

# USING THE TEXAS INSTRUMENTS BAI PLUS FINANCIAL CALCULATOR

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Most business and financial calculators offer a multitude of powerful functions. Students in the introductory finance course generally do not need to utilize many of these functions and find them confusing. This outline will provide you with an easy and quick reference guide for some of the most commonly used financial functions. More detailed operational descriptions can be obtained from the owners' manual accompanying the calculator.

The following sections present some basic information regarding general and financial functions. Each step is listed as a number followed by a decimal point. A key is shown in the form of a box with its name inside it. The calculations for each financial function have been explained using a problem. The display on the calculator's screen at the completion of each step has also been shown to enable you to confirm your calculations along the way.

TIBAIPLUS can perform four sets of functions. For the purpose of this appendix, only two sets are relevant. The first set of functions are the ones that are written on the keys. The second set is invoked by pressing the white "second function" key, which is situated in the second row from top on the keypad.

This key will be represented by 

|     |
|-----|
| 2nd |
|-----|

 in this appendix.

The calculator has a continuous memory. Turning off the calculator does not affect the contents stored in the memory, though the display is reset to zero. The calculator automatically turns itself off when not used for more than approximately ten minutes.

## A. Clearing the calculator display and memory, and setting the decimal points:

| Keystrokes |                   |                   |                                   | Display      | Description  |
|------------|-------------------|-------------------|-----------------------------------|--------------|--|
| 1.         | <div>ON/OFF</div> |                   |                                   | 0.00         | Switch the calculator on.                                      |
| 2.         | <div>2nd</div>    | <div>QUIT</div>   |                                   | 0.00         | Resets the calculator to the standard mode, clears the screen. |
| 3.         | <div>2nd</div>    | <div>MEM</div>    | <div>2nd</div> <div>CLRWork</div> | M0 = 0.00    | Clears all the memory locations simultaneously.                |
| 4.         | <div>2nd</div>    | <div>Format</div> | 2 <div>ENTER</div>                | DEC = 2.0000 | Sets the number of decimal places equal to 2.                  |
| 5.         | <div>2nd</div>    | <div>QUIT</div>   |                                   | 0.00         | Brings the calculator to the standard mode.                    |

To clear each memory location individually, use the following key sequence.

| Keystrokes                             | Display   | Description                      |
|--|-----------|----------------------------------|
| 1. <span>2nd</span> <span>MEM</span>   | M0 = 0.00 | Clears the memory location 1.    |
| 2. <span>↑</span> 0 <span>ENTER</span> | M9 = 0.00 | Clears the next memory location. |

A worksheet for this calculator is a framework of formulae, such as the Time-Value-of-Money worksheet. The term "worksheet" has been used extensively in the owners' manual and, hence, is being used in this appendix.

- Note:
1. We will be using two decimal places for all the calculations in this appendix.
  2. Even though it displays two decimal digits, the TIBAIPLUS uses 13 digits in all calculations.
  3. To erase a part of the entered display, use → key.
  4. The CE/C key can be used to clear any error displays.

#### B. Using the memory capability:

**Example:** Before leaving on a sales call one morning, Alfred stored the price of a fax machine (\$1,200) and a printer (\$1,000) in his calculator. Later that day, he sold three fax machines and four printers to a customer. He used his calculator to get the total amount due from this customer in the following way:

| Keystrokes                         | Display  | Description  |
|------------------------------------|----------|--|
| Clear all memory.                  |          |  |
| 1. 1200 <span>STO</span> 1         | 1,200.00 | Stores the price of the fax machine in memory location 1.              |
| 2. 1000 <span>STO</span> 2         | 1,000.00 | Stores the price of the printer in memory location 2.                  |
| 3. <span>ON/OFF</span>             |          | Turns the calculator off.  |
| Later that day:                    |          |  |
| 4. <span>ON/OFF</span>             | 0.00     | After the sale, Alfred turns the calculator on.                        |
| 5. <span>RCL</span> 1              | 1,200.00 | Recalls the cost of the fax to the display.                            |
| 6. <span>x</span> 3 <span>=</span> | 3,600.00 | Multiplies 1,200 by 3 to calculate the cost of the three fax machines. |
| 7. <span>STO</span> 3              | 3,600.00 | Stores the number in the memory location 3.                            |
|                                    |          | Continued...   |

|     | Keystrokes   | Display  | Description  |
|-----|--|----------|--|
| 8.  | <input type="text" value="RCL"/> 2   | 1,000.00 | Recalls the cost of the printer.   |
| 9.  | <input type="text" value="x"/> 4 <input type="text" value="="/>                                  | 4,000.00 | Calculates cost of four printers.  |
| 10. | <input type="text" value="+"/> <input type="text" value="RCL"/> 3 <input type="text" value="="/> | 7,600.00 | Recalls the cost of fax machines to calculate the total amount for the sale. |

