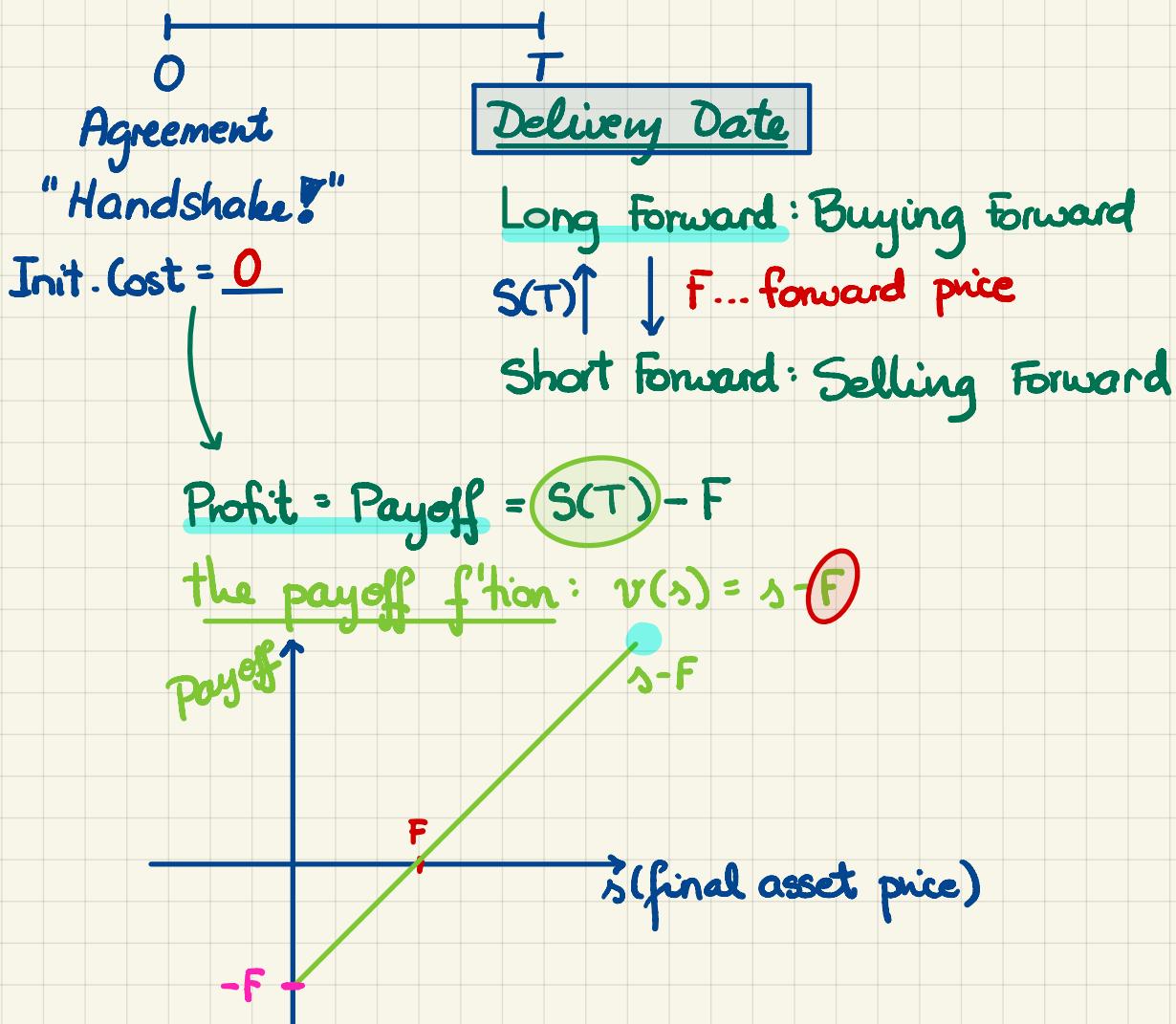


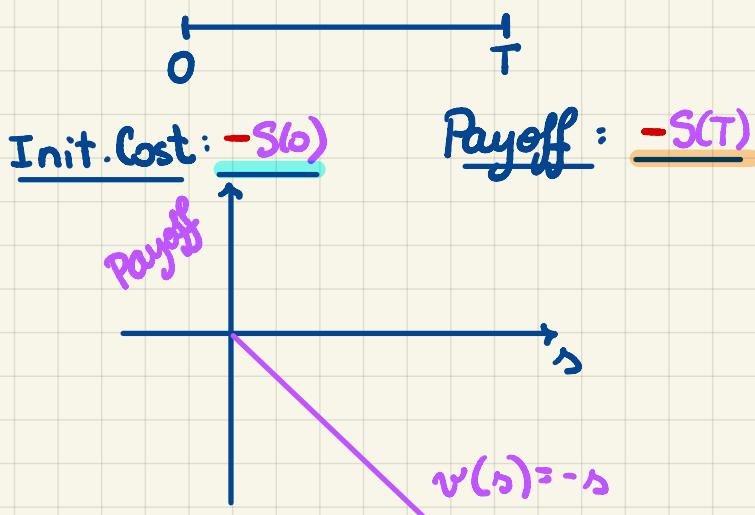
M339D : September 13th, 2023.

More on Forward Contracts.



Problem . [cont'd]

Determine which of the following portfolios have the same cashflows as a short sale of a non-dividend-paying stock.



