CHAPTER

1 INTRODUCTION TO MS EXCEL AS AN AUDIT TOOL

LEARNING OBJECTIVES

- Learn how auditors and MS Excel go together.
- Be aware about the need for MS Excel felt by an organisation
- Learn how data for audit should be obtained
- Know about the key capabilities of MS Excel

1.1 Introduction

Microsoft Excel is one of the most widely used softwares in the world. Lakhs of people around the globe use Microsoft Excel. People use excel for a variety of purposes. Primarily, it is used for all sorts of data processing and calculations. Excel is indispensable and has become life blood of modern commerce.

1.2 Auditors and MS Excel

The discipline of Auditing is not an exception to the phenomenon as described above. As auditors, we live and breathe Microsoft Excel. A lot of dedicated softwares are nowadays available for Auditing. Nevertheless, MS Excel is still the favorite of many and most. Hence, the more we try to learn excel, the sharper will be our audit reports.

1.3 Need for MS Excel

Originally released in 1985, Microsoft Excel is today the most popular spreadsheet program in the world. No business can imagine working without excel. It has become most essential in many departments like:

1. Accounting and Finance

Excel is indispensable in accounting and finance because of its ability to automate calculations. Complex formulas can be built in excel which can perform tedious calculations. Tricky items like accrual of compound interest, depreciation, retirement benefits, net income after adjusting the gross for expenses etc. can be calculated quite effortlessly in excel.

2. Marketing

MS Excel is required by marketing persons for doing their marketing efforts. Product pricing is done by making calculations through excel. Customers data may be maintained in excel. Charts and other visual tools in excel are used by marketing managers to deliver their ideas more effectively.

3. Purchase

This department generates prime cost which is generally a significant portion of the total cost. Therefore, purchase department personnel try to exercise strong control over costs. For this, they make meticulous calculations using excel.

4. Production

Excel is required by the production department to keep track of their production activities. It needs to calculate how much to produce based on production budgets. These budgets may be prepared using excel.

5. Human Resources

HR Managers need to keep track of employee related data. They need to calculate employee salaries, incentives, retirement benefits, leave calculations etc. There may be dedicated softwares for this. However, they can also be calculated using excel. In fact, excel makes customized calculations possible.

6. Administration

The whole organization revolves around this department. All the decisions are made by general managers and their implementation is done by the other departments. Admin department is the brain of an organization. Needless to say, these managers depend upon quality information for their decision making. This information flows to them through a Management Information System (MIS). Today, despite other dedicated softwares, MS Excel is still most popular software for MIS. Indeed, MIS as a system cannot function well if excel is not provided.

Thus, we can see that an organization heavily depends upon excel for its effective functioning. Excel is totally indispensable for today's organisations, be it large or small.

1.4 Obtaining Audit Data

When an auditor tries to perform his auditing function, he has to inevitably work upon data. Such data he needs to obtain from the auditee's records. Nowadays we have modern database systems which hold the auditee's records. These records can be exported to excel. Sometimes, data may also be exported in other formats like text, XML (Extensible Markup Language), CSV (Comma Separated Values) etc. These can be brought to excel pretty easily. Another popular format for exporting data is PDF (Portable Document Format). It is not easy to convert it into excel. We need to make use of converters. There are many converters available in the market. There are also websites which offer PDF to excel conversion. They could either be free or paid. Obviously, the paid converters do a better job than the free ones. So one needs to analyze his requirement and accordingly decide which converter to use.

1.5 Key Steps for Obtaining Audit Data

Broadly, we need to follow the steps given below to obtain the Audit Data:

1. Raise a data Request – We need to raise a request with the auditee to share his data. We need to clearly specify our requirements. This step is very important as any ambiguity in this step will lead to wastage of time and efforts. This request needs to be made to the proper person having the authority to supply such data.

2. Do follow up – If the data is not received within reasonable time, then a follow is needed. We need to issue gentle reminders from time to time to make sure that the data reaches in our hand as soon as possible. If the data reaches late, then we have lesser time to process it and draw our conclusions.

3. Receive the data – In due course, auditee will send the data. We should receive it and should acknowledge its receipt. If some data is in hard copy which we are expected to return back, make a list of such documents and obtain the auditee's attestation on such list. This is to avoid future disputes with respect to possession of document.

4. Validate the data - Check the received data for its authenticity, integrity and completeness. If the data is incomplete, in inappropriate format or doesn't appear to be authentic then we should immediately raise this issue.

5. Follow up – Again, for the missing links in the data, keep making follow up to receive those in good time.

1.6 Key Capabilities of MS Excel

Once the complete data is received, we can perform all sorts of analysis using MS Excel. Following are its notable capabilities:

1. Quick data processing – One of the most amazing things about excel is that it can perform analyses in a flash! It is much faster than performing work manually. Certain features like Pivot Tables can help generate complex reports literally within few seconds.

