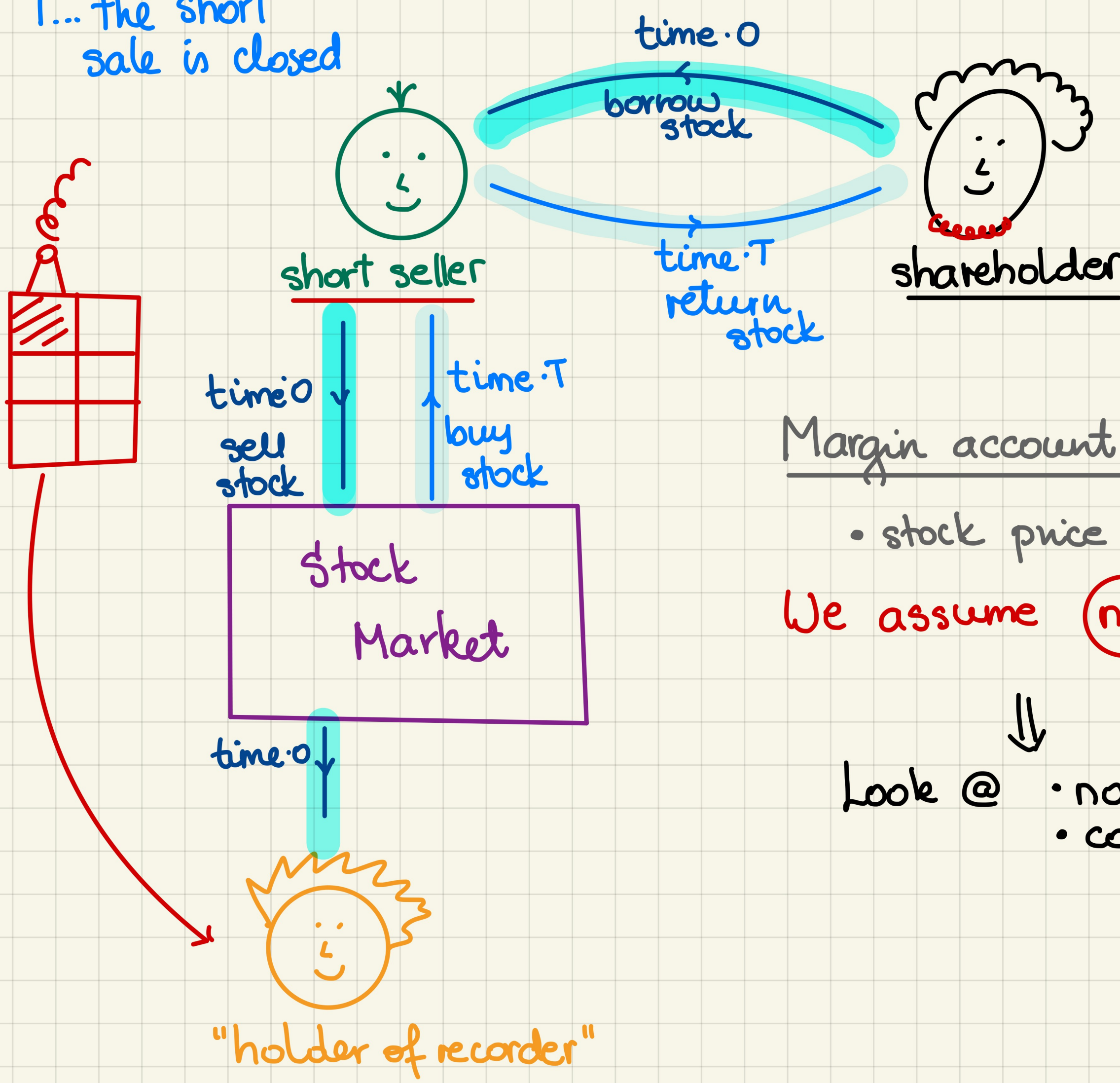
M339D: February 10th, 2021.

