

Problem Set 2

Instructions: This problem set is due on 2/5 at 11:59 pm CST and is an individual assignment. All problems must be handwritten. Scan your work and submit a PDF file.

Problem 1. A stock index currently stands at 5,000. The risk-free interest rate is 8% per year with continuous compounding and the dividend yield on the index is 4% per year. What should be the futures price for an 8-month contract?

Problem 2. The current EUR/USD exchange rate is \$1.05 per €. The interest rate in USD is 5% whereas the interest rate in EUR is 3%.

- Compute the 8-month EUR/USD no-arbitrage forward price. Express your answer with four decimals.
- If you enter into a short-forward as described in a. over a notional of €10,000,000, how many dollars and euros will be exchanged in eight months from now? Be explicit about which currency you're buying and which currency you are selling.
- If the EUR/USD forward price is \$1.08 per €, is there an arbitrage opportunity? If so, explain how to exploit it. Assume that you can buy or sell a maximum of €100 million forward.

Problem 3. Consider a stock that currently trades at \$120. Analysts expect the stock to pay dividends of \$4 every three months. The next dividend is expected next month. The risk-free rate is 8% per year with continuous compounding and assumed the same for all maturities.

- Compute the 6-month no-arbitrage forward price for the stock.
- If the forward price is 120, is there an arbitrage opportunity? If so, explain how to exploit it.

Problem 4. The spot price of silver is \$31.04 per ounce. The storage costs are \$1.10 per ounce per year payable quarterly in advance. Assuming that interest rates are 8% per annum for all maturities, calculate the futures price of silver for delivery in 12 months.

Problem 5. The E-mini S&P 500 futures contract is one of the most liquid and actively traded futures in the world. The contract value is defined as $\$50 \times$ the value of the S&P 500 Index.

Say you deposit \$30,000 in your margin account and sell one S&P 500 E-mini futures at \$6,101.24. Complete the following table describing the evolution of your margin account.

Day	Futures Price	Gain/Loss	Margin Account
0	6,101.24	—	30,000.00
1	6,084.32		
2	6,105.89		
3	6,110.21		

Problem 6. On January 24, 2025, AAPL stock closed at \$222.78. A June call option on AAPL with strike \$225 traded at \$14.40 per share. If the stock price at maturity is \$250, compute the profit per share of buying such a call option.

Problem 7. On January 24, 2025, TSLA stock closed at \$406.58. A December put option on TSLA with strike \$400 traded at \$103.90 per share. If the stock price at maturity is \$380, compute the profit per share of buying such a put option.

Problem 8. The price of a stock is \$120. The price of a one-year European put option on the stock with a strike price of \$90 is quoted as \$21 and the price of a one-year European call option on the stock with a strike price of \$150 is quoted as \$15. Suppose that an investor buys 100 shares, shorts 100 calls, and buys 100 puts. Complete the following table for the strategy.

Stock Price	105	135	165	195
Payoff				
Profit				

Problem 9. Suppose you think that there is a small possibility that XYZ stock might depreciate substantially in value in the next six months. Say the stock's current price is \$120, and put options expiring in six months with an exercise price of \$100 are selling at a premium of \$5 per share. With \$20,000 to invest, you are considering investing \$12,000 in the stock, \$5,000 in puts, and the rest in a risk-free account. The risk-free rate is 5% per year with continuous compounding. Compute the profit of your portfolio six months from now if the price of XYZ stock at point in time is \$90.