X   **(iii) long forward and a short zero·coupon bond**

	Initial Cost	Payoff
Long Forward	0	$S(T) - F$
Short Bond	$-P$	$-Pe^{rT}$
Total	$-P$	$S(T) - F - Pe^{rT}$

Q: Are there F and P such that the cashflows match w/ the short sale one?

Payoff

total payoff of the portfolio

S

$-F - Pe^{rT}$

payoff of short sale
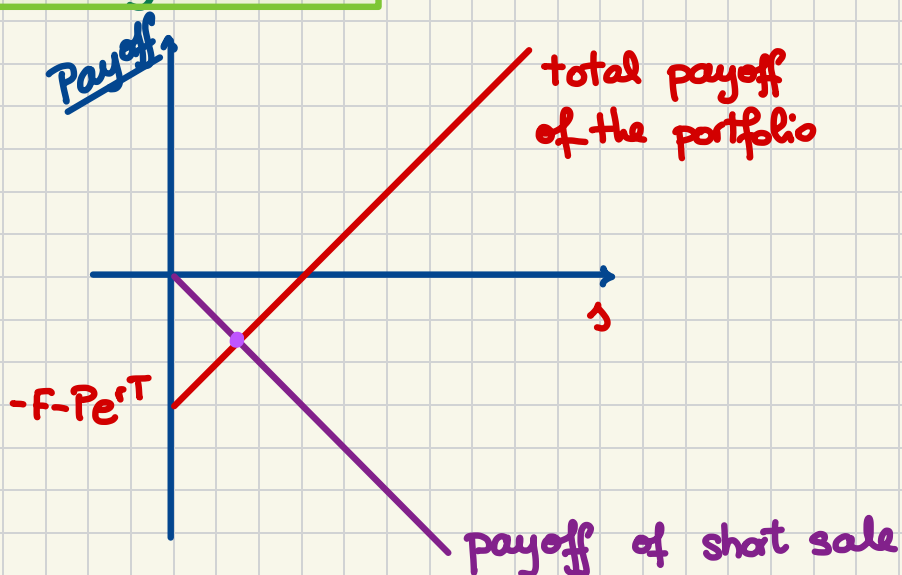
X   **(iv) short forward and a long zero·coupon bond.**

Initial Cost: Price of Bond > 0

(v) short forward and a short zero·coupon bond

	Initial Cost	Payoff
Short Forward	0	$F - S(T)$
Short Bond	$-P$	$-Pe^{rT}$
Total	$-P$	$F - Pe^{rT} - S(T)$
Short Sale	$-S(0)$	$-S(T)$

Match: $P = S(0)$ $\boxed{F = Pe^{rT} = S(0)e^{rT}}$

Important!

Hedging Using Forward Contracts.

Focus on the Producer of Goods

Profit (y-axis)

unhedged $s - c$

F-C (red horizontal line) — **total hedged position**

-C

C, **F**

s(final asset price)
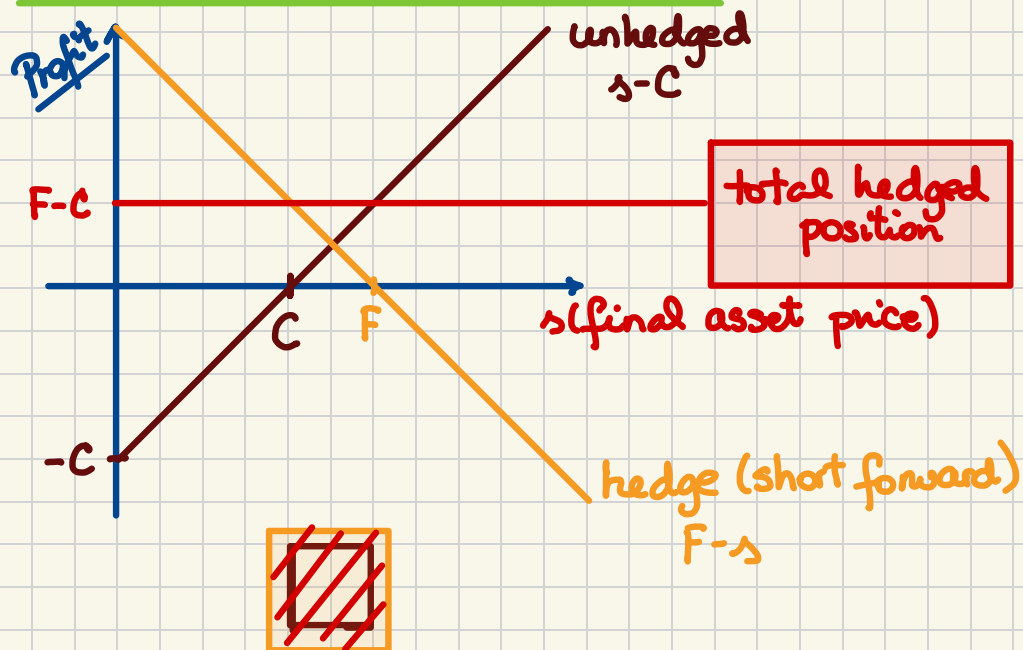
hedge (short forward) $F - s$