Short Sales.

T... the short sale is closed



? dividends

Margin account: alleviate the credit risk

- stock price going up

We assume no margin account.

$\Downarrow$

Look @
- no dividends
- continuous dividends

Case #1. NO DIVIDENDS.

$S(t)$, $t \geq 0$ ... stock price @ time·t

$$\begin{array}{ccc} 0 & \longrightarrow & T \\ \text{short sale initiated} & & \text{short sale closed} \end{array}$$

At time·0: The short seller receives $S(0)$.

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

At time·T: The short seller spends $S(T)$.

$\Rightarrow$ $\boxed{\text{Payoff}: -S(T)}$

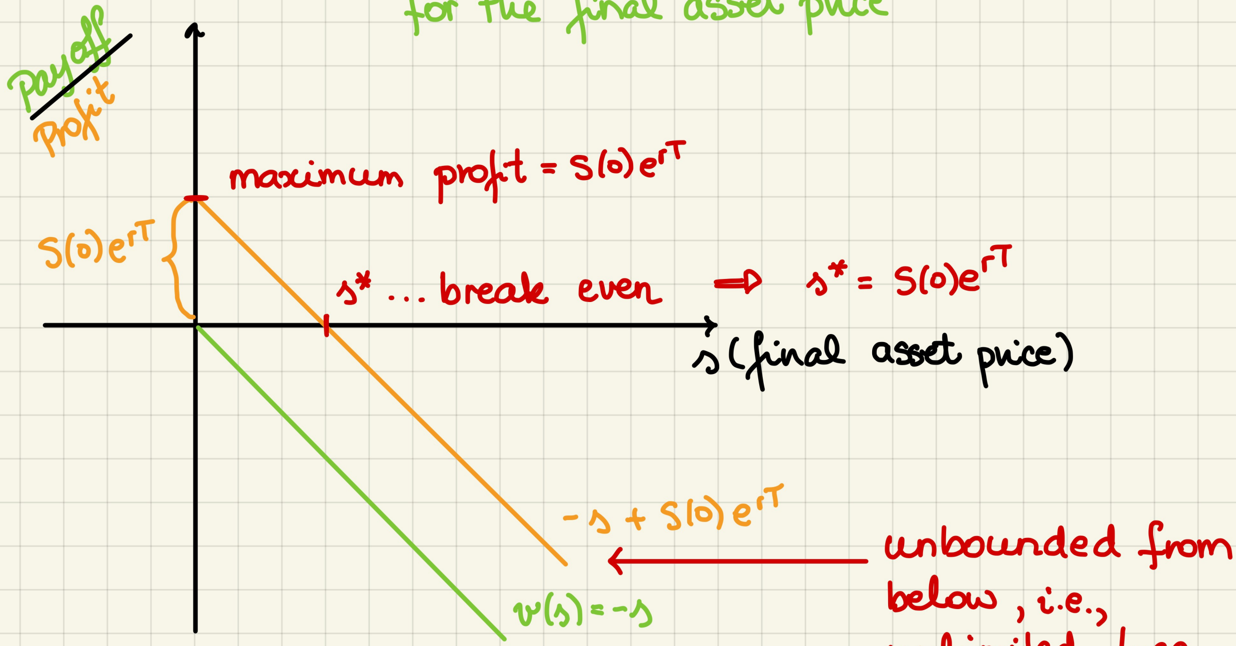
$$\text{Profit} = \text{Payoff} - FV_{0,T}(\text{Init. Cost}) =$$

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

r... ccrfir

Payoff function: $v(s) = -s$

"placeholder" for the final asset price



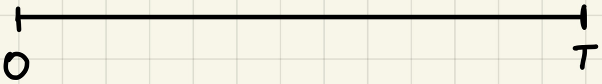
The payoff/profit curves are decreasing as functions of s.

In general: We say that a financial position whose payoff/profit curves are nonincreasing as functions of the final asset price is

SHORT with respect to the underlying asset.

