CHAPTER 11: THE EFFICIENT MARKET HYPOTHESIS

1. The correlation coefficient between stock returns for two non-overlapping periods should be zero. If not, one could use returns from one period to predict returns in later periods and make abnormal profits.

5. No, markets can be efficient even if some investors earn returns above the market average. Consider the Lucky Event issue: Ignoring transaction costs, about 50% of professional investors, by definition, will "beat" the market in any given year. The probability of beating it three years in a row, though small, is not insignificant. Beating the market in the past does not predict future success as three years of returns make up too small a sample on which to base correlation let alone causation.

9. c. This is a predictable pattern in returns which should not occur if the weak-form EMH is valid

11. c. This is a classic filter rule which should not produce superior returns in an efficient market.

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

17. a. Consistent. Based on pure luck, half of all managers should beat the market in any year.

    b. Inconsistent. This would be the basis of an "easy money" rule: simply invest with last year's best managers.

    c. Consistent. In contrast to predictable returns, predictable *volatility* does not convey a means to earn abnormal returns.

    d. Inconsistent. The abnormal performance ought to occur in January when earnings are announced.

    e. Inconsistent. Reversals offer a means to earn easy money: just buy last week's losers.

24. Buy. In your view, the firm 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.

28. 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.

CFA PROBLEMS

1. b. Semi-strong form efficiency implies that market prices reflect all *publicly available* information concerning past trading history as well as fundamental aspects of the firm.

2. a. The full price adjustment should occur just as the news about the dividend becomes publicly available.

3. d. If low P/E stocks tend to have positive abnormal returns, this would represent an unexploited profit opportunity that would provide evidence that investors are not using all available information to make profitable investments.

4. c. In an efficient market, no securities are consistently overpriced or underpriced. While some securities will turn out after any investment period to have provided positive alphas (i.e., risk-adjusted abnormal returns) and some negative alphas, these past returns are not predictive of future returns.

5. c. A random walk implies that stock price changes are unpredictable, using past price changes or any other data.

7. a.

CHAPTER 20: OPTIONS MARKETS: INTRODUCTION

2. Buying a put option on an existing portfolio provides *portfolio insurance*, which is protection against a decline in the value of the portfolio. In the event of a decline in value, the minimum value of the put-plus-stock strategy is the exercise price of the put. As with any insurance purchased to protect the value of an asset, the tradeoff an investor faces is the cost of the put versus the protection against a decline in value. The cost of the protection is the cost of acquiring the protective put, which reduces the profit that results should the portfolio increase in value.

5.

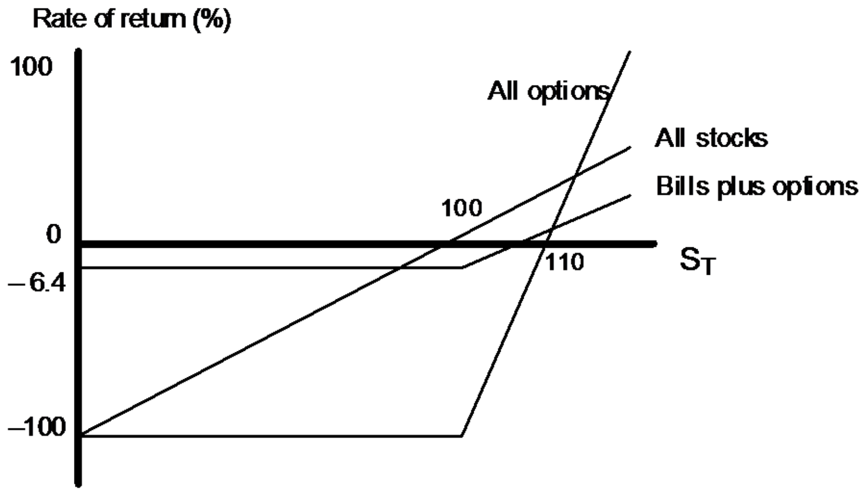
		Cost	Payoff	Profit
a.	Call option, X = $120.00	$8.63	$5.00	-$3.63
b.	Put option, X = $120.00	$1.18	$0.00	-$1.18
c.	Call option, X = $125.00	$4.75	$0.00	-$4.75
d.	Put option, X = $125.00	$2.44	$0.00	-$2.44
e.	Call option, X = $130.00	$2.18	$0.00	-$2.18
f.	Put option, X = $130.00	$4.79	$5.00	$0.21

6. In terms of dollar returns, based on a $10,000 investment:

	Price of Stock 6 Months from Now			
Stock Price	$80	$100	$110	$120
All stocks (100 shares)	$8,000	$10,000	$11,000	$12,000
All options (1,000 options)	$0	$0	$10,000	$20,000
Bills + 100 options	$9,360	$9,360	$10,360	$11,360

