slope calculations for rate of change of a bond position with respect to a change in the bond's internal rate of return. One chord slope assumes that

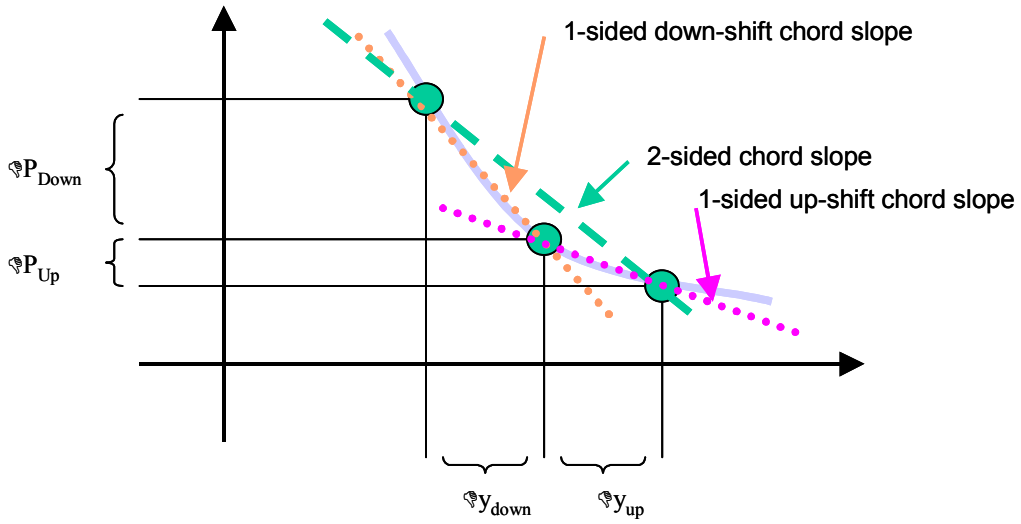

Figure 3.2 – 6. Two chord slopes for a bond position with respect to the underlying bond yield. Notice the ΔP_{up} is in reference to ΔY_{down}, and so is actually "down in P" etc.

If the "current" market condition (i.e. the current underlying bond yield) is represented by the centre point, then the (simple) chord slope calculations are:

$$ChordSlope_{Downside} = \frac{P_{Current} - P_{Down}}{Y_{Current} - Y_{Down}} \tag{3.2}$$

and

$$ChordSlope_{Upside} = \frac{P_{Up} - P_{Current}}{Y_{Up} - Y_{Current}} \tag{3.3}$$

and

$$ChordSlope_{Two-Side} = \frac{P_{Up} - P_{Down}}{Y_{Up} - Y_{Down}} \tag{3.4}$$

Notice that the order in which the data points are included is important. Though to some extent, it is question of convention, still consistent can be crucial. For example, convention dictates that profits are positive, and losses are negative, and getting this mixed up is "career limiting". Similarly with slopes, convention is crucial. This bond profile is "negatively sloping" since by convention up and to the right is positively sloping. Therefore, a first "sanity check" is to confirm that this formulation produces the "correct sign".

Yield	Value	Chord Slope	
6.90%	107.00		
		-0.70 DownSide	
7.00%	100.00		-0.60 Two sided
		-0.50 UpSide	
7.10%	95.00		

Table 3.2 – 1. Up-Side, Down-Side, and Two-Sided chord slope examples.

A chord slope is effectively a "summary" or "interval" measure, though it is taken to be correct at a given point. For example, each of the chord slopes above are taken to be "a measure" of slope only at the current market conditions ($Y_{Current}$), though they actually include information over the specific interval used by each "flavour" of chord slope.

Notice that none of the actual numerical values of the three chord slopes equals one another. Which is correct? They are all correct! However, they are all different flavours and cannot be compared directly to one anther (this is not exactly apples vs. oranges, more like granny smiths vs. golden delicious). For example, if you wanted to hedge this bond position by removing the slope implied market risk, then which slope would you use? See [1] for introductory discussion and calculations dealing with this issue, and see [4] or any of the product/asset class specific books, such as [4] for very detailed analysis and P&L impact to asses "optimal" trading strategies of such decisions.

3.2.2.2 Derivatives and Tangent Slope

Suppose that the horizontal distance between the two outer points in Figure 3.2 – 7 was gradually reduced. In the "limit", the chord slope becomes a special slope called a "tangent" slope. This is also equal to the "derivative of the function" or curve.

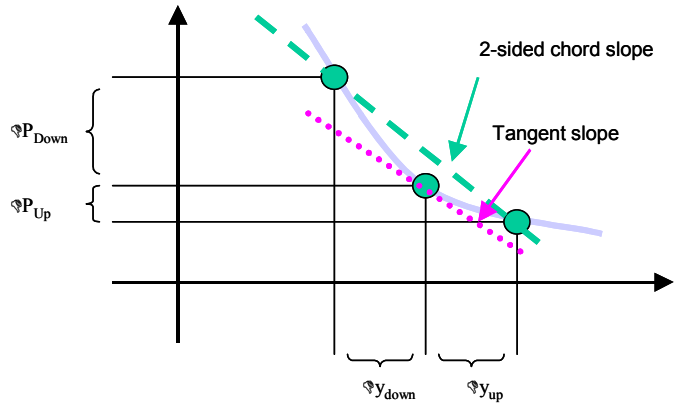

Figure 3.2 – 7. Chord slope vs. Tangent slope for a bond position with respect to the underlying bond yield. Notice the ΔP_{up} is in reference to ΔY_{down}, and so is actually "down in P" etc.

Notice that tangent slope may not equal any of the chord slopes, although in some cases it will. So while a chord slope is an interval slope taken at one point, tangent slope is an "instantaneous" slope taken at one point.

Chapter 3.5 introduces derivatives and further discussion of the derivation of tangent slopes and derivatives is deferred.