Hewlett-Packard 17BII Tutorial

To begin, look at the face of the calculator. Most keys on the 17BII have two functions: a key's primary function is noted in white on the key itself, while the key's secondary function is noted in gold above the key. To use the function on the key, simply press the key. To access the gold function above each key, first press the key with the solid gold face, which we will call the "gold shift" key, and then press the desired function key. (Note that the gold shift key is near the lower left corner of the calculator keyboard.)

Turning the Calculator On and Off

To turn on the calculator, press [CLR].

Note that the ON key is on the lower left corner of the keyboard—the face of the key has a white "CLR," while the word "ON" appears below the key. 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.

To turn the calculator off, press ■ [OFF].

Here we are using the solid black square to represent the gold shift key. Thus, the keystrokes to turn the calculator off are (1) press the gold shift key, and (2) then press the CLR key. Note that the word "OFF" appears above the CLR key in gold. Thus, by pressing the gold shift key first, we are activating the gold function above the CLR key, which is the off function. Also, note that pressing the gold shift key places a little "up arrow" symbol in the upper left corner of the display. Press the gold shift key again and the symbol goes away. The ■ key is a toggle key that switches back and forth between the "regular" and the "gold" functions. ■ is like the typewriter shift key. After you press ■, look only at the gold writing.

Note that the calculator has a continuous memory, so turning it off does not affect any data stored in the calculator.

The Menu System

The HP17BII differs from many calculators in that it uses a menu system. To access the main menu, press ■ [MAIN]. The display shows five menu choices: FIN, BUS, SUM, TIME, and SOLVE. To access one of the menu choices, press the arrowhead key directly below the appropriate choice. To illustrate, press the arrowhead key directly below FIN. (We will designate this operation by [FIN]. Thus, a shaded box means press one of the arrowhead keys rather than one of the regular keys.) Now a new set of menu choices appears. Press [TVM] to get into the time value of money menu. To get back to the main menu, either press ■ [MAIN] or press [EXIT] a number of times until the menu items stop changing.

Clearing the Calculator

To clear the calculator's memory, press ■ [CLEAR DATA].

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 purposely want to save data, but, in general, you will be entering all new data, so starting with a clear memory is the safest approach.

There are three different levels of clearing data:

- ■ [CLEAR DATA] clears all memory and the display.
- [CLR] clears the entire display, but not the memory.
- [»] clears numbers on the display one at a time if you made a mistake entering data.

Changing the Display

To change the number of decimal places from 2 to 4, press [DSP] [FIX] [4] [INPUT]. Now press 5555.5555 [INPUT]. 5,555.5555 is displayed.

Note that the calculator display itself is often used to designate calculator functions. When this occurs, we shade the box as above. To invoke the function displayed, press the arrowhead key directly below the function.

To change from 4 places to 2, press [DSP] [FIX] [2] [INPUT]. Now press 5555.5555 [INPUT]. 5,555.56 is displayed. (Rounding is automatic.)

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 interest rates and rates of return that are entered as decimals.

To control the brightness of the display, hold down [CLR] and press [+] or [-].

Periods per Year Setting

One important setting that can cause problems is the periods per year setting. To check the current setting, first press ■ MAIN to get the main menu, and then press FIN TVM. The display shows the setting for periods/year. The calculator comes pre-set at 12 periods per year, that is, it assumes calculations will be done on a monthly basis. However, the problems in finance textbooks generally use 1 period/year. To change to 1/year:

1) From the main menu, press FIN TVM OTHER 1 P/YR.
2) Return to the main menu by pressing EXIT three times or ■ MAIN.

Time Value of Money (TVM)

To enter the time value of money menu, do the following:

From the main menu, press FIN TVM.

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 have payments, so be sure to either press CLEAR DATA, which sets the payment (PMT) equal to 0, or enter 0 for the PMT. 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 ■ [CLEAR DATA] and enter the following data:

3 [N]

26 [I%YR]

100 [PV]

0 [PMT] (Optional if registers are cleared.)

Next, press [FV] and the future value of -$200.04 is displayed.

The HP is programmed so that if the PV is + then the FV is displayed as - and vice versa, because the HP assumes that one is an inflow and the other is an outflow. If you are entering both PV and FV, one must be entered as negative and the other positive.

Example 2:

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

5 [N]

10 [I%YR]

0 [PMT] (Optional if registers are cleared.)

500 [FV]

Next, press [PV] and the present value of -$310.46 is displayed. Thus, $310.46 will grow to $500 in 5 years at a 10 percent rate.

Example3:

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 [N]

200 [+/-] [PV] (The [+/-] key changes the sign.)

