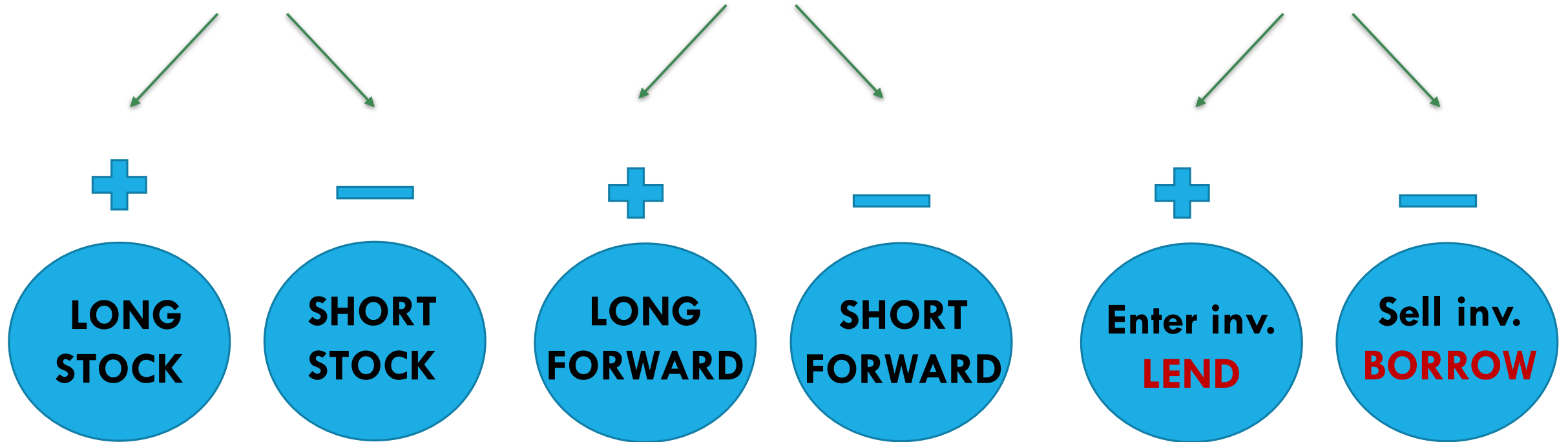
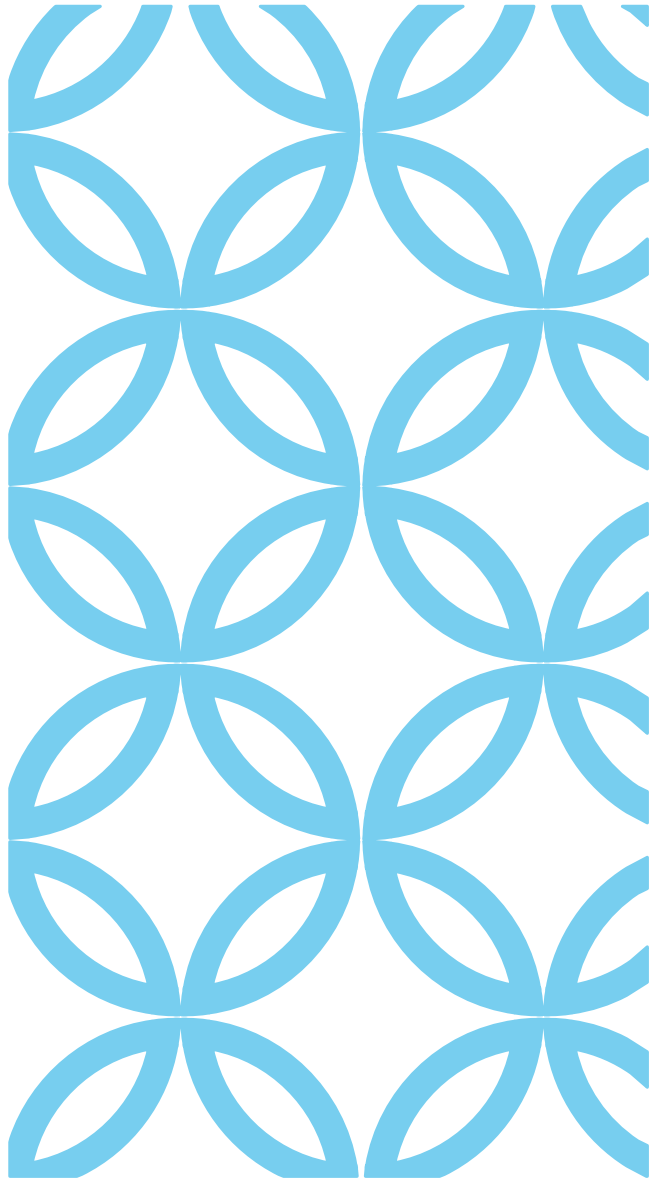


