

# 2

## Introduction to Spreadsheet

### Software

An *electronic spreadsheet* is the computerized version of traditional financial modeling tools -- the accountant's columnar pad, pencil and calculator. It is organized into a grid of rows and columns. The power of the electronic spreadsheet is that when you change a value or values, all other related values on the spreadsheet will be automatically recomputed.

Spreadsheets are especially well suited to business applications that involve numerous calculations with pieces of data that are interrelated with each other. The power of electronic spreadsheet software is the ease with which modeling and "what if" analysis can be performed: after a set of mathematical relationships has been constructed, the spreadsheet can be recalculated immediately using a different set of assumptions. As models become more complex, this capability for instant "what-if" analysis becomes even more valuable.

The term *spreadsheet* should be distinguished from the term *worksheet*. A spreadsheet is a set of program instructions (such as Excel), whereas a worksheet is a model or representation for a specific application that is created using the spreadsheet software package. (Excel uses the term workbooks. Individual worksheets are considered part of workbooks similar to the pages in a spiral notebook.)

We now teach you how to use Excel, the leading spreadsheet software package. Each spreadsheet case is followed by tutorials showing you the Excel software skills you will need to solve the case..



### Introduction to Microsoft Excel

An Excel spreadsheet is divided into rows and columns, with each row and each column uniquely labeled. A sample spreadsheet is illustrated in Figure 2-1.

Rows are identified numerically, with values ranging from 1 to a maximum of 65536 in the latest version of Excel. Columns are identified alphabetically, with letters ranging from A to Z and then from AA to AZ, BA to BZ and so on to IV. Excel can accommodate a maximum of 256 columns.

## Cells

The intersection of every column and row is called a *cell*. Each cell represents a unique location on the spreadsheet for storing a piece of data. Cells are identified by their column and row coordinates. For example, the cell located at the intersection of column B and row 8 is called B8. The maximum number of cells on the spreadsheet is equal to the number of rows times the number of columns. In recent versions of Excel, this amounts to nearly 17,000,000 cells.

## Ranges

A rectangular block of cells is termed a *range*. A *range* can be a single cell, a row, a column, or several rows and columns. Many Excel commands are based on ranges. Ranges are identified by naming the cells that bound their diagonally opposite corners, usually those on the upper left and lower right cells. Thus the range occupied by the cells containing NAME, QUIZ, MIDTERM, and FINAL in the following illustration could be identified as either A1:D1 or as D1:A1. Range naming conventions require that you separate the cell addresses that specify the boundaries of the range by a colon or by two periods (e.g., A1:C4 or A1..C4).

Another way to specify a range is to use a *range name*. Naming ranges can be easier than the other ways of specifying a range if you need to specify the same range frequently for different tasks or if the range is very large. For instance, we could name the range D2..D5, which contains the final grades, FINAL. You will learn how to name ranges later on in this book.

When you work with your spreadsheet your cursor will always be positioned on one of its cells. The cell where the cursor is presently located is termed the *current cell*. The current cell can be identified by the *cell pointer*, a rectangular highlight which appears on the cell. You can move the cursor from one cell to another by clicking the mouse pointer on the other cell or by pressing the arrow keys on your PC keyboard and by pressing other keys defined for movement by your spreadsheet software. Pressing the <CTRL-Home> keys together will move the cursor to the upper left most corner of the spreadsheet, cell A1.

## The Excel Screen

At the top of the Excel screen there is a title bar followed by the main menu bar, one or two toolbars (which contains many useful “shortcut” buttons), and a formula bar (or the edit line, which contains the address and contents of the active cell). At the bottom of the screen is the status bar which displays error and status messages or indicators.

The title bar of the Excel window is the line that has the program name (“Microsoft Excel”), the maximize/minimize window buttons and the file name on it. The main menu contains the commands that you use with Excel in the current context. These include commands relating to file handling, editing, formatting, using specialized tools, and using help.

Below the main menu bar are a set of buttons that are shortcuts for many Excel tasks. For example, you can make an entry bold by clicking a button here instead of choosing the **Format-Cells-Font** command and selecting the bold option in the dialog box. These buttons (or icons) can be moved, hidden or customized. When you point to one of the buttons on the toolbars, a ScreenTip appears to explain the function of the button. Familiarize yourself with the Undo and

Redo buttons which can be used to undo (or redo) your last action. (For example, if you deleted a range of cells by mistake and you want to undo your action you could click on the Undo button).

