M339D : September 16th, 2024.

Problem 3.2. To plant and harvest 20,000 bushels of corn, Farmer Jayne incurs total aggregate costs totaling $33,000. The current spot price of corn is $1.80 per bushel. What is the profit if the spot price is $1.90 per bushel when she harvests and sells her corn?

(a) About $3,000 gain
(b) About $3,000 loss
(c) About $5,000 loss
(d) About $5,000 gain
(e) None of the above

irrelevant

deterministic and valued @ time T (harvest time)

$\longrightarrow$:

$$20{,}000 \cdot 1.90 - 33{,}000 = 5{,}000 \quad \square$$

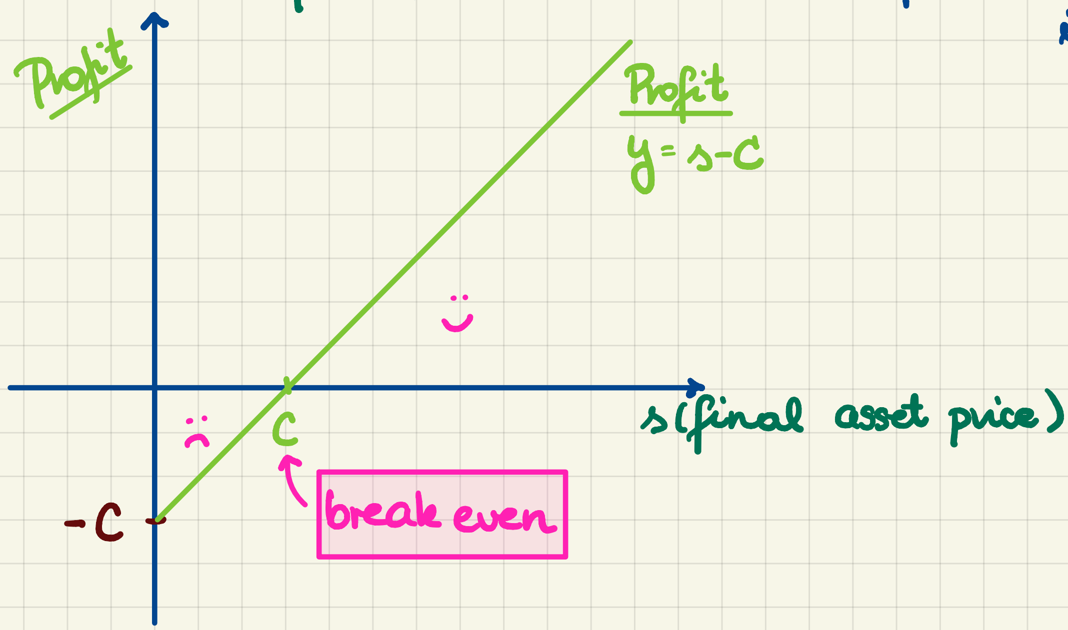
Hedging Motivation

Example. Producer of Goods.

- farmer producing corn, soy beans, peaches
- crude oil
- ore mining
- "widgets"

C.. deterministic total aggregate fixed and variable costs of production valued @ the time of sale, i.e., time T

If the producer sells their goods in the market, they get the market price. This is outside of their domain of influence.



Forward Contract.

*** A BINDING CONTRACT ON BOTH SIDES ! ***

0 ———————— T

No Cashflow!

Handshake!

Delivery date
(when the cash is "exchanged" for the asset)

An agreement:

- the underlying asset
- the quantity (for us: 1 unit)
- the type of settlement: physical or cash
- T... delivery date
- $\boxed{F\text{... forward price}}$