**C. Calculating the present value of a lump sum amount:**

**Example:** Liz anticipates it will cost her \$65,000 to buy a house in eighteen months. How much should she invest today, at an annual interest rate of 15% (interest is compounded monthly), to be able to afford the house in one and a half years?

|    | Keystrokes  | Display           | Description   |
|----|---|-------------------|---|
|    | Clear all memory.   |                   |   |
| 1. | <input type="text" value="2nd"/> <input type="text" value="CLRTVM"/>                                    | 0.00              | Clears Time-Value-of-Money worksheet.   |
| 2. | <input type="text" value="2nd"/> <input type="text" value="P/Y"/> 12 <input type="text" value="ENTER"/> | P/Y=12.00         | Sets number of payments per year to 12.   |
| 3. | <input type="text" value="2nd"/> <input type="text" value="QUIT"/>                                      | 0.00              | Brings the calculator to the standard mode.   |
| 4. | 65000 <input type="text" value="FV"/>   | FV=65,000.00      | Records the future cash flow of \$65,000.   |
| 5. | 15 <input type="text" value="I/Y"/>   | I/Y=15.00         | Records the periodic rate of interest as 15%.   |
| 6. | 1.5 <input type="text" value="2nd"/> <input type="text" value="xP/Y"/>                                  | 18.00             | Calculates the number of time periods as 18.  |
| 7. | <input type="text" value="N"/>  | N=18.00           | Stores the number of time periods.  |
| 8. | <input type="text" value="CPT"/> <input type="text" value="PV"/>  | PV=<br>-51,975.99 | Calculates the present value of \$65000 in 1.5 years discounted at a monthly rate of 1.25%. |

Note: The display in step 8 has a negative sign because it represents a cash outflow (investment) today.

**D. Calculating the future value of a lump sum amount:**

**Example:** If John invests \$1,850 today in an asset earning a 10% rate of return (compounded annually), how much will he have after two years?

| Keystrokes  | Display      | Description  |
|---|--------------|--|
| Clear all memory.   |              |  |
| 1. <input type="button" value="2nd"/> <input type="button" value="CLRTVM"/>                                     | 0.00         | Clears Time-Value-of-Money worksheet.                        |
| 2. <input type="button" value="2nd"/> <input type="button" value="P/Y"/> 1 <input type="button" value="ENTER"/> | P/Y=1.00     | Sets number of payments per year to 1.                       |
| 3. <input type="button" value="2nd"/> <input type="button" value="QUIT"/>                                       | 0.00         | Brings the calculator to the standard mode.                  |
| 4. 1850 <input type="button" value="+/-"/> <input type="button" value="PV"/>                                    | PV=-1,850.00 | Records the present cash outflow of \$1,850.                 |
| 5. 10 <input type="button" value="I/Y"/>  | I/Y=10.00    | Stores annual rate of interest as 10%.                       |
| 6. 2 <input type="button" value="N"/>   | N=2.00       | Records number of time periods as 2.                         |
| 7. <input type="button" value="CPT"/> <input type="button" value="FV"/>   | FV=2,238.50  | Calculates the future value of \$1,850 after 2 years at 10%. |

*E.(i) Calculating the present value of an annuity:*

**Example:** How much should you invest now so that, starting one year from today, your daughter can receive \$6,000 per year for the next five years? Assume the discount rate is 15%.

| Keystrokes  | Display       | Description                                  |
|---|---------------|--|
| Clear all memory.   |               |  |
| 1. <input type="button" value="2nd"/> <input type="button" value="CLRTVM"/>                                     | 0.00          | Clears Time-Value-of-Money worksheet.        |
| 2. <input type="button" value="2nd"/> <input type="button" value="P/Y"/> 1 <input type="button" value="ENTER"/> | P/Y=1.00      | Sets number of payments per year to 1.       |
| 3. <input type="button" value="2nd"/> <input type="button" value="QUIT"/>                                       | 0.00          | Brings the calculator to the standard mode.  |
| 4. 6000 <input type="button" value="PMT"/>  | PMT=6,000.00  | Records the amount of the periodic payments. |
| 5. 15 <input type="button" value="I/Y"/>  | I/Y=15.00     | Records annual rate of interest as 15%.      |
| 6. 5 <input type="button" value="N"/>   | N=5.00        | Records number of time periods as 5.         |
| 7. <input type="button" value="CPT"/> <input type="button" value="PV"/>   | PV=-20.112.93 | Calculates the PV of the annuity.            |

