2020 FRM Part II

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风险管理与投资管理

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4.   Risk Management and Investment Management

4.1.   Key Point: Factor Theory

4.1.1.   重要知识点

4.1.1.1. Factors and CAPM

➢ **Factors definition**

- Factors are to assets what nutrients are to food.

- Factor risks are driving force behind assets' risk premiums.

- Factors matter, not assets.

- Assets are bundles of factors.

- Different investors need different risk factors.

➢ **Factor risks are bad.**

➢ **Factor theory specifies different types of underlying factor risk.**

➢ **CAPM and its assumptions**

- Assumptions:

  ✓ No transaction costs.

  ✓ Assets are infinitely divisible.

  ✓ The absence of personal income tax.

  ✓ An individual can not affect the price of a stock by his trading.

  ✓ Investors' decision making solely depend on terms of returns and standard deviations of the returns.

  ✓ Unlimited short sales are allowed.

  ✓ Unlimited lending and borrowing at the riskless rate.

  ✓ All investors have identical expectations.

  ✓ All assets are marketable.

- CAPM risk premiums depend only on the assets' beta, which means only one factor – market portfolio.

- Shortcomings of CAPM come from its assumptions.

- Basic intuitions of the CAPM still holds true: risk premiums are compensation for investors' losses during bad times.

➢ Efficient Market Theory and how markets can be inefficient. Losses during bad times are compensated for by high returns.

4.1.2. 基础题

Q-1.   Which of the following concepts most likely to be a factor?

A.   US Treasury Bill.

B.   Corporate Bonds.

C.   Private Equity.

D. Hedge Fund.

Q-2. Andrew Ang develops an analogy, writing "factors are to assets what nutrients are to food." His theory of factor risk premiums includes each of the following three ideas EXCEPT which is not in the theory?

A. Assets are bundles of factors (just as most foods are combinations of nutrients)

B. Factors do matter but asset classes do not (just as healthy eating is about the nutrients not the labels)

C. Different investors prefer and/or need different factors (just as different people have different nutritional needs)

D. Because factors represent different good times, most investors should seek exposure to most investable factors (just as most people should seek a balanced diet of most nutrients)

Q-3. In regard to the capital asset pricing model (CAPM), which of the following assumptions (or implications) of the CAPM is a genuine success such that it is both true in practice and useful to us?

A. Information is costless and available to all investors: technology has reduced information friction to roughly zero

B. Risk is factor exposure: The risk of an individual asset is measured in terms of the factor exposure of that asset

C. Investors have mean-variance utility: asset owners care only about means (which they like) and variances (which they dislike)

D. Investors have homogeneous expectations: investors have identical expectations with respect to the necessary inputs into the portfolio decision

Q-4. Which of the following statements is a limitation of the capital asset pricing model (CAPM)?

A. Investors have a single period investment horizon.

B. The market is not transparent

C. Investors have heterogeneous expectations.

D. People need to pay a liquidity premium to do transaction.

Q-5. Assets that have big profits during periods of low market returns have:

A. Low betas and low risk premiums.

B. Low betas and high risk premiums.

C. High betas and low risk premiums.

D. High betas and high risk premiums.

Q-6. Which behavior does asset payoffs and "bad times" events would most likely perform?

A. The expected payoff of an asset in bad times is unrelated to the asset's expected return, because arbitrageurs eliminate any expected return potential.

B. The expected payoff of an asset in bad times is unrelated to the asset's expected return, because it depends on investor preferences.

C. The higher the expected payoff of an asset in bad times, the higher the asset's expected return.

D. The higher the expected payoff of an asset in bad times, the lower the asset's expected return

4.2.   Key Point: Factors

4.2.1. 重要知识点

4.2.1.1. Factors

➢ **Factors Investing**

● Value Investing and Value Premium

● A value-growth strategy is long value growth stocks and short growth stocks.

● A value stock has a high book-to-market ratio, a growth stock has a low book-to-market ratio.

➢ **Macroeconomic risk factors**

● Economic growth, inflation, and volatility are the three most important macro factors that affect asset prices.

● Rather than level of a factor, it is the unanticipated change to a risk factor that affects asset prices.

➢ **Mitigating volatility risk and Challenges**

● Two basic approaches to mitigate volatility risk:

✓ Invest in less-volatile assets like bonds.

✓ Buy volatility protection in the derivatives market.

➢ **Dynamic risk factor**

● The Fama-French model explains asset returns on three dynamic factors:

✓ Traditional CAPM market risk factor.

✓ A factor that captures size effect (SMB or small cap minus big cap)

✓ A factor that captures value/growth effect (HML or high book-to-market value minus low book-to-market value.

➢ **Value and momentum investment strategies**

- A momentum strategy is long "winners" and short "losers".
- Value strategy is a negative feedback strategy, momentum is a positive feedback strategy.
- Momentum strategies are subject to crashes.

➢ **Different strategy based on different situations and needs.**

4.2.2. 基础题

Q-7. A high book-to-market value ratio is indicative of a:

A. Small-cap stock.

B. Large-cap stock.

C. Value stock.

D. Growth stock

Q-8. Which of the following statements is TRUE about the momentum factor?

A. Momentum is a negative feedback strategy which is inherently stabilizing

B. The momentum factor is observed in equities but is NOT observed in bonds, commodities and real estate

C. Momentum investing by definition is an anti-value strategy; correlations between HML and WML are strongly negative

D. The cumulated profits on momentum strategies have been an order of magnitude larger than cumulated profits on either size or value

Q-9. Which of the following is a factor in the Fama-French three-factor model?

A. Investment Growth.

B. The small capitalization minus big capitalization risk factor.

C. The winners minus losers risk factor.

D. Inflation.

Q-10. Which of the following investment strategies destabilizes asset prices most?

A. A value strategy.

B. A size investment strategy.

C. A momentum investment strategy.

D. Value, momentum, and size strategies all stabilize asset prices.

4.3. Key Point: Alpha and the Low-Risk Anomaly

4.3.1. 重要知识点

4.3.1.1. Alpha and the Low-Risk Anomaly

- Alpha, tracking error, information ratio, Sharpe ratio.
  - Alpha is the average performance of an investor in excess of their benchmark.
  - The standard deviation of excess return is known as tracking error.
  - Information ratio is the ratio of alpha to its tracking error.
  $$IR = \frac{\alpha}{\sigma_\alpha}$$
  - If an investor is using risk free rate as benchmark, Sharpe ratio is:
  $$SR = \frac{E(R_P) - R_f}{\sigma_P}$$
- Ideal Benchmark should be:
  - Well defined.
  - Tradable.
  - Replicable
  - Adjusted for risk.
- Grinold's fundamental law of active management suggests a tradeoff between the number of investment bets placed(breadth) and the required degree of forecasting accuracy(information coefficient)
  $$IR \approx IC \times \sqrt{BR}$$
- Factor Regression
  - Traditional CAPM, APT, Fama-French.
- Application of Factor Regression:
  - Style analysis
- Alphas for nonlinear strategies
- Risk Anomaly
  - Risk anomaly – the stocks with low betas and low volatilities have high returns.
  - Explanations:
    - ✓ Data mining
    - ✓ Leverage constraints
    - ✓ Agency Problems
    - ✓ Preferences
- A comprehensive explanation for risk anomaly is elusive.

4.3.2. 基础题

Q-11. Which of the following statements is incorrect concerning the low-risk anomaly?

A. The low-risk anomaly conflicts with the CAPM.

B. The firms with higher beta perform indifferently with the lower beta firms.

C. The low-risk anomaly point to a negative relationship between risk and reward.

D. The low-risk anomaly suggests that low-beta stocks will outperform high-beta stocks.

Q-12. Which of the following statements is not true regarding benchmark?

