

**Question #1 of 30**

Question ID: 1580692

Aaron Manning wishes to minimize the risk of his portfolio returns as measured by standard deviation while meeting a minimum expected return objective. The risk-free rate is 2%. The following asset allocations are available:

	<b>Expected Return</b>	<b>Standard Deviation of Returns</b>
Allocation 1	10%	12%
Allocation 2	7%	10%
Allocation 3	11%	15%

Based on the information provided, which of the following allocations should Manning choose?

**A) Allocation 3.**



**B) Allocation 2.**



**C) Allocation 1.**

**Explanation**

Calculate the Sharpe ratio for each allocation:

$$\text{Allocation 1: } (10\% - 2\%) / 12\% = 0.67$$

$$\text{Allocation 2: } (7\% - 2\%) / 10\% = 0.50$$

$$\text{Allocation 3: } (11\% - 2\%) / 15\% = 0.60$$

Allocation 1 has the highest Sharpe ratio; therefore, it is the optimal risk allocation that Manning should choose.

(Module 4.3, LOS 4.d)

**Question #2 of 30**

Question ID: 1587530

The highest percentage allocation to fixed income for a 25-year-old investor would be under the:

**A) 60/40 split.**



**B) 120 minus age rule.**



**C) 1/N rule, with 3 asset classes.**



### Explanation

Under a 60/40 split, the investor's allocation to fixed income is permanently 40%, with a 60% allocation to equities, regardless of age. This approach assumes there is no difference in asset allocation preferences between investors.

Under the 120 minus age rule, a 25-year-old investor would have  $120 - 25 = 95\%$  allocation to equities and 5% allocation to fixed income.

Under the 1/N rule, the portfolio is equally weighted along each selected asset class. If fixed income is one of the three asset classes selected, then this approach caps the fixed income allocation at  $1/3 = 0.33$ , or 33%.

(Module 4.7, LOS 4.n)

---

### Question #3 of 30

Question ID: 1551722

A pension fund has pension assets that significantly exceed the value of pension liabilities. The fund wants to minimize the risk that the pension plan will become underfunded. Which of the following liability-relative approaches is *most appropriate* for the fund?

**A) Integrated asset-liability approach.**



**B) Surplus optimization.**



**C) Two-portfolio (return-seeking) approach.**



### Explanation

The two-portfolio approach is most appropriate for the pension fund because it allows the fund to create an asset portfolio that hedges its liabilities, while separately creating a portfolio that manages the remaining assets using mean-variance optimization (MVO) under a return-seeking approach. Should the funded status of the plan deteriorate in the future, the manager could reduce allocation to the return-seeking portfolio and increase allocation to the hedging portfolio.

Surplus optimization is an extension of MVO that manages the portfolio surplus against the surplus volatility.




An integrated asset-liability approach jointly optimizes assets and liabilities, typically against future changes in multiple factors.

(Module 4.6, LOS 4.k)

## Question #4 of 30

Question ID: 1587521

Which of the following statements regarding liabilities in the context of the asset allocation decision is correct?

- A) A university endowment contribution is an example of a legal liability. 
- B) A small pension liability in relation to the size of the sponsoring organization should be ignored. 
- C) **The pension liability associated with a defined pension plan is an example of a fixed liability.** 

**Explanation**

A small liability in relation to the size of the sponsoring organization can usually be ignored, as its effect on the optimal asset allocation is minimal.

The pension liability associated with a defined pension plan is an example of a *contingent* liability because the cash flows depend on uncertain future events.




University endowment contributions are an example of *quasi-legal* liabilities, which are not legal obligations, but are cash outflows expected to occur in the future and are essential to the mission of the institution.

(Module 4.6, LOS 4.j)

## Question #5 of 30

Question ID: 1551716

Which of the following statements about using investment factors in constructing asset allocations is *correct*?

- A) The investment factors are market-neutral, long/short portfolios. 
- B) The factors are constructed to have high correlation with each other. 
- C) **The use of investment factors is consistent with factor return models.** 

**Explanation**

The use of investment factors is consistent with factor return models, including the three-factor Fama-French model (where the factors are size, value and market).

The investment factors are *zero-dollar*, long/short portfolios that are long the outperforming attribute and short the underperforming attribute.

The investment factors are constructed to have *low* correlation with each other and with the market portfolio, which results in superior risk-return tradeoff.

(Module 4.5, LOS 4.i)

---

Jonas Hoffman is an investment consultant for Wealth International Partners (WIP), located in Luxembourg. WIP specializes in providing investment and financial planning services for wealthy private European clients.

Hoffman has recently taken on three new clients and has asked his assistant, Klaus Salinger, to review their IPS objectives and constraints. These are summarized in Exhibit 1.