E.(ii) Calculating the present value of an annuity due:

**Example:** In this case, instead of receiving payments at the end of each year, your daughter will receive the payments at the beginning of each year. Therefore, her first payment will be received immediately.

There are two methods to calculate the present value of an annuity due.

1. You can calculate the present value of an annuity, as shown in section E.(i), and multiply it by  $(1 + k)$ . In that case the additional step would be:

| Keystrokes  | Display    | Description                           |
|---|------------|---------------------------------------|
| Follow steps 1-7 from section E.(i)                                   |            |                                       |
| 8. <input type="text" value="x"/> 1.15 <input type="text" value="="/> | -23,129.87 | Calculates the PV of the annuity due. |

2. The TIBAIPLUS allows you to set the timing of the payment. You have to set the payment mode at "BEGIN" and start from the the first step. This method is shown below.

| Keystrokes  | Display           | Description                                       |
|---|-------------------|---|
| Clear all memory.   |                   |   |
| 1. <input type="text" value="2nd"/> <input type="text" value="CLRTVM"/>                                   | 0.00              | Clears Time-Value-of-Money worksheet.             |
| 2. <input type="text" value="2nd"/> <input type="text" value="P/Y"/> 1 <input type="text" value="ENTER"/> | P/Y=1.00          | Sets number of payments per year to 1.            |
| 3. <input type="text" value="2nd"/> <input type="text" value="BGN"/>                                      | END               | Shows the default setting for the payment mode.   |
| 4. <input type="text" value="2nd"/> <input type="text" value="SET"/>                                      | BGN               | Sets the payment mode to beginning of the period. |
| 5. <input type="text" value="2nd"/> <input type="text" value="QUIT"/>                                     | 0.00              | Brings the calculator to the standard mode.       |
| 6. 6000 <input type="text" value="PMT"/>  | PMT=6,000.00      | Records the amount of the periodic payments.      |
| 7. 15 <input type="text" value="I/Y"/>  | I/Y=15.00         | Records annual rate of interest as 15%.           |
| 8. 5 <input type="text" value="N"/>   | N=5.00            | Records number of time periods as 5.              |
| 9. <input type="text" value="CPT"/> <input type="text" value="PV"/>                                       | PV=<br>-23,129.87 | Calculates the PV of the annuity due.             |
| 10. <input type="text" value="2nd"/> <input type="text" value="BGN"/>                                     | BGN               | Invokes the payment mode.                         |
| Continued...  |                   |   |

| Keystrokes |  | Display | Description                                     |
|------------|--|---------|---|
| 11.        | <input type="button" value="2nd"/> <input type="button" value="SET"/>  | END     | Sets the payment mode to the end of the period. |
| 12.        | <input type="button" value="2nd"/> <input type="button" value="QUIT"/> | 0.00    | Brings the calculator to the standard mode.     |

*F.(i) Calculating the future value of an annuity:*

**Example:** You have recently won a lottery for \$10,000. Your winnings will come in five annual payments of \$2,000 each, starting one year from now. If the annual compound rate is 11.4%, how much is the lottery worth at the end of five years?

| Keystrokes        |  | Display      | Description                                 |
|-------------------|--|--------------|---|
| Clear all memory. |  |              |   |
| 1.                | <input type="button" value="2nd"/> <input type="button" value="CLRTVM"/>                                     | 0.00         | Clears Time-Value-of-Money worksheet.       |
| 2.                | <input type="button" value="2nd"/> <input type="button" value="P/Y"/> 1 <input type="button" value="ENTER"/> | P/Y=1.00     | Sets number of payments per year to 1.      |
| 3.                | <input type="button" value="2nd"/> <input type="button" value="QUIT"/>                                       | 0.00         | Brings the calculator to the standard mode. |
| 4.                | 2000 <input type="button" value="PMT"/>  | PMT=2,000.00 | Records the amount of periodic payments.    |
| 5.                | 11.4 <input type="button" value="I/Y"/>  | I/Y=11.40    | Records the annual compound rate as 11.4%.  |
| 6.                | 5 <input type="button" value="N"/>   | N=5.00       | Records the number of time periods as 5.    |
| 7.                | <input type="button" value="CPT"/> <input type="button" value="FV"/> <input type="button" value="+/-"/>      | 12,555.07    | Calculates FV of the annuity.               |

