

**QUESTION 6 HAS FOUR PARTS FOR A TOTAL OF 25 MINUTES**

In 1955, David Peebles, founder of the successful California-based Peebles Winery, established the Tokay Endowment to fund research on producing globally competitive California wine grapes. Since Peebles’s initial contribution of \$1 million, the fund has grown to its \$75 million current value.

Peebles’s grandson, Vincent Scavuzzo, a graduate of a globally recognized private business school and holder of the CFA Charter, was recently given responsibility for managing the endowment’s portfolio. He believes the endowment’s asset mix, currently 60% equities (\$45 million) and 40% bonds (\$30 million), needs to be updated to include alternative investments. He has gathered the historical data in Exhibits 1 and 2 on the Tokay portfolio, managed futures, hedge funds, and buyout funds (a form of private equity). He is suggesting the fund invest 10% of total assets in managed futures by selling a portion of the bonds held.

**Exhibit 1: Returns and Standard Deviation for the Most Recent 10-Year Period**

	<i>Annualized Return</i>	<i>Standard Deviation</i>
Tokay equities	9.8%	14.9%
Tokay bonds	6.9%	4.3%
Buyout funds	13.9%	15.2%
Hedge funds	14.6%	10.1%
Managed futures	12.5%	11.9%
Risk-free asset	3.0%	—

**Exhibit 2: Correlations for the Most Recent 10-Year Period**

	<i>Tokay Equities</i>	<i>Tokay Bonds</i>	<i>Buyout Funds</i>	<i>Hedge Funds</i>	<i>Managed Futures</i>
Tokay equities	1.00				
Tokay bonds	0.37	1.00			
Buyout funds	0.86	0.28	1.00		
Hedge funds	0.85	0.10	0.45	1.00	
Managed futures	-0.12	0.10	-0.04	-0.14	1.00

Mario Rudd, a trusted friend and financial analyst, offers Scavuzzo some advice:

“I agree that adding alternatives to your portfolio will improve its return performance from a risk-adjusted perspective. If I was making the decision, however, I would invest in hedge funds instead of managed futures. Their historical Sharpe ratios have been consistently higher than those of managed futures.”

- A. In the template provided, **discuss** *six* major due diligence criteria that the Tokay Endowment should consider when selecting an active manager for its alternative investments.

(6 minutes)

**Template for Question 6A**

<b>Due diligence discussion</b>
1.
2.
3.
4.
5.
6.

- B. Using the data in Exhibits 1 and 2, **determine** whether you agree with Rudd's recommendation and **support** your decision with one reason.  
*Note: Using Rudd's statement in its current form or reworded is insufficient support of your answer.*

**(4 minutes)**

- C. **Discuss** *two* reasons managed futures should be added to Tokay's Endowment portfolio.

**(6 minutes)**

- D. **Discuss** the criteria Tokay Endowment should consider when evaluating a potential investment in middle-market buyout funds. Specifically, **comment** on the following:
- Benchmarks.
  - Investment characteristics.
  - Impact on the overall portfolio's risk/return profile.

**(9 minutes)**

**Template for Question 6D**

Benchmarks	
Investment characteristics	
Impact on the overall portfolio's risk/return profile	

**QUESTION 7 HAS TWO PARTS FOR A TOTAL OF 8 MINUTES**

Tom Amato is an analyst for Orthogonal Research and specializes in commodities markets. Amato is discussing the pricing of commodities in the spot and futures markets and makes the following comments:

“To derive the futures contract price using the cost of carry model, an investor would add the periodic financing and storage costs to the spot rate. For assets that have a convenience yield, the convenience yield would then be subtracted to obtain the no arbitrage price for a futures contract.”

“The financing and storage costs for corn are substantial and can be greater than the convenience yield, and futures contracts save the investor the cost of holding spot corn. Therefore, considering both long term contracts of two to three years as well as short term contracts of a few months, the futures price curve will be continually upward sloping.”

- A. **State** whether or not *each* of these comments is correct. If incorrect, **explain** why.

**Answer Question 7A in the template provided.**

**(6 minutes)**

Amato is examining the following futures prices for crude oil, gasoline, and heating oil.

