1) One share of Bank of America (BAC) costs $10 right now. A European put with a strike of $9 and a time to expiry of two years is trading at $2. The annual risk-free interest rate is 8%. If you expect BAC to pay out a dividend of $1 tomorrow, how much should you be willing to pay for a European call option with a strike of $9 which expires in two years?

a) 2.67
b) 3.28
c) 3.67
d) 4.28
e) 4.56

2) A share of Toyota (TM) is currently trading at $86. The company will not pay any dividends in the next year. An investor is considering buying an American put or a call with a strike of $120 and a time to expiry of one year. These American options are currently trading at the same price as their European counterparts, which are fairly priced. Which of the following is the best action to take?

a) Do not buy either of the American options
b) Buy the American call
c) Buy the American put
d) Buy both the call and the put

3) Which of the following stock-picking strategies do you expect to yield the worst returns?

a) long past 3-month winners, short past 3-month losers
b) long past 6-month winners, short past 6-month losers
c) long past 12-month winners, short past 12-month losers
d) long past 24-month winners, short past 24-month losers
e) long past 36-month winners, short past 36-month losers

Use the following set-up to answer the next three questions:
Suppose that there are three groups of investors A, B, C in proportions of 1/3, 1/3 and 1/3 in the population. There is 1 share of the stock outstanding. The demand for group A for the stock is given by $D_A = 100 - P$. For group B, it is $D_B = 70 - P$. For group C, it is $D_C = 50 - P$.

4) What is the price of the stock?

a) 66
b) 72
c) 84
d) 91
e) 97

5) Suppose that investor C cannot short. What is the price?

a) 66
b) 72
c) 84
d) 91
e) 97

6) What is the price if all investors cannot short?

a) 66
b) 72
c) 84
d) 91
e) 97

7) You are an analyst trying to value company CBA. You expect that starting next year, CBA will pay an annual dividend of $10 per share, for 4 years. The appropriate discount rate over this period is 8%. Every year after that, you expect the dividends of CBA to decline at a rate of 3% per year. The appropriate discount rate over this period is 6%. What should the price of CBA be today? (Choose the alternative below that is closest to the results you have computed.)

a) 98
b) 105
c) 112
d) 121
e) 129

8) Company OPQ has a constant growth rate 3% and a constant plowback ratio 80% per year. The appropriate discount rate to use is 8%. By how much does the P/E ratio of company OPQ change approximately if the growth rate increases by Δ (where Δ is very small)? (Choose the alternative below that is closest to the results you have computed.)

a) 56Δ
b) 66Δ
c) 76Δ
d) 86Δ
e) -76Δ

Use the following set-up to answer the next two questions:
Consider the following three scenarios for the economy and the returns in each scenario for the market portfolio and a stock A.

Scenario	Probability	Mkt Return	A's Return
Deep contraction	0.01	-10%	-16%
Mild contraction	0.13	-1%	-1%
Expansion	0.86	3%	15%

9) What is the beta of stock A?

a) 0.059
b) 0.290
c) 0.968
d) 1.217
e) 3.225

10) Suppose the T-bill rate is 5 percent. According to the CAPM, the asset is:

a) underpriced; the actual expected rate of return is at least 15% points greater than the fair expected rate of return

b) underpriced; the actual expected rate of return is less than 15% points, but at least 10% points, greater than the fair expected rate of return

c) underpriced; the actual expected rate of return is less than 10% points, but at least 5 percentage points, greater than the fair expected rate of return

d) underpriced; the actual expected rate of return is less than 5% percentage points greater than the fair expected rate of return

e) fairly priced.

Use the following set-up to answer the next two questions:
Consider the following model of a stock market. There are two groups of traders: smart money and noise traders. There are N smart money traders and each has a demand for the stock of (100-P). Suppose that there are 100 shares of the stock outstanding. There are M noise traders and each have a demand of (120 – P). Δ is the bias in the expectations of the noise traders.