X(iv) short forward and a long zero-coupon bond

Initial Cost: Price of bond > 0

(v) short forward and a short zero-coupon bond ✓

	<u>Init.Cost</u>	<u>Payoff</u>
short forward	0	$F - S(T)$
short bond	$-P$	$-Pe^{-rT}$
Total	$-P$	$(F - S(T)) - Pe^{-rT}$

Short Sale: $-S(0)$ $-S(T)$

If we let the forward price match the redemption amt:

$$F = Pe^{-rT}$$

Also, match the bond price P to the stock price $S(0)$:

$$P = S(0)$$

$$\Rightarrow F = S(0)e^{-rT}$$

Important!

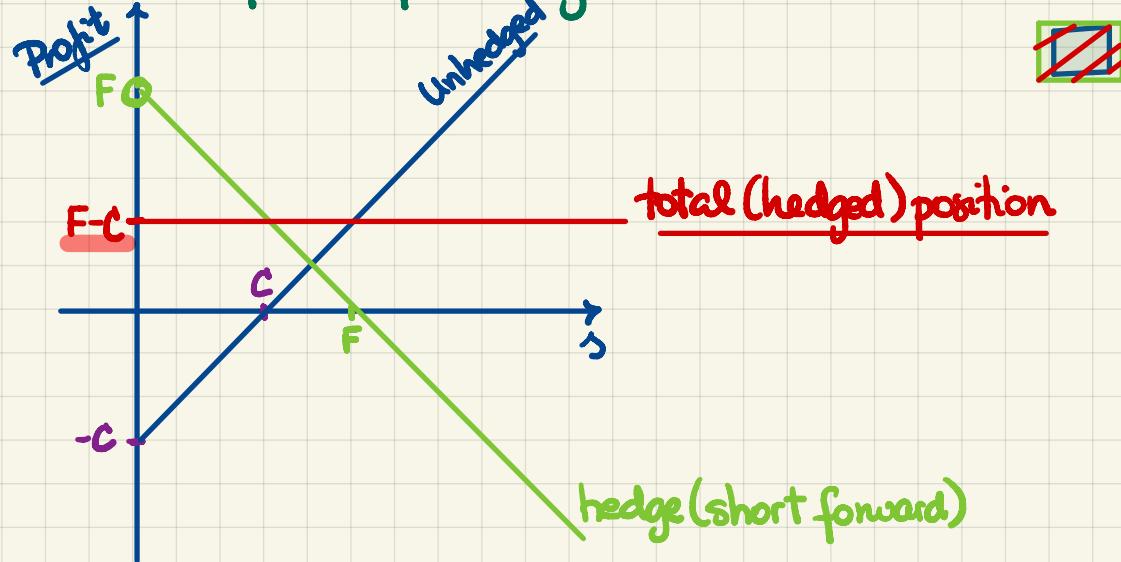


Hedging Using Forward Contracts.

Focus on a producer of goods.

C... total aggregate costs of production valued @ time $\cdot T$

$S(T)$... the market price of the good @ time $\cdot T$



Algebraically:

$$\text{Profit (Unhedged)} + \text{Profit (Hedge)} = \text{Profit (Total Hedged)}$$

$$\cancel{S(T)-C} + \cancel{F - S(T)} = \underline{F-C}$$

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Problem Set #4

Forward contracts.

Problem 4.1. (5 points) A soy-bean farmer shorts forward contracts on soy in an amount matching his crop volume and with delivery at harvest time. Then, he is considered:

- (a) an arbitrageur.
- (b) a broker.
- (c) a speculator.
- (d) a hedger.
- (e) None of the above.

Problem 4.2. Derivative securities can reduce the risk of both the buyer and the writer of the security. *True or false?*

Problem 4.3. A short forward contract has an unlimited loss potential. *True or false?*

Problem 4.4. A farmer produces one million bushels of corn. The total cost of production is \$1.3 million. The farmer entered a forward contract to hedge at a forward price of \$2.50 per bushel on one million bushels. What is the farmer's profit?

$$10^6 \cdot (2.50 - 1.3) = 1.2 \cdot 10^6$$

□

Problem 4.5. Assume that farmer Brown is uncertain about his crop yield. Based on past experience, he thinks the following is a good model:

- 100,000 bushels with probability 1/4;
- 80,000 bushels with probability 3/4.

How many forward contracts do you think farmer Brow should short to hedge against fluctuations in corn prices at harvest time? Explain your way of thinking ...

Idea #1: The Expectation : $\frac{1}{4}(100000) + \frac{3}{4}(80000) = 85000$

Idea #2: The Mode : 80000

Problem 4.6. Pancakes, Inc. produces chocolate chip pancakes. It longed a forward contract on 100 lbs of chocolate chips at \$3.00 per pound. Total fixed revenue is \$2,000 for the pancakes produced with the above chocolate chips. Other costs total \$1200. Find the company's profit.

- (a) 2,000
- (b) 1,700
- (c) 800
- (d) 500
- (e) None of the above.

$$2000 - 300 - 1200 = 500$$

Problem 4.7. The Extra-Healty Cereal (EHC) company longed 20,000 forward contracts on corn at \$2.80 per bushel. The revenue from cereal made with the above corn is \$200,000 while the other (non-corn) aggregate fixed and variable costs amount to \$120,000. What is the EHC's profit?

$$200000 - 2.8 \cdot 20,000 - 120000 = 24,000$$

□

Def'n. The two random variables X and Y are said to be equal iff they are on the same probability space and $\mathbb{P}[X = Y] = 1$.

Def'n. X and Y are said to be identically distributed iff

$$F_X(u) = F_Y(u) \text{ for all } u \in \mathbb{R}.$$