

The Morning Session of the 2016 Level III CFA® Examination has 10 questions. For grading purposes, the maximum point value for each question is equal to the number of minutes allocated to that question.

Question	Topic	Minutes
1	Portfolio Management – Institutional	20
2	Portfolio Management – Fixed Income	22
3	Portfolio Management – Equity	19
4	Portfolio Management – Asset Allocation	13
5	Portfolio Management – Trading, Monitoring, Rebalancing	13
6	Portfolio Management – Individual	22
7	Portfolio Management – Individual	17
8	Portfolio Management – Risk Management	20
9	Portfolio Management – Economics	18
10	Portfolio Management – Individual/Behavioral	16
Total:		180

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QUESTION 1 HAS FOUR PARTS (A, B, C, D) FOR A TOTAL OF 20 MINUTES.

Sopho College is a small, private university. The university library has an endowment currently valued at USD 21,000,000. The endowment's only purpose is to fully fund the library's annual subscription expense for online academic journals. The journals are considered essential to keep Sopho competitive.

Sopho is changing the library's subscription service to a new provider. The provider offers two subscription options as shown in Exhibit 1. The administration desires the highest level subscription that the endowment can fund in perpetuity. Mark Madison, a financial advisor to the endowment's board, is analyzing the subscription options and reviewing the IPS.

Exhibit 1
Summary of Subscription Options

Option	One-time Initiation Fee (due immediately)	Annual Subscription Expense (due at year end)	Expected Increase in Annual Subscription Expense
Basic	USD 500,000	USD 800,000	Inflation plus 1%
Premium	USD 1,000,000	USD 1,000,000	Inflation plus 1%

The objective of the endowment is to fully fund the subscription costs in perpetuity and maintain the purchasing power of the investable asset base after payment of the one-time initiation fee. The endowment's risk management practices require Madison to use Monte Carlo simulations to account for return volatility in evaluating the risk of purchasing power erosion. Given capital market expectations and the endowment's asset allocation, the expected long-term total return of the endowment is 8.5% per year with an expected standard deviation of 18.0%. Annual management fees are 0.5% of the market value of the endowment's assets.

The endowment's board understands that the spending rate affects risk tolerance, and they are comfortable with an above-average risk exposure. The endowment reinvests any portfolio surplus. No donations are expected in the foreseeable future. Economy-wide inflation is forecast to be 2.0% per year.

- A. **Calculate** the return requirement to fully fund *each* subscription option. **Determine** which subscription option is *most* appropriate for the endowment, given its objective and risk management practices. **Justify** your response.

Note: Use arithmetic returns, rather than geometric returns, for the return requirement calculations.

8 minutes (Answer 1-A on page 5)

- B. **Discuss**, other than the portfolio return requirement, *one* factor that:
- i. decreases the endowment's ability to take risk.
 - ii. increases the endowment's ability to take risk.

Note: Restating case facts without additional support will not receive credit.

4 minutes (Answer 1-B on page 6)

Madison also advises the board of Prairie Foundation. The foundation funds annual research grants on a discretionary basis for the development of agricultural technologies. The foundation's return objective is to earn the highest total return consistent with its risk objective while maintaining the purchasing power of the investable asset base.

The legally required minimum spending rate for the foundation to maintain its tax-exempt status is 4.0%. The foundation's spending rate is slightly above that at 4.3%. Annual management fees are 0.2% of the market value of assets and are not included in the minimum spending rate calculation for tax purposes. The current market value of the foundation's portfolio is USD 20,000,000.

The foundation recently received a donation commitment of USD 2,000,000 for each of the next five years. Following this new development, Madison reviews the foundation's IPS.

- C. **Determine** whether the foundation's ability to take risk is lower than, the same as, or higher than that of the Sopho College library endowment. **Justify** your response with *two* reasons.

5 minutes (Answer 1-C on page 7)

Three years later, the foundation's portfolio value has decreased. At the beginning of the year, the board decides to switch from the current fixed target spending rate to a rolling three-year average spending rule, with the same spending rate of 4.3%.

- D. **Determine** whether the foundation's target spending for the coming year will be lower, the same, or higher using the new spending rule instead of the old spending rate. **Justify** your response.

3 minutes (Answer 1-D on page 8)

Answer Question **1-A** on This Page

1-A. **Calculate** the return requirement to fully fund *each* subscription option. **Determine** which subscription option is *most* appropriate for the endowment, given its objective and risk management practices. **Justify** your response.

Note: Use arithmetic returns, rather than geometric returns, for the return requirement calculations.

Answer Question **1-B** on This Page

1-B. **Discuss**, other than the portfolio return requirement, *one* factor that: (see i. and ii. below)

Note: Restating case facts without additional support will not receive credit.

i. decreases the endowment's ability to take risk.

ii. increases the endowment's ability to take risk.