*F.(ii) Calculating the future value of an annuity due:*

**Example:** In this case, your winnings will be paid at the beginning, instead of at the end, of each year for five years. So, you are going to get the first payment of your \$10,000 lottery, i.e. \$2,000, immediately!

There are two methods to calculate the future value of an annuity due.

1. You can calculate the future value of an annuity, as shown in section F.(i), and multiply it by  $(1 + k)$ . In that case the additional step would be:

| Keystrokes   | Display   | Description                           |
|--|-----------|---------------------------------------|
| Follow steps 1-7 from section F.(i)  |           |                                       |
| 8. <span style="border: 1px solid black; padding: 2px 10px;">x</span> 1.114 <span style="border: 1px solid black; padding: 2px 10px;">=</span> | 13,986.35 | Calculates the FV of the annuity due. |

2. The TIBAIPLUS allows you to set the timing of the payment. You have to set the payment mode at "BEGIN" and start from the the first step. This method is shown below.

| Keystrokes  | Display      | Description                                       |
|---|--------------|---|
| Clear all memory.   |              |   |
| 1. <span style="border: 1px solid black; padding: 2px 10px;">2nd</span> <span style="border: 1px solid black; padding: 2px 10px;">CLRTVM</span>   | 0.00         | Clears Time-Value-of-Money worksheet.             |
| 2. <span style="border: 1px solid black; padding: 2px 10px;">2nd</span> <span style="border: 1px solid black; padding: 2px 10px;">P/Y</span> 1 <span style="border: 1px solid black; padding: 2px 10px;">ENTER</span> | P/Y=1.00     | Sets number of payments per year to 1.            |
| 3. <span style="border: 1px solid black; padding: 2px 10px;">2nd</span> <span style="border: 1px solid black; padding: 2px 10px;">BGN</span>  | END          | Shows the default setting for the payment mode.   |
| 4. <span style="border: 1px solid black; padding: 2px 10px;">2nd</span> <span style="border: 1px solid black; padding: 2px 10px;">SET</span>  | BGN          | Sets the payment mode to beginning of the period. |
| 5. <span style="border: 1px solid black; padding: 2px 10px;">2nd</span> <span style="border: 1px solid black; padding: 2px 10px;">QUIT</span>   | 0.00         | Brings the calculator to the standard mode.       |
| 6.    2000 <span style="border: 1px solid black; padding: 2px 10px;">PMT</span>   | PMT=2,000.00 | Records the amount of the periodic payment.       |
| 7.    11.4 <span style="border: 1px solid black; padding: 2px 10px;">I/Y</span>   | I/Y=11.40    | Records annual rate of interest as 11.4%.         |
| 8.    5 <span style="border: 1px solid black; padding: 2px 10px;">N</span>  | N=5.00       | Records number of time periods as 5.              |
| 9. <span style="border: 1px solid black; padding: 2px 10px;">CPT</span> <span style="border: 1px solid black; padding: 2px 10px;">FV</span> <span style="border: 1px solid black; padding: 2px 10px;">+/-</span>      | 13,986.35    | Calculates the FV of an annuity due.              |
| 10. <span style="border: 1px solid black; padding: 2px 10px;">2nd</span> <span style="border: 1px solid black; padding: 2px 10px;">BGN</span>   | BGN          | Invokes the payment mode.                         |
| 11. <span style="border: 1px solid black; padding: 2px 10px;">2nd</span> <span style="border: 1px solid black; padding: 2px 10px;">SET</span>   | END          | Sets the payment mode to the end of the period.   |
| 12. <span style="border: 1px solid black; padding: 2px 10px;">2nd</span> <span style="border: 1px solid black; padding: 2px 10px;">QUIT</span>  | 0.00         | Brings the calculator to the standard mode.       |

G. Calculating the net present value of an annuity:

**Example:** Jane thinks if she invests \$80,000 by buying property today, she can get \$15,000 in rent from it for each of the next twenty years (the rent will be paid quarterly). If she wants a rate of return of 12% (with quarterly discounting) on her investment, what is the net present value of this project?