2. Accurate computation – In addition to the quick processing of data, excel also carries out the computation accurately. The more we use excel features, the more we are confident about the output. Thus, it makes a lot of difference when we replace a manual process with an excel based process.

3. Wide range of pre-set functions – Excel's function library is very rich. Therefore, for many calculations, there are ready made functions available. We simply need to supply some basic inputs and then we automatically get the output.

4. Scope for automation – By using a language called VBA (Visual Basic for Applications), we can carry out programming in excel. A program can be written for a long and complex procedure of working with excel. Thus, we can reduce repetitive tasks to a click of a button!

This leaves no doubt in our minds that MS Excel is one of the most suitable softwares for performing audits. Therefore, we must harness its power to our advantage and achieve our auditing objectives.

1.7 Summary

MS Excel is one of the most widely used softwares in the world. Especially, for auditors, excel is bread and butter. Excel is also needed by the different departments of an organisation. Departments like accounting and finance, marketing, purchase, production, human resources, administration etc. heavily use excel for carrying out their operations.

As auditor, we need to obtain data for auditing purpose. This data may come in various formats like XML, CSV, PDF etc. We can bring that to excel and work upon it.

While obtaining audit data, we need to perform various steps. We need to raise a data request, do follow up, receive the data, validate for its correctness and then again follow up for proper data, if applicable. Audit data is critical for audit and therefore all these steps need to be carried out diligently.

Once we receive the data and bring it in excel, we can do wonderful analysis of it. We can harness the key capabilities of excel like quick data processing, accurate computation, wide range of functions and capacity of automation to bring out the desired results.

1.8 Multiple Choice Questions (MCQ) for Practice

1. When was MS Excel launched for the first time?
   (a) In 1980s
   (b) In 1990s
   (c) In 2000s
   (d) After 2010
2. MS Excel is used by which of the following departments:
   (a) Marketing
   (b) Accounting and Finance
   (c) Human Resources
   (d) All of the above
3. Which of the following formats cannot be easily converted to excel?
   (a) CSV
   (b) PDF
   (c) Text
   (d) XML
4. Rohan says to Deepali:
   (1) There is no need to validate the data given by the auditee as excel data cannot be tampered with.
   (2) We can do programming in MS Excel
   What can you say about the two statements?
   (a) Both of them are right
   (b) 1st statement is right but the 2nd statement is wrong
   (c) 1st statement is wrong but the 2nd statement is right
   (d) Both of them are wrong

5. Which language is used by excel for automation purpose?
   (a) Visual Basic
   (b) Java
   (c) C++
   (d) Visual Basic for Applications

Solutions

1. (a)
2. (d)
3. (b)
4. (c)
5. (d)

CHAPTER

2 USEFUL FUNCTIONS FOR AUDITING

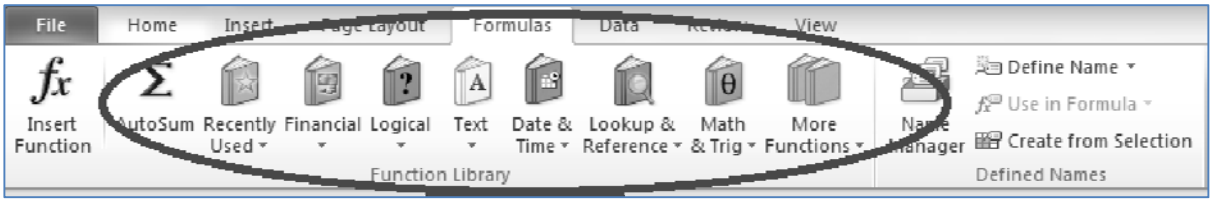
LEARNING OBJECTIVES

- Be familiar with the rich variety of excel functions.
- Be able to apply the functions.
- Learn the differences and similarities between different functions
- Study the intricate features of the functions and their arguments
- Learn how multiple functions can be combined in some illustrative situations

2.1 Introduction

This chapter explores the various functions in MS Excel which can be profitably used by Chartered Accountants from an audit perspective. They help us in making calculations or deriving useful information from a dataset.

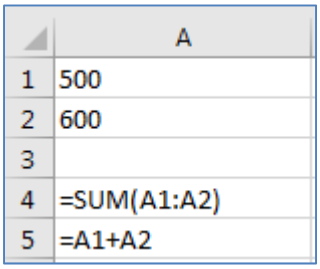
MS Excel has a very rich function library. Various categories of functions are available like Financial, Logical, Text, Date & Time, Math & Trig, Lookup & Reference, etc. The function library is available in Formulas Tab.