In terms of rate of return, based on a $10,000 investment:

	Price of Stock 6 Months from Now			
Stock Price	$80	$100	$110	$120
All stocks (100 shares)	-20%	0%	10%	20%
All options (1,000 options)	-100%	-100%	0%	100%
Bills + 100 options	-6.4%	-6.4%	3.6%	13.6%



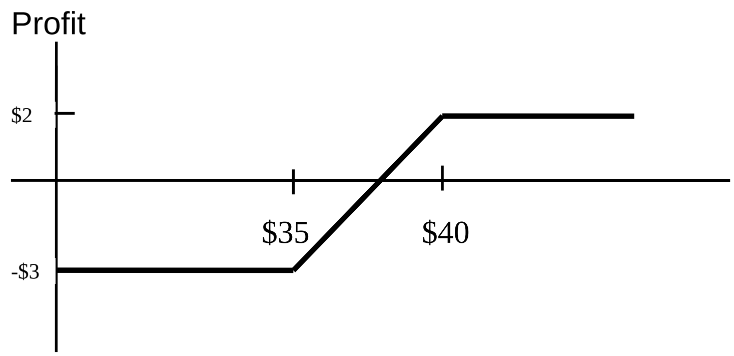
7. a. From put-call parity:

$$P = C - S_0 + \frac{X}{(1+r_f)^T} = 10 - 100 + \frac{100}{1.10^{.25}} = \$7.65$$

b. Purchase a straddle, i.e., both a put and a call on the stock. The total cost of the straddle is: \$10 + \$7.65 = \$17.65

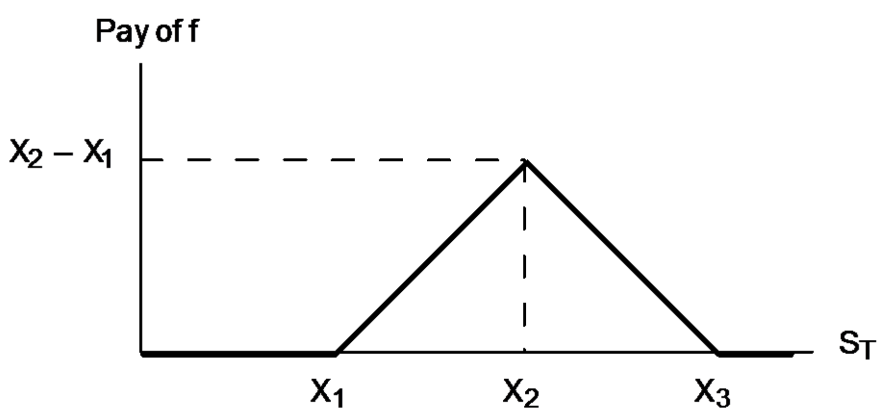
10. Note that the price of the put equals the revenue from writing the call, net initial cash outlays = \$38.00

Position	S_T < 35	35 ≤ S_T ≤ 40	40 < S_T
Buy Stock	S_T	S_T	S_T
Write call (\$40)	0	0	40 - S_T
Buy put (\$35)	35- S_T	0	0
Total	\$35	S_T	\$40



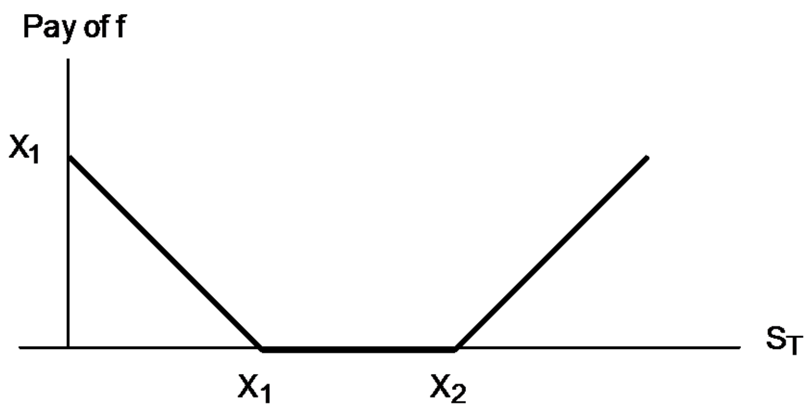
13. a.