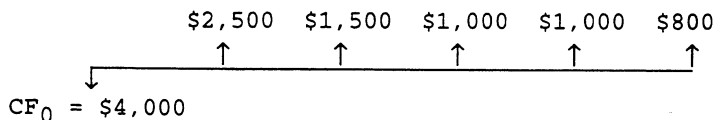
- (i) The annual rate of return will be divided by four, i.e., the quarterly rate of return will be 3%.
- (ii) The number of time periods will be multiplied by four, i.e., 80.
- (iii) The amount of annual rent will be divided by four, i.e., \$3,750.

| Keystrokes        |       |         |           | Display                         | Description  |
|-------------------|-------|---------|-----------|---------------------------------|--|
| Clear all memory. |       |         |           |                                 |  |
| 1.                | 2nd   | CLRWork |           | 0.00                            | Clears the Cash Flow worksheet.                              |
| 2.                | 2nd   | Reset   | ENTER     | RST 0.00                        | Resets all variables to zero.                                |
| 3.                | CF    | 80000   | +/-       | CF <sub>0</sub> -80,000         | Inputs initial cash outflow.                                 |
| 4.                | ENTER |         |           | CF <sub>0</sub> =<br>-80,000.00 | Stores initial cash outflow.                                 |
| 5.                | ↓     | 15000   | ÷         | C01<br>15,000.00                | Calculates periodic cash inflows.                            |
| 6.                | 4     | ENTER   |           | C01=<br>3,750.00                | Stores quarterly cash inflow amount.                         |
| 7.                | ↓     | 20      | x 4 ENTER | F01=80.00                       | Stores the number of times the quarterly cash inflow occurs. |
| 8.                | NPV   | 12      | ÷ 4 ENTER | I=3.00                          | Stores the quarterly interest rate as 3%.                    |
| 9.                | ↓     | CPT     |           | NPV=<br>33,252.86               | Calculates the net present value of the investment.          |

#### H. Calculating the net present value of a series of uneven cash flows:

TIBAIPLUS can store 24 cash flow groups, besides the initial cash investment. A cash flow group comprises the cash flow amount and the number of times it repeats consecutively in the cash flow series. Each cash flow group can have up to 9,999 cash flows i.e., the maximum value of Fnn (the frequency of consecutive cash flows in one group) can be 9,999.

**Example:** Beth is planning to buy a Pentium based PC for rental purposes. She has calculated that her expected cash flows from the investment for the next five years would be as shown below.



If she has to pay an annual interest rate of 9.75%, should she buy the computer?



| Keystrokes        |       |         |       | Display                        | Description   |
|-------------------|-------|---------|-------|--------------------------------|---|
| Clear all memory. |       |         |       |                                |   |
| 1.                | 2nd   | CLRWork |       | 0.00                           | Clears the Cash Flow worksheet.                                 |
| 2.                | 2nd   | Reset   | ENTER | RST 0.00                       | Resets all variables to zero.                                   |
| 3.                | CF    | 4000    | +/-   | CF <sub>0</sub> -4,000         | Inputs initial cash outflow.                                    |
| 4.                | ENTER |         |       | CF <sub>0</sub> =<br>-4,000.00 | Stores initial cash outflow.                                    |
| 5.                | ↓     | 2500    | ENTER | C01=2,500.00                   | Stores the first cash inflow.                                   |
| 6.                | ↓     |         |       | F01 = 1.00                     | Records that cash inflow of \$2,500 occurs once.                |
| 7.                | ↓     | 1500    | ENTER | C02=<br>1,500.00               | Stores the second cash inflow.                                  |
| 8.                | ↓     |         |       | F02 = 1.00                     | Records that cash inflow of \$1,500 occurs once.                |
| 9.                | ↓     | 1000    | ENTER | C03=<br>1,000.00               | Stores the third cash inflow.                                   |
| 10.               | ↓     | 2       | ENTER | F03=2.00                       | Stores the number of times that cash inflow of \$1,000 repeats. |
| 11.               | ↓     | 800     | ENTER | C04=800.00                     | Stores the fifth cash inflow.                                   |
| 12.               | NPV   | 9.75    | ENTER | I=9.75                         | Stores the annual interest rate as 9.75%.                       |
| 13.               | ↓     | CPT     |       | NPV=<br>1,471.37               | Calculates the net present value of the investment.             |

