Financial Risk Manager (FRM®) Examination

Sample Questions

PART I
Financial Markets and Products

1. When a stock pays a dividend, what happens to the prices of an American call option and an American put option?

   a. Both option values increase.
   b. The call option’s value increases and the put option’s value decreases.
   c. The call option’s value decreases and the put option’s value increases.
   d. Both option values decrease.

Answer: c

Explanation: American call and put options allow for early exercise. Cash dividends affect option prices, because they affect the underlying stock price. Since the stock price drops by the amount of the dividend on the ex-dividend date, the call option’s value decreases as well. Correspondingly, the put option’s value increases if the stock price decreases.

Topic: Financial Markets and Products

Subtopic: American options, effects of dividends, early exercise

AIMS: Discuss the effects dividends have on the put-call parity, the bounds of put and call option prices, and on the early exercise feature of American options

Reference: Hull, Options, Futures, and Other Derivatives, 7th Edition, Chapter 9
2. Consider an investor with an equity portfolio of USD 50 million. The portfolio beta relative to the S&P 500 is 2.2. The investor has bearish expectations for the next couple of months and wishes to reduce the systematic risk in her portfolio such that the portfolio beta becomes 1.5. The S&P 500 futures price is USD 1,250 and the multiplier is 250. Determine the number of futures contracts that she needs to buy or sell to accomplish this:

a. Sell 112 futures contracts  
b. Sell 352 futures contracts  
c. Buy 112 futures contracts  
d. Buy 352 futures contracts

Answer: a

**Explanation:** The proper trade to accomplish the investor’s objective is to: short the number of contracts given by:

\[(\beta - \beta^*) \times (P/F) = \text{number of futures contracts to be sold}\]

\[(2.2 - 1.5) \times \left[\frac{50,000,000}{1250 \times 250}\right] = 112\]

\(\beta\): current beta  
\(\beta^*\): target beta  
\(P\): portfolio value  
\(F\): futures price

**Topic:** Financial Markets and Products

**Subtopic:** Minimum Variance Hedge Ratios

**AIMS:** Define, compute and interpret the minimum variance hedge ratio and hedge effectiveness. Define, compute and interpret the optimal number of futures contracts needed to hedge an exposure, including a “tailing the hedge” adjustment

**Reference:** John Hull, *Options, Futures, and Other Derivatives, 7th Edition* (Pearson, 2009), Chapter 3
Foundations of Risk Management

1. A high net worth investor is monitoring the performance of an index tracking fund in which she has invested. The performance figures of the fund and the benchmark portfolio are summarized in the table below:

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<tr>
<th>Year</th>
<th>Benchmark Return</th>
<th>Fund Return</th>
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<tr>
<td>2005</td>
<td>9.00%</td>
<td>1.00%</td>
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<tr>
<td>2006</td>
<td>7.00%</td>
<td>3.00%</td>
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<tr>
<td>2007</td>
<td>7.00%</td>
<td>5.00%</td>
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<tr>
<td>2008</td>
<td>5.00%</td>
<td>4.00%</td>
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<tr>
<td>2009</td>
<td>2.00%</td>
<td>1.50%</td>
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What is the tracking error of the fund over this period?

a. 0.09%
b. 1.10%
c. 3.05%
d. 4.09%

Answer: c

Explanation: Relative risk measures risk relative to a benchmark index, and measures it in terms of tracking error or deviation from the index.

We need to calculate the standard deviation (square root of the variance) of the series: {0.08, 0.04, 0.02, 0.01, 0.005}.
Perform the calculation by computing the difference of each data point from the mean, square the result of each, take the average of those values, and then take the square root.
This is equal to 3.05%.

Topic: Foundations of Risk Management

Subtopic: Tracking Error

AIMS: Compute and interpret tracking error, the information ratio, and the Sortino ratio

Quantitative Analysis

1. SunStar is a mutual fund with a stated objective of controlling volatility, as measured by the standard deviation of monthly returns. Given the information below, you are asked to test the hypothesis that the volatility of SunStar’s returns is equal to 5%.

Mean Monthly Return 2.5%
Monthly Standard Deviation 4.9%
Number of Observations 30

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<table>
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<th>Chi-Square Table</th>
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What is the correct test to be used and what is the correct conclusion at the 5% level of significance?

a. Chi-Square test; reject the hypothesis that volatility is 5%.
b. Chi-Square test; do not reject the hypothesis that volatility is 5%.
c. t-test; reject the hypothesis that volatility is 5%.
d. t-test; do not reject the hypothesis that volatility is 5%.

Answer: b
Explanation: Since you are trying to test population variance, it is appropriate to use the Chi-Square test for the equality of two variances:

\[ H_0 : \sigma^2 = .0025 \]
\[ H_1 : \sigma^2 \neq .0025 \]

with the test statistic \( X^2 = (n - 1) \frac{\hat{\sigma}^2}{\sigma^2} \)

\[ n = 30, \hat{\sigma}^2 = .049^2 = .0024, \sigma^2 = .052^2 = .0025 \]
\[ X^2 = (29) \frac{.0024}{.0025} = 27.84 \]

For 29 observations, Chi square values at probability of 0.975 and .025 are 16.04707 and 45.72229. We reject the hypothesis if computed value is < 16.04707 or > 45.72229.
Since the computed value is 27.84 we do not reject the hypothesis that sample standard deviation is 5%.

Topic: Quantitative Analysis

Subtopic: Statistical inference and hypothesis testing

AIMS: Define and interpret the null hypothesis and the alternative hypothesis. Define, calculate and interpret chi-squared test of significance

**Valuation and Risk Models**

1. Mixed Fund has a portfolio worth USD 12,428,000 that consists of 42% of fixed income investments and 58% of equity investments. The 95% annual VaR for the entire portfolio is USD 1,367,000 and the 95% annual VaR for the equity portion of the portfolio is USD 1,153,000. Assume that there are 250 trading days in a year and that the correlation between stocks and bonds is zero. What is the 95% daily VaR for the fixed income portion of the portfolio?

   a. USD 21,263  
   b. USD 46,445  
   c. USD 55,171  
   d. USD 72,635

Answer: b  

**Explanation:** The computation follows:

\[
\text{VaR}^2 (\text{portfolio}) = \text{VaR}^2 (\text{stocks}) + \text{VaR}^2 (\text{fixed income}), \text{assuming the correlation is 0}
\]

\[
(1,367,000)^2 = (1,153,000)^2 + \text{VaR}^2 (\text{fixed income})
\]

\[
\text{VaR} (\text{fixed income}) = 734,357
\]

Next convert the annual VaR to daily VaR: 734,357/(250)(1/2) = 46,445

**Topic:** Valuation and Risk Models  

**Subtopic:** VaR for linear and non-linear derivatives  

**AIMS:** Describe the delta-normal approach to calculating VaR for non-linear derivatives  

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