SYNTHETIC'S

King Saud University
Mathematics Department | ACTU461
Exercise's Lecture (4)
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STOCK = FORWARD + ZERO-COUPON BOND





Synthetic Long Forward

Forward = Stock – Zero-Coupon Bond

(Buy Stock) + (Borrow and have Cash)

Cash&Carry

Synthetic Short Forward

- Forward = - Stock + Zero-Coupon bond

(Sell Stock) + (Lend and give Cash)

Reverse Cash&Carry

Suppose you are a market-maker in S&R index forward contracts. The S&R index spot price is 1100, the risk-free rate is 5%, and the dividend yield on the index is 0.

a. What is the no-arbitrage forward price for delivery in 9 months?

b. Suppose a customer wishes to enter a short index futures position. If you take the opposite position, demonstrate how you would hedge your resulting long position using the index and borrowing or lending.

c. Suppose a customer wishes to enter a long index futures position. If you take the opposite position, demonstrate how you would hedge your resulting short position using the index and borrowing or lending.

The S&R index spot price is 1100, the risk-free rate is 5%, and the dividend yield on the index is 0.

- a. Suppose you observe a 6-month forward price of 1135. What arbitrage would you undertake?

- b. Suppose you observe a 6-month forward price of 1115. What arbitrage would you undertake?

A stock has current price $S_0 = 46$. The annual continuous interest rate is $r = .035$ and the continuous dividend yield is $.01$. You observe a one year prepaid forward price of 45.60 . Which of the following is true?

- A) No arbitrage is possible.
- B) You can create an arbitrage by buying one prepaid forward and selling one share of the stock short.
- C) You can create an arbitrage by selling the prepaid forward and buying one share of the stock.
- D) You can create an arbitrage by buying the prepaid forward and selling $e^{-.01}$ shares of the stock short.
- E) You can create an arbitrage by selling the prepaid forward and buying $e^{-.01}$ shares of the stock.

A stock has current price $S_0 = 50$. The annual continuous interest rate is $R = 0.035$ and the continuous dividend yield is $.01$. You observe a one year prepaid forward price of 49.50 , Which of the following is true?

- A) No arbitrage is possible.
- B) You can create arbitrage by buying one prepaid forward and selling one share of the stock short.
- C) You can create an arbitrage by selling the prepaid forward and buying one share of the stock
- D) You can create an arbitrage by buying the prepaid forward and selling $e^{-0.01}$ shares of the stock
- E) You can create an arbitrage by selling the prepaid forward and buying $e^{-0.01}$ shares of the stock

The S&R index has a spot price of $S_0 = 1000$. The continuous interest rate is $r = .03$ and the continuous dividend yield is 0. The one year forward price is 1030.45. You enter into a forward sale contract and buy the index. Which of the following positions is this equivalent to:

- A) A short sale of the index.
- B) Purchase of a one year zero-coupon bond with $r = .03$
- C) A reverse cash and carry hedge.
- D) A cash and carry arbitrage
- E) None of these.

The S&R index has a spot price of $S_0 = 1000$. The continuous interest rate is $r = .03$ and the continuous dividend yield is 0. The one year forward price is 1030.45. Which of the following positions results in a synthetic long forward contract:

- A) Sell the index short for 1000 and lend the proceeds at $r = .03$
- B) Sell the index short for 1000 and borrow 1000 at $r = .03$
- C) Borrow 1000 at $r = .03$ and buy the index.
- D) Borrow 1000 at $r = .03$ and sell the index short
- E) None of these.

You are a market maker in stock index forward contracts. The index spot price is 110, the continuously compounded interest rate is 5%, and the continuously compounded dividend yield on the index is 2%. If you observe a 6-month forward price of 112, describe actions you could take to exploit an arbitrage opportunity, and calculate the resulting profit (per index unit).

- A) Buy observed forward, sell synthetic forward, Profit = 0.34
- B) Buy observed forward, sell synthetic forward, Profit = 0.78
- C) Buy observed forward, sell synthetic forward, Profit = 1.35
- D) Sell observed forward, buy synthetic forward, Profit = 0.78
- E) Sell observed forward, buy synthetic forward, Profit = 0.34