Test bank

to accompany the textbook

Fixed Income Securities: Valuation, Risk, and Risk Management by Pietro Veronesi

Preliminary Version

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Chapter 1

1. Is the following an arbitrage opportunity? A gift that makes me feel good just by having it.

Ans. This is an arbitrage opportunity because it doesn't cost anything at initiation and it generates a positive profit by a certain date in the future (i.e. 'you feel good').

2. Is the following an arbitrage opportunity? A bond that cost nothing but will payoff zero with certainty in the future.

Ans. This is not an arbitrage opportunity, since it doesn't give a positive payoff in the future.

3. Is the following an arbitrage opportunity? A free car that if I repair well, I won't have to spend money on gasoline or maintenance costs (i.e. repairs) ever.

Ans. This is not an arbitrage opportunity, since I have to pay money (to repair the car) in order to be free of future costs.

4. Is the following an arbitrage opportunity? Suppose you are in the desert and are given a bag of ice with a penny inside. Assume that the ice will melt instantly and the cost of disposing of the bag is zero.

Ans. This is an arbitrage opportunity because even though I can't take advantage of the ice, I gain the penny for free.

5. Is the following an arbitrage opportunity? A security that cost zero and might pay a dollar in the future, but pays zero otherwise.

Ans. This is an arbitrage opportunity because I get for free the chance of getting a dollar in the future.

6. What steps would you follow in order to take advantage of the following arbitrage opportunity (if there is one)? Security A costs \$3 and pays \$5 in 2 years, while security B costs \$3 and pays \$4 in 2 years.

Ans. You borrow security B and sell it, which means you receive \$3, with these proceeds you buy security A. In 2 years you receive \$5 and have to pay \$4. You make a \$1 profit.

7. What steps would you follow in order to take advantage of the following arbitrage opportunity (if there is one)? Security A costs \$100 and pays \$120 in 3 years. Security B costs \$100 and pays \$110 in one year. Your friend tells you that he would like you to lend him \$110 in a year and that he would give \$130 the following year. Finally you know that in two years, with \$130, you can invest in a security that will pay you either \$140 or \$121 (with equal probability) after a year.

Ans. You borrow security A and sell it, with the proceeds you buy security B. After a year you lend the money to your friend. The next year when he pays back, you invest in the risky security. After the third year, this will give you either \$140 or \$121, while you have to pay \$120. So you either have a profit of \$20 or \$1.

8. What steps would you follow in order to take advantage of the following arbitrage opportunity (if there is one)? Security A costs \$100 and pays \$110 in 2 years. Security B costs \$100 and pays \$109 in one year. You know that in a year with \$109 you can invest in a security that pays \$120 or \$109 (with equal probability) the following year.

Ans. This is not an arbitrage opportunity.

9. Intuitively, is the Federal Funds rate generally higher, lower or the same as LIBOR? Why?

Ans. The LIBOR rate should be higher than the Federal Funds rate, since it should include a higher probability of default by the banks trading LIBOR.

10. Intuitively, is LIBOR generally higher, lower or the same as the repo rate? Why?

Ans. LIBOR should be higher than the repo rate since it is not collateralized with another security, as it occurs with the repo rate.

11. What are the steps to take a long position on a given U.S. security via the repo market?

Ans. The trader must take the following steps (repo):

At time t:

i. Buy bond at P_t and deliver the bond to the repo dealer.

ii. The repo dealer will pay P_t- haircut to the trader, which is made whole (minus the haircut) for the cost of the bond.

At time T:

iii. The trader gets the bond from the repo dealer and sells it for P_T.

iv. With the proceeds P_T the trader pays back $(P_t-\text{haircut}) \times (1+\text{Repo})$ to the repo dealer.

12. What are the steps to take a short position on a given U.S. security via the repo market?

Ans. The trader must take the following steps (reverse repo):

At time t:

i. Borrows the bond from the repo dealer and sells it at P_t.

ii. Receives P_t which he posts as collateral with the repo dealer.