A. A benchmark should be well-defined.

B. A benchmark should be replicable.

C. A benchmark should be equally applied to all risky assets irrespective of their risk exposure.

D. A benchmark should be tradeable.

Q-13. Following Grinold's fundamental law of active management, one should find:

A. sector allocation is the most important factor in active management.

B. to maximize the information ratio, active investors need to either have high-quality predictions or place a large number of investment bets in a given year.

C. a small number of investment bets decreases the chances of making a mistake and, therefore, increases the expected investment performance.

D. investors should focus on increasing only their predictive ability relative to stock price movements.

Q-14. Why would an investor include multiple factors in a regression study?

I. To attempt to improve the adjusted R^2 measure.

II. To search for a benchmark that is more representative of a portfolio's investment style.

III. To increase the tests of statistical significance.

A. I only.

B. Both I and III.

C. Both I and II.

D. I, II, and III.

Q-15. Regarding of the risk anomaly, which of the following characteristics is a possible reason?

A. Investor preferences.

B. The presence of highly leveraged retail investors.

C. Lack of short selling constraints for institutional investments.

D. Lack of tracking error constraints for institutional investments.

4.4. Key Point: Portfolio Construction

4.4.1. 重要知识点

4.4.1.1. Portfolio Construction

➢ Portfolio Construction Techniques

- Screens
- Stratification
- Linear Programming
- Quadratic Programming

4.4.2. 基础题

Q-16. Which statement about risk control in portfolio construction is correct?

A. Quadratic programming allows for risk control through parameter estimation but generally requires many more inputs estimated from market data than other methods require.

B. The screening technique provides superior risk control by concentrating stocks in selected sectors based on expected alpha.

C. When using the stratification technique, risk control is implemented by overweighting the categories with lower risks and underweighting the categories with higher risk.

D. When using the linear programming technique, risk is controlled by selecting the portfolio with the lowest level of active risk.

4.5. Key Point: Portfolio Risk Measures

4.5.1. 重要知识点

4.5.1.1. Portfolio Risk Measures

➢ Portfolio VaR

- VaR for uncorrelated positions ($\rho=0$):

$$\text{VaR}_p = \sqrt{\text{VaR}_1^2 + \text{VaR}_2^2}$$

- Undiversified VaR ($\rho=1$)

$$\text{VaR}_p = \text{VaR}_1 + \text{VaR}_2$$

➢ Marginal VaR, Incremental VaR and Component VaR

- $\text{MVaR}_A = \frac{\partial \text{VaR}_P}{\partial V_A}$

$$= z_\alpha \times \frac{\text{Cov}(R_A, R_P)}{\sigma_P}$$

$$= z_\alpha \times \rho_{A,P} \times \sigma_A$$

$$= z_\alpha \times \beta_{A,P} \times \sigma_P$$

$$= \frac{VaR_P}{V_P} \times \beta_{A,P}$$

- Incremental $VaR_A \approx MVaR_A \times W_A$ (any amount)

    Component $VaR_A = MVaR_A \times V_A$

- Global Minimum Portfolio: $MVaR_i = MVaR_j$

- Optimal Portfolio:

    $$\frac{\text{Position i return} - \text{risk free rate}}{MVaR_i} = \frac{\text{Position j return} - \text{risk free rate}}{MVaR_j}$$

> Liquidity Duration: It is an approximation of the number of days necessary to dispose of a portfolio's holdings without a significant market impact.

$$LD = \frac{\text{number of shares of a security}}{\text{desired max daily volume}(\%) \times \text{daily volume}}$$

4.5.2. 基础题

Q-17. A wealth management firm has a portfolio consisting of USD 48 million invested in US equities and USD 35 million invested in emerging markets equities. The 1-day 95% VaR for each individual position is USD 1.2 million. The correlation between the returns of the U.S. equities and emerging markets equities is 0.36. While rebalancing the portfolio, the manager in charge decides to sell USD 8 million of the US equities to buy USD 8 million of the emerging markets equities. At the same time, the CRO of the firm advises the portfolio manager to change the risk measure from 1-day 95% VaR to 10-day 99% VaR. Assuming that returns are normally distributed and that the rebalancing does not affect the volatility of the individual equity positions, by how much will the portfolio VaR increase due to the combined effect of portfolio rebalancing and change in risk measure?

A. USD 4.529 million

B. USD 6.258 million

C. USD 7.144 million

D. USD 7.223 million

Q-18. The bank's trading book consists of the following two assets:

Asset	Annual Return	Volatility of Annual Return	Value
A	10%	25%	100
B	20%	20%	50

Correlation (A, B) = 0.2

How would the daily VaR at 99% level change if the bank sells 50 worth of asset A and buys 50 worth of asset B?

Assume there are 250 trading days in a year. ($\mu_{1-day} = 0$)

A. 0.2286

B. 0.4578

C. 0.7705

D. 0.7798

Q-19. A portfolio manager is evaluating the risk profile for a portfolio of stocks. Currently, the portfolio is valued at CAD 20 million and contains CAD 5 million in stock XYZ. The standard deviation of returns of stock XYZ is 15% annually and that of the overall portfolio is 12% annually. The correlation of returns between stock XYZ and the portfolio is 0.3. Assuming the portfolio manager uses a 1-year 99% VaR and that returns are normally distributed, what is the estimated component VaR of stock XYZ?

A. CAD 162,972

B. CAD 234,906

C. CAD 523,350

D. CAD 632,152

Q-20. Consider a USD 1 million portfolio with an equal investment in two funds, Alpha and Omega, with the following annual return distributions:

Fund	Expected Return	Volatility
Alpha	5%	20%
Omega	7%	25%

Assuming the returns follow the normal distribution and that there are 252 trading days per year, what is the maximum possible daily 95% Value-at-Risk (VaR) estimate for the portfolio?($\mu_{1-day} = 0$)

A. USD 16,587

B. USD 23,316

C. USD 23,459

D. USD 32,973

Q-21. A portfolio consists of two positions. The VaR of the two positions are $10 million and $20million. If the returns of the two positions are not correlated. The VaR of the portfolio would be closest to:

A. $5.48million

B. $15.00million

C. $22.36million

D. $25.00million

Q-22. A portfolio is composed of two securities and has the following characteristics:

Investment in X:	USD 1.8 million
Investment in Y:	USD 3.2 million
Volatility of X:	8%
Volatility of Y:	4%
Correlation between X and Y:	15%

The portfolio diversified VaR at the 95% confidence level is closest to:

A. $14,074

B. $206,500

C. $404,740

D. $340,725

Q-23. The manager of the Beta Balance fund, a balanced global equity and fixed-income portfolio, believes that globalization is causing the correlations of equity and fixed-income returns across different markets to rise over time. He decides to adjust the correlations in his VaR analysis for the coming year to reflect the higher correlations he expects. If his expectation turns out to be incorrect, what is the most likely result?

A. There will be no impact on the portfolio because VaR is only a prediction, and portfolio return depends on what actually happens.

B. The portfolio return will be lower than it should have been, given the expected risk level, because asset allocation will not have been optimal.

C. The risk of the portfolio will have been understated because of the incorrect estimate of correlation among global markets.

D. The portfolio return will be higher than it should have been, given the expected risk level, because of the higher correlation among asset classes

The next two questions are based on the following information.

A risk manager assumes that the joint distribution of returns is multivariate normal and calculates the following risk measures for a 2-asset portfolio:

Asset	Position	Individual VaR	Marginal VaR	VaR Contribution
1	USD 100	USD 23.3	0.176	USD 17.6
2	USD 100	USD 46.6	0.440	USD 44.0
Portfolio	USD 200	USD 61.6		USD 61.6

Q-24. If asset 1 is dropped from the portfolio, what will be the reduction in portfolio VaR?