0 [PMT]

1000 [FV]

Next, press [I%YR] and a rate of return of 12.18 percent is displayed.

Remember to press [+/-] to convert the 200 to -200 because the purchase of the bond is a cash outflow!

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

Override the -200 by simply entering 300 [+/-] [PV] and then press [I%YR] 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.

Ordinary Annuities

Now we will use the PMT key, and either the PV or the FV key, depending on whether we want to find the PV or the FV of the annuity.

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?

```
0        1         2         3         4         5
  6%
/))))))))3))))))))3))))))))3))))))))3))))))))1
      -100      -100      -100      -100      -100
```

5 N

6 I%YR

0 PV

100 +/- PMT

Now press the FV 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, then press PV 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 FIN TVM OTHER BEG. The words “BEGIN MODE” appear on the screen. Now the HP analyzes the cash flows based on beginning of period payments. Change back to end mode by pressing END. To get back to the TVM menu press EXIT.

Interest Conversion

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

$$EAR = \left[1 + \frac{k_{Nom}}{m}\right]^{m} - 1.$$

Given: k_{Nom} = 10% and m = 12 payments/year,

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

This formula is fine, however, the calculator can be used to convert the rates much faster.

From the main menu press [FIN] [ICNV] [PER].

Now, enter 12 and then press [P] to compound 12 times per year.

To enter 10 percent as the nominal rate, press 10 [NOM %].

Now, to determine the effective rate simply press [EFF %] and 10.47 percent is displayed.

Cash Flow Operations

The HP is useful for finding the PV, FV, and IRR (rate of return) of a series of unequal cash flows.

Example 1: Uneven Cash Flows

Assume the following cash flows:

```
 0  10%   1          2          3          4
/))))))))))3)))))))))3)))))))))3)))))))))1
0        50        100        150        200
```

What is the PV of these CFs? Clear the memory by pressing [CLEAR DATA].

You should also clear any previously entered cash flow lists by pressing [FIN] [CFLO] [CLEAR DATA] [YES].

Now, press [#T?] until "#TIMES PROMPTING: OFF" is displayed because each cash flow is different than the one before it and thus occurs only one time. There is no need for the HP to prompt you for the number of times that a particular cash flow occurs since each one is different than the one before it.

The screen should now display "FLOW(0)=?". Next, enter the following:

0	INPUT	This enters 0 as the cash flow at time 0.
50	INPUT	This enters 50 as the CF_1.
100	INPUT	This enters 100 as the CF_2.
150	INPUT	This enters 150 as the CF_3.
200	INPUT	This enters 200 as the CF_4.

After all the cash flows have been entered, press EXIT to return to the menu. Select CALC and "NPV, NUS, NFV NEED I%" is displayed.

Now enter the 10 percent interest rate by pressing 10 I%.

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

Example 2: Embedded Annuities

Assume the following cash flows, which contain embedded annuities or groups of equal, consecutive cash flows:

```
                0 10% 1     2     3     4     5     6     7     8     9
/)))))))3))))))3))))))3))))))3))))))3))))))3))))))3))))))3))))))
))1
                0    100   100   100   200   200   300   300   300   300
```

What's the PV?

Clear the previously entered cash flow lists by pressing FIN CFLO ■ CLEAR DATA YES from the main menu.

Now enter #T? until "#TIMES PROMPTING: ON" is displayed. After each cash flow is entered the calculator will prompt you for the number of times that cash flow occurs. This feature saves you from having to enter identical, consecutive cash flows one by one. If each cash flow is different than the one before it (see previous example), then the "#TIMES PROMPTING" can be turned off.

The screen should now display “FLOW(0)=?”.

Next enter the cash flows.

0	INPUT	This enters 0 as CF_0.
100	INPUT	This enters 100 as the CF_1.
3	INPUT	This tells the HP that the \$100 CF occurs three consecutive times.
200	INPUT	This enters 200 as the CF_2.
2	INPUT	This tells the HP that the \$200 CF occurs two consecutive times.
300	INPUT	This enters 300 as the CF_3.
4	INPUT	This tells the HP that the \$300 CF occurs four consecutive times.

After all the cash flows have been entered, press EXIT to return to the menu. Select CALC and "NPV, NUS, NFV NEED I%" is displayed.

Now enter the 10 percent interest rate by pressing 10 I%.

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

Lastly, the > and ? keys can be used to view your cash flow list entries. First, exit to the menu that looks like this:

CALC INSR DELET NAME GET #T?

Then simply use the > and ? keys to view the cash flow entries.

