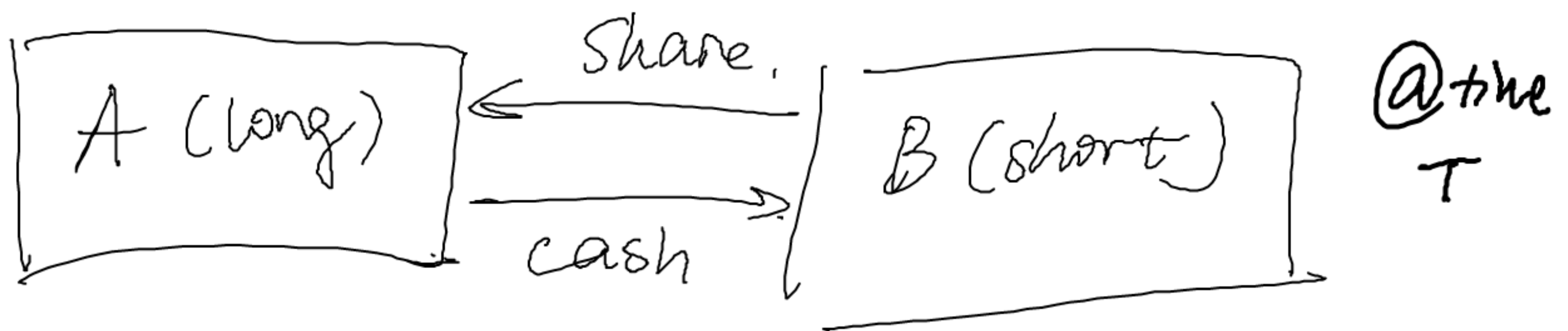


Derivatives Note #2.

Contract for forward delivery.
Commodity, stocks, currencies, OTC



Forward Price #.

$$F = FV \times (S - PV \cdot DIVI)$$

| | | |

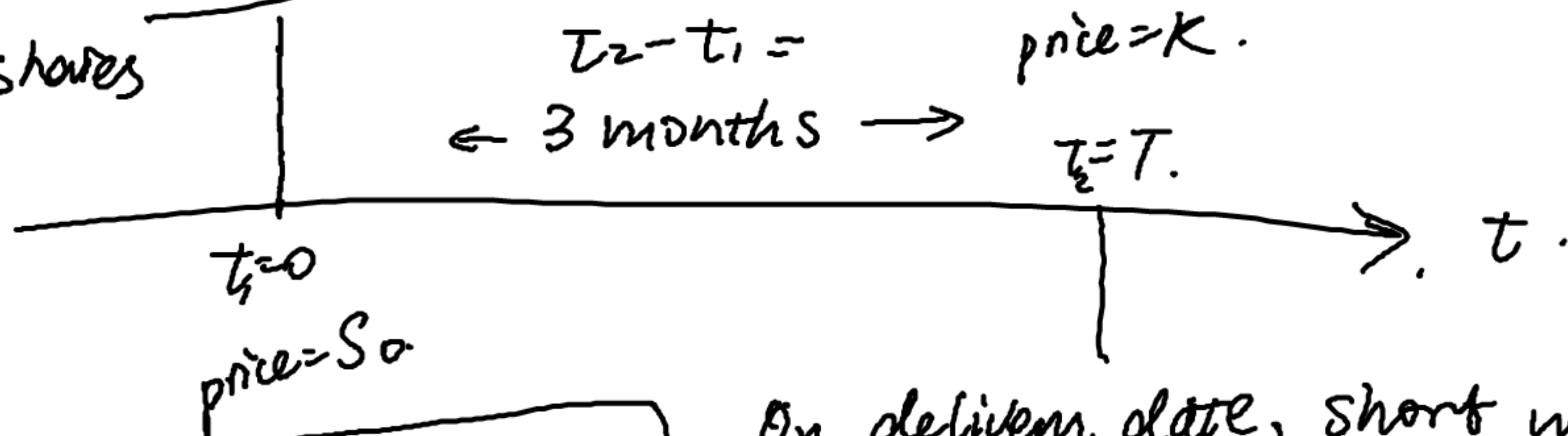
forward Spot present- dividend
value value value

Short must hedge by buying the stock at the starting date.

