Risk Aversion & Loss Aversion

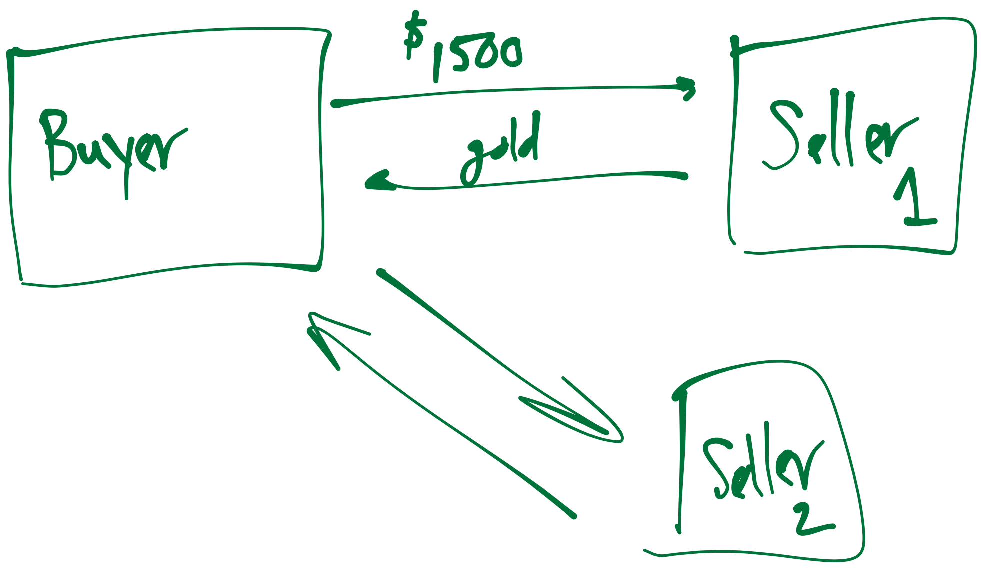
(A) H $100
T -$100

(B) .01 + $100,000
.99 - 1000

Forward: contract to guarantee sale of a specified asset at an agreed-upon price on a specified future date

Say the price of Gold varies between $1000 and $2000 per oz.

Gold buyer and gold seller want to reduce income volatility, they agree to trade gold in 6 months for \$1500 / oz.



Payment	Delivery	Name	Price
0	0	Outright Purchase	S_0
T	0	Fully Leveraged Purchase	$S_0 e^{rT}$

0	T	Prepaid Forward	S_0
T	T	Forward Contract	$S_0 e^{rT}$

(if we consider dividend δ and storage costs γ)