At time T:

iii. The trader buys the bond for P_T and gives it back to the repo dealer.

iv. The repo dealer pays $P_t \times$ (1+Repo). The dealer makes a profit if this is larger than P_T.

13. What's the return on capital for a trader who entered into a one-month repo where $P_t = 98.5$, $P_T = 99.01$, Repo= 5% and haircut= 0.8?

Ans. The return on capital is 0.13.

14. What's the profit for a trader who entered into a one-week reverse repo where $P_t = 99.40$, $P_T = 99.48$ and Repo= 6%?

Ans. The profit is 0.0347.

15. You find a bond that has a repo rate substantially lower than the GCR. Is this, for certain, an arbitrage opportunity?

Ans. No, it might be that the bond is short on supply (hard to find), which means that the trader might be thinking that the bond is overpriced and is speculating that the price will fall. By entering in a reverse repo, the trader might make a substantial profit, even willing to forgo part of the rate to be in the transaction.

16. You are told that there is an ample supply for the bond mentioned in question 13. Does this affect your previous answer?

Ans. Yes, since it shows that the lower rate is not due to scarcity of a specific type of bond.

17. What are the gains from trade of entering into a swap for these two firms?

	Firm A	Firm B
Fixed Rate	13%	16%
Floating Rate	LIBOR + 3%	LIBOR + 6%

Ans. Gains from trade are zero.

18. What are the gains from trade of entering into a swap for these two firms?

	Firm A	Firm B
Fixed Rate	10%	15.5%
Floating Rate	LIBOR + 2%	LIBOR + 4%

Ans. Gains from trade are 3.5%.

19. What are the gains from trade of entering into a swap for these two firms?

	Firm A	Firm B
Fixed Rate	9%	5%
Floating Rate	LIBOR + 7%	LIBOR + 4%

Ans. Gains from trade are 1%.

Chapter 2

1. Do discount factors depend on compounding frequency? Why?

Ans. No, discount factors do not depend on compounding frequency, since they are terms of exchange (prices) between having money at time t versus having at a later date T. If they changed with compounding frequency, there would be an arbitrage opportunity.

2. What effect does inflation have on discount factors?

Ans. Higher inflation makes less appealing money in the future, so discount factors will go down.

3. Can a bond be quoted in more than one interest rate?

Ans. Yes. It can be quoted in various compounding frequencies.

4. From the following data obtain the discount curve:

   a. A zero coupon bond $P_z(0, 0.5) = 99.20$.

   b. A coupon bond paying 3% quarterly $P(0, 0.25) = 100.5485$.

   c. A coupon bond paying 6% quarterly $P(0, 0.75) = 100.1655$.

   d. A coupon bond paying 5% semiannually $P(0, 1) = 103.0325$.

Ans. The discount factors are the following:

t	$Z(0,t)$
0.25	0.9980
0.50	0.9920
0.75	0.9870
1.00	0.9810

5. Using the previous discount curve price the following: A zero coupon bond expiring at $t = 0.75$.

Ans. The price of the bond is 98.70.

6. Using the previous discount curve price the following: A 1-year coupon bond paying 4% quarterly.

Ans. The price of the bond is 102.0580.

7. Using the previous discount curve price the following: A 6-month coupon bond paying 7% semiannually.

Ans. The price of the bond is 102.6720.

8. Using the previous discount curve price the following: A 9-month coupon bond paying 5% semiannually.

Ans. The price of the bond is 103.6625.

9. For the following scenario, check if there is a mispriced security:

   a. A zero coupon bond $P_z(0, 0.5) = 99.00$.
   b. A coupon bond paying 6% quarterly $P(0, 0.25) = 101.1955$.
   c. A coupon bond paying 4% quarterly $P(0, 0.50) = 102.0830$.
   d. A coupon bond paying 7% semiannually $P(0, 0.75) = 105.8440$.

