CHAPTER 01
INVESTMENTS: BACKGROUND AND ISSUES

1. Equity is a lower priority claim and represents an ownership share in a corporation, whereas debt has a higher priority claim, but does not have an ownership interest. Debt also pays a specified cash flow over a specific period and the claim will eventually expire. Equity has an indefinite life.

2. A derivative asset provides a payoff that depends on the values of a primary asset. The primary asset has a claim on the real assets of a firm, whereas a derivative asset does not.

3. Asset allocation is the allocation of an investment portfolio across broad asset classes. Security selection is the choice of specific securities within each asset class.

4. Agency problems are conflicts of interest between managers and stockholders. They are addressed through the corporate governance process via audits, compensation structures and board elections.

5. Real assets are assets used to produce goods and services. Financial assets are claims on real assets or the income generated by them.

6. Investment bankers are firms specializing in the sale of new securities to the public, typically by underwriting the issue. Commercial banking processes the financial transactions of businesses such as checks, wire transfers and savings account management.

7.
    a. The factory is a real asset that is created. The loan is a financial asset that is created by the transaction.

    b. When the loan is repaid, the financial asset is destroyed but the real asset continues to exist.

    c. The cash is a financial asset that is traded in exchange for a real asset, inventory.

8.
    a. No. The real estate in existence has not changed, merely the perception of its value.

    b. Yes. The financial asset value of the claims on the real estate has changed, thus the balance sheet of individual investors has been reduced.

c. The difference between these two answers reflects the difference between real and financial asset values. Real assets still exist, yet the value of the claims on those assets or the cash flows they generate do change. Thus, the difference.

9.

a. The bank loan is a financial liability for Lanni. Lanni's IOU is the bank's financial asset. The cash Lanni receives is a financial asset. The new financial asset created is Lanni's promissory note held by the bank.

b. The cash paid by Lanni is the transfer of a financial asset to the software developer. In return, Lanni gets a real asset, the completed software. No financial assets are created or destroyed. Cash is simply transferred from one firm to another.

c. Lanni sells the software, which is a real asset, to Microsoft. In exchange Lanni receives a financial asset, 1,500 shares of Microsoft stock. If Microsoft issues new shares in order to pay Lanni, this would constitute the creation of new financial asset.

d. In selling 1,500 shares of stock for $120,000, Lanni is exchanging one financial asset for another. In paying off the IOU with $50,000 Lanni is exchanging financial assets. The loan is "destroyed" in the transaction, since it is retired when paid.

10.

a.

Assets		*Liabilities & Shareholders' equity*	
Cash	$70,000	Bank loan	$50,000
Computers	30,000	Shareholders' equity	50,000
Total	$100,000	Total	$100,000

Ratio of real to total assets = $30,000/$100,000 = 0.30

b.

Assets		*Liabilities & Shareholders' equity*	
Software product*	$70,000	Bank loan	$50,000
Computers	30,000	Shareholders' equity	50,000
Total	$100,000	Total	$100,000

*Valued at cost

Ratio of real to total assets = $100,000/$100,000 = 1.0

c.

Assets		*Liabilities & Shareholders' equity*	
Microsoft shares	$120,000	Bank loan	$50,000
Computers	30,000	Shareholders' equity	100,000
Total	$150,000	Total	$150,000

Ratio of real to total assets = $30,000/$150,000 = 0.2

Conclusion: when the firm starts up and raises working capital, it will be characterized by a low ratio of real to total assets. When it is in full production, it will have a high ratio of real assets. When the project "shuts down" and the firm sells it

11. Ultimately, real assets determine the material well being of an economy. Individuals can benefit when financial engineering creates new products which allow them to manage portfolios of financial assets more efficiently. Since bundling and unbundling creates financial products creates new securities with varying sensitivities to risk, it allows investors to hedge particular sources of risk more efficiently.

12. For commercial banks, the ratio is: $121.2/$11,426.2 = 0.0106
    For non-financial firms, the ratio is: $14,773/$28,507 = 0.5182
    The difference should be expected since the business of financial institutions is to make loans that are financial assets.

13. National wealth is a measurement of the real assets used to produce the GDP in the economy. Financial assets are claims on those assets held by individuals. These financial assets are important since they drive the efficient use of real assets and help us allocate resources, specifically in terms of risk return trade-offs.

14.
    a. A fixed salary means compensation is (at least in the short run) independent of the firm's success. This salary structure does not tie the manager's immediate compensation to the success of the firm. The manager might, however, view this as the safest compensation structure with the most value.

b. A salary paid in the form of stock in the firm means the manager earns the most when shareholder wealth is maximized. When the stock must be held for five years, the manager has less of an incentive to manipulate the stock price. This structure is most likely to align the interests of managers with the interests of the shareholders. If stock compensation is used too much, the manager might view it as overly risky since the manager's career is already linked to the firm. This undiversified exposure would be exacerbated with a large stock position in the firm.

c. When executive salaries are linked to firm profits, the firm creates incentives for managers to contribute to the firm's success. The success of the firm is linked to the compensation of the manager. This may lead to earnings manipulation, but that is what audits and external analysts will look out for.

15. If an individual shareholder could monitor and improve managers' performance, and thereby increase the value of the firm, the payoff would be small, since the ownership share in a large corporation would be very small. For example, if you own $10,000 of IBM stock and can increase the value of the firm by 5%, a very ambitious goal, you benefit by only: 0.05 x $10,000 = $500.

    In contrast, a bank that has a multimillion-dollar loan outstanding to the firm has a big stake in making sure the firm can repay the loan. It is clearly worthwhile for the bank to spend considerable resources to monitor the firm.

16. Since the trader benefited from profits but did not get penalized by losses, they were encouraged to take extraordinary risks. Since traders sell to other traders, there also existed a moral hazard since other traders might facilitate the misdeed. In the end, this represents an agency problem.

17. Securitization requires access to a large number of potential investors. To attract these investors, the capital market needs:
    (1) a safe system of business laws and low probability of confiscatory taxation/regulation;
    (2) a well-developed investment banking industry;
    (3) a well-developed system of brokerage and financial transactions, and;
    (4) well-developed media, particularly financial reporting.

    These characteristics are found in (indeed make for) a well-developed financial market.

18. Securitization leads to disintermediation; that is, securitization provides a means for market participants to bypass intermediaries. For example, mortgage-backed securities channel funds to the housing market without requiring that banks or thrift institutions make loans from their own portfolios. As securitization progresses, financial intermediaries must increase other activities such as providing short-term liquidity to consumers and small business, and financial services.

19. Mutual funds accept funds from small investors and invest, on behalf of these investors, in the national and international securities markets.

    Pension funds accept funds and then invest, on behalf of current and future retirees, thereby channeling funds from one sector of the economy to another.

    Venture capital firms pool the funds of private investors and invest in start-up firms.

    Banks accept deposits from customers and loan those funds to businesses, or use the funds to buy securities of large corporations.

20. Even if the firm does not need to issue stock in any particular year, the stock market is still important to the financial manager. The stock price provides important information about how the market values the firm's investment projects. For example, if the stock price rises considerably, managers might conclude that the market believes the firm's future prospects are bright. This might be a useful signal to the firm to proceed with an investment such as an expansion of the firm's business.

    In addition, the fact that shares can be traded in the secondary market makes the shares more attractive to investors since investors know that, when they wish to, they will be able to sell their shares. This in turn makes investors more willing to buy shares in a primary offering, and thus improves the terms on which firms can raise money in the equity market.

21. Treasury bills serve a purpose for investors who prefer a low-risk investment. The lower average rate of return compared to stocks is the price investors pay for predictability of investment performance and portfolio value.

22. You should be skeptical. If the author actually knows how to achieve such returns, one must question why the author would then be so ready to sell the secret to others. Financial markets are very competitive; one of the implications of this fact is that riches do not come easily. High expected returns require bearing some risk, and obvious bargains are few and far between. Odds are that the only one getting rich from the book is its author.

CHAPTER 02
ASSET CLASSES AND FINANCIAL INSTRUMENTS

1. Common stock is an ownership share in a publicly held corporation. Common shareholders have voting rights and may receive dividends. Preferred stock represents nonvoting shares in a corporation, usually paying a fixed stream of dividends. While corporate bonds are long-term debt by corporations, typically paying semi-annual coupons and returning the face value of the bond at maturity.

2. While the DJIA has 30 large corporations in the index, it does not represent the overall market nearly as well as the 500 stocks contained in The Wilshire index. The DJIA is simply too small.

3. They are short term, very safe, and highly liquid. Also, their unit value almost never changes.

4. Treasury bills, certificates of deposit, commercial paper, bankers' acceptances, Eurodollars, repos, reserves, federal funds and brokers' calls.

5. American Depository Receipts, or ADRs, are certificates traded in U.S. markets that represent ownership in shares of a foreign company. Investors may also purchase shares of foreign companies on foreign exchanges. Lastly, investors may use international mutual funds to own shares indirectly.

6. Because they produce coupons that are tax free.

7. The fed funds rate is simply the rate of interest on very short-term loans among financial institutions. The London Interbank Offer Rate (LIBOR) is the rate at which large banks in London are willing to lend money among themselves.

8. General obligation bonds are backed by the local governments, while revenue bonds have proceeds attached to specific projects. A revenue bond has less guarantees, therefore, it is riskier and will have a higher yield.

9. Corporations may exclude 70% of dividends received from domestic corporations in the computation of their taxable income.

10. Limited liability means that the most shareholders can lose in event of the failure of the corporation is their original investment.

11. Money market securities are referred to as "cash equivalents" because of their great liquidity. The prices of money market securities are very stable, and they can be converted to cash (i.e., sold) on very short notice and with very low transaction costs.

12. Taxable equivalent yield = .0675 / (1-.35) = .1038

13.

a. The taxable bond. With a zero tax bracket, the after-tax yield for the taxable bond is the same as the before-tax yield (5%), which is greater than the yield on the municipal bond.

b. The taxable bond. The after-tax yield for the taxable bond is:
0.05 x (1 – 0.10) = 4.5%

c. You are indifferent. The after-tax yield for the taxable bond is:
0.05 x (1 – 0.20) = 4.0%
The after-tax yield is the same as that of the municipal bond.

d. The municipal bond offers the higher after-tax yield for investors in tax brackets above 20%.

14. The after-tax yield on the corporate bonds is: [0.09 x (1 – 0.30)] = 0.0630 = 6.30%. Therefore, the municipals must offer at least 6.30% yields.

15. The equivalent taxable yield (r) is: r = rm/(1 – t)

a. 4.00%
b. 4.44%
c. 5.00%
d. 5.71%

16.

a. You would have to pay the asked price of:
107:27 = 107.8438% of par = $1,078.438

b. The coupon rate is 4.875%, implying coupon payments of $48.75 annually or, more precisely, $24.375 semiannually.

c. Current yield = Annual coupon income/price =
4.875/107.8438= 0.0452 = 4.52%

17.

a. The closing price today is $74.92, which is $1.82 below yesterday's price. Therefore, yesterday's closing price was: $74.92 + $1.82 = $76.74

b. You could buy: $5,000/$74.92 = 66.74 shares

c. Your annual dividend income would be 1.90 % of $5,000, or $95.

d. Earnings per share can be derived from the price-earnings (PE) ratio.

Price/Earnings = 13 and Price = $74.92 so that Earnings = $74.92/13 = $5.7631

18.

a. At t = 0, the value of the index is: (90 + 50 + 100)/3 = 80
At t = 1, the value of the index is: (95 + 45 + 110)/3 = 83.3333
The rate of return is: (83.3333/80) – 1 = 4.167%

b. In the absence of a split, stock C would sell for 110, and the value of the index would be: (95 + 45 + 110)/3 = 83.3333

After the split, stock C sells at 55. Therefore, we need to set the divisor (d) such that:

83.3333 = (95 + 45 + 55)/d…..d = 2.340

c. The rate of return is zero. The index remains unchanged, as it should, since the return on each stock separately equals zero.

19.

a. Total market value at t = 0 is: (9,000 + 10,000 + 20,000) = 39,000
Total market value at t = 1 is: (9,500 + 9,000 + 22,000) = 40,500
Rate of return = (40,500/39,000) – 1 = 3.85%

b. The return on each stock is as follows:

R_a = (95/90) – 1 = 0.0556
R_b = (45/50) – 1 = –0.10
R_c = (110/100) – 1 = 0.10
The equally-weighted average is: [0.0556 + (-0.10) + 0.10]/3 = 0.0185 = 1.85%

20. The fund would require constant readjustment since every change in the price of a stock would bring the fund asset allocation out of balance.

21. It would increase by 19 points. (60 – 3) / 3 = 19

22.

Price
3.4% x (87/360) = 0.8217% or a $ price of $10,000 x (1-.008217) = $9,917.83

Equivalent Yield
10,000 / 9,9917.83 = 1.0083 x 365/87 = 4.23%

23.

a. The higher coupon bond
b. The call with the lower exercise price
c. The put on the lower priced stock

24.

a. The December maturity futures price is $5.116 per bushel. If the contract closes at $5.25 per bushel in December, your profit / loss on each contract (for delivery of 5,000 bushels of corn) will be: ($5.25 - $5.116) x 5000 = $ 670 gain.

b. There are 5114,099 contracts outstanding, representing 570,495,000 bushels of corn.

25.

a. Yes. As long as the stock price at expiration exceeds the exercise price, it makes sense to exercise the call.

   Gross profit is: $111 - $ 105 = $6
   Net profit = $6 – $ 22.40 = $16.40 loss
   Rate of return = -16.40 / 22.40 = - .7321 or 73.21% loss

b. Yes, exercise.

   Gross profit is: $111 - $ 100 = $11
   Net profit = $11 – $ 22.40 = $11.40 loss
   Rate of return = -11.40 / 22.40 = 0.5089 or 50.89 % loss

c. A put with exercise price $105 would expire worthless for any stock price equal to or greater than $105. An investor in such a put would have a rate of return over the holding period of –100%.

26.

a. Long call
b. Long put
c. Short put
d. Short call

27. There is always a chance that the option will expire in the money. Investors will pay something for this chance of a positive payoff.

28.

	Value of call at expiration	Initial Cost	Profit
a.	0	4	-4
b.	0	4	-4
c.	0	4	-4
d.	5	4	1
e.	10	4	6

	Value of put at expiration	Initial Cost	Profit
a.	10	6	4
b.	5	6	-1
c.	0	6	-6
d.	0	6	-6
e.	0	6	-6

29. The spread will widen. Deterioration of the economy increases credit risk, that is, the likelihood of default. Investors will demand a greater premium on debt securities subject to default risk.

30. Eleven stocks have a 52 week high at least 150% above the 52 week low. Individual stocks are much more volatile than a group of stocks.

31. The total before-tax income is $4. After the 70% exclusion, taxable income is:

    0.30 x $4 = $1.20

    Therefore:

    Taxes = 0.30 x $1.20 = $0.36

    After-tax income = $4 – $0.36 = $3.64

    After-tax rate of return = $3.64 / $40 = 9.10%

32. A put option conveys the right to sell the underlying asset at the exercise price. A short position in a futures contract carries an obligation to sell the underlying asset at the futures price.

33. A call option conveys the right to buy the underlying asset at the exercise price. A long position in a futures contract carries an obligation to buy the underlying asset at the futures price.