$$S_0 e^{(r-\delta+\gamma)T}$$

$$E[S_T] = S_0 e^{\alpha T}$$

e.g. $r = 3\%$ $\alpha = 10\%$

$$PV(E[S_T]) = S_0 e^{\alpha T} e^{-\alpha T}$$

Payoff / Profit

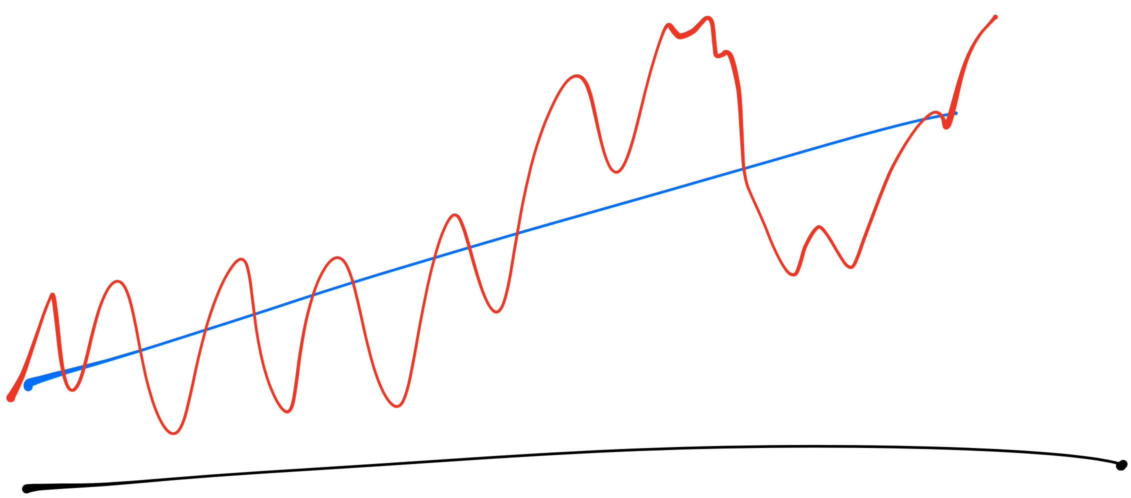
Payoff

Action	$t=0$	$t=T$
Buy Bond	$-P$	$+Pe^{rT}$

Borrow	P	$-Pe^{rT}$
	0	0

profit

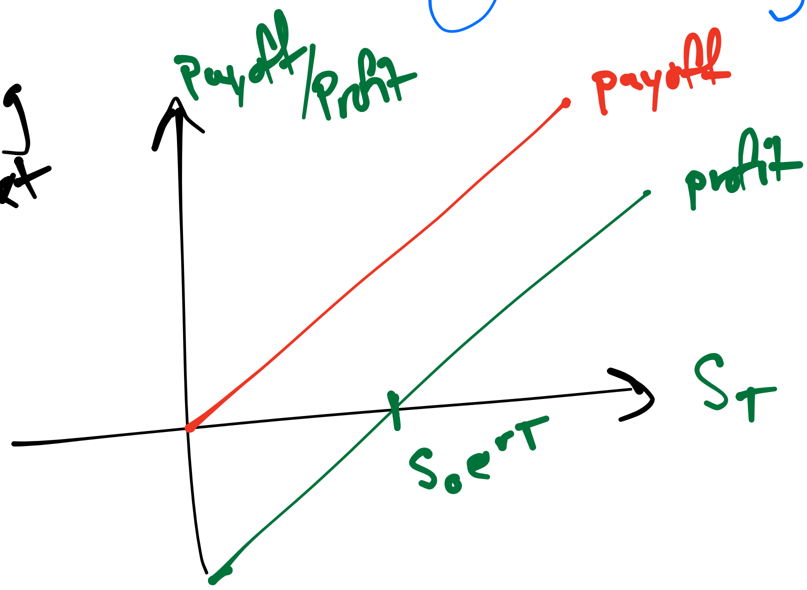
Action	$t=0$	$t=T$
Buy IBM	$-S_0$	S_T
Borrow	S_0	$-S_0 e^{rT}$
	0	$S_T - S_0 e^{rT}$



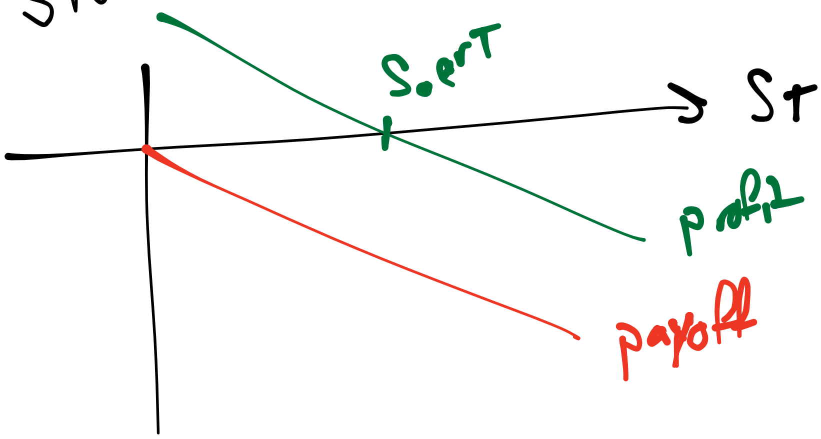
Long / Short

Action	$t=0$	$t=T$
Short IBM	S_0	$-S_T$
Lend	$-S_0$	S_0e^{rT}
	0	$S_0e^{rT}-S_T$

Long Asset



Short sale



$S_0 = 100$

$r = 5\%$

I want a 1-yr forward with price \$100

I'd have to pay the short side of the contract

$$PV\left(100e^{.05} - 100\right)$$

EX

$r = 5\%$

AAPL price = \$100

AAPL δ = 0%

AAPL α = 10%

1) What is the expected profit on buying 1 share of AAPL and holding it for 1/2 year?

Action	$t=0$	$t=\frac{1}{2}$
Buy AAPL	-100	$100e^{.1(.5)}$

Borrow	100	$-100e^{.05(.5)}$
		$100e^{.05} - 100e^{.025}$

2) What would $S_{1.5}$ have to be to achieve a profit on a short sale?

Action	$t=0$	$t=1.5$
Short AAPL	100	$-S_{1.5}$
Lend	-100	$100e^{(.05)(1.5)}$
		$100e^{(.075)} - S_{1.5}$

To achieve a profit, $S_{1.5} \geq 100e^{.075}$

3) What is $F_{0,1}$ (a forward contract written at $t=0$ for completion at $t=1$)

$$S_0 e^{(r-\delta)T} = 100 e^{(.05-0)(1)}$$
$$= 100 e^{.05}$$

IBM: $S_0 = \$50$
$\delta = 2\%$
$\alpha = 5\%$

Action	$t=0$	$t=1/2$
Buy IBM	-50	$+50e^{(.02+.05)(.5)}$
Borrow	$+50$	$-50e^{(.5)(.05)}$

Action	$t=0$	$t=1.5$
		$-S_T$
Short IBM	50	
Lend	-50	$50e^{(.05)1.5}$
Dividends	0	$-(50e^{(.02)1.5}-50)$

$50e^{(.05)(1.5)} - (S_T + 50(e \quad -1))$

$$F_{0,1} = S_0 e^{(r-\delta)T}$$
$$= 50e^{(.05-.02)(1)}$$
$$= 50e^{.03}$$

Futures

How are they different from Forwards?

1) Traded on an exchange
   - brings together buyers and sellers
   - allows for the participation of market-makers

2) Totally standardized
   - Asset quality
   - expiration dates

- prices

3) Margin Accounts

- Collateral that both long and short futures traders must provide
- At the end of trading each day, margin accounts are marked to market