2.2 Difference between function and formula

A function should be distinguished from formula. Both terms are used in excel, but they have different meanings. A function is a pre-set calculation methodology developed by Microsoft. It may require some inputs (known as arguments). When a user specifies those inputs, the function will calculate the intended output for that function.

A formula, on the other hand, may involve multiple functions or may even be free from any functions. A formula is the complete structure of calculation laid down for the purpose of deriving the final output.



	A
1	500
2	600
3	
4	=SUM(A1:A2)
5	=A1+A2

Fig. 2.2.1: Function and Formula

In Fig. 2.2.1, A4 cell has made use of sum function. As sum function is preset by Microsoft, it will automatically add the arguments of this function i.e. cells A1 and A2. On the other hand, cell A5 makes use of a formula. Here no function is used, but it will again add the cells A1 and A2.

Important thing to note about functions is that their inputs/arguments are not always compulsory in nature. Most users often miss out on commas and brackets in a function. The best way to avoid that error is to closely observe the parameters that a function requires. For instance SUMIF function shows (range, criteria, [sum_range]) as parameters. Since sum_range is written in square brackets this part of the formula is optional. Every time a function is being written by the user, excel highlights a parameter in bold font Fig. 2.2.2. User has to ensure that they keep a track on this bold font. After every parameter user has to insert a comma and the moment they reach the last parameter brackets have to be closed. This information sounds very easy but most users don't follow it and often end up with errors.

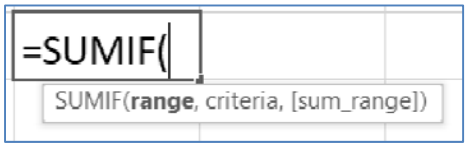


Fig. 2.2.2: Parameter Highlighted

We will now proceed to learn some important functions in MS Excel.

2.3 Financial Functions

Financial functions perform many of the common financial calculations required in project analysis, loan amortization schedules, valuation, asset depreciation etc. Let us explore few financial functions.

2.3.1 NPV Function

NPV stands for Net Present Value. This function is used to calculate the present values of all future cashflows. It is highly useful in project analysis. NPV for a project is calculated (based on its forecasted cashflows) using a rate of discounting (usually the cost of capital). If the NPV is positive, the project is accepted else it is rejected.

The arguments of NPV are rate and values. Rate is the rate of discounting. Values are various cashflows occurring in future, starting from period 1. Therefore, if we wish to calculate the net present value of a project, we must include the future cashflows inside the function and we should subtract the initial cash outflow from it.

	A	B	C
1	Year	Cashflow	
2	0	-1,00,000.00	
3	1	35,000.00	
4	2	28,000.00	
5	3	32,000.00	
6	4	44,000.00	
7			
8	NPV Formula	=NPV(10%,B3:B6)+B2	
9	NPV Value	9,053.34	

Fig. 2.3.1: NPV

Above illustrates the use of NPV function as shown In Fig 2.3.1. The initial cash outflow is Rs 1,00,000. Subsequent cashflows, as expected in future, are laid down further. Insert NPV function and define the rate as 10%. Then specify the range of values as B3 to B6, covering the future cashflows. Do not include the initial cashflow at this stage. Then close the function and thereafter, add the initial cashflow. Since the initial cashflow is entered as a negative figure, it reduces the present value of future cashflows and returns the NPV.

The final structure of the formula is shown in B8 cell and the resultant value is shown in B9 cell.

2.3.2 IRR Function

IRR stands for Internal Rate of Return. It is related to the concept of net present value. IRR is the rate of discounting at which NPV = 0 i.e. the present value of all cash inflows is equal to the present value of all cash outflows. Thus, it is expressed in percentage form. IRR is another useful tool for project analysis. If IRR for a project exceeds its cost of capital then the project is accepted else it is rejected.

The arguments for IRR function are values and guess rate. Unlike NPV function, all the cashflows (including the initial cash outflow) should be specified in values. Guess rate is an estimated IRR. This is an optional argument so it may or may not be specified by the user. If it is not specified by the user, excel assumes it to be 10%.

	A	B	C
1	Year	Cashflow	
2	0	-1,00,000.00	
3	1	35,000.00	
4	2	28,000.00	
5	3	32,000.00	
6	4	44,000.00	
7			
8	IRR Formula	=IRR(B2:B6,12%)	
9	IRR Value	13.95%	

Fig. 2.3.2: IRR

Above illustrates the use of IRR function as shown in Fig 2.3.2. The initial cash outflow is Rs 1,00,000. Subsequent cashflows, as expected in future, are laid down further. Insert IRR function and specify the range of values as B2 to B6, covering all the cashflows. You may specify the guess rate at, say, 12%. Then close the function and hit enter. The IRR will be computed by excel.

