Chapter 7 Capital Allocation Between the Risky Asset and the Risk-Free Asset

Multiple Choice Questions

1. The Capital Allocation Line can be described as the
   A) investment opportunity set formed with a risky asset and a risk-free asset.
   B) investment opportunity set formed with two risky assets.
   C) line on which lie all portfolios that offer the same utility to a particular investor.
   D) line on which lie all portfolios with the same expected rate of return and different standard deviations.
   E) none of the above.

   Answer: A Difficulty: Moderate

   Rationale: The CAL has an intercept equal to the risk-free rate. It is a straight line through the point representing the risk-free asset and the risky portfolio, in expected-return/standard deviation space.

2. Which of the following statements regarding the Capital Allocation Line (CAL) is **false**?
   A) The CAL shows risk-return combinations.
   B) The slope of the CAL equals the increase in the expected return of a risky portfolio per unit of additional standard deviation.
   C) The slope of the CAL is also called the reward-to-variability ratio.
   D) The CAL is also called the efficient frontier of risky assets in the absence of a risk-free asset.
   E) Both A and D are true.

   Answer: D Difficulty: Moderate

   Rationale: The CAL consists of combinations of a risky asset and a risk-free asset whose slope is the reward-to-variability ratio; thus, all statements except d are true.

3. Given the capital allocation line, an investor's optimal portfolio is the portfolio that
   A) maximizes her expected profit.
   B) maximizes her risk.
   C) minimizes both her risk and return.
   D) maximizes her expected utility.
   E) none of the above.

   Answer: D Difficulty: Moderate

   Rationale: By maximizing expected utility, the investor is obtaining the best risk-return relationships possible and acceptable for her.

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4. An investor invests 30 percent of his wealth in a risky asset with an expected rate of return of 0.15 and a variance of 0.04 and 70 percent in a T-bill that pays 6 percent. His portfolio's expected return and standard deviation are _____ and _____, respectively.
   A) 0.114; 0.12
   B) 0.087;0.06
   C) 0.295; 0.12
   D) 0.087; 0.12
   E) none of the above

   Answer: B Difficulty: Moderate

   Rationale: $E(r_P) = 0.3(15\%) + 0.7(6\%) = 8.7\%$; $s_P = 0.3(0.04)1/2 = 6\%$.

Use the following to answer questions 5-8:

You invest $100 in a risky asset with an expected rate of return of 0.12 and a standard deviation of 0.15 and a T-bill with a rate of return of 0.05.

5. What percentages of your money must be invested in the risky asset and the risk-free asset, respectively, to form a portfolio with an expected return of 0.09?
   A) 85% and 15%
   B) 75% and 25%
   C) 67% and 33%
   D) 57% and 43%
   E) cannot be determined

   Answer: D Difficulty: Moderate

   Rationale: $9\% = w_1(12\%) + (1 - w_1)(5\%)$; $9\% = 12\%w_1 + 5\% - 5\%w_1$; $4\% = 7\%w_1$; $w_1 = 0.57$; $1 - w_1 = 0.43$; $0.57(12\%) + 0.43(5\%) = 8.99\%$.

6. What percentages of your money must be invested in the risk-free asset and the risky asset, respectively, to form a portfolio with a standard deviation of 0.06?
   A) 30% and 70%
   B) 50% and 50%
   C) 60% and 40%
   D) 40% and 60%
   E) cannot be determined

   Answer: C Difficulty: Moderate

   Rationale: $0.06 = x(0.15)$; $x = 40\%$ in risky asset.

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7. A portfolio that has an expected outcome of $115 is formed by
   A) investing $100 in the risky asset.
   B) investing $80 in the risky asset and $20 in the risk-free asset.
   C) borrowing $43 at the risk-free rate and investing the total amount ($143) in the risky asset.
   D) investing $43 in the risky asset and $57 in the riskless asset.
   E) Such a portfolio cannot be formed.

   Answer: C Difficulty: Difficult

   Rationale: For $100, (115-100)/100=15%; $.15 = w_1(.12) + (1 - w_1)(.05)$; $.15 = .12w_1 + .05 - .05w_1$; $0.10 = 0.07w_1$; $w_1 = 1.43(\$100) = \$143$; $(1 - w_1)\$100 = -\$43$.

8. The slope of the Capital Allocation Line formed with the risky asset and the risk-free asset is equal to
   A) 0.4667.
   B) 0.8000.
   C) 2.14.
   D) 0.41667.
   E) Cannot be determined.