The first item in the formula line is the selection indicator, which displays the name or address of the current selection. The last item on the formula bar is the contents box. When you enter data, such as formulas, numbers, labels and functions, Excel displays the data in the contents box.

Figure 2-1 shows an Excel worksheet screen for a course roster with data entered in range A1..D5.

**Figure 2-1**

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	NAME	QUIZ	MIDTERM	FINAL										
2	James Jackson	77	89	93										
3	Steven Parker	77	71	80										
4	Andrew Reynolds	85	88	90										
5	Joyce Winters	68	75	85										
6														
7														
8														
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The status bar is located at the very bottom of your Excel window. This gives you information about the current selection and tells you what Excel is doing in addition to allowing you to perform certain simple tasks with the mouse.

Also, just before the Status bar is the “sheet-tabs” line where you can see small icons for the different worksheets within the file. An Excel 2000 or Excel 97 file opens with 3 worksheets, and allows you to include many more worksheets per workbook. (Excel 97 allows up to 255 worksheets per workbook and Excel 2000 allows as many worksheets as your computer memory can accommodate.) Multiple worksheets allow you great flexibility when working with large amounts of data.

The Status bar displays the status and mode indicators that contain useful information on the current context in which you are operating the spreadsheet. The mode indicator at the lower left portion of your screen indicates the state or condition under which the spreadsheet software is

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currently operating. Some important mode indicators are READY, indicating Excel is in ready mode, and EDIT, indicating that a cell's contents are being edited.

The status indicator, at the lower right portion of the screen, describes a particular program or key condition. Some important status indicators in Excel are: NUM, indicating the Num Lock is on, SCRL, indicating the Scroll lock is on, and END, indicating that the End key has been pressed and is active.

### Moving Around the Spreadsheet

Usually spreadsheets are too large to be viewed on the screen at once. To view other parts of the spreadsheet you must *scroll* the cell pointer up and down the worksheet or across it using the mouse, the arrow keys and other cursor movement keys. When the cell pointer reaches the edge of the current screen, the screen will shift to follow the cell pointer in the direction it is moving.

Clicking the mouse pointer on any cell makes that the current active cell. At the right and at the bottom of the Excel worksheet window are the vertical scroll bar and the horizontal scroll bar. Clicking on the arrow buttons on these scroll bars moves your window one line up/down or one tab right/left. You can also click on any point inside these scroll bars to scroll faster. For instance, clicking in the middle of the vertical bar (and holding the mouse button down) will move you to the middle of your file.

You can also use the keyboard to navigate around the spreadsheet. When Excel is in READY mode, various keys will behave as follows:

#### Excel Keyboard Pointer-Movement Keys

Key	Function
LEFT ARROW	Moves left 1 cell
RIGHT ARROW	Moves right 1 cell
UP ARROW	Moves up 1 cell
DOWN ARROW	Moves down 1 cell
SHIFT-TAB	Moves left 1 cell
TAB	Moves right 1 cell
PAGE UP	Moves up 1 screen
PAGE DOWN	Moves down 1 screen
CTRL-HOME	Moves to upper left corner
END HOME	Moves to lower right corner of the active area

## **Using the Mouse**

You can use the mouse, like the keyboard, to choose commands, highlight ranges, resize windows and many other tasks. There are some actions that you can do only with a mouse such as using the “shortcut buttons” on the toolbars. Whenever a selection is to be made with the mouse, use the left mouse button (unless you specified left-handed use of the mouse in the Windows Control Panel).

## **Spreadsheet Commands**

Commands are tools provided by spreadsheet software to manipulate the spreadsheet in various ways. For example, there are commands for copying data, formatting your worksheet, or printing your worksheet. Some commands affect the entire worksheet, but others only affect certain cells or groups of cells.

Commands appear in the Main Menu, directly below the title bar. You choose commands from the menu to perform actions in Excel. The commands in the main menu change depending on your current selection. When you open a worksheet the initial commands that appear in the main menu are

***File Edit View Insert Format Tools Data Window Help***

When you choose a command in the main menu a pull-down menu appears listing additional commands you can choose. For example, if you choose “File” from the menu, you see the File pull-down menu from which you can choose “New” to open a new file.

You can choose a command from the menu by clicking with the mouse on the command or by using the arrow keys to select the command and pressing Enter. You can also hit ALT-F to bring up the File pull-down menu. Every command in the menu has a character that is underlined. For example the Format command has “o” underlined. Pressing ALT-O would bring up the Format pull-down menu.

