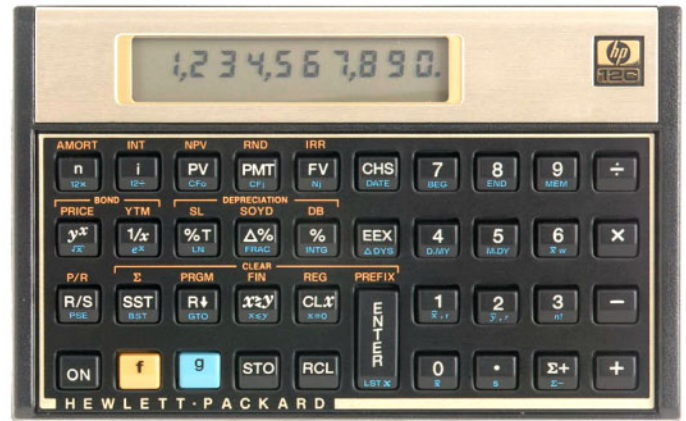**hp calculators**

HP 12C Bonds

Bonds

Bonds in the HP12C

Practice calculating with bonds

Bonds

It is not unusual that either companies or governments themselves need extra funds to expand into new markets or raise funds to pay for programs. In these cases, they typically need large quantities of money that the average bank cannot provide. Raising money by **issuing bonds** to a public market is one solution.

By purchasing bonds, an investor becomes a creditor to the corporation or government. Many investors have at least part of their portfolio invested in bonds. The issuer of a bond must pay the investor a "fee" (interest payments) for the privilege of using his or her money. The interest rate is often referred to as the **coupon**, and the date on which the issuer has to repay the amount borrowed (face value) is called the **maturity date**. The total return an investor receives if the bond is held to maturity is equal to all the interest payments received plus any gain or loss. This is called the yield to maturity, or **YTM**.

Bonds in the HP12C

The HP12C uses the following expression to compute a semiannual coupon with 6 months or less to maturity:

$$PRICE = \left[\frac{100 \left(RDV + \frac{CPN}{2} \right)}{100 + \left(\frac{DSM}{E} \times \frac{YIELD}{2} \right)} \right] - \left[\frac{DCS}{E} \times \frac{CPN}{2} \right]$$

Figure 1

The HP12C uses the following expression to compute a semiannual coupon with more than 6 months to maturity (don't worry - there is no need to understand the particulars of this long equation to work with bonds on the HP 12C):

$$PRICE = \left[\frac{RDV}{\left(1 + \frac{YIELD}{200} \right)^{N - 1 + \frac{DSC}{E}}} \right] + \left[\sum_{K=1}^{N} \frac{\frac{CPN}{2}}{\left(1 + \frac{YIELD}{200} \right)^{K - 1 + \frac{DSC}{E}}} \right] - \left[\frac{DCS}{E} \times \frac{CPN}{2} \right]$$

Figure 2

where:

DIM = days between issue and maturity date;
DSM = days between settlement date and maturity date;
DCS = days between beginning of coupon period and settlement date;
E = number of days in coupon period where settlement occurs;
$DSC = E - DCS$ = days from settlement days to next 6-month coupon date.
N = number of semiannual coupons payable between settlement date and maturity date;
CPN = annual coupon rate (percentage);
$YIELD$ = annual yield (percentage);
$PRICE$ = dollar price per $100 par value;
RDV = redemption value.

The HP12C allows either the YTM or bond price to be calculated, provided one of the two is known. The TVM registers $\boxed{i}$, $\boxed{PV}$ and $\boxed{PMT}$ are used to hold the necessary data, as shown below:

Register	Contents
$\boxed{PMT}$	annual coupon rate (percentage)
$\boxed{PV}$	quoted price (percent of par)
$\boxed{i}$	yield to maturity

Then enter settlement date and maturity date separated by $\boxed{ENTER}$ and press $\boxed{f}\boxed{YTM}$ to calculate yield to maturity or $\boxed{f}\boxed{PRICE}$ to calculate both bond price and the amount of accrued interest. If price is calculated, the display shows the bond price and the amount of accrued interest can be brought to the display by pressing $\boxed{x \gtrless y}$ and/or the net price can be calculated by pressing $\boxed{+}$. Dates must be entered according to current date mode.