11) Suppose N=M=50. Calculate the equilibrium price.

a) 103
b) 109
c) 115
d) 120
e) None of the above

12) Now suppose that 50 shares are available to be lent, so the maximum short position = 50 and that there is a lending fee. (Assume that the custodian (e.g. E-Trade, Schwab) gets the lending fee. The buyers do not get the fee.) Then, in this case, what is the equilibrium price and lending fee? Hint: the lending fee sets the aggregate demand for shorts equal to the supply of shorts.

a) P=117, fee=16
b) P=120, fee=20
c) P=113, fee=13
d) P=109, fee=10
e) None of the above

13) Which of the following is the least likely explanation for the Palm-3Com mispricing?

a) Difficult to short 3-Com
b) Difficult to short Palm
c) Irrational investors
d) Volatile internet share prices
e) Volatile stock market

14) You are an analyst trying to value company ABC. You expect that starting next year, ABC will pay an annual dividend of $5 per share, for 3 years. The appropriate discount rate over this period is 12%. Every year after that, you expect ABC to pay an annual dividend of $8 per share. The appropriate discount rate over this period is 8%.

What should the price of ABC be today? (Round your answer.) Choose the closest.

a) 67
b) 71
c) 75
d) 83
e) 90

15) Consider a stock expected to pay a dividend $10 per share in six months. The current stock price is $100, and the risk-free interest is 20% per year. An investor tries to take a long position in a one-year forward contract on the stock. What is the forward price? Choose the closest answer.

a) 95
b) 100
c) 105
d) 110
e) 115

16) After three months, the stock price rose to $110. All other conditions are unchanged. What will be the nine-month forward price at this point? Choose the closest answer.

a) 95
b) 100
c) 105
d) 110
e) 115

17) Asset A has beta=2, asset B has beta=4. Portfolio C is formed by combining with equal weights asset A and asset B. Given the expected return on the market portfolio is r_M =6% and the risk-free rate is r_f= 3%, find the expected rate of return on portfolio C.

a) 12%
b) 13.5%
c) 15%
d) 16.5%
e) 18%

18) Consider the following two assets.

Asset	expected rate of return	beta
A	17%	2
B	21%	3

Expected return on the market portfolio is 10% and the risk-free rate is 4%. Which asset is a better buy?

a) A
b) B
c) Not enough information

19) The R&D department of Horizon invented a new technology. The company can start a project by adopting the new technology; the CEO of the company must decide when to start the project. If the company postpones the project, competitors will start the similar projects by copying its technology. This will lower the initial investment but the annual income will be lower too. The project is assumed to be perpetual and the discount rate is 10% per year.

Today is year 0. If the company begins the project in year 1, the initial cost will be $2000 and will earn $300 each year, starting in year 2. If the company begins the project in year 2, the initial cost will be $1500 and will earn $270 each year, starting in year 3. If the company begins the project in year 3, the initial cost will be $1000 and will earn $238 each year, starting in year 4. If the company begins the project in year 4, the initial cost will be $500 and will earn $199 each year, starting in year 5.

When is the optimal timing for beginning the project?

a) Year 1
b) Year 2
c) Year 3
d) Year 4
e) Don't do the project since the project is not profitable

20) Saks is expected to pay a dividend in year 1 of $1.65, a dividend in year 2 of $1.97, and a dividend in year 3 of $2.54. After year 3, dividends are expected to grow at the rate of 8% per year. An appropriate required return for the stock is 11%. The stock should be worth ____ today (year 0).

a) $ 67.4
b) $ 71.8
c) $ 75.9
d) $ 84.2
e) $ 96.3

21) Downward Corporation is expected to pay a dividend in year 1 of $1.5 and the dividends are expected to decline at a rate of 2% per year. An appropriate required rate of return for the stock is 8%. The stock should be worth _____ in year 0.

a) 9
b) 13
c) 15
d) 18
e) 21

22) Given the data below, which stock is a better deal, according to the CAPM? Pick the alternative below that shows the α of that stock.