Answer Question **1-C** on This Page

<p>Determine whether the foundation’s ability to take risk is lower than, the same as, or higher than that of the Sopho College library endowment. (circle one)</p>	<p>Justify your response with <i>two</i> reasons.</p>
<p>lower than</p>	<p>1.</p>
<p>the same as</p>	<p>2.</p>
<p>higher than</p>	

Answer Question **1-D** on This Page

<p>Determine whether the foundation’s target spending for the coming year will be lower, the same, or higher using the new spending rule instead of the old spending rate. (circle one)</p>	<p>Justify your response.</p>
<p>lower</p> <p>the same</p> <p>higher</p>	

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QUESTION 2 HAS FIVE PARTS (A, B, C, D, E) FOR A TOTAL OF 22 MINUTES.

William MacDougal, a portfolio manager for Ethereal Capital, manages fixed income investments for institutional clients in the country of Scorponia. He manages a portfolio that invests in both domestic government bonds and domestic corporate bonds.

MacDougal manages the portion of the portfolio invested in government bonds to match the duration of the 10-year Scorponia government bond. He is concerned about an upward shift in interest rates and is seeking ways to increase the fund's return. He assesses the effect of adding foreign sovereign debt from Tauravia and adjusting the current portfolio's duration. Bond market data and MacDougal's exchange rate forecast appear in Exhibit 1.

Exhibit 1
Bond Market Data and Exchange Rate Forecast

	Scorponia	Tauravia
Currency	SCF	TRF
1-year risk-free interest rate	1.80%	4.00%
Yield to maturity of 10-year government bond	4.30%	7.50%
Duration of 10-year government bond	7.50	8.00
Country beta		0.50
Current spot exchange rate		2.00 SCF = 1 TRF
MacDougal's forecast spot exchange rate in one year		1.97 SCF = 1 TRF

MacDougal determines that adding bonds from Tauravia to his existing government bond portfolio will increase the portfolio's yield and decrease its duration. However, he is concerned about the effect of changes in exchange rates on the returns for these bonds. He assumes the forward exchange rates of both currencies reflect interest rate parity.

- A. **Calculate** the percentage of MacDougal's domestic government portfolio that should be allocated to 10-year Tauravia government bonds to decrease the portfolio's duration to 6.00. **Show** your calculations.

4 minutes (Answer 2-A on page 12)

- B. **Calculate** the minimum change (in bps) in the yield for the Tauravia bond that would eliminate its *quarterly* yield advantage relative to the Scorponia bond. **Show** your calculations.

Note: Ignore the impact of currency movements.

4 minutes (Answer 2-B on page 13)

- C. **Determine** whether the Tauravia bonds would have a higher expected return over the coming year if the currency exposure is fully hedged or unhedged. **Justify** your response. **Show** your calculations.

Note: Assume MacDougal's spot exchange rate forecast is correct and there are no changes in the yield curves.

4 minutes (Answer 2-C on page 14)

The current credit spread of the corporate bonds in MacDougal's portfolio relative to government bonds is 100 bps. MacDougal is concerned that the credit spread could widen due to changes in overall market conditions. He investigates using either a credit spread forward or a credit spread call option to hedge against the expected spread widening. The credit spread forward's contracted spread is 100 bps and the credit spread call option has a strike spread of 100 bps.

- D. **Select**, for *each* of the following, the *most* appropriate hedging strategy (buy long or sell short) that would address MacDougal's concern using a credit spread:
- i. forward contract.
 - ii. call option contract.

Determine whether *each* strategy has a negative, zero, or positive payoff to Ethereal if the credit spread is 150 bps at expiration.

6 minutes (Answer 2-D on page 15)

Several years later, the corporate bonds in the portfolio are valued at SCF 200,000,000 and they are not leveraged. MacDougal forecasts that interest rates will decrease, and he would like to increase the duration of this portion of the portfolio. MacDougal decides to use interest rate futures to accomplish his objective and collects the information in Exhibit 2. The risk-free rate is 2.2%.

Exhibit 2
Corporate Bond Portfolio and
Interest Rate Futures Market Information

Current portfolio duration	8.00
Target portfolio duration	10.00
Duration of cheapest-to-deliver bond	7.60
Conversion factor for cheapest-to-deliver bond	0.85
Price of cheapest-to-deliver bond	SCF 103,500

- E. **Determine** whether MacDougal should buy or sell interest rate futures to achieve his duration objective. **Calculate** the number of contracts MacDougal should trade. **Show** your calculations.

4 minutes (Answer 2-E on page 16)

Answer Question **2-A** on This Page

2-A. **Calculate** the percentage of MacDougal's domestic government portfolio that should be allocated to 10-year Tauravia government bonds to decrease the portfolio's duration to 6.00. **Show** your calculations.

Answer Question **2-B** on This Page

2-B. **Calculate** the minimum change (in bps) in the yield for the Tauravia bond that would eliminate its *quarterly* yield advantage relative to the Scorponia bond. **Show** your calculations.

Note: Ignore the impact of currency movements.