#### Exhibit 1: Client IPS Objectives and Constraints

New Clients	Elias Weber	Lina Wagner	Tobias Weisser
Investable assets	EUR 25.0 million	EUR 15.0 million	EUR 7.0 million
Required return	7.00%	5.50%	7.50%
Risk aversion coefficient	4.5	3.5	5.5
MVO constraints	—	—	No illiquid assets

Salinger also compiles a table of potential portfolio allocations, as shown in Exhibit 2. Salinger notes that Tobias Weisser is unable to invest in Allocations A, B, or C due to liquidity constraints.

#### Exhibit 2: Potential Portfolio Allocations

Allocations	Expected Return	Standard Deviation of Return
A	9.35%	16.00%
B	8.76%	14.78%
C	8.24%	14.25%
D	7.15%	12.64%
E	5.50%	10.32%

F	5.25%	10.11%
G	3.60%	7.28%
Risk free		1.75% per annum

---

### Question #6 - 9 of 30

Question ID: 1551688

For Elias Weber, for Portfolios B, D, and F, which of the following are ranked from highest to lowest in their utility (certainty equivalent return)?

A) F, B, D.



B) B, D, F.



C) D, F, B.



#### Explanation

$$\text{Utility} = E/R - (0.005 \times \lambda \times \sigma^2)$$

$$B = 8.76 - (0.005 \times 4.5 \times 14.78^2) = \mathbf{3.845}$$

$$D = 7.15 - (0.005 \times 4.5 \times 12.64^2) = 3.555$$

$$F = 5.25 - (0.005 \times 4.5 \times 10.11^2) = 2.950$$

Allocation B has the highest utility, followed by D, then F.

**Candidate discussion:** To use decimals, change 0.005 to 0.5 as follows:

$$= 0.0876 - (0.5 \times 4.5 \times 0.1478^2) = \mathbf{3.845}.$$

(Module 4.3, LOS 4.d)

### Question #7 - 9 of 30

Question ID: 1551689

For Lina Wagner, assuming Allocation A is recommended, and borrowing and lending at the risk-free rate is permitted, which of the following is the correct allocation to the risk-free rate?

A) EUR 7.40 million.



B) EUR 7.60 million.



C) EUR 6.80 million.



**Explanation**

Solve to find the required weight in Allocation A:

$$5.5 = 9.35w + 1 - w(1.75)$$

$$5.5 = 9.35w + 1.75 - 1.75w$$

$$3.75 = 7.6w$$

$$w = 3.75 / 7.6$$

$$w = 0.4934$$

In other words: 49.34% in Allocation A, and **50.66% in risk free**

$$0.5066 \times \text{EUR } 15 \text{ million} = \text{EUR } 7,599,000 \text{ in risk free}$$

To check:




$$(0.4934 \times 9.35\%) + (0.5066 \times 1.75\%) = 5.50\%$$

(Module 4.3, LOS 4.d)

**Question #8 - 9 of 30**

Question ID: 1551690

For Tobias Weisser to achieve his required return of 7.5%, which of the following is *most correct*?

- A) Borrow EUR 0.454 million at the risk-free rate and invest EUR 7.454 million in Allocation D. 
- B) Lend EUR 0.412 million at the risk-free rate and invest EUR 7.412 million in Allocation D. 
- C) **Borrow EUR 0.412 million at the risk-free rate and invest EUR 7.412 million in Allocation D.** 

**Explanation**

Use the most efficient allocation allowable (i.e., the one with the highest Sharpe ratio—Portfolio D and the risk-free asset):

$$A = (9.35 - 1.75) / 16.00 = 0.475$$

$$B = (8.76 - 1.75) / 14.78 = 0.474$$

$$C = (8.24 - 1.75) / 14.25 = 0.455$$

$$\mathbf{D = (7.15 - 1.75) / 12.64 = 0.427}$$

$$E = (5.50 - 1.75) / 10.32 = 0.363$$

$$F = (5.25 - 1.75) / 10.11 = 0.346$$

$$G = (3.60 - 1.75) / 7.28 = 0.254$$

Solve to find the weight in Allocation D:

$$7.50 = 7.15w + 1.75 (1 - w)$$

$$7.50 = 7.15w + 1.75 - 1.75w$$

$$7.50 - 1.75 = 7.15w - 1.75w$$

$$5.75 = 5.40w$$

$$w = 1.0648$$

So: 106.481% in Allocation D and -6.481% in risk free

To check:

$$(1.06481 \times 7.15\%) + (-0.06481 \times 1.75\%) = \mathbf{7.50\%}$$

In Allocation D: EUR 7 million  $\times$  1.06481 = **EUR 7.454 million**

Borrow at the risk free: **EUR 0.454m**

(Module 4.3, LOS 4.d)

## Question #9 - 9 of 30

Question ID: 1551691

Hoffman meets again with Lina Wagner, who advises that she now requires a minimum return of at least 2.5%, and a maximum volatility of 13%. Which of the following allocations should now be recommended to Wagner by Hoffman?