When you choose a command not followed by an “...” (ellipsis) or an arrowhead, Excel performs that command immediately. For example, if you choose “New” under the File pull-down menu Excel opens a new worksheet. However, when you choose “Save As...” under the File pull-down menu, the command is not performed immediately since you need to specify the new file name in the dialog box that comes up.

Pressing ESC at any time you are working with menu commands will return you to the previous command. Pressing ESC as often as necessary will return you to whatever point you wish in the command menus and even bring you out of MENU mode altogether.

## **Setting Up a Worksheet**

Consult with your technical support specialist about how to install and configure Excel for your particular computer system and whether you are allowed to make a backup copy of the program.

To illustrate how spreadsheet software works, we will be developing a simple spreadsheet with which you are very familiar. Let us start by creating a course roster with information on student names and grades for a quiz, midterm, and final exam. The final product will look like Figure 2-1.

Assuming Excel has been properly installed, you can start using it by guiding the mouse pointer over the Start button, clicking on Start, and moving the pointer up the Start menu to Programs. Highlight Programs and then highlight Microsoft Excel. Click once to open the application. (If Excel is not on the Program menu, try looking under Microsoft Office.) Excel will open up with a blank worksheet. You can now start entering data into your worksheet.

### **How to Enter Data into a Worksheet**

The student roster illustrated in Figure 2-1 is a very simple list. You need only enter data about the student's name and grades. No calculations are required. You can start at cell A1 and enter your column headings. Enter NAME in cell A1, QUIZ in B1, MIDTERM in C1, and FINAL in D1.

You enter data into a cell by moving the cell pointer to the cell, typing the entry, and pressing ENTER. The entry appears in the cell as you type.

Each character you type appears in the contents box of the edit line (below the main menu). The cursor indicates where the next character you type will appear. In addition to pressing ENTER, you can complete a cell entry by clicking on another cell or by pressing one of the pointer-movement keys. This will complete the entry and move the cell pointer to another cell as directed by the mouse or the pointer movement key.

You can complete your roster by entering the student names in cells A2 through A5, the quiz grades in cells B2 through B5, the midterm grades in cells C2 through C5, and the final grades in cells D2 through D5.

### **How to Change Column Widths**

You will notice that after you enter the quiz grades in Column B, the student names in Column A become truncated. This occurs because the column widths are at the default width of 8.43 characters, and the names on our list are longer. Since the cells in Column B contain the quiz grades, Excel cuts off the entries in Column A at the right edge of the cells. (However, if the cells to the right of Column A were empty, the entries in Column A would extend into the blank cells in Column B.)

Sometimes pound signs (#####) will appear in a cell containing a numeric value. This happens when the column width is too narrow to accommodate the number of places in the numeric value plus additional punctuation for decimal points, commas, dollar signs, and so forth.

You can make column widths smaller or larger by using the **Format - Column** and then **Width** command. Let us reset the column for student names in our example to 20 positions.

First select the range for which we would like to adjust the column width. You can select a range by first clicking at the center of the cell, and then holding the mouse button down while dragging the mouse pointer to the opposite corner of the range. To select more than one range at a time keep the Control key pressed while selecting the next range. In our example we need to select an entire column which can be done in an easier manner. Every column in the worksheet has column headings just above the first row of the worksheet (the column headings range from A to IV). Clicking on a column heading marks (selects) the entire column. Click on Column A and you will find the whole column highlighted.

Then choose **Format** in the main menu by clicking on it and the Format pull-down menu will appear. Point to **Column** and a sub menu will appear. You have five choices here. You could adjust the column width for the selected range to a certain number of columns. To do this, click Width and then enter the desired width in the **Width** box. You could also select the **Auto Fit Selection** option to adjust the column width so that the widest entry in the column fits exactly. You could hide or unhide the column. You could also change the default width of all the columns in the worksheet. In our example set the width of Column A to 20 characters and click on OK.

### Values and Labels

Excel, like 1-2-3, has two types of cell entries: *values* and *labels*. Values are either numbers, functions or formulae. Labels are used for text entries within your spreadsheet. Labels can't be used in calculations.

As long as there is a letter in the cell Excel will consider the entry as a label, even if the entry begins with a numerical character. The entry will always be treated as a value if the beginning character is one of the following:

= + - \$

Position the cell pointer on the student name Steven Parker. Then position it on the column heading NAME. You will notice that the contents box in the edit line displays Steven Parker or NAME. Any cell containing a letter is considered a label. The entries could be aligned left, right or center, but labels are left-aligned by default.