Expected market return: 12%
Risk-free rate: 3%

Stock X's expected return: 8%, Stock X's beta: 0.4, Stock X's variance: 0.4
Stock Y's expected return: 15%, Stock Y's beta: 1.5, Stock Y's variance: 0.3

a) 0.0
b) 1.0
c) 1.2
d) 1.4
e) 1.5

23) Which of the following is the least likely "limits-of-arbitrage" reason behind the price movements of Royal Dutch/ Shell?

a) fundamental risk
b) lack of shares available for shorting
c) noise trader risk
d) career concerns of money managers
e) performance-based arbitrage

24) Consider a single factor APT. Portfolio A has a beta of 1.2 and an expected return of 25%. Portfolio B has a beta of 0.5 and an expected return of 11%. The risk-free rate of return is 1%. If you want to take advantage of an arbitrage opportunity, you should take:

a) short B and long A
b) short A and long B
c) long A and long B
d) short A and short B
e) none of the above

25) The spot price of an ounce of gold is $1100. Suppose that the 5-year treasury bill rate is 5% per year (compounded annually). Assuming that gold can be stored costlessly and no arbitrage exists, the forward price of gold for delivery in 5 years is:

a) $1404
b) $1344
c) $1296
d) $1100
e) $862

26) There are two states of nature, Up and Down. A risky bond of firm XYZ pays out $1000 in the Up state; in the Down state, it defaults and only pays out $500. A credit default swap on XYZ is a derivative that pays out $0 in the Up state, and $500 in the Down state. There is also a risk-free treasury with rate of return r_f. Assume no arbitrage.

The risk free rate is $r_f = 5\%$. The credit default swap costs $200. How much does the XYZ bond cost?

a) $900
b) $800
c) $857
d) $761
e) $752

27) A European put option on a stock index with a strike of 100 that expires one year from now has a price of 60. The risk-free rate is 5%. The forward price of a forward contract of the same stock index that expires one year from now is 50. What is the price of a European call option with a strike of 100 on the same stock index? Choose the closest option.

a) 10
b) 12
c) 14
d) 16
e) 18

28) Consider an economy with 2 stocks. Let stock 1 have a mean return of 6 and variance of 10. Stock 2 has a mean return of 8 and a variance of 20. The covariance is 5. Now suppose that an investor has a portfolio containing 50% stock 1 and 50% stock 2. Additionally, assume that the investor has borrowed (at the risk-free rate) to buy this portfolio and her leverage is 2 (half of the value of the portfolio is financed by debt). What is the variance of the investor's return, taking into account her leverage?

a) 7.5
b) 10
c) 15
d) 30
e) 40

29) You are asked to evaluate the performance of a fund. You estimate the one-factor CAPM and three-factor Fama-French models and find:

$$r_P - r_f = 0.015 + 1.2\ (r_M - r_f) + e_1$$
$$r_P - r_f = 0.009 + 1.1\ (r_M - r_f) - 0.2\ SMB + 1.2\ HML + e_2$$

Furthermore, you find that $E(r_M - r_f) = 0.07$, ($\sigma(e_1) = 0.021$, $\sigma(e_2) = 0.015$, and $\sigma(r_P) = 0.081$. What is Jensen's alpha and the Treynor ratio of the fund?

a) 0.015, 0.0125
b) 0.015, 0.0825
c) 0.015, 0.7143
d) 0.009, 0.0080
e) 0.009, 0.0900

30) Based on the information given in the previous question, how would you best categorize the style of the fund?

a) large cap, growth
b) large cap, value
c) small cap, growth
d) small cap, value
e) large cap, momentum

31) Consider the following market timing regression.

$$r_P - r_f = a + b\,(r_M - r_f)\,1[r_M - r_f > 0] + c\,(r_M - r_f)\,1[r_M - r_f < 0] + e$$

$1[r_M - r_f > 0]$ is an indicator variable that takes the value of 1 if $(r_M - r_f) > 0$ and 0 otherwise. Likewise for $1[r_M - r_f < 0]$.

Suppose an investor is successfully able to time the market in the following way: she buys stocks just before the market goes up and sells (or shorts) stocks before the market goes down. What would the coefficients b and c look like for the investor described above?

a) $b = 0, c > 0$
b) $b > 0, c = 0$
c) $b > 0, c > 0$
d) $b = 0, c < 0$
e) $b > 0, c < 0$

32) Company XYZ is expected to pay a dividend in year 1 of $1, a dividend in year 2 of $2, and grow thereafter at the rate of 5% per year. An appropriate required return for the stock is 10%. The stock should be worth ____ today (year 0).

