Professor Robert Shiller

Econ 252 - Financial Markets

Spring 2011

Professor Robert Shiller

Problem Set 5

Question 1

Assume that futures on 50 bushels of wheat have an initial margin requirement of $12 per contract and a maintenance margin requirement of $7 per contract.

Consider a buyer and seller of 100 contracts for wheat futures initiated in period 0 and settled in period 4.

The settlement prices of wheat futures expiring in period 4 evolve as follows:

Period	Price
0	$130
1	$126
2	$120
3	$128
4	$131

(a) Assume no party withdraws margin from their account. Describe the evolution of the margin account for each party.

QUESTION 1 CONTINUES ON THE NEXT PAGE.

Professor Robert Shiller

CONTINUATION OF QUESTION 1.

(b) Assume that each party always removes any margin above the initial margin in each period and describe the evolution of the margin accounts for each party under this assumption.

(c) What must be the price of 50 bushels of wheat in period 4?

Professor Robert Shiller

Question 2

Consider a futures contract for asset X maturing in one year.

Assume that asset X has a spot price of $50 and that it pays a dividend of 2% (to be distributed a year from now) of the spot price today. Also, assume that the annual risk-free interest rate is 3%.

(a) What is the fair value of the futures contract in the context of the no-arbitrage principle?

(b) Suppose that the futures price in the market is $3 more than the price found in part (a). Describe an investment strategy that profits from this arbitrage opportunity. State explicitly what an investor would have to do today and one year from now.

(c) Suppose the futures price in the market is $3 less than the price found in part (a). Describe an investment strategy that profits from this arbitrage opportunity. State explicitly what an investor would have to do today and one year from now.

Now, instead of the risk-free interest rate of 3%, assume that the risk-free interest rate for lending is 2% and that the risk-free interest rate for borrowing is 4%.

(d) If an investor is only allowed to lend money and not borrow, what range of futures prices prevents this investor from making an arbitrage profit?

(e) If an investor is only allowed to borrow money and not lend, what range of futures prices prevents this investor from making an arbitrage profit?

(f) Combine (d) and (e) to find the range of potential futures prices, which are consistent with a lack of arbitrage opportunities in the market.

Professor Robert Shiller

Question 3

Assume that a bank holds the following assets:

- $100 million in U.S. Treasury securities,
- $50 million in municipal general obligation bonds,
- $500 million in residential mortgages,
- $300 million in commercial loans and commercial mortgages.

Consider the risk-weights from Table 3-3 on page 50 in the textbook by Fabozzi et al.

Assume that the capital requirement is 10% of the total risk-weighted capital.

(The capital requirements in Basel III are more complicated than those in this question. However, they are in the spirit of the simplified assumptions from this question.)

(a) What is the risk-weighted value of the bank's assets?

(b) How much capital must the bank hold to be in compliance with the capital requirement?

(c) Suppose that the bank is holding just enough capital to meet its capital requirements. If the bank wants to add $100 million in municipal general obligation bonds and $200 million in residential mortgages to its balance sheet, what is the smallest amount of capital it must raise to be in compliance with the simplified capital requirement?

QUESTION 3 CONTINUES ON THE NEXT PAGE.

Professor Robert Shiller

CONTINUATION OF QUESTION 3.

(d) Revert back to the initial asset amounts and suppose, again, that the bank is holding just enough capital to meet its capital requirements. Now, consider a situation in which $50 million in residential mortgage loans default and the bank recovers no money from them. What is the smallest amount of additional capital that the bank must raise in order to be in compliance with the simplified capital requirement?

(e) Suppose that the defaults in part (d) come from commercial loans instead of residential mortgages. What is the smallest amount of additional capital that the bank must raise in order to be in compliance with the simplified capital requirement?