**A) Allocation E.**



**B) Allocation A.**



**C) Allocation D.**



### Explanation

Using Roy's safety-first approach, with the additional constraint of a maximum of 13% volatility:

$$A = 9.35 - 2.50 / 16.00 = 0.428$$

$$B = 8.76 - 2.50 / 14.78 = 0.423$$

$$C = 8.24 - 2.50 / 14.25 = 0.403$$

$$\mathbf{D = 7.15 - 2.50 / 12.64 = \mathbf{0.368}}$$

$$E = 5.50 - 2.50 / 10.32 = 0.291$$

$$F = 5.25 - 2.50 / 10.11 = 0.272$$

Allocation D has the highest Roy's safety-first z-score, meaning it has the lowest probability of shortfall below the minimum target return of 2.5%. Although Allocations A, B, and C have even lower probabilities of shortfall (higher RSF scores), the risk is higher than 13%, so they have been excluded.

(Module 4.3, LOS 4.d)

---

### Question #10 of 30

Question ID: 1580690



Shad Reed is on the board of trustees for the Wesley Ridge World Hunger Organization. The primary role of the organization is to oversee a large endowment fund that was originally established to provide food to low-income children in the United States. The original donor of the endowment recently died and provided the fund with another \$200 million from his will to broaden the scope of the fund to provide food for hungry children all over the world. With the addition, the endowment's assets are currently valued at \$600 million. When the fund was originally established, the spending rate was 5%; however, with the broader scope, the spending rate has increased to 6%. Also, because funds are going to be distributed to other countries, the board has determined that approximately 25% of the foundation's annual payout will be in the foreign currencies of other countries. The fund's revised investment policy statement is shown as follows:




<b>Return Objective</b>	Accounting for inflation of 2.5% and the new spending rate of 6%, the return requirement for the plan is 8.5%. A total return approach is appropriate.
<b>Risk Tolerance</b>	Above average, although risk tolerance has declined due to higher spending needs.
<b>Liquidity</b>	The endowment has minimal operating expenditures—liquidity requirements are low.
<b>Time Horizon</b>	Long-term
<b>Legal/Regulatory</b>	N/A
<b>Taxes</b>	N/A
<b>Unique Considerations</b>	N/A

The board has consulted with an investment advisor to discuss changes to the endowment's current asset allocation, which is shown as follows:

<b>Asset Class</b>	<b>Allocation (%)</b>	<b>Expected Return</b>	<b>Expected Standard Deviation</b>
Cash and marketable securities	7%	3.0%	2%
Intermediate-term U.S. Treasury bonds	28%	5.5%	7%
Foreign government bonds	8%	6.5%	10%

U.S. equities	45%	9.5%	18%
International equities	7%	11.0%	23%
Venture capital	5%	19.0%	38%

Which of the following recommendations would be *most appropriate* for the endowment fund?

- Increase the allocation to foreign government bonds, increase the allocation to
- A) international equities, keep the allocation to cash the same, and keep the allocation to venture capital the same.** 
- Decrease the allocation to U.S. equities, decrease the allocation to**
- B) international equities, increase the allocation to foreign government bonds, and increase the allocation to intermediate-term U.S. Treasury bonds.** 
- Increase the allocation to cash, decrease the allocation to U.S. equities, decrease
- C) the allocation to international equities, and increase the allocation to venture capital.** 

### Explanation

Because liquidity needs are low, the allocation to cash is appropriate (because the 7% allocation slightly exceeds the 6% annual spending rate). Because payments are going to be made in foreign currencies, it makes sense to increase the allocation to both foreign bonds and international equities. Especially if these asset classes have low correlation with other assets in the portfolio, increasing their weight in the portfolio could reduce risk, although their higher standard deviations suggest only moderate increases. Because the fund has a long time horizon and above-average risk tolerance, the allocation to venture capital is fine given its above-average returns and likely low correlation with other assets in the portfolio.

(Module 4.3, LOS 4.d)

### Question #11 of 30

Question ID: 1587516

The following information is available regarding corner portfolios from an efficient frontier:

Corner Portfolio	Expected Return	Exp. Std. Dev.	Sharpe Ratio	Asset Class Weights				
				1	2	3	4	5
1	14.00%	18.00%	0.639	0.00%	0.00%	100.00%	0.00%	0.00%
2	13.66%	16.03%	0.696	0.00%	0.00%	86.36%	0%	14.00%
3	13.02%	13.58%	0.775	21.69%	0.00%	56.56%	0.00%	21.76%
4	12.79%	13.00%	0.792	21.48%	0.00%	52.01%	5.24%	21.27%
5	10.54%	8.14%	0.988	9.40%	51.30%	26.55%	0.00%	12.76%
6	8.70%	6.32%	0.981	0.00%	89.65%	4.67%	0.00%	5.68%

The following portfolios are under consideration by an investor:

Portfolio	Expected Return
A	11.0%
B	13.5%

For an investor with a risk-aversion of 6, which portfolio would have the highest utility?

