D: 02/08/2017.

Outright Purchase.

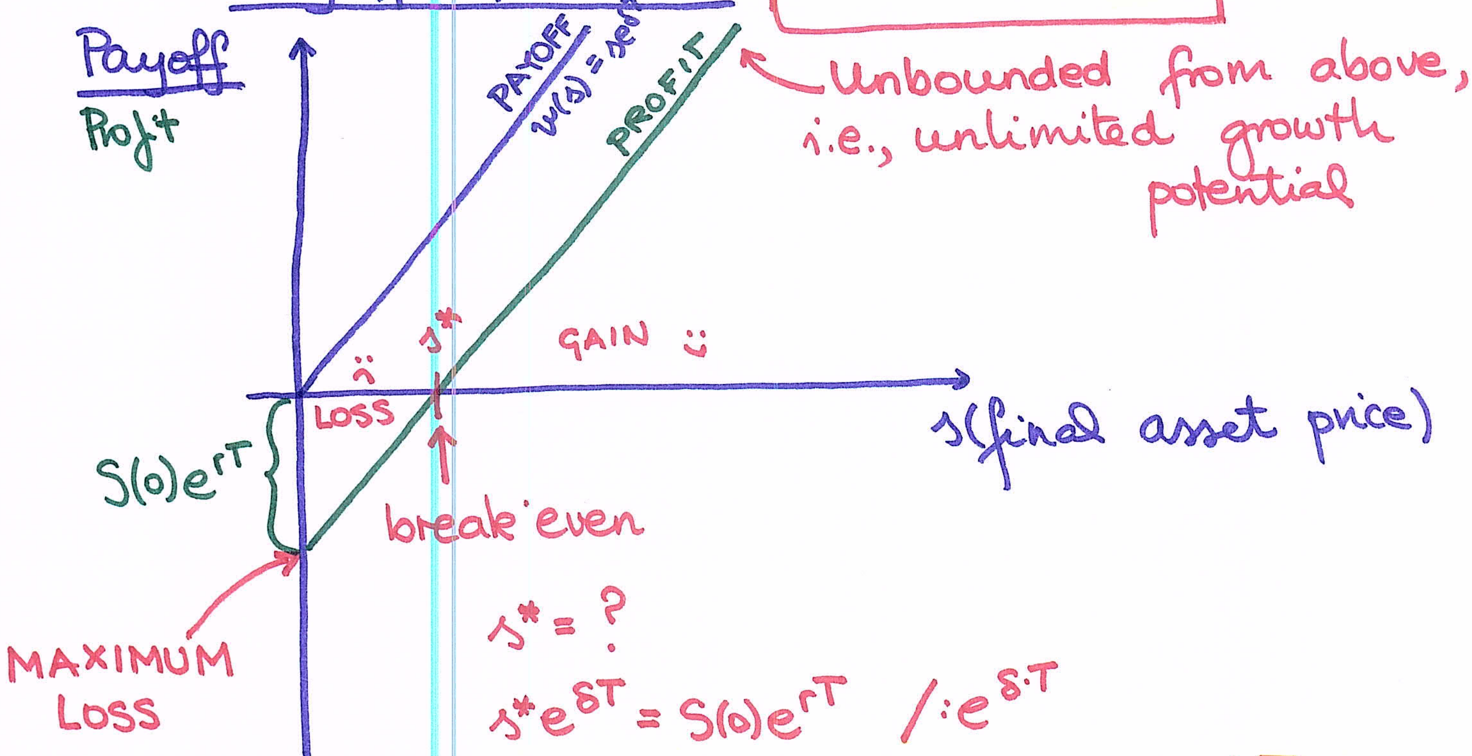
Consider the purchase @ time 0 of one share of a continuous dividend paying stock w/ the dividend yield δ.

$\Rightarrow$ **Initial cost**: $S(0)$

Payoff : $\underbrace{e^{\delta \cdot T}}_{\text{\# of shares you own @ time T}} \cdot \underbrace{S(T)}_{\text{market price per share}}$

s... independent argument representing the final asset price ("placeholder for $S(T)$")