Answer Question **2-C** on This Page

2-C. **Determine** whether the Tauravia bonds would have a higher expected return over the coming year if the currency exposure is fully hedged or unhedged. **Justify** your response. **Show** your calculations.

Note: Assume MacDougal's spot exchange rate forecast is correct and there are no changes in the yield curves.

Answer Question **2-D** on This Page

Hedging strategy	Select, for <i>each</i> of the following, the <i>most</i> appropriate hedging strategy (buy long or sell short) that would address MacDougal’s concern using a credit spread: (circle one)	Determine whether <i>each</i> strategy has a negative, zero, or positive payoff to Ethereum if the credit spread is 150 bps at expiration. (circle one)
i. forward contract.	<div>buy long</div> <div>sell short</div>	<div>negative</div> <div>zero</div> <div>positive</div>
ii. call option contract.	<div>buy long</div> <div>sell short</div>	<div>negative</div> <div>zero</div> <div>positive</div>

Answer Question **2-E** on This Page

<p>Determine whether MacDougal should buy or sell interest rate futures to achieve his duration objective. (circle one)</p>	<p>Calculate the number of contracts MacDougal should trade. Show your calculations.</p>
<p>buy</p> <p>sell</p>	

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QUESTION 3 HAS THREE PARTS (A, B, C) FOR A TOTAL OF 19 MINUTES.

James Nielsen is a consultant for the Laurier pension fund. Based on performance, he proposes replacing Laurier's US large-cap growth equity mandate with a pure indexing mandate with zero alpha and zero tracking risk. He reviews the pension fund's current equity allocation as shown in Exhibit 1. All expected active returns are uncorrelated.

Exhibit 1
Laurier Pension Fund Equity Allocation Details

Equity Mandate	Weight in Equity Allocation (%)	Expected Alpha (%)	Expected Active Risk (%)
US large-cap growth	55	2.5	5.0
European large-cap growth	20	2.3	4.0
Emerging market	25	3.5	8.0

- A. **Calculate** the information ratio for the total equity allocation, assuming Nielsen's proposal is adopted. **Show** your calculations.

5 minutes (Answer 3-A on page 20)

Nielsen notices an increase in realized tracking risk for the European large-cap growth mandate and is concerned that its manager may be experiencing style drift. He conducts both a returns-based and a holdings-based style analysis. The result of his returns-based analysis are shown in Exhibit 2. The regression using the four indexes produced a style fit of 96.2%. Nielsen also reviews the characteristics of the European large-cap growth mandate and its benchmark, shown in Exhibit 3.

Exhibit 2
Regression Results for the European Large-cap Growth Mandate

Index	Past Style Weights (%)	Current Style Weights (%)
European large-cap growth	85	58
European large-cap value	5	5
European small-cap growth	5	32
European small-cap value	5	5

Exhibit 3
Portfolio and Benchmark Characteristic for the European Large-cap Growth Mandate

Characteristic	Portfolio	Benchmark
P/E ratio	22.1	20.1
Dividend yield	2.2%	2.4%
Price-to-book ratio	2.9	2.8
Holdings in Each Quartile by Market Cap (%)		
Top quartile	33	45
Second quartile	34	31
Third quartile	28	22
Bottom quartile	5	2

Based on these analyses, Nielsen believes that the European large-cap growth mandate deviates from its large-cap style but not from its growth style.

B. **Support**, with *both* a returns-based reason and a holdings-based reason for *each* of the following, Nielsen's belief regarding the mandate's:

- i. large-cap style.
- ii. growth style.

8 minutes (Answer 3-B on page 21)

Nielsen wants to capture alpha by appointing a new small-cap manager. He will fund this new position by replacing an existing emerging market equity manager and implementing an equitization strategy based on the following guidelines:

- Maintain the beta exposure of the emerging market equity allocation
- Provide no additional beta exposure
- Prohibit borrowing of cash
- Limit derivatives to long-only futures

Nielsen considers adding one of the small-cap managers in Exhibit 4 as a component of his overall strategy. All of the managers have positive expected alpha but apply different investment styles. Futures on small-cap and emerging equity indexes exist in the marketplace.

Exhibit 4
Active Small-cap Equity Managers

Manager	Investment Style	Benchmark
Carina	Long only	Small-cap equity
Ara	Short extension	Small-cap equity
Octans	Market neutral	Risk-free rate

C. **Select** the manager from Exhibit 4 that is *most* appropriate as a component of Nielsen's overall strategy. **Explain** how a strategy following Nielsen's guidelines would:

- i. maintain the beta exposure of the emerging market equity allocation.
- ii. provide no additional beta exposure.

6 minutes (Answer 3-C on page 22)

Answer Question **3-A** on This Page

3-A. **Calculate** the information ratio for the total equity allocation, assuming Nielsen's proposal is adopted. **Show** your calculations.