### Justifying Labels

You can right-justify the labels above the grades by selecting them and clicking the align right button or center justify them by clicking the center button. Alternatively, you can use the **Format - Cells** command to align a selected range of labels. In the dialog box that appears you can specify the alignment and the range.

### Numbers in Excel

In Excel a number can contain a maximum of 240 characters, cannot contain spaces and is limited to only one decimal point. (You can change the cell formats for displaying a number, which will be discussed later.) A number can be entered in scientific notation, or can end with % to indicate percentage. When a number ends with a percent sign, Excel will divide the number that precedes the sign by 100.

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Let us review the student roster you've entered. At this point, the labels will all be right-justified except for NAME and the numbers will be right-justified as well. The width of column A will be 20 characters and that of the rest of the columns will remain at the default value of 8.43 characters. The worksheet will look like Figure 2-1.

### **How to Edit Data**

You can edit a cell entry in either of two ways:

1. You can enter data into a cell that already contains information using the same procedure for entering data into an empty cell. This will cause the new data to replace the earlier entry.
2. You can also use the F2 (Edit) key to edit data in a cell. Position the cursor on the cell you wish to edit and press the F2 key. This will switch Excel into EDIT mode. The easier way to switch into the EDIT mode is to click the mouse button inside the Contents Box on the edit line (where the contents of an active cell appear).

### **Erasing Worksheet Data**

The **Cut** button (below the main menu), symbolized by a pair of scissors, is a useful shortcut (for **Edit-Cut**) to delete data. If you want to delete data in a particular cell, click the mouse in the cell (in order to make that cell the “active cell”) and either click on the Cut button or hit the Delete key.

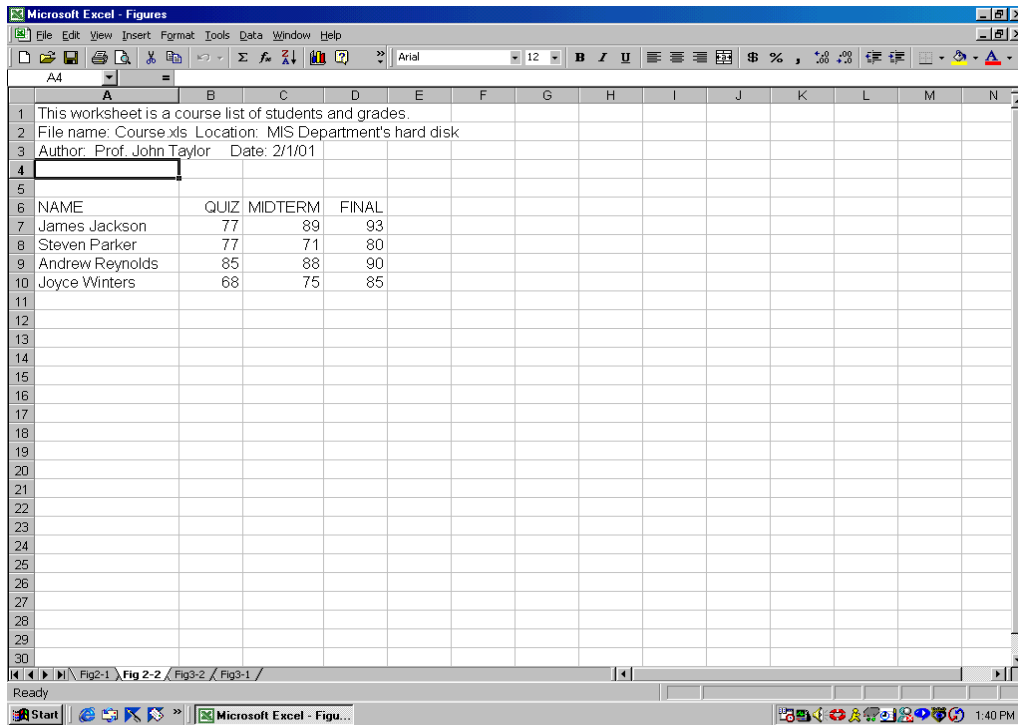
If you want to delete an entire range of cells you would first have to mark (or select) the range that you want to delete. If the range you want to delete is A1..B2 (4 cells), click inside A1, hold the mouse button down and drag the mouse pointer to B2. This procedure highlights the range selected. Once the range is selected you can hit the Delete key or click on the Cut button to erase the contents of the cells in the marked range.

### **Moving Data**

It is a good idea to document each worksheet you create. Figure 2-2 illustrates how the worksheet we just created could be documented. The cell A1 explains the purpose of the worksheet. Cell A2 provides the name and location of the worksheet file. Cell A3 identifies the author of the worksheet and the date it was created.