*I. Calculating the internal rate of return of an annuity:*

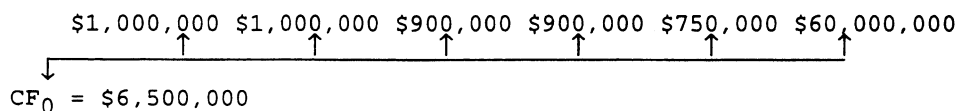
**Example:** ABC Inc. is planning to spend \$35,000 to buy a warehouse. Under the contract, they will receive an after-tax cash flow of \$6,000 (paid semiannually) from the property for the next eight years. What is the internal rate of return for the investment?

| Keystrokes        |     |         | Display | Description                     |
|-------------------|-----|---------|---------|---------------------------------|
| Clear all memory. |     |         |         |                                 |
| 1.                | 2nd | CLRWork | 0.00    | Clears the Cash Flow worksheet. |
|                   |     |         |         | Continued...                    |


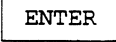



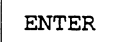

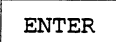

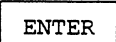




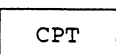
| Keystrokes |                                      |                                      |                                       | Display              | Description                                    |
|------------|--------------------------------------|--------------------------------------|---------------------------------------|----------------------|--|
| 2.         | <input type="button" value="2nd"/>   | <input type="button" value="Reset"/> | <input type="button" value="ENTER"/>  | RST 0.00             | Resets all variables to zero.                  |
| 3.         | <input type="button" value="CF"/>    | 35000                                | <input type="button" value="+/-"/>    | $C_0$<br>-35,000.00  | Change sign to show cash outflow.              |
| 4.         | <input type="button" value="ENTER"/> |                                      |                                       | $CF_0$<br>-35,000.00 | Stores initial cash investment.                |
| 5.         | <input type="button" value="↓"/>     | 6000                                 | <input type="button" value="÷"/>      | $C_{01}$ 6,000.00    | Computes semi-annual cash inflow.              |
| 6.         | 2                                    | <input type="button" value="ENTER"/> |                                       | $C_{01}$ =3,000.00   | Stores semi-annual cash inflow.                |
| 7.         | <input type="button" value="↓"/>     | 8                                    | <input type="button" value="x"/>      | $F_{01}$ 8.00        | Calculate the total number of time periods.    |
| 8.         | 2                                    | <input type="button" value="ENTER"/> |                                       | $F_{01}$ =16.00      | Store total number of time periods.            |
| 9.         | <input type="button" value="IRR"/>   | <input type="button" value="CPT"/>   |                                       | IRR=3.98             | Calculates semi-annual IRR of this investment. |
| 10.        | <input type="button" value="x"/>     | 2                                    | <input "="" type="button" value="="/> | IRR 7.97             | Calculates annual IRR of this investment.      |

*J. Calculating the internal rate of return of a series of uneven cash flows:*

**Example:** Healthtime has the opportunity to make an investment that requires an initial cash outflow of \$6,500,000. The estimated cash inflows from the project for the next 6 years are shown below. What is the IRR on this investment?







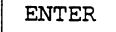

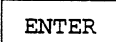

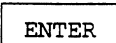

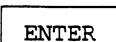
| Keystrokes        |                                      |  |                                      | Display                 | Description                       |
|-------------------|--------------------------------------|--|--------------------------------------|-------------------------|-----------------------------------|
| Clear all memory. |                                      |  |                                      |                         |                                   |
| 1.                | <input type="button" value="2nd"/>   | <input type="button" value="CLRWork"/> |                                      | 0.00                    | Clears the Cash Flow worksheet.   |
| 2.                | <input type="button" value="2nd"/>   | <input type="button" value="Reset"/>   | <input type="button" value="ENTER"/> | RST 0.00                | Resets all variables to zero.     |
| 3.                | <input type="button" value="CF"/>    | 6500000                                | <input type="button" value="+/-"/>   | $CF_0$<br>-6,500,000.00 | Change sign to show cash outflow. |
| 4.                | <input type="button" value="ENTER"/> |  |                                      | $CF_0$<br>-6,500,000.00 | Stores initial cash investment.   |
| Continued...      |                                      |  |                                      |                         |                                   |

