CFA Institute
Chartered Financial Analyst® Examination

2017 Level III Morning Session

Essay Guideline Answers

LEVEL III

Question: #1
Topic: Alternative Investments
Minutes: 19

Reading References:

#24 - Alternative Investments Portfolio Management by Jot K. Yau, PhD, CFA, Thomas Schneeweis, PhD, Thomas R. Robinson, PhD, CFA, and Lisa R. Weiss, CFA.

2016 Level II - #30 – Equity – Return Concepts by Jerald E. Pinto, PhD, CFA, Elaine Henry, PhD, CFA, Thomas R. Robinson, PhD, CFA and John D. Stowe, PhD, CFA.

2016 Level II - #42 – A Primer on Commodity Investing by Frank J. Fabozzi, PhD, CPA, CFA, Roland Fuss, PhD, and Dieter G. Kaiser PhD

LOS:

#24: The candidate should be able to:

a. describe common features of alternative investments and their markets and how alternative investments may be grouped by the role they typically play in a portfolio;
b. explain and justify the major due diligence checkpoints involved in selecting active managers of alternative investments;
c. explain distinctive issues that alternative investments raise for investment advisers of private wealth clients;
d. distinguish among the principal classes of alternative investments, including real estate, private equity, commodity investments, hedge funds, managed futures, buyout funds, infrastructure funds, and distressed securities;
e. discuss the construction and interpretation of benchmarks and the problem of benchmark bias in alternative investment groups;
f. evaluate the return enhancement and/or risk diversification effects of adding an alternative investment to a reference portfolio (for example, a portfolio invested solely in common equity and bonds);
g. describe advantages and disadvantages of direct equity investments in real estate;
h. discuss the major issuers and suppliers of venture capital, the stages through which private companies pass (seed stage through exit), the characteristic sources of financing at each stage, and the purpose of such financing;
i. compare venture capital funds and buyout funds;
j. discuss the use of convertible preferred stock in direct venture capital investment;
k. explain the typical structure of a private equity fund, including the compensation to the fund's sponsor (general partner) and typical timelines;
l. discuss issues that must be addressed in formulating a private equity investment strategy;
m. compare indirect and direct commodity investment;
n. explain the three components of return for a commodity futures contract and the effect that an upward- or downward-sloping term structure of futures prices will have on roll yield;
o. describe the principal roles suggested for commodities in a portfolio and explain why some commodity classes may provide a better hedge against inflation than others;
p. identify and explain the style classification of a hedge fund, given a description of its investment strategy;
q. discuss the typical structure of a hedge fund, including the fee structure, and explain the rationale for high-water mark provisions;
r. describe the purpose and characteristics of fund-of-funds hedge funds;
s. discuss concerns involved in hedge fund performance evaluation;
t. describe trading strategies of managed futures programs and the role of managed futures in a portfolio;

u. describe strategies and risks associated with investing in distressed securities;
v. explain event risk, market liquidity risk, market risk, and "J-factor risk" in relation to investing in distressed securities.

2016 Level II – #30: The candidate should be able to:

a. distinguish among realized holding period return, expected holding period return, required return, return from convergence of price to intrinsic value, discount rate, and internal rate of return;
b. calculate and interpret an equity risk premium using historical and forward-looking estimation approaches;
c. **estimate the required return on an equity investment using the capital asset pricing model, the Fama-French model, the Pastor-Stambaugh model, macroeconomic multifactor models, and the build-up method (e.g., bond yield plus risk premium);**
d. explain beta estimation for public companies, thinly traded public companies, and nonpublic companies;
e. describe strengths and weaknesses of methods used to estimate the required return on an equity investment;
f. explain international considerations in required return estimation;
g. explain and calculate the weighted average cost of capital for a company;
h. evaluate the appropriateness of using a particular rate of return as a discount rate, given a description of the cash flow to be discounted and other relevant facts.

2016 Level II – #42: The candidate should be able to:

a. describe types of market participants in commodity futures markets;
b. explain storability and renewability in the context of commodities and determine whether a commodity is storable and/or renewable;
c. explain the convenience yield and how it relates to the stock (inventory level) of a commodity;
d. distinguish among capital assets, store-of-value assets, and consumable or transferable assets and explain implications for valuation;
e. compare ways of participating in commodity markets, including advantages and disadvantages of each;
f. explain backwardation and contango in terms of spot and futures prices;
g. describe the components of return to a commodity futures and a portfolio of commodity futures;
h. explain how the sign of the roll return depends on the term structure of futures prices;
i. compare the insurance perspective, the hedging pressure hypothesis, and the theory of storage and their implications for futures prices and expected future spot prices.

Answer Question 1-A on This Page

Calculate, for the August contract, the: (see i. and ii. below)
Show your calculations.

The return on a commodity futures contract has three components: spot return, collateral return, and roll return. The spot return is calculated as the change in the spot price of the underlying commodity over the specified time period.

Total return = Roll return + Spot return + Collateral return
= (Change in futures price – Change in spot price) + Change in spot price + Collateral return
= Change in futures price + Collateral return

i. collateral return (in USD) in February.

Collateral return is derived from the assumption that the full value of the underlying futures contract is invested to earn the risk-free interest rate. That is, an investor long a futures contract posts 100 percent margin in the form of T-bills (in such a case, the futures position is said to be fully collateralized).

Collateral return = Total return – Change in futures price
= USD 18.00 – (USD 533.50 – USD 518.50)
= USD 3.00

Roll return arises from rolling long futures positions forward through time.

ii. roll return (in USD) in February.

Roll return = Change in futures price – Change in spot price
= (USD 533.50 – USD 518.50) – USD 6.25
= USD 8.75

Answer Question 1-B on This Page

Determine the *most likely* shape of the nickel futures curve, given Brunner's proposed scenario.
(circle one)

contango flat backwardation cannot be determined

Justify your response.

(Note: Interest rates and the spot price remain unchanged.)

The shape of the futures curve cannot be determined. A decrease in convenience yield moves the curve into contango, while a decrease in cost of storage moves the curve into backwardation. Hence, the total impact of the two factors on the curve shape cannot be determined, as it depends on which of the two changes is greater in magnitude.

Under the cost-of-carry model, the futures price is defined by $F = Se^{(r+c-y)(T-t)}$ where:

- S is the current spot price.
- r is the risk-free rate.
- c is the cost of storage.
- y is the convenience yield.
- $T - t$ is the time to maturity of the contract.

Decreases in *c* and *y* have opposing effects on the futures price (*F*).

Answer Question 1-C on This Page

Change	**Determine** the *most likely* effect of *each* change on the fund's reported Sharpe ratio. (circle one)	**Justify** *each* response. (Note: Consider each change independently.)
Change 1	Decrease no change [increase]	The Sharpe Ratio is calculated as: $SR = \frac{r_p - r_f}{\sigma_p}$, where r_p is the annualized fund return, r_f is the risk-free rate and σ_p is the annualized fund standard deviation (or volatility). Commodities that trade infrequently often have stale prices which reduce the volatility of the fund, therefore increasing the Sharpe ratio. Also, the resulting illiquidity premium increases the rate of return of the fund, thus increasing the Sharpe Ratio.
Change 2	[Decrease] no change increase	The Sharpe Ratio is calculated as: $SR = \frac{r_p - r_f}{\sigma_p}$, where r_p is the annualized fund return, r_f is the risk-free rate and σ_p is the annualized fund standard deviation (or volatility). Shortening the returns' measurement interval typically results in a higher estimate of volatility of the fund, thus decreasing the Sharpe Ratio.

