performance measurement, performance attribution, and performance appraisal;
- c) calculate, interpret, and contrast time-weighted and money-weighted rates of return and discuss how each is affected by cash contributions and withdrawals;
- d) identify and explain potential data quality issues as they relate to calculating rates of return;
- e) **demonstrate the decomposition of portfolio returns into components attributable to the market, to style, and to active management;**
- f) discuss the properties of a valid benchmark and explain the advantages and disadvantages of alternative types of performance benchmarks;
- g) explain the steps involved in constructing a custom security-based benchmark;
- h) discuss the validity of using manager universes as benchmarks;
- i) evaluate benchmark quality by applying tests of quality to a variety of possible benchmarks;
- j) discuss the issues that arise when assigning benchmarks to hedge funds;
- k) distinguish between macro and micro performance attribution and discuss the inputs typically required for each;
- l) demonstrate, justify, and contrast the use of macro and micro performance attribution methodologies to evaluate the drivers of investment performance;
- m) discuss the use of fundamental factor models in micro performance attribution;
- n) evaluate the effect of the external interest rate environment and the effect of active management on fixed-income portfolio returns;
- o) explain the management factors that contribute to a fixed-income portfolio’s total return and interpret the results of a fixed-income performance attribution analysis;
- p) **calculate, interpret, and contrast alternative risk-adjusted performance measures, including (in their *ex post* forms) alpha, information ratio, Treynor measure, Sharpe ratio, and  $M^2$ ;**
- q) **explain how a portfolio’s alpha and beta are incorporated into the information ratio, Treynor measure, and Sharpe ratio;**
- r) **demonstrate the use of performance quality control charts in performance appraisal;**
- s) **discuss the issues involved in manager continuation policy decisions, including the costs of hiring and firing investment managers;**
- t) **contrast Type I and Type II errors in manager continuation decisions.**

### LEVEL III

**Question:** 11  
**Topic:** Performance Evaluation  
**Minutes:** 16

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#### **Guideline Answer:**

##### **Part A**

i. Style Return = 0.0%

Style Return (S) = Benchmark Return (B) – Market Index Return (M)

For Lux, B = M because its benchmark (“broad Scandinavian equity market index”) is the same as its relevant market index (“diversified portfolio of equities across the Scandinavian region”). Therefore, Style Return =  $-6.5\% - (-6.5\%) = 0$ .

ii. Active Return = 0.8%

Active Return (A) = Portfolio Return (P) – Benchmark Return (B)

For Lux, P =  $-5.7\%$  and B =  $-6.5\%$ , so Active Return =  $-5.7\% - (-6.5\%) = 0.8\%$

##### **Part B**

i. Rigel is most appropriate for Client 1 on a risk-adjusted basis.

Total risk is most relevant for a portfolio which is not fully diversified. With all his assets invested in a stand-alone energy sector fund, Client 1 does not hold a fully diversified portfolio. Therefore, the Sharpe ratio is the most appropriate risk-adjusted performance measure for Client 1 because it compares a portfolio’s excess return to its total risk. Rigel has the highest Sharpe ratio of the three funds.

ii. Procyon is most appropriate for Client 2 on a risk-adjusted basis.

Beta risk is most relevant for a portfolio in which nonsystematic risk has been diversified away. Since Client 2 holds a well-diversified portfolio, the Treynor measure is the most appropriate risk-adjusted performance measure because it compares a portfolio’s excess return relative to its systematic risk, represented by beta. Procyon has the highest Treynor measure of the three funds.

### LEVEL III

**Question:** 11  
**Topic:** Performance Evaluation  
**Minutes:** 16

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#### Part C

#### Template for Question 11-C

**Note: Consider each criterion independently.**

| Criterion   | Determine the <i>most likely</i> effect on the risk of committing a Type I error (decrease, no effect, increase) for <i>each</i> criterion if the proposed guideline is implemented. (circle one) | Justify <i>each</i> response with <i>one</i> reason.   |
|---|---|--|
| Statistical significance for zero-value-added return outcomes | <div>decrease</div> <div>no effect</div> <div>increase</div>  | Changing the level of statistical significance from 15% to 5% reduces the probability of a zero- or negative-value-added manager being misclassified as a value-added manager (Type I error). Fewer unskilled managers will exceed the more demanding value-added threshold by chance. |
| Exceptions allowed for MCP guideline violations               | <div>decrease</div> <div>no effect</div> <div>increase</div>  | Allowing exceptions to the MCP guidelines increases the tolerance for guideline violations and therefore increases the probability of retaining underperforming managers who otherwise would have been fired; i.e., increases the risk of making a Type I error.                       |