One-month crude oil futures price	\$70.29 per barrel <sup>1</sup>
Two-month gasoline futures price	\$1.7500 per gallon
Two-month heating oil futures price	\$1.8200 per gallon

<sup>1</sup>There are 42 gallons of crude oil in a barrel.

- B. **Calculate** the value of a 5-3-2 crack spread.

**(2 minutes)**

**Template for Question 7A**

<b>Comment</b>	<b>Is the statement correct or incorrect? (circle one)</b>	<b>If incorrect, explain why</b>
<p>“To derive the futures contract price using the cost of carry model, an investor would add the periodic financing and storage costs to the spot rate. From this, the convenience yield would be subtracted to obtain the no arbitrage price for a futures contract.”</p>	<p><b>Correct</b></p> <p><b>Incorrect</b></p>	
<p>“The financing and storage costs for corn are substantial and are greater than the convenience yield. Futures contracts save the investor the costs of holding the spot. Therefore, using short-term contracts of a few months to long-term contracts of two to three years, the futures price curve will be upward sloping.”</p>	<p><b>Correct</b></p> <p><b>Incorrect</b></p>	

QUESTION 6

Source: Study Session 13, LOS 36.b

Answer for Question 6-A

Due Diligence	
1. <b>For the exam:</b> Determine persistence of the market opportunities.	<b>Discussion:</b> Understand the markets being considered for investment. Determine whether active management can continue to generate a positive alpha in the future.
2. <b>For the exam:</b> Evaluate manager investment policies.	<b>Discussion:</b> Identify managers with best practices and a competitive advantage among the managers under consideration.
3. <b>For the exam:</b> Evaluate the organization.	<b>Discussion:</b> Determine whether the manager has low historical personnel turnover, adequate succession plans, and fair compensation.
4. <b>For the exam:</b> Evaluate personnel.	<b>Discussion:</b> Conduct an interview with all the principals of the firm under consideration. Speak with current and past clients. Determine whether the principals and employees are trustworthy and competent.
5. <b>For the exam:</b> Evaluate the terms of the deal.	<b>Discussion:</b> Determine whether terms are fair and reasonable based on the alternative investment category under consideration.
6. <b>For the exam:</b> Evaluate manager's service providers.	<b>Discussion:</b> Ask about service providers such as lawyers, auditors, prime brokers, and lenders that deal with the manager.
7. <b>For the exam:</b> Check documents.	<b>Discussion:</b> Read and understand all contract documents.

8. **For the exam:**  
Maintain written records.

**Discussion:**  
Make a written record of all the issues described above.

Sample scoring key: (maximum 6 points)  
1 point each for any six of the due diligence discussions listed.

Source: Study Session 13, LOS 36.d,f

- B. **For the exam:**  
Disagree (2 points)  
Hedge funds are highly correlated with endowment equities (2 points)  
-or-  
Managed futures offer better diversification potential (2 points)

**Discussion:**  
Hedge funds, as mentioned by Rudd, have provided better historical Sharpe ratios than managed futures. It is also true that most alternative investments offer good diversification benefits when added to a traditional portfolio of stocks and bonds. In this situation, however, the hedge funds have also been highly correlated with the equities held by Tokay. The following calculations show the Sharpe ratios of the equity portfolio with the addition of the two different alternatives. *Note: The question does not specifically mention showing your calculations, so you would not have had to use calculations as support of your decision. If the question had told you to show your calculations, you would have performed them and referred to the resulting Sharpe ratios as support.*

By comparing Sharpe ratios of the equity segment with managed futures versus hedge funds, we implicitly assume that the expected return and standard deviation of the remaining bond portfolio as well as its correlation with the rest of the portfolio remains unchanged. (From the exhibit we see that the correlation of Tokay bonds with both alternative classes is 0.10.) With this assumption we can simply compare the Sharpe ratios of the equity plus alternative investments segment of the portfolio using managed futures and using hedge funds to determine which will produce the better risk-adjusted expected return.

