

Texas Instruments BA II PLUS

Keystrokes Prior to Use of Time Value of Money Keys

ON/OFF turns on/off, when it is turned on, the default setting for TVM is I/Y IS 12. You must change this number to 1. Press 2nd, I/Y, the number 1 and then ENTER.

Regular arithmetic (add, subtract, multiply, and divide) may be performed while the calculator is in any mode. To perform the TVM calculation, each of the values N, I/Y, PMT, PV, and FV is set to 0. In fact, the calculator is automatically set to 0.

General Comments

1. Press 2ND QUIT to clear the TVM worksheet before you start a new problem.
2. Once you have computed an unknown, you may recall the entries made to arrive at that computation. For example, you might verify the number of compounding periods by RCL N. Being able to check what you have entered eliminates the need for reentry of all of them just to be sure you did not make any errors.
3. The calculator may give slightly different answers than the time value of money tables, because the tables are rounded to 5 places. Don't set your calculator to two decimals for time value calculations. The default is two decimals. To change the default setting, press 2ND, "." (format), and then at least 4 and then press ENTER. The display should say DEC.
4. Annuities are classified as ordinary or due. When needing a computation for either type of annuity, use CPT and the unknown key, e.g., CPT PV.

The default setting is ordinary. If you need an ordinary annuity, you have nothing else to do.

But if you want to have an annuity due, press 2ND, PMT, 2ND again and then ENTER. You will see the word is changed from END to BGN. END is for an ordinary annuity and BGN is for an annuity due.

5. +/- switches the displayed value from plus to minus.
6. One of the most common errors in time value of money computations is failing to make the rate of interest or discount correspond to the number of compounding periods. In other words, the I/Y must be entered as annual if N is years, quarterly if N is quarters, etc. This is why we set I/Y to 1 and do the math ourselves at this point--less mistakes.
7. If you are doing an annuity problem and enter the PMT as a positive number, FV will be calculated as a negative number. Just disregard the negative sign and use the number as the answer. Conversely, entry of the PMT as a negative number will generate a positive FV.
8. If you are solving for N, I/Y, or PMT, you need to enter both a value for PV and FV. **Either FV or PV must be entered as a negative number.** Otherwise you will see **ERROR 5** appear on the screen.
9. There are five time value of money (TVM) tables in the text. If you are able to understand these five types of problems generically plus another type (Future value of annuity due) for which there is no separate table, your mastery of the calculator will follow more easily. Once you learn to use the BA II PLUS Calculator, you will be able to solve TVM problems more quickly than by using the tables, and without interpolating for "in between values" of interest. In addition to making it easier to solve TVM problems for accounting, you will also be able to quickly address many TVM decisions in your daily life.

Work these examples for practice

Future Amount of a Single Sum (FVL)

Example: How much will \$25,000 grow to in 10 years if invested at 12% per year?

Keystroke	Keystroke	Display	Explanation
2ND QUIT			To clear TVM registers.
10	N	10.00	Assigns a value of 10 to N, the number of compounding periods.
12	I/Y	12.00	Assigns a value of 12 to I/Y, the rate of compounding per period.
25000	PV	25000.00	Assigns a value of 25000 to PV, the present value lump sum of today.
0	<i>pmt</i>		<i>optional</i>
CPT	FV	77646.21	Computes FV, the future value of 25000 invested for 10 compounding periods at 12% per period.

Example: How much will \$18,000 grow to in 6 years if invested at 10% per year, compounded quarterly?

Keystroke	Keystroke	Display	Explanation
2ND QUIT			To clear TVM registers.
24	N	24.00	Assigns a value of 24 to N, the number of compounding periods. 6 years x 4 quarters per year = 24 quarters.
2.5	I/Y	2.50	Assigns a value of 2.5 to I/Y, the quarterly compounding rate. 10% per year is 2.5% per quarter.
18000	PV	18000.00	Assigns a value of 18000 to PV, the present value lump sum of today.
0	<i>pmt</i>		<i>optional</i>
CPT	FV	32557.07	Computes FV, the future value of 18000 invested for 24 compounding periods at 2.5% per period.

Example: You have been told of an investment opportunity that will allegedly double your \$10,000 in 7 years. What annual rate of yield would be needed? (WARNING: either one of PV or FV has to be a negative number)

Keystroke	Keystroke	Display	Explanation
2ND QUIT			To clear TVM registers.
7	N	7.00	Assigns a value of 7 to N, the number of compounding periods.
-10000	PV	10000.00	Assigns a value of 10000 to PV, the present value lump sum of today.
20000	FV	20000.00	Assigns a value of 20000 to FV.
0	<i>pmt</i>		<i>optional</i>
CPT	I/Y	10.41	Computes necessary I/Y yield.