CFA 1

Answer: c

CHAPTER 03
SECURITIES MARKETS

1. An IPO is the first time a formerly privately owned company sells stock to the general public. A seasoned issue is the issuance of stock by a company that has already undergone an IPO.

2. The effective price paid or received for a stock includes items such as bid-ask spread, brokerage fees, commissions, and taxes (when applicable). These reduce the amount received by a seller and increase the cost incurred by a seller.

3. The primary market is the market for new issues of securities, while the secondary market is the market for already-existing securities. Corporations sell stock in the primary market, while investors purchase stock from other investors in the secondary market.

4. One source of the specialist's income is frequent trading at the bid and ask prices, with the spread as a trading profit. Since the specialist also takes a position in securities and maintains the ultimate diary of buys and sells, the trader has the ability to profit by trading on information not available to others.

5. When a firm as a willing buyer of securities and wishes to avoid the extensive time and cost associated with preparing a public issue, they may issues shares privately.

6. A stop order is a trade is not to be executed unless stock hits a price limit. The stop-loss is used to limit losses when prices are falling. An order specifying a price at which an investor is willing to buy or sell a security is a limit order, while a market order directs the broker to buy or sell at whatever price is available in the market.

7. Block orders are the buying and selling or large quantities of stock, usually by institutional investors. The advent of electronic trading now permits trades to be broken into smaller units, thus avoiding the negative impact on prices usually experience by block trades.

8. Underwriters purchase securities from the issuing company and resell them. A prospectus is a description of the firm and the security it is issuing.

9. Margin is a type of leverage that allows investors to post only a portion of the value of the security they purchase. As such, when the price of the security rises or falls, the gain or loss represents a much higher percentage, relative to the actual money invested.

10.

a. In principle, potential losses are unbounded, growing directly with increases in the price of IBM.

b. If the stop-buy order can be filled at $128, the maximum possible loss per share is $8. If the price of IBM shares go above $128, then the stop-buy order would be executed, limiting the losses from the short sale.

11. Answers to this problem will vary.

12.

a. In addition to the explicit fees of $60,000, DRK appears to have paid an implicit price in underpricing of the IPO. The underpricing is $4 per share, or a total of $400,000, implying total costs of $460,000.

b. No. The underwriters do not capture the part of the costs corresponding to the underpricing. The underpricing may be a rational marketing strategy. Without it, the underwriters would need to spend more resources in order to place the issue with the public. The underwriters would then need to charge higher explicit fees to the issuing firm. The issuing firm may be just as well off paying the implicit issuance cost represented by the underpricing.

13.

a. The stock is purchased for: 300 x $40 = $12,000
The amount borrowed is $4,000. Therefore, the investor put up equity, or margin, of $8,000.

b. If the share price falls to $30, then the value of the stock falls to $9,000. By the end of the year, the amount of the loan owed to the broker grows to:
$4,000 x 1.08 = $4,320
Therefore, the remaining margin in the investor's account is:
$9,000 - $4,320 = $4,680
The percentage margin is now: $4,680/$9,000 = 0.52 = 52%
Therefore, the investor will not receive a margin call.

c. The rate of return on the investment over the year is:
(Ending equity in the account - Initial equity)/Initial equity
= ($4,680 - $8,000)/$8,000 = - 0.415=-41.5%

14.

a. The initial margin was: 0.50 x 1,000 x $40 = $20,000

As a result of the increase in the stock price Old Economy Traders loses:

$10 x 1,000 = $10,000

Therefore, margin decreases by $10,000. Moreover, Old Economy Traders must pay the dividend of $2 per share to the lender of the shares, so that the margin in the account decreases by an additional $2,000. Therefore, the remaining margin is:

$20,000 – $10,000 – $2,000 = $8,000

b. The percentage margin is: $8,000/$50,000 = 0.16 = 16%
So there will be a margin call.

c. The equity in the account decreased from $20,000 to $8,000 in one year, for a rate of return of: (-$12,000/$20,000) = - 0.60 = - 60%

15.

a. The buy order will be filled at the best limit-sell order price: $50.25

b. The next market buy order will be filled at the next-best limit-sell order price: $51.50

c. You would want to increase your inventory. There is considerable buying demand at prices just below $50, indicating that downside risk is limited. In contrast, limit sell orders are sparse, indicating that a moderate buy order could result in a substantial price increase.

16.

a. You buy 200 shares of Telecom for $10,000. These shares increase in value by 10%, or $1,000. You pay interest of: 0.08 x 5,000 = $400

The rate of return will be:

$$\frac{\$1{,}000 - \$400}{\$5{,}000} = 0.12 = 12\%$$

b. The value of the 200 shares is 200P. Equity is (200P – $5,000). You will receive a margin call when:

$$\frac{200P - \$5{,}000}{200P} = 0.30 \quad \text{when } P = \$35.71 \text{ or lower}$$

17.

a. Initial margin is 50% of $5,000 or $2,500.

b. Total assets are $7,500 ($5,000 from the sale of the stock and $2,500 put up for margin). Liabilities are 100P. Therefore, net worth is ($7,500 – 100P). A margin call will be issued when:

$$\frac{\$7{,}500 - 100P}{100P} = 0.30 \quad \text{when } P = \$57.69 \text{ or higher}$$

18. The broker is instructed to attempt to sell your Marriott stock as soon as the Marriott stock trades at a bid price of $20 or less. Here, the broker will attempt to execute, but may not be able to sell at $20, since the bid price is now $19.95. The price at which you sell may be more or less than $20 because the stop-loss becomes a market order to sell at current market prices.

19.

a. 55.50

b. 55.25

c. The trade will not be executed because the bid price is lower than the price specified in the limit sell order.

d. The trade will not be executed because the asked price is greater than the price specified in the limit buy order.

20.

a. In an exchange market, there can be price improvement in the two market orders. Brokers for each of the market orders (i.e., the buy and the sell orders) can agree to execute a trade inside the quoted spread. For example, they can trade at $55.37, thus improving the price for both customers by $0.12 or $0.13 relative to the quoted bid and asked prices. The buyer gets the stock for $0.13 less than the quoted asked price, and the seller receives $0.12 more for the stock than the quoted bid price.

b. Whereas the limit order to buy at $55.37 would not be executed in a dealer market (since the asked price is $55.50), it could be executed in an exchange market. A broker for another customer with an order to sell at market would view the limit buy order as the best bid price; the two brokers could agree to the trade and bring it to the specialist, who would then execute the trade.

21.

a. You will not receive a margin call. You borrowed \$20,000 and with another \$20,000 of your own equity you bought 1,000 shares of Disney at \$40 per share. At \$35 per share, the market value of the stock is \$35,000, your equity is \$15,000, and the percentage margin is: \$15,000/\$35,000 = 42.9%. Your percentage margin exceeds the required maintenance margin.

b. You will receive a margin call when:

$$\frac{1{,}000P - \$20{,}000}{1{,}000P} = 0.35 \quad \text{when } P = \$30.77 \text{ or lower}$$

22. The proceeds from the short sale (net of commission) were: (\$21 x 100) – \$50 = \$2,050

A dividend payment of \$300 was withdrawn from the account. Covering the short sale at \$15 per share cost you (including commission): \$1500 + \$50 = \$1550

Therefore, the value of your account is equal to the net profit on the transaction:
\$2050 – \$300 – \$1550 = \$200

Note that your profit (\$200) equals (100 shares x profit per share of \$2). Your net proceeds per share was:

\$21	selling price of stock
–\$ 15	repurchase price of stock
–\$ 3	dividend per share
–\$ 1	2 trades x \$0.50 commission per share
\$ 2	

23. The total cost of the purchase is: \$40 x 500 = \$20,000

You borrow \$5,000 from your broker, and invest \$15,000 of your own funds. Your margin account starts out with net worth of \$15,000.

a.

(i) Net worth increases to: (\$44 x 500) – \$5,000 = \$17,000
Percentage gain = \$2,000/\$15,000 = 0.1333 = 13.33%

(ii) With price unchanged, net worth is unchanged.
Percentage gain = zero

(iii) Net worth falls to (\$36 x 500) – \$5,000 = \$13,000
Percentage gain = (–\$2,000/\$15,000) = –0.1333 = –13.33%

The relationship between the percentage return and the percentage change in the price of the stock is given by:

$$\% \text{ return} = \% \text{ change in price x } \frac{\text{Total investment}}{\text{Investor's initial equity}}$$
$$= \% \text{ change in price x } 1.333$$

For example, when the stock price rises from \$40 to \$44, the percentage change in price is 10%, while the percentage gain for the investor is:

$$\% \text{ return} = 10\% \text{ x } \frac{\$20{,}000}{\$15{,}000} = 13.33\%$$

b. The value of the 500 shares is 500P. Equity is (500P – \$5,000). You will receive a margin call when:

$$\frac{500P - \$5{,}000}{500P} = 0.25 \quad \text{when P} = \$13.33 \text{ or lower}$$

c. The value of the 500 shares is 500P. But now you have borrowed \$10,000 instead of \$5,000. Therefore, equity is (500P – \$10,000). You will receive a margin call when:

$$\frac{500P - \$10{,}000}{500P} = 0.25 \quad \text{when P} = \$26.67$$

With less equity in the account, you are far more vulnerable to a margin call.

d. By the end of the year, the amount of the loan owed to the broker grows to:
\$5,000 x 1.08 = \$5,400

The equity in your account is (500P – \$5,400). Initial equity was \$15,000. Therefore, your rate of return after one year is as follows:

(i) $$\frac{(500 \times \$44) - \$5{,}400 - \$15{,}000}{\$15{,}000} = 0.1067 = 10.67\%$$

(ii) $$\frac{(500 \times \$40) - \$5{,}400 - \$15{,}000}{\$15{,}000} = -0.0267 = -2.67\%$$

(iii) $$\frac{(500 \times \$36) - \$5{,}400 - \$15{,}000}{\$15{,}000} = -0.1600 = -16.00\%$$

The relationship between the percentage return and the percentage change in the price of Intel is given by:

$$\% \text{ return} = \left(\% \text{ change in price} \times \frac{\text{Total investment}}{\text{Investor's initial equity}}\right) - \left(8\% \times \frac{\text{Funds borrowed}}{\text{Investor's initial equity}}\right)$$

For example, when the stock price rises from \$40 to \$44, the percentage change in price is 10%, while the percentage gain for the investor is:

$$\left(10\% \times \frac{\$20{,}000}{\$15{,}000}\right) - \left(8\% \times \frac{\$5{,}000}{\$15{,}000}\right) = 10.67\%$$

e. The value of the 500 shares is 500P. Equity is (500P – \$5,400). You will receive a margin call when:

$$\frac{500P - \$5{,}400}{500P} = 0.25 \quad \text{when } P = \$14.40 \text{ or lower}$$

24.

a. The gain or loss on the short position is: (–500 × ΔP)
Invested funds = \$15,000
Therefore: rate of return = (–500 × ΔP)/15,000
The rate of return in each of the three scenarios is:
(i) rate of return = (–500 × \$4)/\$15,000 = –0.1333 = –13.33%
(ii) rate of return = (–500 × \$0)/\$15,000 = 0%
(iii) rate of return = [–500 × (–\$4)]/\$15,000 = +0.1333 = +13.33%

Total assets in the margin account are \$20,000 (from the sale of the stock) + \$15,000 (the initial margin) = \$35,000. Liabilities are 500P. A margin call will be issued when:

$$\frac{\$35{,}000 - 500P}{500P} = 0.25 \quad \text{when } P = \$56 \text{ or higher}$$

b. With a \$1 dividend, the short position must now pay on the borrowed shares: (\$1/share × 500 shares) = \$500. Rate of return is now:

$$[(-500 \times \Delta P) - 500]/15{,}000$$

(i) rate of return =[(–500 × \$4) – \$500]/\$15,000 = –0.1667 = –16.67%

(ii) rate of return = [(–500 × \$0) – \$500]/\$15,000 = –0.0333 = –3.33%

(iii) rate of return = [(–500) × (–\$4) – \$500]/\$15,000 = +0.1000 = +10.00%

Total assets are \$35,000, and liabilities are (500P + 500). A margin call will be issued when:

$$\frac{35{,}000 - 500P - 500}{500P} = 0.25 \quad \text{when } P = \$55.20 \text{ or higher}$$

CFA 1

Answer: d - The broker will sell, at current market price, after the first transaction at \$55 or less.

CFA 2

Answer: b

CFA 3

Answer: d

CHAPTER 04
MUTUAL FUNDS AND OTHER INVESTMENT COMPANIES

1. Mutual funds offer many benefits. Some of those benefits include the ability to invest with small amounts of money, diversification, professional management, low transaction costs, tax benefits, and reduce administrative functions.
2. Close-end funds trade on the open market and are thus subject to market pricing. Open-end funds, are sold by the mutual fund and must reflect the NAV of the investments.
3. Annual fees charged by a mutual fund to pay for marketing and distribution costs.
4. A unit investment trust is an unmanaged mutual fund. Its portfolio is fixed and does not change due to asset trades, as does a close-end fund. .
5. Exchange-traded funds can be traded during the day, just as the stocks they represent. They are most tax effective, in that they do not have as many distributions. They also have much lower transaction costs. They also do not require load charges, management fees, and minimum investment amounts.
6. Hedge funds have much less regulation since they are part of private partnerships and free from mist SEC regulation. They permit investors to take on many risks unavailable to mutual funds. Hedge funds, however, may require higher fees and provide less transparency to investors. This offers significant counter party risk and hedge fund investors need to be more careful about the firm the invest with.
7. An open-end fund will have higher fees since they are actively marketing and managing their investor base. The fund is always looking for new investors. A unit investment trust need not spend too much time on such matters since investors find each other.
8. Asset allocation funds may dramatically vary the proportions allocated to each market in accord with the portfolio manager's forecast of the relative performance of each sector. Hence, these funds are engaged in market timing and are not designed to be low-risk investment vehicles.
9.

   a. A unit investment trusts offer low costs and stable portfolios. Since they do not change their portfolio, the investor knows exactly what they own. They are better suited to sophisticated investors.

   b. Open-end mutual funds offer higher levels of service to investors. The investors do not have any administrative burdens and their money is actively managed. This is better suited for less knowledgeable investors.

   c. Individual securities offer the most sophisticated investors ultimate flexibility. They are able to save money since they are only charged the expenses they incur. All decisions are under the control of the investor.

10. Open-end funds must honor redemptions and receive deposits from investors. This flow of money necessitates retaining cash. Close-end funds no longer take and receive money from investors. As such, they are free to be fully invested at all times.

11. The offering price includes a 6% front-end load, or sales commission, meaning that every dollar paid results in only \$0.94 going toward purchase of shares. Therefore:

$$\text{Offering price} = \frac{\text{NAV}}{1-\text{load}} = \frac{\$10.70}{1-0.06} = = \$11.38$$

12. NAV = offering price × (1 – load) = \$12.30 × 0.95 = \$11.69

13.