Answer Question **3-B** on This Page

Style	Support, with <i>both</i> a returns-based reason and a holdings-based reason for <i>each</i> of the following, Nielsen’s belief regarding the mandate’s style.	
	Returns-based reason	Holdings-based reason
i. large-cap style.		
ii. growth style.		

Answer Question **3-C** on This Page

Select the manager from Exhibit 4 that is <i>most</i> appropriate as a component of Nielsen’s overall strategy. (circle one)	
Carina	Ara
Octans	
Explain how a strategy following Nielsen’s guidelines would:	
i. maintain the beta exposure of the emerging market equity allocation.	
ii. provide no additional beta exposure.	

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QUESTION 4 HAS THREE PARTS (A, B, C) FOR A TOTAL OF 13 MINUTES.

Reema Darzi is an investment advisor for institutional clients. Darzi advises the Wellcare Endowment and is asked to recommend an optimal asset allocation. The objective of the endowment is to achieve a nominal return of 8.0% per year with the lowest possible level of risk. The endowment board's risk management policies include a maximum standard deviation of 14.0% and prohibit the use of leverage. Exhibit 1 provides the results of a mean-variance optimization based on annual inflation of 1.5% and a risk-free rate of 0.5%.

Exhibit 1
Wellcare Endowment Corner Portfolios

Corner Portfolio	Expected Return (%)	Expected Standard Deviation (%)	Expected Sharpe Ratio	Asset Class Weights (%)			
				Domestic Equity	Inter-national Equity	Corporate Bonds	Government Bonds
1	9.00	18.0	0.47	100	0	0	0
2	8.90	16.2	0.52	90	10	0	0
3	8.60	13.8	0.59	75	20	5	0
4	7.65	11.2	0.64	60	15	15	10
5	7.00	10.5	0.62	50	10	25	15

- A. **Recommend** which *two* corner portfolios Darzi should use for the optimal asset allocation to achieve the endowment's return requirement. **Determine** the weights for *each* of these two corner portfolios. **Show** your calculations.

6 minutes (Answer 4-A on page 25)

Darzi advises the board to allow the use of leverage. She proposes a strategic asset allocation that combines the corner portfolio closest to the tangency portfolio in Exhibit 1 with borrowing at the risk-free rate. The endowment's annual nominal return objective remains 8.0%.

- B. **Calculate** the optimal level of leverage to achieve the endowment's return objective. **Show** your calculations.

4 minutes (Answer 4-B on page 26)

- C. **Determine** whether the unleveraged or leveraged strategic asset allocation offers lower expected volatility to achieve the endowment's return objective. **Justify** your response.

Note: No calculations are required.

3 minutes (Answer 4-C on page 27)

Answer Question **4-A** on This Page

- 4-A. **Recommend** which *two* corner portfolios Darzi should use for the optimal asset allocation to achieve the endowment's return requirement. **Determine** the weights for *each* of these two corner portfolios. **Show** your calculations.

Answer Question **4-B** on This Page

4-B. **Calculate** the optimal level of leverage to achieve the endowment's return objective. **Show** your calculations.

Answer Question **4-C** on This Page

4-C. **Determine** whether the unleveraged or leveraged strategic asset allocation offers lower expected volatility to achieve the endowment's return objective. **Justify** your response.

Note: No calculations are required.

QUESTION 5 HAS THREE PARTS (A, B, C) FOR A TOTAL OF 13 MINUTES.

Julian Cole is a portfolio manager at Synergy, a UK-based asset management firm. He manages a EUR 200 million portfolio for George Milton. Cole's proprietary research has led him to believe that the share price of Blue Creek (BLUE) will increase substantially. BLUE is currently trading at EUR 9.75 per share. Cole wants to purchase 1,000,000 shares of BLUE for Milton's portfolio as quickly as possible with minimal effect on the share price. Average daily trading volume in BLUE over the previous 10 days was 1,500,000 shares. Cole decides to use the "advertise-to-draw-liquidity" technique for this trade execution.

- A. **Explain** two disadvantages of Cole's proposed technique for the BLUE trade execution.

4 minutes (Answer 5-A on page 29)

In addition to BLUE, Cole buys 3,000 shares of Livingston Homes (LIVS) for Milton's portfolio. LIVS trades on a quote-driven dealer market and has an average daily trading volume of 25,000,000 shares. Cole's order is executed in two trades as shown in Exhibit 1. He analyzes the trading costs of the entire transaction.

Exhibit 1
LIVS Trade Data
(prices in EUR)

	Bid Price	Bid Size (shares)	Ask Price	Ask Size (shares)	Trade Price	Trade Size (shares)
First trade	21.07	3,000	21.13	2,500	21.13	2,000
Second trade	21.05	3,000	21.11	2,500	21.09	1,000

- B. **Calculate** the share-volume-weighted effective spread for the LIVS transaction. **Show** your calculations.

