payments. The calculator keystrokes are identical to those used to find the present value of an annuity. Notice that the PMT value is entered as a negative number. As we found earlier, the present value of the coupon payment annuity stream is $851.36.

The second calculator solution shows the present value of the $1,000 principal payment that will be received at the end of 20 years. The calculator keystrokes are identical to those used to find the present value of a single amount. If the FV value is entered as a negative number, the present value of the principal will be $148.64. This is the value found using the present value equation earlier. Of course, the value of the bond ($1,000) is the sum of the present values in Panel A and Panel B.

Finally, the third calculator solution demonstrates how we calculate the bond value when entering the principal and coupon payments simultaneously. Again, the coupon amounts are entered as a negative value using the PMT key, and the principal is entered as a negative value using the FV key. The value of the bond is $1,000.

FINANCIAL CALCULATOR

PV of Interest Payments

Value	*Function*
20	N
10	I/Y
0	FV
−100	PMT
Function	*Solution*
CPT	
PV	851.36

Using Excel's PV Function to Calculate a Bond Price

Excel's **PV** function can calculate the price of a bond. In order to produce a positive bond price, the coupon payment annuity amount is input as a negative value for the **pmt** argument. The principal payment (−1000) is entered as the **fv** argument. The function in cell D1 references the arguments in cells B1 to B4. The function in cell D5 uses hard-coded numerical values. In both cases, the bond values produced by the **PV** function are identical to the calculator solution.

	A	B	C	D	E	F
1	rate	10.00%		=+PV(B1,B2,B3,B4)		
2	nper	20		PV(rate, nper, pmt, [fv], [type])		
3	pmt	−100		$1,000.00		
4	fv	−1000				
5				=+PV(0.1,20,−100,−1000)		
6				PV(rate, nper, pmt, [fv], [type])		
7				$1,000.00		

FINANCIAL CALCULATOR

PV of Principal

Value	*Function*
20	N
10	I/Y
−1000	FV
0	PMT
Function	*Solution*
CPT	
PV	148.64

Concept of Yield to Maturity

In the previous example, the yield to maturity that was used as the discount rate was 10 percent. The **yield to maturity**, or discount rate, is the rate of return required by bondholders. The bondholder, or any investor for that matter, will allow *three* factors to influence his or her required rate of return:

1. The required **real rate of return**—This is the rate of return the investor demands for giving up the current use of the funds on a noninflation-adjusted basis. It is the financial "rent" the investor charges for using his or her funds for one year, five years, or any given period. Although it varies from time to time, historically the real rate of return demanded by investors has been about 2 to 3 percent.
2. **Inflation premium**—In addition to the real rate of return discussed above, the investor requires a premium to compensate for the eroding effect of inflation on the value of the dollar. It would hardly satisfy an investor to have a

FINANCIAL CALCULATOR

Bond Price

Value	*Function*
20	N
10	I/Y
−1000	FV
−100	PMT
Function	*Solution*
CPT	
PV	1000.00