Stock	Value held by fund
A	\$ 7,000,000
B	12,000,000
C	8,000,000
D	15,000,000
Total	\$42,000,000

$$\text{Net asset value} = \frac{\$42{,}000{,}000 - \$30{,}000}{4{,}000{,}000} = \$10.49$$

14. Value of stocks sold and replaced = \$15,000,000

$$\text{Turnover rate} = \frac{\$15{,}000{,}000}{\$42{,}000{,}000} = 0.357 = 35.7\%$$

15.

a. $$\text{NAV} = \frac{\$200\text{million} - \$3\text{million}}{5\text{million}} = \$39.40$$

b. $$\text{Premium (or discount)} = \frac{\text{Price} - \text{NAV}}{\text{NAV}} = \frac{\$36 - \$39.40}{\$39.40} = -0.086 = -8.6\%$$

The fund sells at an 8.6% discount from NAV

16. $$\text{Rate of return} = \frac{\Delta(\text{NAV}) + \text{Distributions}}{\text{Start of year NAV}} = \frac{-\$0.40 + \$1.50}{\$12.50} = 0.0880 = 8.80\%$$

17.

a. Start of year price = \$12.00 × 1.02 = \$12.24

End of year price = \$12.10 × 0.93 = \$11.25

Although NAV increased, the price of the fund fell by \$0.99.

$$\text{Rate of return} = \frac{\Delta(\text{Price}) + \text{Distributions}}{\text{Start of year price}} = \frac{-\$0.99 + \$1.50}{\$12.24} = 0.0417 = 4.17\%$$

b. An investor holding the same portfolio as the fund manager would have earned a rate of return based on the increase in the NAV of the portfolio:

$$\text{Rate of return} = \frac{\Delta(\text{NAV}) + \text{Distributions}}{\text{Start of year NAV}} = \frac{\$0.10 + \$1.50}{\$12.00} = 0.1333 = 13.33\%$$

18. Assume a hypothetical investment of \$100.

Loaded up

a. Year 1 = 100 x (1+.06-.0175) = 104.25
b. Year 3 = 100 x (1+.06-.0175)^3 = 116.30
c. Year 10 = 100 x (1+.06-.0175)^10 = 151.62

Economy fund

a. Year 1 = 100 x .98 x (1+.06-.0025) = 103.64
b. Year 3 = 100 x .98 x (1+.06-.0025) ^ 3 = 115.90
c. Year 10 = 100 x .98 x (1+.06-.0025) ^ 10 = 171.41

19. NAV

a. (450,000,000 – 10,000,000) / 44,000,000 = \$10 per share

b. (440,000,000 – 10,000,000) / 43,000,000 = \$10 per share

20.

a. Empirical research indicates that past performance of mutual funds is not highly predictive of future performance, especially for better-performing funds. While there *may* be some tendency for the fund to be an above average performer next year, it is unlikely to once again be a top 10% performer.

b. On the other hand, the evidence is more suggestive of a tendency for poor performance to persist. This tendency is probably related to fund costs and turnover rates. Thus if the fund is among the poorest performers, investors would be concerned that the poor performance will persist.

21. Start of year NAV = \$20

Dividends per share = \$0.20

End of year NAV is based on the 8% price gain, less the 1% 12b-1 fee:

End of year NAV = \$20 × 1.08 × (1 – 0.01) = \$21.384

$$\text{Rate of return} = \frac{\$21.384 - \$20 + \$0.20}{\$20} = 0.0792 = 7.92\%$$

22. The excess of purchases over sales must be due to new inflows into the fund. Therefore, \$400 million of stock previously held by the fund was replaced by new holdings. So turnover is: \$400/\$2,200 = 0.182 = 18.2%

23. Fees paid to investment managers were: 0.007 × \$2.2 billion = \$15.4 million
Since the total expense ratio was 1.1% and the management fee was 0.7%, we conclude that 0.4% must be for other expenses. Therefore, other administrative expenses were: 0.004 × \$2.2 billion = \$8.8 million

24. As an initial approximation, your return equals the return on the shares minus the total of the expense ratio and purchase costs: 12% – 1.2% – 4% = 6.8%

But the precise return is less than this because the 4% load is paid up front, not at the end of the year.

To purchase the shares, you would have had to invest: \$20,000/(1 – 0.04) = \$20,833

The shares increase in value from \$20,000 to: \$20,000 × (1.12 – 0.012) = \$22,160

The rate of return is: (\$22,160 – \$20,833)/\$20,833 = 6.37%

25. Suppose you have \$1000 to invest. The initial investment in Class A shares is \$940 net of the front-end load. After 4 years, your portfolio will be worth:

$\$940 \times (1.10)^4 = \$1{,}376.25$

Class B shares allow you to invest the full \$1,000, but your investment performance net of 12b-1 fees will be only 9.5%, and you will pay a 1% back-end load fee if you sell after 4 years. Your portfolio value after 4 years will be:

$\$1{,}000 \times (1.095)^4 = \$1{,}437.66$

After paying the back-end load fee, your portfolio value will be:

$\$1{,}437.66 \times 0.99 = \$1{,}423.28$

Class B shares are the better choice if your horizon is 4 years.

With a 15-year horizon, the Class A shares will be worth:

$\$940 \times (1.10)^{15} = \$3{,}926.61$

For the Class B shares, there is no back-end load in this case since the horizon is greater than 5 years. Therefore, the value of the Class B shares will be:

$$\$1{,}000 \times (1.095)^{15} = \$3{,}901.32$$

At this longer horizon, Class B shares are no longer the better choice. The effect of Class B's 0.5% 12b-1 fees cumulates over time and finally overwhelms the 6% load charged to Class A investors.

26. For the bond fund, the fraction of portfolio income given up to fees is:

$$\frac{0.6\%}{4.0\%} = 0.150 = 15.0\%$$

For the equity fund, the fraction of investment earnings given up to fees is:

$$\frac{0.6\%}{12.0\%} = 0.050 = 5.0\%$$

Fees are a much higher fraction of expected earnings for the bond fund, and therefore may be a more important factor in selecting the bond fund.

This may help to explain why unmanaged unit investment trusts are concentrated in the fixed income market. The advantages of unit investment trusts are low turnover and low trading costs and management fees. This is a more important concern to bond-market investors.

27.

a. After two years, each dollar invested in a fund with a 4% load and a portfolio return equal to r will grow to:

$$\$0.96 \times (1 + r - 0.005)^2$$

Each dollar invested in the bank CD will grow to:

$$\$1 \times (1.06)^2$$

If the mutual fund is to be the better investment, then the portfolio return, r, must satisfy:

$$0.96 \times (1 + r - 0.005)^2 > (1.06)^2$$

$$0.96 \times (1 + r - 0.005)^2 > 1.1236$$

$$(1 + r - 0.005)^2 > 1.1704$$

$$1 + r - 0.005 > 1.0819$$

$$1 + r > 1.0869$$

Therefore, $r > 0.0869 = 8.69\%$

b. If you invest for six years, then the portfolio return must satisfy:

$0.96 \times (1 + r - 0.005)^6 > (1.06)^6 = 1.4185$

$(1 + r - 0.005)^6 > 1.4776$

$1 + r - 0.005 > 1.0672$

$1 + r > 1.0722$

$r > 7.22\%$

The cutoff rate of return is lower for the six year investment because the "fixed cost" (i.e., the one-time front-end load) is spread out over a greater number of years.

c. With a 12b-1 fee instead of a front-end load, the portfolio must earn a rate of return (r) that satisfies:

$1 + r - 0.005 - 0.0075 > 1.06$

In this case, r must exceed 7.25% regardless of the investment horizon.

28. The turnover rate is 50%. This means that, on average, 50% of the portfolio is sold and replaced with other securities each year. Trading costs on the sell orders are 0.4%; and the buy orders to replace those securities entail another 0.4% in trading costs. Total trading costs will reduce portfolio returns by: $2 \times 0.4\% \times 0.50 = 0.4\%$

29. Suppose that finishing in the top half of all portfolio managers is purely luck, and that the probability of doing so in any year is exactly ½. Then the probability that any particular manager would finish in the top half of the sample five years in a row is $(½)^5 = 1/32$. We would then expect to find that $[350 \times (1/32)] = 11$ managers finish in the top half for each of the five consecutive years. This is precisely what we found. Thus, we should not conclude that the consistent performance after five years is proof of skill. We would expect to find eleven managers exhibiting precisely this level of "consistency" even if performance is due solely to luck.

CHAPTER 05
RISK AND RETURN: PAST AND PROLOGUE

1. The 1% VaR will be less than -30%. As percentile or probability of a return declines so does the magnitude of that return. Thus, a 1 percentile probability will produce a smaller VaR than a 5 percentile probability.

2. The geometric return represents a compounding growth number and will artificially inflate the annual performance of the portfolio.

3. No. Since all items are presented in nominal figures, the input should also use nominal data.

4. Decrease. Typically, standard deviation exceeds return. Thus, a reduction of 4% in each will artificially decrease the return per unit of risk. To return to the proper risk return relationship the portfolio will need to decrease the amount of risk free investments.

5. $E(r) = [0.3 \times 44\%] + [0.4 \times 14\%] + [0.3 \times (-16\%)] = 14\%$

   $\sigma^2 = [0.3 \times (44 - 14)^2] + [0.4 \times (14 - 14)^2] + [0.3 \times (-16 - 14)^2] = 540$

   $\sigma = 23.24\%$

   The mean is unchanged, but the standard deviation has increased.

6.

   a. The holding period returns for the three scenarios are:

      Boom: $(50 - 40 + 2)/40 = 0.30 = 30.00\%$

      Normal: $(43 - 40 + 1)/40 = 0.10 = 10.00\%$

      Recession: $(34 - 40 + 0.50)/40 = -0.1375 = -13.75\%$

      $E(HPR) = [(1/3) \times 30\%] + [(1/3) \times 10\%] + [(1/3) \times (-13.75\%)] = 8.75\%$

   $\sigma^2(HPR) = [(1/3) \times (30 - 8.75)^2] + [(1/3) \times (10 - 8.75)^2] + [(1/3) \times (-13.75 - 8.75)^2]$

   $= 319.79$

   $\sigma = \sqrt{319.79} = 17.88\%$

   b. $E(r) = (0.5 \times 8.75\%) + (0.5 \times 4\%) = 6.375\%$

   $\sigma = 0.5 \times 17.88\% = 8.94\%$

7.

a. Time-weighted average returns are based on year-by-year rates of return.

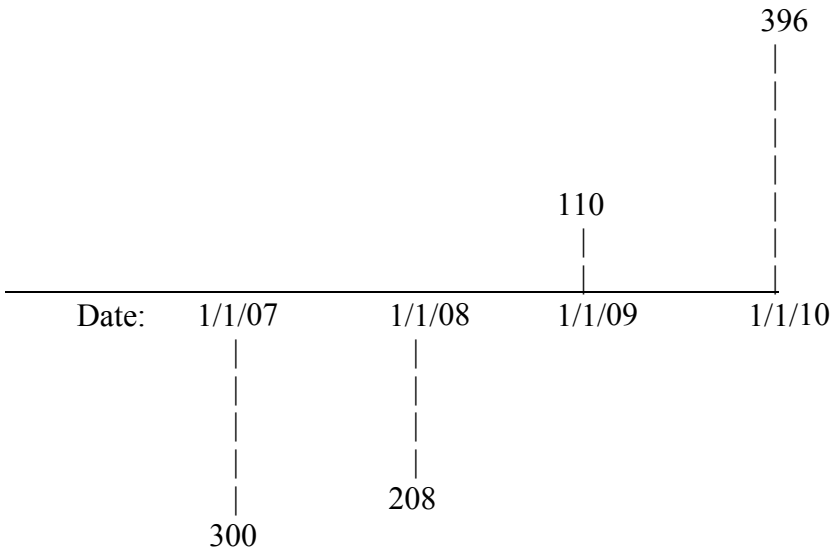
Year	Return = [(capital gains + dividend)/price]
2007-2008	(110 – 100 + 4)/100 = 14.00%
2008-2009	(90 – 110 + 4)/110 = –14.55%
2009-2010	(95 – 90 + 4)/90 = 10.00%

Arithmetic mean: 3.15%

Geometric mean: 2.33%

b.

Time	Cash flow	Explanation
0	-300	Purchase of three shares at $100 per share
1	-208	Purchase of two shares at $110, plus dividend income on three shares held
2	110	Dividends on five shares, plus sale of one share at $90
3	396	Dividends on four shares, plus sale of four shares at $95 per share



Dollar-weighted return = Internal rate of return = –0.1661%

8.

a. $E(r_P) - r_f = ½A\sigma_P^2 = ½ \times 4 \times (0.20)^2 = 0.08 = 8.0\%$

b. $0.09 = ½A\sigma_P^2 = ½ \times A \times (0.20)^2 \Rightarrow A = 0.09/(½ \times 0.04) = 4.5$

c. Increased risk tolerance means decreased risk aversion (A), which results in a decline in risk premiums.

9. For the period 1926 – 2008, the mean annual risk premium for large stocks over T-bills is 9.34%

E(r) = Risk-free rate + Risk premium = 5% + 7.68% =12.68%

10. In the table below, we use data from Table 5.2. Excess returns are real returns since the risk free rate incorporates inflation.

Large Stocks: 7.68%
Small Stocks: 13.51%
Long-Term T-Bonds: 1.85%
T-Bills: 0.66 % (table 5.4)

11.

a. The expected cash flow is: (0.5 × \$50,000) + (0.5 × \$150,000) = \$100,000
With a risk premium of 10%, the required rate of return is 15%. Therefore, if the value of the portfolio is X, then, in order to earn a 15% expected return:

$X(1.15) = \$100{,}000 \Rightarrow X = \$86{,}957$

b. If the portfolio is purchased at \$86,957, and the expected payoff is \$100,000, then the expected rate of return, E(r), is:

$$\frac{\$100{,}000 - \$86{,}957}{\$86{,}957} = 0.15 = 15.0\%$$

The portfolio price is set to equate the expected return with the required rate of return.

c. If the risk premium over T-bills is now 15%, then the required return is:

5% + 15% = 20%

The value of the portfolio (X) must satisfy:

$X(1.20) = \$100{,}000 \Rightarrow X = \$83{,}333$

d. For a given expected cash flow, portfolios that command greater risk premia must sell at lower prices. The extra discount from expected value is a penalty for risk.