Answer Question 1-D on This Page

Discuss *two* weaknesses of using this benchmark to measure the performance of Matterhorn's hedge fund.

- The return database used to construct the index is self-reported because it includes only managers who elect to report their returns and holdings. The use of manager-based hedge fund indices in performance appraisal is based on the premise that the indices neutrally reflect the underlying performance of the strategy. This should be important to Matterhorn, as it is compensated based on its performance against this index. A self-reported index is not likely to neutrally reflect the underlying performance of the strategy; if anything, managers with better track records may be more likely to report their returns, which would bias index returns upward. A self-reported index may also suffer from inconsistent reporting by the component managers over time.

- Because index weights are based on each manager's assets under management, the index is value-weighted (rather than equal-weighted or some other method). Value weighting may result in a particular index taking on the return characteristics of the best-performing hedge funds in a particular time period: as top-performing funds grow from new inflows and high returns and poorly performing funds are closed, the top-performing funds represent an increasing share of the index. This could create a momentum effect in index returns, which could make the index difficult to track.

- As managers enter and exit the business over time, the composition of the index will also change. As a result, despite the fact that Matterhorn's benchmark index is constructed to avoid the issues of survivorship bias and backfill bias, the past returns of the index reflect the performance of a different set of managers from today's or tomorrow's managers. This may also be a more severe problem for value-weighted indices than for equal-weighted indices because value-weighted indices are more heavily weighted in the recent best-performing funds.

- The index is not a truly value-weighted index. The index weights are based on managers' assets under management, but are only rebalanced annually. A true value-weighted index's weights would rebalance automatically based on reported assets under management, not annually.

LEVEL III

Question: #2
Topic: Institutional PM
Minutes: 22

Reading References:

13 - Managing Institutional Investor Portfolios by R. Charles Tschampion, CFA, Laurence B. Siegel, Dean J. Takahashi, and John L. Maginn, CFA

#14 - Linking Pension Liabilities to Assets by Aaron Meder, FSA, CFA, and Renato Staub, PhD

LOS:

#13 – The candidate should be able to:

a. contrast a defined-benefit plan to a defined-contribution plan and discuss the advantages and disadvantages of each from the perspectives of the employee and the employer;
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 participant directed 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, and source of funds;
i. compare the investment objectives and constraints of foundations, endowments, insurance companies, and banks;
j. discuss the factors that determine investment policy for pension funds, foundation endowments, life and non-life insurance companies, and banks;
k. prepare an investment policy statement for a foundation, an endowment, an insurance company, and a bank;
l. contrast investment companies, commodity pools, and hedge funds to other types of institutional investors;
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.

#14 – 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.

Answer Question 2-A on This Page

	Discuss, for *each* of the following, *two* factors that indicate the Marvel plan has a: (Note: Restating case facts without additional support will not receive credit.)
i. low ability to take risk.	1. The Marvel plan is currently underfunded. (The projected benefit obligation of VCU 900 million exceeds the assets of VCU 800 million). Additionally, Marvel's objective for each annual plan contribution to be lower than that year's increase in accrued benefits will lead to further underfunding. This indicates a low ability to take risk. Although an underfunded plan may increase the plan sponsor's willingness to take risk in an attempt to make the plan fully funded, an underfunded plan has less ability to take risk because a funding shortfall already exists. Low or negative investment returns could further jeopardize coverage of plan liabilities.
	2. The plan offers an early retirement option to employees. Employees may elect to retire and begin receiving their benefits starting at age 57. This option increases the liquidity requirement and reduces the duration of plan liabilities. A shorter duration of plan liabilities implies a low ability to take risk, as less time is available for the plan to recover from any unfavorable investment results.
ii. high ability to take risk.	1. The plan has a relatively high proportion of active lives (75%, compared to 60% for the average company). A higher proportion of active lives (lower proportion of retired lives) implies a longer duration of plan liabilities and lower liquidity needs, all else equal. This, in turn, implies a high ability to take risk, as the plan has more time to recover from any unfavorable investment results.
	2. The Marvel plan's relatively low debt-to-equity ratio (30%, compared to 45% for its peers) indicates it has a high ability to take risk. The Marvel plan has an obligation to make ongoing contributions to its pension plan, particularly because it is currently underfunded. The company's above-peer financial strength improves its ability to make such contributions when needed (as an example, in the case of unfavorable investment returns in the plan portfolio).

Answer Question 2-B on This Page

Determine which scenario would *most likely* shorten the Marvel plan's time horizon.
(circle one)

1 2 [3] 4

Justify your response.

Scenario 3 would shorten the plan's time horizon. When a pension plan is open to new participants, the plan's time horizon is longer. Therefore, implementing a hiring freeze would close the plan to new participants during that time, and thus would shorten its time horizon. The benefit obligation to current participants would remain, but during the hiring freeze, there would no longer be new entrants whose effect would have been to extend the time horizon of the benefit liability farther into the future.

Scenarios 1 and 2 would have no effect on the plan's time horizon (these scenarios would, however, change the duration of the plan's liabilities). The discount rate for plan liabilities is used in calculating the plan's funded status; a decrease (increase) in this rate would increase (decrease) the plan's projected benefit obligation and would thus make it appear more (less) underfunded.

Scenario 4 would lengthen, not shorten, the plan's time horizon. Provisions for early retirement reduce the duration of plan liabilities; increasing the minimum age by three years would mean some incremental plan participants would stay active longer and not begin receiving benefit payments until an older age, which implies a longer time horizon for the plan.

Answer Question 2-C on This Page

Determine which plan *most likely* has proportionally more liability noise.
(circle one)

Marvel Grant

Justify your response.

The Grant plan has proportionally more liability noise than the Marvel plan because of the lower number of participants.

There are two components of liability noise:

- model uncertainty – the fact that the underlying probabilities are not certain; and
- plan demographic experience differing from the actuary's model, even if the underlying probabilities were certain.

If the probabilities underlying the actuary's model are certain, the main factor that drives liability noise is the number of participants. Statistical methods can be used to estimate this component of noise; the larger the plan's population, the more closely the experience will track the model. The component relating to the uncertainty of the underlying probabilities being the same for both plans has already been identified as a factor in the case. Therefore, the Grant plan has proportionally more liability noise because it has significantly fewer employees than Marvel.

Answer Question 2-D on This Page

Determine *two* additional asset classes that should be added to the Grant plan's portfolio to *best* implement the proposal.	**Describe** the specific market-related exposure of the pension liability that would be hedged by *each* additional asset class.
1. Equities	Equities should be used to hedge the future real wage growth exposure for active employees until retirement. Real wage growth is linked with economic growth through labor's share of productivity increases, and there is also a stable long-term relationship between the stock market and real GDP. Therefore, equities are a good hedge for the plan's exposure to future real wage growth.
2. Domestic real rate (inflation-indexed) bonds	Real rate (inflation-indexed) bonds or real estate should be used to hedge the future wage inflation exposure for active employees until retirement. Because there is a long-term relationship between wage inflation and general inflation, cash flows of real rate bonds will follow the variations in the estimated benefit payments attributable to future wage inflation. Therefore, real rate (inflation-indexed) bonds are a good hedge for the plan's exposure to future wage inflation. Real estate can also be used to hedge future inflation exposure because of its long-term capital appreciation potential and inflation hedging potential.