The final structure of the formula is shown in B8 cell and the resultant value is shown in B9 cell.

2.3.3 XNPV and XIRR Function

NPV and IRR functions assume that the cashflows are spaced equally. However, in real life, we may come across many situations where the cashflows occur unevenly. In such cases, we may rather use the XNPV and XIRR functions in excel. These functions calculate NPV and IRR based on the dates of cashflows. Thus, they can enable us to carry out more meaningful project analysis when the cashflows are not periodic.

XNPV function's arguments are rate, values and dates. Rate is the rate of discounting, values are the cashflows and dates are the dates corresponding to the cashflows. All the arguments are mandatory.

The arguments of XIRR are values, dates and guess. Values are the cashflows and dates are the dates corresponding to the cashflows. Guess is an optional argument which is an estimated IRR. If it is not specified by the user, excel assumes it to be 10%.

	A	B	C	D	E	F	G
1	Dates	Cashflow					
2	03-07-13	-1,00,000.00					
3	15-05-14	35,000.00					
4	16-07-15	28,000.00					
5	13-11-16	32,000.00					
6	30-05-17	44,000.00					
7							
8	XNPV Formula	=XNPV(10%,B2:B6,A2:A6)		XIRR Formula	=XIRR(B2:B6,A2:A6,12%)		
9	XNPV Value	8,818.04		XIRR Value	13.83%		

Fig. 2.3.3: XNPV and XIRR

Above illustrates the use of XNPV and XIRR functions as shown in Fig 2.3.3. We have a cashflow schedule with dates and cashflows. You may note that the cashflows are occurring on dates without any periodicity between themselves.

Insert XNPV function with rate as 10%, values as the range B2 to B6 and dates as the range A2 to A6. Close the function, hit enter and the NPV is calculated. Similarly, insert XIRR function. Specify values as the range B2 to B6 and dates as the range A2 to A6. You may specify the guess rate at, say, 12%. Then close the function and hit enter. The IRR will be computed by excel.

The final structures of the formulas are shown in B8 and E8 cells respectively. The resultant values are shown in B9 and E9 cells, respectively.

2.3.4 DB Function

This function is used for calculating depreciation as per Written Down Value method. You may use this function while verifying depreciation expense claimed by your auditee. The arguments of this function are cost, salvage, life, period and month. Cost is the original cost of an asset and salvage is its salvage value. Life denotes its useful life. In period, you must specify the period for which you wish to calculate depreciation. Month is an optional argument. You may specify the number of months for which depreciation needs to be calculated in the first year. Month becomes relevant when an asset is purchased in the middle of the year (which is almost always the case!). If month is omitted, it is taken to be 12.

Internally, DB function first derives the applicable fixed rate of depreciation, based on the given inputs. For this purpose, it uses the following formula:

$$Depreciation\ rate = 1 - \sqrt[Life]{\frac{Salvage}{Cost}}$$

The above rate is then applied to each year, on a written down value basis. If month is specified, the depreciation calculation for the 1st period and last period is done in a special manner.

$$Depreciation\ for\ 1st\ period = Cost \times Depreciation\ rate \times \frac{Month}{12}$$

$$Depreciation\ for\ last\ period = (Cost - Depreciation\ from\ prior\ periods) \times rate \times \frac{12 - Month}{12}$$

	A	B	C	D	E	F
1	Year	Depreciation	Formula		Date of purchase	01-09-2011
2	1	2,15,250.00	=DB($F$2,$F$3,$F$4,A2,7)		Original Cost (Rs)	10,00,000
3	2	2,89,572.75	=DB($F$2,$F$3,$F$4,A3,7)		Salvage Value (Rs)	1,00,000
4	3	1,82,720.41	=DB($F$2,$F$3,$F$4,A4,7)		Life (years)	5
5	4	1,15,296.58	=DB($F$2,$F$3,$F$4,A5,7)			
6	5	72,752.14	=DB($F$2,$F$3,$F$4,A6,7)			
7	6	19,127.75	=DB($F$2,$F$3,$F$4,A7,7)			

Fig. 2.3.4: DB

As shown in Fig 2.3.4, a fixed asset is assumed to be purchased on 01st September, 2011. Its cost is Rs 10 Lakhs and salvage value is Rs 1 Lakh. Its useful life is 5 years. These details of the asset are enlisted in columns E and F. Depreciation based on these details is calculated for each year in column B. The underlying formulas are shown in column C.

