

Assignment 2: Answers

(October 8, 1998)

1. This one's up to you.
2. Two approaches to duration, one based on spot rates, the other on yield-to-maturity.

- (a) Use the spot rates to compute discount factors, and the discount factors to value the individual cash flows. The price is the sum of these values (118.572). The yield-to-maturity is 5.113.
- (b) The standard definition of (modified) duration is the weighted average life of the cash flows, with weights based on the the values of payments discounted by the yield. Eg, the third weight is

$$w_3 = \frac{7.5/(1 + .05113/2)^3}{118.572} = 0.06325,$$

which is clearly different from above. Duration computed with these weights is 1.773 years.

- (c) Now we attack this the other way, using spot rates. Think of the bond as a portfolio of zeros, each valued using spot rates (discount factors). The values of the components are 7.317, 7.001, 6.864, and 97.390, so the third weight is

$$w_3 = \frac{7.5/(1 + .06000/2)^3}{118.572} = \frac{6.864}{118.572} = 0.05789.$$

We compute the durations of the components in the usual way for zeros, giving us durations of 0.488, 0.966, 1.456, and 1.951. (Each is the maturity of the payment multiplied by $(1 + y/2)^{-1}$.) The weighted average of the durations is 1.774.

- (d) There isn't much difference here (it would be more if there were more slope in the spot rate curve and the maturity was longer), but what difference there is comes from the weights. Part (b) uses the yield to compute weights. Part (c) uses spot rates. The latter is more sensible, but you can see that it often makes little difference. The advantage of former is that you can compute it without knowing the complete spot rate curve.

3. Interest sensitivity of the Mexican Global.

- (a) DV01 is 0.0666, duration is 7.244 years.

- (b) The answer to the latter is duration: 7.244%. The answer to the former is $7.244\% \times \$92.044$ (the invoice price), or \$6.66. Alternatively, you can compute this by multiplying the DV01 by 100. Both are approximate, but the approximation is pretty good for a change of this size.
- (c) This is standard for a coupon bond. The effects are larger, though, because of the high yield and coupon: the coupons have greater weight, since they're large and we discount the principal at a high rate. Also important is the relation between these yields and treasuries, which we will touch on later in the course. When treasury yields rise, yields on emerging market debt tend to rise more, giving these instruments greater interest sensitivity than treasuries for a given duration.