LEVEL III

Question: #3
Topic: Performance Evaluation
Minutes: 15

Reading References:

31 - Evaluating Portfolio Performance by Jeffery V. Bailey, CFA, Thomas M. Richards, CFA, and David E. Tierney

LOS:

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 performance benchmark and explain advantages and disadvantages of alternative types of 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 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 and contrast the use of macro and micro performance attribution methodologies to identify the sources of investment performance;
m. discuss the use of fundamental factor models in micro performance attribution;
n. evaluate the effects of the external interest rate environment and 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.

Answer Question 3-A on This Page

Determine which annualized return measure is higher for the period 2013−2016.
(circle one)

TWR MWR

Explain the cause of the difference between the account's TWR and MWR.

(Note: Calculations of TWR and MWR are not required.)

The MWR is higher than the TWR. Specifically, Collignon invested a large cash inflow to the account at the end of 2015, before a large positive return occurred in the account during calendar year 2016.

While not required for credit, the following provides relevant calculations. The TWR is calculated by compounding together the returns of 1 dollar of investment in the account, after deducting the cash flow occurring at year end, and annualizing the result.

$$Return = (1 + r_1)(1 + r_2)(1 + r_3)(1 + r_4) - 1$$

$$= \left(1 + \frac{100 - 90 - 5}{90}\right)\left(1 + \frac{110 - 100 - 5}{100}\right)\left(1 + \frac{230 - 110 - 120}{110}\right)\left(1 + \frac{250 - 230 - (-30)}{230}\right) - 1$$

$$= (1.056)(1.05)(1)(1.217) - 1$$

$$= 0.3494$$

The TWR is calculated by annualizing the result. $TWR = (1 + Return)^{1/4} - 1 = 7.78\%$

The MWR is calculated by finding the annual return which yields the terminal fund value. So, we solve for the variable MWR in the below equation.

$$250 = 90(1 + MWR)^4 + 5(1 + MWR)^3 + 5(1 + MWR)^2 + 120(1 + MWR)^1 - 30(1 + MWR)^0$$

We get $MWR = 10.56\%$. If we use the Modified Dietz approximation, we get $MWR = 10.21\%$.

Answer Question 3-B on This Page

Determine which return measure is *more* appropriate to use in evaluating the external advisor's investment performance.
(circle one)

TWR MWR

Justify your response.

The TWR is more appropriate than the MWR to evaluate the investment performance of the external manager, given that the external advisor does not have control over the timing and the size of the cash flows into and out of the account. Since the TWR is defined as the return of an account over a period of time of one dollar invested in the account, cash inflows and outflows do not affect it.

Answer Question 3-C on This Page

Criterion	**Determine**, for *each* criterion, the *most* appropriate performance measure from Exhibit 2.	**Explain**, for *each* of these measures, the source of the difference in performance between the two managers.
Criterion 1	Treynor measure	The Treynor measure is calculated as $T_A = \frac{R_A - r_f}{\beta_A}$. Manager 1 has achieved a higher Treynor measure than Manager 2 (16.67>14.95), for the same excess return over the risk-free rate (18.00-2.00). Therefore Manager 1's account has been exposed to a lower level of systematic risk (beta).
Criterion 2	Sharpe ratio	The Sharpe Ratio is calculated as $S_A = \frac{R_A - r_f}{\sigma_A}$. Manager 2 has a higher Sharpe Ratio than Manager 1 (1.05 > 1.02), for the same excess return. Manager 1 has taken on a larger amount of total risk as measured by units of standard deviation, given that the excess return over the risk-free rate of both managers is the same.
Criterion 3	Information ratio	The Information Ratio is calculated as $IR_A = \frac{R_A - R_B}{\sigma_{A-B}}$. Information ratio is defined as the reward per incremental unit of risk incurred by deviating from the benchmark's holdings. Manager 1 has outperformed Manager 2 based on the IR (1.38 > 0.72). This is because Manager 1's active risk (or tracking error or tracking risk) is lower than Manager 2's, as the two managers share the same benchmark and have the same rate of return.

LEVEL III

Question: #4
Topic: Individual PM
Minutes: 15

Reading References:

9 - Taxes and Private Wealth Management in a Global Context by Stephen M. Horan, PhD, CFA, CIPM, and Thomas R. Robinson, PhD, CFA

LOS:

The candidate should be able to:

a. compare basic global taxation regimes as they relate to the taxation of dividend income, interest income, realized capital gains, and unrealized capital gains;
b. determine the effects of different types of taxes and tax regimes on future wealth accumulation;
c. calculate accrual equivalent tax rates and after-tax returns;
d. explain how investment return and investment horizon affect the tax impact associated with an investment;
e. discuss the tax profiles of different types of investment accounts and explain their impact on after-tax returns and future accumulations;
f. explain how taxes affect investment risk;
g. discuss the relation between after-tax returns and different types of investor trading behavior;
h. explain the benefits of tax loss harvesting and highest-in/first-out (HIFO) tax lot accounting;
i. demonstrate how taxes and asset location relate to mean–variance optimization.

Answer Question 4-A on This Page

Calculate the accrual equivalent tax rate for the non-dividend-paying account. **Explain** the reason for the difference in future after-tax wealth between the two accounts. **Show** your calculations.

The accrual equivalent tax rate is derived from the accrual equivalent return. It is the hypothetical tax rate, $T_{AE,}$ that produces an after-tax return equivalent to the accrual equivalent return. It is found by solving for T_{AE} in the following expression:

$r(1- T_{AE}) = R_{AE}$

The accrual equivalent after tax return is the tax-free return that, if accrued annually, produces the same after-tax accumulation as the taxable portfolio, and is calculated as follows:

$FV_{cg} = PV_{cg} [(1 + r)^n (1 – t_{cg}) + t_{cg}]$

Notation used:
FV = Future value
r = Expected rate of return
n = Number of years
t = Tax rate
cg = Non-dividend paying equities

After-tax future value of non-dividend paying equities:

FV_{cg} = CLC 100,000 $[(1 + 0.08)^{10} (1 – 0.20) + 0.20]$
FV_{cg} = CLC 100,000 [(2.1589) (0.80) + (0.20)]
FV_{cg} = CLC 192,714

Accrual equivalent after-tax return (R_{AE}):

CLC 100,000 $(1 + R_{AE})^{10} = FV_{cg}$
CLC 100,000 $(1 + R_{AE})^{10}$ = CLC 192,714
R_{AE} = 6.78%

Accrual equivalent tax rate (T_{AE}):

$r (1 – T_{AE}) = R_{AE}$ where r = 8% (the expected rate of return)
$0.08 (1 – T_{AE}) = 0.0678$
T_{AE} = 15.25%

Non-dividend paying equities generate a future wealth of CLC 192,714, greater than that of dividend-paying equities, CLC 185,959. The difference is explained as follows:

- Investment returns on non-dividend paying equities are not taxed until the end of the 10 years. The value of the tax deferral or postponing taxes allows their returns to grow more rapidly (compounding at a higher rate) over time.
- Investment returns on dividend-paying equities are taxed every year during the 10 years. The impact of taxes on their returns compounds periodically, eroding value over time.

Answer Question 4-B on This Page

Demonstrate that the amount of Wald's total two-year tax liability is the same for both plans.
Show your calculations.