A. USD 15.0

B. USD 38.3

C. USD 44.0

D. USD 46.6

Q-25. Let $\beta_i = \rho\sigma_i/\sigma_p$, where ρ denotes the correlation between the return of asset i and the return of the portfolio, σ_i is the volatility of the return of asset i and σ_p is the volatility of the return of the portfolio. What is β_2?

A. 0.714

B. 1.429

C. 1.513

D. Cannot determine from information provided.

Q-26. Consider the following two asset portfolios:

Asset	Position Value (In Thousands of USD)	Return Standard Deviation (%)	Beta
A	400	3.60	0.5
B	600	8.63	1.2
Portfolio	1,000	5.92	1

Calculate the component VaR of asset A and marginal VaR of asset B, respectively, at the 95% confidence level.

A. USD 21,773 and 0.1306

B. USD 21,773 and 0.1169

C. USD 19,477 and 0.1169

D. USD 19,477 and 0.1306

Q-27. A risk analyst is evaluating the risks of a portfolio of stocks. Currently, the portfolio is valued at EUR 200 million and contains EUR 15 million in stock A. The standard deviation of returns of stock A is 16% annually and that of the overall portfolio is 21% annually. The correlation of returns between stock A and the portfolio is 0.37. Assuming the risk analyst uses a 1-year 99% VaR and that returns are normally distributed, how much is the component VaR of stock A?

A. EUR 2.066 million

B. EUR 2.326 million

C. EUR 5.582 million

D. EUR 7.327 million

Q-28. A portfolio manager currently holds 8,000 shares of GF Inc. in a particular portfolio. The daily volume of GF shares traded on the stock exchange is 2,000. Additionally, on any

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given day, the portfolio manager wishes to trade no more than 25% of the daily trading volume of GF. Which of the following amounts is closest to the liquidity duration of GF in this portfolio?

A. 0.06

B. 0.40

C. 6.50

D. 16.00

Q-29. A portfolio manager wants to invest a small amount of new money that has recently come into a fund. The fund is benchmarked to an index and, rather than adding a new holding, the manager is considering increasing the holdings of one of the four assets described in the following table:

Asset	Expected Return	Beta to the Index	Beta to the Portfolio
A	12%	1.2	0.90
B	10%	0.7	0.90
C	10%	0.6	0.85
D	8%	0.3	1.10

The portfolio manager wants to select the asset that has the lowest marginal VaR as long as its Treynor ratio is at least 0.1. Assuming the risk free rate is 2%, which asset should the portfolio manager select?

A. Asset A

B. Asset B

C. Asset C

D. Asset D

4.6. Key Point: Portfolio Risk Management

4.6.1. 重要知识点

4.6.1.1. tracking error

> Relevant return is the tracking error (TE), which is excess return of asset over benchmark.

$$TE = R_P - R_B$$

$$TEV = \sigma(e) = \sqrt{\sigma_P^2 - 2\rho\sigma_P\sigma_B + \sigma_B^2}$$

4.6.1.2. policy mixed VaR

> the policy mix risk is the risk of a dollar loss owing to the policy mix selected by the fund.

4.6.1.3. Surplus at Risk

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> Surplus (S) is the difference between the value of the assets (A) and the liabilities (L). The change in the surplus (ΔS) is equal to the change in assets (ΔA) minus the change in liabilities (ΔL). If we normalize by the assets, the return on the surplus is given by:

$$\text{Expected surplus} = A \times (1 + R_A) - L \times (1 + R_L)$$

$$\sigma_{Surplus} = \sqrt{A^2\sigma_A{}^2 + L^2\sigma_L{}^2 - 2A\sigma_A L\sigma_L\rho}$$

$$\text{Surplus at risk} = z_\alpha \times \sigma_{Surplus}$$

> Funding risk should be measured as the potential shortfall in surplus over the horizon, this is sometimes called surplus at risk.

4.6.1.4. Risk Budgeting

> **Budget Risk across Asset Classes**: Budgeting risk across asset classes means selecting assets whose combined VaRs are less than the total allowed. The budgeting process would examine the contribution each position makes to the portfolio VaR.

> **Budget Risk across Active Managers**: For allocating across active managers, if the tracking errors of the managers are independent of each other, it can be shown that the optimal allocation is achieved with the following formula:

$$\text{weight of portfolio managed by manager } i = \frac{IR_i \times (\text{Portfolio's tracking error volatility})}{IR_P \times (\text{Manager' s tracking error volatility})}$$

■ For a given group of active managers, the weights may not sum to one. The remainder of the weight can be allocated to the benchmark, which has no tracking error.

4.6.2. 基础题

Q-30. You are evaluating the performance of Valance, an equity fund designed to mimic the performance of the Russell 2000 Index. Based upon the information provided below, what is the best estimate of the tracking error of Valance relative to the Russell 2000 Index?

Annual volatility of Valance:	35%
Annual volatility of the Russell 2000 Index:	40%
Correlation between Valance and the Russell 2000 Index:	0.90

A. 3.1%

B. 17.5%

C. 39.6%

D. 53.2%

Q-31. On January 1, 2006, a pension fund has assets of EUR 100 billion and is fully invested in the equity market. It has EUR 85 billion in liabilities. During 2006, the equity market declined by 15% and yields increases by 1.2%. If the modified duration of the liabilities is 12.5, what is the pension fund's surplus on December 31, 2006?

A. EUR 15.00 billion

B. EUR 12.93 billion

C. EUR 12.75 billion

D. EUR 12.57 billion

Q-32. At the end of 2007, Chad & Co.'s pension had USD 350 million worth of assets that were fully invested in equities and USD 180 million in fixed-income liabilities with a modified duration of 14. In 2008, the wide spread effects of the subprime crisis hit the pension fund, causing its investment in equities to loss 50% of their market value. In addition, the immediate response from the government – cutting interest rates – to salvage the situation, caused bond yields to decline by 2%. What was the change in the pension fund's surplus in 2008?

A. USD -55.4 million

B. USD -124.6 million

C. USD -225.4 million

D. USD -230.4 million

Q-33. An analyst reports the following fund information to the advisor of a pension fund that currently invests in government and corporate bonds and carries a surplus of USD 10 million.

Pension Assets	Assets	Liabilities
Amount (in USD million)	100	90
Expected Annual Growth	6%	7%
Modified Duration	12	10
Annual Volatility of Growth	10%	5%

To evaluate the sufficiency of the fund's surplus, the advisor estimates the possible surplus values at the end of one year. The advisor assumes that annual returns on assets and the annual growth of the liabilities are jointly normally distributed and their correlation coefficient is 0.8. The advisor can report that, with a confidence level of 95%, the surplus value will be greater than or equal to:

A. USD -11.4 million

B. USD -8.3 million

C. USD -1.7 million

D.   USD 0 million

Q-34.   Which of the following statements about risk management in the pension fund industry is correct?

A.   A pension plan's total VaR is equal to the sum of its policy-mix VaR and active management VaR.

B.   Pension fund risk analysis does not consider performance relative to a benchmark.

C.   In most defined-benefit pension plans, if liabilities exceed assets, the shortfall does not create a risk for the plan sponsor.

D.   From the plan sponsor's perspective, nominal pension obligations are similar to a short position in a bond.

Q-35.   A company's pension fund is established as a defined benefit plan, and therefore the board must consider funding risk. Which of the following statements about the pension fund's funding risk is correct?

A.   The longer the horizon for expected payouts, the lower the funding risk.

B.   Decreases in interest rates will reduce funding risk.

C.   The funding risk has been effectively transferred to the employees.

D.   Funding risk represents the true long-term risk to the plan sponsor.

Q-36.   The AT&T pension fund has an allocation of $60 million devoted to U.S. equities. Now the fund wants to allocate this $60 million to two managers. This is equivalent to a risk budget of $3.948 million. Each manager has a TEV of 6%. The fund managers have different capabilities, their IRs are 0.6(manager 1) and 0.4(manager 2).To achieve an exact TEV of 4% and information ratio of 0.725, the weight for each should be?