   Answer: A Difficulty: Moderate

   Rationale: (0.12 - 0.05)/0.15 = 0.4667.

9. Consider a T-bill with a rate of return of 5 percent and the following risky securities:

   Security A: E(r) = 0.15; Variance = 0.04
   Security B: E(r) = 0.10; Variance = 0.0225
   Security C: E(r) = 0.12; Variance = 0.01
   Security D: E(r) = 0.13; Variance = 0.0625

   From which set of portfolios, formed with the T-bill and any one of the 4 risky securities, would a risk-averse investor always choose his portfolio?
   A) The set of portfolios formed with the T-bill and security A.
   B) The set of portfolios formed with the T-bill and security B.
   C) The set of portfolios formed with the T-bill and security C.
   D) The set of portfolios formed with the T-bill and security D.
   E) Cannot be determined.

   Answer: C Difficulty: Difficult

   Rationale: Security C has the highest reward-to-volatility ratio.

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Use the following to answer questions 10-13:

You are considering investing $1,000 in a T-bill that pays 0.05 and a risky portfolio, P, constructed with 2 risky securities, X and Y. The weights of X and Y in P are 0.60 and 0.40, respectively. X has an expected rate of return of 0.14 and variance of 0.01, and Y has an expected rate of return of 0.10 and a variance of 0.0081.

10. If you want to form a portfolio with an expected rate of return of 0.11, what percentages of your money must you invest in the T-bill and P, respectively?
    A) 0.25; 0.75
    B) 0.19; 0.81
    C) 0.65; 0.35
    D) 0.50; 0.50
    E) cannot be determined

    Answer: B Difficulty: Moderate

    Rationale: $E(r_P) = 0.6(14\%) + 0.4(10\%) = 12.4\%$; $11\% = 5x + 12.4(1 - x)$; $x = 0.189$ (T-bills) $(1-x) = 0.811$ (risky asset).

11. If you want to form a portfolio with an expected rate of return of 0.10, what percentages of your money must you invest in the T-bill, X, and Y, respectively if you keep X and Y in the same proportions to each other as in portfolio P?
    A) 0.25; 0.45; 0.30
    B) 0.19; 0.49; 0.32
    C) 0.32; 0.41; 0.27
    D) 0.50; 0.30; 0.20
    E) cannot be determined

    Answer: C Difficulty: Difficult

    Rationale: $E(r_P) = .100.10 = 5w + 12.4(1 - w)$; $x = 0.32$ (weight of T-bills); As composition of X and Y are .6 and .4 of P, respectively, then for 0.68 weight in P, the respective weights must be 0.41 and 0.27; .6(.68) = 41%; .4(.68) = 27%

12. What would be the dollar values of your positions in X and Y, respectively, if you decide to hold 40% percent of your money in the risky portfolio and 60% in T-bills?
    A) $240; $360
    B) $360; $240
    C) $100; $240
    D) $240; $160
    E) Cannot be determined

    Answer: D Difficulty: Moderate

    Rationale: $400(0.6) = $240 in X; $400(0.4) = $160 in Y.

13. What would be the dollar value of your positions in X, Y, and the T-bills, respectively, if you decide to hold a portfolio that has an expected outcome of $1,200?
    A) Cannot be determined
    B) $54; $568; $378
    C) $568; $54; $378
    D) $378; $54; $568
    E) $108; $514; $378

    Answer: B Difficulty: Difficult

    Rationale: ($1,200 - $1,000)/$1,000 = 12%; (0.6)14% + (0.4)10% = 12.4%; 12% = w5% + 12.4%(1 - w);w=.054; 1-w=.946; w = 0.054($1,000) = $54 (T-bills); 1 - w = 1 - 0.054 = 0.946($1,000) = $946; $946 x 0.6 = $568 in X; $946 x 0.4 = $378 in Y.

14. A reward-to-volatility ratio is useful in:
    A) measuring the standard deviation of returns.
    B) understanding how returns increase relative to risk increases.
    C) analyzing returns on variable rate bonds.
    D) assessing the effects of inflation.
    E) none of the above.

    Answer: B Difficulty: Moderate

    Rationale: B is the only choice relevant to the reward-to-volatility ratio (risk and return).

