Problem Set 4 Solutions

Foundations of Finance

I. Options: Definitions and Payoffs

1. BKM 12th Edition, Chapter 20, Question 13, part a.
2. BKM 12th Edition, Chapter 20, Question 28.

II. Options: Valuation

1. BKM 12th Edition, Chapter 20, Question 8.
2. BKM 12th Edition, Chapter 20, Question 12.
3. BKM 12th Edition, Chapter 20, Question 29, parts a-c and e.

III. Forward Contracts

1. A forward contract on a non-dividend paying stock:

$$F_1(0) = S(0)[1 + y_1(0)] = 150 \times (1 + 0.06) = 159.$$

2. For a 3-year maturity:

$$F_3(0) = S(0)[1 + y_3(0)]^3 = 150 \times (1 + 0.06)^3 = 178.65.$$

3. With an 8% riskless rate:

$$F_3(0) = S(0)[1 + y_3(0)]^3 = 150 \times (1 + 0.08)^3 = 188.96.$$

IV. Arbitrage Opportunity

The S&P portfolio pays a 2% dividend annually, with a current value of 1020. Given a futures price of 1060:

$$F_T(0) = 1020 \times (1 + 0.05) = 1050.6.$$

Since the forward price is too high, sell forward contracts and buy the underlying.

V. Gold Futures Arbitrage

The spot price implied by the December futures price:

$$S_{Dec} = \frac{360}{1 + 0.08} = 333.33.$$

The arbitrage involves selling December futures contracts and creating the following strategy:

$$\text{Net Cash Flow} = 0.11.$$

VI. Hedging Equity Portfolio

1. **Should you be long or short?** Short the index futures contracts to offset equity losses.
2. **Number of Contracts:**

$$\text{Each contract controls stock worth} = 250 \times 1350 = 337,500.$$

$$\text{Required contracts} = \frac{13.5\,\text{million}}{337,500} = 40.$$

3. **With 60% in equities:**

$$\text{Required contracts} = 0.6 \times 40 = 24.$$

VII. Currency Arbitrage

The forward price of GBP/USD for one year is higher than implied by covered interest parity. Construct an arbitrage position:

$$\text{Net Cash Flow} = 0.0147.$$

VIII. Equity Valuation

1. **Expected Return:**

$$E[R] = \frac{E[D_1]}{P_0} + g = \frac{0.6}{20} + 0.08 = 0.11.$$

2. **Price under DDM:**

$$P_0 = \frac{E[D_1]}{E[R] - g} = \frac{8}{0.1 - 0.05} = 160.$$

IX. Market Efficiency

1. No, weak form efficiency does not imply semi-strong form efficiency.
2. Yes, public information is not reflected, indicating inefficiency.
3. Yes, absence of all information implies a lack of strong form efficiency.