A.   Manager1: 55.17%, Manager2: 36.78%

B.   Manager1: 55.17%, Manager2: 44.83%

C.   Manager1: 36.78%, Manager2: 55.17%

D.   Insufficient information to calculate

4.7.   Key Point: Performance Measurement and Evaluation

4.7.1.   重要知识点

4.7.1.1. Portfolio Performance Measurement

➤ Performance Analysis

$$SR = \frac{E(R_P) - R_f}{\sigma_P}$$

$$TR = \frac{E(R_P) - R_f}{\beta_P}$$

$$\alpha_P = E(R_P) - \{R_F + \beta_P[E(R_M) - R_F]\}$$

$$IR = \frac{E(R_P) - E(R_B)}{\sigma_{TE}}$$

$$\sigma_{TE}^2 = \sigma_{(P-B)}^2 = \sigma_P^2 + \sigma_B^2 - 2\rho\sigma_P\sigma_B$$

➤ Performance Attribution

● Refers to the set of techniques used by performance analysts to identify the sources of value addition to the portfolio. For example, how much of the performance (excess returns above benchmark) is attributable to the selection of the right asset classes or how much is attributable to selection of right sector or security within an asset class.

4.7.2. 基础题

Q-37. A manager who obtains an average alpha of 2.5% with a tracking-error of 4%. If he wish the result to be significant to 95%, how many years it is necessary to observe the portfolio return?

A. 8.8 years

B. 9.8 years

C. 10.8 years

D. 11.8 years

Q-38. Based on 60 monthly returns, you estimate an actively managed portfolio alpha = 1.24% and standard error of alpha = 0.1278%. The portfolio manager wants to get due credit for producing positive alpha and believes that the probability of observing such a large alpha by chance is only 1%. Calculate the t-statistic, and based on the estimated t-value would you accept (or reject) the claim made by the portfolio manager.

A. t = 9.70, accept

B. t = 2.66, accept

C. t = 2.66, reject

D. t = 9.70, reject

Q-39. Consider the following performance date for a sample period:

	Portfolio (P)	Market (M)
Average return	15%	9%

Beta	1.6	1.0
Standard deviation	32%	24%
Tracking error	20%	0
Risk free rate	—	3%

If the Portfolio (P) is one sub-portfolio that is combined with several other portfolios into a large investment fund, which is the appropriate risk-adjusted performance measure (RAPM) and what is its value for Portfolio (P)?

- A. Sharpe of 25.0%
- B. Treynor of 6.0%
- C. Treynor of 7.5%
- D. Information ratio of 12.0%

Q-40. Consider the following performance date for a sample period:

	Portfolio (P)	Market (M)
Average return	15%	8%
Beta	0.9	1.0
Standard deviation	27%	15%
Tracking error	20%	0
Risk free rate	—	2%

If the Portfolio (P) represents the active portfolio to be optimally mixed with the passive portfolio, which is the appropriate risk-adjusted performance measure (RAPM) and what is its value for Portfolio (P)?

- A. Sharpe of 0.4815
- B. Jensen (alpha) of 0.0760
- C. Treynor of 14.44%
- D. Information ratio of 0.380

Q-41. Rick Masler is considering the performance of the managers of two funds, the HCM Fund and the GRT Fund. He uses a linear regression of each manager's excess returns (r_i) against the excess returns of a peer group (r_B):

$r_i = a_i + b_i \times r_B + e_i$

The information he compiles is as follows:

Fund	Initial Equity	Borrowed Funds	Total Investment Pool	a_i	b_i
HCM	USD 100	USD 0	USD 100	0.0150 (t = 4.40)	0.9500 (t = 12.1)
GRT	USD 500	USD 3,000	USD 3,500	0.0025 (t = 0.002)	3.4500 (t = 10.20)

Based on this information, which of the following statements is correct?

A. The regression suggests that both managers have greater skill than the peer group.

B. The a_i term measures the extent to which the manager employs greater or lesser amounts of leverage than do his/her peers.

C. If the GRT Fund were to lose 10% in the next period, the return on equity (ROE) would be -60%.

D. The sensitivity of the GRT fund to the benchmark return is much higher than that of the HCM fund.

Q-42. A portfolio has an average return over the last year of 13.2%. Its benchmark has provided an average return over the same period of 12.3%. The portfolio's standard deviation is 15.3%, its beta is 1.15, its tracking error volatility is 6.5% and its semi-standard deviation is 9.4%. Lastly, the risk-free rate is 4.5%. Calculate the portfolio's information Ratio (IR).

A. 0.569

B. 0.076

C. 0.138

D. 0.096

Q-43. Portfolio Q has a beta of 0.7 and an expected return of 12.8%. The market risk premium is 5.25%. The risk-free rate is 4.85%. Calculate Jensen's Alpha measure for Portfolio Q.

A. 7.67%

B. 2.70%

C. 5.73%

D. 4.27%

Q-44. A risk manager runs a performance attribution analysis on an actively managed portfolio using a selected benchmark. The weights and performance of the different market sectors within the portfolio and the benchmark are given below:

Market Sector	Benchmark		Portfolio	
	Weight	Annual Return	Weight	Annual Return
Equity	20%	8%	40%	6%
Fixed Income	50%	4%	55%	5%
Cash	30%	2%	5%	3%

What conclusion can be drawn from the data above by using common performance attribution analysis?

19-38

A. The portfolio outperforms the benchmark primarily because of the contribution of asset allocation.

B. The portfolio outperforms the benchmark primarily because of the contribution of security selection within market sectors.

C. The portfolio underperforms the benchmark primarily because of the contribution of asset allocation.

D. The portfolio underperforms the benchmark primarily because of the contribution of security selection within market sectors.

4.8. Key Point: Hedge Fund Strategy

4.8.1. 重要知识点

4.1.1.1. Hedge Fund Trading Strategy

➢ Equity long/short strategy: go long and short similar securities to exploit mispricing-decreases market risk and generates alpha.

➢ Global macro strategy: makes leveraged bets on anticipated price movements in broad equity and fixed-income markets, interest rates, foreign exchange, and commodities.

➢ Emerging markets strategy: invests in developing countries' securities or sovereign debt.

➢ Fixed-income arbitrage strategy: long/short strategy that looks for pricing inefficiencies between various fixed-income securities.

➢ Convertible arbitrage strategy: investor purchases a convertible bond and sells the underlying stock.

➢ Merger arbitrage strategy: involves purchasing shares in a target firm and selling short shares in the purchasing firm.

➢ Distressed investing strategy: purchase bonds of distressed company and sell short the stock, antic bating that the shares will eventually be worthless.

➢ Fund of hedge funds: perform screening and due diligence of other funds. Fees can be extensive, and the due diligence does not always identify fraud. A key advantage is diversification benefit without large capital commitment.

4.8.2. 基础题

Q-45. Which of the following statements about convertible arbitrage hedge fund strategies is correct?

A. Credit risk plays only a minor role in convertible arbitrage hedge funds.

B. Investing in convertible arbitrage does not require an understanding of liquidity considerations as the market for convertible securities is sufficiently liquid today.

C. Gamma trading entails significant directional exposure to the equity markets.

D. Re-hedging after significant moves of the underlying stock price is the essence of gamma trading.

Q-46. Identify the risks in a convertible arbitrage strategy that takes long positions in convertible bonds hedged with short positions in Treasuries and the underlying stock.