1. borrow to buy one stock ($t=0$)
2. collect dividends, if any ($0 < t < T$).
3. exchange stock for stipulated price ($t=T$).
4. return loan + interest ($t=T$).

Forward Price.

• On trade date: short borrows $N S_0$ dollars and buys N shares



here K is the agreed on delivery price of the forward

On delivery date, short will:

- delivers the N shares
- pays back loan, $-N \cdot S_0 e^{rT}$
- receive $N \cdot K$ dollars
- has accumulated dividends $+ N \cdot \sum_i d_i e^{r(T-t_i)}$

$$\Rightarrow PNL = -N S_0 e^{rT} + N K + N \cdot \sum_i d_i e^{r(T-t_i)}$$

Let $PNL = 0$ to solve a break-even K .

$$\Rightarrow K = F_T = S_0 \cdot e^{rT} - e^{rT} \cdot \sum_i d_i e^{-r t_i}$$

clarification of variables,

- Valuation of Forward Contract

K - the agreed upon delivery price.

T - the delivery date is T years from today

r - T years risk-free interest rate

F_0 - the forward price that would be applicable.

if we negotiated the contract today.

f - value of the forward contract today

* at the beginning of the contract

$$K = F_0 \text{ \& \& } f = 0.$$

as time passes, K stays the same, but the forward price changes and the value of the contract becomes $+$ or $-$

Evolution of Forward Price

① If the forward contract is negotiated at the forward price, its value at time 0 is zero. In principle, no cash flows are required initially

② If K is different from the forward price, then there should be an initial cash-flow $= e^{-rT}(F_{0T} - K)$ by the long to the short because the contract is off-market

(this means if the delivery price is too cheap.

$(K < F_{0T})$ then the long should give the short some money to enter such contract

In OTC transaction, you can mark to market everyday and mitigate the risk everyday.

Futures are exchange-traded.

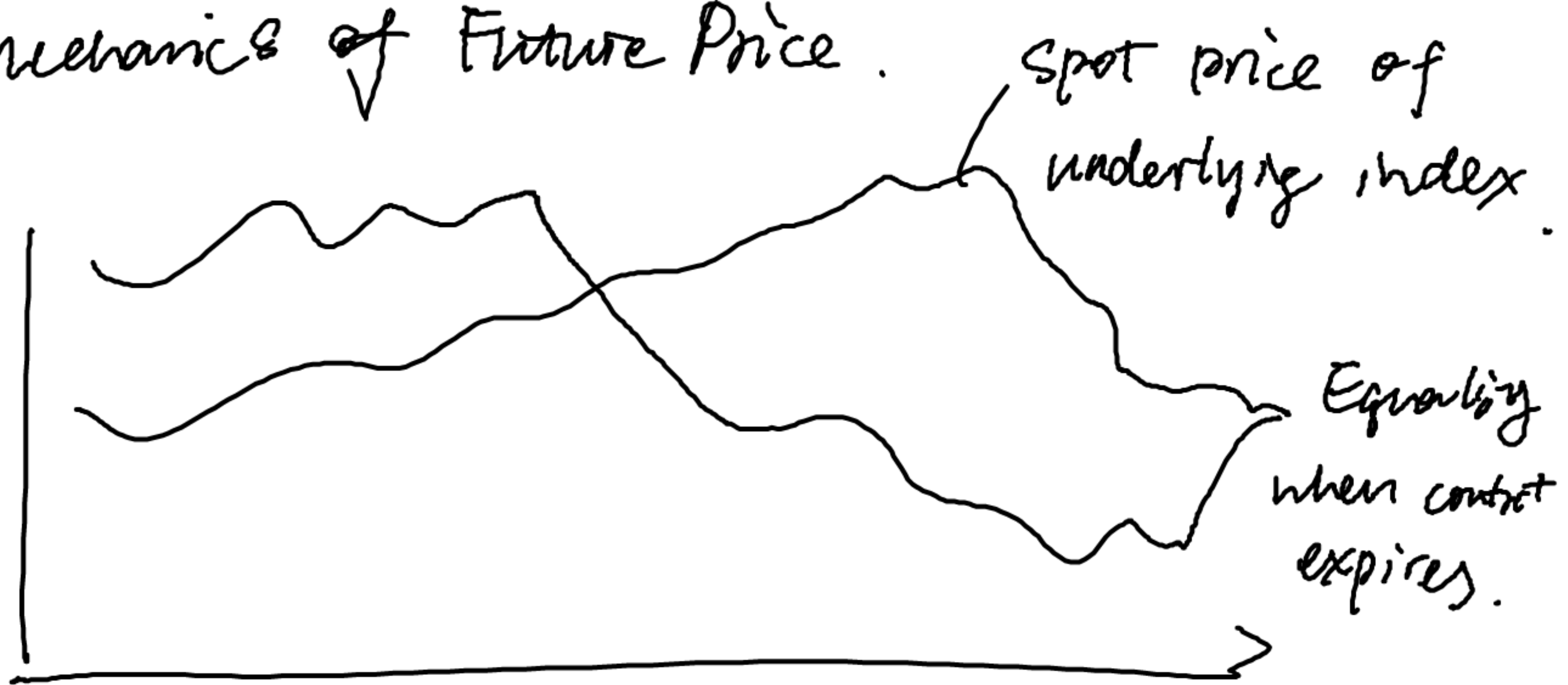
ex. $\$50 \times 3000$
 $= 150,000$.