15. The change from a straight to a kinked capital allocation line is a result of:
    A) reward-to-volatility ratio increasing.
    B) borrowing rate exceeding lending rate.
    C) an investor's risk tolerance decreasing.
    D) increase in the portfolio proportion of the risk-free asset.
    E) none of the above.

    Answer: B Difficulty: Difficult

    Rationale: The linear capital allocation line assumes that the investor may borrow and lend at the same rate (the risk-free rate), which obviously is not true. Relaxing this assumption and incorporating the higher borrowing rates into the model results in the kinked capital allocation line.

16. The first major step in asset allocation is:
    A) assessing risk tolerance.
    B) analyzing financial statements.
    C) estimating security betas.
    D) identifying market anomalies.
    E) none of the above.

    Answer: A Difficulty: Moderate

    Rationale: A should be the first consideration in asset allocation. B, C, and D refer to security selection.

17. Based on their relative degrees of risk tolerance
    A) investors will hold varying amounts of the risky asset in their portfolios.
    B) all investors will have the same portfolio asset allocations.
    C) investors will hold varying amounts of the risk-free asset in their portfolios.
    D) A and C.
    E) none of the above.

    Answer: D Difficulty: Easy

    Rationale: By determining levels of risk tolerance, investors can select the optimum portfolio for their own needs; these asset allocations will vary between amounts of risk-free and risky assets based on risk tolerance.

18. Passive investing
    A) may be accomplished by investing in index mutual funds.
    B) involves considerable security selection.
    C) involves considerable transaction costs.
    D) A and C.
    E) B and C.

    Answer: A Difficulty: Easy

    Rationale: Passive investing involves virtually no security selection and minimal transaction costs if accomplished via investing in index mutual funds.

19. Asset allocation
    A) may involve the decision as to the allocation between a risk-free asset and a risky asset.
    B) may involve the decision as to the allocation among different risky assets.
    C) may involve considerable security analysis.
    D) A and B.
    E) A and C.

    Answer: D Difficulty: Easy

    Rationale: A and B are possible steps in asset allocation. C is related to security selection.

20. In the mean-standard deviation graph, the line that connects the risk-free rate and the optimal risky portfolio, P, is called _____.
    A) the Security Market Line
    B) the Capital Allocation Line
    C) the Indifference Curve
    D) the investor's utility line
    E) none of the above

    Answer: B Difficulty: Moderate

    Rationale: The Capital Allocation Line (CAL) illustrates the possible combinations of a risk-free asset and a risky asset available to the investor.

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21. Treasury bills are commonly viewed as risk-free assets because
    A) their short-term nature makes their values insensitive to interest rate fluctuations.
    B) the inflation uncertainty over their time to maturity is negligible.
    C) their term to maturity is identical to most investors' desired holding periods.
    D) Both A and B are true.
    E) Both B and C are true.

    Answer: D Difficulty: Easy

    Rationale: Treasury bills do not exactly match most investor's desired holding periods, but because they mature in only a few weeks or months they are relatively free of interest rate sensitivity and inflation uncertainty.

22. When a portfolio consists of only a risky asset and a riskless asset, increasing the fraction of the overall portfolio invested in the risky asset will
    A) increase the expected return on the portfolio.
    B) increase the standard deviation of the portfolio.
    C) not change the risk-reward ratio.
    D) Neither A, B nor C is true.
    E) A, B and C are all true.

    Answer: E Difficulty: Easy

    Rationale: All three statements correctly describe a portfolio invested in a combination of a risky asset and a riskless asset.

23. In a top-down analysis of portfolio construction
    A) decisions about which executives will manage the portfolio are made first, then capital allocation decisions are made.
    B) decisions about asset allocation are made first, then specific securities are chosen.
    C) decisions about specific securities are made first, then asset allocation decisions are made.
    D) all securities transactions must be approved by upper-level management.
    E) an investor's first decision would be about how much to hold in her favorite stock.

    Answer: B Difficulty: Moderate

    Rationale: This is the approach most often used by institutional investors. Individual investors typically follow a less-structured approach.

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24. When wealth is shifted from the risky portfolio to the risk-free asset, what happens to the relative proportions of the various risky assets within the risky portfolio?
    A) They all decrease.
    B) Some increase and some decrease.
    C) They all increase.
    D) They are not changed.
    E) The answer depends on the specific circumstances.

