

Empirical duration: a better way to compare interest rate sensitivity

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There's another way to calculate duration. Empirical duration considers historical prices, making it a better practical measure if interest rates change.

When interest rates go up, the price of bonds decreases, and when interest rates decline, the price of bonds increases — it's a fundamental principle of investing. This inverse relationship is more intense for some types of bonds, a price sensitivity referred to as **duration**. Duration is expressed in number of years, and the greater a bond's duration, the more sensitive it will be to changes in interest rates.

It seems straightforward enough. But there are different ways to calculate duration, and each method can reveal important information about various bond investments.

Analytical duration

How it works:

A set mathematical formula predicts, "If interest rates change by 100 basis points, the price of this bond will change by x."

What you should know:

Analytical duration looks at interest rates; it does not take any other factors into consideration when predicting the change in a bond's price.

Most useful for:

Getting a quick idea of a bond or product's sensitivity to interest rates.

VS.

Empirical duration

How it works:

This calculation looks back in time and uses historical data to show the price sensitivity of bonds in different scenarios.

What you should know:

Empirical duration takes several factors into consideration when predicting a bond's price sensitivity to interest rate changes, including how much credit risk the bond has.

Most useful for:

Comparing sensitivity to interest rate changes across sectors.

Analytical duration is most often used as the stated duration — it's what you see when you look at a mutual fund's fact sheet. It's driven by a formula that predicts, "If interest rates change by 100 basis points (or 1%), the price will change by X%." Calculated using inflexible math, it only considers one variable: interest rates.



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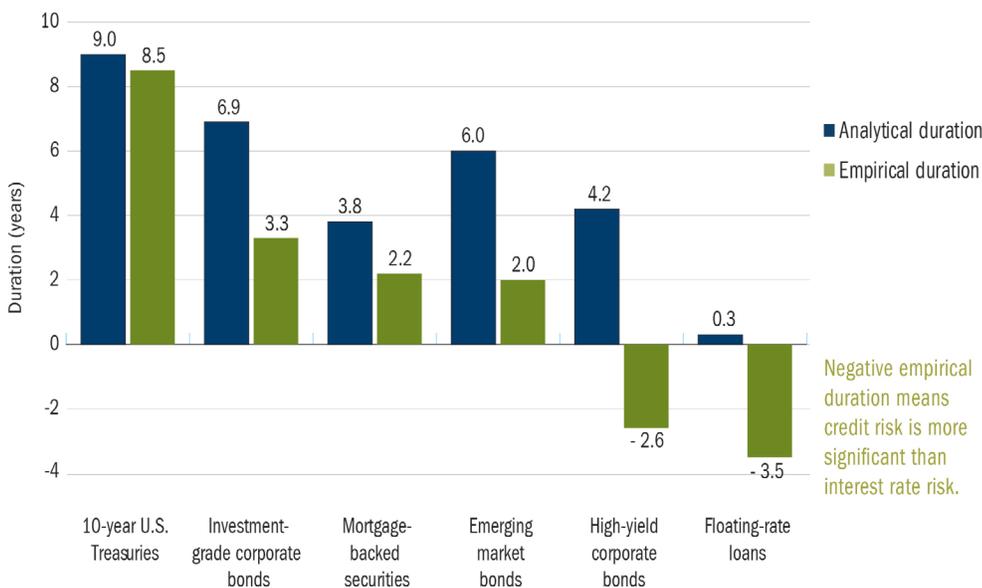
Analytical duration is also referred to as effective duration.

The principle behind analytical duration is correct, but it doesn't take the real life variables into account. The number of patrons at a restaurant is never the only thing influencing your wait time for a table — the availability of waiters, the speed of the chefs and if the patrons decide to get dessert all influence how long you wait. Interest rates aren't the only thing that influences the price of bonds. The economy, the financial health of companies and countries issuing bonds, and supply and demand dynamics all affect the price.

There's another way to measure a bond's sensitivity to changes in interest rates that helps to overcome these drawbacks: **empirical duration**, which uses real historical data to show what the price sensitivity of bonds has been in different interest rate scenarios. It serves as a better practical measure of what to expect if interest rates rise, and it can be used to compare interest rate sensitivity across fixed-income sectors.

As a general rule, empirical duration demonstrates that true interest rate sensitivity tends to fall for riskier bond sectors. The following chart shows the difference between the average analytical duration and empirical duration for bond market sectors over the last 10 years. The larger the difference between the two bars, the more credit risk matters compared with interest rate risk. It makes sense that the empirical duration of a 10-year Treasury is very close to its analytical duration; because U.S. Treasuries are issued by the U.S. government, they don't have the additional variable of credit risk — they only have interest rate risk. The chart demonstrates that if interest rates rise by 100 basis points, U.S. Treasury bond prices should be expected to fall by over 8%, regardless of the method of calculating duration.

For some sectors of the bond market, credit risk matters more than interest rate risk



Source: Bloomberg, Credit Suisse, and Columbia Threadneedle Investments. Data reflects 10 years as of 12/31/17 and is updated annually.

On the other hand, for riskier sectors of the bond market such as high-yield corporate bonds and floating-rate loans, the effect of changes in credit quality (measured by empirical duration) dwarfs the effect of interest rate changes. The very low or negative empirical duration for these sectors highlights that investors are not primarily taking interest rate risk in these sectors and that credit risk is more important.

Bottom line

History demonstrates that fixed-income sectors can have tremendous variance in performance when interest rates change. Duration is a significant driver of return for bonds with high price sensitivity to interest rates. But interest rates aren't the only variable — investors need to look at empirical duration to understand that for some sectors of the bond market, credit risk matters more.



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