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:

[1]If a negative CF occurs at the end of a project's life, then the HP may give an error message, indicating that there are two IRRs. Enter data, then enter 10 STO IRR to get the first IRR. Then enter a large percentage, such as 100 STO IRR to find the other IRR. You might have to experiment with "guesses" to locate the two IRRs.

```
      0        1        2        3        4
      /))))))))3))))))))3))))))))3))))))))1
  -1000      300      400      200      600
```

What rate of return will we earn?

Clear the previously entered cash flow lists by pressing FIN CFLO ■ CLEAR DATA YES. Now press #T? until the "#TIMES PROMPTING" is turned off.

Now enter the cash flows as follows:

1000 +/- INPUT

300 INPUT

400 INPUT

200 INPUT

600 INPUT

After all the cash flows have been entered, press EXIT to return to the menu. Select CALC and "NPV, NUS, NFV NEED I%" is displayed.

Now enter the 10 percent interest rate by pressing 10 I%.

At this point the HP knows the cash flows, the number of periods, and the interest rate.

To find the IRR, press IRR% to get IRR = 16.71%.

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 I% NPV

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 HP can also be used for several types of statistical calculations.

Mean and Standard Deviation (F)

Year	Sales
1994	$150
1995	95
1996	260

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

The first step is to enter the data into a sum list. From the main menu press SUM.

Clear any previously entered sum lists by next pressing:

CLEAR DATA YES.

"ITEM(1)=?" is displayed.

Enter the sales data into the sum list as follows:

150 INPUT

95 INPUT

260 INPUT

Now press EXIT to return to the menu and then press CALC to display the following menu:

TOTAL MEAN MEDN STDEV RANG MORE

Press MEAN and the mean of $168.33 is displayed.

Press STDEV and the standard deviation of $84.01 is displayed.

Linear Regression

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

Year	Market (k_M)	Stock (k_j)
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

Enter the data as follows.

To clear any previously entered list, from the main menu, press:

[SUM] [■] [CLEAR ALL] [YES].

First we must create two sum lists: one for the x-values and one for the y-values. Each list must have the same number of items.

To create a sum list for the x-values do the following:

Enter the five X variables:

23.8 [INPUT]

7.2 [+/-] [INPUT]

6.6 [INPUT]

20.5 [INPUT]

30.6 [INPUT]

Now we must store this list under a name before we create another sum list for the Y variables. Store the X variable sum list as follows:

[EXIT] [NAME]

The HP now asks you to input a name for the sum list. We will name the list "X" by pressing:

[WXYZ] [X] [INPUT]

Of course you could have named the list any name that sufficiently describes the contents of the list (market return) such as KM or MKRT.

We have just created a sum list names "X", which contains the five X variables.

The display now shows "ITEM(6)=?" but we need to create a sum list for the Y variables starting with Item(1). To create a new sum list for Y, start a new list as follows:

[GET] [*NEW] This tells the HP to start a new sum list.

Now simply enter the Y variables and name the list "Y" just as you did for the X variables above.

Next, press [CALC] [MORE] [FRCST].

At this time, the HP asks you to select the X variable from the lists we created:

Press [X] to select the list named "X" and press [Y] to select the list named "Y" as the Y variable.

Next, we must select the curve-fitting model we want to use by pressing:

[MORE] [MODL] [LIN].

To calculate the curve-fitting results, press

[CORR] Calculates the correlation coefficient, 0.91.

[M] Calculates the slope coefficient, or the beta coefficient, 1.60.

[B] Calculates the Y-intercept, -8.92.

That's all there is to it!

Amortization

The amortization menu calculates the loan balance after payments are made and calculates the amount of the payments applied toward interest and principal.

Example:

Assume a $1,000 loan at 10 percent with annual payments is amortized over 3 years. Create an amortization schedule for this loan.

From the main menu, press FIN TVM OTHER 1 P/YR to set payments/year equal to 1.

Exit to the TVM menu and enter the following:

3	N
10	I%YR
1000	PV

Next, to calculate the payment press PMT and the loan payment of $402.11 is displayed.

Now press OTHER AMRT to enter the amortization menu.

Key in the number of payments for which to calculate the amortization schedule:

1	#P	We entered 1 because we want to determine the principal paid, interest paid, and remaining balance after each payment is made.

Now press:

INT	Displays interest paid in first year: "INTEREST = -100.0".
PRIN	Displays principal paid in first year: "PRINCIPAL = -302.11".
BAL	Displays balance at end of first year: "BALANCE = 697.89".

To calculate the amortization schedule for the second year, press NEXT INT PRIN BAL.

Repeat for the third year.

The amortization table you create should contain these results. If not, try it again.

	Beg. Bal.	Payment	Interest	Princ. Repmt.	Ending Bal.
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