Plan	Tax Liability Year 1	Tax Liability Year 2	Total Tax Liability Year 1 + Year 2
Plan A	Realized gains = CLC 50,000 Realized losses = CLC 45,000 Net gain = CLC 5,000 Capital gains tax = 0.20 x CLC 5,000 = CLC 1,000	Stock Z: Current market value = CLC 250,000 (assuming expectation is correct) Cost basis = CLC 175,000 (CLC 220,000 – CLC 45,000) Net gain = CLC 75,000 Capital gains tax = 0.20 x CLC 75,000 = CLC 15,000	Wald's two-year tax liability is equal to CLC 1,000 + CLC 15,000 = CLC 16,000
Plan B	Realized gains = CLC 50,000 Capital gains tax = 0.20 x CLC 50,000 = CLC 10,000	Stock Y: Current market value = CLC 250,000 (assuming expectation is correct) Cost basis = CLC 220,000 (CLC 250,000 – CLC 220,000) Net gain = CLC 30,000 Capital gains tax = 0.20 x CLC 30,000 = CLC 6,000	Wald's two-year tax liability is equal to CLC 10,000 + CLC 6,000 = CLC 16,000

Answer Question 4-C on This Page

Explain how Plan A could increase Wald's expected after-tax account value at the end of Year 2.

A subtle advantage of tax loss harvesting is pushing a portion of the tax liability into subsequent years, even though the two-year tax liability does not change. Recognizing an already incurred loss for tax purposes saves taxes in the current year and thus increases the amount of net-of-tax money available for investment. Assuming, on average, positive portfolio returns, this larger investment will lead to a greater future wealth accumulation.

LEVEL III

Question: #5
Topic: Individual/Behavioral
Minutes: 15

Reading References:

6 - The Behavioral Biases of Individuals by Michael M. Pompian, CFA

#7 - Behavioral Finance and Investment Processes by Michael M. Pompian, CFA, Colin McLean, FSIP, and Alistair Byrne, PhD, CFA

#23 – Fixed Income and Equity Portfolio Management by Gary L. Gastineau, Andrew R. Olma, CFA and Robert G. Zielinski, CFA

LOS:

#6 – The candidate should be able to:

a. distinguish between cognitive errors and emotional biases;
b. discuss commonly recognized behavioral biases and their implications for financial decision making;
c. identify and evaluate an individual's behavioral biases;
d. evaluate how behavioral biases affect investment policy and asset allocation decisions and recommend approaches to mitigate their effects.

#7 – The candidate should be able to:

a. explain the uses and limitations of classifying investors into personality 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 characteristics that may not be explained by traditional finance.

#23 – 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 market 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;
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 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.

Answer Question 5-A on This Page

Client	**Determine**, based on their observed biases, whether *each* client will *most likely* hold or sell AERO. (circle one)	**Justify** *each* response.
i. Client 1	hold sell	Investors with a conservatism bias maintain or are slow to update prior views when presented with new information. Client 1 will most likely overweight the base information on AERO (four years of above-average earnings growth relative to the industry), which is favorable to a "hold," and underreact to the new information (two most recent quarters falling below analyst expectations), which is favorable to a "sell." Therefore, Client 1 will *most likely* hold AERO.
ii. Client 2	hold sell	Investors with a representativeness bias overweight new information based on past experiences, models or heuristics and assume small samples are representative of populations. Client 2 will most likely underweight the base information on AERO (four years of above-average earnings growth relative to the industry), which is favorable to a "hold," and overreact to the new information based on a small sample (two most recent quarters falling below analyst expectations), which is favorable to a "sell." Therefore, Client 2 will *most likely* sell AERO.

Answer Question 5-B on This Page

Determine, based on his observed bias, whether Client 3 will *most likely* continue to believe that his portfolio is invested in a value style.
(circle one)

Yes No

Justify your response.

Investors with a confirmation bias will tend to look for and notice what supports their beliefs and ignore or undervalue what contradicts their beliefs. They place greater weight on information that confirms their views. Client 3 will place the most emphasis on the dividend yield metric because it is above that of the market benchmark. It is consistent with value investing and supports Client 3's investment style. The P/E ratio and EPS growth are also above those of the benchmark, but are reflective of a growth style. Price/book (P/B) is close to the benchmark, which also does not support a value style. Therefore, Client 3 will disregard P/E, P/B, and EPS growth because they do not confirm or support his value investment style.

Answer Question 5-C on This Page

Explain how Client 4's trading behavior is consistent with his observed bias.

The regret aversion bias can initiate herding behavior in individuals. Regret aversion causes financial market participants to avoid the pain of regret resulting from a poor investment decision, whether the loss comes from an investment that goes down or a perceived loss resulting from a stock that went up that they did not own.

Client 4's trading behavior of actively buying equities as the market rises is consistent with their regret aversion bias. Regret aversion can also encourage investors to participate in a bubble, believing they are potentially missing out on profit opportunities as stocks continue to appreciate.

Answer Question 5-D on This Page

Determine, based on her observed bias, whether Client 5 is *likely* to buy equities as the market rises. (circle one)

Yes No

Justify your response.

Self-attribution is a bias in which people take credit for successes and assign responsibility for failures. Client 5 would likely buy into the market bubble because she would attribute the recent positive performance of her account to her investing ability.

The overconfidence and excessive trading that contribute to a bubble are linked to confirmation bias and self-attribution bias. In a rising market, sales of stocks from a portfolio will typically be profitable, even if winners are being sold too soon. Investors can have faulty learning models that bias their understanding of this profit to take personal credit for success.

LEVEL III

Question: #6
Topic: Individual PM
Minutes: 22

Reading References:

8 - Managing Individual Investor Portfolios by James W. Bronson, CFA, Matthew H. Scanlan, CFA, and Jan R. Squires, DBA, CFA

#24 - Alternative Investments Portfolio Management by Jot K. Yau, PhD, CFA, Thomas Schneeweis, PhD, Thomas R. Robinson, PhD, CFA, and Lisa R. Weiss, CFA

LOS:

#8: 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's attitude toward risk;
- c. explain the influence of investor psychology on risk tolerance and investment choices;
- d. explain potential benefits, for both clients and investment advisers, of having a formal investment policy statement;
- e. explain the process involved in creating an investment policy statement;
- f. distinguish between required return and desired return and explain how these affect the individual investor's investment policy;
- **g. 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;**
- **h. discuss the major constraint categories included in an individual investor's investment policy statement;**
- **i. prepare and justify an investment policy statement for an individual investor;**
- **j. determine the strategic asset allocation that is most appropriate for an individual investor's specific investment objectives and constraints;**
- k. compare Monte Carlo and traditional deterministic approaches to retirement planning and explain the advantages of a Monte Carlo approach.