12.

a. $E(r_P) = (0.3 \times 7\%) + (0.7 \times 17\%) = 14\%$ per year

$\sigma_P = 0.7 \times 27\% = 18.9\%$ per year

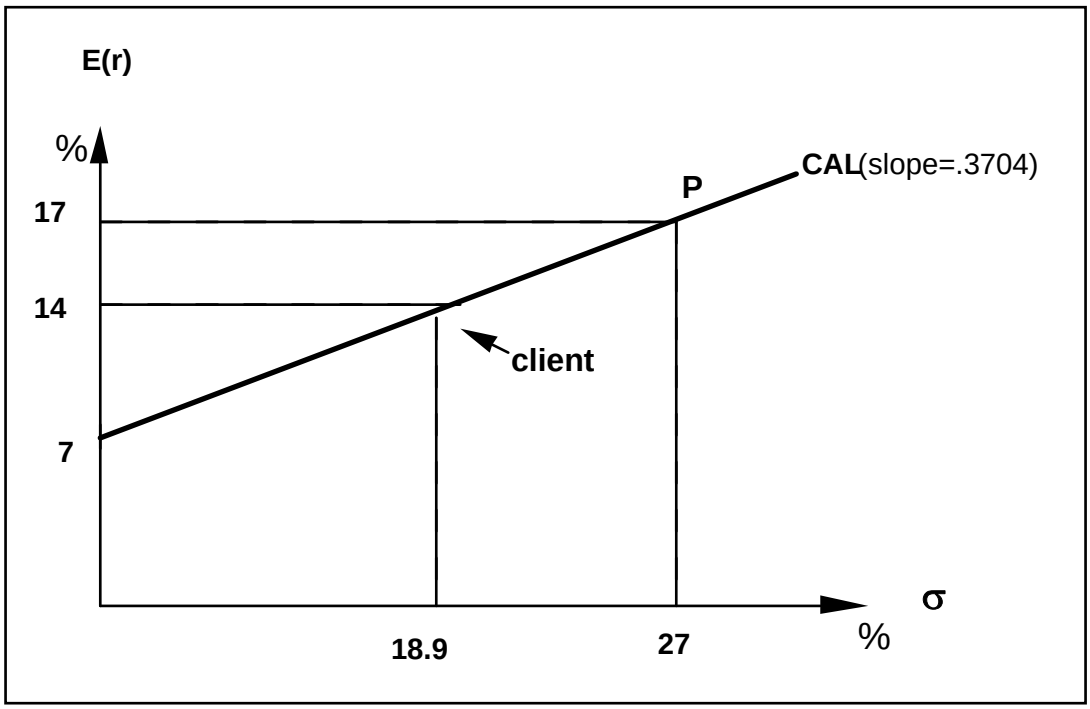
b.

Security		Investment Proportions
T-Bills		30.0%
Stock A	$0.7 \times 27\% =$	18.9%
Stock B	$0.7 \times 33\% =$	23.1%
Stock C	$0.7 \times 40\% =$	28.0%

c. Your Reward-to-variability ratio = $S = \dfrac{17-7}{27} = 0.3704$

Client's Reward-to-variability ratio = $\dfrac{14-7}{18.9} = 0.3704$

d.



13.

a. Mean of portfolio = $(1 - y)rf + y\,rP = rf + (rP - rf)y = 7 + 10y$
If the expected rate of return for the portfolio is 15%, then, solving for y:

$$15 = 7 + 10y \Rightarrow y = \frac{15-7}{10} = 0.8$$

Therefore, in order to achieve an expected rate of return of 15%, the client must invest 80% of total funds in the risky portfolio and 20% in T-bills.

b.

Security		Investment Proportions
T-Bills		20.0%
Stock A	$0.8 \times 27\% =$	21.6%
Stock B	$0.8 \times 33\% =$	26.4%
Stock C	$0.8 \times 40\% =$	32.0%

c. $\sigma_P = 0.8 \times 27\% = 21.6\%$ per year

14.

a. Portfolio standard deviation = $\sigma_P = y \times 27\%$
If the client wants a standard deviation of 20%, then:
$y = (20\%/27\%) = 0.7407 = 74.07\%$ in the risky portfolio.

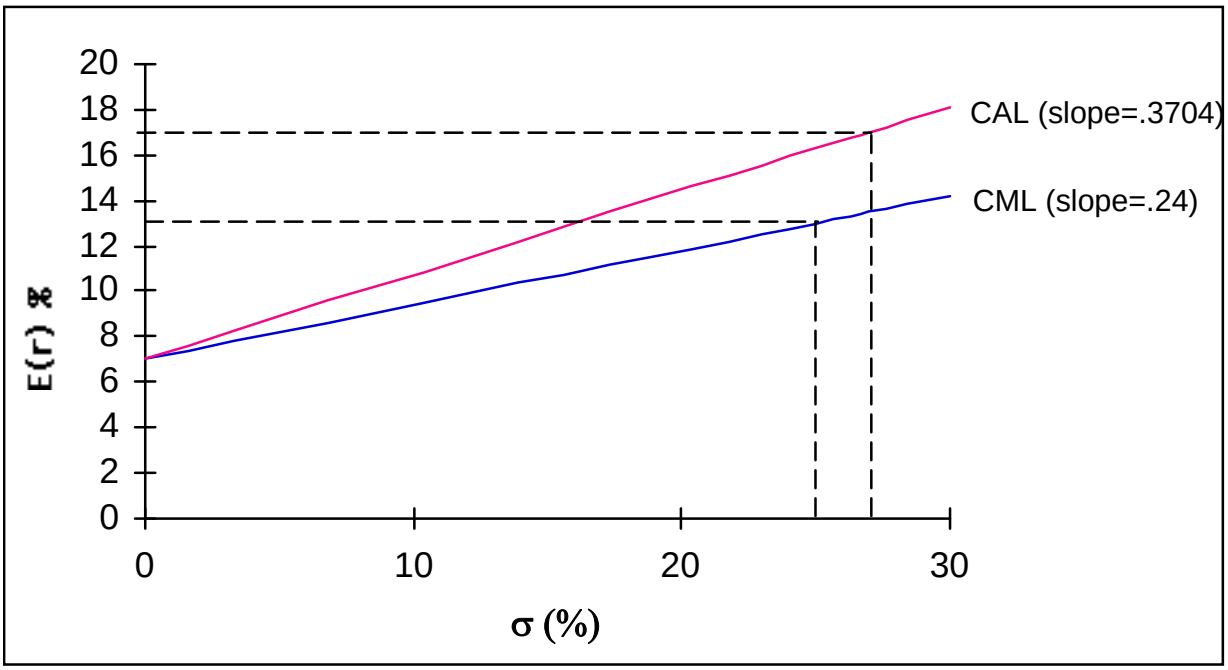
b. Expected rate of return = $7 + 10y = 7 + (0.7407 \times 10) = 14.407\%$

15.

a. Slope of the CML = $\frac{13-7}{25} = 0.24$

See the diagram on the next page.

b. My fund allows an investor to achieve a higher expected rate of return for any given standard deviation than would a passive strategy, i.e., a higher expected return for any given level of risk.



16.

a. With 70% of his money in my fund's portfolio, the client has an expected rate of return of 14% per year and a standard deviation of 18.9% per year. If he shifts that money to the passive portfolio (which has an expected rate of return of 13% and standard deviation of 25%), his overall expected return and standard deviation would become:

$$E(r_C) = r_f + 0.7(r_M - r_f)$$

In this case, $r_f = 7\%$ and $r_M = 13\%$. Therefore:

$$E(r_C) = 7 + (0.7 \times 6) = 11.2\%$$

The standard deviation of the complete portfolio using the passive portfolio would be:

$$\sigma_C = 0.7 \times \sigma_M = 0.7 \times 25\% = 17.5\%$$

Therefore, the shift entails a decline in the mean from 14% to 11.2% and a decline in the standard deviation from 18.9% to 17.5%. Since both mean return *and* standard deviation fall, it is not yet clear whether the move is beneficial. The disadvantage of the shift is apparent from the fact that, if my client is willing to accept an expected return on his total portfolio of 11.2%, he can achieve that return with a lower standard deviation using my fund portfolio rather than the passive portfolio. To achieve a target mean of 11.2%, we first write the mean of the complete portfolio as a function of the proportions invested in my fund portfolio, y:

$$E(r_C) = 7 + y(17 - 7) = 7 + 10y$$

Because our target is: $E(r_C) = 11.2\%$, the proportion that must be invested in my fund is determined as follows:

$$11.2 = 7 + 10y \Rightarrow y = \frac{11.2 - 7}{10} = 0.42$$

The standard deviation of the portfolio would be:

$$\sigma_C = y \times 27\% = 0.42 \times 27\% = 11.34\%$$

Thus, by using my portfolio, the same 11.2% expected rate of return can be achieved with a standard deviation of only 11.34% as opposed to the standard deviation of 17.5% using the passive portfolio.

b. The fee would reduce the reward-to-variability ratio, i.e., the slope of the CAL. Clients will be indifferent between my fund and the passive portfolio if the slope of the after-fee CAL and the CML are equal. Let f denote the fee:

$$\text{Slope of CAL with fee} = \frac{17 - 7 - f}{27} = \frac{10 - f}{27}$$

$$\text{Slope of CML (which requires no fee)} = \frac{13 - 7}{25} = 0.24$$

Setting these slopes equal and solving for f:

$$\frac{10 - f}{27} = 0.24$$

$$10 - f = 27 \times 0.24 = 6.48$$

$$f = 10 - 6.48 = 3.52\% \text{ per year}$$

17. Assuming no change in tastes, that is, an unchanged risk aversion, investors perceiving higher risk will demand a higher risk premium to hold the same portfolio they held before. If we assume that the risk-free rate is unaffected, the increase in the risk premium would require a higher expected rate of return in the equity market.

18. Expected return for your fund = T-bill rate + risk premium = 6% + 10% = 16%
Expected return of client's overall portfolio = (0.6 × 16%) + (0.4 × 6%) = 12%
Standard deviation of client's overall portfolio = 0.6 × 14% = 8.4%

19. Reward to variability ratio $= \dfrac{\text{Risk premium}}{\text{Standard deviation}} = \dfrac{10}{14} = 0.71$

20. Excess Return (%)

	Average	Standard Deviation	Sharpe Measure
1926–2008	13.51	37.81	0.36
1926–1955	20.02	49.25	0.41
1956–1984	12.18	32.31	0.38
1985–2008	6.77	25.44	0.27

a. In three of the four time frames presented, small stocks provide worse ratios than large stocks.

b. Small stocks show a declining trend in risk, but the decline is not stable.

21. Geometric return data is used from table 5.2 and geometric inflation data from table 5.4. Standard deviations are from the excess return data in table 5.2.

Real Returns - Large Cap

	Average	Inflation	Real Return
1926–2008	9.34	3.02	6.1%
1926–1955	9.66	1.36	8.2%
1956–1984	9.52	4.8	4.5%
1985–2008	8.68	2.91	5.6%

Risk Return Ratio - Large Cap

	Average	Standard Deviation (%)	Sharpe Measure
1926–2008	6.1%	20.88	0.29
1926–1955	8.2%	25.4	0.32
1956–1984	4.5%	17.58	0.26
1985–2008	5.6%	18.23	0.31

22.

Real Returns - Small Cap

	Average	Inflation	Real Return
1926–2008	11.43	3.02	8.2%
1926–1955	11.32	1.36	9.8%
1956–1984	13.81	4.8	8.6%
1985–2008	8.56	2.91	5.5%

Risk Return Ratio - Large Cap

	Average	Standard Deviation (%)	Sharpe Measure
1926–2008	8.2%	37.81	0.22
1926–1955	9.8%	49.25	0.20
1956–1984	8.6%	32.31	0.27
1985–2008	5.5%	25.44	0.22

23.

Results	T Bill	S&P 500	Market
Average	3.65	5.25	5.23
SD	2.95	20.46	20.48
Skew	0.89	-0.84	-0.85
Kurtosis	0.71	0.99	0.88
Percentile (5%)	0.14	-32.09	-35.94
Normal (5%)	-1.20	-28.40	-28.45
Min	-0.04	-61.89	-59.69
Max	13.73	43.24	45.13
Serial corr	0.91	0.08	0.09
Corr(SP500,Mkt)		0.99	
Corr(pf, risk-free)		-0.11	-0.13

Comparison

The combined markets index represents the Fama-French market factor (Mkt). It is better diversified than the S&P 500 index since it contains approximately ten times as many stocks. The total market capitalization of the additional stocks, however, is relatively small compared to the S&P 500. As a result, the performance of the value weighted portfolios is expected to be quite similar, and the correlation of the excess returns very high. Even though the sample contains 82 observations, the standard deviation of the annual returns is relatively high, but the difference between the two indices is very small. When comparing the continuously compounded excess returns we see that the difference between the two portfolios is indeed quite small, and the correlation coefficient between their returns is 0.99. Both deviate from the normal distribution as seen from the negative skew and positive kurtosis. Accordingly, the VaR (5% percentile) of the two is smaller than what is expected from a normal distribution with the same mean and standard deviation. This is also indicated by the lower minimum excess return for the period. The serial correlation is also small and indistinguishable across the portfolios.

As a result of all this, we expect the risk premium of the two portfolios to be similar, as we find from the sample. It is worth noting that the excess return of both portfolios has a small negative correlation with the risk-free rate. Since we expect the risk-free rate to be highly correlated with the rate of inflation, this suggests that equities are not a perfect hedge against inflation. More rigorous analysis of this point is important, but beyond the scope of this question.

CFA 1

Answer: $V(12/31/2007) = V(1/1/1991) \times (1 + g)^7 = \$100{,}000 \times (1.05)^7 = \$140{,}710.04$

CF 2

Answer: i and ii. The standard deviation is non-negative.

CFA 3

Answer: c. Determines most of the portfolio's return and volatility over time.

CFA 4

Investment 3. For each portfolio: Utility = $E(r) - (0.5 \times 4 \times \sigma^2)$

Investment	E(r)	σ	U
1	0.12	0.30	-0.0600
2	0.15	0.50	-0.3500
3	0.21	0.16	0.1588
4	0.24	0.21	0.1518

We choose the portfolio with the highest utility value.

CFA 5

Answer: Investment 4. When an investor is risk neutral, A = 0 so that the portfolio with the highest utility is the portfolio with the highest expected return.

CFA 6

Answer: b

CFA 7

$$E(r_X) = [0.2 \times (-20\%)] + [0.5 \times 18\%] + [0.3 \times 50\%)] = 20\%$$
$$E(r_Y) = [0.2 \times (-15\%)] + [0.5 \times 20\%] + [0.3 \times 10\%)] = 10\%$$

CFA 8

$\sigma_X^2 = [0.2 \times (-20 - 20)^2] + [0.5 \times (18 - 20)^2] + [0.3 \times (50 - 20)^2] = 592$

$\sigma_X = 24.33\%$

$\sigma_Y = [0.2 \times (-15 - 10)^2] + [0.5 \times (20 - 10)^2] + [0.3 \times (10 - 10)^2] = 175$

$\sigma_Y = 13.23\%$

CFA 9

$E(r) = (0.9 \times 20\%) + (0.1 \times 10\%) = 19\%$

CFA 10

The probability is 0.50 that the state of the economy is neutral. Given a neutral economy, the probability that the performance of the stock will be poor is 0.30, and the probability of both a neutral economy and poor stock performance is:

$.30 \times 0.50 = 0.15$

CFA 11

$E(r) = [0.1 \times 15\%] + [0.6 \times 13\%] + [0.3 \times 7\%)] = 11.4\%$

CHAPTER 06
EFFICIENT DIVERSIFICATION

1. So long as the correlation coefficient is neither zero nor 1.0, the portfolio will contain diversification benefits. Any other combination will cause a diversification benefit since the standard deviation will fall, relative to the return on the portfolio. Otherwise, the risk and return will change in unison.

2. The covariance with the other assets is more important. Diversification is accomplished via correlation with other assets. Covariance helps determine that number.

3. a. and b. will both have the same impact of increasing the sharpe measure from .40 to .45.

4. The expected return of the portfolio will be impacted if the asset allocation is changed. Since the expected return of the portfolio is the first item in the numerator of the sharpe ratio, the ratio will be changed.