**Figure 2-2**





We need to make room for this documentation at the top of the worksheet by moving the worksheet down five rows. To do this, first highlight the range A1..D5 using the mouse. Choose **Edit-Cut** from the main menu. This will delete the selected range (but save the contents in the Clipboard so that it can be pasted elsewhere using the Paste command). Then click in cell A6 (which is where you want the upper-left corner of your selected range to be) and choose **Edit-Paste**.

You could equivalently use the shortcut buttons to make the task simpler. After highlighting the range A1..D5 click on the “Cut” button. Then click inside the cell A6 and click on the “Paste” button.

Another method of inserting rows is to use the main menu. First highlight the number of rows you would like to insert and then from the menu bar choose **Insert - Rows**. For instance, if you want to insert three rows at the beginning of your worksheet you could select the first three rows using the mouse and choose **Insert -Rows**. Similarly if columns needed to be inserted, the same procedure could be repeated using the **Columns** command from the **Insert** menu.

Once you have moved the worksheet down, you can enter the documentation in cells A1..A3 so that your worksheet looks like Figure 2-2. Note that the contents of these cells seem to extend into the blank cells in Columns B through F because the cells to the right of A1..A3 are empty.

## How to Save Files

You will learn more about formatting and organizing the worksheet in the case problems. Let's save the practice worksheet for future use. To save a file, you must use the **File-Save** command. This command will make an exact copy of your worksheet on disk, including any special formats and settings you have specified.

First, click your mouse button on **File** in the main command menu. A pull-down menu will appear, on which you click on **Save**. If this is the first time that you are working on this file and saving it, Excel will provide a default filename (book1.xls) in the **File name** box. You can click inside this box, delete the default name and type in a name (such as "Course") that you choose for the worksheet. The "Save in" box indicates the drive and folder in which Excel will store the file. (The drive and folder are established during configuration but they can be changed.) You can change the folder in which you want to save the file by clicking the "Save in" list arrow.

Enter the name you have assigned to your worksheet file in the **File name** box and click on **Save**. Let's call the worksheet Course. Windows 98 supports file names of up to 255 characters. The file name can contain uppercase or lowercase letters, numbers, and most symbols. When you a file name, Excel will automatically assign a three character extension, depending on the type of file. (Recent versions of Excel use the extension .xls for an Excel workbook.) You could choose to save the file in other formats (including Web page format) using the **File - Save As - Save as type** commands.

Be sure to save Course.xls. after you use it for a tutorial. You can save it under the same name after each tutorial session. Most of the changes you make to your worksheet during a tutorial will be required by subsequent sessions. Follow tutorial instructions to determine what changes to your worksheet must be saved or erased.

### Ending Your Excel Session

To exit Excel, choose **FILE-EXIT** in the main command menu. It is a good practice to save all your files and Close them before quitting. If you had not saved a file, Excel brings up a dialog box that asks you whether you want to save the file. Click on **YES** to save the file or on **NO** to lose the changes and exit. Clicking on **CANCEL** takes you back into Excel in the **READY** mode.

## Spreadsheet Design Principles

Like any helpful tool, Excel worksheets can be abused and misused, especially if worksheets are carelessly built, poorly documented, and based on false assumptions. These problems can be minimized by following a few basic principles of spreadsheet design that have emerged over the last decade.

A vertical five-section structure can produce more accurate and more easily understood spreadsheets. The five section are: documentation, assumptions, input, calculations, and macros. These sections are illustrated in Figure 2-5.

The first section contains *documentation*--a complete description of the name, author, and purpose of the worksheet. In general, you should try to keep the description simple, and to the point. The first line of documentation section shows the purpose of the worksheet: to display three-year sales projections for EBZ Toy Company.