#24: The candidate should be able to:

- a. describe common features of alternative investments and their markets and how alternative investments may be grouped by the role they typically play in a portfolio;
- b. explain and justify the major due diligence checkpoints involved in selecting active managers of alternative investments;
- c. explain distinctive issues that alternative investments raise for investment advisers of private wealth clients;
- **d. distinguish among the principal classes of alternative investments, including real estate, private equity, commodity investments, hedge funds, managed futures, buyout funds, infrastructure funds, and distressed securities;**
- e. discuss the construction and interpretation of benchmarks and the problem of benchmark bias in alternative investment groups;
- f. evaluate the return enhancement and/or risk diversification effects of adding an alternative investment to a reference portfolio (for example, a portfolio invested solely in common equity and bonds);

g. describe advantages and disadvantages of direct equity investments in real estate;
h. discuss the major issuers and suppliers of venture capital, the stages through which private companies pass (seed stage through exit), the characteristic sources of financing at each stage, and the purpose of such financing;
i. compare venture capital funds and buyout funds;
j. discuss the use of convertible preferred stock in direct venture capital investment;
k. explain the typical structure of a private equity fund, including the compensation to the fund's sponsor (general partner) and typical timelines;
l. discuss issues that must be addressed in formulating a private equity investment strategy;
m. compare indirect and direct commodity investment;
n. explain the three components of return for a commodity futures contract and the effect that an upward- or downward-sloping term structure of futures prices will have on roll yield;
o. describe the principal roles suggested for commodities in a portfolio and explain why some commodity classes may provide a better hedge against inflation than others;
p. identify and explain the style classification of a hedge fund, given a description of its investment strategy;
q. discuss the typical structure of a hedge fund, including the fee structure, and explain the rationale for high-water mark provisions;
r. describe the purpose and characteristics of fund-of-funds hedge funds;
s. discuss concerns involved in hedge fund performance evaluation;
t. describe trading strategies of managed futures programs and the role of managed futures in a portfolio;
u. describe strategies and risks associated with investing in distressed securities;
v. explain event risk, market liquidity risk, market risk, and "J-factor risk" in relation to investing in distressed securities.

Answer Question 6-A on This Page

Determine Patel's nominal after-tax required rate of return for the coming year. **Show** your calculations.

(Note: Assume that pension payments and ongoing expenses are end-of-year cash flows.)

Below is a summary of Patel's Year 1 cash flows and investable assets used to determine her nominal after-tax required rate of return for the coming year.

Factor	Inputs	Amount (NZD)
Inflows		
Patel's pension	375,000, no inflation adjustment, taxed at 33% (375,000 x (1-tax rate of 0.33))	251,250
Outflows		
Living expenses	400,000 last year, inflation adjusted (400,000 x 1.0125)	(405,000)
Net Savings / (Cash Need)		**(153,750)**
Investable Assets		
Investment portfolio	5,200,000	5,200,000
Performance bonus	1,100,000, taxed at 33% (1,100,000 x (1- tax rate of 0.33))	737,000
Investment in training facility	450,000 immediately	(450,000)
Total Asset Base		**5,487,000**

Return Calculation:		
Real After-Tax Req. Return	Cash Need / Total Asset Base (153,750 / 5,487,000)	2.80%
Nominal After-Tax Req. Return Arithmetic Or Geometric	 Real Return 2.80% + Inflation 1.25% (1.0280 x 1.0125) - 1	 **4.05%** **4.09%**

An explanation regarding the adjusting for inflation:

The real after-tax required return of 2.80% needs to be adjusted for 1.25% inflation, even though expenses are already adjusted for inflation in the previous "outflows" step. The purpose of the inflation adjustment in the outflows step is to forecast living expenses in the coming year, which will be NZD 405,000. The purpose of the inflation adjustment on the required return is to ensure that the investment portfolio maintains its purchasing power. In the absence of a second inflation adjustment, earning a return of 2.80% (NZD 153,750/ NZD 5,487,000) implies that the investment portfolio will still be valued at NZD 5,487,000 at the beginning of next year. However, to satisfy Patel's goal of maintaining the portfolio's purchasing power, the portfolio should earn an extra 1.25% so that the purchasing value of NZD 5,487,000 is maintained at year end. By way of example, after drawdowns, the portfolio should have a value of: NZD 5,555,587.50 = (1+1.25%) × 5,487,000 at year end.

Answer Question 6-B on This Page

Identify *three* factors that indicate Patel has a high ability to take risk.

- She has a long time horizon and has greater ability to invest across market cycles.
- She receives a pension and although it does not cover all her expenses, it serves as a cushion against a decline in portfolio value.
- Her asset base is large relative to her spending needs, net of her pension.
- Her spending need appears to be relatively stable.
- Although she does not intend to seek further employment, Patel can do so in the future, if she so chooses.
- She has no debt.

Answer Question 6-C on This Page

Formulate the constraints section of Patel's IPS for *each* of the following:

i. Time horizon

As described at this point in her life, age 35, Patel has a long-term, single-stage time horizon. She does not indicate any significant life event changes in the future, so planning is based on this single stage.

ii. Unique circumstances

Patel has a unique circumstance that acts to constrain portfolio choices. She is making a relatively large direct equity investment in real estate (sports training facility) that is outside the portfolio. Even though this holding will be maintained separately from the advisor-managed portfolio, the advisor should consider this outside investment when developing the asset allocation of the investment portfolio.

Answer Question 6-D on This Page

Determine the *most* appropriate allocation from Exhibit 1 for Patel, given her three objectives. (circle one)	**Explain** why *each* of the other two allocations is *not* appropriate. **Show** your calculations. (Note: For the two allocations *not* selected, the answer should be written in the box to the right of *each* of these allocations. For the allocation you selected, the box to the right should remain empty.)
A	Allocation A is not appropriate as it does not meet Patel's second objective. With a 16% allocation to private equity, this allocation exceeds the 10% limit on illiquid alternative assets in the portfolio.
B	Allocation B is not appropriate as it does not meet Patel's third objective. Shortfall risk is calculated as follows: Nominal pre-tax expected return – 2x nominal expected standard deviation Allocation B's shortfall risk is 9.3% – 2(10.3%) = −11.3% The negative sign indicates that the 11.3 is a loss larger than 11%, the shortfall risk to the portfolio.
C	

An explanation for determining Allocation C:

Allocation C represents the most appropriate choice for Patel, as it meets all her objectives.

Objective 1: Real after-tax required return of 4%.

For Allocation C, real after-tax required return equals (9.1% x (1-.33) – 2.0%) = 4.1%
(nominal pre-tax expected return x (1-tax rate) – inflation)

Objective 2: Alternative investment exposure, but no more than 10% in illiquid alternative assets.

Allocation C has exposure to alternative investments (5% in private equity and 12% in REITs), but illiquid assets are below the 10% maximum (only 5% in private equity and REITs are not illiquid).

Objective 3: Shortfall risk of no more than 11%.

For Allocation C, shortfall risk equals (9.1% – 2(8.9%) = –8.7%) = –8.7%
(nominal pre-tax expected return – 2x nominal expected standard deviation)
The negative sign indicates that the 8.7% is a loss less than 11%.

LEVEL III

Question: #7
Topic: Economics
Minutes: 20

Reading References:

16 - Equity Market Valuation by Peter C. Stimes, CFA, and Stephen E. Wilcox, PhD, CFA

LOS:

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.

Answer Question 7-A on This Page

Determine, using the Cobb-Douglas production function, which country will achieve a greater *increase* in real GDP growth as a result of its stimulus plan.
(circle one)

A B

Justify your response.

Country B will achieve a greater increase in real GDP growth.

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
α = output elasticity of capital (K)
L = labor input
β = output elasticity of labor (L)

Under the assumption of constant returns to scale, the output elasticity of labor equals:

(1 – output elasticity of capital) or $\beta = (1 - \alpha)$.

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

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

Or:

Estimated percentage growth 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 question focuses on estimating the increase in real GDP growth as a result of economic stimulus plans. Because the plans address changes in either TFP or growth in capital stock, the labor factor is held constant.