Case #2. CONTINUOUS DIVIDENDS.

δ ... dividend yield



Initial Cost:

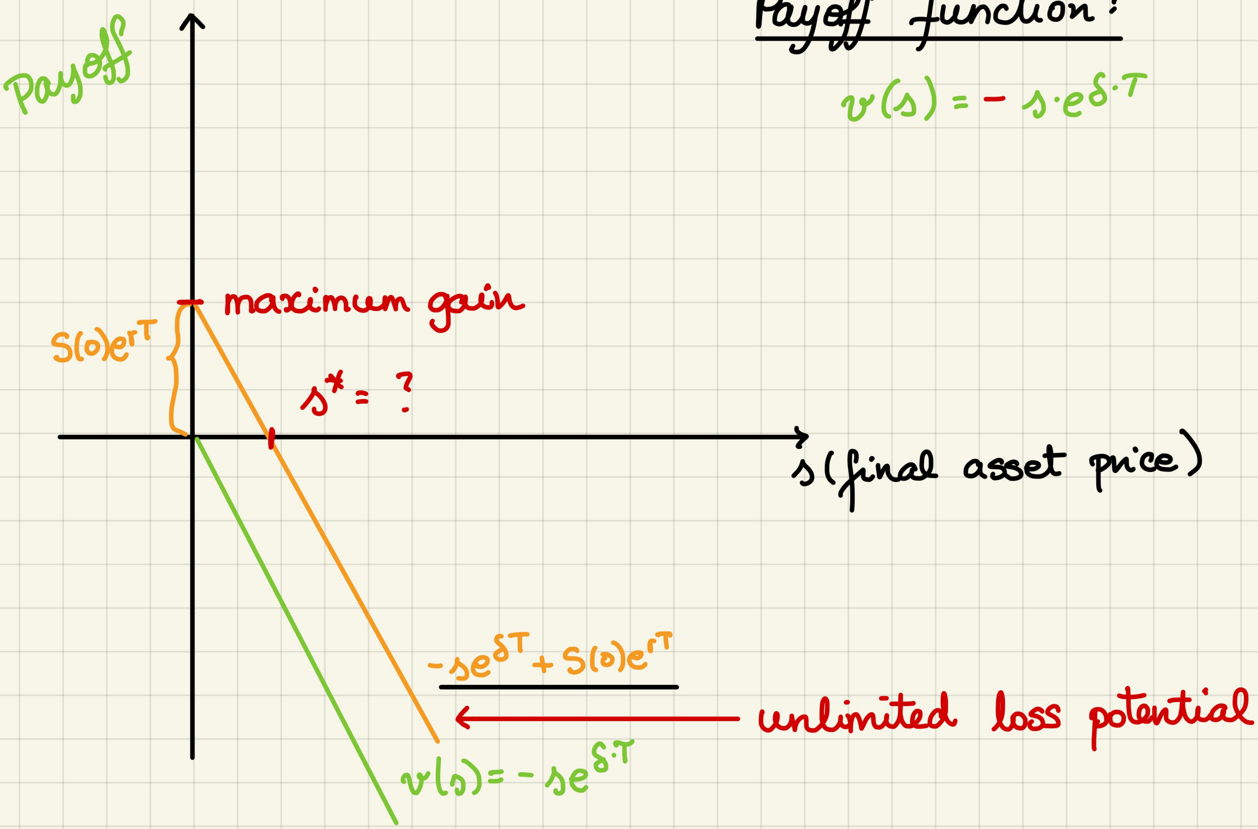
$-S(0)$

Payoff:

$-\underbrace{e^{\delta T}}_{\text{\# of shares that need to be bought back}} \cdot S(T)$

Payoff function:

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



To get the break-even point s^*, we solve for s in profit function $= 0$, i.e.,

$$-se^{\delta T} + S(0)e^{rT} = 0$$

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

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

Problem Set #4:
- Do it for practice!
- Contemplate borrowing money to invest in stock!