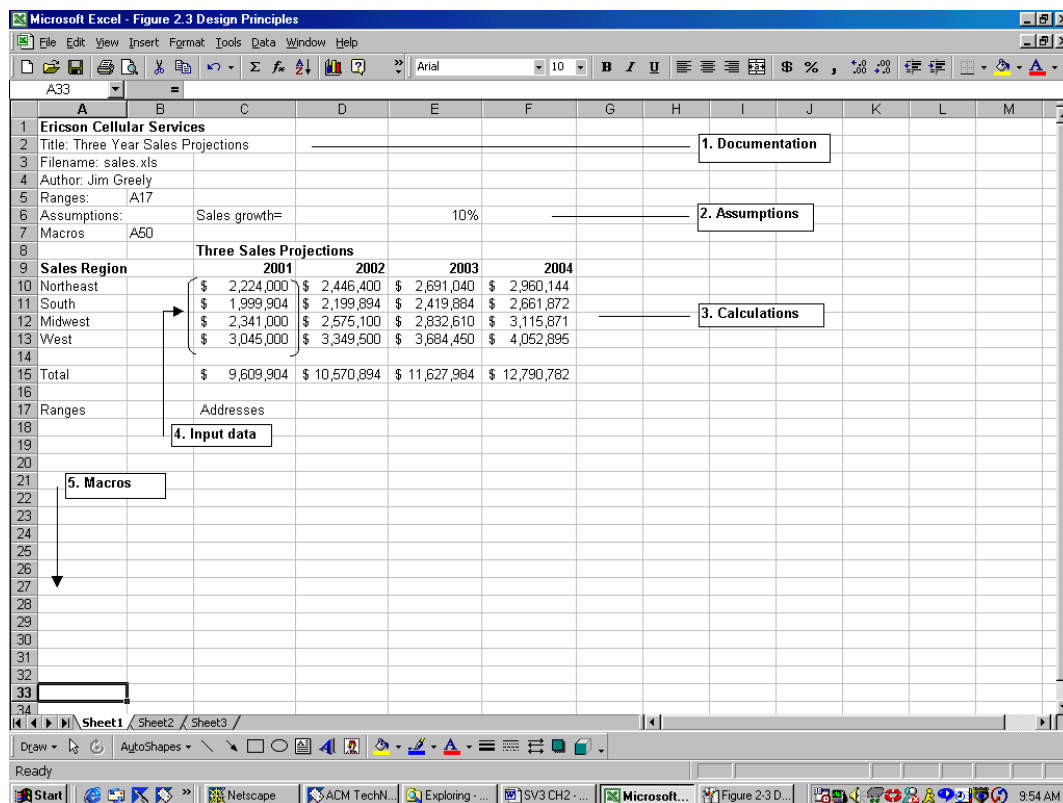
The second line of the documentation section shows the worksheet file name and identifies where the worksheet is located in the firm's computer systems. Generally, spreadsheets will either be stored on a network or the hard disk of a specific machine.

The third line of documentation identifies the author of the worksheet and the date the worksheet was created.

The fourth line of the documentation shows where any table of range (block) names and any strings of commands called "macros" are located. A macro is a set of instructions for automating spreadsheet tasks and consists of a series of keystrokes. The documentation shows that the upper left corner of the macro area for this worksheet starts in cell F28.

The second section in a spreadsheet is reserved for *assumptions*. Assumptions are variable factors that may change in a worksheet. It is important the basic assumptions used to create the output are clearly identified. In our sample application, we are assuming an annual sales growth figure of 10%. This could of course change and assumptions are frequently changed in spreadsheets to test various "what-if" conditions. For instance, the results of this worksheet will be different if we change the assumption for annual sales growth to 5% or to 15%. By isolating the assumptions in a specific section, it is very easy to change the spreadsheet as conditions change.

Figure 2-5



The third section is the *input* section. The input data are the raw data which must be supplied to the worksheet so that they can be manipulated to produce the required results. In the spreadsheet application illustrated here, the data consist of the names of the sales regions and actual sales figures for 2001.

The fourth section is the *calculations* section. The calculations section presents the final output of the spreadsheet, the result of calculations performed on the raw input data. The calculations are the projected sales for 1992-1993 and the total sales for each year. Calculations are usually placed to the right of or below the input data.

The fifth section is the *macro* section. The macro section is the area of the worksheet for storing macros and their documentation. Macros should be located below and to the left of the current worksheet in a portion of the worksheet that will not be affected by changes made to the rest of the worksheet. Usually Macros are placed on the left margin of the spreadsheet. That way, macros are unlikely to be affected by having data copied or moved or by having columns inserted or deleted. The macros in the worksheet illustrated here print and save the worksheet automatically.

The worksheet files on your data disk are designed to encourage you to use these spreadsheet design principles. The first four lines of each worksheet file are reserved for documentation. The *Solve it!* worksheet files provide much of the data for the input section of the worksheet. You will then complete the input and calculation sections of the worksheet to develop the solution for the spreadsheet case. If required by the problem, you can add an assumptions section by inserting rows above the input section or by moving the input section down several rows. Spreadsheet Case 10 will teach you how to set up a worksheet with a macro section.