    Answer: D Difficulty: Moderate

    Rationale: A shift in the proportion of the investor's portfolio that is held in the risky portfolio (variable in the text) changes only the proportion held in the risk-free asset (1-y). The composition of the underlying portfolio of risky assets remains unchanged.

Use the following to answer questions 25-28:

Your client, Bo Regard, holds a complete portfolio that consists of a portfolio of risky assets (P) and T-Bills. The information below refers to these assets.

$E(R_p)$	12.00%
Standard Deviation of P	7.20%
T-Bill rate	3.60%
Proportion of Complete Portfolio in P	80%
Proportion of Complete Portfolio in T-Bills	20%

Composition of P:

Stock A	40.00%
Stock B	25.00%
Stock C	35.00%
Total	100.00%

25. What is the expected return on Bo's complete portfolio?
    A) 10.32%
    B) 5.28%
    C) 9.62%
    D) 8.44%
    E) 7.58%

    Answer: A Difficulty: Easy

    Rationale: E(rC) = .8*12.00% + .2*3.6% = 10.32%

26. What is the standard deviation of Bo's complete portfolio?
    A) 7.20%
    B) 5.40%
    C) 6.92%
    D) 4.98%
    E) 5.76%

    Answer: E Difficulty: Easy

    Rationale: Std. Dev. of C = .8*7.20% = 5.76%

27. What is the equation of Bo's Capital Allocation Line?
    A) $E(r_C) = 7.2 + 3.6$ * Standard Deviation of C
    B) $E(r_C) = 3.6 + 1.167$ * Standard Deviation of C
    C) $E(r_C) = 3.6 + 12.0$ * Standard Deviation of C
    D) $E(r_C) = 0.2 + 1.167$ * Standard Deviation of C
    E) $E(r_C) = 3.6 + 0.857$ * Standard Deviation of C

    Answer: B Difficulty: Moderate

    Rationale: The intercept is the risk-free rate (3.60%) and the slope is (12.00%-3.60%)/7.20% = 1.167.

28. What are the proportions of Stocks A, B, and C, respectively in Bo's complete portfolio?
    A) 40%, 25%, 35%
    B) 8%, 5%, 7%
    C) 32%, 20%, 28%
    D) 16%, 10%, 14%
    E) 20%, 12.5%, 17.5%

    Answer: C Difficulty: Moderate

    Rationale: Proportion in A = .8 * 40% = 32%; proportion in B = .8 * 25% = 20%; proportion in C = .8 * 35% = 28%.

29. To build an indifference curve we can first find the utility of a portfolio with 100% in the risk-free asset, then
    A) find the utility of a portfolio with 0% in the risk-free asset.
    B) change the expected return of the portfolio and equate the utility to the standard deviation.
    C) find another utility level with 0% risk.
    D) change the standard deviation of the portfolio and find the expected return the investor would require to maintain the same utility level.
    E) change the risk-free rate and find the utility level that results in the same standard deviation.

    Answer: D Difficulty: Difficult

    Rationale: This references the procedure described on page 207-208 of the text. The authors describe how to trace out indifference curves using a spreadsheet.

30. The Capital Market Line

    I) is a special case of the Capital Allocation Line.
    II) represents the opportunity set of a passive investment strategy.
    III) has the one-month T-Bill rate as its intercept.
    IV) uses a broad index of common stocks as its risky portfolio.

    A) I, III, and IV
    B) II, III, and IV
    C) III and IV
    D) I, II, and III
    E) I, II, III, and IV

    Answer: E Difficulty: Moderate

    Rationale: 'The Capital Market Line is the Capital Allocation Line based on the one-month T-Bill rate and a broad index of common stocks. It applies to an investor pursuing a passive management strategy.

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31. An investor invests 40 percent of his wealth in a risky asset with an expected rate of return of 0.18 and a variance of 0.10 and 60 percent in a T-bill that pays 4 percent. His portfolio's expected return and standard deviation are _____ and _____, respectively.
    A) 0.114; 0.112
    B) 0.087; 0.063
    C) 0.096; 0.126
    D) 0.087; 0.144
    E) none of the above

    Answer: C Difficulty: Moderate

    Rationale: $E(r_P) = 0.4(18\%) + 0.6(4\%) = 9.6\%$; $s_P = 0.4(0.10)1/2 = 12.6\%$.