$\Rightarrow$ **Payoff function** : $\boxed{v(s) = e^{\delta \cdot T} \cdot s}$



$s^* = ?$

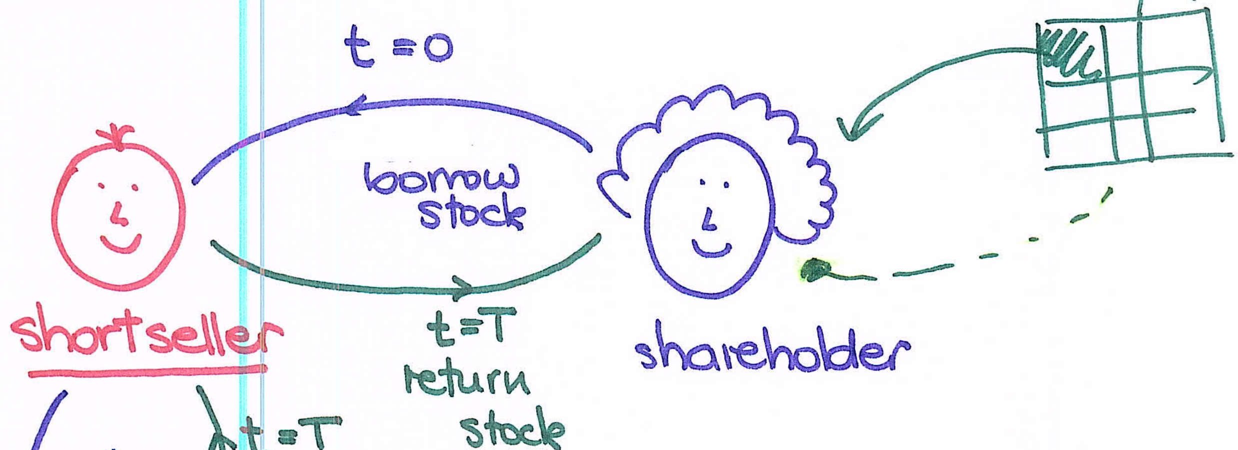
$s^* e^{\delta T} = S(0) e^{rT} \quad / : e^{\delta \cdot T}$

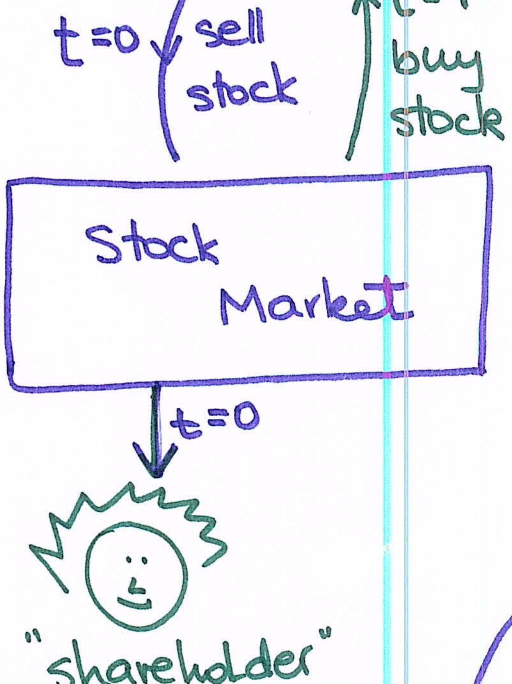
$s^* = S(0) e^{rT} e^{-\delta \cdot T} = S(0)\, e^{(r-\delta)\cdot T}$

Note: The payoff/profit functions are nondecreasing as functions of the final asset price.

If a financial position has the payoff curve which is nondecreasing as a function of the final asset price, we say that it is LONG WITH RESPECT TO THE UNDERLYING (ASSET).

Short sales.





T... the time @ which the short sale is closed

<u>Margin account</u>: alleviate credit risk

- imagine it as a savings acct whose owner is the short seller (the initial deposit is the initial margin)
- the source of dividend pmts

From now on: assume no MARGIN ACCT.

⇒ We only look @
- no dividends
- continuous dividends

Case #1. $\boxed{\text{NO DIVIDENDS}}$

0 — T

short sale initiated (0) — short sale closed (T)

At $t=0$: Short seller receives $S(0)$.