The year ending date for each year is 31st March. Since for the 1st year the asset was in existence for only 7 months (01st September to 31st March), month has been specified as 7. You may note that even though we are making calculations for subsequent periods, nevertheless we need to keep specifying month as 7 in every formula.

DB is an extremely convenient function for calculating depreciation under WDV method and hence should be used frequently.

2.4 Date & Time Functions

More often than not, we are required to perform calculations on dates and timings. This may be necessary for interest calculations, deriving due dates, computing overtime wages, etc. Let us explore some important functions under Date & Time category.

2.4.1 Eomonth Function

Eomonth function is a very simple yet highly effective function. It lets you calculate the end of the month date corresponding to a given date. It also lets you calculate the end of the month date few months ahead or behind the reference date. It is useful for calculating maturity dates. It can also be used to obtain number of days in a month.

The arguments of Eomonth are start date and months. Both are mandatory arguments. Start date is the reference date for which we wish to compute the end of month date. Months denotes the number of months ahead or behind we wish to obtain end of month date. For same month as reference date, enter months as zero.

	A	B	C
1	**Date**	**End of month**	**End of month**
2	03-04-15	=EOMONTH(A2,0)	42124
3	16-10-16	=EOMONTH(A3,2)	42735
4	31-05-17	=EOMONTH(A4,-3)	42794

Fig. 2.4.1: Eomonth

As shown in Fig 2.4.1, some dates are given in column A. The formula structures are given in column B and their output is given in column C. Eomonth function has been used throughout to achieve the month end dates.

In case of the first date, month end date for the same month has been achieved. Thus, you may note that the second argument (months) has been defined as zero. For the 2nd date, month end date after 2 months was desired. Hence months has been defined as 2. Finally, for the 3rd date, months has been defined as -3 which yields month end date three months before.

However, you may notice that eomonth returns the output formatted as numbers. The numbers, as we can see in column C, are not much useful for us. Hence, we need to format them as dates.

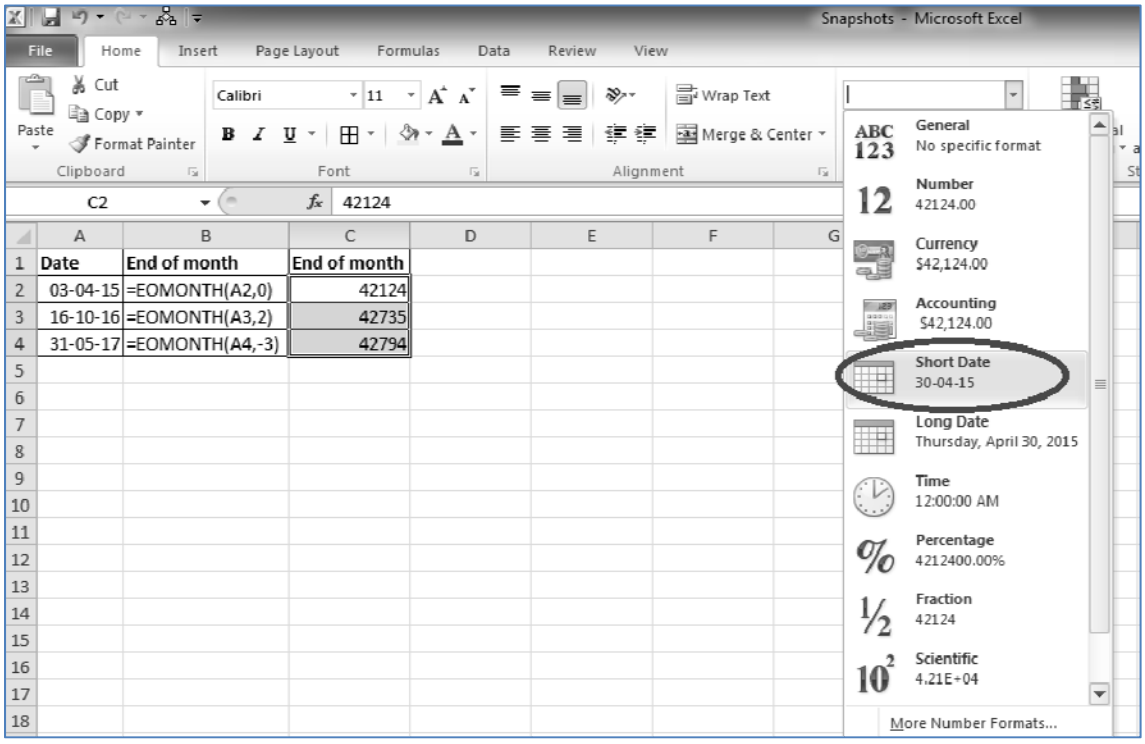


Fig. 2.4.2: Format being changed to Short Date

As illustrated in the Fig 2.4.2, highlight the dates. Then go to Home tab and click on the dropdown button for the number format. From there, select Short Date (or any other date format as per your choice). Then the dates will get transformed to proper date format. Look at the following image.

