

Texas Instrument BAII PLUS Tutorial

To begin, look at the face of the calculator. Almost every key on the BAII PLUS has two functions: each key's primary function is noted on the key itself; while each key's secondary function is noted in white above the key. To use the function on the key, simply press the key. To access the white function above each key, first press the gray key with "2nd" printed on it, which we will call the "2nd shift" key, and then press the desired function key. (Note that the 2nd shift key is near the upper left corner of the calculator keyboard.)

Turning the Calculator On and Off

To turn on the calculator, press .

To turn off the calculator, press .

Note that the "ON/OFF" key is on the upper right corner of the keyboard. Also, we will designate keys throughout this tutorial by the use of small boxes, as above. To conserve the battery, the calculator turns itself off about 10 minutes after your last keystroke.

Also, note that pressing the 2nd shift key places a little "2nd" symbol in the upper left corner of the display. Press the 2nd shift key again and the symbol goes away. The key is a toggle key that switches back and forth between the "regular" and the "2nd" functions. is like the computer shift key. After you press , look only at the white writing above the keys.

Note that the calculator has a continuous memory, so turning it off does not affect any data stored in the calculator, but it will erase any number showing on the screen.

Clearing the Calculator

Five of the most commonly used methods of clearing data are presented below:

clears all 10 memory locations and the display.

clears the TVM worksheet.

clears worksheets other than the TVM worksheet.

clears the entire display, but not the memory.

clears the numbers on the display one at a time if you made a mistake entering data.

Review your owner's manual for other methods of clearing information.

2 | Texas Instrument BAII Plus Tutorial

Clearing the calculator is very important, since unwanted data in memory can result in improper calculations, and hence wrong answers. It is best to get into the habit of automatically clearing memory before starting a calculation. Occasionally, you may want to save data, but, in general, you will be entering all new data, so starting with a clear memory is the safest approach.

Changing the Display

To change decimals from 2 to 4, press .
0.0000 is displayed.

To change from 4 to 2, press .
0.00 is displayed.

We usually set the display to 2 places, which is especially convenient when working with dollars and percentages. However, we often use 4 places when dealing with the interest rates and rates of return that are entered as decimals.

Periods per Year Setting

One important setting that can cause problems is the periods per year setting. To check the current setting, press . The display shows the setting for periods/year. The calculator comes preset at 12 periods per year, that is, it assumes calculations will be done on a monthly basis. However, finance textbook problems generally use 1 period/year. To change to 1/year:

Press .

Now the calculator is set to assume 1 period/year. To confirm this setting, press

. Unless needed for other work, we generally leave the calculator setting at 1 period per year.

Time Value of Money (TVM)

The TVM keys are located on the third row from the top of the keyboard.

In general, TVM problems involve four variables – three are known and the fourth is unknown.

Lump Sums

To begin, we consider TVM calculations with single (lump) sums. In this situation, we do not use the PMT key, so be sure to either press , which sets the payment (PMT) equal to 0, or enter 0 as the PMT when entering the input data. If you know any three variables, you can find the value of the fourth.

Example 1:

What is the FV of \$100 after 3 years if the interest rate is 26 percent? First, clear with

Next, enter the data.

3
26
100
0 (Optional if registers are cleared.)

To determine the FV simply press and the FV of -\$200.04 is displayed.

The BAI PLUS is programmed so that if the PV is + then the Fv is displayed as – and vice-versa, because the BAI PLUS assumes that one is an inflow and the other is an outflow. When entering both PV and FV, one must be entered as negative and the other as positive.

Example 2:

What is the PV of \$500 due in 5 years if the interest rate is 10 percent? Clear first and then enter the following data.

5
10
0 (Optional is registers are cleared.)
500

Pressing the key reveals that \$310.46 will grow to \$500 in 5 years at a 10 percent rate.

4 | Texas Instrument BAI Plus Tutorial

Example 3:

Assume a bond can be purchased today for \$200. It will return \$1,000 after 14 years. The bond pays no interest during its life. What rate of return would you earn if you bought the bond?

14
200 (The +/- key changes the sign.)
0
1000

Simply press the key and the BAI PLUS calculates the rate of return to be 12.18%.

Remember the BAI PLUS is programmed so that if the PV is + then the FV is displayed as – and vice versa because the BAI PLUS assumes that one is an inflow and the other is an outflow.

Now suppose you learn that the bond will actually cost \$300. What rate of return will you earn?

Override the -200 by entering 300 , then press to get 8.98 percent. If you pay more for the bond, you earn less on it. The important thing, though, is that you can do “what if” analyses with the calculator.

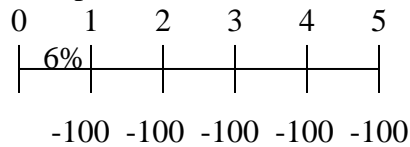
Now do nothing except press to turn off the calculator. Then turn on the calculator . The display shows 0.00. Is the memory erased? Not completely.