32. An investor invests 70 percent of his wealth in a risky asset with an expected rate of return of 0.11 and a variance of 0.12 and 30 percent in a T-bill that pays 3 percent. His portfolio's expected return and standard deviation are _____ and _____, respectively.
    A) 0.086; 0.242
    B) 0.087; 0.267
    C) 0.295; 0.123
    D) 0.087; 0.182
    E) none of the above

    Answer: A Difficulty: Moderate

    Rationale: $E(r_P) = 0.7(11\%) + 0.3(3\%) = 8.6\%$; $s_P = 0.7(0.12)1/2 = 24.2\%$.

Use the following to answer questions 33-35:

You invest $100 in a risky asset with an expected rate of return of 0.11 and a standard deviation of 0.20 and a T-bill with a rate of return of 0.03.

33. What percentages of your money must be invested in the risky asset and the risk-free asset, respectively, to form a portfolio with an expected return of 0.08?
    A) 85% and 15%
    B) 75% and 25%
    C) 62.5% and 37.5%
    D) 57% and 43%
    E) cannot be determined

    Answer: C Difficulty: Moderate

    Rationale: $8\% = w_1(11\%) + (1 - w_1)(3\%)$; $8\% = 11\%w_1 + 3\% - 3\%w_1$; $5\% = 8\%w_1$; $w_1 = 0.625$; $1 - w_1 = 0.375$; $0.625(11\%) + 0.375(3\%) = 8.0\%$.

34. What percentages of your money must be invested in the risk-free asset and the risky asset, respectively, to form a portfolio with a standard deviation of 0.08?
    A) 30% and 70%
    B) 50% and 50%
    C) 60% and 40%
    D) 40% and 60%
    E) Cannot be determined.

    Answer: C Difficulty: Moderate

    Rationale: $0.08 = x(0.20)$; $x = 40\%$ in risky asset.

35. The slope of the Capital Allocation Line formed with the risky asset and the risk-free asset is equal to
    A) 0.47
    B) 0.80
    C) 2.14
    D) 0.40
    E) Cannot be determined.

    Answer: D Difficulty: Moderate

    Rationale: $(0.11 - 0.03)/0.20 = 0.40$.

Use the following to answer questions 36-38:

You invest $1000 in a risky asset with an expected rate of return of 0.17 and a standard deviation of 0.40 and a T-bill with a rate of return of 0.04.

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36. What percentages of your money must be invested in the risky asset and the risk-free asset, respectively, to form a portfolio with an expected return of 0.11?
    A) 53.8% and 46.2%
    B) 75% and 25%
    C) 62.5% and 37.5%
    D) 46.1% and 53.8%
    E) Cannot be determined.

    Answer: A Difficulty: Moderate

    Rationale: $11\% = w_1(17\%) + (1 - w_1)(4\%)$; $11\% = 17\%w_1 + 4\% - 4\%w_1$; $7\% = 13\%w_1$; $w_1 = 0.538$; $1 - w_1 = 0.461$; $0.538(17\%) + 0.462(4\%) = 11.0\%$.

37. What percentages of your money must be invested in the risk-free asset and the risky asset, respectively, to form a portfolio with a standard deviation of 0.20?
    A) 30% and 70%
    B) 50% and 50%
    C) 60% and 40%
    D) 40% and 60%
    E) Cannot be determined.

    Answer: B Difficulty: Moderate

    Rationale: $0.20 = x(0.40)$; $x = 50\%$ in risky asset.

38. The slope of the Capital Allocation Line formed with the risky asset and the risk-free asset is equal to
    A) 0.325.
    B) 0.675.
    C) 0.912.
    D) 0.407.
    E) Cannot be determined.

    Answer: A Difficulty: Moderate

    Rationale: $(0.17 - 0.04)/0.40 = 0.325$.

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Short Answer Questions

39. Discuss the differences between the **asset allocation** decision and the **security selection** decision.

    Answer: The **asset allocation** decision involves the choice of the proportion of the overall portfolio to be invested in broad general asset categories. In general, this decision should be the first step in the portfolio management process (after determining the investor's level of risk tolerance. The **security selection** decision describes the choice of which specific securities to hold within each broad asset classification group.

    As asset allocation and security selection are the two major components of portfolio formation, it is important that the student is able to distinguish between the two, and to understand the roles of each in portfolio management.

