INVESTMENT FUNDAMENTALS

Bond duration.

Duration is a key measure of sensitivity in fixed-income investing. Whether it be a single bond or a whole portfolio, understanding duration allows investors to evaluate the potential value of an investment over time. But what is duration, how does it affect a bond portfolio, and why is it measured in years?

Duration was initially conceived as a measure of how long it takes an investor to be repaid a bond's price by its total cash flows.[1] This approach, known as Macaulay duration, initiated the convention of measuring this fixed-income attribute in years[2]. While duration is still quoted in years today, investors now think about duration in a slightly more complicated manner—as a measure of how sensitive a bond's price is to interest rate changes—most commonly in the form of modified duration. In short, it is a measure of interest-rate risk—the potential for changes in interest rates to impact an investment's price.

Recall that as interest rates rise, a bond's price (value) declines because new bond issues will offer a coupon to bondholders at the higher, more attractive interest rate. Conversely, as interest rates decline, existing bonds become more valuable as their income stream (coupon) is higher than the prevailing rate the market offers.[3]

So how does duration fit in? Investors holding a high duration bond need to wait longer for the bond's value to be repaid. But over a longer timeline, it is more likely that interest rates will rise, which means there is a higher likelihood that the bond's value will decline. This is why all things equal, a longer duration indicates greater sensitivity to changes in interest rates.

Duration and bond prices

The table below illustrates how bond duration affects the value (price) of a bond in different interest-rate environments. As a general rule, for every 1% increase or decrease in interest rates, a bond's price will change approximately 1% in the opposite direction for every year of duration. Therefore, the value of shorter-duration bonds (1 year) is much less sensitive to interest rate changes than bonds with longer durations (10 or 30 years).

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[1] Note however, that duration is distinct from a bond's *term to maturity*, which measures the length of time the investor receives interest payments (if any) from the bond issuer.

[2] In technical terms, Macaulay duration tells the weighted average time that a bond needs to be held so that the total present value of the cash flows received is equal to the current market price paid for the bond.

[3] For a refresh, see SEI's Investment Fundamentals: Bond Math.

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Exhibit 1: Duration and interest rate sensitivity

Bond Duration (in years)	+1% interest rates		-1% interest rates	
	% change in Bond Value	Bond Value	% change in Bond Value	Bond Value
1	-1%	$990	-1%	$1,010
5	-5%	$950	-5%	$1,050
10	-10%	$900	-10%	$1,100
30	-30%	$700	-30%	$1,300

Initial bond value of $1,000
For illustrative purposes only. Not specific to an SEI product or strategy.

Duration in investment portfolios

Duration is but another tool to help investors in constructing an investment portfolio. When considering a fixed-income investment, buyers should consider the interest-rate environment they are in, and where they expect it to go over the lifetime of their investment. If there is an expectation that interest rates will rise, the investor may be more attracted to a shorter-duration bond or bond fund as it will be less affected by rising rates. Conversely, an investor who is less sensitive to interest-rate movements, or expects interest rates to fall, may be more attracted to a longer-duration bond or bond fund.

One can also calculate the duration of a fixed income portfolio. Indeed, portfolio duration is computed as the weighted average of individual bond durations held in the portfolio. If a portfolio manager expects interest rates to change or if the portfolio's duration needs to be adjusted, he or she may need to adjust a portfolio's underlying holdings in order to reflect the target duration.

While duration is an effective analytical tool, it is not the only factor that affects the price of bonds or the value of a fixed-income portfolio. Investors must consider the breadth of characteristics of a bond or bond fund (credit risk, yield, liquidity, bond strategy) before determining whether the investment is consistent with their goals and risk tolerance.

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