

Problem Set 1

Instructions: This problem set is due on 1/27 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. Consider the following risk-free securities available to buy or sell to all investors in the market.

Security	Price (t=0)	Cash Flow (t=1)	Cash Flow (t=2)	Cash Flow (t=3)
A	38	40		
B	?		30	
C	16			20
D	298	120	120	120

- What should be the no-arbitrage price of security B?
- If security B is trading at 24, is there an arbitrage opportunity? If so, explain how to exploit it.

Problem 2. Consider the following risk-free securities available to buy or sell to all investors in the market.

Security	Price (t=0)	Cash Flow (t=1)	Cash Flow (t=2)	Cash Flow (t=3)
A	76	80		
B	55	20	40	
C	78	20	40	50
D	?		20	
E	?			100

- What should be the no-arbitrage price of security D?
- What should be the no-arbitrage price of security E?

Problem 3. An investor receives \$1,080 in one year in return for an investment of \$1,000 now. Calculate the percentage return per year with:

- Annual compounding
- Semiannual compounding
- Monthly compounding
- Continuous compounding

Problem 4. An effective annual rate (EAR) of 9% per year is equivalent to which rate expressed per year with continuous compounding?

Problem 5. You have information of cash flows and zero-coupon rates (per year with continuous compounding) for different maturities as shown below:

Time (years)	1	5	10	15	20
Zero-coupon rate (%)	5.0	5.5	6.0	6.0	6.5
Cash flow	100	150	200	250	300

Compute the present value of those cash flows.

Problem 6. Suppose you enter into a 6-month forward contract on a non-dividend-paying stock when the stock price is \$100, and the risk-free interest rate is 10% per year with continuous compounding.

- What is the no-arbitrage forward price?
- If the forward price is 102, is there an arbitrage opportunity? If so, explain how to exploit it.

Problem 7. You enter in a 1-year long forward contract on a non-dividend-paying stock when the stock price is \$50, and the risk-free rate of interest is 10% per year with continuous compounding.

- What are the forward price and the initial value of the forward contract?
- Six months later, the price of the stock is \$45, and the risk-free interest rate is still 10%.
 - What are the forward price and the value of the forward contract?
 - If you decide to close the forward position, how much do you need to pay or get paid?