For Country A, growth in capital stock is expected to increase from 3.5% to 5.5% because of economic stimulus. The estimated percentage change in real GDP is thus:

= 2.0% + (1 – 0.6) x 5.5%
= 2.0% + 2.2%
= 4.2%

(continued on next page)

Country A's long-term economic forecast of GDP growth before the economic stimulus is:

= 2.0% + (1 – 0.6) x 3.5%
= 2.0% + 1.4%
= 3.4%

Thus, the increase in GDP for country A is 4.2% – 3.4% = 0.80%

For Country B, TFP is expected to increase from 1.5% to 3.0% because of economic stimulus. The estimated percentage change in real GDP is:

= 3.0% + (1 – 0.5) x 2.5%
= 3.0% + 1.25%
= 4.25%

Country B's long-term economic forecast of GDP growth before the economic stimulus is:

= 1.5% + (1 – 0.5) x 2.5%
= 1.5% + 1.25%
= 2.75%

Thus, the increase in GDP for country B is 4.25% – 2.75% = 1.50%

Answer Question 7-B on This Page

Determine whether Country Z's equity market is currently undervalued, fairly valued, or overvalued based on CAPE.
(circle one)

undervalued fairly valued overvalued

Justify your response. **Show** your calculations.

Cyclically Adjusted P/E Ratio (CAPE) is considered by many analysts to be mean-reverting, and is expressed in real terms. Consequently, if current CAPE is higher than long-term average CAPE (100 years), the market is overvalued, and vice-versa.

Current CAPE = Equity price index (real) / 10-year average earnings (real)
= 975 / 52.7
= 18.50

Long-term average CAPE = 16.90

Hence, the current CAPE of 18.50 exceeds long-term average CAPE of 16.90, indicating that Country Z's market is overvalued.

Answer Question 7-C on This Page

Event	**Determine** whether *each* event *most likely* reduces the effectiveness of CAPE in assessing the valuation of Country Z's equity market. (circle one)	**Justify** *each* response.
i. Event 1	Yes [No]	Event 1 should not impact the effectiveness of CAPE in assessing the valuation of Country Z's equity market. This event describes a normal fluctuation in the business cycle due to a recession. CAPE utilizes a 10-year average of real earnings to control for business cycle effects on earnings, so this event should not impact the effectiveness of CAPE.
ii. Event 2	[Yes] No	Event 2 will reduce the usefulness of CAPE in assessing the valuation of Country Z's equity market. This event is a structural change to accounting rules, which leads to disparate (and non-comparable) earnings calculations in the 100 year long-term average CAPE. To assess the market valuation, current CAPE is compared with long-term average CAPE. Because of the change, earnings are not comparable before and after 2005. In the case of Event 2, companies that have pension deficits or surpluses will have changes in their reported earnings. This affects the usefulness of comparing current CAPE to its long-term average.

LEVEL III

Question: #8
Topic: Asset Allocation
Minutes: 20

Reading References:

14 - Linking Pension Liabilities to Assets by Aaron Meder, FSA, CFA, and Renato Staub, PhD

LOS:

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.

17 - Asset Allocation by William F. Sharpe, Peng Chen, PhD, CFA, Jerald E. Pinto, PhD, CFA, and Dennis W. McLeavey, CFA

LOS:

The candidate should be able to:

- a. explain the function of strategic asset allocation in portfolio management and discuss its role in relation to specifying and controlling the investor's exposures to systematic risk;
- b. compare strategic and tactical asset allocation;
- c. discuss the importance of asset allocation for portfolio performance;
- **d. contrast the asset-only and asset/liability management (ALM) approaches to asset allocation and discuss the investor circumstances in which they are commonly used;**
- e. explain the advantage of dynamic over static asset allocation and discuss the trade-offs of complexity and cost;
- f. explain how loss aversion, mental accounting, and fear of regret may influence asset allocation policy;
- g. evaluate return and risk objectives in relation to strategic asset allocation;
- **h. evaluate whether an asset class or set of asset classes has been appropriately specified;**
- i. select and justify an appropriate set of asset classes for an investor;
- j. evaluate the theoretical and practical effects of including additional asset classes in an asset allocation;
- **k. demonstrate the application of mean–variance analysis to decide whether to include an additional asset class in an existing portfolio;**
- l. describe risk, cost, and opportunities associated with nondomestic equities and bonds;
- m. explain the importance of conditional return correlations in evaluating the diversification benefits of nondomestic investments;
- n. explain expected effects on share prices, expected returns, and return volatility as a segmented market becomes integrated with global markets;
- o. explain the major steps involved in establishing an appropriate asset allocation;
- **p. discuss the strengths and limitations of the following approaches to asset allocation: mean–variance, resampled efficient frontier, Black–Litterman, Monte Carlo simulation, ALM, and experience based;**
- q. discuss the structure of the minimum-variance frontier with a constraint against short sales;
- r. formulate and justify a strategic asset allocation, given an investment policy statement and capital market expectations;

s. compare the considerations that affect asset allocation for individual investors versus institutional investors and critique a proposed asset allocation in light of those considerations;
t. formulate and justify tactical asset allocation (TAA) adjustments to strategic asset class weights, given a TAA strategy and expectational data.

Answer Question 8-A on This Page

Discuss why *each* of the following approaches could be appropriate in setting RFCF's policy asset allocation:

i. AO

There are three reasons why AO could be appropriate; only one is needed for credit.

- RFCF's minimum spending rate (3% of fund value) is not liability-like because it is stated as a percentage of the fund's beginning value, so absolute spending is reduced if there is a decline in the portfolio. This contrasts with spending that is based on a fixed amount, which does not fluctuate with portfolio value.
- Roggen's desire to limit declines in portfolio value to less than 10% is not related to spending (the liability stream), but rather only to the value of the portfolio.
- AO would improve the likelihood of the foundation being able to operate in perpetuity because it typically invests more in higher-returning equities.

ii. ALM

The desire to spend at least EUR 5 million (inflation-adjusted) each year supports the use of ALM because this spending is a fixed amount. By considering this minimum spending requirement as a liability, the policy asset allocation can minimize the uncertainty related to funding this requirement. In an AO approach, this liability is ignored or assumed to be zero.

Answer Question 8-B on This Page

Discuss, with *two* reasons, why the set of six asset classes (current portfolio plus Loucks' recommendations) for the RFCF policy asset allocation are *not* appropriately specified.

There are five criteria that should be met for a set of asset classes to be appropriately specified:

- Assets within an asset class should be relatively homogeneous
- Asset classes should be mutually exclusive
- Asset classes should be diversifying
- The asset classes as a group should make up a preponderance of world investable wealth
- The asset class should have the capacity to absorb a significant fraction of the investor's portfolio without seriously affecting the portfolio's liquidity

Loucks' set of six asset classes is not appropriately specified because:

1) Adding broad EUR fixed income exposure violates the second criterion – that asset classes should be mutually exclusive. RFCF already has exposure to EUR-denominated government bonds. The broad EUR fixed income exposure contains both EUR-denominated government bonds and EUR-denominated credit bonds. This addition creates overlap between the existing asset class and the new asset class.
2) Even if all four of the recommended asset classes are added, the fourth criterion is not satisfied: the RFCF portfolio would still not have any exposure to non-EUR bonds (and potentially other asset classes).
3) Placing real estate, commodities, and private equity into a single asset class violates the first criterion: assets within an asset class should be relatively homogeneous.

Answer Question 8-C on This Page

Determine, based on mean-variance analysis, whether emerging market equities should be added to the current RFCF portfolio.
(circle one)

Yes No

Justify your response. **Show** your calculations.