4 minutes (Answer 5-B on page 30)

Six months later, Cole discusses three potential portfolio rebalancing strategies with Milton: buy-and-hold, constant-mix, and constant-proportion portfolio insurance (CPPI). To manage risk, Cole rebalances Milton's portfolio by adjusting the allocation between equities and money market instruments. Milton is willing to invest a greater proportion of his wealth in risky assets as his portfolio value increases. Cole believes the recent bull market has ended and the market will be flat but oscillating. His objective is to choose the rebalancing strategy with the highest expected return that is also consistent with Milton's risk tolerance.

- C. **Determine**, given Cole's objective, the *most* appropriate rebalancing strategy for Milton. **Explain** why the two strategies *not* selected are *less* appropriate.

5 minutes (Answer 5-C on page 31)

Answer Question **5-A** on This Page

5-A. **Explain** *two* disadvantages of Cole's proposed technique for the BLUE trade execution.

Answer Question **5-B** on This Page

5-B. **Calculate** the share-volume-weighted effective spread for the LIVS transaction. **Show** your calculations.

Answer Question **5-C** on This Page

<p>Determine, given Cole’s objective, the <i>most</i> appropriate rebalancing strategy for Milton. (circle one)</p>	<p>Explain why the two strategies <i>not</i> selected are <i>less</i> appropriate.</p>
buy-and-hold	
constant-mix	
CPPI	

QUESTION 6 HAS FIVE PARTS (A, B, C, D, E) FOR A TOTAL OF 22 MINUTES.

Paul and Marta Mattison are married, both 45 years old, and own their home with no debt. The couple earns a combined after-tax salary of EUR 250,000 per year. After paying for living expenses, they save EUR 100,000 per year, which is added to their joint investment account in equal monthly installments. The account's current balance is EUR 350,000. Upon retirement, Paul will be entitled to a government-funded, after-tax pension of EUR 40,000 per year, which will be indexed to inflation.

The Mattisons meet with their financial advisor, Olivia Greer. They remind Greer that because their portfolio suffered significant losses during a previous recession, they prefer that it be allocated primarily to conservative investments. The couple expects no changes in salary, savings, or recurring living expenses for the next five years.

The Mattisons outline their financial goals over the next 15 years, at which point they both plan to retire.

Five years from now:

Purchase a second home worth approximately EUR 1,100,000 to be used for holidays. They expect to borrow 60% of the purchase price using a mortgage.

Ten years after the purchase of their second home:

Sell their first home, adding the sale proceeds to their investment account to help fund their retirement needs. Move into the second home.

Greer determines the Mattisons' risk tolerance to be average.

A. **Identify** *one* factor that:

- i. decreases the Mattisons' ability to take risk.
- ii. increases the Mattisons' ability to take risk.

4 minutes (Answer 6-A on page 34)

Five years later, the Mattisons purchase their second home for EUR 1,100,000 using a combination of cash from their investment account and a mortgage. Following the purchase, their joint investment account is valued at EUR 700,000. Their income is unchanged and sufficient to cover the monthly mortgage payments, but they can now contribute only EUR 72,000 each year to their joint investment account, in equal monthly installments.

The Mattisons plan to work another 10 years until they retire, at which point they will move into their second home. Greer revisits her prior assessment of the Mattisons' risk tolerance.

B. **Identify** *one* factor that:

- i. decreases the Mattisons' ability to take risk compared to five years ago.
- ii. increases the Mattisons' ability to take risk compared to five years ago.

4 minutes (Answer 6-B on page 35)

Greer estimates that, including the sale proceeds from their first home, the Mattisons will need EUR 3,000,000 upon retirement in 10 years to adequately supplement Paul's pension and preserve their current lifestyle. The first home's value is EUR 290,000, still with no debt, and is expected to appreciate by 3% per year. There are no capital gains taxes on home sales.

- C. **Calculate** the minimum annual after-tax return required for the Mattisons to be able to retire in 10 years, assuming Greer's assumptions are correct.

Note: Assume all cash flows occur at month-end.

7 minutes (Answer 6-C on page 36)

Greer believes that the market environment during the Mattisons' retirement years is likely to be fundamentally different than during their careers. She also believes that a capital gains tax will be enacted sometime in the next few years. Greer discusses with the Mattisons how changing their asset allocation might impact the likelihood of reaching their retirement goals. She has used a deterministic (point estimate) approach for forecasting, but considers changing to a Monte Carlo simulation approach based on the past 30 years of market data.

- D. **Discuss**, based *only* on the information provided, *one* benefit and *one* shortcoming of Greer's consideration of a Monte Carlo simulation approach.

4 minutes (Answer 6-D on page 37)

Paul Mattison's employer announces an optional conversion from the current defined benefit pension plan to a new defined contribution (DC) plan. The employer offers to fund the DC plan with an amount equal to the employee's accumulated pension benefits, plus 10% of the value of that funding as a bonus for converting. Paul accepts the conversion offer and invests the payout into a balanced portfolio.

- E. **Determine** the *most likely* effect (decrease, no change, increase) on the Mattisons' longevity risk of accepting the DC conversion offer. **Justify** your response.

