

#### Homework 4

1. Consider an ARM 1/1, 30-year amortization, \$75,000 mortgage, Indexed to the 1-year constant maturity Treasury with a 3 percent margin, and 2-6 caps (2 percent annually, 6 percent lifetime). The initial interest rate is 5.75 percent. This is a monthly payment mortgage. Assume no prepayment. Answer the following questions with the assistance of Excel:

1) What is the first monthly payment on this mortgage?

\$437.68

2) What is the balance due at the end of the first year?

\$74,035.18

3) Suppose the 1-year T-Bill is at 5.84 percent at the index date. What is the new contract interest rate on this mortgage for the second year?

7.75%

4) What is the required monthly payment during the second year?

\$535.09

5) What is the interest rate in the third year if the T-Bill rate stays at 5.84 percent at the next adjustment date?

8.875%

6) What is the required monthly payment during the third year?

\$592.10

2. For a mortgage pass-through, suppose average loan size is \$100,000, 10 loans in pool, 10-year term for loans, 10.00% interest rate on loans in pool, 40 pass-through securities, 0% prepayment rate (CPR), and a 10% discount rate. Assume no service and guarantee fees. Assume no delay to pass the payment. Instead of monthly payments, assume mortgages in the pool require annual payments. Use Excel to answer the following questions:

1) What is the current value of each pass-through security under these inputs?

\$25,000

2) What happens to the current value of each pass-through if CPR is 10% per year?

\$25,000 as well

3) What is average life of the second pass-through? (The one with new CPR)

4.6 years.

3. The following is the contract specification for the silver futures.

- Initial margin: \$1,800 per contract (in this case, margin requirement is not a ratio)
- Maintenance margin: \$1,400 per contract (in this case, margin requirement is not a ratio)
- Contract size: 500 ounces.

An investor longs three silver futures contracts on day 0 at the closing price (settlement price). Table 1 shows the closing futures prices between Days 0 and 4.

Table 1: Daily closing price for the futures contract

Day 0	Day 1	Day 2	Day 3	Day 4
\$90.00	\$89.50	\$89.00	\$89.00	\$89.80

Calculate the investor's margin account balances for Days 0, 1, 2, 3 and 4. (Suppose when there is a margin call, only deposit the minimum money required).

Time	Daily closing price per ounce for futures contract	Balance before Margin Call	Margin Call	Balance after Margin Call
0	\$90.00	\$0	$\$1,800 * 3 = \$5,400$	<b>\$5,400</b>
1	\$89.50	$\$5,400 - (\$0.50) * (500) * (3) = \$4,650$	\$0.00	<b>\$4,650</b>
2	\$89.00	$\$4,560 - (\$0.50) * (500) * (3) = \$3,900$	\$300	<b>\$4,200</b>
3	\$89.00	$\$4,200 - \$0 = \$4,200$	\$0.00	<b>\$4,200</b>
4	\$89.80	$\$4,200 + (\$0.80) * (500) * (3) = \$5,400$	\$0.00	<b>\$5,400</b>

4. Futures price of a S&P500 stock index futures contract is  $\$250 * \text{S\&P500 index points}$  (quoted by CME, not the spot index). A trader who buys 10 such a contract at a level of 1000 and who later sells at 1050 points will receive a net cash payment of  $10 * 50 * 250 = \$125,000$ . Answer the following questions:

1) Use technical indicators and market information to predict how spot S&P500 index is going to change in the next week. (From Thursday April 22 to next Tuesday April 29) (No need to write a long explanation, just simple analysis). Should CME's future index quotes have the same changing direction? Explain

The index should go up, (based on some technical indicators)

The CME's Future index quotes should move in the same direction as the current index changes. (based on the future pricing formula)

2) If you believe your prediction is correct, should you long or short such an index futures contract on April 22 to speculate? Explain

Give credits anyway

3) Suppose you decide to long (or short, depends on your prediction) 10 index futures contract with maturity of Jun08 on April 22 and keep the same position until April 29 (you will close whatever position you have on April 29). Based on each day's settlement price quoted by CME (From:

[http://www.cme.com/trading/dta/del/delayed\\_quote.html?ProductSymbol=SP&ProductFoiType=FUT&ProductVenue=R&ProductType=idx](http://www.cme.com/trading/dta/del/delayed_quote.html?ProductSymbol=SP&ProductFoiType=FUT&ProductVenue=R&ProductType=idx))

see whether they calculate the future profit correct.