Adding emerging market equities to the current RFCF portfolio would achieve a mean-variance improvement. The Sharpe ratio of the current portfolio is:

= (expected return – risk-free rate) / standard deviation
= (4.5% – 1.0%) / 6.5% = 3.5% / 6.5% = 0.538

The Sharpe ratio of the "new" asset class (emerging market equities) is:
= (expected return – risk-free rate) / standard deviation
= (7.5% – 1.0%) / 13.5% = 6.5% / 13.5% = 0.481

Although a simple comparison of the Sharpe ratios seems to imply that adding emerging market equities would reduce RFCF's Sharpe ratio, the addition of an asset class is beneficial if the new asset class' Sharpe ratio is greater than the current portfolio's Sharpe ratio multiplied by the correlation between the two:

Sharpe ratio of new asset class > Sharpe ratio of current portfolio × correlation
0.481 > 0.538 × 0.79
0.481 > 0.425

Because the Sharpe ratio of emerging market equities is greater than the product of the current portfolio's Sharpe ratio and the correlation between the two asset classes, adding emerging market equities to the policy portfolio would improve its risk-return characteristics.

Answer Question 8-D on This Page

Support, with *two* reasons, Loucks' choice of Monte Carlo simulation, rather than MVO, to determine RFCF's target asset class weights.

Loucks' use of Monte Carlo simulation for determining RFCF's target asset allocation weights is more appropriate than MVO because of the following:

- The foundation is expected to operate in perpetuity, so it has a multi-period framework. Monte Carlo simulation is able to incorporate the effect of changes to variables over time. In this case, Loucks can demonstrate how various spending policies could affect the portfolio's value and ability to grow in real terms. MVO is a single-period framework, so as an example, it cannot be used to evaluate the likelihood of the foundation dropping below the EUR 5 million (real) desired spending level in the future.
- Roggen currently rebalances the portfolio every six months. Monte Carlo analysis allows Loucks to analyze different rebalancing policies and their costs over time. In a single-period setting, such as that assumed by MVO, rebalancing is not taken into account.
- As there are cash flows out of the portfolio each year, terminal wealth (or the portfolio's value at a given point in the future) will be path-dependent. Withdrawing 3% of the portfolio's beginning balance (or EUR 5 million) during a period of low asset prices will be more harmful than if the outflow occurs during a bull market. Similarly, Monte Carlo simulation addresses the sequencing issues in looking at returns. For example, it adjusts for the potential of large losses in early years.
- Monte Carlo can incorporate statistical properties outside the normal distribution, such as skewness and excess kurtosis, in the distribution of the equity portion of RFCF's portfolio. It can also be incorporated in alternative investments (such as private equity, real estate, and commodities), which RFCF is considering adding to the portfolio.

LEVEL III

Question: #9
Topic: Fixed Income
Minutes: 21

Reading References:

20 - Fixed- Income Portfolio Management—Part I by H. Gifford Fong and Larry D. Guin, DBA, CFA

#21 – Relative- Value Methodologies for Global Credit Bond Portfolio Management by Jack Malvey, CFA

LOS:

#20 – 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. critique the use of bond market indexes as benchmarks;
e. 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;
f. contrast and demonstrate the use of total return analysis and scenario analysis to assess the risk and return characteristics of a proposed trade;
g. formulate a bond immunization strategy to ensure funding of a predetermined liability and evaluate the strategy under various interest rate scenarios;
h. demonstrate the process of rebalancing a portfolio to reestablish a desired dollar duration;
i. explain the importance of spread duration;
j. discuss the extensions that have been made to classical immunization theory, including the introduction of contingent immunization;
k. explain the risks associated with managing a portfolio against a liability structure, including interest rate risk, contingent claim risk, and cap risk;
l. compare immunization strategies for a single liability, multiple liabilities, and general cash flows;
m. compare risk minimization with return maximization in immunized portfolios;
n. 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.

#21 – 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.

Answer Question 9-A on This Page

Select the portfolio that is *most* appropriate, given the stated objective. (circle one)	**Explain** why *each* of the other two portfolios is *less* appropriate. (Note: For the two portfolios *not* selected, the answer should be written in the box to the right of *each* of these portfolios. For the portfolio you selected, the box to the right should remain empty.)
1	Portfolio 1 is less appropriate because it has higher reinvestment risk than Portfolio 2. One of the portfolio objectives is to minimize reinvestment risk and there are two ways to determine the potential portfolio with the least reinvestment risk: 1. We can compare the average coupons of the portfolios. Portfolio 2, with the lower average coupon (4.91% vs. 5.19% for Portfolio 1), will have smaller cash flows requiring reinvestment, and therefore the portfolio will have less reinvestment risk. 2. We can compare the assets used to construct the portfolio. The lower the quality of the securities considered, the higher the potential risks. Immunization assumes that there will be no defaults and that securities are responsive only to changes in overall interest rates. Corporate bonds (credit), unlike government bonds, have default risk, which makes them less suitable for use in an immunization strategy. Based on the spread duration of each of the portfolios, we can determine that Portfolio 2 (2.00) has less exposure to corporate bonds than Portfolio 1 (4.33) and will thus have less reinvestment risk.
2	
3	Portfolio 3 is less appropriate because its duration (8) does not match the duration of the liability (10). The first part of the objective, to immunize the liability, requires that the appropriate portfolio must satisfy two conditions. First, it must match the duration of the liability. Portfolios 1 and 2 both satisfy this requirement with durations of 10. Second, the initial present value of all cash flows must equal the present value of the future liability. The case states that all three portfolios satisfy this condition.

An explanation for selecting Portfolio 2:

Portfolio 2 will best achieve the objective of immunizing the liability while minimizing reinvestment risk. As noted above, the appropriate portfolio must satisfy two conditions. First, it must match the duration of the liability. Second, the initial present value of all cash flows must equal the present value of the future liability. Portfolio 2 satisfies both requirements.

The second part of the objective is to minimize reinvestment risk. As noted above, because Portfolio 2 has a lower average coupon and lower spread duration it has lower reinvestment risk.

Answer Question 9-B on This Page

Calculate the amount (in CAD) of cash required to rebalance the portfolio's dollar duration. **Show** your calculations.

1. New dollar duration = Duration × Portfolio value × 0.01

   Canadian Govt = 11.2 × 771,360 × 0.01 = 86,392
   Denton Corp = 9.4 × 855,000 × 0.01 = 80,370
   Generation Corp = 9.1 × 728,000 × 0.01 = 66,248

   New dollar duration = 86,392 + 80,370 + 66,248 = 233,010

2. Rebalancing ratio = Desired dollar duration / New dollar duration

   Rebalancing ratio = 240,000 / 233,010 = 1.03

3. Cash requirement = (Rebalancing ratio − 1) × Market value of positions

   Cash requirement = (1.03 − 1) × 2,354,360 = 70,631 (or 70,624 if no rounding in step 2)

Answer Question 9-C on This Page

Select the portfolio that will be *most* effective at immunizing Smixon's liability schedule.
(circle one)

A B C D

Justify your response.

(Note: No calculations are required.)

Portfolio B will be the most effective at immunizing liabilities, given the three conditions that must be satisfied to assure multiple liability immunization in the case of parallel rate shifts:

1. The present value of the assets equals the present value of the liabilities
2. The (composite) duration of the portfolio must equal the (composite) duration of the liabilities
3. The distribution of the durations of individual portfolio assets must have a wider range than the distributions of the liabilities.

All four alternatives satisfy condition 1, as stated in the case. Therefore, we must compare the alternatives based on conditions 2 and 3.