5. Impact on total variance

Om	Os	B	TOTAL Variance	Corr Coeff
0.2	0.3	1.5	0.1800	0.5000
0.2	0.3	1.65	0.1989	0.5475
0.2	0.33	1.5	0.1989	0.4525

a. Both will have the same impact. The total variance will increase from .18 to .1989
b. An increase in beta, however, increases the correlation coefficient and thus creates more diversification benefit.

6.

a. Without doing any math, the severe recession is worse and the boom is better. Thus, there appears to be a higher variance, yet the mean is probably the same since the spread is equally larger on both the high and low side. The mean return, however, should be higher since there is higher probability given to the higher returns.

b. Calculation of mean return and variance for the stock fund:

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Scenario	Probability	Rate of Return	Col. B × Col. C	from Expected Return	Squared Deviation	Col. B × Col. F
Severe recession	0.05	-40	-2	-51.2	2621.44	131.07
Mild recession	0.25	-14	-3.5	-25.2	635.04	158.76
Normal growth	0.4	17	6.8	5.8	33.64	13.46
Boom	0.3	33	9.9	21.8	475.24	142.57
	Expected Return =		11.2		Variance =	445.86
				Standard Deviation =		21.12

c. Calculation of covariance:

(A)	(B)	(C)	(D)	(E)	(F)
		Deviation from Mean Return			
Scenario	Probability	Stock Fund	Bond Fund	Col. C × Col. D	Col. B × Col. E
Severe recession	0.05	-51.2	-14	716.8	35.84
Mild recession	0.25	-25.2	10	-252	-63
Normal growth	0.4	5.8	3	17.4	6.96
Boom	0.3	21.8	-10	-218	-65.4
				Covariance =	-85.6

Covariance has increased because the stock returns are more extreme in the recession and boom periods. This makes the tendency for stock returns to be poor when bond returns are good (and vice versa) even more dramatic.

7.

d. One would expect variance to increase because the probabilities of the extreme outcomes are now higher.

e. Calculation of mean return and variance for the stock fund:

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Scenario	Probability	Rate of Return	Col. B × Col. C	from Expected Return	Squared Deviation	Col. B × Col. F
Severe recession	0.1	-40	-2	-51.2	2621.44	131.07
Mild recession	0.2	-14	-3.5	-25.2	635.04	158.76
Normal growth	0.35	17	6.8	5.8	33.64	13.46
Boom	0.35	33	9.9	21.8	475.24	142.57
	Expected Return =		11.2		Variance =	445.86
				Standard Deviation =		21.12

f. Calculation of covariance

(A)	(B)	(C)	(D)	(E)	(F)
		Deviation from Mean Return			
Scenario	Probability	Stock Fund	Bond Fund	Col. C × Col. D	Col. B × Col. E
Severe recession	0.1	-51.2	-14	716.8	71.68
Mild recession	0.2	-25.2	10	-252	-50.4
Normal growth	0.35	5.8	3	17.4	6.09
Boom	0.35	21.8	-10	-218	-76.3
				Covariance =	-48.93

Covariance has decreased because the probabilities of the more extreme returns in the recession and boom periods are now higher. This gives more weight to the extremes in the mean calculation, thus making their deviation from the mean less pronounced.

8 The parameters of the opportunity set are:

$E(r_S) = 15\%$, $E(r_B) = 9\%$, $\sigma_S = 32\%$, $\sigma_B = 23\%$, $\rho = 0.15$, $r_f = 5.5\%$

From the standard deviations and the correlation coefficient we generate the covariance matrix [note that $Cov(r_S, r_B) = \rho\sigma_S\sigma_B$]:

	Bonds	***Stocks***
Bonds	529.0	110.4
Stocks	110.4	1024.0

The minimum-variance portfolio proportions are:

$$w_{Min}(S) = \frac{\sigma_B^2 - Cov(r_S, r_B)}{\sigma_S^2 + \sigma_B^2 - 2Cov(r_S, r_B)}$$

$$= \frac{529 - 110.4}{1024 + 529 - (2 \times 110.4)} = 0.3142$$

$w_{Min}(B) = 0.6858$

The mean and standard deviation of the minimum variance portfolio are:

$$E(r_{Min}) = (0.3142 \times 15\%) + (0.6858 \times 9\%) = 10.89\%$$

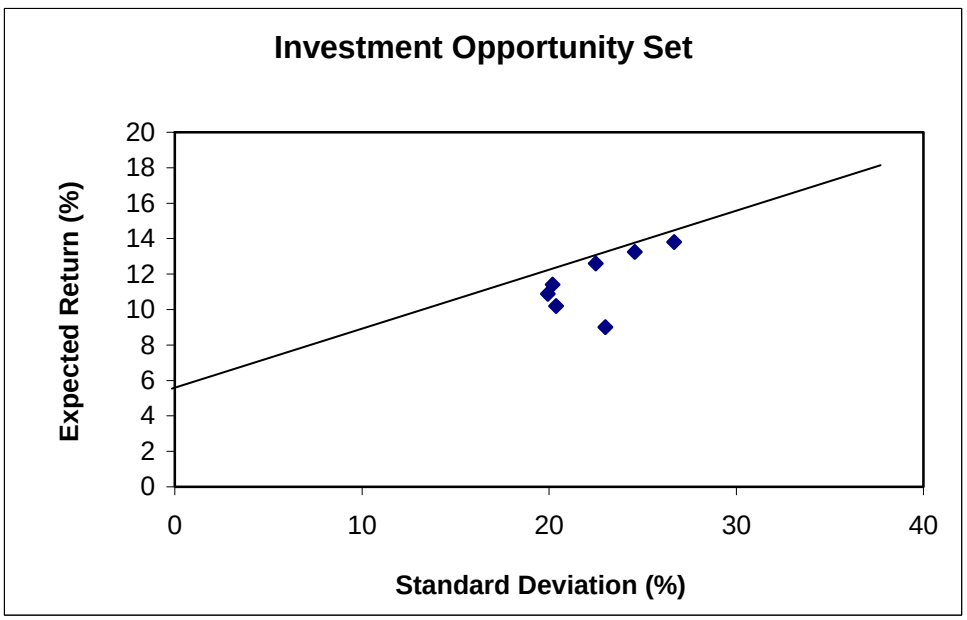
$$\sigma_{Min} = \left[w_S^2\sigma_S^2 + w_B^2\sigma_B^2 + 2w_S w_B Cov(r_S, r_B)\right]^{1/2}$$

$$= [(0.3142^2 \times 1024) + (0.6858^2 \times 529) + (2 \times 0.3142 \times 0.6858 \times 110.4)]^{1/2}$$

$$= 19.94\%$$

% in stocks	% in bonds	Exp. return	Std dev.	
00.00	100.00	9.00	23.00	
20.00	80.00	10.20	20.37	
31.42	**68.58**	**10.89**	**19.94**	**Minimum variance**
40.00	60.00	11.40	20.18	
60.00	40.00	12.60	22.50	
70.75	**29.25**	**13.25**	**24.57**	**Tangency portfolio**
80.00	20.00	13.80	26.68	
100.00	00.00	15.00	32.00	

9.



The graph approximates the points:

	E(r)	σ
Minimum Variance Portfolio	10.89%	19.94%
Tangency Portfolio	13.25%	24.57%

10.

The reward-to-variability ratio of the optimal CAL is:

$$\frac{E(r_p) - r_f}{\sigma_p} = \frac{13.25 - 5.5}{24.57} = 0.3154$$

11.

g. The equation for the CAL is:

$$E(r_C) = r_f + \frac{E(r_p) - r_f}{\sigma_p}\sigma_C = 5.5 + 0.3154\sigma_C$$

Setting E(rC) equal to 12% yields a standard deviation of: 20.61%

h. The mean of the complete portfolio as a function of the proportion invested in the risky portfolio (y) is:

i.

$E(r_C) = (1 - y)r_f + yE(r_P) = r_f + y[E(r_P) - r_f] = 5.5 + y(13.25 - 5.5)$

Setting $E(r_C) = 12\% \Rightarrow y = 0.8387$ (83.87% in the risky portfolio)

$1 - y = 0.1613$ (16.13% in T-bills)

From the composition of the optimal risky portfolio:
Proportion of stocks in complete portfolio = 0.8387 × 0.7075 = 0.5934
Proportion of bonds in complete portfolio = 0.8387 × 0.2925 = 0.2453

12. Using only the stock and bond funds to achieve a mean of 12% we solve:

$12 = 15w_S + 9(1 - w_S) = 9 + 6w_S \Rightarrow w_S = 0.5$

Investing 50% in stocks and 50% in bonds yields a mean of 12% and standard deviation of:

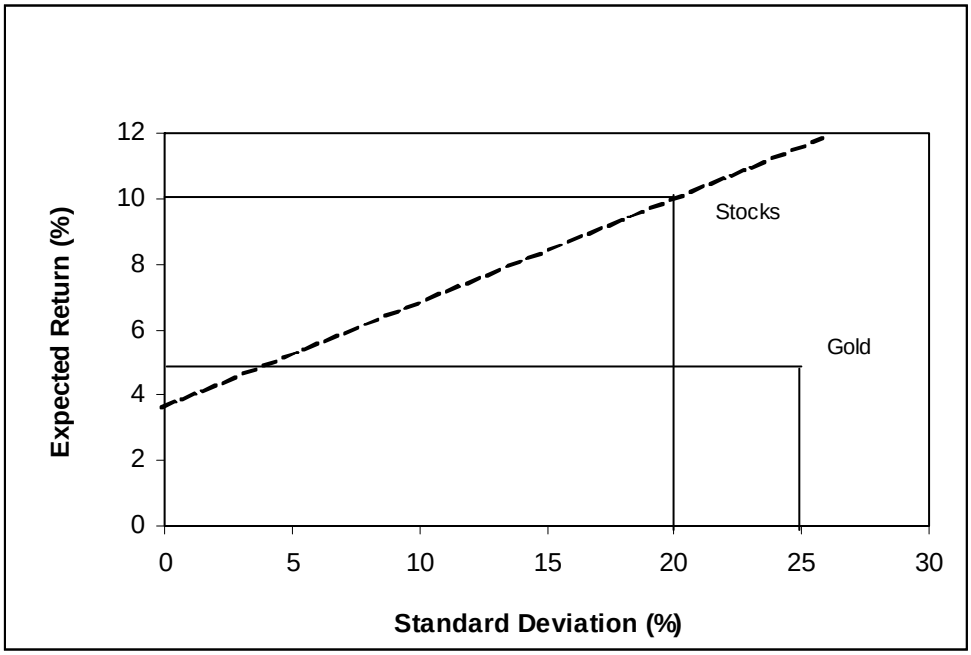
$$\sigma_P = [(0.50^2 \times 1024) + (0.50^2 \times 529) + (2 \times 0.50 \times 0.50 \times 110.4)]^{1/2} = 21.06\%$$

The efficient portfolio with a mean of 12% has a standard deviation of only 20.61%. Using the CAL reduces the standard deviation by 45 basis points.

13.

j. Although it appears that gold is dominated by stocks, gold can still be an attractive diversification asset. If the correlation between gold and stocks is sufficiently low, gold will be held as a component in the optimal portfolio.

k. If gold had a perfectly positive correlation with stocks, gold would not be a part of efficient portfolios. The set of risk/return combinations of stocks and gold would plot as a straight line with a negative slope. (See the following graph.) The graph shows that the stock-only portfolio dominates any portfolio containing gold. This cannot be an equilibrium; the price of gold must fall and its expected return must rise.



14. Since Stock A and Stock B are perfectly negatively correlated, a risk-free portfolio can be created and the rate of return for this portfolio in equilibrium will always be the risk-free rate. To find the proportions of this portfolio [with w_A invested in Stock A and $w_B = (1 - w_A)$ invested in Stock B], set the standard deviation equal to zero. With perfect negative correlation, the portfolio standard deviation reduces to:

$$\sigma_P = \text{Abs}[w_A\sigma_A - w_B\sigma_B]$$

$$0 = 40\ w_A - 60(1 - w_A) \Rightarrow w_A = 0.60$$

The expected rate of return on this risk-free portfolio is:

$$E(r) = (0.60 \times 8\%) + (0.40 \times 13\%) = 10.0\%$$

Therefore, the risk-free rate must also be 10.0%.

15. Since these are annual rates and the risk-free rate was quite variable during the sample period of the recent 20 years, the analysis has to be conducted with continuously compounded rates in excess of T-bill rates. Notice that to obtain cc rates we must convert percentage return to decimal. The decimal cc rate, ln(1+percentage rate/100), can then be multiplied by 100 to return to percentage rates. Recall also that with cc rates, excess returns are just the difference between total returns and the risk-free (T-bill) rates.

	Annual returns from Table 2			Continuously compounded rates			Excess returns	
Year	Large Stock	Long-Term T-Bonds	T-Bills	Large Stock	Long-Term T-Bonds	T-Bills	Large Stock	Long-Term T-Bonds
1989	31.34	19.49	8.38	27.26	17.81	8.05	19.21	9.76
1990	-3.20	7.13	7.84	-3.25	6.89	7.55	-10.80	-0.66
1991	30.66	18.39	5.60	26.74	16.88	5.45	21.29	11.43
1992	7.71	7.79	3.50	7.43	7.50	3.44	3.99	4.06
1993	9.87	15.48	2.90	9.41	14.39	2.86	6.55	11.53
1994	1.29	-7.18	3.91	1.28	-7.45	3.84	-2.55	-11.29
1995	37.71	31.67	5.60	32.00	27.51	5.45	26.55	22.06
1996	23.07	-0.81	5.20	20.76	-0.81	5.07	15.69	-5.88
1997	33.17	15.08	5.25	28.65	14.05	5.12	23.53	8.93
1998	28.58	13.52	4.85	25.14	12.68	4.74	20.40	7.94
1999	21.04	-8.74	4.69	19.10	-9.15	4.58	14.51	-13.73
2000	-9.10	20.27	5.88	-9.54	18.46	5.71	-15.25	12.74
2001	-11.89	4.21	3.86	-12.66	4.12	3.79	-16.45	0.34
2002	-22.10	16.79	1.63	-24.97	15.52	1.62	-26.59	13.90
2003	28.69	2.38	1.02	25.22	2.35	1.01	24.21	1.34
2004	10.88	7.71	1.19	10.33	7.43	1.18	9.14	6.24
2005	4.91	6.50	2.98	4.79	6.30	2.94	1.86	3.36
2006	11.78	-1.21	4.81	11.14	-1.22	4.70	6.44	-5.92
2007	3.53	10.25	4.67	3.47	9.76	4.56	-1.10	5.20
2008	-38.49	1.34	1.55	-48.60	1.33	1.54	-50.14	-0.21
						Average	3.53	4.06
						SD	19.64	8.88
						Corr(stocks,bonds)	0.13	

	Weights in		Portfolio	
	Stocks	Bonds	Mean	SD
	0.0	1	4.06	8.88
	0.1	0.9	4.01	8.47
	0.2	0.8	3.95	8.55
	0.3	0.7	3.90	9.10
	0.4	0.6	3.85	10.05
	0.5	0.5	3.79	11.29
	0.6	0.4	3.74	12.74
	0.7	0.3	3.69	14.34
	0.8	0.2	3.63	16.04
	0.9	0.1	3.58	17.81
	1.0	0	3.53	19.64
Min-Var	0.1338	0.8662	3.99	8.44

The bond portfolio is less risky as represented by its lower standard deviation. Yet, as the portfolio table shows, mixing 0.87% of bonds with 13% stocks would have produced a portfolio less risky than bonds. In this sample of these 20 years, the average return on the less risky portfolio of bonds was higher than that of the riskier portfolio of stocks. This is exactly what is meant by "risk." Expectation will not always be realized.