**A) Portfolio A with a utility of 0.085.**



**B) Portfolio A with a utility of 0.092.**



**C) Portfolio B with a utility of 0.115.**



**Explanation**

For Portfolios A and B, we first need the approximate standard deviation.

Portfolio A with an expected return of 11% lies between Corner Portfolios 4 and 5. Let  $w$  denote the weight of Corner Portfolio 5, we solve for  $w$  in the following equation:

$$11 = (10.54)(w) + (12.79)(1 - w)$$

$$w = 0.80$$

$$\text{Approximate standard deviation of Portfolio A} = (0.80)(8.14) + (0.20)(13) = 9.11.$$

Similarly, Portfolio B with an expected return of 13.50% lies between Corner Portfolios 2 and 3. Let  $w$  denote the weight of Corner Portfolio 2, we solve for  $w$  in the following equation:

$$13.50 = (13.66)(w) + (13.02)(1 - w)$$

$$w = 0.75$$

$$\text{Approximate standard deviation of Portfolio B} = (0.75)(16.03) + (0.25)(13.58) = 15.418.$$

$$R_Z = 6$$

$$U_A = E(R_A) - 0.5(R_Z)(\sigma_A^2) = 0.11 - 0.5(6)(0.0911)^2 = 0.085$$

$$U_B = E(R_B) - 0.5(R_Z)(\sigma_B^2) = 0.135 - 0.5(6)(0.154)^2 = 0.064$$

(Module 4.5, LOS 4.h)

Hikaru Tanaka is a portfolio manager with Yokohama Asset Management (YAM). Himari Nakamura, the Head of Risk at YAM, has been working with Tanaka to implement a revised risk budgeting approach that aims to maximize returns per unit of risk taken. Central to the YAM risk budgeting approach is the adoption of two new risk metrics: the marginal contribution to risk (MCTR) and the absolute contribution to risk (ACTR).

Tanaka reviews an existing private client portfolio of Katashi Takahashi, who has recently contacted the firm with additional funds to invest. Tanaka decides to use the risk budgeting optimization approach to allocate these additional funds. He collects relevant data on the existing Takahashi portfolio, shown in Exhibit 1.

#### Exhibit 1: Takahashi Portfolio

Takahashi Portfolio Data	Beta	Expected Return	Weight
Domestic fixed income	0.359	3.25%	40%
Domestic equities	1.447	6.97%	32%
International equities	1.404	7.83%	28%

Domestic cash	0	2.50%	0%
Portfolio volatility		10.02%	

---

### Question #12 - 15 of 30

Question ID: 1551708

Which asset class should be increased to improve the return/risk optimization of the Takahashi portfolio?

A) Domestic equities.



B) International equities.



C) Domestic fixed income.



#### Explanation

Increase the asset class with the highest risk-adjusted return (i.e., the highest excess return as a percentage of its marginal contribution to risk):

$$\text{Marginal contribution to risk (MCTR)} = \text{beta} \times \sigma_{\text{portfolio}}$$

$$\text{Domestic fixed income} = 0.359 \times 0.1002 = 0.0359718$$

$$\text{Domestic equity} = 1.447 \times 0.1002 = 0.1449894$$

$$\text{International equity} = 1.404 \times 0.1002 = 0.1406808$$

Excess return / MCTR:

$$\text{Domestic fixed income} = 3.25\% - 2.50\% / 0.0359718 = 20.85$$

$$\text{Domestic equity} = 6.97\% - 2.50\% / 0.1449894 = 30.83$$

$$\text{International equity} = 7.83\% - 2.50\% / 0.1406808 = \mathbf{37.89}$$

Increase the allocation to **international equities**, as it has the highest risk-adjusted return.

(Module 4.5, LOS 4.g)

### Question #13 - 15 of 30

Question ID: 1551709

Which asset class should be reduced to move the Takahashi allocation closer to the optimal mix?

A) International equities.



**B) Domestic equities.**



**C) Domestic fixed income.**



### Explanation

Decrease the asset class with the lowest risk-adjusted return (i.e., excess return as a percentage of its marginal contribution to risk).

$$\text{Marginal contribution to risk (MCTR)} = \text{beta} \times \sigma_{\text{portfolio}}$$

$$\text{Domestic fixed income} = 0.359 \times 0.1002 = 0.0359718$$

$$\text{Domestic equity} = 1.447 \times 0.1002 = 0.1449894$$

$$\text{International equity} = 1.404 \times 0.1002 = 0.1406808$$

Excess return / MCTR:

$$\text{Domestic fixed income} = 3.25\% - 2.50\% / 0.0359718 = \mathbf{20.85}$$

$$\text{Domestic equity} = 6.97\% - 2.50\% / 0.1449894 = 30.83$$

$$\text{International equity} = 7.83\% - 2.50\% / 0.1406808 = 37.89$$

Decrease the allocation to **domestic fixed income**, as it has the lowest risk-adjusted return.