    Difficulty: Easy

40. Discuss the characteristics of **indifference curves**, and the theoretical value of these curves in the portfolio building process

    Answer: **Indifference curves** represent the trade-off between two variables. In portfolio building, the choice is between risk and return. The investor is indifferent between all possible portfolios lying on one indifference curve. However, indifference curves are contour maps, with all curves parallel to each other. The curve plotting in the most northwest position is the curve offering the greatest utility to the investor. However, this most desirable curve may not be attainable in the market place. The point of tangency between an indifference curve (representing what is desirable) and the capital allocation line (representing what is possible). is the optimum portfolio for that investor.

    This question is designed to ascertain that the student understands the concepts of utility, what is desirable by the investor, what is possible in the market place, and how to optimize an investor's portfolio, theoretically.

    Difficulty: Moderate

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41. Describe how an investor may combine a risk-free asset and one risky asset in order to obtain the optimal portfolio for that investor.

    Answer: The investor may combine a risk-free asset (U. S. T-bills or a money market mutual fund and a risky asset, such as an indexed mutual fund in the proper portions to obtain the desired risk-return relationship for that investor. The investor must realize that the risk-return relationship is a linear one, and that in order to earn a higher return, the investor must be willing to assume more risk. The investor must first determine the amount of risk that he or she can tolerate (in terms of the standard deviation of the total portfolio, which is the product of the proportion of total assets invested in the risky asset and the standard deviation of the risky asset). One minus this weight is the proportion of total assets to be invested in the risk-free asset. The portfolio return is the weighted averages of the returns on the two respective assets. Such an asset allocation plan is probably the easiest, most efficient, and least expensive for the individual investor to build an optimal portfolio.

    This question is designed to insure that the student understands how using the simple strategy of combining two mutual funds, the investor can build an optimal portfolio, based on the investor's risk tolerance.

    Difficulty: Moderate

42. The optimal proportion of the risky asset in the complete portfolio is given by the equation $y^* = [E(r_P)-r_f] / (.01A*\text{Variance of P})$. For each of the variables on the right side of the equation, discuss the impact the variable's effect on y* and why the nature of the relationship makes sense intuitively. Assume the investor is risk averse.

    Answer: The optimal proportion in y is the one that maximizes the investor's utility. Utility is positively related to the risk premium $[E(r_P)-r_f]$. This makes sense because the more expected return an investor gets, the happier he is. The variable "A" represents the degree of risk aversion. As risk aversion increases, "A" increases. This causes y* to decrease because we are dividing by a higher number. It makes sense that a more risk-averse investor would hold a smaller proportion of his complete portfolio in the risky asset and a higher proportion in the risk-free asset. Finally, the standard deviation of the risky portfolio is inversely related to y*. As P's risk increases, we are again dividing by a larger number, making y* smaller. This corresponds with the risk-averse investor's dislike of risk as measured by standard deviation.

This allows the students to explore the nature of the equation that was derived by maximizing the investor's expected utility. The student can illustrate an understanding of the variables that supercedes the application of the equation in calculating the optimal proportion in P. Difficulty: Difficult

43. You are evaluating two investment alternatives. One is a passive market portfolio with an expected return of 10% and a standard deviation of 16%. The other is a fund that is actively managed by your broker. This fund has an expected return of 15% and a standard deviation of 20%. The risk-free rate is currently 7%. Answer the questions below based on this information.
    a. What is the slope of the Capital Market Line?
    b. What is the slope of the Capital Allocation Line offered by your broker's fund?
    c. Draw the CML and the CAL on one graph.
    d. What is the maximum fee your broker could charge and still leave you as well off as if you had invested in the passive market fund? (Assume that the fee would be a percentage of the investment in the broker's fund, and would be deducted at the end of the year.)
    e. How would it affect the graph if the broker were to charge the full amount of the fee?

    Answer:
    a. The slope of the CML is (10-7)/16 = 0.1875.
    b. The slope of the CAL is (15-7)/20= 0.40.
    c. On the graph, both the CML and the CAL have an intercept equal to the risk-free rate (7%). The CAL, with a slope of 0.40, is steeper than the CML, with a slope of 0.1875.
    d. To find the maximum fee the broker can charge, the equation (15-7-fee)/20 = 0.1875 is solved for "fee". The resulting fee is 4.25%.
    e. If the broker charges the full amount of the fee, the CAL's slope would also be 0.1875, so it would rotate down and be identical to the CML.

    This question tests both the application of CAL/CML calculations and the concepts involved.

    Difficulty: Difficult