Practice calculating with bonds

Example 1:   What price should be paid on August 10, 2003 for a 6¾% U.S. Treasury bond that matures on May 1, 2018 considering a yield of 8³/₈%? The coupon payments are semi-annual. (The example assumes *MM.DDYYYY* date format.)

Solution: To make sure there is no residual value from previous calculations, clear the TVM registers contents to zero and set MDY mode prior to start the calculation:

$\boxed{f}\boxed{FIN}$ $\boxed{g}\boxed{M.DY}$

Now enter the initial data:

$\boxed{6}\boxed{\bullet}\boxed{7}\boxed{5}\boxed{PMT}\ \boxed{3}\boxed{ENTER}\ \boxed{8}\boxed{\div}\boxed{8}\boxed{+}\boxed{i}$

Enter the settlement and maturity dates and compute the bond price:

$\boxed{8}\boxed{\bullet}\boxed{1}\boxed{0}\boxed{2}\boxed{0}\boxed{0}\boxed{3}\boxed{ENTER}$
$\boxed{5}\boxed{\bullet}\boxed{0}\boxed{1}\boxed{2}\boxed{0}\boxed{1}\boxed{8}\ \boxed{f}\boxed{PRICE}$

$$86.38$$

Figure 3

To verify the amount of accrued interest and then calculate the net price:

$\boxed{x \gtrless y}$

$$1.85$$

Figure 4

$\boxed{+}$

$$88.23$$
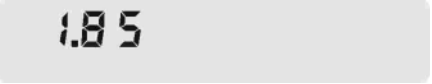
Figure 5

Answer: The net price paid for the 6¾% U.S. Treasury bond on August 10, 2003 should be $88.23 per $100.

Example 2: Keeping previous example data, suppose that the actual market quote for the bond is 8¼% instead of 8³/₈%. What yield does it represent now?

Solution: Simply update the quote price in $\boxed{PV}$, enter the settlement and maturity dates and press $\boxed{f}\boxed{YTM}$:

$\boxed{8}\boxed{8}\boxed{\bullet}\boxed{2}\boxed{5}\boxed{PV}$
$\boxed{8}\boxed{\bullet}\boxed{1}\boxed{0}\boxed{2}\boxed{0}\boxed{0}\boxed{3}\boxed{ENTER}$
$\boxed{5}\boxed{\bullet}\boxed{0}\boxed{1}\boxed{2}\boxed{0}\boxed{1}\boxed{8}\boxed{f}\boxed{YTM}$

$$8.13$$

Figure 6

Answer: The yield for the 6¾% U.S. Treasury bond now quoted at $88.25 per $100 is 8.13%.

Example 3: Consider a zero-coupon, semi-annual bond purchased on May 19, 2003 that matures on June 30, 2017. What is the price given a yield to maturity of 14%? Use D.MY date mode this time.

Solution: To make sure there is no residual value from previous calculations, clear the TVM registers contents to zero ($\boxed{PMT}$ is automatically set to zero) and set D.MY mode prior to calculate the price.

$\boxed{f}\boxed{FIN}\boxed{g}\boxed{D.MY}\boxed{1}\boxed{4}\boxed{i}$
$\boxed{1}\boxed{9}\boxed{\bullet}\boxed{0}\boxed{5}\boxed{2}\boxed{0}\boxed{0}\boxed{3}\boxed{ENTER}$
$\boxed{3}\boxed{0}\boxed{\bullet}\boxed{0}\boxed{6}\boxed{2}\boxed{0}\boxed{1}\boxed{7}\boxed{f}\boxed{PRICE}$

$$14.81$$

D.MY

Figure 7

Answer: The price for the zero-coupon bond in the example is $14.81 per $100.