a) 33.8
b) 37.3
c) 40.9
d) 42.3
e) 45.0

33) The spot price of a barrel of oil $100. Suppose that the 3-year Treasury bill rate is 5% per year (compounded annually). Assuming that oil can be stored for 3 years at a total cost of $5 per barrel (you pay that cost up-front today) and no arbitrage exists, the forward price of oil for delivery in 3 years (rounded to the nearest dollar) is:

a) 86
b) 91
c) 111
d) 116
e) 121

34) You can only invest in two risky assets. Asset 1 has expected returns of 8% and standard deviation of 20%. Asset 2 has expected returns of 4% and standard deviation of 15%. Their correlation is 0.3. What is the expected return of the minimum variance portfolio? Choose the closest answer.

a) 4%
b) 5%
c) 6%
d) 7%
e) 8%

35) Assume the assets available are the same as in previous question. An investor has utility function given by $U(E,S) = E - 1.5 \cdot S^2$. What is the expected return of the optimal portfolio for that investor? Choose the closest number.

a) 4%
b) 5%
c) 6%
d) 7%
e) 8%

36) The risk-free rate is 2% and the expected market return is 6%. Two assets have the following properties:

Asset A: $E[r_A] = 8\%$, $SD[r_A] = 24\%$, $\beta_A = 1.5$
Asset B: $\alpha_B = 0.5\%$, $SD[r_B] = 20\%$, $Cov(r_B, r_M) = 0.8$

Which asset(s), if any, is/are mispriced according to CAPM?

a) Asset A
b) Asset B
c) Neither asset A nor B
d) Both assets A and B

37) A share of Twitter stock is currently trading at $50. Twitter does not pay dividends. The annual risk-free rate is 1%. A European call option on one share of Twitter with a strike of $55 and an expiry date one year from today costs $15. What is the price of a European put option with the same strike and expiration date? Choose the closest answer.

a) $15
b) $20
c) $25
d) $30
e) $35

38) Suppose you had a panel data set of 100 equity mutual funds with monthly excess returns from 1970 – 2000. (Assume that the excess returns have already been corrected for risk and allocation differences, so that the excess returns are comparable across funds.)

(a) Describe an empirical strategy for testing for persistence?

(b) Why does one test for persistence?

39) These questions are about behavioral economics/finance.

(a) What does Prospect Theory imply about the kind of stocks that investors are more likely to sell? Explain.

(b) Suppose you were trying to find evidence consistent with Prospect Theory's prediction about the type of stocks investors sell, using data on sales of stocks by individual investors. What variable would you examine? How would you control for general movements in the market?

40) You have been hired by an investment bank to evaluate the performance of three funds. You estimate the Fama-French three factor model for these three funds and find that:

$$\text{Fund A:}\quad r_A - r_f = 0.3 + 0.9 \times (r_M - r_f) + 1.1 \times SMB + 0.5 \times HML + \varepsilon_A$$

$$\text{Fund B:}\quad r_B - r_f = 0.6 + 1.1 \times (r_M - r_f) + 1.5 \times SMB - 0.3 \times HML + \varepsilon_B$$

$$\text{Fund C:}\quad r_C - r_f = 0.8 + 1.2 \times (r_M - r_f) - 0.2 \times SMB - 0.3 \times HML + \varepsilon_C$$

Note that all returns are expressed in percentage points (so 0.3 means 0.3%, not 30%). The standard deviations of ε_A, ε_B and ε_C are 1.7, 3.6, and 5.2 respectively. Furthermore, the standard errors of the intercepts for Funds A, B and C are 0.1, 0.2 and 0.8, respectively. Note that the t-statistics for the intercept = estimate of the intercept/standard error of the estimate. Also assume that an estimate is statistically significant if the t-statistics is greater than or equal to 2.

(a) Calculate Jensen's alpha for the three funds. Using sound statistical reasoning, which of the three funds would you recommend, on the basis of alpha and its standard error?

(b) Now calculate the information ratio of the three funds. Based on this measure, which of the three funds would you recommend?

(c) If $E[r_M - r_b] = 7\%$, $E[SMB] = 8\%$, $E[HML] = 4\%$ which fund has the highest expected excess return?

41) Stock Prime has a price-earnings ratio of 15 and a beta of 1.2. It pays out 70% of earnings as dividends on average. The average Treasury bill rate is 1%. The average market return is 9%.