A. Short implied volatility

B. Long duration

C. Long stock delta

D. Positive gamma

Q-47. George Smith, a hedge fund manager, has just established a short position in short-term Swiss government bonds that are currently yielding 3.5% and a long position in short-term Italian government bonds that are yielding 4.2%. Smith believes the market has underestimated the probability that the Swiss Franc will appreciate relative to the euro. Which of the following hedge fund strategies is most similar to Smith's strategy?

A. Pair trading strategy.

B. Managed futures strategy.

C. Global macro strategy.

D. Event-driven strategy.

Q-48. A fund of hedge funds combines a mix of strategy sectors, managers, and styles, and therefore fund of funds risk managers need to understand the common attributes of hedge fund strategies. Which of the following statements is incorrect?

A. Equity market neutral funds aim to generate returns that have low correlation with the overall equity market and to insulate their portfolios from broad market risk factors.

B. Convertible arbitrage funds typically purchase securities that are convertible into the issuer's stock and simultaneously short the underlying stock. These funds earn returns in part form gamma trading on the stock's volatility.

C. Merger arbitrage funds buy the stock of an acquisition target company and simultaneously short the bidding company's stock. These funds have large exposure to deal risk.

D. Equity short-selling funds sell stocks not currently owned by the seller in order to take a directional bet that the stock price will decline. These funds tend to be uncorrelated with traditional long-only equity portfolios.

Q-49. EACH of the following makes it difficult to evaluate the performance of hedge funds EXCEPT for:

A. Liquidity risk: Hedge funds tend to hold more illiquid assets, such that compensation for illiquidity may mistakenly appear to be alpha

B. Tail risk: Some hedge fund strategies will earn consistent profits for a period, appearing to be high reward per unit of risk, but are exposed to tail risk; e.g., writing deep OTM puts

C. Incentive structure: carried interest fee creates a circularity in the evaluation model that is difficult to overcome

D. Instability of risk attributes: As hedge funds have greater leeway to invest opportunistically, their factor loading and risk profile changes rapidly

4.9. Key Point: Risk Management of Hedge Fund

4.9.1. 重要知识点

4.1.1.2. Hedge Fund Risk

➢ Liquidity Risk

● More liquid assets should exhibit less serial autocorrelation than illiquid assets.

● A Q-statistic is used as a summary measure of the overall statistical significance of autocorrelations.

● This create two biases: Low correlations; Low volatility

➢ Style Drift

● Changes in the risk factor exposures

● Changes in the overall risk of the fund

➢ Phase-Locking Phenomenon

4.9.2. 基础题

Q-50. Every year Business Week reports the performance of a group of existing equity mutual funds, selected for their popularity. Taking the average performance of this group of funds will create

A. Survivorship bias only

B. Selection bias only

C. Both survivorship and selection bias

D. Instant-history bias only

Q-51. A factor analysis of returns for hedge funds employing a equity market-neutral strategy produces strongly positive performance information for the strategy (for example,

impressive Sharpe ratios). However, the analysis is guilty of neglecting the effects of survivorship bias. If the problem is survivorship bias, which of the following criticisms of the methodology is best?

A. The sample is too small

B. The historical window is too short

C. Risk metrics needs to be included along with return metrics

D. Past performance is no guarantee of future performance

Q-52. A risk analyst at an investment bank is reviewing the way performance analysis of hedge funds and real estate funds have been conducted. Each year, whenever a hedge fund stops trading, the hedge fund is removed from the database of hedge funds. Also, because of the addition of new assets to the real estate fund, the liquidity of that asset category has improved each year and trading has become more frequent. Which of the following best describes the impacts these changes have historically had on hedge fund and real estate fund analyses performed using these databases?

A. The average Sharpe ratio of hedge funds is understated and the average Sharpe ratio of real estate funds has increased.

B. The average Sharpe ratio of hedge funds is overstated and the average Sharpe ratio of real estate funds has decreased.

C. The average volatility of hedge funds is overstated and the average volatility of real estate funds has decreased.

D. The average volatility of hedge funds is understated and the average volatility of real estate funds has increased.

Q-53. Which of the following statements are true?

I. Hedge fund manager compensation is often symmetric (i.e., a dollar of gain has the opposite impact on compensation as a dollar of loss), while the compensation of mutual fund managers is almost always asymmetric.

II. Leverage obtained through lines of credit increases the risk of a hedge fund more than leverage obtained by issuing debt, because unexpected cancellation of a line of credit by a lender during troubled times can force a fund to liquidate its positions in illiquid markets.

III. A hedge fund investor should pay performance-based compensation to the manager for producing alpha, but should not pay performance-based compensation to a hedge fund manager who has done well because the fund invests in risk factors that mirror the performance of his style or strategy, and the style or strategy has performed well.

      IV. The lack of hedge fund transparency is particularly Problematic for investors with fiduciary responsibilities such as pension fund managers, and to secure funding from these investors, hedge fund managers often have to provide more information to these investors.

A. I, II, and IV only.

B. II, III, and IV only.

C. II and IV only.

D. I and III only.

Q-54. For a portfolio of illiquid assets, hedge fund managers often have considerable discretion in portfolio valuation at the end of each month and may have incentives to smooth returns by marking values below actual in high-return months and above actual in low-return months. Which of the following is not a consequence of return smoothing over time?

A. Higher Sharpe ratio

B. Lower volatility

C. Higher serial correlation

D. Higher market beta

Q-55. In performing due diligence on a potential investment manager, which of the following factors is the least important for the investor to consider?

A. Risk controls

B. Business model

C. Past performance

D. Investment process

Q-56. A due diligence specialist is evaluating the risk management process of a hedge fund in which his company is considering making an investment. Which of the following statements best describes criteria used for such an evaluation?

A. Because of the overwhelming importance of tail risk, the company should not invest in the fund unless it fully accounts for fat tail using extreme value theory at the 99.99% level when estimating VaR.

B. Today's best practices in risk management require that a fund employ independent risk service providers and that these service providers play important roles in risk-related decisions.

C. When considering a leveraged fund, the specialist should assess how the fund estimates risks related to leverage, including funding liquidity risks during periods of

market stress.

D. It is crucial to assess the fund's valuation policy, and in general if more than 10% of asset prices are based on model prices or broker quotes, the specialist should recommend against investment in the fund regardless of other information available about the fund.

Q-57. A due diligence specialist at an asset management firm is evaluating the risk management process of a hedge fund in which the firm is considering making an investment. Which of the following statements best describes appropriate criteria the specialist should use for such an evaluation?

A. The firm should ensure that the hedge fund allows direct, in-person communications with the fund's senior management or key decision makers at the fund.

B. Today's best practices in risk management require that a fund employ independent risk service providers and that these service providers play important roles in risk-related decisions.

C. When considering investing in a leveraged fund, the company should not invest in the fund unless the fund's gross leverage ratio is above the peer group average.

D. It is crucial to assess the fund's valuation policy, and in general if more than 10% of asset prices are based on model prices or broker quotes, the specialist should recommend against investment in the fund.

Q-58. When measuring risk in hedge funds that hold illiquid assets using monthly data, certain biases can create a misleading picture. For example, these hedge funds might have the appearance of low systematic risk. Which of the following represents an appropriate means of correction?

A. Account for negative serial correlation of returns by first differencing the data when extrapolating risk to longer time horizons.

B. Account for positive serial correlation of returns by aggregating the data.

C. Use regressions with fewer lags of the market factors and sum the coefficients across lags.

D. Use regressions with additional lags of the market factors and sum the coefficients across lags.

SOLUTIONS

1.   Solution: A

Assets, including corporate bonds, private equity, and hedge funds, are not considered factors themselves, but contain many factors, such as equity risk, interest rate risk, volatility risk, and default risk.

Some assets, like equities and government bonds, can be thought of as factors themselves. Factors may also include the market (a tradable investment factor), interest rates, or investing styles (including value/growth, low volatility, or momentum).

