**Factors Affecting Interest Rate Risk**

We all know that if interest rates go up, the value of a bond goes down, and if interest rates go down, the value of a bond goes up. This is the first rule of bonds. An important question though, is *how much* does a bond’s value change for a given change in interest rates? This is what interest rate risk measures.

Three attributes of a bond affect its price-sensitivity to a change in the discount rate:

1. Maturity
2. Coupon Rate
3. Yield to Maturity

Maturity is the most intuitive of the three. If interest rates go up, this means that new bonds are being issued at a higher coupon rate than existing bonds. This makes the existing bonds less attractive – they are now paying interest at a below-market rate. If you want to sell one of these old bonds, you have to discount the price in order to induce someone to buy it. You have to discount the price far enough to equate the yield on the old bond with the yield on the new ones. Since the old bond is offering what is now a below-market coupon rate, the longer the bond owner is “stuck” with that lousy rate, the less desirable the bond is, and the more the owner must discount the price.

Example: If new bonds are being issued at 8%, and you hold two older bonds that are each paying 6%, one that matures in 5 years, and one that matures in 20 years, the one that matures in 20 years is less desirable, because it forces you to accept a below-market coupon rate for a longer period of time.

If each bond was selling at par prior to the increase in interest rates, the 5-year bond will now have a price of 91.89 while the 20-year bond will drop to 80.21.

5-year 6% coupon bond with an 8% BEY:



20-year 6% coupon bond with an 8% BEY:



Lower Coupon Bonds are more price-sensitive than Higher Coupon Bonds. This is because a greater percentage of their total cash payments are received further in the future (at maturity), so the change in rates has a longer time to affect them. Zero-coupon-bonds have the greatest price-sensitivity of any group of bonds with a given maturity and yield.

Coupon payments can be reinvested at the new interest rate when received (positive reinvestment risk), so if you get more of your money in coupon payments, you are less affected by interest rate changes.

**Example Proving the Point:**

Consider two bonds, each with 10 years till maturity, and each priced to yield 10% with interest rates at 10%. The only difference in the two bonds is that the first one has a 10% coupon rate while the second one has a 16% coupon rate.

The first one is, of course, priced at 100 (10% coupon rate and 10% BEY).

The second has a 16% coupon rate is thus priced at 137.39. You pay a premium for the high coupon rate.



Assume that interest rates increase to 12%. Let’s see how this impacts the price of each bond.

10% coupon bond:



New Price = 88.53

This is a drop of 11.47% (from 100 to 88.53) in the bond’s value.

16% coupon bond:



New Price = 122.94

This is a drop of 10.52% in the bond’s value (from 137.39 to 122.94)

(137.39 – 122.94) = .1052 = 10.52%

137.39

So the bond with the lower coupon rate experienced a greater drop in value.

So far, we have seen that a bond’s price-sensitivity to a change in the discount rate is affected by two factors:

1. Maturity: An increase in maturity leads to an increase in price sensitivity.

2. Coupon Rate: A decrease in coupon rate leads to an increase in price sensitivity.

There is a third factor: The bond’s yield.

A 100 basis point change in the discount rate has a greater price-effect on a bond with a low yield than one with a high yield.

Example: A 6% 10-year bond with a YTM of 3% is priced at $125.75



If interest rates go up by 100 basis points (to 4%), the price drops to $116.35



This is a drop of $9.40 – a loss of 7.5% of the value of the bond.

Supose the same bond has a YTM of 9%. It’s price will be $80.49.



If interest rates go up by 100 basis points (to 10%), the price drops to $75.08



This is a drop in price of only $5.41 – a loss of 6.7% of the value of the bond.

The bond with the lower yield of 3% suffered a larger drop in price – both in dollars and percentage of value than the bond with the higher yield of 9%

Bonds with lower yields are more price-sensitive to changes in their yields than bonds with higher yields.

Bonds with lower yields have more interest rate risk.

Conclusion:

Bonds with more interest rate risk have:

1. Longer maturities
2. Lower coupon rates
3. Lower yields