The current value of equities held is \$45 million. The amount of alternatives that will be added is \$7.5 million (10% of total assets). Total equity plus alternative investments segment is therefore \$52.5 million. The results show that adding managed futures to the portfolio produces a better expected Sharpe ratio than adding hedge funds:

$$\sigma_{S,a}^2 = (w_e)^2 \sigma_e^2 + (w_a)^2 \sigma_a^2 + 2w_e w_a \sigma_e \sigma_a \rho_{a,e}$$

where:

$\sigma_{S,a}^2$  = variance of portfolio segment containing equities and alternatives

$w_e$  = weight of equities in the segment  
= \$45 million / \$52.5 million = 0.857

$w_a$  = weight of alternatives (either managed futures or hedge funds)  
= \$7.5 million / \$52.5 million = 0.143

**Adding \$7.5 million in managed futures:**

$$\begin{aligned}\sigma_{S,M}^2 &= w_e^2 \sigma_e^2 + w_M^2 \sigma_M^2 + 2w_e w_M \sigma_e \sigma_M \rho_{M,e} \\ &= (0.857)^2 (0.149)^2 + (0.143)^2 (0.119)^2 + 2(0.857)(0.143)(0.149)(0.119)(-0.12) \\ &= 0.0163 + 0.0003 - 0.0005 = 0.0161\end{aligned}$$

$$\sigma_{S,M} = \sqrt{0.0161} = 0.1269 \text{ (equities plus managed futures)}$$

$$\begin{aligned}\hat{R}_{S,M} &= w_e \hat{R}_e + w_M \hat{R}_M = 0.857(0.098) + 0.143(0.125) \\ &= 0.0840 + 0.0179 = 0.1019\end{aligned}$$

$$\text{Sharpe}_{S,M} = \frac{0.1019 - 0.03}{0.1269} = 0.5666$$

**Adding \$7.5 million in hedge funds:**

$$\begin{aligned}\sigma_{S,H}^2 &= w_e^2 \sigma_e^2 + w_H^2 \sigma_H^2 + 2w_e w_H \sigma_e \sigma_H \rho_{H,e} \\ &= (0.857)^2 (0.149)^2 + (0.143)^2 (0.101)^2 + 2(0.857)(0.143)(0.149)(0.101)(0.85) \\ &= 0.0163 + 0.0002 + 0.0031 = 0.0196\end{aligned}$$

$$\sigma_{S,H} = \sqrt{0.0196} = 0.1400 \text{ (equities plus hedge funds)}$$

$$\begin{aligned}\hat{R}_{S,H} &= w_e \hat{R}_e + w_H \hat{R}_H = 0.857(0.098) + 0.143(0.146) \\ &= 0.0840 + 0.0209 = 0.1049\end{aligned}$$

$$\text{Sharpe}_{S,H} = \frac{0.1049 - 0.03}{0.1400} = 0.5350$$

Sample scoring key: maximum 4 points.

Source: Study Session 13, LOS 36.f

C. 3 points for each:

1. **For the exam:**

Low positive correlation with bond returns (1 point) and low negative correlation with stock returns (2 points).

**Discussion:**

Managed futures may perform best when Tokay's stock and bond investments are performing relatively poorly. Academic research suggests that historically when stocks have negative returns, the returns of managed futures are positive. In addition, managed futures have a positive correlation with bonds, thus adding managed futures to a portfolio of stocks and bonds will result in higher returns in both up and down markets.

2. **For the exam:**

Very liquid (2 points) and provide leverage (1 point).

**Discussion:**

Managed futures provide Tokay Endowment the opportunity to swiftly respond to major price movements either upward or downward in the financial and commodity markets. The transaction does not require liquidation of other investment holdings or adding to overall portfolio risk, but the investment is highly leveraged.

Sample scoring key: maximum 6 points.