	A	B	C
1	Date	End of month	End of month
2	03-04-15	=EOMONTH(A2,0)	30-04-15
3	16-10-16	=EOMONTH(A3,2)	31-12-16
4	31-05-17	=EOMONTH(A4,-3)	28-02-17

Fig. 2.4.3: Format changed to Short Date

Let us consider another example. Suppose, we wish to ascertain the number of days in different months. The month beginning dates are available. In that case, we can derive the month end dates for those dates using eomonth, subtract the month beginning dates from them and add 1. This will yield the number of days for those months.

E	F	G
Date	**No of days**	**No of days**
01-04-15	=EOMONTH(E2,0)-E2+1	30
01-10-16	=EOMONTH(E3,0)-E3+1	31
01-02-17	=EOMONTH(E4,0)-E4+1	28

Fig. 2.4.4: No of days in a month

The same has been done in the above image. Look at the example laid down in columns E to G. Column F shows the formula while column G shows the result.

Eomonth function works very well for all the dates. It takes into account leap year factor, wherever applicable. Hence it is one of the most useful functions while making tricky calculations on dates.

2.4.2 Edate Function

Edate is somewhat similar to Eomonth. The arguments are the same i.e. start date and months. However, the output is different. Eomonth returns the *month end date*, specified number of months before or after the start date. However, Edate returns the *date with the same day* which is specified number of months before and after the start date.

For example, if the start date is 05th October, 2016 and months is 2 then Eomonth function will return 31st December, 2016. On the other hand, Edate function will return 05th December, 2016.

This function can be helpful in deriving a schedule of dates at equal intervals. For example, Edate can be used to build a series of EMI due dates, at monthly intervals.

	A	B
1	**EMI Due Dates**	**EMI Due Dates**
2	10-01-16	10-01-16
3	42410	=EDATE(B2,1)
4	42439	=EDATE(B3,1)
5	42470	=EDATE(B4,1)
6	42500	=EDATE(B5,1)
7	42531	=EDATE(B6,1)
8	42561	=EDATE(B7,1)
9	42592	=EDATE(B8,1)
10	42623	=EDATE(B9,1)
11	42653	=EDATE(B10,1)
12	42684	=EDATE(B11,1)
13	42714	=EDATE(B12,1)
14	42745	=EDATE(B13,1)
15	42776	=EDATE(B14,1)
16	42804	=EDATE(B15,1)
17	42835	=EDATE(B16,1)

Fig. 2.4.5: Edate

As demonstrated in above Fig 2.4.5, we can see that Edate function helps us in building the monthly dates *with the same day* very easily. Similar to Eomonth function, Edate also returns the output by default formatted as

number. We may change that to Short Date format as discussed earlier. The final output will be as shown in Fig 2.4.6.

	A	B
1	EMI Due Dates	EMI Due Dates
2	10-01-16	10-01-16
3	10-02-16	=EDATE(B2,1)
4	10-03-16	=EDATE(B3,1)
5	10-04-16	=EDATE(B4,1)
6	10-05-16	=EDATE(B5,1)
7	10-06-16	=EDATE(B6,1)
8	10-07-16	=EDATE(B7,1)
9	10-08-16	=EDATE(B8,1)
10	10-09-16	=EDATE(B9,1)
11	10-10-16	=EDATE(B10,1)
12	10-11-16	=EDATE(B11,1)
13	10-12-16	=EDATE(B12,1)

Fig. 2.4.6: Edate with Short Date format

2.4.3 Networkdays Function

This function calculates the number of working days between two dates. Networkdays can be used to verify employee benefits which are paid by the auditee on the basis of number of actual days worked during a period. Networkdays excludes all weekends (Saturdays and Sundays) in between two dates and returns the remaining number of days.

There are three arguments to Networkdays function; start date, end date and holidays. Start date and end date are the starting and ending dates of the period under consideration. Both of them are mandatory. Holidays is an optional argument. If applicable, you may specify a range of cells containing holidays other than Saturdays and Sundays i.e. public holidays falling on weekdays. These dates will also be excluded.

The start date and end date are included while returning the output of Networkdays.

	A	B	C	D	E	F
1	Start Date	01-01-17				Holiday List
2	End Date	31-03-17				26-01-17
3						24-02-17
4	Working Days	=NETWORKDAYS(B1,B2,F2:F4)				28-03-17
5		NETWORKDAYS(start_date, end_date, **[holidays]**)				
6	Working Days	62				

Fig. 2.4.7: Networkdays

In the above Fig 2.4.7, the start date is given in cell B1. End date is given in cell B2. A list of holidays is given in Column F. The working days excluding all weekends and holidays as listed is 62. This can be obtained using the Networkdays function. The construction of the formula is given in cell B4 and its result is shown in cell B6.

