Learning Outcome Statement

After completing this caselet, students and trainees should be able to explain how key rate durations (and dv01s) are calculated. In addition, they should be able to demonstrate that the key rate durations are an accurate reflection of a bond's effective duration.

Caselet# 17

Renowned Darla Moore School of Business graduate and bond analyst, Ms. Jane Gotzrox, calls to her intern.

“Sparky, many portfolio managers have asked us to show them exactly how key rate durations (and dv01s) are calculated. So, Sparky, I want you to build a key rate duration calculator in Excel. Here is how to go about it.”

“First, put the coupon and principal cash flows from a 6% coupon, 10-year Treasury in a column, with the payments labeled by payment number. Then, put a spot curve that is flat at 6% in another column. Discount the cash flows using the spot rates. We are assuming that the 10-year is brand new and we do not have to worry about day count conventions or accrued interest. Let’s pause there. Write down your predicted price for the bond. You’ve been at this long enough now that you’ll get it right.”

“Now that you have the basic set up, shift the spot curve parallel to itself by 50bp in yet another column. Using the original and new price calculate the dv01 of the 10-year. Using a little algebra and the definition of dv01, get the bond’s duration. Compare that duration to Excel’s duration function for a new 6% 10-year priced at par. If they differ, jot down a quick note as to why.”

“You along so far, Sparky? The easy stuff is over; now is the time to pay close attention. The next step is to shift 0-2yrs on the spot curve by 50bp and linearly interpolate between -50bp and 0bp between 2s and 5s. Then, calculate the new price of the 10-yr and record the partial dv01.”

“Do the same for shifting 5s and interpolating back to 2s and out to 10s and for shifting 5-10yrs. In all, you will have 3 partial dv01s. Compare the sum of your partial dv01s to the dv01 that you found from shifting the whole curve. Finally, explain the relative sizes of the partial dv01s and plot the three curve shifts versus their payment numbers. Can you explain why the curves cross where they do?”

“Once you have done your own partial dv01s, I want you to check your work with Yield Book Add-in. Build a flat user curve with 6% yields and a new 10-year note with a 6% coupon. Then, with the price/yield function find the partial dv01s for the 2yr, 5yr and
10yr points on the curve. Be sure to include your custom curve. How do they compare with your partial dv01s? How does their sum compare?"