Source: Study Session 13, LOS 36.d,f,i

Answer for Question 6-D

<p>1. Benchmarks (3 points)</p>	<p><b>For the exam:</b> Custom or existing benchmarks. May not reflect true risk.</p> <p><b>Discussion:</b> Tokay Endowment can either develop custom benchmarks or use benchmarks provided by Cambridge Associates and Thomson Venture Economics. Tokay must carefully evaluate the historical performance of buyout funds. Benchmark pricing data may not accurately reflect the true volatility of buyout funds. Private equity markets evaluate investments using internal rate of return based cash flow analysis.</p>
<p>2. Investment characteristics (3 points)</p>	<p><b>For the exam:</b> Ability to withdraw initial investment through recapitalization. High return potential.</p> <p><b>Discussion:</b> Middle-market buyouts represent companies in their mature stage. The companies have a long track record and substantial revenues. Normally, the company has only a few funds or perhaps only one fund providing investment capital. (Compare this with venture capital companies where several funds may take a position in the company.) The buyout fund is heavily involved in the management of the company and normally uses debt financing for the buyout. Recapitalization is when the buyout fund issues debt through the acquired company. The debt replaces the equity of the acquired company, allowing investors to recoup their original investment. The failure rate of companies that are targeted by buyout funds is low. (Comparably, venture capital funds have a high failure rate with the companies they invest in.)</p>
<p>3. Impact on the overall portfolio's risk/return profile (3 points)</p>	<p><b>For the exam:</b> Small potential for return enhancement but good diversification potential.</p> <p><b>Discussion:</b> Capital is normally committed for a long period of time with the potential for future cash calls. The indirect investment approach provides greater liquidity compared to using a direct investment approach. Tokay is relying on the manager's skill in choosing and managing the portfolio of companies in the buyout fund to generate strong investment returns to a greater degree than other investment vehicles. Returns/cash flows to buyout funds come more quickly than those to VC funds, but returns are usually somewhat lower.</p>

Sample scoring key: maximum 9 points.

QUESTION 7

Source: Study Session 13, LOS 38.a,b

Answer for Question 7-A

Comment	Is the statement correct or incorrect? (Circle One)	If incorrect, explain why.
<p>“To derive the futures contract price using the cost of carry model, an investor would add the periodic financing and storage costs to the spot rate. From this, the convenience yield would be subtracted to obtain the no arbitrage price for a futures contract.”</p>	<p><b>Incorrect</b></p>	<p><b>For the exam:</b> Range of no arbitrage prices if there is a convenience yield.</p> <p><b>Discussion:</b> The convenience yield is the benefit from physically holding the asset. If there is a convenience yield for an asset, one cannot calculate an exact no arbitrage price for a futures contract, but can only specify upper and lower boundaries for the futures price.</p> <p>The convenience yield cannot necessarily be earned by an individual investor. It can be earned by a firm that has a commercial use for the commodity, but it will vary by firm.</p> <p>To calculate the upper boundary futures price, the financing and storage costs would be added to the spot rate. To calculate the lower boundary futures price, the financing and storage costs would be added to the spot rate, net of the benefit from the convenience yield.</p>
<p>“The financing and storage costs for corn are substantial and are greater than the convenience yield. Futures contracts save the investor the costs of holding the spot. Therefore, using short-term contracts of a few months to long-term contracts of two to three years, the futures price curve will be upward sloping.”</p>	<p><b>Incorrect</b></p>	<p><b>For the exam:</b> Futures price falls with fall harvest.</p> <p><b>Discussion:</b> It is true that, if the financing and storage costs for corn are greater than the convenience yield, the futures price curve for corn will be upward sloping.</p> <p>However, even in that case the futures price curve for corn will exhibit variation within the year and not always be upward sloping. At harvest, storage of corn is no longer necessary and the futures price will decline sharply. Using contracts of two to three years, the futures price curve will not be uniformly upward sloping.</p>

Sample scoring key: (maximum 6 points)  
 1 point each for correctly identifying whether the statement is correct or incorrect.  
 2 points for each explanation.  
 0 points possible if the correct/incorrect decision is wrong.

Exam 1  
Morning Session Answers

Source: Study Session 13, LOS 38.b

- B. In the 5-3-2 crack spread, five gallons of crude oil will be bought to produce three gallons of gasoline and two gallons of heating oil. These outputs will be sold.

There are 42 gallons of oil in a barrel so the price *per gallon* of the crude oil is:

$$\$70.29 / 42 = \$1.6736$$

Using the 5-3-2 denominations for the input and outputs, the crack spread is:

$$(-5 \times \$1.6736) + (3 \times \$1.7500) + (2 \times \$1.8200) = -8.368 + 5.250 + 3.640 = \$0.522/5 \text{ gallons or } \$0.104/\text{gallon}$$

Note that there is no adjustment for the interest costs from the different maturities of the contracts. Also, the crack spread here will not create a perfect hedge, because crude oil can be used for other outputs such as jet fuel and there are other inputs into the production of gasoline and heating oil.

Sample scoring key: (maximum 2 points) 2 points for calculating the crack spread.
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