16. If the lending and borrowing rates are equal and there are no other constraints on portfolio choice, then optimal risky portfolios of all investors will be identical. However, if the borrowing and lending rates are not equal, then borrowers (who are relatively risk averse) and lenders (who are relatively risk tolerant) will have different optimal risky portfolios.

17. No, it is not possible to get such a diagram. Even if the correlation between A and B were 1.0, the frontier would be a straight line connecting A and B.

18. In the special case that all assets are perfectly positively correlated, the portfolio standard deviation is equal to the weighted average of the component-asset standard deviations. Otherwise, as the formula for portfolio variance (Equation 6.6) shows, the portfolio standard deviation is *less* than the weighted average of the component-asset standard deviations. The portfolio *variance* is a weighted *sum* of the elements in the covariance matrix, with the products of the portfolio proportions as weights.

19. The probability distribution is:

Probability	Rate of Return
0.7	100%
0.3	-50%

Expected return = $(0.7 \times 100\%) + 0.3 \times (-50\%) = 55\%$

Variance = $[0.7 \times (100 - 55)^2] + [0.3 \times (-50 - 55)^2] = 4725$

Standard deviation = $\sqrt{4725} = 68.74\%$

20. The expected rate of return on the stock will change by beta times the unanticipated change in the market return: $1.2 \times (8\% - 10\%) = -2.4\%$

Therefore, the expected rate of return on the stock should be revised to: $12\% - 2.4\% = 9.6\%$

21.

l. The risk of the diversified portfolio consists primarily of systematic risk. Beta measures systematic risk, which is the slope of the security characteristic line (SCL). The two figures depict the stocks' SCLs. Stock B's SCL is steeper, and hence Stock B's systematic risk is greater. The slope of the SCL, and hence the systematic risk, of Stock A is lower. Thus, for this investor, stock B is the riskiest.

m. The undiversified investor is exposed primarily to firm-specific risk. Stock A has higher firm-specific risk because the deviations of the observations from the SCL are larger for Stock A than for Stock B. Deviations are measured by the vertical distance of each observation from the SCL. Stock A is therefore riskiest to this investor.

22. The answer will vary, depending on the data set selected. The following raw data is used to produce the subsequent results of 2.16. As with problem 15, excess returns are used in this computation.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.37
R Square	0.14
Adjusted R Square	0.12
Standard Error	8.32
Observations	60.00

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	(1.65)	1.08	(1.52)	0.13
Spy	0.87	0.28	3.05	0.00

23. A scatter plot results in the following diagram. The slope of the regression line is 2.0 and intercept is 1.0.

24. Regression output produces the following.
a. alpha = 3.18, beta = 1.39, Residual St Dev = 12.78
b. Sharpe measure = -.61 / 4.03 = -0.15
c. Information ratio = 3.18 / 12.78 = .25
d. $Wg = \dfrac{3.18/12.78^2}{-.61/4.03^2} = -51.84\%$

GOOG Weight = -.5184 / [1+(-51.84(1-1.39)] = - 2.04%

e. So = $\sqrt{\left(\frac{3.18}{12.78}\right)^2 + .12^2} = .28$ …so sharpe increases from .12 to .28

SUMMARY OUTPUT: Regression of Google on SPY (excess returns)

Regression Statistics	
Multiple R	0.44
R Square	0.19
Adjusted R Square	0.18
Standard Error	11.59
Observations	52.00

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	3.18	1.63	1.95	0.06
Spy	1.39	0.40	3.46	0.00

	Google	*Spy*
Google	1.00	
Spy	0.44	1.00

CFA 1

$E(r_P) = (0.5 \text{ x } 15) + (0.4 \text{ x } 10) + (0.10 \text{ x } 6) = 12.1\%$

CFA 2

Fund D represents the single best addition to complement Stephenson's current portfolio, given his selection criteria. First, Fund D's expected return (14.0 percent) has the potential to increase the portfolio's return somewhat. Second, Fund D's relatively low correlation with his current portfolio (+0.65) indicates that Fund D will provide greater diversification benefits than any of the other alternatives except Fund B. The result of adding Fund D should be a portfolio with approximately the same expected return and somewhat lower volatility compared to the original portfolio.

The other three funds have shortcomings in terms of either expected return enhancement or volatility reduction through diversification benefits. Fund A offers the potential for increasing the portfolio's return, but is too highly correlated to provide substantial volatility reduction benefits through diversification. Fund B provides substantial volatility reduction through diversification benefits, but is expected to generate a return well below the current portfolio's return. Fund C has the greatest potential to increase the portfolio's return, but is too highly correlated to provide substantial volatility reduction benefits through diversification.

CFA 3

n. Subscript OP refers to the original portfolio, ABC to the new stock, and NP to the new portfolio.

   i. $E(r_{NP}) = w_{OP}\, E(r_{OP}) + w_{ABC}\, E(r_{ABC}) = (0.9 \times 0.67) + (0.1 \times 1.25) = 0.728\%$

   ii. $Cov = r \times \sigma_{OP} \times \sigma_{ABC} = 0.40 \times 2.37 \times 2.95 = 2.7966 \cong 2.80$

   iii. $\sigma_{NP} = [w_{OP}^2\, \sigma_{OP}^2 + w_{ABC}^2\, \sigma_{ABC}^2 + 2\, w_{OP}\, w_{ABC}\, (Cov_{OP\,,\,ABC})]^{1/2}$

   $= [(0.9^2 \times 2.37^2) + (0.1^2 \times 2.95^2) + (2 \times 0.9 \times 0.1 \times 2.80)]^{1/2}$

   $= 2.2673\% \cong 2.27\%$

o. Subscript OP refers to the original portfolio, GS to government securities, and NP to the new portfolio.

   i. $E(r_{NP}) = w_{OP}\, E(r_{OP}) + w_{GS}\, E(r_{GS}) = (0.9 \times 0.67) + (0.1 \times 0.42) = 0.645\%$

   ii. $Cov = r \times \sigma_{OP} \times \sigma_{GS} = 0 \times 2.37 \times 0 = 0$

   iii. $\sigma_{NP} = [w_{OP}^2\, \sigma_{OP}^2 + w_{GS}^2\, \sigma_{GS}^2 + 2\, w_{OP}\, w_{GS}\, (Cov_{OP\,,\,GS})]^{1/2}$

   $= [(0.9^2 \times 2.37^2) + (0.1^2 \times 0) + (2 \times 0.9 \times 0.1 \times 0)]^{1/2}$

   $= 2.133\% \cong 2.13\%$

p. Adding the risk-free government securities would result in a lower beta for the new portfolio. The new portfolio beta will be a weighted average of the individual security betas in the portfolio; the presence of the risk-free securities would lower that weighted average.

q. The comment is not correct. Although the respective standard deviations and expected returns for the two securities under consideration are equal, the covariances between each security and the original portfolio are unknown, making it impossible to draw the conclusion stated. For instance, if the covariances are different, selecting one security over the other may result in a lower standard deviation for the portfolio as a whole. In such a case, that security would be the preferred investment, assuming all other factors are equal.

r. Grace clearly expressed the sentiment that the risk of loss was more important to her than the opportunity for return. Using variance (or standard deviation) as a measure of risk in her case has a serious limitation because standard deviation does not distinguish between positive and negative price movements.

CFA 4

a. Restricting the portfolio to 20 stocks, rather than 40 to 50, will very likely increase the risk of the portfolio, due to the reduction in diversification. Such an increase might be acceptable if the expected return is increased sufficiently.

b. Hennessy could contain the increase in risk by making sure that he maintains reasonable diversification among the 20 stocks that remain in his portfolio. This entails maintaining a low correlation among the remaining stocks. As a practical matter, this means that Hennessy would need to spread his portfolio among many industries, rather than concentrating in just a few.

CFA 5

Risk reduction benefits from diversification are not a linear function of the number of issues in the portfolio. (See Figures 6.1 and 6.2 in the text.) Rather, the incremental benefits from additional diversification are most important when the portfolio is least diversified. Restricting Hennessy to 10 issues, instead of 20 issues, would increase the risk of his portfolio by a greater amount than reducing the size of the portfolio from 30 to 20 stocks.

CFA 6

The point is well taken because the committee should be concerned with the volatility of the entire portfolio. Since Hennessy's portfolio is only one of six well-diversified portfolios, and is smaller than the average, the concentration in fewer issues might have a minimal effect on the diversification of the total fund. Hence, unleashing Hennessy to do stock picking may be advantageous.

CFA 7

a. Systematic risk refers to fluctuations in asset prices caused by macroeconomic factors that are common to all risky assets; hence systematic risk is often referred to as market risk. Examples of systematic risk factors include the business cycle, inflation, monetary policy and technological changes.

   Firm-specific risk refers to fluctuations in asset prices caused by factors that are independent of the market, such as industry characteristics or firm characteristics. Examples of firm-specific risk factors include litigation, patents, management, and financial leverage.

b. Trudy should explain to the client that picking only the five best ideas would most likely result in the client holding a much more risky portfolio. The total risk of a portfolio, or portfolio variance, is the combination of systematic risk and firm-specific risk.

   The systematic component depends on the sensitivity of the individual assets to market movements, as measured by beta. Assuming the portfolio is well-diversified, the number of assets will not affect the systematic risk component of portfolio variance. The portfolio beta depends on the individual security betas and the portfolio weights of those securities.

   On the other hand, the components of firm-specific risk (sometimes called nonsystematic risk) are not perfectly positively correlated with each other and, as more assets are added to the portfolio, those additional assets tend to reduce portfolio risk. Hence, increasing the number of securities in a portfolio reduces firm-specific risk. For example, a patent expiration for one company would not affect the other securities in the portfolio. An increase in oil prices might hurt an airline stock but aid an energy stock. As the number of randomly selected securities increases, the total risk (variance) of the portfolio approaches its systematic variance.

CHAPTER 07
CAPITAL ASSET PRICING AND ARBITRAGE PRICING THEORY

1. The required rate of return on a stock is related to the required rate of return on the stock market via beta. Assuming the beta of Google remains constant, the increase in the risk of the market will increase the required rate of return on the market, and thus increase the required rate of return on Google.

2. An example of this scenario would be an investment in the SMB and HML. As of yet, there are no vehicles (index funds or ETFs) to directly invest in SMB and HML. While they may prove superior to the single index model, they are not yet practical, even for professional investors.

3. The APT may exist without the CAPM, but not the other way. Thus, statement a is possible, but not b. The reason being, that the APT accepts the principle of risk and return, which is central to CAPM, without making any assumptions regarding individual investors and their portfolios. These assumptions are necessary to CAPM.

4. $E(r_P) = r_f + \beta[E(r_M) - r_f]$

   $20\% = 5\% + \beta(15\% - 5\%) \Rightarrow \beta = 15/10 = 1.5$

5. If the beta of the security doubles, then so will its risk premium. The current risk premium for the stock is: (13% - 7%) = 6%, so the new risk premium would be 12%, and the new discount rate for the security would be: 12% + 7% = 19%

   If the stock pays a constant dividend in perpetuity, then we know from the original data that the dividend (D) must satisfy the equation for a perpetuity:

   Price = Dividend/Discount rate

   $40 = D/0.13 \Rightarrow D = 40 \times 0.13 = \$5.20$

   At the new discount rate of 19%, the stock would be worth: \$5.20/0.19 = \$27.37
   The increase in stock risk has lowered the value of the stock by 31.58%.

6. The cash flows for the project comprise a 10-year annuity of \$10 million per year plus an additional payment in the tenth year of \$10 million (so that the total payment in the tenth year is \$20 million). The appropriate discount rate for the project is:

   $r_f + \beta[E(r_M) - r_f] = 9\% + 1.7(19\% - 9\%) = 26\%$

   Using this discount rate:

$$NPV = -20 + \sum_{t=1}^{10} \frac{10}{1.26^t} + \frac{10}{1.26^{10}}$$

$= -20 + [10 \times \text{Annuity factor (26\%, 10 years)}] + [10 \times \text{PV factor (26\%, 10 years)}]$

$= 15.64$

The internal rate of return on the project is 49.55%. The highest value that beta can take before the hurdle rate exceeds the IRR is determined by:

$49.55\% = 9\% + \beta(19\% - 9\%) \Rightarrow \beta = 40.55/10 = 4.055$

7.

s. False. $\beta = 0$ implies $E(r) = r_f$, not zero.

t. False. Investors require a risk premium for bearing systematic (i.e., market or undiversifiable) risk.

u. False. You should invest 0.75 of your portfolio in the market portfolio, and the remainder in T-bills. Then:

$\beta_P = (0.75 \times 1) + (0.25 \times 0) = 0.75$

8.

v. The beta is the sensitivity of the stock's return to the market return. Call the aggressive stock *A* and the defensive stock *D*. Then beta is the change in the stock return per unit change in the market return. We compute each stock's beta by calculating the difference in its return across the two scenarios divided by the difference in market return.

$$\beta_A = \frac{2-32}{5-20} = 2.00$$

$$\beta_D = \frac{3.5-14}{5-20} = 0.70$$

w. With the two scenarios equal likely, the expected rate of return is an average of the two possible outcomes:

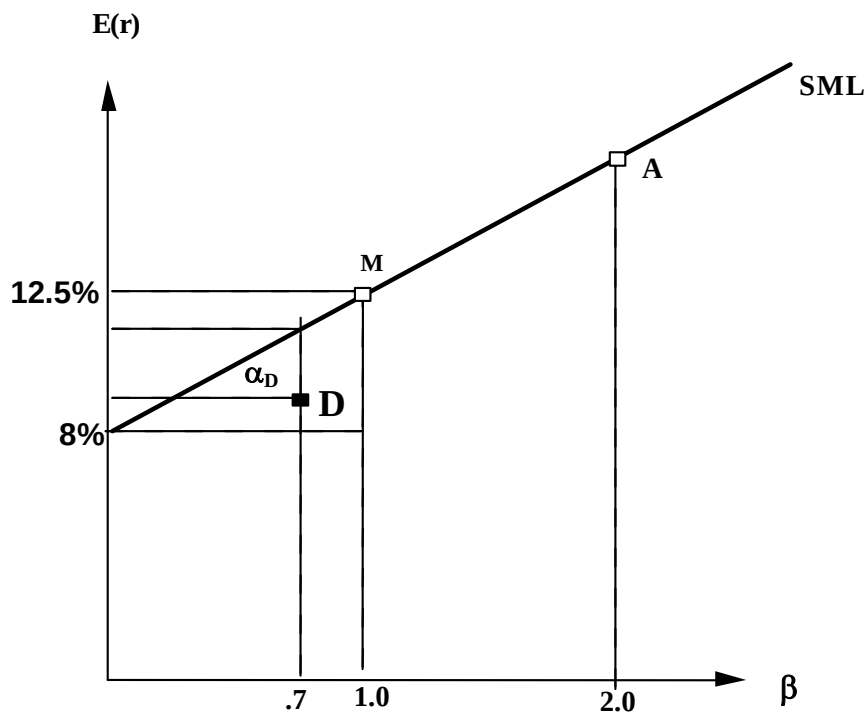
$E(r_A) = 0.5 \times (2\% + 32\%) = 17\%$

$E(r_B) = 0.5 \times (3.5\% + 14\%) = 8.75\%$

x. The SML is determined by the following: T-bill rate = 8% with a beta equal to zero, beta for the market is 1.0, and the expected rate of return for the market is:

$0.5 \times (20\% + 5\%) = 12.5\%$

See the following graph.