What was on the screen is gone, but press to get $N = 14$.

Ordinary Annuities

Example 1:

What is the FV of an annuity of \$100 paid at the end of each year for 5 years if the interest rate equals 6 percent?



5

6

0

100

Now press the key, and an FV of \$563.71 is displayed.

Example 2:

What is the PV of the same annuity?

Leave data in calculator, but enter 0 as the FV to override, the press to get \$421.24.

Annuities Due

Each payment of an annuity due occurs at the beginning of the period instead of at the end as with a regular annuity. In essence, each payment is shifted back one period. To analyze annuities due press . “BGN” appears

on the screen and in the upper right corner of the display. Now the BAI PLUS analyzes the cash flows based on beginning of period payments. Change back to end mode by pressing .

Interest Conversion

The following equation is used to convert a nominal rate to an effective rate.

$$\text{EAR} = [1 + K_{\text{Nom}}/m]^m - 1.$$

Given: $K_{\text{Nom}} = 10\%$ and $m = 12$ payments/year,

$$\text{EAR} = [1 + 0.10/12]^m - 1 = (1.0083)^{12} - 1 = 1.1047 - 1 = 0.1047 = 10.47\%.$$

However, it's much easier to convert the nominal rate using the calculator.

First, we need to set the calculator to 12 payments per year:

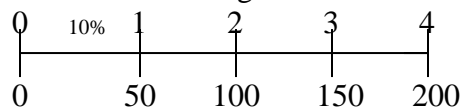
12
 10

The effective rate of 10.47 percent is displayed on the screen.

Cash Flow Operations

Example 1:

We can also find the PV, FV, an IRR (internal rate of return) of a series of unequal cash flows. Assume the following cash flows:



What is the PV of the CFs?

First clear the BAII PLUS and make sure that periods/year is set equal to 1.

Enter the cash flow worksheet by pressing then clear any previous cash flow analyses, .

7 | Texas Instrument BAI Plus Tutorial

Next, enter the cash flows:

- 0 Sets CF_0 equal to 0 and moves to CF_1 .
- 50 Sets CF_1 equal to 50 and moves to frequency of occurrence of CF_1 .
- 1 Tells calculator that the \$50 CF occurs only once.
- 100
- 1
- 150
- 1
- 200
- 1

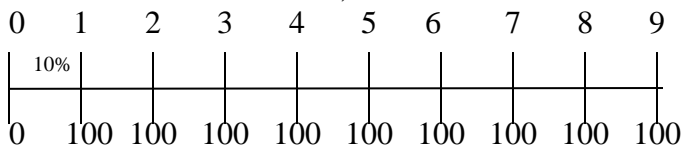
The CFs from the time line are entered. Now enter the interest rate.

10

At this point the BAI PLUS knows the cash flows, the number of periods, and the interest rate. To find the PV, press to get $PV = NPV = \$377.40$.

Example 2:

We have these cash flows, which contain embedded annuities:



What's the PV?

Clear, set P/YR = 1 if changed.

8 | Texas Instrument BAI Plus Tutorial

First enter the cash flow worksheet by pressing then clear any previous cash flow analyses, . Next, enter the cash flows:

0 Sets CF_0 equal to 0 and moves to CF_1 .

100 Sets CF_1 equal to 100 and moves to frequency of occurrence of CF_1 .

3 Tells calculator that the \$100 CF occurs three consecutive times.

200

2

300

4

Now the BAI PLUS knows the cash flows. Thus, enter the interest rate:

10 .

At this point the BAI PLUS knows the cash flows, the number of periods, and the interest rate. To find the PV, press to get $PV = NPV = \$1,099.94$.

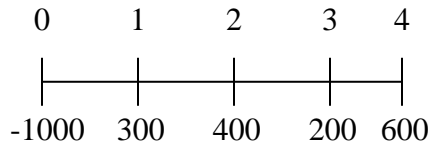
To check your entries:

then use the up and down arrow keys to view each cash flow.

9 | Texas Instrument BAI Plus Tutorial

Example 3: The Rate of Return Offered by an Investment (IRR)¹

Assume that we invest \$1,000 now (t=0) and then expect to receive an uneven set of cash flows. Here is the CF time line:



What rate of return will we earn?

First enter the cash flow worksheet by pressing then clear any previous cash flow analyses, . Next, enter the cash flows:

1000 Sets CF₀ equal to -1,000 and moves to CF₁.

300 Sets CF₁ equal to -1000 and moves to frequency of occurrence of CF₁. The second tells the calculator that the \$300 CF occurs only once².

400

200

600

Now the BAI PLUS knows the cash flows. Thus, simply press and the IRR of 16.71 percent is displayed.