Tick size. per point. $0.25 \text{ pts} = \$12.50$
 \uparrow
 $(\$50 \times 25\%).$

Contract Size: Mar
Jun. Quarterly.
Sep. cash
Dec. settle.

3rd Friday in Future month

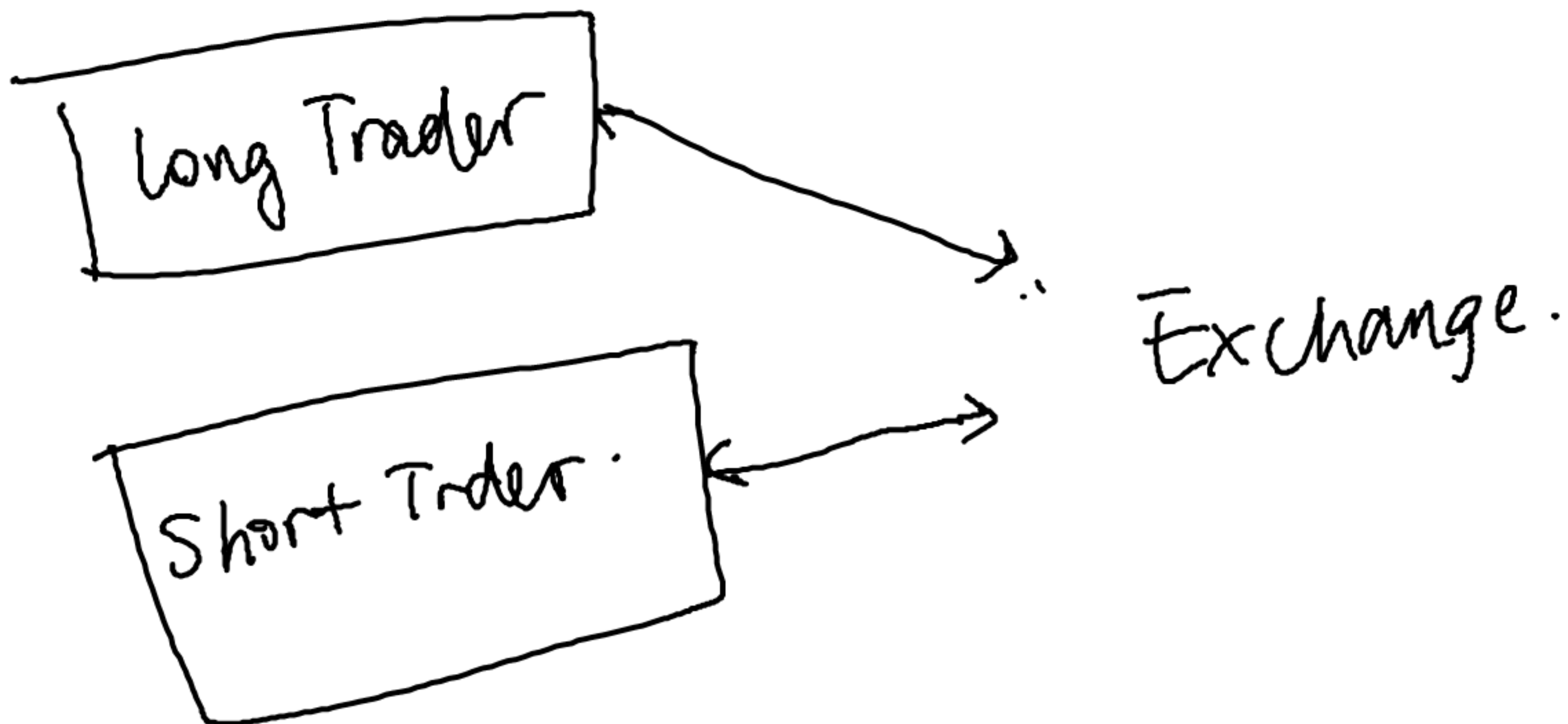
Mechanics of Future Price.