The equation for the security market line is: $E(r) = 8\% + \beta(12.5\% - 8\%)$

y. The aggressive stock has a fair expected rate of return of:

$E(r_A) = 8\% + 2.0(12.5\% - 8\%) = 17\%$

The security analyst's estimate of the expected rate of return is also 17%. Thus the alpha for the aggressive stock is zero. Similarly, the required return for the defensive stock is:

$E(r_D) = 8\% + 0.7(12.5\% - 8\%) = 11.15\%$

The security analyst's estimate of the expected return for D is only 8.75%, and hence:

α_D = actual expected return – required return predicted by CAPM

$= 8.75\% - 11.15\% = -2.4\%$

The points for each stock are plotted on the graph above.

z. The hurdle rate is determined by the project beta (i.e., 0.7), not by the firm's beta. The correct discount rate is therefore 11.15%, the fair rate of return on stock D.

9. Not possible. Portfolio A has a higher beta than Portfolio B, but the expected return for Portfolio A is lower.

10.

Possible. If the CAPM is valid, the expected rate of return compensates only for systematic (market) risk as measured by beta, rather than the standard deviation, which includes nonsystematic risk. Thus, Portfolio A's lower expected rate of return can be paired with a higher standard deviation, as long as Portfolio A's beta is lower than that of Portfolio B.

11. Not possible. The reward-to-variability ratio for Portfolio A is better than that of the market, which is not possible according to the CAPM, since the CAPM predicts that the market portfolio is the most efficient portfolio. Using the numbers supplied:

$$S_A = \frac{16-10}{12} = 0.5$$

$$S_M = \frac{18-10}{24} = 0.33$$

These figures imply that Portfolio A provides a better risk-reward tradeoff than the market portfolio.

12. Not possible. Portfolio A clearly dominates the market portfolio. It has a lower standard deviation with a higher expected return.

13. Not possible. Given these data, the SML is: $E(r) = 10\% + \beta(18\% - 10\%)$

A portfolio with beta of 1.5 should have an expected return of:

$E(r) = 10\% + 1.5 \times (18\% - 10\%) = 22\%$

The expected return for Portfolio A is 16% so that Portfolio A plots below the SML (i.e., has an alpha of –6%), and hence is an overpriced portfolio. This is inconsistent with the CAPM.

14. Not possible. The SML is the same as in Problem 12. Here, the required expected return for Portfolio A is: $10\% + (0.9 \times 8\%) = 17.2\%$
This is still higher than 16%. Portfolio A is overpriced, with alpha equal to: –1.2%

15. Possible. Portfolio A's ratio of risk premium to standard deviation is less attractive than the market's. This situation is consistent with the CAPM. The market portfolio should provide the highest reward-to-variability ratio.

16

a.

	Ford	GM	Toyota	S&P
Beta 5 years	1.81	0.86	0.71	1.00
Beta first twp years	2.01	1.05	0.47	3.78 SD
Beta last two years	1.97	0.69	0.49	
SE of residual	12.01	8.34	5.14	
SE beta 5 years	0.42	0.29	0.18	
Intercept 5 years	-0.93	-1.44	0.45	
Intercept first two years	-2.37	-1.82	1.80	
Intercept last two years	0.81	-3.41	-1.91	

b.

As a first pass we note that large standard deviation of the beta estimates. None of the subperiod estimates deviate from the overall period estimate by more than two standard deviations. That is, the t-statistic of the deviation from the overall period is not significant for any of the subperiod beta estimates. Looking beyond the aforementioned observation, the differences can be attributed to different alpha values during the subperiods. The case of Toyota is most revealing: The alpha estimate for the first two years is positive and for the last two years negative (both large). Following a good performance in the "normal" years prior to the crisis, Toyota surprised investors with a negative performance, beyond what could be expected from the index. This suggests that a beta of around 0.5 is more reliable. The shift of the intercepts from positive to negative when the index moved to largely negative returns, explains why the line is steeper when estimated for the overall period. Draw a line in the positive quadrant for the index with a slope of 0.5 and positive intercept. Then draw a line with similar slope in the negative quadrant of the index with a negative intercept. You can see that a line that reconciles the observations for both quadrants will be steeper. The same logic explains part of the behavior of subperiod betas for Ford and GM.

17. Since the stock's beta is equal to 1.0, its expected rate of return should be equal to that of the market, that is, 18%.

$$E(r) = \frac{D + P_1 - P_0}{P_0}$$

$$0.18 = \frac{9 + P_1 - 100}{100} \Rightarrow P_1 = \$109$$

18. If beta is zero, the cash flow should be discounted at the risk-free rate, 8%:

PV = \$1,000/0.08 = \$12,500

If, however, beta is actually equal to 1, the investment should yield 18%, and the price paid for the firm should be:

$$PV = \$1{,}000/0.18 = \$5{,}555.56$$

The difference ($6944.44) is the amount you will overpay if you erroneously assume that beta is zero rather than 1.

19. Using the SML: $6\% = 8\% + \beta(18\% - 8\%) \Rightarrow \beta = -2/10 = -0.2$

20. $r_1 = 19\%$; $r_2 = 16\%$; $\beta_1 = 1.5$; $\beta_2 = 1.0$

aa. In order to determine which investor was a better selector of individual stocks we look at the abnormal return, which is the ex-post alpha; that is, the abnormal return is the difference between the actual return and that predicted by the SML. Without information about the parameters of this equation (i.e., the risk-free rate and the market rate of return) we cannot determine which investment adviser is the better selector of individual stocks.

bb. If $r_f = 6\%$ and $r_M = 14\%$, then (using alpha for the abnormal return):

$$\alpha_1 = 19\% - [6\% + 1.5(14\% - 6\%)] = 19\% - 18\% = 1\%$$

$$\alpha_2 = 16\% - [6\% + 1.0(14\% - 6\%)] = 16\% - 14\% = 2\%$$

Here, the second investment adviser has the larger abnormal return and thus appears to be the better selector of individual stocks. By making better predictions, the second adviser appears to have tilted his portfolio toward under-priced stocks.

cc. If $r_f = 3\%$ and $r_M = 15\%$, then:

$$\alpha_1 = 19\% - [3\% + 1.5(15\% - 3\%)] = 19\% - 21\% = -2\%$$

$$\alpha_2 = 16\% - [3\% + 1.0(15\% - 3\%)] = 16\% - 15\% = 1\%$$

Here, not only does the second investment adviser appear to be a better stock selector, but the first adviser's selections appear valueless (or worse).

21.

dd. Since the market portfolio, by definition, has a beta of 1.0, its expected rate of return is 12%.

ee. $\beta = 0$ means the stock has no systematic risk. Hence, the portfolio's expected rate of return is the risk-free rate, 4%.

ff. Using the SML, the *fair* rate of return for a stock with $\beta = -0.5$ is:

$$E(r) = 4\% + (-0.5)(12\% - 4\%) = 0.0\%$$

The *expected* rate of return, using the expected price and dividend for next year:

$$E(r) = (\$44/\$40) - 1 = 0.10 = 10\%$$

Because the expected return exceeds the fair return, the stock must be under-priced.

22. The data can be summarized as follows:

	Expected Return	Beta	Standard Deviation
Portfolio A	11%	0.8	10%
Portfolio B	14%	1.5	31%
S & P 500	12%	1	20%
T-bills	6%	0	0%

gg. Using the SML, the expected rate of return for any portfolio P is:

$$E(r_P) = r_f + \beta[E(r_M) - r_f]$$

Substituting for portfolios A and B:

$$E(r_A) = 6\% + 0.8 \times (12\% - 6\%) = 10.8\%$$

$$E(r_B) = 6\% + 1.5 \times (12\% - 6\%) = 15.0\%$$

Hence, Portfolio A is desirable and Portfolio B is not.

hh. The slope of the CAL supported by a portfolio P is given by:

$$S = \frac{E(r_P) - r_f}{\sigma_P}$$

Computing this slope for each of the three alternative portfolios, we have:

S (S&P 500) = 6/20

S (A) = 5/10

S (B) = 8/31

Hence, portfolio A would be a good substitute for the S&P 500.

23. Since the beta for Portfolio F is zero, the expected return for Portfolio F equals the risk-free rate.

For Portfolio A, the ratio of risk premium to beta is: (10% – 4%)/1 = 6%
The ratio for Portfolio E is higher: (9% – 4%)/(2/3) = 7.5%

This implies that an arbitrage opportunity exists. For instance, you can create a Portfolio G with beta equal to 1.0 (the same as the beta for Portfolio A) by taking a long position in Portfolio E and a short position in Portfolio F (that is, borrowing at the risk-free rate and investing the proceeds in Portfolio E). For the beta of G to equal 1.0, the proportion (w) of funds invested in E must be: 3/2 = 1.5
The expected return of G is then:

$$E(r_G) = [(-0.50) \times 4\%] + (1.5 \times 9\%) = 11.5\%$$

$$\beta_G = 1.5 \times (2/3) = 1.0$$

Comparing Portfolio G to Portfolio A, G has the same beta and a higher expected return. Now, consider Portfolio H, which is a short position in Portfolio A with the proceeds invested in Portfolio G:

$$\beta_H = 1\beta_G + (-1)\beta_A = (1 \times 1) + [(-1) \times 1] = 0$$

$$E(r_H) = (1 \times r_G) + [(-1) \times r_A] = (1 \times 11.5\%) + [(-1) \times 10\%] = 1.5\%$$

The result is a zero investment portfolio (all proceeds from the short sale of Portfolio A are invested in Portfolio G) with zero risk (because $\beta = 0$ and the portfolios are well diversified), and a positive return of 1.5%. Portfolio H is an arbitrage portfolio.

24. Substituting the portfolio returns and betas in the expected return-beta relationship, we obtain two equations in the unknowns, the risk-free rate (r_f) and the factor return (F):

$$14.0\% = r_f + 1 \times (F - r_f)$$

$$14.8\% = r_f + 1.1 \times (F - r_f)$$

From the first equation we find that F = 14%. Substituting this value for F into the second equation, we get:

$$14.8\% = r_f + 1.1 \times (14\% - r_f) \Rightarrow r_f = 6\%$$

25.

a. Shorting equal amounts of the 10 negative-alpha stocks and investing the proceeds equally in the 10 positive-alpha stocks eliminates the market exposure and creates a zero-investment portfolio. Using equation 7.5, and denoting the market factor as R_M, the expected dollar return is [noting that the expectation of residual risk (*e*) in equation 7.8 is zero]:

$$\$1{,}000{,}000 \times [0.03 + (1.0 \times R_M)] - \$1{,}000{,}000 \times [(-0.03) + (1.0 \times R_M)]$$

$$= \$1{,}000{,}000 \times 0.06 = \$60{,}000$$

The sensitivity of the payoff of this portfolio to the market factor is zero because the exposures of the positive alpha and negative alpha stocks cancel out. (Notice that the terms involving R_M sum to zero.) Thus, the systematic component of total risk also is zero. The variance of the analyst's profit is not zero, however, since this portfolio is not well diversified.

For n = 20 stocks (i.e., long 10 stocks and short 10 stocks) the investor will have a \$100,000 position (either long or short) in each stock. Net market exposure is zero, but firm-specific risk has not been fully diversified. The variance of dollar returns from the positions in the 20 firms is:

$$20 \times [(100{,}000 \times 0.30)^2] = 18{,}000{,}000{,}000$$

The standard deviation of dollar returns is \$134,164.

b. If n = 50 stocks (i.e., 25 long and 25 short), \$40,000 is placed in each position, and the variance of dollar returns is:

$$50 \times [(40{,}000 \times 0.30)^2] = 7{,}200{,}000{,}000$$

The standard deviation of dollar returns is \$84,853.

Similarly, if n = 100 stocks (i.e., 50 long and 50 short), \$20,000 is placed in each position, and the variance of dollar returns is:

$$100 \times [(20{,}000 \times 0.30)^2] = 3{,}600{,}000{,}000$$

The standard deviation of dollar returns is \$60,000.

Notice that when the number of stocks increases by a factor of 5 (from 20 to 100), standard deviation falls by a factor of $\sqrt{5} = 2.236$, from \$134,164 to \$60,000.

26. Any pattern of returns can be "explained" if we are free to choose an indefinitely large number of explanatory factors. If a theory of asset pricing is to have value, it must explain returns using a reasonably limited number of explanatory variables (i.e., systematic factors).

27. The APT factors must correlate with major sources of uncertainty, i.e., sources of uncertainty that are of concern to many investors. Researchers should investigate factors that correlate with uncertainty in consumption and investment opportunities. GDP, the inflation rate and interest rates are among the factors that can be expected to determine risk premiums. In particular, industrial production (IP) is a good indicator of changes in the business cycle. Thus, IP is a candidate for a factor that is highly correlated with uncertainties related to investment and consumption opportunities in the economy.

28. The revised estimate of the expected rate of return of the stock would be the old estimate plus the sum of the unexpected changes in the factors times the sensitivity coefficients, as follows:

$$\text{Revised estimate} = 14\% + [(1 \times 1) + (0.4 \times 1)] = 15.4\%$$

29. Equation 7.11 applies here:

$$E(r_P) = r_f + \beta_{P1}[E(r_1) - r_f] + \beta_{P2}[E(r_2) - r_f]$$

We need to find the risk premium for these two factors:

$\gamma_1 = [E(r_1) - r_f]$ and

$\gamma_2 = [E(r_2) - r_f]$

To find these values, we solve the following two equations with two unknowns:

$40\% = 7\% + 1.8\gamma_1 + 2.1\gamma_2$

$10\% = 7\% + 2.0\gamma_1 + (-0.5)\gamma_2$

The solutions are: $\gamma_1 = 4.47\%$ and $\gamma_2 = 11.86\%$
Thus, the expected return-beta relationship is:

$E(r_P) = 7\% + 4.47\beta_{P1} + 11.86\beta_{P2}$

30. The first two factors (the return on a broad-based index and the level of interest rates) are most promising with respect to the likely impact on Jennifer's firm's cost of capital. These are both macro factors (as opposed to firm-specific factors) that can not be diversified away; consequently, we would expect that there is a risk premium associated with these factors. On the other hand, the risk of changes in the price of hogs, while important to some firms and industries, is likely to be diversifiable, and therefore is not a promising factor in terms of its impact on the firm's cost of capital.

31. Since the risk free rate is not given, we assume a risk free rate of 0%. The APT required (i.e., equilibrium) rate of return on the stock based on Rf and the factor betas is:

Required E(r) = 0 + (1 x 6) + (0.5 x 2) + (0.75 x 4) = 10%

According to the equation for the return on the stock, the actually expected return on the stock is 6 % (because the expected surprises on all factors are zero by definition). Because the actually expected return based on risk is less than the equilibrium return, we conclude that the stock is overpriced.

