Problem Set 5

 # 1: Suppose you enter into a short position on 10 CME gold futures contracts. (contract size: 100 ounces). Suppose the initial margin requirement is $4000 per contract and the maintenance margin is $3400 per contract. Track the balance in your margin account on the first 5 days you hold this position if the futures prices on these days are

$$
\begin{aligned}
K_T(t_1) &= \$1230/\text{ounce} \\
K_T(t_2) &= \$1234/\text{ounce} \\
K_T(t_3) &= \$1242/\text{ounce} \\
K_T(t_4) &= \$1238/\text{ounce} \\
K_T(t_5) &= \$1245/\text{ounce}
\end{aligned}
$$

 # 2: Suppose you manage an oil and gas partnership that produces roughly 50,000 barrels of crude oil per month. With high oil prices at $75/barrel, you want to protect your profits from price risk 3 months out. Explain how to do this using NYMEX crude oil futures contracts, with a contract size of 1000 barrels. Suppose you decide to take on a unitary hedge, and suppose 3 months later the oil price has dropped to $60/barrel. How effective has your hedge been? Answer this question under 2 different scenarios: 1) the cost of carry $c = 0$; 2) the futures basis decreases from $2/barrel when you enter the contract to $1.20/barrel.

 # 3: Suppose you own an import/export company, and you have a bill to pay in 4 months of GBP 14,000,000. Are you long or short GBP? Now suppose the current exchange rate is $1.30/pound, and suppose you want protection from price risk, but have decided you want to leave some exposure to GBP because you expect the exchange rate to move in your favor. So you decide to only cover 50% of your cash position with futures hedges. What position would you take using CME British pound futures (contract size 62,500 pounds available for delivery for every month for the next 6, and suppose the futures price is $1.28/pound). What is the P&L of your total, hedged, position if in 3 months the basis is -$0.01/pound and GBP is trading at $1.25/pound? What if it is $1.35/pound in 3 months, also with a -$0.01 basis? In either case, compare the outcome with what would happen if no futures hedging had been done.

 # 4: Suppose you are a speculator and you want to short oil, because you are expecting a big price drop over the next 6 months. Suppose you want to short 20,000 barrels of crude oil using futures contracts. How would you do this using NYMEX oil futures contracts? If the initial margin requirement is $4000 per contract, what is your initial investment? What has happened to your investment if the futures price, when you enter into the futures position, is $60/barrel, and 3 months later it is $54/barrel? What if it is then at $68/barrel?

 # 5: (a) If the current interest rate paid for a 3 year CD is 3.5% and for a 6 year CD is 5.5% what forward interest rate can be locked in today for a 3 year CD starting in 3 years?
(b) If now the forward rate for a 2 year CD starting in 6 years is 9% what is the rate for an 8 year CD starting today.

 # 6: Suppose you have sold 100 Eurodollar futures contracts. What happens in your margin acount in 1 day if today Eurodollar futures contracts are trading for $98.50 and tomorrow they are trading for $97.70.

 # 7: Suppose you are an investment manager managing a loan portolio that earns 6 month LIBOR on a loan notional value of $40,000,000. Expecting interest rates to drop, you want to convert these floating rate payments to a fixed rate for the next 2 years. Suppose the term structure of semiannual discount factors for the next 2 years are

$$
\begin{aligned}
d(0.5) &= 0.99 \\
d(1.0) &= 0.979 \\
d(1.5) &= 0.966 \\
d(2.0) &= 0.953
\end{aligned}
$$

What swap position will implement your desired protection? What fair swap rate can you expect to contract?

 # 8: Fill in the details of the LIBOR curve construction process that was outlined in lecture.

 # 9: (a) Construct a LIBOR curve using the following money market data

Type	Tenor	Rate/Price
Deposits	1W	2.0
	1M	2.2
	2M	2.27
	3M	2.36
Futures	6M	97.4
	9M	97.0
Swaps	1Y	3.0
	2Y	3.6
	3Y	3.95
	4Y	4.2

(b) Use the curve you built in part (a) to price a 2 year semiannual coupon bond with a $10,000 face value paying a 7% coupon.