

Problem Set 2: Bond Markets

Question 1

You have just purchased \$10 million par amount of the 2yr, and \$8 million par amount of the 30yr US Treasury bonds shown below, at the prices shown. (Assume all bonds are semi-annual compounding.)

Par Amt \$millions	Bond Maturity Coupon	Bond Price	Yield	\$Duration (= DV01)
10.00	2yr	109.88	1.00%	1.80
	10yr	129.65	2.50%	7.50
8.00	30yr	146.94	3.50%	13.00

- (i) Calculate the market values of the 2yr and 30yr bonds you purchased.
- (ii) Calculate the “DV01 risk” for both of the bonds that you purchased. DV01 risk, for a given bond, is the dollar amount that you would make/lose if the bond’s yield moved by 1% instantaneously.
- (iii) What par amount do you need to buy or sell of the 10yr US Treasury bond, so that the DV01 risk of the entire portfolio is negligible? (Negligible in this context means “less than \$100 of DV01 risk over the entire portfolio”.) You must calculate the par amount of the 10yr bond to the 3rd decimal place (i.e., to the nearest thousand dollars).
- (iv) What are the coupons on the three bonds?
- (v) Here are the convexity values for the 3 bonds:

2yr convexity = 0.02; 10yr convexity = 0.50; 30yr convexity = 2.30.

Using Duration and Convexity, estimate the change in market value of the portfolio to the nearest \$1000 if all interest rates increase by 50bp.

- (iv) Given that your portfolio is duration neutral (i.e., the *estimated* change in value of the portfolio, for small parallel shifts in rates, is supposed to be zero), why do you, in fact, *make* money when the curve moves parallel?

Question 2

- (i) Suppose you have a view that the yield curve will *steepen* over the next few months. You plan to purchase one bond, and *short* sell another bond, so that you will make money if you are right about this view. The two bonds that will be in your portfolio are 2yr US Treasury bonds, and 30 yr US Treasury bonds. Which of these two bonds will you *buy*, and which will you *sell short*, given your view about the likely yield curve movements over the next few months?
- (ii) The 2yr bond has a DV01 of 1.8. The 30yr bond has a DV01 of 13. You would like your portfolio to be neutral to small parallel yield curve shifts (i.e., both bonds’ yields moving by the same amount in the same direction). That is, you would like your portfolio neither to *make* money nor *lose* money if the yield curve shifts parallel by a few basis points. For the 30yr bond, your position (either long or short, based on your answer to part (i)) will be \$5 million par amount. What par amount (to the nearest \$10,000) of the 2yr bond should you have in your portfolio so that you will be neutral to small parallel yield curve shifts? Answer this question using duration alone, without considering any convexity differences between the two bonds.

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(iii) Now bear in mind that these two bonds have very different convexities. Right after you created your portfolio as determined by parts (i) and (ii) above, the yield on both the 2yr bond and the 30yr bond *decrease* by 20bp that same day. Will your portfolio's value in fact remain the same? If not, do you anticipate that you will *make* money or *lose* money following these yield changes? You should answer this part of the question by including convexity, assuming that the 2 yr bond has a convexity of 0.02, while the 30 year's convexity is 2.3.

(iv) Again taking convexity into account, will your portfolio make or lose money if both bonds' yields *increase* by 20bp that same day?

Question 3

Qintex Ltd. has issued a prospectus for their forthcoming bond issue. The Qintex bonds have a 16% coupon (semi-annual) and mature in 10 years. The CFO of Qintex is fully aware that his company's reputation in the debt market leaves a lot to be desired. He is not, however, worried about attracting buyers. "Over a ten-year horizon, the market-determined yield for high-risk companies, like ourselves, is only 12%" he tells you. "Hence, by paying a coupon of 16% per annum, investors will find our bonds very attractive." He continues "One of our major competitors, who is of similar risk to ourselves, is selling 10-year bonds and are offering a coupon of only 10%. Investors would be crazy to buy their bonds rather than ours."

(i) Evaluate the merit of the managing director's argument. Does the fact that the coupon rate (16%) exceeds the market-determined yield (12%) make the bonds particularly attractive to investors? Do you think investors will favor Qintex's bonds over the competitor's because they offer a higher coupon? No calculations are necessary to answer this question; however, you need to be very clear about your reasons for why investors would or wouldn't disagree with the Qintex CFO's comments.

(ii) Calculate the market price at which the 10-year Qintex bonds will sell.

(iii) Calculate the market price at which the major competitor's bonds will sell.

(iv) Which bond's price is more sensitive to changes in yield on a *percentage* basis?