(Module 4.5, LOS 4.g)

---

### Question #14 - 15 of 30

Question ID: 1551710

Which asset class of the Takahashi portfolio is *closest* to its optimal weighting?

**A) International equities.**



**B) Domestic fixed income.**



**C) Domestic equities.**



### Explanation

The portfolio is optimized if the excess return / MCTR of an allocation equals the portfolio Sharpe ratio:

$$\begin{aligned}\text{Portfolio return} &= 0.40 (3.25\%) + 0.32 (6.97\%) + 0.28 (7.83\%) \\ &= 1.3\% + 2.2304\% + 2.1924\% \\ &= \mathbf{5.72\%}\end{aligned}$$

$$\mathbf{\text{Portfolio Sharpe ratio}} = (0.0572 - 0.025) / 0.1002 = \mathbf{0.3214}$$

$$\text{Marginal contribution to risk (MCTR)} = \text{beta} \times \sigma_{\text{portfolio}}$$

$$\text{Domestic fixed income} = 0.359 \times 0.1002 = 0.0359718$$

$$\text{Domestic equity} = 1.447 \times 0.1002 = 0.1449894$$

$$\text{International equity} = 1.404 \times 0.1002 = 0.1406808$$

Excess return / MCTR:

$$\text{Domestic fixed income} = 3.25\% - 2.50\% / 0.0359718 = 20.85$$

$$\text{Domestic equity} = 6.97\% - 2.50\% / 0.1449894 = \mathbf{30.83}$$

$$\text{International equity} = 7.83\% - 2.50\% / 0.1406808 = 37.89$$

**Domestic equities** is closest to its optimal allocation (i.e., excess return / MCTR of 30.83 is closest to the portfolio Sharpe ratio of 0.3214).

$$(\text{Portfolio Sharpe ratio} = 5.72\% - 2.50\% / 0.1002 = 32.14)$$

(Module 4.5, LOS 4.g)

### Question #15 - 15 of 30

Question ID: 1551711

Which of the following is an estimate of the percentage contribution of domestic bonds to overall portfolio risk of the Takahashi portfolio?

A) 13.36%.



B) 12.36%.



C) 14.36%.



**Explanation**

Absolute contribution to risk (ACTR) = marginal contribution to risk (MCTR) × weight:

$$\text{Domestic fixed income} = 0.0359718 \times 0.40 = \mathbf{0.01438872}$$

$$\text{Domestic equity} = 0.1449894 \times 0.32 = 0.04639661$$

$$\text{International equity} = 0.1406808 \times 0.28 = \underline{0.03939062}$$

$$\text{Portfolio standard deviation} = 0.1002$$

Domestic fixed income contributes  $0.01438872 / 0.1002 = \mathbf{14.36\%}$  of the portfolio risk of 10.02%.

(Module 4.5, LOS 4.g)

---

### Question #16 of 30

Question ID: 1587517



Corri Morgan is an investment advisor for Izaguirre Investment Management (IIM). Morgan is reviewing the account for Brian and Nicole Herbster.

Brian and Nicole are both age 65, and have one daughter, Andrea, age 18. The Herbsters are recently retired from Tucker Technology, Inc., a large manufacturer of microprocessors for various applications. Andrea is an aspiring finance student and would like to attend a prestigious university to pursue a degree in finance. The tuition at the university costs \$40,000 per year, but Andrea's strong academic performance in high school allowed her to earn a scholarship covering half of the tuition. The Herbsters have expressed a desire to fund the amount of the college education not covered by the scholarship, as well as leave a large inheritance to Andrea at their death. During their careers, the Herbsters earned relatively high incomes, and they were able to save approximately 10% of their income each year. Regarding their portfolio, they say they prefer investments that have minimal volatility. Their current investment portfolio is valued at \$1.2 million.

The investment policy statement for the Herbsters is shown here:

<b>Return Objective</b>	The Herbsters' income requirement is \$6,000 monthly. Total return requirement is $\$72,000 / \$1,200,000 = 6\%$ .
<b>Risk Tolerance</b>	Ability to take on risk: average. Willingness to take risk: below average.
<b>Liquidity</b>	Need cash each year for the next four years to fund college education.
<b>Time Horizon</b>	Three stages. Stage 1: funding daughter's college tuition. Stage 2: retirement. Stage 3, after death: inheritance for daughter.
<b>Legal/Regulatory</b>	N/A
<b>Taxes</b>	Little need to defer income.
<b>Unique Considerations</b>	Desire to fund daughter's college education.

