Homework 2 Review:

- Calculating open interest
  - Some of you just forgot to cross things out. Remember that if someone has 2 contracts *short* and 1 contract *long*, they have bought and sold one of the contracts, so they are **only** responsible for **1 short**. In the table:

	Long	Short
A	2	
B	~~1~~	~~2~~ 1
C		1
	2	2

  - In the problem, while D had *sold* 2 contracts, D only *bought* 1 contract, meaning they got profits from only **one** contract. Some of you calculated the gain from both contracts even though only **one** was reversed.

Intro to Synthetic Options

- In class, we saw that combining puts, calls, and futures can generate positions that act exactly like another type of derivative if they have the same *maturity date* and *strike price*. These are *synthetic positions*, and there is basically a cookbook for them:
  - Long call + short put = long futures
  - Long put + short call = short futures
- Graphing them, lets see how adding these together generates graphs of things we recognize.
- Why is there an incentive to create a synthetic derivative? **Arbitrage**. If there is no arbitrage, we expect the following to be true:

$$F_0 = K + C - P$$

  Where the right hand side is the cost of the synthetic derivative. Think about what would happen if the inequality went in either direction.

- **Put-Call Parity** is a way of accounting for the fact that one payment has to be made now (the premiums for the options $c - p$) while the other ($F_0 - K$) has to be made in the future. We account for this by noting that you could have earned interest, so it is *discounted* by e^{-rt}. So if we accounted for this it would be:

$$\begin{aligned} F_0 &= K + C - P && \\ F_0 - K &= C - P && \text{rearranged} \\ K - F_0 &= P - C && \text{multiplied by -1} \\ (K - F_0)e^{-rt} &= P - C && \text{adjusted for discounting} \end{aligned}$$

Practice Problem

Jared is breaking into the very lucrative Himalayan pink salt market on the Pakistani exchange PMEX.[1] Thanks to a hot tip, Jared thinks there is the potential to arbitrage using a synthetic future. Use the option quotes on futures in the following table to construct a synthetic long futures position using a call and a put with the same strike price of 685 cents/lb.

Strike price (cents/lb)	Call premium (cents/lb)	Put premium (cents/lb)
685	16.65	6.65
695	14.50	14.50
705	10.08	20.00

1. Which option should Jared be long on and which one should he be short on?
2. Fill in the profits/losses of the call and put for given futures prices F_T at expiration.

	Call	Put
$F_T > 685$		
$F_T < 685$		

3. Fill in the combined profits/losses of the synthetic long futures position for given futures prices.

	Synthetic Short Futures
$F_T > 685$	
$F_T < 685$	

4. Graph the profit diagram of the synthetic long futures position and indicate the synthetic futures price.

5. Consider a futures contract with price $F_0 = 694$ while the interest rate is $r = .05$ and six months from maturity, or $T = 6/12$; does this satisfy put-call parity? If not, at what futures price would put-call parity hold?

[1] This is a real product which people (falsely) claim has extraordinary health benefits. So far, the only scientific consensus on the difference between this and regular salt is that it is, in fact, pink.