Note, if you are using Excel 2010 and above there is a function called NETWORKDAYS.INTL it is similar to NETWORKDAYS except that it has an extra parameter called "weekend" that allows you to decide whether Saturday and Sunday both should be treated as weekends or any other day/combination of days as available in a drop down list.

2.4.4 Workday Function

Workday function is somewhat similar to Networkdays function. Networkdays returns the number of working days between two dates. On the other hand, Workday returns the working day before or after specified number of workdays with respect to a start date. The output of Workday will be a date. Workday, like Networkdays, excludes all weekends (Saturdays and Sundays).

Workday has three arguments viz. start date, days and holidays. Start date is the base date. Days is the number of working days we wish to specify. If we want to go backwards and derive a date in the past, we must specify days as negative. Both these arguments are mandatory. Holidays is an optional argument. If applicable, we may specify a range of cells containing holidays other than Saturdays and Sundays i.e. public holidays falling on weekdays. These dates will also be excluded.

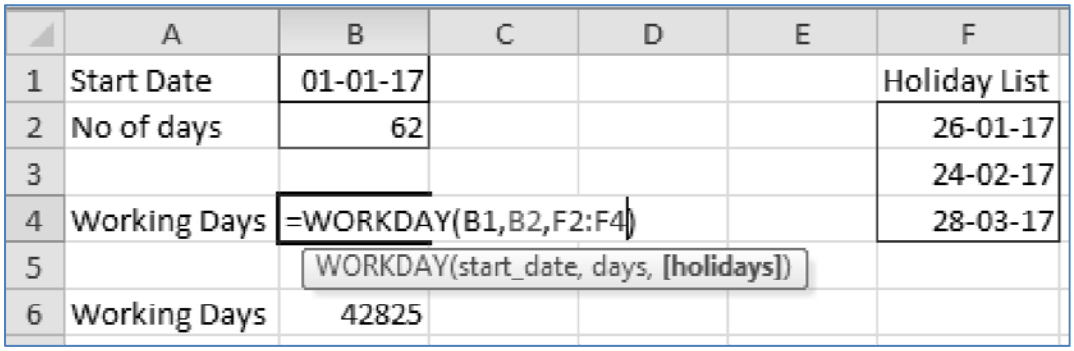


Fig. 2.4.7: Workday

In the above image, the start date is given in cell B1. Days is given in cell B2. A list of holidays is given in Column F. Now the Working day after 62 days from 01st January, 2017 can be obtained using the Workday function. The construction of the formula is given in cell B4 and its result is shown in cell B6.

As in the case of Eomonth and Edate function, Workday function also returns the output formatted as a number. It can be converted to short date format after which the final output appears as shown in Fig 2.4.8.

	A	B	C	D	E	F
1	Start Date	01-01-17				Holiday List
2	No of days	62				26-01-17
3						24-02-17
4	Working Days	=WORKDAY(B1,B2,F2:F4)				28-03-17
5		WORKDAY(start_date, days, **[holidays]**)				
6	Working Days	31-03-17				

Fig. 2.4.8: Workday with Short Date format

Note, if you are using Excel 2010 and above there is a function called WORKDAY.INTL it is similar to WORKDAY except that it has an extra parameter called "weekend" that allows you to decide whether Saturday and Sunday both should be treated as weekends or any other day/combination of days as available in a drop down list.

2.5 Math & Trig Functions

Math & Trig category of functions includes a rich variety of functions but most of them are not relevant for auditors. They are rather useful for professionals from technical disciplines like engineering. Nevertheless, there are some functions which still provide lot of value while performing audits. Following is a brief discussion on the same:

2.5.1 MOD Function

Ordinarily, if we divide a number by some divisor and if the dividend is not completely divisible by the divisor, the quotient is expressed in decimal form. However, sometimes we are interested in obtaining the remainder separately. In such a case, we can make use of Mod function.

Mod is a very simple function having only two arguments, number and divisor. Both are mandatory.

	A	B	C	D	E	F
1	Date 1	01-01-17				
2	Date 2	31-03-17				
3						
4	Number of days remaining after casting out complete weeks:					
5						
6	Formula	=MOD(B2-B1,7)				
7		MOD(number, **divisor**)				
8	Result	5				

Fig. 2.5.1: MOD

Say, we wish to obtain the days remaining after casting out completed weeks, in between two dates. This can be achieved quite easily, using Mod function. An example has been given in the above image. In B1 and B2 cells, two dates have been entered. We may divide the difference between these two dates by 7. The integral portion of the quotient will be completed weeks. However, we are interested in the remainder. To obtain the remainder, use Mod function. Specify number as the difference between B2 and B1 cells and the divisor as 7.