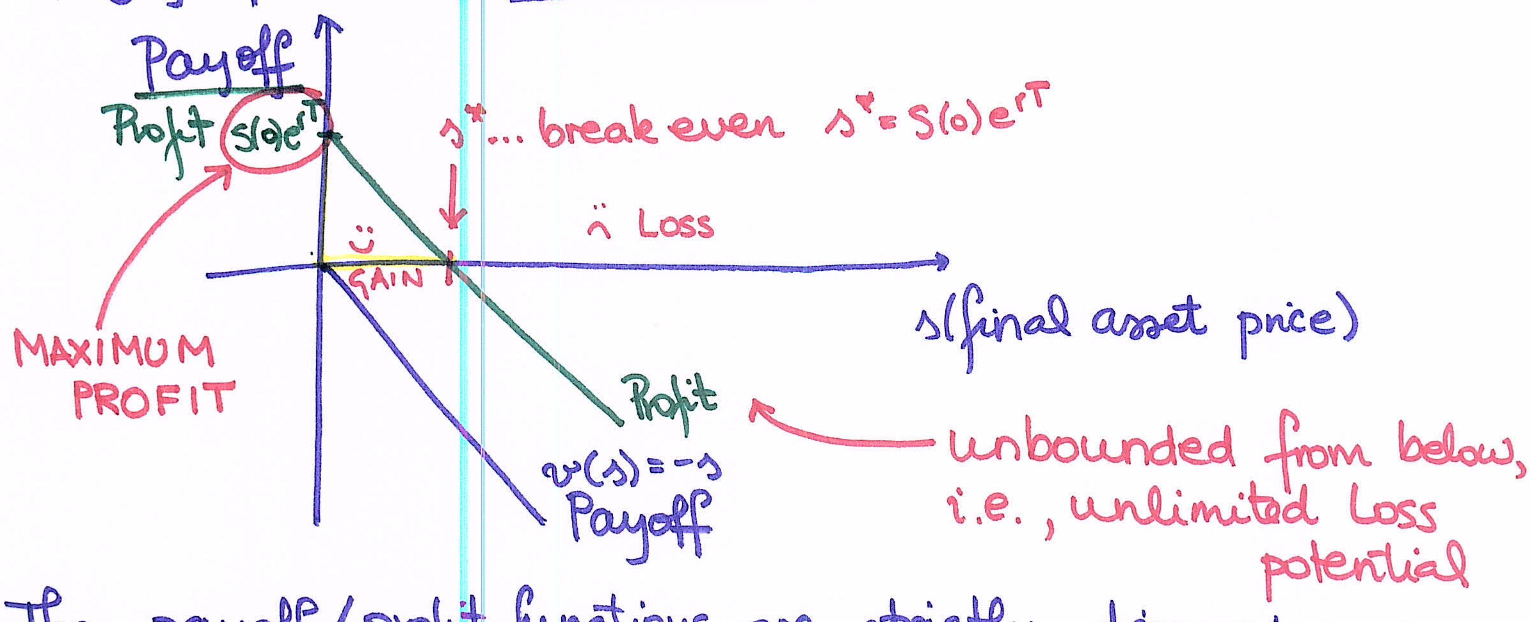
$\Rightarrow$ Initial cost: $-S(0)$

At $t=T$: Short seller spends $S(T)$.

$\Rightarrow$ Payoff : $-S(T)$

$$\text{Profit} = -S(T) + FV_{0,T}(+S(0))$$
$$= -S(T) + S(0)e^{rT}$$

Payoff function: $\boxed{v(s) = -s}$



The payoff / profit functions are strictly decreasing as functions of the final asset price.

We say that a financial position whose payoff curve is noncreasing as a function of the final asset price is SHORT WITH RESPECT TO THE UNDERLYING (ASSET).

Case #2. $\boxed{\text{CONTINUOUS DIVIDENDS}}$

δ ... dividend yield

$0 \longrightarrow T$

Initial cost:

$-S(0)$

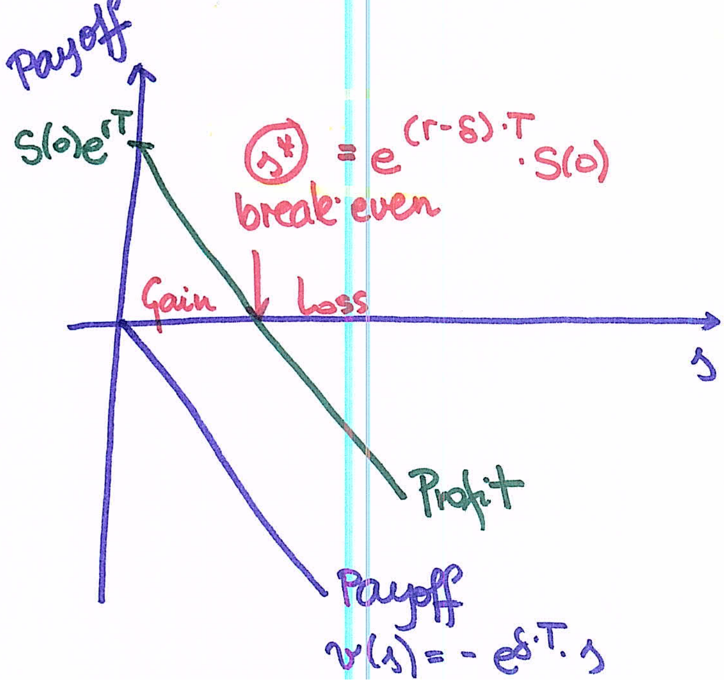
* per share *

Payoff:

$-\underbrace{e^{\delta T}}\cdot S(T)$

have to buy back this many shares

$$\text{Profit} = \text{Payoff} - FV_{0,T}(\text{Init. Cost})$$
$$= -e^{\delta \cdot T}\cdot S(T) + FV_{0,T}(+S(0))$$
$$= -e^{\delta \cdot T}\cdot S(T) + S(0)e^{rT}$$



The payoff function:

$v(s) = -e^{\delta T}\cdot s$