

# Bond Valuation

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## What Is Bond Valuation?

Bond valuation is a technique for determining the theoretical fair value of a particular bond. Bond valuation includes [calculating the present value of a bond's future interest payments](#), also known as its cash flow, and the bond's value upon maturity, also known as its face value or par value. Because a bond's [par value](#) and interest payments are fixed, an investor uses bond valuation to determine what [rate of return](#) is required for a bond investment to be worthwhile.

### Key Takeaways

- Bond valuation is a way to determine the theoretical fair value (or par value) of a particular bond.
- It involves calculating the present value of a bond's expected future coupon payments, or cash flow, and the bond's value upon maturity, or face value.
- As a bond's par value and interest payments are set, bond valuation helps investors figure out what rate of return would make a bond investment worth the cost.

## Understanding Bond Valuation

A bond is a debt instrument that provides a steady income stream to the investor in the form of [coupon payments](#). At the maturity date, the full face value of the bond is repaid to the bondholder. The characteristics of a regular bond include:

- **Coupon rate:** Some bonds have an interest rate, also known as the coupon rate, which is paid to bondholders [semi-annually](#). The coupon rate is the fixed return that an investor earns periodically until it matures.
- **Maturity date:** All bonds have [maturity dates](#), some short-term, others long-term. When a bond matures, the [bond issuer](#) repays the investor the full [face value](#) of the bond. For corporate bonds, the face value of a bond is usually \$1,000 and for government bonds, the face value is \$10,000. The face value is not necessarily the invested principal or purchase price of the bond.
- **Current Price:** Depending on the level of interest rate in the environment, the investor may purchase a bond at par, below par, or above par. For example, if interest rates increase, the value of a bond will decrease since the coupon rate will be lower than the interest rate in the economy. When this occurs, the bond will trade [at a discount](#), that is, below par. However, the bondholder will be paid the full face value of the bond at maturity even though he purchased it for less than the par value.

## Bond Valuation in Practice

Since bonds are an essential part of the capital markets, investors and analysts seek to understand how the different features of a bond interact in order to determine its intrinsic value. Like a stock, the value of a bond determines whether it is a suitable investment for a portfolio and hence, is an integral step in bond investing.

Bond valuation, in effect, is calculating the [present value](#) of a bond's expected future coupon payments. The theoretical fair value of a bond is calculated by discounting the present value of its coupon payments by an appropriate [discount rate](#). The discount rate used is the yield to maturity, which is the rate of return that an investor will get if s/he reinvested every coupon payment from the bond at a fixed interest rate until the bond matures. It takes into account the price of a bond, par value, coupon rate, and time to maturity.

### \$42.8 trillion

The size of the U.S. bond market, or the total amount of debt outstanding, at the end of 2018, according to the Securities Industry and Financial Markets Association (SIFMA), an industry group

## Coupon Bond Valuation

Calculating the value of a coupon bond factors in the annual or semi-annual coupon payment and the par value of the bond.

The present value of expected cash flows is added to the present value of the face value of the bond as seen in the following formula:

$$V_{\text{coupons}} = \sum \frac{C}{(1+r)^t}$$

$$V_{\text{face value}} = \frac{F}{(1+r)^T}$$

**where:**

$C$  = future cash flows, that is, coupon payments

$r$  = discount rate, that is, yield to maturity

$F$  = face value of the bond

$t$  = number of periods

$T$  = time to maturity

For example, let's find the value of a corporate bond with an annual interest rate of 5%, making semi-annual interest payments for 2 years, after which the bond matures and the principal must be repaid. Assume a YTM of 3%.

$F = \$1000$  for corporate bond

Coupon rate<sub>annual</sub> = 5%, therefore, Coupon rate<sub>semi-annual</sub> =  $5\%/2 = 2.5\%$

$C = 2.5\% \times \$1000 = \$25$  per period

$t = 2 \text{ years} \times 2 = 4$  periods for semi-annual coupon payments

$T = 4$  periods

Present value of semi-annual payments =  $25/(1.03)^1 + 25/(1.03)^2 + 25/(1.03)^3 + 25/(1.03)^4$

=  $24.27 + 23.56 + 22.88 + 22.21$

= 92.93

Present value of face value =  $1000/(1.03)^4$

= 888.49

Therefore, value of bond =  $\$92.93 + \$888.49 = \$981.42$

## Zero-Coupon Bond Valuation

A zero-coupon bond makes no annual or semi-annual coupon payments for the duration of the bond. Instead, it is sold at a [deep discount](#) to par when issued. The difference between the purchase price and par value is the investor's interest earned on the bond. To calculate the value of a zero-coupon bond, we only need to find the present value of the face value.

Following our example above, if the bond paid no coupons to investors, its value will simply be:

$\$1000/(1.03)^4 = \$888.49$

Under both calculations, a coupon-paying bond is more valuable than a zero-coupon bond.

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