¹If a negative CF occurs at the end of a project's life, or if a sequence of cash flows has two or more sign changes, there may be multiple IRR solutions. The calculator displays the IRR closest to zero. However, the displayed solution has no financial meaning. Thus, you should use caution in making investment decisions based on IRR computed for a cash flow stream with more than one sign change. When you are solving very complex cash flow problems, the calculator may not be able to find IRR, even if a solution exists. When this is the case, the calculator displays *ERROR 7* (iteration limit exceeded).

²If you do not enter a value for frequency after you enter the cash flow value, the calculator assumes a value of 1; however, the down arrow key must be pressed again before entering the next cash flow.

You can also determine the NPV of the investment. Leave data entered and then enter the opportunity cost interest rate, say 8 percent. To find NPV press

8

The NPV of \$220.50 is displayed. Thus, the PV of the cash inflows exceeds the cost of the investment by \$220.50.

Statistical Calculations

The BAI PLUS can also be used for several types of statistical calculations.

Mean and Standard Deviation (σ)

<u>Year</u>	<u>Sales</u>
1994	\$150
1995	95
1996	260

What’s the mean (average) and standard deviation (σ) of sales over the 3 years?

First select the data-entry portion of the statistics worksheet by pressing then clear any previous data entries . Next, enter the data:

150 This enters 150 as the data entry and tells the calculator there is no Y-variable associated with the X variable.

95 This enters 95 as the second data entry and tells the calculator there is no Y-variable associated with the X-variable.

260 This enters 260 as the third entry and tells the calculator there is no Y-variable associated with the X-variable.





Now select the statistical calculation portion of the statistics worksheet by pressing then clear any previous data entries, .

“LIN” should now be displayed on the screen. Keep pressing then until “1-V” (one variable calculation method) is displayed. Press the down arrow key three times to view (1) sample size, n, (2) mean, \bar{x} , and (3) standard deviation, S_x . The mean equals \$168.33. The standard deviation is \$84.01.

Line Regression




Beta coefficients can be calculated by using the BAI PLUS's linear regression capabilities. The X (independent variable) and Y (dependent variable) values must be entered in the proper sequence, where the data X is on the horizontal axis (market) and Y data is on the vertical axis (stock).


<u>Year</u>	<u>Market (K_m)</u>	<u>Stock (K_j)</u>
1	23.8%	38.6%
2	-7.2	-24.7
3	6.6	12.3
4	20.5	8.2
5	30.6	40.1

First select the data-entry portion of the statistics worksheet by pressing  . Then clear any previous statistical entries,  . Next, enter the data as follows:

23.8   This enters 23.8 as the first X variable.

38.6   This enters 38.6 as the first Y variable.

7.2    This enters -7.2 as the second X variable.

24.7    This enters -24.7 as the second Y variable.

6.6   This enters 6.6 as the third X variable.




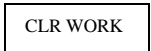
12.3   This enters 12.3 as the third Y variable.


20.5   This enters 20.5 as the fourth X variable.


8.2   This enters 8.2 as the fourth Y variable.

30.6   This enters 30.6 as the fifth X variable.

40.1   This enters 40.1 as the fifth Y variable.

Now select the statistical calculation portion of the statistics worksheet by pressing   then clear any previous statistical entries,  .

“LIN” should now be displayed on the screen. Keep pressing  until “a=” appears on

the screen. This is the value of the y-intercept of the regression line. Press  one

more time and “b=” appears on the screen. This is the value of the slope of the regression line. If you press one more time, “r =” appears on the screen. This is the value of the correlation coefficient of the regression line. (The intercept value is -8.92, the slope value is 1.60, and the correlation coefficient is 0.91.)

Clear the calculator by pressing .

Amortization

The BAI PLUS can also be used to calculate amortization schedules. First, clear the TVM registers by pressing

Example:

Determine the interest and principal paid each year and the balance at the end of each year on a three-year \$1,000 amortizing loan which carries an interest rate of 10 percent. The payments are due annually.

First, check payments/year and be sure it's 1. ()

Now perform the following steps:

3
 10
 1000
 A payment of -402.11 is displayed.

Now we will use the amortization worksheet to generate an amortization schedule for the loan:

Enters the Amort worksheet and clears any old contents.

1 Ending period set at 1 because we want to view the amortization information for each and every payment.

Now just use the down arrow key to view the balance after the payment as well as the interest and principal portions of the first payment.

13 | Texas Instrument BAII Plus Tutorial

To view the results for the second payment, press to move to “P1,” press and use the down arrow key to view the ending balance after the payment is made as well as the interest and principal portions of the second payment.

Repeat the third and last payment.

This is the amortization schedule corresponding to the loan.

	<u>Beg. Bal.</u>	<u>Payment</u>	<u>Interest</u>	<u>Princ. Repmt.</u>	<u>Ending Bal.</u>
1	1,000.00	402.11	100.00	302.11	697.89
2	697.89	402.11	69.79	332.32	365.57
3	365.57	402.11	36.56	365.55	.02