The Herbsters' current portfolio is shown here:

<b>Asset/Fund</b>	<b>Allocation (%)</b>	<b>Expected Return</b>	<b>Expected Yield</b>	<b>Expected Standard Deviation</b>
Tucker Technology common stock	32%	19.0%	0.5%	28%
Money market fund	2%	2.5%	2.5%	2%

Diversified bond fund	30%	6.5%	5.5%	8%
Large capitalization equities	15%	9.5%	2.0%	16%
Emerging market equities	15%	16.0%	1.0%	26%
Undeveloped commercial land	6%	19.0%	0%	N/A

After reviewing the notes on the Herbsters, Morgan reviews recommendations complied by Todd Irons, a fellow portfolio manager with IIM. Irons's recommendations include the following:

- Recommendation 1: Reduce the weighting in Tucker Technology common stock—the large position exposes the portfolio to unnecessary security-specific risk.
- Recommendation 2: Increase the allocation to the diversified bond fund to increase income and decrease volatility.
- Recommendation 3: Increase the allocation to large capitalization equities to provide growth.
- Recommendation 4: Maintain the allocation to emerging market equities due to their high returns.
- Recommendation 5: Maintain the allocation to the undeveloped commercial land due to its low correlation with other assets in the portfolio.

After reviewing Irons's recommendations, Morgan should agree with:

- A) Recommendations 1, 2, and 3 only.**
- B) Recommendations 1, 3, and 5 only.**
- C) Recommendations 1, 2, and 4 only.**



### Explanation




Morgan should agree with Recommendations 1, 2, and 3. The allocation to emerging market equities is probably too high given the Herbsters' preference for low-volatility investments. Also, the allocation to undeveloped commercial land would be a cash drain on the Herbsters' portfolio due to payments for taxes and the like. The Herbsters need income and liquidity to meet ongoing portfolio disbursement requirements, and the undeveloped commercial land provides neither.

(Module 4.5, LOS 4.h)

**Question #17 of 30**

Question ID: 1551721

Which of the following statements regarding the two-portfolio (or the hedging/return-seeking) approach to liability-relative asset allocation is correct?

- A) The hedging portfolio could be constructed using cash flow matching.** 
- B)** If the funding ratio is greater than 1, then it becomes difficult to create a hedging portfolio that completely hedges the liabilities. 
- C)** The asset allocation decisions regarding the two portfolios are made in conjunction with each other. 

**Explanation**

The hedging portfolio could be constructed using various techniques such as cash flow matching, duration matching, and immunization.

If the funding ratio is *less* than 1, then it becomes difficult to create a hedging portfolio that completely hedges the liabilities.




The two-portfolio approach has the distinctive feature that the composition of the liabilities is already in place when the asset allocation decisions are made, so the two decisions are made *independently*.

(Module 4.6, LOS 4.k)

**Question #18 of 30**

Question ID: 1587520

Mean-variance optimization (MVO) outputs using factor exposures differ from using asset class exposures that reflect the same underlying assets in that:

- A)** the choice of exposures reflects how an investor forms capital market expectations. 
- B)** one approach will typically be superior to the other, depending on the space in which the investor operates. 
- C) their efficient frontiers differ from each other.** 

**Explanation**

The choice of whether to use factor exposures or asset class exposures depends on the way investors form capital market expectations.

When factor exposures and asset class exposures reflect the same exposures (i.e., underlying assets), the MVO results indicate that neither approach is superior to the other. As a result, their efficient frontiers will not be significantly different.

(Module 4.5, LOS 4.i)

---

### Question #19 of 30

Question ID: 1587518

Which of the following methods is the *most appropriate* way of incorporating client risk preferences into asset allocations?

- A) Specify additional constraints.
- B) Specify a diversification objective.
- C) **Specify a risk tolerance factor.**



#### Explanation

One way to incorporate investor risk preferences into an asset allocation decision is to specify additional constraints, such as setting limits on allocations to risky asset classes or setting a ceiling on portfolio risk.

Specifying a risk *aversion* factor (not risk tolerance factor) is another way to incorporate investor risk preferences into an asset allocation decision.

There is no such thing as a diversification objective, per se, in the reading.

(Module 4.5, LOS 4.h)

---

### Question #20 of 30

Question ID: 1551694

Which of the following asset classes is *least likely* to require a liquidity return premium?

- A) Infrastructure.
- B) Direct real estate.
- C) **Commodities.**



#### Explanation

Commodities are not generally thought of as a less liquid asset class requiring a liquidity return premium to compensate the investor for the additional liquidity risk. On the other hand, asset classes such as direct real estate and infrastructure would be considered less liquid and would require a liquidity return premium.

(Module 4.4, LOS 4.f)

---

### Question #21 of 30

Question ID: 1580695

Consider an investor whose future wages are uncertain. The investor's human capital could be modeled as a(n):

**A)** mix of inflation-linked bonds, equities, and corporate bonds.



**B) inflation-linked bond.**



**C)** real return bond.



#### Explanation

Investors with uncertain future wages are exposed to various risks. As a result, their human capital should be modeled as a combination of various risks, including a mix of inflation-linked bonds, equities, and corporate bonds.

For investors who have jobs that are stable and increase with inflation, modeling their human capital as inflation-linked bonds is appropriate.