CFA 1

a, c and d

CFA 2

a. $E(r_X) = 5\% + 0.8(14\% - 5\%) = 12.2\%$

$\alpha_X = 14\% - 12.2\% = 1.8\%$

$E(r_Y) = 5\% + 1.5(14\% - 5\%) = 18.5\%$

$\alpha_Y = 17\% - 18.5\% = -1.5\%$

b.

1. For an investor who wants to add this stock to a well-diversified equity portfolio, Kay should recommend Stock X because of its positive alpha, while Stock Y has a negative alpha. In graphical terms, Stock X's expected return/risk profile plots above the SML, while Stock Y's profile plots below the SML. Also, depending on the individual risk preferences of Kay's clients, Stock X's lower beta may have a beneficial impact on overall portfolio risk.

2. For an investor who wants to hold this stock as a single-stock portfolio, Kay should recommend Stock Y, because it has higher forecasted return and lower standard deviation than Stock X. Stock Y's Sharpe ratio is:

   $(0.17 – 0.05)/0.25 = 0.48$

   Stock X's Sharpe ratio is only:

   $(0.14 – 0.05)/0.36 = 0.25$

   The market index has an even more attractive Sharpe ratio:

   $(0.14 – 0.05)/0.15 = 0.60$

   However, given the choice between Stock X and Y, Y is superior. When a stock is held in isolation, standard deviation is the relevant risk measure. For assets held in isolation, beta as a measure of risk is irrelevant. Although holding a single asset in isolation is not typically a recommended investment strategy, some investors may hold what is essentially a single-asset portfolio (e.g., the stock of their employer company). For such investors, the relevance of standard deviation versus beta is an important issue.

CFA 3

a. McKay should borrow funds and invest those funds proportionally in Murray's existing portfolio (i.e., buy more risky assets on margin). In addition to increased expected return, the alternative portfolio on the capital market line (CML) will also have increased variability (risk), which is caused by the higher proportion of risky assets in the total portfolio.

b. McKay should substitute low beta stocks for high beta stocks in order to reduce the overall beta of York's portfolio. By reducing the overall portfolio beta, McKay will reduce the systematic risk of the portfolio and therefore the portfolio's volatility relative to the market. The security market line (SML) suggests such action (moving down the SML), even though reducing beta may result in a slight loss of portfolio efficiency unless full diversification is maintained. York's primary objective, however, is not to maintain efficiency but to reduce risk exposure; reducing portfolio beta meets that objective. Because York does not permit borrowing or lending, McKay cannot reduce risk by selling equities and using the proceeds to buy risk free assets (i.e., by lending part of the portfolio).

CFA 4

c. "Both the CAPM and APT require a mean-variance efficient market portfolio." This statement is incorrect. The CAPM requires the mean-variance efficient portfolio, but APT does not.

d. "The CAPM assumes that one specific factor explains security returns but APT does not." This statement is correct.

CFA 5

a

CFA 6

d

CFA 7

d You need to know the risk-free rate.

CFA 8

d You need to know the risk-free rate.

CFA 9

Under the CAPM, the only risk that investors are compensated for bearing is the risk that cannot be diversified away (i.e., systematic risk). Because systematic risk (measured by beta) is equal to 1.0 for each of the two portfolios, an investor would expect the same rate of return from each portfolio. Moreover, since both portfolios are well diversified, it does not matter whether the specific risk of the individual securities is high or low. The firm-specific risk has been diversified away from both portfolios.

CFA 10

b $r_f = 8\%$ and $E(r_M) = 16\%$

$E(r_X) = r_f + \beta_X[E(r_M) - r_f] = 8\% + 1.0(16\% - 8\%) = 16\%$
$E(r_Y) = r_f + \beta_Y[E(r_M) - r_f] = 8\% + 0.25(16\% - 8\%) = 10\%$
Therefore, there is an arbitrage opportunity.

CFA 11

c

CFA 12

d

CFA 13

c

Investors will take on as large a position as possible only if the mis-pricing opportunity is an arbitrage. Otherwise, considerations of risk and diversification will limit the position they attempt to take in the mis-priced security.

CFA 14

d

CHAPTER 08
THE EFFICIENT MARKET HYPOTHESIS

1. The correlation coefficient should be zero. If it were not zero, then one could use returns from one period to predict returns in later periods and therefore earn abnormal profits.

2. The phrase would be correct if it were modified to say "expected risk adjusted returns." Securities all have the same risk adjusted expected return, however, actual results can and do vary. Unknown events cause certain securities to outperform others. This is not known in advance so expectations are set by known information.

3. Over the long haul, there is an expected upward drift in stock prices based on their fair expected rates of return. The fair expected return over any single day is very small (e.g., 12% per year is only about 0.03% per day), so that on any day the price is virtually equally likely to rise or fall. However, over longer periods, the small expected daily returns cumulate, and upward moves are indeed more likely than downward ones.

4. No, this is not a violation of the EMH. Microsoft's continuing large profits do not imply that stock market investors who purchased Microsoft shares after its success already was evident would have earned a high return on their investments.

5. No. Random walk theory naturally expects there to be some people who beat the market and some people who do not. The information provided, however, fails to consider the risk of the investment. Higher risk investments should have higher returns. As presented, it is possible to believe him without violating the EMH.

6. b. This is the definition of an efficient market.

7. d. It is not possible to offer a higher risk risk-return trade off if markets are efficient.

8. Strong firm efficiency includes all information; historical, public and private.

9. Incorrect. In the short term, markets reflect a random pattern. Information is constantly flowing in the economy and investors each have different expectations that vary constantly. A fluctuating market accurately reflects this logic. Furthermore, while increased variability may be the result of an increase in unknown variables, this merely increases risk and the price is adjusted downward as a result.

10. c

    This is a predictable pattern in returns, which should not occur if the stock market is weakly efficient.

11. c

    This is a classic filter rule, which would appear to contradict the weak form of the efficient market hypothesis.

12. c

    The P/E ratio is public information so this observation would provide evidence against the semi-strong form of the efficient market theory.

13. No, it is not more attractive as a possible purchase. Any value associated with dividend predictability is already reflected in the stock price.

14. No, this is not a violation of the EMH. This empirical tendency does not provide investors with a tool that will enable them to earn abnormal returns; in other words, it does not suggest that investors are failing to use all available information. An investor could not use this phenomenon to choose undervalued stocks today. The phenomenon instead reflects the fact that dividends occur as a response to good performance. After the fact, the stocks that happen to have performed the best will pay higher dividends, but this does not imply that you can identify the best performers early enough to earn abnormal returns.

15. While positive beta stocks respond well to favorable new information about the economy's progress through the business cycle, these should not show abnormal returns around already anticipated events. If a recovery, for example, is already anticipated, the actual recovery is not news. The stock price should already reflect the coming recovery.

16.

    e. Consistent. Half of all managers should outperform the market based on pure luck in any year.

    f. Violation. This would be the basis for an "easy money" rule: simply invest with last year's best managers.

    g. Consistent. Predictable volatility does not convey a means to earn abnormal returns.

    h. Violation. The abnormal performance ought to occur in January, when the increased earnings are announced.

    i. Violation. Reversals offer a means to earn easy money: simply buy last week's losers.

17. An anomaly is considered an EMH exception because there is historical data to substantiated a claim that said anomalies have produced excess risk adjusted abnormal returns in the past. Several anomalies regarding fundamental analysis have been uncovered. These include the P/E effect, the small-firm-in-January effect, the neglected- firm effect, post–earnings-announcement price drift, and the book-to-market effect. Whether these anomalies represent market inefficiency or poorly understood risk premiums is still a matter of debate. There are rational explanations for each, but not everyone agrees on the explanation. One dominant explanation is that many of these firms are also neglected firms, due to low trading volume, thus they are not part of an efficient market or offer more risk as a result of their reduced liquidity.

18. Implicit in the dollar-cost averaging strategy is the notion that stock prices fluctuate around a "normal" level. Otherwise, there is no meaning to statements such as: "when the price is high." How do we know, for example, whether a price of $25 today will be viewed as high or low compared to the stock price in six months from now?

19. The market responds positively to new news. If the eventual recovery is anticipated, then the recovery is already reflected in stock prices. Only a better-than-expected recovery (or a worse-than-expected recovery) should affect stock prices.

20. You should buy the stock. In your view, the firm's management is not as bad as everyone else believes it to be. Therefore, you view the firm as undervalued by the market. You are less pessimistic about the firm's prospects than the beliefs built into the stock price.

21. The market may have anticipated even greater earnings. Compared to prior expectations, the announcement was a disappointment.

22. The negative abnormal returns (downward drift in CAR) just prior to stock purchases suggest that insiders deferred their purchases until after bad news was released to the public. This is evidence of valuable inside information. The positive abnormal returns after purchase suggest insider purchases in anticipation of good news. The analysis is symmetric for insider sales.

23. The negative abnormal returns (downward drift in CAR) just prior to stock purchases suggest that insiders deferred their purchases until after bad news was released to the public. This is evidence of valuable inside information. The positive abnormal returns after purchase suggest insider purchases in anticipation of good news. The analysis is symmetric for insider sales.

24. If a shift were actually predictable, it would be a violation of EMH. Such shifts would be expected to occur as a result of a recession, but the recession is not predictable, thus it is not actually a violation of EMH. That being said, such a shift is consistent with EMH since the shift occurs after a recession or recovery occurs. As the news hits the market, the risk premiums are adjusted. The reason this is perceived as an overreaction is because there are two events occurring. First, recessions lead to reduced profits, impacting the numerator in a fundamental analysis. This reduced cash flow represses stock prices. Simultaneously, the recession causes risk premiums to rise, thus increasing the denominator in the fundamental analysis calculation. An increase in the denominator further reduces the price. The result is the appearance of an overreaction.

CFA 1

b

Public information constitutes semi-string efficiency, while the addition of private information leads to strong form efficiency.

CFA 2

a

The information should be absorbed instantly.

CFA 3

b

Since information is immediately included in stock prices, there is no benefit to buying stock after an announcement.

CFA 4

c

Stocks producing abnormal excess returns will increase in price to eliminate the positive alpha.

CFA 5

c

A random walk reflects no other information and is thus random.

CFA 6

d

Unexpected results are by definition an anomaly.

CFA 7

Assumptions supporting passive management are:

a. informational efficiency
b. primacy of diversification motives

Active management is supported by the opposite assumptions, in particular, that pockets of market inefficiency exist.

CFA 8

a. The grandson is recommending taking advantage of (i) the small firm anomaly and (ii) the January anomaly. In fact, this seems to be one anomaly: the small-firm-in-January anomaly.

b.

(i) Concentration of one's portfolio in stocks having very similar attributes may expose the portfolio to more risk than is desirable. The strategy limits the potential for diversification.

(ii) Even if the study results are correct as described, each such study covers a specific time period. There is no assurance that future time periods would yield similar results.

(iii) After the results of the studies became publicly known, investment decisions might nullify these relationships. If these firms in fact offered investment bargains, their prices may be bid up to reflect the now-known opportunity.

CFA 9

a. The efficient market hypothesis (EMH) states that a market is efficient if security prices immediately and fully reflect all available relevant information. If the market fully reflects information, the knowledge of that information would not allow an investor to profit from the information because stock prices already incorporate the information.

The *weak form* of the EMH asserts that stock prices reflect all the information that can be derived by examining market trading data such as the history of past prices and trading volume.

A strong body of evidence supports weak-form efficiency in the major U.S. securities markets. For example, test results suggest that technical trading rules do not produce superior returns after adjusting for transaction costs and taxes.

ii. The *semistrong form* states that a firm's stock price reflects all publicly available information about a firm's prospects. Examples of publicly available information are company annual reports and investment advisory data.

Evidence strongly supports the notion of semistrong efficiency, but occasional studies (e.g., those identifying market anomalies such as the small-firm-in-January or book-to-market effects) and events (such as the stock market crash of October 19, 1987) are inconsistent with this form of market efficiency. However, there is a question concerning the extent to which these "anomalies" result from data mining.

The *strong form* of the EMH holds that current market prices reflect *all* information (whether publicly available or privately held) that can be relevant to the valuation of the firm.

Empirical evidence suggests that strong-form efficiency does not hold. If this form were correct, prices would fully reflect all information. Therefore even insiders could not earn excess returns. But the evidence is that corporate officers do have access to pertinent information long enough before public release to enable them to profit from trading on this information.

b. *Technical analysis* involves the search for recurrent and predictable patterns in stock prices in order to enhance returns. The EMH implies that technical analysis is without value. If past prices contain no useful information for predicting future prices, there is no point in following any technical trading rule.

   Fundamental analysis uses earnings and dividend prospects of the firm, expectations of future interest rates, and risk evaluation of the firm to determine proper stock prices. The EMH predicts that most fundamental analysis is doomed to failure. According to semistrong-form efficiency, no investor can earn excess returns from trading rules based on publicly available information. Only analysts with unique insight achieve superior returns.

   In summary, the EMH holds that the market appears to adjust so quickly to information about both individual stocks and the economy as a whole that no technique of selecting a portfolio using either technical or fundamental analysis can consistently outperform a strategy of simply buying and holding a diversified portfolio of securities, such as those comprising the popular market indexes.

c. Portfolio managers have several roles and responsibilities even in perfectly efficient markets. The most important responsibility is to identify the risk/return objectives for a portfolio given the investor's constraints. In an efficient market, portfolio managers are responsible for tailoring the portfolio to meet the investor's needs, rather than to beat the market, which requires identifying the client's return requirements and risk tolerance. Rational portfolio management also requires examining the investor's constraints, including liquidity, time horizon, laws and regulations, taxes, and unique preferences and circumstances such as age and employment.

CFA 10

a. The earnings (and dividend) growth rates of growth stocks may be consistently overestimated by investors. Investors may extrapolate recent earnings (and dividend) growth too far into the future and thereby downplay the inevitable slowdown. At any given time, growth stocks are likely to revert to (lower) mean returns and value stocks are likely to revert to (higher) mean returns, often over an extended future time horizon.

b. In efficient markets, the current prices of stocks already reflect all known, relevant information. In this situation, growth stocks and value stocks provide the same risk-adjusted expected return.

CFA 11

a. Some empirical evidence that supports the EMH is:

(i) professional money managers do not typically earn higher returns than comparable risk, passive index strategies;
(ii) event studies typically show that stocks respond immediately to the public release of relevant news;
(iii) most tests of technical analysis find that it is difficult to identify price trends that can be exploited to earn superior risk-adjusted investment returns.

b. Some evidence that is difficult to reconcile with the EMH concerns simple portfolio strategies that apparently would have provided high risk-adjusted returns in the past. Some examples of portfolios with attractive historical returns:

(i) low P/E stocks;
(ii) high book-to-market ratio stocks;
(iii) small firms in January;
(iv) firms with very poor stock price performance in the last few months.

Other evidence concerns post-earnings-announcement stock price drift and intermediate-term price momentum.

c. An investor might choose not to index even if markets are efficient because he or she may want to tailor a portfolio to specific tax considerations or to specific risk management issues, for example, the need to hedge (or at least not add to) exposure to a particular source of risk (e.g., industry exposure).