Initial Cost = 0

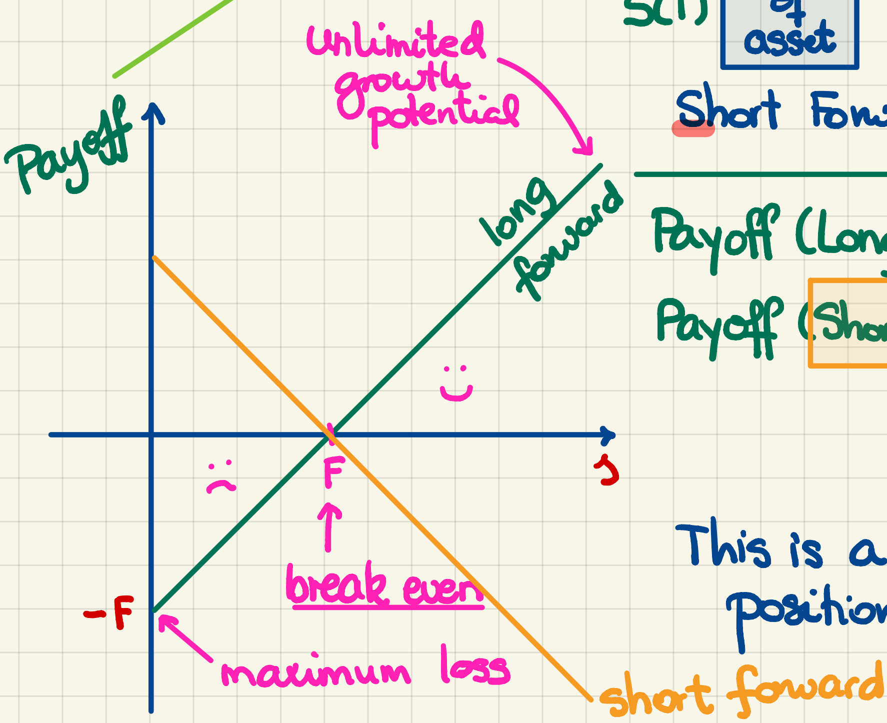
$\Downarrow$

$\boxed{\text{Payoff = Profit}}$

Long Forward : Buy Forward

S(T) $\boxed{\text{1 unit of asset}}$ $\uparrow$ $\downarrow$ Forward Price : F

Short Forward : Sell Forward



$$\left.\begin{aligned} \text{Payoff (Long Forward)} &= S(T) - F \\ \text{Payoff (Short Forward)} &= F - S(T) \end{aligned}\right\}$$

Payoff f'tion:

$\boxed{v(s) = s - F}$

This is a long position w.r.t. the underlying

Problem. Sample SOA Problem.

Determine which of the following portfolios have the same cashflows as a <u>shortsale</u> of a non-dividend-paying stock.

$$0 \longrightarrow T$$

<u>Initial Cost:</u> $\underline{-S(0)}$ <u>Payoff:</u> $\underline{-S(T)}$

X (i) long forward and a long zero-coupon bond

<u>Init. Cost:</u> <u>Price of Bond</u> > 0

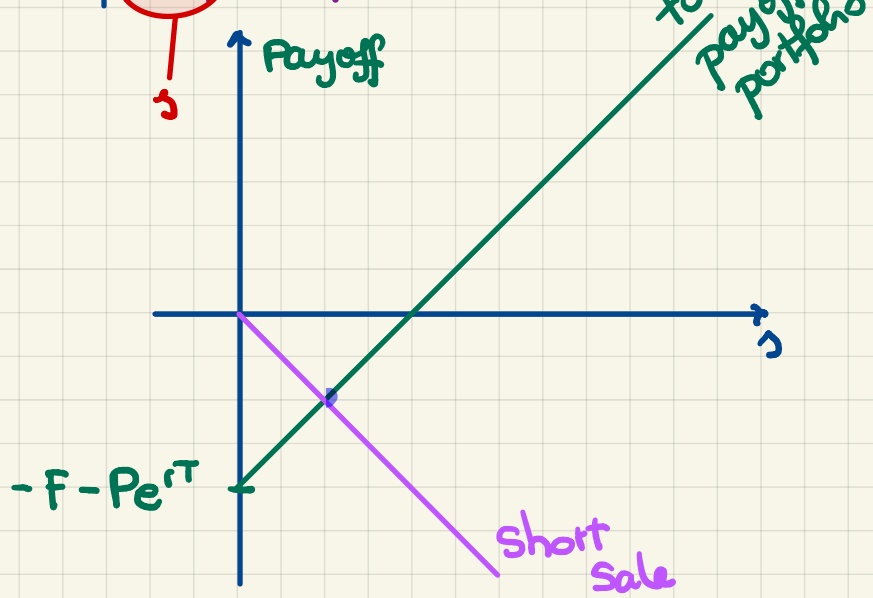
X (ii) long forward and a short forward

<u>Init. Cost:</u> 0

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	$-P$	$S(T) - F - Pe^{rT}$

s



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

Important!