(Module 4.4, LOS 4.c)

---

### Question #22 of 30

Question ID: 1551678

Which of the following does NOT accurately reflect a statement describing the resampled efficient frontier?

**A)** A single portfolio with specific asset class weights at each level of return.



**B)** At each level of return the most efficient of the simulated efficient portfolios is at the center of a distribution.



**C)** A portfolio may be considered statistically equivalent if the manager's portfolio is within a 90% confidence interval of the most efficient portfolio.



#### Explanation

A single portfolio with specific asset class weights at each level of return describes traditional mean variance optimization. The other answer choices describe the resampled efficient frontier where Monte Carlo simulation is used to create an efficient frontier at each return level and run thousands of times resulting in an efficient frontier that is the result of an averaging process. The efficient frontier becomes a blur rather than a single sharp curve. At each level of return, the most efficient of the simulated efficient portfolios is at the center of the distribution.




(Module 4.2, LOS 4.a)

---

### Question #23 of 30

Question ID: 1587527

Which of the following statements about an investor's goals-based asset allocation approach is *least correct*?

- A) **The goals-based asset allocation approach typically uses pre-established subportfolios to meet client goals.** 
- B) The asset opportunity sets will consist of both taxable and tax-exempt investments. 
- C) The investor's different goals with specified probabilities of success will be averaged, and a single module with the highest expected return will be used for the asset allocation. 

#### Explanation

The advantage of the goals-based asset allocation approach is that it is able to incorporate different goals by an investor that could differ by amount, timing and urgency. Each goal is evaluated separately by looking at modules (pre-established subportfolios) that provide the minimum expected return needed to satisfy that goal. Goals are not averaged, and multiple modules are used because each module will result in different minimum returns depending on the level of specified probabilities of success.

The asset opportunity set for each module consists of both taxable and tax-exempt investments.




(Module 4.7, LOS 4.m)

---

### Question #24 of 30

Question ID: 1580701

A portfolio comprises three asset classes: 65% equities, 30% bonds, and 5% cash. The ratio of excess returns to the marginal contribution to total risk (MCTR) is equal to the portfolio's Sharpe ratio. This implies that:

- A) The sum of the MCTRs of equities and bonds is equal to total portfolio risk. 
- B) The  $MCTR_{\text{equities}}$  is equal to the absolute contribution of total risk, or  $ACTR_{\text{equities}}$ . 
- C) **The 65%/30%/5% allocation is optimal from a risk-budgeting perspective.** 

### Explanation

Because the ratio of excess return to  $MCTR_{\text{equities}}$  is equal to the portfolio Sharpe ratio (portfolio excess return / portfolio standard deviation), it implies that the current asset allocation is appropriate.

The statement that  $MCTR_{\text{equities}}$  is equal to  $ACTR_{\text{equities}}$  is incorrect, because  $ACTR_{\text{equities}} = \text{weight}_{\text{equities}} \times MCTR_{\text{equities}}$ .




The sum of the ACTRs (of equities and bonds only, because cash has zero ACTR) is equal to total portfolio risk, or standard deviation.

(Module 4.5, LOS 4.g)

### Question #25 of 30

Question ID: 1587526

Which of the following statements regarding the goals-based approach to asset allocation is correct?

- A) **The relevant risk measure for both individuals and institutions is the probability of missing the goal.** 
- B) The return determination for individuals is based on minimum expectations, while for institutions, it is based on mathematical expectations. 
- C) Individuals are often concerned with single goals, while institutions are often concerned with multiple goals. 

### Explanation

For institutions, *mathematical expectations* refers to the weighted expected return of the portfolio components.

The relevant measure for institutions is volatility of return or surplus.

Individuals are often concerned with *multiple* goals, while institutions are often concerned with *single* goals.

(Module 4.7, LOS 4.m)

---

### Question #26 of 30

Question ID: 1587529

A 30-year-old wealthy investor wants to maximize her allocation to commodity investments. Which of the following approaches to asset allocation would *best* achieve her objective?

**A) 1/N rule, with 10 asset classes.**



**B) 120 minus age rule.**



**C) Endowment model.**



#### Explanation

The endowment model (or Yale model) allows for higher allocation to alternative investments, including commodities, real estate, and private equity, than recommended under mean-variance optimization (MVO). The investor should select managers with significant exposure to these alternative asset classes. The model does not cap the allocation to alternative investments.

The 120 minus age rule considers only two asset classes: equities and fixed income, with the equity allocation percentage determined as 120 minus age, but it does not consider alternative investments.

The 1/N rule considers an equally weighted portfolio to each selected asset class. If commodities is one of the 10 asset classes selected, then this approach caps the commodities allocation at  $1/10 = 0.10$ , or 10%, which may be insufficient for the investor.

(Module 4.7, LOS 4.n)

---

### Question #27 of 30

Question ID: 1580698

Which of these functions is *least likely* to be addressed with Monte Carlo simulation?