Ans. The mispriced bond is [a.] the zero coupon bond.

10. For the following scenario, check if there is a mispriced security:

    a. A zero coupon bond $P_z(0, 0.25) = 99.40$.
    b. A zero coupon bond $P_z(0, 0.50) = 98.00$.
    c. A coupon bond paying 3% quarterly $P(0, 0.50) = 100.4880$.

Ans. The mispriced security is [b.].

11. For the following scenario, check if there is a mispriced security:

    a. A coupon bond paying 1% quarterly $P(0, 0.25) = 100.6498$.
    b. A coupon bond paying 4% semiannually $P(0, 0.25) = 101.8980$.
    c. A coupon bond paying 3% quarterly $P(0, 0.50) = 101.2978$.
    d. A coupon bond paying 5% quarterly $P(0, 0.75) = 103.4425$.
    e. A coupon bond paying 4% semiannually $P(0, 1.00) = 103.5880$.

Ans. The mispriced bond is [a.].

12. For the following scenario, check if there is a mispriced security:

    a. A zero coupon bond $P_z(0, 0.5) = 99.50$.
    b. A coupon bond paying 3% quarterly $P(0, 0.50) = 100.9948$.
    c. A coupon bond paying 5% quarterly $P(0, 0.75) = 102.7288$.
    d. A coupon bond paying 2% semiannually $P(0, 1.25) = 102.8720$.
    e. A zero coupon bond $P_z(0, 1.25) = 98.4$.

Ans. The mispriced bond is [d.].

13. For the following scenario, check if there is a mispriced security:

    a. A zero coupon bond $P_z(0, 0.25) = 99.30$.
    b. A zero coupon bond $P_z(0, 0.50) = 98.70$.
    c. A coupon bond paying 3% semiannually $P(0, 0.50) = 100.1850$.
    d. A coupon bond paying 2% semiannually $P(0, 0.75) = 101.4880$.

Ans. The mispriced bond is [d.], since it requires the discount factor $Z(0, 0.75)$ to be larger than the previous ones.

14. What is the price on a 4.5-year floating rate bond that pays a semiannual coupon (no spread)?

Ans. The price of the coupon is 100.

15. What is the price on a 5.75-year floating rate bond that pays a semiannual coupon (no spread)? We know the following:

    a. There is a coupon bond paying 3% quarterly $P(0, 0.25) = 100.0448$.

    b. Last quarter the semiannually compounded rate was 3%.

Ans. The price of the floating rate bond is 100.7895.

16. What is the price of a 0.5-year floating rate bond that pays a quarterly coupon equal to floating rate plus a 1% spread? We know the following:

    a. There is a zero coupon bond $P_z(0, 0.25) = 99.80$.

    b. There is a coupon bond paying 2% quarterly $P(0, 0.5) = 100.3960$.

Ans. The price of the floating rate bond is 100.4980.

17. What is the price of a 0.75-year floating rate bond that pays a semiannual coupon equal to floating rate plus 2% spread? We know the following:

    a. There is a zero coupon bond $P_z(0, 0.25) = 99.70$.

    b. There is a zero coupon bond $P_z(0, 0.50) = 99.20$.

    c. There is a coupon bond paying 3% quarterly $P(0, 0.75) = 101.7380$.

Ans. The price is 102.3145.

18. You have two coupon bonds with same maturity, one pays 5% semiannually and the other 5% quarterly. Which one has a higher yield?

Ans. The second bond has a higher yield because it compounds more frequently than the first one, increasing the expected return.

19. A Treasury dealer quotes the following 182-day bill at a 3.956% discount. What is the price of the security?

Ans. The price of the Treasury is 98.00.

20. A Treasury dealer quotes the following 91-day bill at a 3.956% discount. What is the price of the security?

Ans. The price of the Treasury is 99.00.