2.   Solution: D

There are three similarities between food and assets:

1.   Factors matter, not assets.

2.   Assets are bundles of factors.

3.   Different investors need different risk factors.

3.   Solution: B

Here is a summary of the successes of CAPM ("ideas it gets right"):

1.   Don't hold an individual asset, hold the factor.

2.   Each investor has his own optimal exposure of factor risk.

3.   The average investor holds the market.

4.   The factor risk premium has an economic story.

5.   Risk is factor exposure.

6.   Assets paying off in bad times have low risk premiums.

4.   Solution: A

The CAPM does not assume uniform taxes and transaction costs; it assumes there are no taxes or transaction costs (i.e., frictionless markets). The other limiting assumptions of the CAPM include:

1. Investors only have financial wealth.

2. Investors have mean-variance utility.

3. Investors have a single period investment horizon.

4. Investors have homogeneous (identical) expectations.

5. All investors are price takers.

5.   Solution: A

Assets that have losses during periods of low market returns have high betas (high sensitivity to market movements), which indicates they are risky and, therefore, should have high risk premiums. Low beta assets have positive payoffs when the market performs poorly, making them valuable to investors. As a result, investors do not require high risk premiums to hold these assets.

6. Solution: D

The higher the expected payoff of an asset in bad times, the lower the assets expected return. Assets that have a positive payoff in bad times are valuable to hold, leading to high prices and, therefore, low expected returns.

7. Solution: C

A company's book value per share is equal to total assets minus total liabilities all divided by shares outstanding. It indicates, on a per-share basis, what a company would be worth if it liquidated its assets and paid off its liabilities. Value stocks have high book-to-market ratios while growth stocks have low book-to-market ratios.

8. Solution: D

Momentum is a positive feedback strategy

Momentum is observed in every asset class: we observe it in international equities, commodities, government bonds, corporate bonds, industries and sectors, and real estate.

Momentum returns are not the opposite of value returns: Value is a negative feedback strategy, where stocks with declining prices eventually fall far enough that they become value stocks. Then value investors buy them when they have fallen enough to have attractive high expected returns. Value investing is inherently stabilizing. Stocks with high past returns are attractive, momentum investors continue buying them, and they continue to go up! Positive feedback strategies are ultimately destabilizing and are thus subject to periodic crashes.

9. Solution: B

The Fama-French model includes the following three risk factors:

1. The traditional capital asset pricing model market risk factor.
2. A factor that captures the size effect (SMB).
3. A factor that captures the value/growth effect (HML).

The winners minus losers (WML) momentum factor was discovered by Jagadeesh and Titman in 1993 and was first put into use by Carhard to build a four-factor model.

10. Solution: C

Value and momentum are opposite each other in that value investing is inherently stabilizing. It is a negative feedback strategy where stocks that have fallen in value eventually are priced low enough to become value investments, pushing prices back up. Momentum is inherently destabilizing. It is a positive feedback strategy where stocks that have been increasing in value are attractive to investors, so investors buy them, and prices increase even more. Momentum can be

riskier than value or size investing in that it is more prone to crashes.

11. Solution: B

The low-risk anomaly violates the CAPM and suggests that low beta stocks will outperform high-beta stocks. This has been empirically proven with several studies. The CAPM points to a positive relationship between risk and reward, but the low-risk anomaly suggests an inverse relationship.

12. Solution: C

An appropriate benchmark should be well-defined, replicable, tradeable, and risk-adjusted. If the benchmark is not on the same risk scale as the assets under review, then there is an unfair comparison.

13. Solution: B

Grinold's fundamental law of active management focuses on the trade-off of high quality predictions relative to placing a large number of investment bets. Investors can focus on either action to maximize their information ratio, which is a measure of risk-adjusted performance. While sector allocation is a very important component of the asset allocation decision, Grinold focused only on the quality of predictions and the number of investment bets made.

14. Solution: D

An investor should consider adding multiple factors to the regression analysis to potentially improve the adjusted R^2 measurement, potentially increase the tests of statistical significance, and to search for a benchmark that is more representative of a portfolio's investment style.

15. Solution: A

Potential explanations for the risk anomaly include: the preferences of investors, leverage constraints on retail investors that drive them to buy pre-leveraged investments in the form of high-beta stocks, and institutional investor constraints like prohibitions against short selling and tracking error tolerance bands.

16. Solution: A

Quadratic programming requires many more inputs than other portfolio construction techniques because it entails estimating volatilities and pair-wise correlations between all assets in a portfolio. Quadratic programming is a powerful process, but given the large number of inputs it introduces the potential for noise and poor calibration given the less than perfect nature of most data.

On the other hand, the screening technique strives for risk control by including a sufficient number of stocks that meet the screening parameters and by weighting them to avoid concentrations in any particular stock. However, screening does not necessarily select stocks evenly across sectors and can ignore entire sectors or classes of stocks entirely if they do not pass the screen. Therefore, risk control in a screening process is fragmentary at best.

Stratification separates stocks into categories (for example, economic sectors) and implements risk control by ensuring that the weighting in each sector matches the benchmark weighting. Therefore, it does not allow for overweighting or underweighting specific categories.

Linear programming does not necessarily select the portfolio with the lowest level of active risk. Rather, it attempts to improve on stratification by introducing many more dimensions of risk control and ensuring that the portfolio approximates the benchmark for all these dimensions.

17. Solution: D

D is correct. The first step is to calculate the VaR of the original portfolio of two equities, U.S (u) and emerging markets (e). This can be derived by using the following equation:

$VaR_p = \sqrt{VaR_u^2 + VaR_e^2 + 2\rho \times VaR_u \times VaR_e}$, where ρue is the correlation coefficient.

(i) Initial position: The portfolio 1-day 95% VaR (before the rebalancing) is therefore:

$VaR_p = \sqrt{1.2^2 + 1.2^2 + 2 \times 0.36 \times 1.2 \times 1.2} = USD\ 1.979 million$

(ii) Rebalanced position: 1-day 95% VaR: After the rebalance, the market value of the position in the U.S. equities is reduced by 8/48 = 0.1667, so VaR_u is now equal to (1 - 0.1667)×(USD 1.2 million) = USD 1.0 million. Meanwhile the market value for the position in the emerging market equities has increased by 8/35 = 0.2286 so that VaR_e is now (1 + 0.2286)× (USD 1.2 million) = USD 1.474 million. Hence the 1-day 95% VaR of the new portfolio (after rebalancing) = USD 2.058 million and is calculated as follows:

$VaR_p = \sqrt{1.474^2 + 1^2 + 2 \times 0.36 \times 1.474 \times 1} = USD\ 2.058 million$

(iii) Next, convert the 1-day 95% VaR to 10-day 95% VaR:

10-day 95% VaR = (1-day 95% VaR) × sqrt(10)/1 = 2.058 x 3.162278 = USD 6.508 million.

(iv) Finally, convert the 10-day 95% VaR to 10-day 99% VaR:

10-day 99% VaR = (10-day 95% VaR) × (2.326/1.645) = 6.508 x 1.4140 = USD 9.202 million. The question is to compare the original 1-day 95% VaR (USD 1.979m) to the new rebalanced 10-day 99% VaR (USD 9.202). Thus, VaR will increase by (9.202 − 1.979) million, or USD 7.223 million. Thus, D is correct.