**A) Assisting individual investors in identifying risk tolerance levels.**





**B) Transforming a dataset with a nonnormal distribution to a normal distribution.**



**C) Rebalancing and taxes of a portfolio in a multiperiod framework.**



### Explanation

Transforming datasets from nonnormal distributions to normal distributions is not addressed by Monte Carlo simulation. Multiperiod analysis of rebalancing and taxes within a portfolio is difficult to analyze mathematically, but it is relatively straightforward using Monte Carlo simulation. Monte Carlo simulation can be useful in illustrating the range and likelihood of possible outcomes given various assumptions of how much risk to take on. This provides the investor with more information to decide on a risk tolerance level with which the investor is comfortable.

(Module 4.4, LOS 4.e)

---

### Question #28 of 30

Question ID: 1587519

Which of the following statements regarding factor-based asset allocation is correct?

**A) The size factor is the combined return from a short position in small stocks and long position in large stocks.**



**B) The factors may be highly correlated with the market portfolio.**



**C) The value-growth factor is the combined return from a short position in growth stocks and a long position in value stocks.**



### Explanation

The Fama-French model is an example of factor-based asset allocation. There are three factors to consider:

- A zero-dollar portfolio long in small stocks and short in large stocks (the size factor)
- A zero-dollar portfolio long in value (high book-to-market) stocks and short growth (low book-to-market) stocks (the value-growth factor)
- The market portfolio

Because of the way the factors are formed, they are not correlated with each other or the market portfolio, which improves the risk-return tradeoff from the optimal portfolios and expands the efficient frontier.

(Module 4.5, LOS 4.i)

**Question #29 of 30**

Question ID: 1587531

In context of portfolio rebalancing, if the correlation of the asset class with the rest of the portfolio is lower, then the optimal corridor of the asset class will be:

**A) narrower.**



**B) unchanged.**



**C) wider.**

**Explanation**

The lower the correlation of the asset class with the rest of the portfolio, the narrower the corridor, because the portfolio will not "move" as closely with the asset class—so the allocations are more likely to diverge from the target allocation. Therefore, the corridor needs to be narrowed to control the risk.

(Module 4.8, LOS 4.o)

---

**Question #30 of 30**

Question ID: 1587525

Taylor Robinson, age 60, recently retired from her position as director of public giving for United Electric Power, a large public utility company. Robinson has accumulated \$2,000,000 in her 401(k) portfolio for retirement. Robinson estimates that she will need \$50,000 after tax in today's dollars to live comfortably. Inflation is expected to be 2.5% annually. With her background in public giving, Robinson has two favorite charities and would like to make non-tax-deductible gifts of \$10,000 to each of them annually, indexed for inflation. In her will, Robinson has specified that at her death, a gift fund will be established for each charity. Given this objective, one of Robinson's primary goals is to maintain the principal in her retirement fund to have a \$1,000,000 gift account for each charity. Robinson recently met with her financial advisor, Brian Mitchell, CFA. During their meeting, Robinson stated, "If I wanted to gamble with my investments, I would play blackjack. At least then I would have fun losing money." Mitchell presented Robinson with three different model portfolios.

Asset Class	Portfolio A	Portfolio B	Portfolio C
Large-cap U.S. stocks	5%	15%	25%
Small-cap U.S. stocks	5%		15%
International—developed market equities	10%	5%	10%
International—emerging market equities	15%		5%
U.S. corporate bonds	10%	50%	30%
U.S. Treasury bonds	5%	20%	
Hedge fund of funds	10%		5%
Venture capital	15%		
Cash	25%	10%	10%
Total expected after-tax return	5.8%	5.5%	6.0%
Current yield	1.4%	1.6%	1.8%

Which of the portfolios would be *most appropriate* for Robinson?

**A)** Portfolio A.



**B)** Portfolio C.



**C) Portfolio B.****Explanation**

Based on the information given, it would appear that Portfolio C would be the best choice. Robinson needs \$50,000 per year to meet her living expenses with an additional \$20,000 per year given to charity. This implies a real required return of  $\$70,000 / \$2,000,000 = 3.5\%$  after taxes. Factoring in inflation =  $3.5 + 2.5 = 6.00\%$  or  $(1.035)(1.025) - 1 = 6.09\%$ . Robinson's statement about not wanting to gamble with her investments implies a low risk tolerance. Portfolio C provides a return of at least the required 6.0%, and it has a respectable income component given the other choices. It also appears to be well diversified among various asset classes. The small allocation to a fund of hedge funds provides an asset with low correlation that should reduce risk. Portfolio B is too conservative and does not meet Robinson's return requirement. Portfolio A looks like a good choice because its return is close to the required return, but it has a high allocation to cash. If we take a closer look at the allocation of the portfolio, it would seem the 15% venture capital allocation is likely driving Portfolio A's return. Because Portfolio A falls short of the required return and has a high cash allocation and 15% allocated to venture capital, Portfolio A would not be the best choice.

(Module 4.7, LOS 4.m)