3 minutes (Answer 6-E on page 38)

Answer Question **6-A** on This Page

6-A. **Identify** *one* factor that:

i. decreases the Mattisons' ability to take risk.

ii. increases the Mattisons' ability to take risk.

Answer Question **6-B** on This Page

6-B. **Identify** *one* factor that:

i. decreases the Mattisons' ability to take risk compared to five years ago.

ii. increases the Mattisons' ability to take risk compared to five years ago.

Answer Question **6-C** on This Page

6-C. **Calculate** the minimum annual after-tax return required for the Mattisons to be able to retire in 10 years, assuming Greer's assumptions are correct.

Note: Assume all cash flows occur at month-end.

Answer Question **6-D** on This Page

6-D. **Discuss**, based *only* on the information provided, *one* benefit and *one* shortcoming of Greer's consideration of a Monte Carlo simulation approach.

Answer Question **6-E** on This Page

<p>Determine the <i>most likely</i> effect (decrease, no change, increase) on the Mattisons' longevity risk of accepting the DC conversion offer. (circle one)</p>	<p>Justify your response.</p>
<p>decrease</p> <p>no change</p> <p>increase</p>	

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QUESTION 7 HAS THREE PARTS (A, B, C) FOR A TOTAL OF 17 MINUTES.

Lourdes Gonzalez, 48 years old, is a successful entrepreneur who owns a chocolate company worth USD 150,000,000. She owns 100% of its equity, representing the majority of her net worth. Gonzalez is exploring a sale of the company.

Acquisitions in Gonzalez's industry are typically priced at close to the same multiple of earnings. She is convinced that her company, despite having similar characteristics to the rest of the industry, is worth at least a 25% premium to that valuation multiple. Gonzalez searches for expert opinions that would support her opinion of the company's valuation.

- A. **Identify** the cognitive behavioral bias *most likely* exhibited by Gonzalez. **Justify** your response.

3 minutes (Answer 7-A on page 42)

One month later, Gonzalez contacts an investment banker. She wants to diversify a significant portion of her equity in the company and generate liquidity.

Even though she has a capable senior management team, Gonzalez believes that she can still add substantial value to the business for several years. As a result, she wants to achieve the following objectives in the near term:

- Keep her current management responsibilities
- Retain some upside exposure to the value of the business
- Surrender majority ownership of the company
- Avoid scrutiny from the broad investment community

Gonzalez asks the investment banker for a strategy that will achieve all of her objectives. The investment banker presents the following four potential monetization strategies:

1. Partial sale to a private equity firm through a leveraged recapitalization
2. Partial sale through an initial public offering
3. Full sale to the senior management team in a management buyout
4. Borrow through a personal line of credit secured by company shares

- B. **Select** the monetization strategy that will *most likely* achieve *all* of Gonzalez's objectives. **Identify**, for *each* strategy *not* selected, *one* objective it fails to achieve.

8 minutes (Answer 7-B on page 43)

Gonzalez personally owns several real estate holdings in another country in which the capital gains tax rate is 30%. One of these holdings is land with a current market value of USD 15,000,000. She wants to utilize its value to generate liquidity. Gonzalez considers monetizing her property through either a mortgage financing or a sale and leaseback.

The property has a cost basis for tax purposes equal to 15% of its current market value. Gonzalez can achieve a loan-to-value ratio of 75% through a mortgage financing at an 8% interest rate. Lease payments and mortgage interest are both deductible for tax purposes. Gonzalez wants to determine how much liquidity each method will generate upon closing.

C. **Calculate** the initial net proceeds (in USD) of *each* of the following methods:

- i. mortgage financing
- ii. sale and leaseback

6 minutes (Answer 7-C on page 44)

Answer Question **7-A** on This Page

7-A. **Identify** the cognitive behavioral bias *most likely* exhibited by Gonzalez. **Justify** your response.

Answer Question **7-B** on This Page

<p>Select the monetization strategy that will <i>most likely</i> achieve <i>all</i> of Gonzalez’s objectives. (circle one)</p>	<p>Identify, for <i>each</i> strategy <i>not</i> selected, <i>one</i> objective it fails to achieve.</p>
<p>1. Partial sale to a private equity firm through a leveraged recapitalization</p> <p>2. Partial sale through an initial public offering</p> <p>3. Full sale to the senior management team in a management buyout</p> <p>4. Borrow through a personal line of credit secured by company shares</p>	

Answer Question **7-C** on This Page

7-C. **Calculate** the initial net proceeds (in USD) of *each* of the following methods:

i. mortgage financing

ii. sale and leaseback

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QUESTION 8 HAS THREE PARTS (A, B, C) FOR A TOTAL OF 20 MINUTES.

