# Portfolio Management - Answers

**Use the following information to answer Questions 1 through 6.**

Faster Analytics Capital Management makes portfolio recommendations using various factor models. Bill Adams, chief economist at Faster Analytics, is responsible for providing macroeconomic and capital market forecasts. Mauricio Rodriguez, a Faster Analytics research analyst, is examining the prospects of several portfolios: the FACM Century Fund (CF), the FACM Esquire Fund (EF), the FACM Zeta Fund (ZF), and the FACM Delta Benchmark (DB).

**Selected Data for CF, ZF and Their Benchmark**

| | |
|---|---|
| Information ratio (CF) | 0.12 |
| Information ratio (ZF) | 0.25 |
| Benchmark Sharpe ratio | 0.30 |
| Benchmark total risk(s) | 20% |

Rodriguez's supervisor, Barbara Woodson, asks Rodriguez to use the capital asset pricing model (CAPM) and a multifactor model (APT) to make a decision about whether to continue or terminate the Esquire Fund. The two factors in the multifactor model are not identified. To help with the decision, Adams provides Rodriguez with the capital market forecasts shown in **Capital Market Forecasts**

**Capital Market Forecasts**

| | |
|---|---|
| Risk-free rate | 4% |
| Market portfolio risk premium | 8% |
| APT factor 1 risk premium | 5% |
| APT factor 2 risk premium | 2% |
| Inflation rate | 3% |

After examining the prospects for the EF portfolio, Rodriguez derives the forecasts in **EF Data**.

**EF Data**

| | |
|---|---|
| Expected Return | 12% |
| CAPM beta | 0.80 |
| APT factor 1 risk sensitivity | 1.50 |

| | |
|---|---|
| APT factor 2 risk sensitivity | 2.00 |

Rodriguez also develops a 2-factor macroeconomic factor model for the EF portfolio. The two factors used in the model are the surprise in GDP growth and the surprise in investor sentiment. The equation for the macro factor model is:

$$R_{EF} = a_{EF} + b_{EF,1}F_{GDP} + b_{EF,2}F_{IS} + \varepsilon_{EF}$$

During an investment committee meeting, Woodson makes the following statements related to the 2-factor macroeconomic factor model:

| | |
|---|---|
| Statement 1: | An investment allocated between CF and EF that provides a GDP growth factor beta equal to one and an investor sentiment factor beta equal to zero will have lower active factor risk than a tracking portfolio consisting of CF and EF. |
| Statement 2: | When markets are in equilibrium, no combination of CF and EF will produce an arbitrage opportunity. |

Rodriguez says to Woodson that for a long-term, default-risk-free bond, if the covariance between the bond's price and investors' inter-temporal rate of substitution is positive, the bond will trade at a lower price than it otherwise would, and that covariance will capture the risk premium on the bond.

In their final meeting, Rodriguez informs Woodson that the DB portfolio consistently outperformed its benchmark over the past five years. "The consistency with which DB outperformed its benchmark is amazing. The difference between the DB monthly return and its benchmark's return was nearly always positive and varied little over time," says Rodriguez.

**Question 1 of 6**

The highest possible Sharpe ratio for a portfolio consisting of a combination of the CF fund and the benchmark is *closest* to:

**A) 0.32. ✓**

**B)** 0.35.

**C)** 0.38.

**Explanation**

The optimal combination of the CF and the benchmark portfolio will result in highest possible Sharpe ratio.

The Sharpe ratio for the optimal portfolio consisting of the benchmark and the CF fund can be calculated using the following equality: $SR_P^2 = SR_B^2 + IR_{CF}^2$

$$\begin{aligned} \text{SR}_\text{P} &= \sqrt{{\text{SR}_\text{B}}^2 + {\text{IR}_\text{CF}}^2} \\ &= \sqrt{0.30^2 + 0.12^2} \\ &= 0.3231 \end{aligned}$$

(Module 35.2, LOS 35.b)

**Related Material**
SchweserNotes - Book 5

**Question 2 of 6**

For an investor in the ZF, the optimal level of active risk, and the corresponding total excess return (over risk-free rate), are respectively *closest* to:

| | Optimal active risk | Total excess return |
|---|---|---|
| **A)** | 12.0% | 9.2%. |
| **B)** | **16.7%** ✓ | **10.2%.** |
| **C)** | 18.6% | 11.9%. |