| Keystrokes |   |   |   | Display               | Description  |
|------------|---|---|---|-----------------------|--|
| 5.         |  | 1000000   |  | C01=<br>1,000,000.00  | Stores first cash inflow.                            |
| 6.         |  | 2   |  | F01=2.00              | Records that cash inflow of \$1,000,000 occurs twice |
| 7.         |  | 900000  |  | C02=<br>900,000.00    | Stores second cash flow amount.                      |
| 8.         |  | 2   |  | F02=2.00              | Records that cash inflow of \$900,000 occurs twice.  |
| 9.         |  | 750000  |  | C03=<br>750,000.00    | Stores third cash flow amount.                       |
| 10.        |  |   |   | F03=1.00              | Shows that cash flow of \$750,000 occurs once.       |
| 11.        |  | 60000000  |  | C04=<br>60,000,000.00 | Stores final cash inflow of \$60,000,000.            |
| 12.        |  |  |   | IRR=51.88             | Calculates IRR of this investment.                   |

K. *Bond valuation with interest compounded annually:*

**Example:** How much would you be willing to pay for a bond today if it pays \$100 in interest annually for 20 years (starting next year), and has a principal payment of \$1,000? The yield to maturity is 15%.

This question can be interpreted as that of finding the NPV of an uneven cash flow series, with the initial cash outflow equal to zero. Hence, we will follow the steps used for calculating NPV to compute the current price of the bond.

| Keystrokes        |   |   |   | Display               | Description  |
|-------------------|---|---|---|-----------------------|--|
| Clear all memory. |   |   |   |                       |  |
| 1.                |  |  |   | 0.00                  | Clears the Cash Flow worksheet.                    |
| 2.                |  |  |  | RST 0.00              | Resets all variables to zero.                      |
| 3.                |  | 0   |  | CF <sub>0</sub> =0.00 | Inputs initial cash outflow as zero.               |
| 4.                |  | 100   |  | C01=100.00            | Stores the first cash inflow.                      |
| 5.                |  | 19  |  | F01=19.00             | Records that cash inflow of \$100 occurs 19 times. |
| Continued...      |   |   |   |                       |  |

| Keystrokes |                                    |                                    |                                      | Display      | Description                               |
|------------|------------------------------------|------------------------------------|--------------------------------------|--------------|---|
| 6.         | <input type="button" value="↓"/>   | 1100                               | <input type="button" value="ENTER"/> | C02=1,100.00 | Stores the final cash inflow.             |
| 7.         | <input type="button" value="NPV"/> | 15                                 | <input type="button" value="ENTER"/> | I=15.00      | Stores the annual discount rate as 15%.   |
| 8.         | <input type="button" value="↓"/>   | <input type="button" value="CPT"/> |                                      | NPV=687.03   | Calculates the initial price of the bond. |

**L. Bond valuation with interest compounded semiannually:**

Since most bonds pay interest semiannually, we will show the conversion required to calculate the current value of such bonds.

**Example:** If the bond described in section K pays interest semiannually, the calculations will be:

$$I_t = \$50, \quad P_n = \$1000, \quad i = 7.5\%, \quad n = 40.$$

| Keystrokes        |                                    |  |  | Display               | Description   |
|-------------------|------------------------------------|--|--|-----------------------|---|
| Clear all memory. |                                    |  |  |                       |   |
| 1.                | <input type="button" value="2nd"/> | <input type="button" value="CLRWork"/> |  | 0.00                  | Clears the Cash Flow worksheet.                                       |
| 2.                | <input type="button" value="2nd"/> | <input type="button" value="Reset"/>   | <input type="button" value="ENTER"/>   | RST 0.00              | Resets all variables to zero.   |
| 3.                | <input type="button" value="CF"/>  | 0                                      | <input type="button" value="ENTER"/>   | CF <sub>0</sub> =0.00 | Inputs initial cash outflow as zero.                                  |
| 4.                | <input type="button" value="↓"/>   | 100                                    | <input type="button" value="÷"/>       | C01 100.00            | Calculates the semiannual interest payment.                           |
| 5.                | 2                                  | <input type="button" value="ENTER"/>   |  | C01=50.00             | Stores the semiannual interest payment as \$50.                       |
| 6.                | <input type="button" value="↓"/>   | 20                                     | <input type="button" value="x"/>       | F01 20.00             | Calculates the number of periods when cash inflow of \$50 will occur. |
| 7.                | 2                                  | <input type="button" value="-"/>       | 1 <input type="button" value="ENTER"/> | F01=39.00             | Stores the number of interest periods.                                |
| 8.                | <input type="button" value="↓"/>   | 1050                                   | <input type="button" value="ENTER"/>   | C02=1,050.00          | Stores the final cash inflow.   |
| 9.                | <input type="button" value="NPV"/> | 15                                     | <input type="button" value="÷"/>       | I 15.00               | Calculates semiannual discount rate.                                  |
| 10.               | 2                                  | <input type="button" value="ENTER"/>   |  | I=7.50                | Stores semiannual discount rate as 7.5%.                              |
| 11.               | <input type="button" value="↓"/>   | <input type="button" value="CPT"/>     |  | NPV=685.14            | Calculates the initial price of the bond.                             |

