

M339D: February 7th, 2022.

Static Portfolios [cont'd].

Example. [Fully-leveraged purchase]

We borrow money and invest it in one share of continuous dividend paying stock.

- At time · 0 :
- Borrow $S(0)$ @ the continuously compounded, risk-free interest rate r to be repaid in full @ time · T .
 - Buy one share of stock.

Initial Cost :

$$\underbrace{-S(0)}_{\text{money borrowed}} + \underbrace{S(0)}_{\text{stock bought}} = \underline{0} \quad \checkmark$$

- At time · T :
- Pay back $FV_{0,T}(S(0)) = S(0)e^{rT}$.

- We own e^{ST} of shares of stock.

=> The worth of these shares is $e^{ST} \cdot S(T)$.

Payoff :

$$\underbrace{-S(0)e^{rT}}_{\text{paying back the loan}} + \underbrace{e^{ST} \cdot S(T)}_{\text{the value of the shares}}$$

$$\text{Profit} = \text{Payoff} = e^{ST} \cdot S(T) - S(0)e^{rT}$$

Fully Leveraged

Payoff / Profit Function :

$$v(s) = e^{ST} s - S(0)e^{rT}$$

slope e^{ST} intercept $-S(0)e^{rT}$

Profit (Outright Purchase)

"

Profit (Fully Leveraged Purchase)

Solve for δ :

$$e^{ST} \cdot \delta - S(0) e^{rT} = 0$$

$$e^{ST} \cdot \delta = S(0) e^{rT}$$

$$\delta^* = S(0) e^{(r-\delta)T}$$

Basic Risk Management.

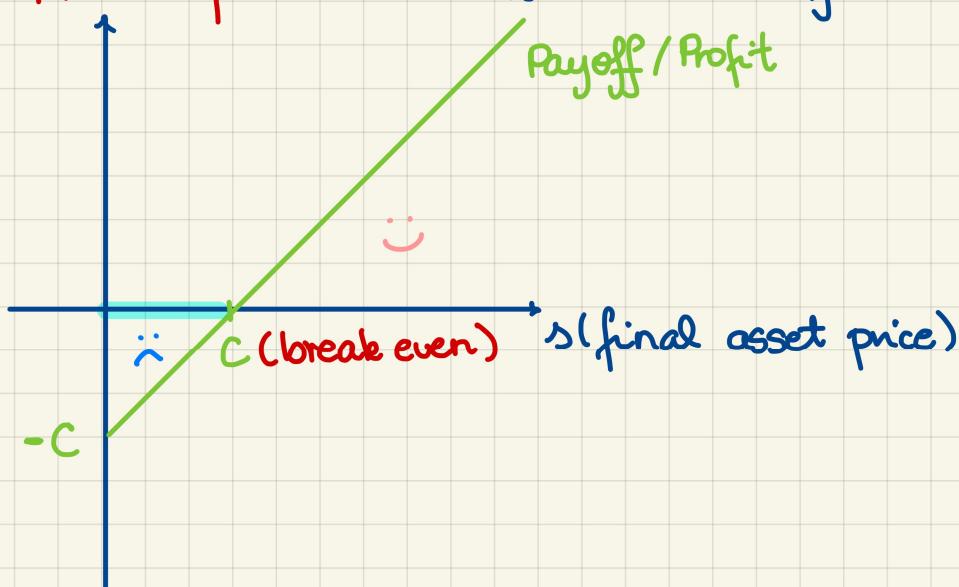
Hedging Motivation.

Example. [Producer of Goods]

- farmers producing corn, soy beans, peanuts, ...
- mining company excavating : nickel, gold, silver, ...
- oil company extracting crude oil
- factories making "widgets", "verges", ...

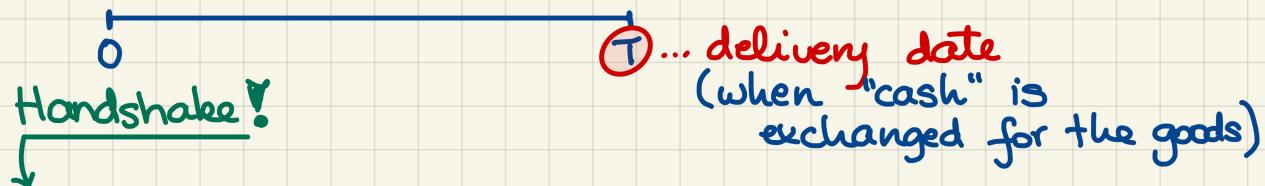
C... deterministic total aggregate fixed and variable costs valued at the time of sale of the good, i.e., time T

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



Forward Contract.

* A binding contract on both sides! *



An agreement:

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