**Explanation**

$$\text{Optimal active risk} = \sigma_{\text{ZF}}{}^{*} = \left(\frac{\text{IR}_{\text{ZF}}}{\text{SR}_{\text{B}}}\right)\sigma_{\text{B}} = \left(\frac{0.25}{0.30}\right)0.20 = 0.1667 = 16.67\%$$

Expected excess return for ZF (active return):

$E(R_A)$ = IR × $\sigma_A$ = (0.25) × (0.1667) = 4.17%

Benchmark excess return = (0.30) × (0.20) = 6%

Total excess return = 4.17% + 6% = 10.17%

(Module 35.2, LOS 35.b)

**Related Material**
SchweserNotes - Book 5

**Question 3 of 6**

Considering the data provided in **Capital Market Forecasts** and **EF Data**, should Rodriguez recommend that Faster Analytics continue to invest in the EF fund using an analysis based on the CAPM or 2-factor APT?

| | CAPM? | 2-factor APT? |
|---|---|---|
| **A)** | Yes | Yes |
| **B)** | **Yes** ✓ | **No** |
| **C)** | No | Yes |

**Explanation**

The equations for required rate of return using the CAPM and a 2-factor APT are respectively:

CAPM: $R_{EF} = RF + \beta_{EF}[E(R_M) - RF]$

2-factor APT: $R_{EF} = RF + \beta_{EF,1}(\lambda_1) + \beta_{EF,2}(\lambda_2)$

Using the data provided in n **Capital Market Forecasts** and n **EF Data**:

CAPM required rate of return = 0.04 + 0.80(0.08) = 0.104 = 10.4%

2-factor APT required rate of return = 0.04 + 1.5(0.05) + 2(0.02) = 0.155 = 15.5%

The expected return for the EF is 12%, which exceeds the CAPM required return. Therefore, Rodriguez predicts that the EF portfolio return will exceed its CAPM required return; a signal to continue investing in EF. However, the forecasted EF return of 12% is less than the 2-factor APT model required return of 15.5%; this is a signal to not invest in EF. (Module 37.1, LOS 37.c)

**Related Material**
SchweserNotes - Book 5

**Question 4 of 6**

Rodriguez's statement regarding default risk-free bonds is *most likely*:

**A)** correct.

**B)** incorrect about the existence of a risk premium on a default-risk-free bond.

**C)** **incorrect about the covariance being positive.** ✓

**Explanation**

The covariance between the uncertain future price of a default-risk-free bond and the investor's intertemporal rate of substitution is negative, resulting in a positive risk premium for a longer-term, default-risk-free bond. (Module 34.1, LOS 34.c)

**Related Material**
SchweserNotes - Book 5

**Question 5 of 6**

Are Woodson's statements 1 and 2 regarding the macro factor model correct?

**A)** Both statements are correct.

**B)** Only statement 1 is correct.

**C)** **Only statement 2 is correct.** ✓

**Explanation**

A portfolio that has a factor beta equal to one for one factor and factor betas equal to zero for all other factors is called a factor portfolio. In contrast, a portfolio that has factor betas equal to the benchmark factor betas is called a tracking portfolio. Unlike the tracking portfolio, the factor portfolio betas are not identical to the benchmark betas. As a result, factor portfolios have higher active factor risk (which refers to the deviations of a portfolio's factor betas from those of the benchmark). Therefore, Woodson's first statement is not correct.

Her second statement is correct. When markets are in equilibrium, all expected (i.e., forecast) asset returns are equal to their required returns. An arbitrage opportunity refers to an investment that requires no cost and no risk yet still provides a profit. If markets are in equilibrium, no profits can be earned from a costless, riskless investment. (Module 37.3, LOS 37.f)

**Related Material**
SchweserNotes - Book 5

**Question 6 of 6**

The historical performance of the DB portfolio is *best* summarized as:

**A)** high active risk.

**B)** high tracking risk.

**C)** **high information ratio.** ✓

**Explanation**

The information ratio equals active return divided by active risk. Active return equals the average difference between the DB portfolio return and the benchmark return. Active risk equals the standard deviation of the DB return minus benchmark return. From the comments made by Rodriquez about the historical performance of the DB portfolio, we know that the numerator of the information ratio is positive and that the denominator is very close to zero. Therefore, the information ratio will be high.

The fund standard deviation is very close to that of its benchmark (since its returns were nearly always a constant percentage above the benchmark). The DB rose and fell with the benchmark (same risk as the benchmark) but always beat the benchmark (outperformed the benchmark). Therefore, tracking risk (which is also referred to as active risk) is low. (Module 37.3, LOS 37.e)

**Related Material**
SchweserNotes - Book 5