18. Solution: B

$$\sigma_p = \sqrt{\omega_1^2\sigma_1^2 + \omega_2^2\sigma_2^2 + 2\rho\omega_1\sigma_1\omega_2\sigma_2}$$

$$\sigma_{previous}^{1-year} = \sqrt{(\frac{2}{3})^2 \times (25\%)^2 + (\frac{1}{3})^2 \times (20\%)^2 + 2 \times 0.2 \times \frac{1}{3} \times \frac{2}{3} \times 20\% \times 25\%} = 0.191485$$

$$\sigma_{now}^{1-year} = \sqrt{(\frac{1}{3})^2 \times (25\%)^2 + (\frac{2}{3})^2 \times (20\%)^2 + 2 \times 0.2 \times \frac{1}{3} \times \frac{2}{3} \times 20\% \times 25\%} = 0.170783$$

$$\sigma_{previous}^{1-year} = \sigma_{previous}^{1-day} \times \sqrt{250} \rightarrow \sigma_{previous}^{1-day} = \frac{0.191485}{\sqrt{250}} = 0.012111$$

$$\sigma_{now}^{1-year} = \sigma_{now}^{1-day} \times \sqrt{250} \rightarrow \sigma_{now}^{1-day} = \frac{0.170783}{\sqrt{250}} = 0.010801$$

$$\text{VaR}_{change} = z \times \sigma_{change} \times P = 2.33 \times (0.12111 - 0.010801) \times 150 = 0.4578$$

The trade will decrease the VaR by 0.4578.

19. Solution: C

Let Z(99%) represent the 99% confidence factor for the VaR estimate, which is 2.326, r_{XYZ} represent the correlation of stock XYZ with the portfolio, which is 0.3, and V_{XYZ} represent the value of stock XYZ, which is CAD 5 million.

Then, $MVaR_{XYZ} = Z(99\%) \times s_{XYZ} \times r_{XYZ} = 2.326 \times 15\% \times 0.3$

Component $VaR_{XYZ} = MVaR_{XYZ} \times V_{XYZ} = $ CAD 523,350

20. Solution: B

This question tests that the candidate understands correlation in calculating portfolio VaR. From the table, we can get daily volatility for each fund:

Fund Alpha volatility: $0.20 / 252^{0.5} = 1.260\%$

Fund Omega volatility: $0.25 / 252^{0.5} = 1.575\%$

Portfolio variance:

$0.5^2 \times 0.01259^2 + 0.5^2 \times 0.01574^2 + 2 \times 0.5 \times 0.5 \times 0.01259 \times 0.01574 \times \rho$

Portfolio volatility = (portfolio variance)$^{0.5}$

Portfolio volatility is least when $\rho = -1 \rightarrow$ portfolio volatility = 0.1575%

Portfolio volatility is greatest when $\rho = 1 \rightarrow$ portfolio volatility = 1.4175%

Therefore, 95% VaR maximum is $1.645 \times 0.014175 \times 1,000,000 = USD23, 316$

21. Solution: C

For uncorrelated positions, the answer is the square root of the sum of the spread VaRs:

$$\text{VaR}_p = \sqrt{10^2 + 20^2} = \$22.36 \text{ million}$$

22. Solution: D

$$\text{VaR}_p = 1.65 \times \sqrt{(1.8 \times 0.08)^2 + (3.2 \times 0.04)^2 + 2 \times 15\% \times (1.8 \times 0.08) \times (3.2 \times 0.04)}$$
$$= 0.340754 \text{ Million}$$

23. Solution: B

An error in predicting correlation among asset classes will cause the calculation of optimal asset allocation to be in error as well. Thus, the asset allocation of the portfolio will be less than optimal. Any portfolio that does not have optimal asset allocation will, by definition, have returns that are too low for the expected level of risk. The risk of the portfolio will be overstated because the estimates of correlation among markets were too high.

24. Solution: A

A is correct: The new portfolio VaR is that of asset 2 alone (USD 46.6), which implies a reduction in portfolio VaR of USD 61.6 - USD 46.6 = USD 15.0

25. Solution: B

Marginal VaR$_i$ = β_i × Portfolio VaR / Portfolio Value

So, β_i = Marginal VaR$_i$ × Portfolio Value/Portfolio VaR

β_2= 0.44×200/ 61.6 = 1.429

26. Solution: C

$$\text{VaR}_p = \alpha \times \text{portfolio standard deviation} \times \text{portfolio value}$$
$$= 1.645 \times 0.0592 \times \text{USD}1{,}000{,}000 = \text{USD}97{,}384$$

$$\text{Component VaR}_A = \text{USD}97{,}384 \times 0.5 \times \frac{400}{1000} = \text{USD}19{,}477$$

$$\text{Marginal VaR}_B = \text{USD}97{,}384 \times 1.2/\text{USD}1{,}000{,}000 = 0.1169$$

27. Solution: A

$$\beta = \rho \frac{\sigma_i}{\sigma_P} = 0.37 \times \frac{16\%}{21\%} = 0.2819$$

$$\text{Component VaR} = 0.2819 \times 2.326 \times 21\% \times 15\text{million} = 2.066\text{million}$$

28. Solution: D

Liquidity duration is an approximation of the number of days necessary to dispose of a portfolio's holdings (of a particular share in this case) without a significant market impact. It is calculated as: $8{,}000 /(0.25 \times 2{,}000) = 16$.

29. Solution: C

$$TR_A = \frac{12\% - 2\%}{1.2} = 0.0833$$

$$TR_B = \frac{10\% - 2\%}{0.7} = 0.1143$$

$$TR_C = \frac{10\% - 2\%}{0.6} = 0.1333$$

$$TR_D = \frac{(8\% - 2\%)}{0.3} = 0.2$$

Asset B, C, D have Treynor measures greater than 0.1. Of these, C has the lowest marginal VaR as its Beta to the portfolio is the lowest.

30. Solution: B

$$\sigma_{TE}^2 = \sigma_{(R_p - R_B)}^2 = \sigma_P^2 + \sigma_B^2 - 2\rho\sigma_P\sigma_B = 0.35^2 + 0.4^2 - 2 \times 0.35 \times 0.4 \times 0.9 = 0.0305$$

$$\sigma_{TE} = 17.5\%$$

31. Solution: C

The surplus at the beginning of the year was 100 − 85 = 15 billion EUR. During the year, the equity portfolio declines 15%, or 15 billion EUR, to 85 billion EUR. Due to the increase in yields, the dollar value of the liabilities decrease by 12.5 × 1.2% × 85 billion EUR, or 12.75. Thus at the end of the year, the assets are worth (100-15)=85 billion EUR and the liabilities (85 - 12.75) = 72.25 billion. The surplus is the 12.75, a decrease of 2.25 billion EUR.

32. Solution: C

The change in the pension fund's surplus for the year 2008 is equal to the initial surplus S_0 at the end of 2007 less the ending surplus S_1 at the end of 2008.

The initial surplus is calculated as S_0 = 350 − 180 = 170.

Next we have to calculate the surplus at the end of 2008. Given the 50% decline in the equity market, the new level of assets A_1 at the end of 2008 is equal to:

(1 − 0.5) × 350 = 175

The new level of liabilities L_1 can be calculated as:

L_1 = (1 − 14 × (-0.02)) × 180 = 230.4

Therefore the 2008 surplus S_1 is equal to A_1 − L_1 = 175 − 230.4 = -55.4 (which implies the pension fund is actually in a deficit situation at the end of 2008). The change in surplus for 2008 is hence S_1 − S_0 = -55.4 − 170 = -225.4 million.

33. Solution: C

The lower bound of the 95% confidence interval is equal to: Expected Surplus − (95% confidence factor × Volatility of Surplus). The required variables can be calculated as follows:

Variance of the surplus = $100^2 \times 10\%^2 + 90^2 \times 5\%^2 - 2 \times 100 \times 90 \times 10\% \times 5\% \times 0.8 = 48.25$

Volatility of the surplus = 6.94

The expected surplus = 9.7

Therefore, the lower bound of the 95% confidence interval = $9.7 - 1.645 \times 6.94 = -1.725$

34. Solution: D

Explanation: Liabilities at a pension fund are typically composed of accumulated benefit obligations, measured by the present value of all pension benefits owed to employees discounted by an approximate interest rate. When liabilities consist mostly of nominal payments, their value in general will behave like a short position in a long-term bond.