Sarah Thurman is a portfolio manager at Devon Asset Management. One of Thurman's clients has a portfolio valued at USD 150,000,000 that is allocated 75% to equities and 25% to bonds. She wants to reduce the portfolio's equity allocation to 50% and raise its bond allocation to 50%. Thurman wants to simultaneously lower the modified duration of the bond portfolio from 6.05 to 5.50, but leave the beta of the equity portfolio unchanged at 1.08. She will use equity index and bond futures to achieve these objectives. Exhibit 1 provides information on the relevant futures contracts. The risk-free rate is 2.15%.

Exhibit 1
Futures Contracts Information

Beta of equity index futures contract	0.95
Price of equity index futures contract	USD 125,000
Modified duration of bond futures contract	7.50
Price of bond futures contract	USD 105,000

Note: Yield beta of the bond futures contract is 1.00.

- A. **Determine**, to achieve Thurman's desired asset allocation and bond portfolio modified duration, the number of:
- i. equity index futures contracts she should sell.
 - ii. bond futures contracts she should buy.

Show your calculations.

9 minutes (Answer 8-Ai on page 48 and 8-Aii on page 49)

Devon's derivatives trading desk uses delta hedging to manage the risk of the firm's option positions. Devon is currently short the equity index call options shown in Exhibit 2. These three options have the same expiration date, the same underlying index, and no material difference in implied volatility.

Exhibit 2
Devon's Short Options Positions

Call ID	Exercise Price
C (120)	USD 120
C (135)	USD 135
C (148)	USD 148

One week before the options' expiration date, the index is at 133.

- B. **Determine**, one week before expiration, which option's delta hedge is the *most* difficult to maintain. **Justify** your response.

3 minutes (Answer 8-B on page 50)

One of Devon's clients is planning to acquire a competing firm in 109 days. The acquisition will initially be financed by a USD 80,000,000 bridge loan with a term of 180 days and a rate of 180-day Libor plus 300 bps. Principal and interest will be paid at the end of the loan term. The client is concerned about a potential increase in interest rates before the initiation of the loan, and asks for advice on fully hedging this interest rate risk.

A derivatives analyst at Devon advises the client to buy an interest rate call option on 180-day Libor with an exercise rate of 2.0% for a premium of USD 86,000. The call expires in 109 days and any payoff occurs at the end of the loan term. Current 180-day Libor is 2.2%. The client can finance the call option premium at current 180-day Libor plus 300 bps.

At initiation of the loan 109 days later, 180-day Libor is 3.5%.

C. **Calculate** the effective annual rate (in bps) on the loan. **Show** your calculations.

8 minutes (Answer 8-C on page 51)

Answer Question **8-Ai** on This Page

8-A. **Determine**, to achieve Thurman's desired asset allocation and bond portfolio modified duration, the number of:

- i. equity index futures contracts she should sell. **Show** your calculations.

Answer Question **8-Aii** on This Page

8-A. **Determine**, to achieve Thurman's desired asset allocation and bond portfolio modified duration, the number of:

- ii. bond futures contracts she should buy. **Show** your calculations.

Answer Question **8-B** on This Page

8-B. **Determine**, one week before expiration, which option's delta hedge is the *most* difficult to maintain. **Justify** your response.

Answer Question **8-C** on This Page

8-C. **Calculate** the effective annual rate (in bps) on the loan. **Show** your calculations.

QUESTION 9 HAS FOUR PARTS (A, B, C, D) FOR A TOTAL OF 18 MINUTES.

Gopal Chadhuri is Chief Market Strategist at Cambro Partners, an asset management firm. Chadhuri constructs an intermediate-term GDP forecast for the developed country of Northland by aggregating the forecasts of its GDP components. He uses the following components: potential labor force size, actual labor force participation rate, capital inputs, and total factor productivity.

After making these forecasts, Chadhuri learns about the following reforms by Northland's government.

Reform 1: Pension reform which will increase the maximum tax-deductible amount for employee contributions to retirement plans.

Reform 2: A new labor policy for large firms, requiring them to provide mandatory paid childcare leave for all employees.

A. **Determine** the *most likely* effect (decrease or increase) of:

- i. Reform 1 on growth from capital inputs.
- ii. Reform 2 on growth in the actual labor force participation rate.

Justify *each* response.

Note: Consider *each* reform independently.

6 minutes (Answer 9-A on page 54)

Chadhuri also prepares economic forecasts for the developed country of Indusi. Haigang Yang, a portfolio manager at Cambro, considers Chadhuri's forecasts when determining the tactical asset allocation of Cambro's Balanced Fund, which invests solely in Indusi's equity and government bond markets. The fund's benchmark is 50% equity and 50% government bonds, but Yang has discretion to tactically adjust allocations.

The fund's current allocation is neutral to the benchmark, but Chadhuri is concerned about the emergence of an output gap and its potential effect on consumer spending. Last year, inflation was 0.75%. The consensus forecast is for the inflation rate to decline slightly to 0.65%. However, Chadhuri's own forecast is for the inflation rate to decline to 0.25%. Chadhuri's other forecasts are shown in Exhibit 1.