Portfolio B meets condition 2 because its composite duration (3.8) matches the composite duration of the liabilities (3.8), and it meets condition 3 because it has both an asset with a duration (0.91) lower than the shortest liability (1 year) and an asset with a duration (7.30) higher than the longest liability (7 years).

Portfolio C meets condition 2 but does not meet condition 3, because although it has an asset with a duration (0.85) lower than the shortest liability (1 year), it does not have an asset with a duration (6.85) higher than the longest liability (7 years).

Neither Portfolio A nor Portfolio D meet condition 2 because their composite durations are 4.0; Portfolio D does meet condition 3 but Portfolio A does not, because although it has an asset with a duration (7.90) higher than the longest liability (7 years), it does not have an asset with a duration (1.03) lower than the shortest liability (1 year).

Answer Question 9-D on This Page

Trade	**Determine**, assuming Carter's forecast is correct, whether he should execute *each* trade. (circle one)	**Justify** *each* response.
i. Trade 1	Yes No	Carter should execute Trade 1 given his market outlook. Callable bonds significantly underperform non-callable bonds when interest rates decline because of their negative convexity. Callable bonds do not fully participate in bond market rallies because of the upper bound imposed by call prices. In other words, lower rates mean that the bond is more likely to be called. Therefore, it will be profitable to swap from callable bonds into non-callable bonds when interest rates decline.
ii. Trade 2	Yes No	Carter should not execute Trade 2, given his market outlook. Because he anticipates a parallel downward shift in the yield curve, reducing duration by moving from a 5-year fixed-rate bond to a 5-year floating-rate bond is not appropriate. By investing in the lower duration 5-year floating rate bond, as interest rates declined, it would underperform the higher duration 5-year fixed rate bond.

LEVEL III

Question: #10
Topic: Risk Management
Minutes: 17

Reading References:

25 - Risk Management by Don M. Chance, PhD, CFA, Kenneth Grant, and John R. Marsland, CFA

LOS:

The candidate should be able to:

a. discuss features of the risk management process, risk governance, risk reduction, and an enterprise risk management system;
b. evaluate strengths and weaknesses of a company's risk management process;
c. describe steps in an effective enterprise 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 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 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.

31 - Evaluating Portfolio Performance by Jeffrey V. Bailey, CFA, Thomas M. Richards, CFA, and David E. Tierney.

LOS:

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 performance benchmark and explain advantages and disadvantages of alternative types of 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 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 and contrast the use of macro and micro performance attribution methodologies to identify the sources of investment performance;
m. discuss the use of fundamental factor models in micro-performance attribution;
n. evaluate the effects of the external interest rate environment and 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 M2;
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.

Answer Question 10-A on This Page

Calculate the 5% weekly VaR (in USD) for Fund X using the variance-covariance method. **Show** your calculations.

The key components to calculate a 5% weekly VaR are the weekly expected return and standard deviation of the portfolio. These can be calculated with the following formulae (or formulas):

$\mu_P = w_E \mu_E + w_B \mu_B$
Weekly expected return of the portfolio = μ_P / 52

$\sigma_P = (w_B^2 \sigma_B^2 + w_E^2 \sigma_E^2 + 2 \rho_{B,E} w_B w_E \sigma_B \sigma_E)^{0.5}$
Weekly expected standard deviation of the portfolio = $\sigma_P / \sqrt{52}$

Where:
μ_P: annual expected return of the portfolio
σ_P: annual expected standard deviation of the portfolio
w_B: target weight of bonds in the portfolio
w_E: target weight of equity in the portfolio
μ_B: annual expected return on bonds
μ_E: annual expected return on equity
σ_B: annual expected standard deviation on bonds
σ_E: annual expected standard deviation on equity
$\rho_{B,E}$: expected correlation between bond returns and equity returns

Using the information in Exhibit 1,

Weekly expected return $= (w_B \mu_B + w_E \mu_E) / 52$
$= [(0.60)(0.08) + (0.40)(0.14)] / 52$
$= (0.0480 + 0.0560) / 52$
$= 0.1040 / 52$
$= 0.0020$ (or 0.20%)

Weekly expected standard deviation $= (w_B^2 \sigma_B^2 + w_E^2 \sigma_E^2 + 2 \rho_{B,E} w_B w_E \sigma_B \sigma_E)^{0.5} / \sqrt{52}$
$= [(0.60)^2(0.10)^2 + (0.40)^2 (0.16)^2 + 2(0.50)(0.60)(0.40)(0.10)(0.16)]^{0.5} / \sqrt{52}$
$= (0.0036 + 0.004096 + 0.00384)^{0.5} / \sqrt{52}$
$= (0.011536)^{0.5} / \sqrt{52}$
$= 0.0148945$ (or 0.01489 or 1.489%)

For a standard normal distribution and a 5% probability, the z-value of 1.65.

5% weekly VaR = USD 100,000,000 [0.20% – 1.65(1.48945%)]
= USD 100,000,000 (–2.257593%)
= –USD 2,257,593 (or –USD 2.258 million)

The 5% weekly VaR is a loss of USD 2,257,593. The answers above are calculated without any rounding in the prior calculation steps.

Answer Question 10-B on This Page

Calculate the 5% monthly VaR (in USD) for Fund Y using the historical method. **Show** your calculations.

For the 10-year period, there are 120 monthly returns. Of the 120 monthly returns, the lowest 5 percent are the 6 worst returns: 5% × 120 = 6. Therefore, based on the historical method, the 5% VaR would be the 6th worst return. From the returns given, the 6th worst return is -3.2%.

Given that the portfolio size is USD 175 million,

5% monthly VaR = 3.2% × USD 175 million
= USD 5.6 million

Answer Question 10-C on This Page

Discuss *one* reason why the historical method might *not* be appropriate for Fund Y.

The primary disadvantage of the historical method is its complete reliance on the observed past return distribution, which may not be applicable to the future. Given that Aster recently reformed its corporate tax code, there is reason to believe that VaR estimates derived from the past ten years might not be relevant in the future.

Answer Question 10-D on This Page

Determine, based on Brink's beliefs and concern, which performance measure is *most* appropriate. (circle one)	**Explain**, for *each* of the two measures *not* selected, why they are *less* appropriate. (Note: For the two measures *not* selected, the answer should be written in the box to the right of *each* of these measures. For the measure you selected, the box to the right should remain empty.)
Sharpe ratio	The Sharpe ratio is less appropriate because it uses standard deviation to measure risk. Standard deviation measures volatility by using all returns both positive and negative, which does not conform to Brink's view that portfolio managers should not be penalized for volatility associated with positive performance.
information ratio	The information ratio is less appropriate because it is calculated relative to the portfolio's benchmark (active return divided by active risk). Since Brink is not concerned with the portfolio's deviations from the benchmark, the information ratio is not the appropriate risk metric. Additionally, she believes that managers should not be rewarded when their annual returns are lower than the risk free rate, yet this ratio can be positive when returns are below the risk free rate (false positive).
Sortino ratio	

An explanation for determining Sortino ratio:

The Sortino ratio is the most appropriate performance measure based on Brink's beliefs and concern. Brinks believes that portfolio managers should not be penalized for volatility associated with positive performance and should not be rewarded for returns lower than the risk-free rate as a minimum acceptable return. She is not concerned when a fund deviates from its benchmark. The Sortino ratio adopts this perspective and is calculated as the return in excess of the investor's minimum acceptable return (MAR) divided by downside deviation, with MAR as the target return.