Alebraically:

Profit (unhedged) + Profit (short forward) = Profit (tot)

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

User/Buyer of Good (to use as raw material).

fixed i.e. determined in C

C... total aggregate costs of production of some final product *without the underlying asset* valued @ time·T *when the underlying is needed & purchased*

R... "revenue"... the price @ which the user of goods can sell the final product *valued @ time·T*

S(T)... the market price @ time·T of the underlying

All but the underlying → C

Making the Final Product

Risky asset → S(T)

→ R → Finished Product
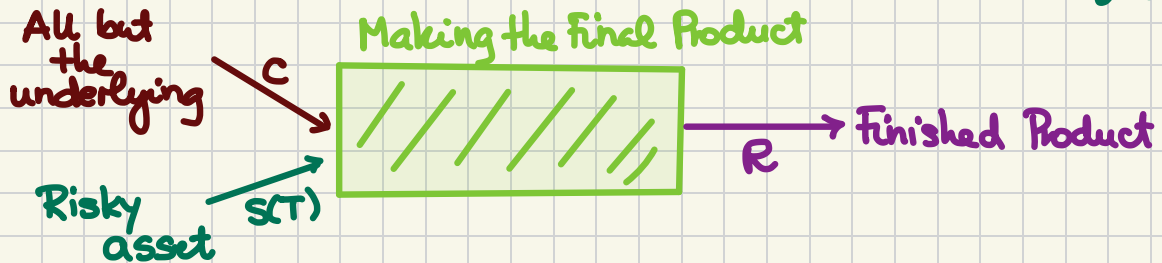
The bottom line @ time·T: $R - C - S(T)$ unhedged

The appropriate hedge is the

LONG FORWARD (BUY FORWARD) $S(T) - F$ hedge

$R - C - F$ total hedged

Profit

R-C

R-C-F

hedge (long forward)

R-C

$ (S)

total hedged

unhedged
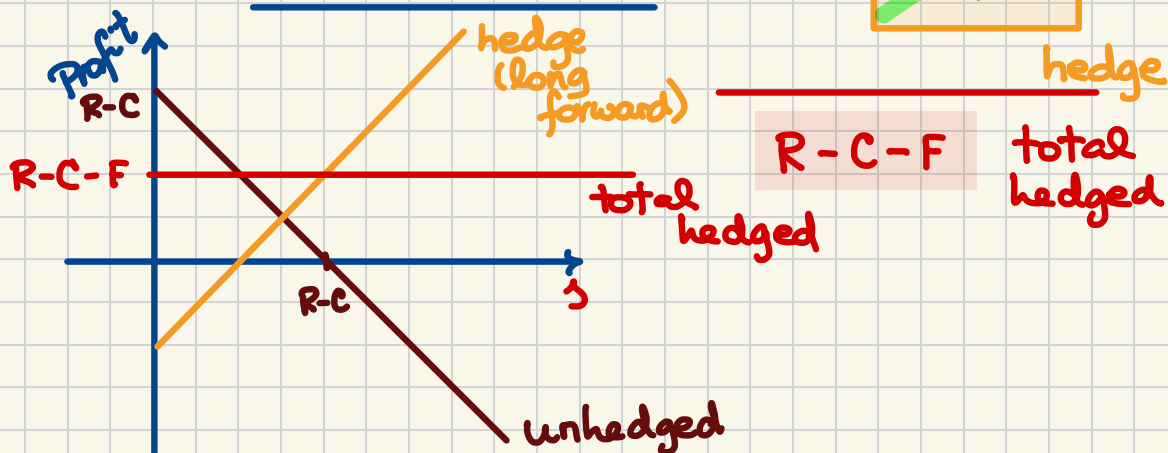
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Problem Set #4

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:
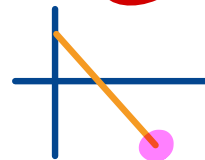
✗ (a) an arbitrageur.

✗ (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?

⟶ : $$(2.5-1.3) \cdot 10^6 = 1.2 \cdot 10^6$$

□

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 Median ⟶

Idea #3: The Mode / The subhedge   80,000

Idea #4: The Break-Even Analysis