(a) Based on the Gordon growth model, what is the dividend growth rate implied by Prime's price-earnings ratio?

(b) Prime announces that it has stopped paying dividends. We have the following financial information on Prime (all numbers are assumed to hold for perpetuity): its EBIT is $426 million, depreciation is $10 million and its capital expenditure is $10 million and there is no change in working capital. Its average tax rate is 35% and its interest payment is $11 million. The value of Prime's total liabilities is $55 million. Using the free cash flow approach, calculate Prime's total firm value, total shareholder value, and price-earnings ratio based on this new information. (The information on Prime's beta, Treasury bill rate and average market return are assumed not to change).

42) Please answer the following questions:

(a) Why does the semi-strong form of the EMH imply that prices should follow a random walk (with drift)?

(b) In general, why is returns predictability sometimes seen as a challenge to the EMH? Why do others argue that returns predictability is not necessarily inconsistent with the EMH?

43) You are a wealthy investor and you want to invest in a fund called Quantum Endowment. In order to estimate expected performance, you run a regression of the excess return of the Quantum fund, $r_Q - r_f$, on the market excess return $r_M - r_f$, and find that:

$$r_Q - r_f = 0.32 + 0.14 \cdot (r_M - r_f) + \varepsilon$$

The average market excess return is 0.65, and its standard deviation is 5.5. The risk free rate is constant at 0.31, and the standard deviation of ε is 3.5.

(a) Can you achieve a higher Sharpe ratio than the market by investing in the Quantum fund and the risk free asset only? Explain using sound mathematical reasoning but with as few words as possible. (You score zero point if you explain in words only without any calculation.)

(b) What is the Treynor Index of the Quantum fund?

(c) What is the information ratio of the Quantum Fund?

44) Suppose that there are many risky assets and a money market (MM). Assume that everybody knows exactly and agrees about the expected returns, standard deviations and covariances for all the assets, and follows portfolio theory. Which statement below is TRUE?

a) All investors will hold the exact same portfolio.
b) No investor will hold a 100% MM portfolio.
c) Every investor will hold at least some MM.
d) All the above statements are false.

45) Suppose that you have two risky assets whose returns are uncorrelated, and with respective standard deviations 15% for asset 1 and 30% for asset 2. Consider now a portfolio P with weights ω in asset 1 and (1- ω) in asset 2. What is the minimum standard deviation achievable by a combination P of the two risky assets (pick the closest answer below)?

a) 11.5%
b) 12.5%
c) 13.5%
d) 14.5%
e) 15.5%

46) You manage an investment fund with an expected rate of return of 7% and a standard deviation of 30% per year. The money market rate is 2%. Suppose that your client wants to obtain an expected return of 6%. What percentage of her wealth should she invest in your fund?

a) 40%
b) 60%
c) 80%
d) 100%
e) 120% (a leveraged position)

47) Use the same data as in the previous problem. Your client now decides that she wants to maximize her expected rate of return subject to the constraint that its standard deviation should not exceed 25%. What proportions of her wealth should she invest in your fund and the money market respectively? What is the expected rate of return on her portfolio (rounded to the nearest integer)?

a) 5%
b) 6%
c) 7%
d) 8%
e) 9%

48) Assume that the CAPM holds. What is the beta of a portfolio with expected return 8%, if the riskfree rate is 2% and the market's expected return is 6%?

a) 0.5
b) 0.75
c) 1.0
d) 1.25
e) 1.5

49) Consider a multifactor model with three factors. A well-diversified portfolio P has loadings of 0.5 on factor 1, 2.0 on factor 2 and -0.5 on factor 3. The risk premia on factors 1 and 2 are $\lambda 1$=1.5% and λ 2=3%, respectively. The expected return of the mimicking portfolio for the third factor is 6%. The risk-free rate of return is 2%. What is the expected return of P according to this model, rounded to the nearest integer?

a) 6%
b) 7%
c) 8%
d) 9%
e) 10%

50) A European put option on a stock index with a strike of 100 that expires one year from now has a price of 60. The risk-free rate is 5%. The price of a forward contract of the same stock index that expires one year from now is 50. What is the price of a European call option with a strike of 100 on the same stock index?

a) $12.24
b) $13.46
c) $12.36
d) $13.24
e) $13.99