Position	$S_T < X_1$	$X_1 \le S_T \le X_2$	$X_2 < S_T \le X_3$	$X_3 < S_T$
Long call (X_1)	0	$S_T - X_1$	$S_T - X_1$	$S_T - X_1$
Short 2 calls (X_2)	0	0	$-2(S_T - X_2)$	$-2(S_T - X_2)$
Long call (X_3)	0	0	0	$S_T - X_3$
Total	0	$S_T - X_1$	$2X_2 - X_1 - S_T$	$(X_2 - X_1) - (X_3 - X_2) = 0$



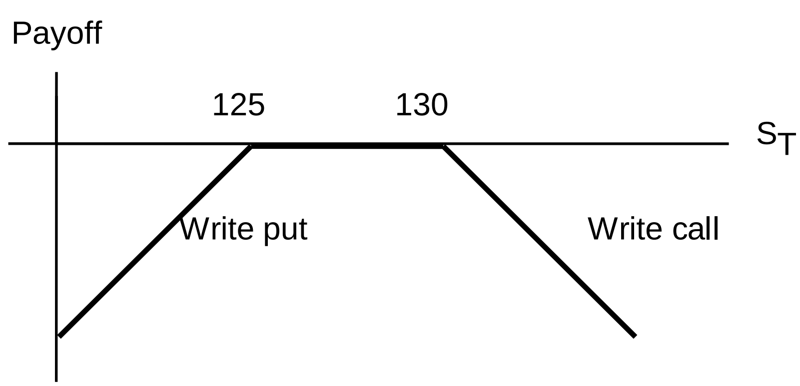
b.

Position	$S_T < X_1$	$X_1 \le S_T \le X_2$	$X_2 < S_T$
Buy call (X_2)	0	0	$S_T - X_2$
Buy put (X_1)	$X_1 - S_T$	0	0
Total	$X_1 - S_T$	0	$S_T - X_2$



20. a.

Position	$S_T < 125$	$125 \le S_T \le 130$	$S_T > 130$
Write call, X = \$130	0	0	$-(S_T - 130)$
Write put, X = \$125	$-(125 - S_T)$	0	0
Total	$S_T - 125$	0	$130 - S_T$



b. Proceeds from writing options:

Call: \$2.18

<u>Put:</u> <u>\$2.44</u>

Total: \$4.62

If IBM sells at \$128 on the option expiration date, both options expire out of the money, and profit = \$4.62. If IBM sells at \$135 on the option expiration date, the call written results in a cash outflow of \$5 at expiration, and an overall profit of: \$4.62– \$5.00 = -\$0.38

c. You break even when either the put or the call results in a cash outflow of \$4.62. For the put, this requires that:

$$\$4.62 = \$125.00 - S_T \Rightarrow S_T = \$120.38$$

For the call, this requires that:

$$\$4.62 = S_T - \$130.00 \Rightarrow S_T = \$134.62$$

d. The investor is betting that IBM stock price will have low volatility. This position is similar to a straddle.

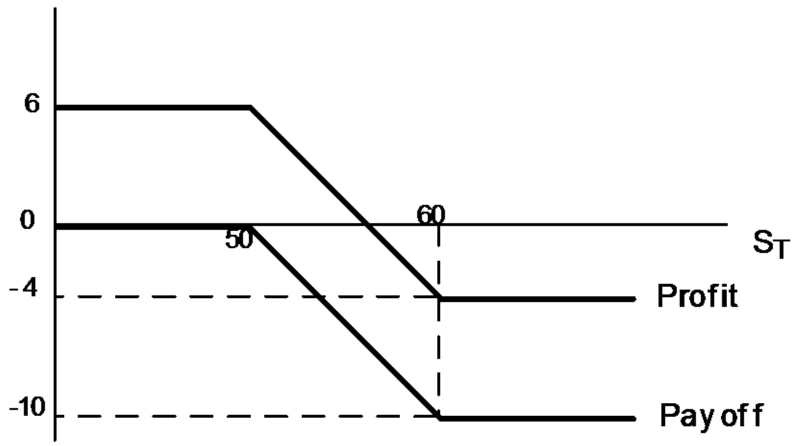
27. a., b. (See graph below)

This strategy is a bear spread. Initial proceeds = \$9 – \$3 = \$6

The payoff is either negative or zero:

Position	$S_T < 50$	$50 \le S_T \le 60$	$S_T > 60$
Buy call, X = \$60	0	0	$S_T - 60$
Write call, X = \$50	0	$-(S_T - 50)$	$-(S_T - 50)$
Total	0	$-(S_T - 50)$	-10

c. Breakeven occurs when the payoff offsets the initial proceeds of \$6, which occurs at stock price S_T = \$56. The investor must be bearish: the position does worse when the stock price increases.