Exhibit 1
One-year Economic Growth Forecasts for Indusi

Economic Variable	Consensus Forecast (%)	Chadhuri's Forecast (%)
Real GDP	+0.55	−0.15
Consumer spending	+0.60	+0.60
Business spending	+0.45	+0.20

- B. **Support**, with *two* reasons based on Chadhuri's forecasts, his concern that an output gap is emerging.

4 minutes (Answer 9-B on page 55)

- C. **Explain** how Chadhuri's forecasts are consistent with the permanent income hypothesis.

3 minutes (Answer 9-C on page 56)

- D. **Determine**, based on Chadhuri's forecasts, whether Yang should decrease, not change, or increase the Balanced Fund's tactical allocation to government bonds. **Justify** your response with *two* reasons.

5 minutes (Answer 9-D on page 57)

Answer Question **9-A** on This Page

Note: Consider *each* reform independently.

Reform/Component	Determine the <i>most likely</i> effect (decrease or increase) of: (circle one)	Justify <i>each</i> response.
i. Reform 1 on growth from capital inputs.	<div>decrease</div> <div>increase</div>	
ii. Reform 2 on growth in the actual labor force participation rate.	<div>decrease</div> <div>increase</div>	

Answer Question **9-B** on This Page

9-B. **Support**, with *two* reasons based on Chadhuri’s forecasts, his concern that an output gap is emerging.

Answer Question **9-C** on This Page

9-C. **Explain** how Chadhuri's forecasts are consistent with the permanent income hypothesis.

Answer Question **9-D** on This Page

<p>Determine, based on Chadhuri’s forecasts, whether Yang should decrease, not change, or increase the Balanced Fund’s tactical allocation to government bonds. (circle one)</p>	<p>Justify your response with <i>two</i> reasons.</p>
<p>decrease</p>	<p>1.</p>
<p>not change</p>	<p>2.</p>
<p>increase</p>	

QUESTION 10 HAS THREE PARTS (A, B, C) FOR A TOTAL OF 16 MINUTES.

Claudia Corbett, 50 years old, recently reallocated her portfolio. The portfolio was previously allocated 90% to equity mutual funds and 10% to bond mutual funds. After reading that her percentage allocation to fixed income should equal her age, she changed to a 50% equity and 50% fixed-income allocation.

Corbett's portfolio has always been invested entirely in Van Gogh mutual funds, a well-known family of funds with below-average fees covering a large number of market segments. She briefly considered switching to other investment companies, but decided to continue to use Van Gogh's mutual funds because they met her basic requirements of convenience, good reputation, and fund variety.

A. **Explain** why *each* of the following is consistent with bounded rationality:

- i. Corbett's new asset allocation
- ii. Corbett's choice of mutual fund company

6 minutes (Answer 10-A on page 59)

Corbett hires Jeremy Jung, a fee-only financial advisor, to review her investment portfolio. Jung administers a risk tolerance questionnaire to Corbett and discusses her financial goals and constraints. Based on the interview, he concludes that one behavioral bias exhibited by Corbett is availability.

Jung uses a proprietary model to generate a proposed diversified portfolio of mutual funds that has the highest expected Sharpe ratio. His analysis suggests that Corbett switch from Van Gogh Funds to mutual funds sponsored by Infinity Funds, a highly regarded but less well-known investment company than Van Gogh.

B. **Determine**, assuming Jung's bias conclusion is correct, whether Corbett would *most likely* remain with Van Gogh or switch to Infinity. **Justify** your response with *two* reasons.

5 minutes (Answer 10-B on page 60)

After further assessment, Jung concludes that Corbett's dominant behavioral biases are loss aversion bias and overconfidence bias. In addition, he determines she has a low probability of outliving her assets due to her significant wealth and modest lifestyle.

C. **Recommend**, assuming Jung's bias conclusion is correct, whether he should moderate or adapt to Corbett's behavioral biases. **Justify** your recommendation with *two* reasons.

5 minutes (Answer 10-C on page 61)

Answer Question **10-A** on This Page

10-A. **Explain** why *each* of the following is consistent with bounded rationality:

- i. Corbett's new asset allocation
- ii. Corbett's choice of mutual fund company

Answer Question **10-B** on This Page

<p>Determine, assuming Jung’s bias conclusion is correct, whether Corbett would <i>most likely</i> remain with Van Gogh or switch to Infinity. (circle one)</p>	<p>Justify your response with <i>two</i> reasons.</p>	
<p>remain with Van Gogh</p>	<p>1.</p>	
<p>switch to Infinity</p>	<p>2.</p>	

10-C

<p>Recommend, assuming Jung's bias conclusion is correct, whether he should moderate or adapt to Corbett's behavioral biases. (circle one)</p>	<p>Justify your recommendation with <i>two</i> reasons.</p>
<p>moderate</p>	<p>1.</p>
<p>adapt</p>	<p>2.</p>

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