35. Solution: D

Explanation: The time horizon of payouts does not eliminate funding risk. In fact it is the mismatch between assets and liabilities that creates funding risk. In an low interest rate environment the value of equities will rise, however the value of the liabilities are likely to increase more thereby exacerbating funding risk. Funding risk is transferred to employees with a defined contribution plan. Immunizing the portfolio, essentially matching duration of assets and liabilities, will reduce funding risk.

36. Solution: A

$$\omega_1 = \frac{IR_1/TEV_1}{IR_P/TEV_P} = \frac{0.6/6\%}{0.725/4\%} = 55.17\%$$

$$\omega_2 = \frac{IR_2/TEV_1}{IR_P/TEV_P} = \frac{0.4/6\%}{0.725/4\%} = 36.78\%$$

37. Solution: B

$$IR \approx \frac{t_{stat}}{\sqrt{T}} \rightarrow T = \left[\frac{t_{stat}}{IR}\right]^2 = \left[\frac{1.96}{2.5\%/4\%}\right]^2 = 9.8 year$$

38. Solution: A

$$t = \frac{alpha}{S.E(alpha)} = \frac{1.24\%}{0.1278\%} = 9.702$$

With 60 observations and such a large t value, you would have rejected H_0 (alpha = 0). The manager should receive credit for the statistically significant alpha.

39. Solution: C

Treynor(Portfolio) $= (15\% - 3\%)/1.6 = 7.5\%$.

40. Solution: D

Jensen (alpha) $= 15.0\% - [2.0\% + 0.90 \times (8.0\% - 2.0\%)] = 0.0760$.

Information ratio $=$ alpha/tracking error $= 0.0760/20\% = 0.380$

41. Solution: D

Statement D is correct as can be seen from the b coefficient. It. is higher for GRT and lower for HCM. This indicates that the sensitivity of the GRT fund to the benchmark return is much higher than that of the HCM fund.

42. Solution: C

$$IR_P = \frac{13.2\% - 12.3\%}{6.5\%} = 0.138$$

43. Solution: D

Jensen's alpha is defined by:

$$\alpha_P = E(R_P) - \{R_F + \beta_P[E(R_M) - R_F]\} = 0.128 - [0.0485 + 0.7 \times 0.0525] = 4.27\%$$

44. Solution: A

$R_P = 40\% \times 6\% + 55\% \times 5\% + 5\% \times 3\% = 5.3\%$

$R_B = 20\% \times 8\% + 50\% \times 4\% + 30\% \times 2\% = 4.2\%$

Asset allocation:$(40\%-20\%)\times8\%+(55\%-50\%)\times4\%+(5\%-30\%)\times2\%=1.3\%$

Security selection:$(6\%-8\%)\times40\%+(5\%-4\%)\times55\%+(3\%-2\%)\times5\%=-0.2\%$

45. Solution: D

Since small movement of an underlying can be captured by delta, large movement should be captured by both delta and gamma. Therefore, re-hedging after significant moves of the underlying stock price is the essence of gamma trading. Credit risk plays an important role in the risk profile of convertible arbitrage hedge funds. Liquidity considerations are essential. Ignorance of this risk can lead to devastating losses as the 2008 financial crisis showed. Gamma trading means frequent re-hedging of directional exposure after market moves.

46. Solution: D

This position is hedged against interest rate risk, so B) is wrong. It is also hedged against directional

movements in the stock, so C) is wrong. The position is long an option (the option to convert the bond into the stock) and so is long implied volatility, so A) is wrong. Long options positions have positive gamma.

47. Solution: C

Global macro strategies take long and short positions based on expectations regarding fundamental changes in global capital markets. The manager in this scenario is engaging in a carry trade by taking a long position in a high-yielding currency (euros) and a short position in a low-yielding currency (Swiss Francs). The manager also expects a fundamental change in the exchange rate between the currencies. Managed futures strategies have a similar philosophy but use futures rather than the underlying assets to execute the strategy.

48. Solution: D

Equity short-selling funds sell stocks not currently owned by the seller in order to take a directional bet that the stock price will decline. However, traditional people who buy stock strategies believe that future stock prices are rising.These short-selling funds tend to be negatively correlated with traditional long-only equity portfolios.

49. Solution: C

In summary, the four difficulties are: 1. Illiquid assets; 2. Tail risk; 3. Unstable risk profiles; and 4. Survivorship bias

50. Solution: C

The publication lists existing funds, so it must be subject to survivorship bias, because dead funds are not considered. In addition, there is selection bias because the publication focuses on just the popular funds, which are large and likely to have done well. A and B are incomplete. D is also incomplete.

51. Solution: A

The sample is too small: survivorship bias implies that certain non-performing funds (e.g., funds that went out of business) are not included in the sample, it is an issue of the sample.
D is closely related and D is probably true, but D relates to interpretation and Ais more directly the implied methodological flaw. So, D is fine, but A is a little better.

52. Solution: B

As poor performers drop out of the database, the average performance increases. The removal of poor performers could actually reduce average volatility and the correlation of returns. The

Sharpe Ratio tends to get inflated due to survivorship bias. With infrequent trading, estimates of volatilities, correlations, and betas are too low when computed using reported returns. Thus, Sharpe ratios would be higher under the circumstances. When trading becomes more frequent, the Sharpe ratios will be lower in – due to higher volatilities – in comparison with those under infrequent trading condition.

53. Solution: B

Statements II, III, and IV are true. Statement I is false — the opposite is true.

54. Solution: D

Thus risk estimates are biased downward by smooth.volatilities, correlations, and betas—are too low when computed using reported returns.

55. Solution: C

Investors should assess potential managers and their investment strategies with an objective and unbiased mind. They should not be unduly concerned with a manager's past successes given that past performance is not always indicative of future performance. Risk controls, the business model, and the investment process are all fundamental parts of the due diligence process.

56. Solution: C

Generally speaking, with a leveraged fund, an investor will need to evaluate historical and current changes in leverage, as well as the level of liquidity of the portfolio, particularly during times of market stress. Certain strategies may in fact expose an investor to tail risk, so while an investor should inquire whether the manager believes that tail risk exists, and whether or not it is hedged, it is then up to the investor to decide whether to accept the risk unhedged or hedge it on their own. Many funds employ independent risk service providers to report risks to investors, but these firms do not get involved in risk related decision making. And finally, while it is important to know what percentage of the assets is exchange-traded and marked to market, what might be acceptable may differ depending on the strategy of the fund.

57. Solution: A

A is correct. Investors should make sure they have access to the people at the top of the firm; the actual risk takers and decision makers, so that they have a better sense of what is really going on at that firm. Direct access to founders or senior management is preferred as part of continuing due diligence but if they are not available then the fund should strive to communicate with managers who perform day-to-day investment tasks at the fund. Communication with investor relations is not sufficient.

B is incorrect. Many funds employ independent risk service providers to report risks to investors, but these firms do not get involved in risk related decision making.

C is incorrect. Investors should evaluate the considered fund's current and historical leverage figures but also understand how and why these figures might deviate from the fund's peers.

D is incorrect. While it is important to know what percentage of the assets is exchange- traded and marked to market, what might be acceptable may differ depending on the strategy of the fund.

58. Solution: D

D is correct. Artificially low asset class correlations leading to the appearance of low systematic risk is a bias faced by hedge funds with illiquid holdings that use monthly valuation data. One way to correct for this is to use enlarged regressions with additional lags of the market factors and to sum the coefficients across lags.