**M. Linear Regression:**

In this section we will find the slope and intercept of the given data.

**Example:** Assume the following sales figures have been given to you by your marketing instructor and you have to do a linear regression on them.

| <u>Sales (<math>Y_t</math>)</u> | <u>Period (<math>X_t</math>)</u> |
|---------------------------------|----------------------------------|
| 2.50                            | 1                                |
| 3.56                            | 2                                |
| 4.15                            | 3                                |
| 1.50                            | 4                                |
| 2.05                            | 5                                |

| Keystrokes  | Display  | Description   |
|---|----------|---|
| Clear all memory.   |          |   |
| 1. <input type="button" value="2nd"/> <input type="button" value="Data"/> <input type="button" value="2nd"/> <input type="button" value="CLRWork"/> | X01 0.00 | Clears all data values in the worksheet.            |
| 2. <input type="button" value="2nd"/> <input type="button" value="Stat"/> <input type="button" value="2nd"/> <input type="button" value="CLRWork"/> | LIN      | Clears the statistics worksheet.                    |
| 3. <input type="button" value="2nd"/> <input type="button" value="Reset"/> <input type="button" value="ENTER"/>                                     | RST 0.00 | Clears the statistics calculations methods.         |
| 4. <input type="button" value="2nd"/> <input type="button" value="Data"/>   | X01 0.00 | Selects data entry portion of statistics worksheet. |
| 5. 1 <input type="button" value="ENTER"/>   | X01=1.00 | Enter the first X value.                            |
| 6. <input type="button" value="↓"/> 2.50 <input type="button" value="ENTER"/>   | Y01=2.50 | Enter the first Y value.                            |
| 7. <input type="button" value="↓"/> 2 <input type="button" value="ENTER"/>  | X02=2.00 | Enter the second X value.                           |
| 8. <input type="button" value="↓"/> 3.56 <input type="button" value="ENTER"/>   | Y02=3.56 | Enter the second Y value.                           |
| 9. <input type="button" value="↓"/> 3 <input type="button" value="ENTER"/>  | X03=3.00 | Enter the third X value.                            |
| 10. <input type="button" value="↓"/> 4.15 <input type="button" value="ENTER"/>  | Y03=4.15 | Enter the third Y value.                            |
| 11. <input type="button" value="↓"/> 4 <input type="button" value="ENTER"/>   | X04=4.00 | Enter the fourth X value.                           |
| 12. <input type="button" value="↓"/> 1.50 <input type="button" value="ENTER"/>  | Y04=1.50 | Enter the fourth Y value.                           |
| 13. <input type="button" value="↓"/> 5 <input type="button" value="ENTER"/>   | X05=5.00 | Enter the fifth X value.                            |
|   |          | Continued...  |

| Keystrokes   | Display  | Description   |
|--|----------|---|
| 14. <span>↓</span> 2.05 <span>ENTER</span>   | Y05=2.05 | Enter the fifth Y value.                                  |
| 15. <span>2nd</span> <span>STAT</span>   | LIN      | Selects statistics calculations portion of the worksheet. |
| 16. <span>2nd</span> <span>CLRWork</span>  | LIN      | Clear Worksheet.  |
| 17. <span>↓</span><br>Note: Repeat step 17 until the display shown in the table is obtained. | a=3.64   | Calculates the intercept of the regression equation       |
| 18. <span>↓</span> <span>+/-</span>  | b 0.30   | Calculates the slope of the regression equation.          |

The linear regression equation is  $Y_t = \alpha + \beta X_t = 3.64 + 0.30X_t$ .