Example: You have been told of an investment opportunity that will allegedly yield 9.05% annually, if you invest \$10,000. How long will it take for your investment to double in value? (attention: either one of PV or FV has to be negative number)

Keystroke	Keystroke	Display	Explanation
2ND QUIT			To clear TVM registers.
9.05	I/Y	9.05	Assigns a value of 9.05 to I/Y.
-10000	PV	10000.00	Assigns a value of 10000 to PV, the present value lump sum of today.
20000	FV	20000.00	Assigns a value of 20000 to FV.
0	<i>pmt</i>		<i>optional</i>
CPT	N	8.00	Computes N, the number of periods that it takes for your investment to double.

Present Value of a Single Sum (PVL)

Example: How much would you need to invest today to have \$100,000 5 years in the future, if you could earn 6% annually on money invested today?

Keystroke	Keystroke	Display	Explanation
2ND QUIT			To clear TVM registers.
5	N	5.00	Assigns a value of 5 to N, the number of discounting periods.
6	I/Y	6.00	Assigns a value of 6 to I/Y, the periodic rate at which you could invest.
100000	FV	100000.00	Assigns a value of 100000 to FV, the future lump value.
0	<i>pmt</i>		<i>optional</i>
CPT	PV	74725.82	Computes PV, the present value (today) lump equivalent of FV.

Example: What is the value today of \$100,000 to be received 5 years in the future, if you could only earn 4% annually on money invested today?

Keystroke	Keystroke	Display	Explanation
2ND QUIT			To clear TVM registers.
5	N	5.00	Assigns a value of 5 to N, the number of discounting periods.
4	I/Y	4.00	Assigns a value of 4 to I/Y, the periodic rate at which you could invest.
100000	FV	100000.00	Assigns a value of 100000 to FV, the future lump value.
0	<i>pmt</i>		<i>optional</i>
CPT	PV	82192.71	Computes PV, the present value (today) lump equivalent of FV.

Future Amount of an Ordinary Annuity (FVOA)

Example: What is the future value of 10 \$1,000 deposits made at the end of each year for the next 10 years if the rate of interest is 12%? ***Note: As the deposits are to be made at the end of the year rather than at the beginning, you are dealing with an ordinary annuity, and you will use the CPT key on the calculator.**

- **Make sure that calculator does not display "BGN" message when computing an ordinary annuity.** If it does, press 2ND, PMT, 2ND again and then ENTER. You will see the word is changed from BGN to END.

Keystroke	Keystroke	Display	Explanation
2ND QUIT			To clear TVM registers.
10	N	10.00	Assigns a value of 10 to N.
12	I/Y	12.00	Assigns a value of 12 to I/Y.
1000	PMT	1000.00	Assigns a value of 1000 to PMT, the periodic deposit.
0	PV	0	<i>optional</i>
CPT	FV	-17548.74	Computes FV, the future value of 1000 deposited at the end of 10 successive years, if the interest paid is 12%. *Note: The computed answer is preceded by a "minus" sign, which is irrelevant--software designers conceptualized this as an outflow.

Example: What if in the previous example, \$250 were deposited at the end of 40 successive quarters, at the same 12% annual interest, which would equate to 3% per quarter? Compute the new future value.

Keystroke	Keystroke	Display	Explanation
2ND QUIT			To clear TVM registers.
40	N	40.00	Assigns a value of 40 to N.
3	I/Y	3.00	Assigns a value of 3 to I/Y.
250	PMT	250.00	Assigns a value of 250 to PMT, the periodic deposit.
0	PV	0	<i>optional</i>
CPT	FV	-18850.32	Computes FV, the future value of 250 deposited at the end of 40 successive quarters.

NOTE:

****If you are trying to find N or I/Y for **FV annuity**, you must enter either the FV or the pmt as a negative number.

Present Value of an Ordinary Annuity (PVOA)

Example: How much is the anticipated receipt of \$1,000 at the end of each of the next 8 years worth today, if the discount (interest) rate is 9%? ***Note: As the receipts are to be made at the end of the year rather than at the beginning, you are dealing with an ordinary annuity. Make sure that calculator does not display "BGN" message when computing an ordinary annuity. Press 2ND, PMT, 2ND again and then ENTER. Make sure "END" is displayed.**

Keystroke	Keystroke	Display	Explanation
2ND QUIT			To clear TVM registers.
8	N	8.00	Assigns a value of 8 to N.
9	I/Y	9.00	Assigns a value of 9 to I/Y.
1000	PMT	1000.00	Assigns a value of 1000 to PMT, the periodic receipt.
0	FV	0	<i>optional</i>
CPT	PV	5534.82	Computes PV, the present value of 1000 received at the end of 8 successive years, if the discount rate is 9%.

Example: What if in the previous example, the annuity recipient could opt for \$500 paid at the end of every semiannual period for 8 years, with the same 9% annual discount rate? What would be the present value of this income stream?

Keystroke	Keystroke	Display	Explanation
2ND QUIT			To clear TVM registers.
16	N	16.00	Assigns a value of 16 to N, since there are 16 semiannual periods in 8 years.
4.5	I/Y	4.50	Assigns a value of 4.5 to I/Y, the semiannual discount rate.
500	PMT	500.00	Assigns a value of 500 to PMT, the periodic receipt.
0	FV	0	<i>optional</i>
CPT	PV	5617.01	Computes PV, the present value of 500 received at the end of 16 successive semiannual periods.