Future Rules.

Central trading.

Central Clearing: Exchange is the counter party of everyone



Future vs. Forward. with same settlement date.

$$\Delta E = \sum_{i=1}^n (f_i - f_{i-1}) e^{r(n-i)\Delta t}$$

$$\Delta E = \sum_{i=1}^n e^{-r(n-i)\Delta t} e^{r(n-i)\Delta t} (f_i - f_{i-1}) = \sum_{i=1}^n (f_i - f_{i-1})$$

② What does it mean by futures have zero cost?
on ppt P14.

$$f_{0,T} = F_{0,T}$$

② P15. price discovery in forward transaction?

$$\underbrace{\Delta I}_{\text{Capital gain}} + \underbrace{q I \Delta t}_{\text{Dividend gain}} - \underbrace{r I \Delta t}_{\text{Financial cost}}$$

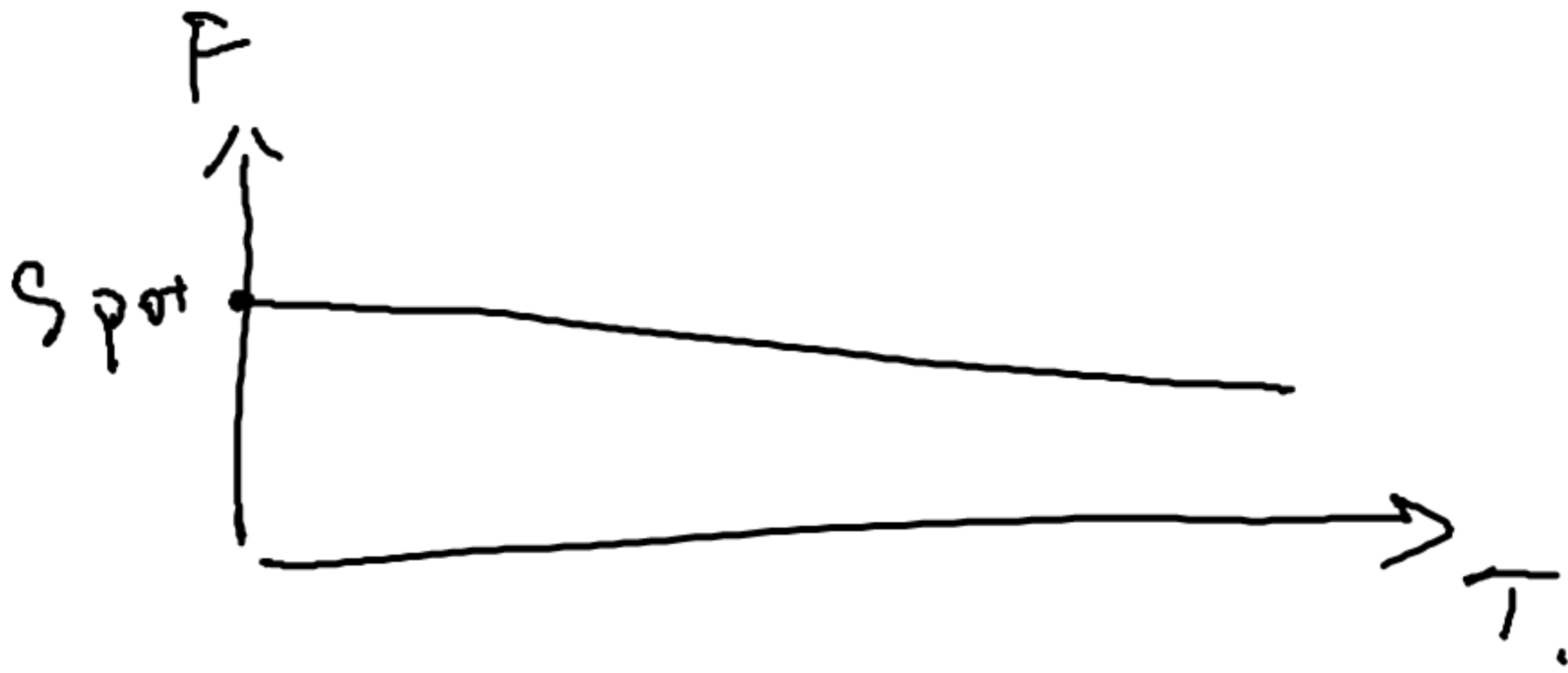
② P_{17} in 17^{th} , now is the equation calculated.