28. Buy a share of stock, write a call with X = \$50, write a call with X = \$60, and buy a call with X = \$110.

Position	$S_T < 50$	$50 \le S_T \le 60$	$60 < S_T \le 110$	$S_T > 110$
Buy stock	S_T	S_T	S_T	S_T
Write call, X = \$50	0	$-(S_T - 50)$	$-(S_T - 50)$	$-(S_T - 50)$
Write call, X = \$60	0	0	$-(S_T - 60)$	$-(S_T - 60)$
Buy call, X = \$110	0	0	0	$S_T - 110$
Total	S_T	50	$110 - S_T$	0

The investor is making a volatility bet. Profits will be highest when volatility is low and the stock price S_T is between \$50 and \$60.

CFA PROBLEMS

3. i. Conversion value of a convertible bond is the value of the security if it is converted immediately. That is:

Conversion value = market price of the common stock × conversion ratio =

\$40 × 22 = \$880

ii. Market conversion price is the price that an investor effectively pays for the common stock if the convertible bond is purchased:

Market conversion price = market price of the convertible bond/conversion ratio =

\$1,050/22 = \$47.73

5. a. (ii) [Profit = \$40 – \$25 + \$2.50 – \$4.00]

b. (i)

CHAPTER 21: OPTION VALUATION

2. A \$1 increase in a call option's exercise price would lead to a decrease in the option's value of less than \$1. The change in the call price would equal \$1 only if: (i) there were a 100% probability that the call would be exercised, and (ii) the interest rate were zero.

5. A call option with a high exercise price has a lower hedge ratio. This call option is less in the money. Both d_1 and $N(d_1)$ are lower when X is higher.

6. a. Put A must be written on the stock with the lower price. Otherwise, given the lower volatility of Stock A, Put A would sell for less than Put B.

b. Put B must be written on the stock with the lower price. This would explain its higher price.

c. Call B must have the lower time to expiration. Despite the higher price of Stock B, Call B is cheaper than Call A. This can be explained by a lower time to expiration.

d. Call B must be written on the stock with higher volatility. This would explain its higher

price.

e. Call A must be written on the stock with higher volatility. This would explain its higher price.

11. $d_1 = 0.2192 \Rightarrow N(d_1) = 0.5868$

$d_2 = -0.1344 \Rightarrow N(d_2) = 0.4465$

$Xe^{-rT} = 49.2556$

$C = \$50 \times 0.5868 - 49.2556 \times 0.4465 = \$7.34$

14. According to the Black-Scholes model, the call option should be priced at:

$[\$55 \times N(d_1)] - [50 \times N(d_2)] = (\$55 \times 0.6) - (\$50 \times 0.5) = \$8$

Since the option actually sells for more than \$8, implied volatility is greater than 0.30.

23. Implied volatility has increased. If not, the call price would have fallen as a result of the decrease in stock price.

26. The hedge ratio approaches 0. As X decreases, the probability of exercise approaches 0. [$N(d_1)$ –1] approaches 0 as $N(d_1)$ approaches 1.

CFA PROBLEMS

2. a. The value of the call option decreases if underlying stock price volatility decreases. The less volatile the underlying stock price, the less the chance of extreme price movements—the lower the probability that the option expires in the money. This makes the participation feature on the upside less valuable.

The value of the call option is expected to increase if the time to expiration of the option increases. The longer the time to expiration, the greater the chance that the option will expire in the money resulting in an increase in the time premium component of the option's value.

b. i. When European options are out of the money, investors are essentially saying that they are willing to pay a premium for the right, but not the obligation, to buy or sell the underlying asset. The out-of-the-money option has no intrinsic value, but, since options require little capital (just the premium paid) to obtain a relatively large potential payoff, investors are willing to pay that premium even if the option may expire worthless. The Black-Scholes model does not reflect investors' demand for any premium above the time value of the option. Hence, if investors are willing to pay a premium for an out-of-the-money option above its time value, the Black-Scholes model does not value that excess premium.

ii. With American options, investors have the right, but not the obligation, to exercise the option prior to expiration, even if they exercise for non-economic reasons. This increased flexibility associated with American options has some value but is not considered in the Black-Scholes model because the model only values options to their expiration date (European options).

3. a. American options should cost more (have a higher premium). American options give the investor greater flexibility than European options since the investor can *choose* whether to exercise early. When the stock pays a dividend, the option to exercise a call early can be valuable. But regardless of the dividend, a European option (put or call) never sells for more than an otherwise-identical American option.

b. $C = S_0 + P – PV(X) = \$43 + \$4 – \$45/1.055 = \$4.346$

Note: we assume that Abaco does not pay any dividends.

c. i) An increase in short-term interest rate $\Rightarrow$ PV(exercise price) is lower, and call value increases.

ii) An increase in stock price volatility $\Rightarrow$ the call value increases.

iii) A decrease in time to option expiration $\Rightarrow$ the call value decreases.