Future Amount of an Annuity Due (FVAD)

Example: What is the future value of \$1000 deposit made at the beginning of each year for the next 10 years if the rate of interest is 12%?

***Note: As the deposits are to be made at the beginning of the year rather than at the end, you are dealing with an annuity due, and you will have to change from END to BGN. Press 2ND, PMT, 2ND again and then ENTER. Make sure "BGN" is displayed.**

Keystroke	Keystroke	Display	Explanation
2ND QUIT			To clear TVM registers.
0	PV	0	<i>optional</i>
10	N	10.00	Assigns a value of 10 to N.
12	I/Y	12.00	Assigns a value of 12 to I/Y.
1000	PMT	1000.00	Assigns a value of 1000 to PMT, the periodic deposit.
CPT	FV	-19654.58	Computes FV, the future value of 1000 deposited at the beginning of 10 successive years, if the interest paid is 12%. *Note: The computed answer is preceded by a "minus" sign---ignore it!

Example: What if in the previous example, \$250 were deposited at the beginning of 40 successive quarters, at the same 12% annual interest, which would equate to 3% per quarter? Compute the new future value. **Make sure "BGN" is displayed.**

Keystroke	Keystroke	Display	Explanation
2ND QUIT			To clear TVM registers.
0	PV	0	<i>optional</i>
40	N	40.00	Assigns a value of 40 to N.
3	I/Y	3.00	Assigns a value of 3 to I/Y.
250	PMT	250.00	Assigns a value of 250 to PMT, the periodic deposit.
CPT	FV	-19415.82	Computes FV, the future value of 250 deposited at the beginning of 40 successive quarters.

Example: What if in the previous example, \$250 were deposited at the beginning of 40 successive quarters, with the additional constraint that \$24000 must be accumulated. What annual rate of interest would be required on the deposits? **Make sure "BGN" is displayed.**

Keystroke	Keystroke	Display	Explanation
2ND QUIT			To clear TVM registers.
0	PV	0	<i>optional</i>
40	N	40.00	Assigns a value of 40 to N.
250	PMT	250.00	Assigns a value of 250 to PMT, the periodic deposit.
24000	+/- FV	-24000.00	Assigns a value of 24000 to FV. *Note: Either the PMT or the FV (but not both) must be entered with a preceding "minus" sign in annuity problems, or an "Error" will result. You get the "minus" in front of 24000 by keying in the 24000, then +/-, then FV.
CPT	I/Y	3.88	Computes the quarterly interest rate needed.
X 4	=	15.53	Straight multiplication by 4 to compute the equivalent annual interest rate. Remember that internally the calculator is holding many more decimal places than you may choose to display. In this case, the quarterly interest rate was actually 3.8815147.

Present Value of an Annuity Due (PVAD)

Example: What is the present value of the anticipated receipt of \$1000 at the beginning of each of the next 8 years, if the discount rate is 9%?

Keystroke	Keystroke	Display	Explanation
2ND QUIT			To clear TVM registers.
0	FV	0	<i>optional</i>
8	N	8.00	Assigns a value of 8 to N.
9	I/Y	9.00	Assigns a value of 9 to I/Y.
1000	PMT	1000.00	Assigns a value of 1000 to PMT, the periodic receipt.
CPT	PV	6032.95	Computes PV, the present value of 1000 received at the beginning of 8 successive years, if the discount rate is 9%.

PVAD Example: What if in the previous example, the annuity recipient was again offered the receipt of \$1000 at the beginning of each of the next 8 years, but at a "bargain price" of \$5500. What would be the yield? **Make sure "BEGIN" is displayed.**

Keystroke	Keystroke	Display	Explanation
2ND QUIT			To clear TVM registers.
0	FV	0	Optional
8	N	8.00	Assigns a value of 8 to N.
-1000	PMT	-1000.00	Assigns a value of 1000 to PMT, the periodic receipt.
5500	PV	5500.00	Assigns a value of 5500 to PV.
CPT	I/Y	12.45	Computes the yield to the recipient.

Calculating Bond Prices:

On January 1, 2006, Cajun King Foods issues \$100,000 of 7% debentures dated January 1, 2006, which pay interest annually (to shorten the table) on December 31. The bonds mature on December 31, 2009. Cajun King has a calendar year-end.

If the market rate is 8%, determine the selling price:

The bond interest payment would be: $\$100,000 \times .07 \times 12/12$ (annually) = 7,000

FV = 100,000

PMT = 7,000

N = 4 (all of 2006 through all of 2009, inclusive)

I/Y = 8

answer is found by CPT PV = 96,688

If the payments are semiannual, $pmt = i$ would be $100,000 \times .07 \times 6/12$ --using the STATED rate here

and the N must be doubled since there are 2x as many compound periods across the life of the bond...

and the I/Y must be cut in half since the compounding occurs semiannually

AND you would use the MARKET rate for the I/Y in the calculation since you want earn the yield offered by the market, regardless of the rate printed on the face of the bond!