$$F_{0T} = S e^{(r_d - r_f)T} = S \left(\frac{1 + R_d T}{1 + R_f T} \right)$$

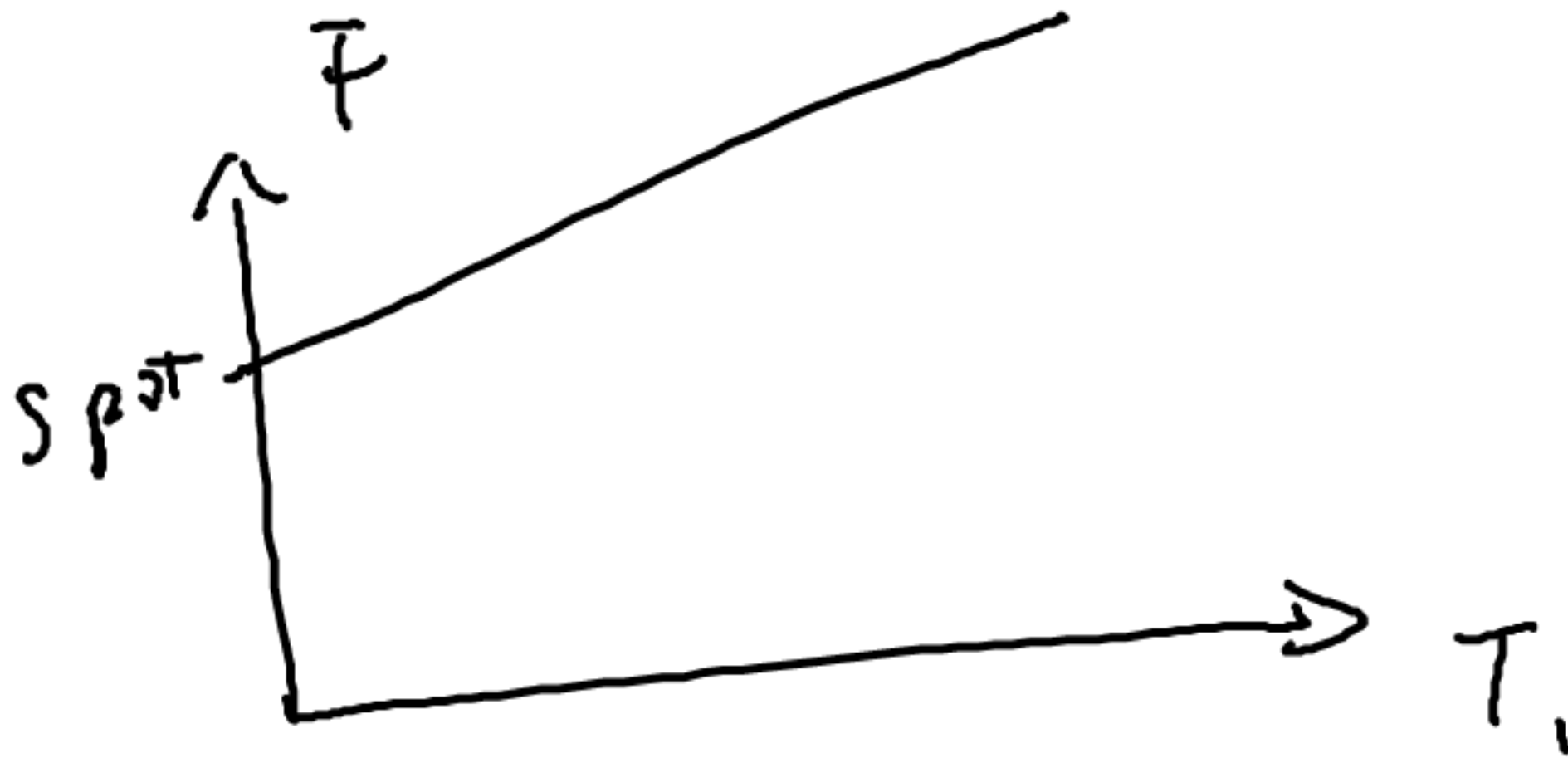
$S = \text{spot rate}.$

Currency Forward Curves,

- I. $R_f > R_d \Rightarrow$ Forward lower than the Spot.
down sloping \Rightarrow positive carry.



- II. $R_f < R_d \Rightarrow$ Forward higher than the Spot.
upward sloping \Rightarrow negative carry.



Tailing strategy to hedge FRA

$$R_0 - R_n - \sum_1^n (R_i - R_{i-1})^2 (n-1) \Delta t$$

Convexity in ED future.

Long Future / Short Forward = short convexity

Short Future / Long Forward = long convexity

$$R^{\text{Forward}} < R^{\text{Future}}$$

$$R^{\text{Forward}} = R^{\text{future}} - \frac{1}{2} \sigma^2 T^2$$

100

99

- 1. OM.
- 2. + ext + book.
- 3. $F = PV(S + DI)$.

$$F = FV(\underbrace{RT}_{\text{RT}} - \underbrace{Rt}_{\text{Rt}} \text{idi} \underbrace{PV: DIV}_{\text{PV: DIV}})$$

10 000.

Unit, $\text{Buy } \$4.50 * 10\# : / .1000.$ MTM.

Unit,		MTM.
4.50		
4.55	+0.05.	
4.53.	-0.02	
4.45	-0.05.	

$$100 \xrightarrow{10\%} 101$$

$$\xrightarrow{2\%}$$

$$- 101 + 2 = 99$$

$$\sum 50(1 + \star)$$

John. Mall
 option 2 future
 & other. Senior Permutua
 Mon/Tues
 after 3pm
 1012
 CW