The construction of the formula is given in B6 cell and the resultant value is given in B8 cell.

2.5.2 Quotient Function

If Mod function is one side of a coin, Quotient function is its other side. Mod function returns the remainder of a division while Quotient function returns the integer portion of the division, ignoring the remainder.

Quotient is also a simple function having two arguments viz. numerator and denominator. Both are mandatory.

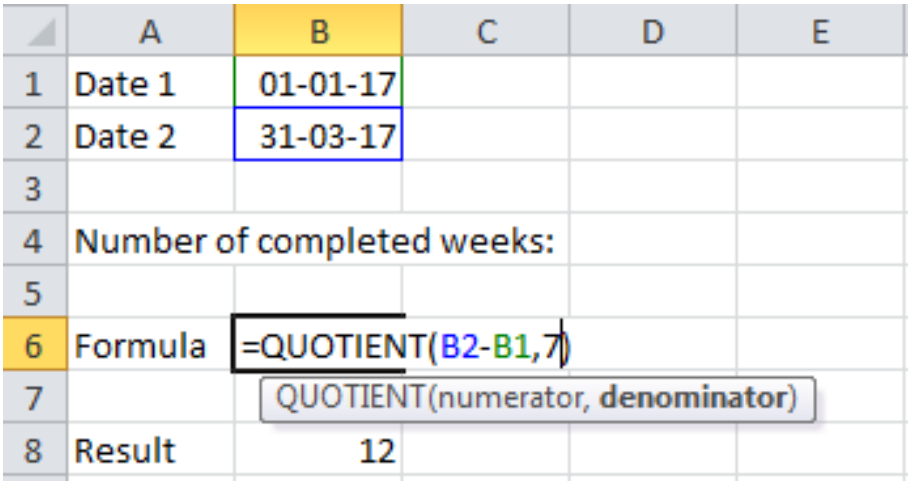


Fig. 2.5.2: MOD

Let us extend the previous example. Suppose we wish to obtain the completed weeks, in between the two dates. This can be achieved quite easily, using Quotient function. In B1 and B2 cells, the two dates have been entered. We may divide the difference between these two dates by 7. To obtain the integral portion of the quotient, use Quotient function. Specify the numerator as the difference between B2 and B1 cells and the denominator as 7.

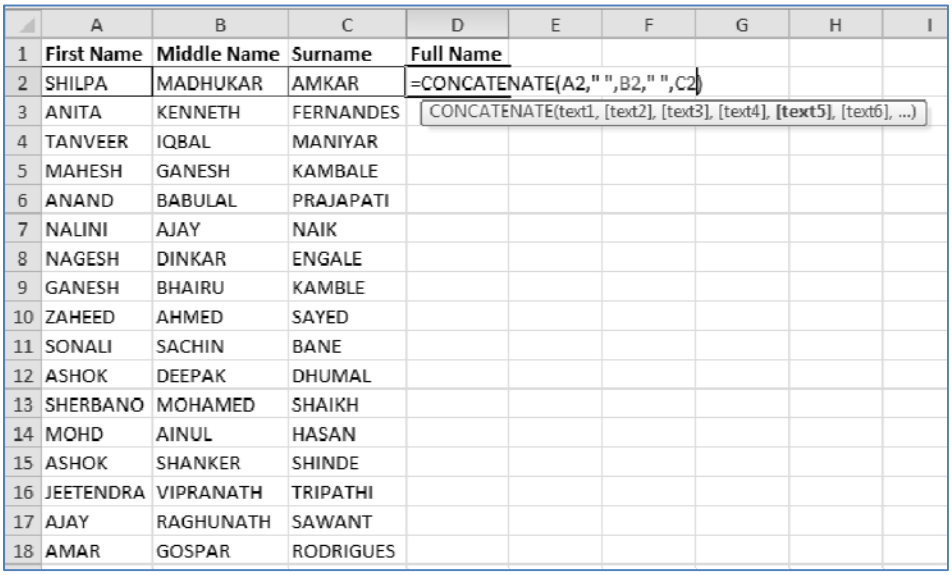
The construction of the formula is given in B6 cell and the resultant value is given in B8 cell.

2.6 Text Functions

Text functions may be used for building up text values or for comparing text values. These could be sometimes very handy while performing audit operations. A couple of text functions are discussed below:

2.6.1 Concatenate Function

To concatenate means to link together or join. This function joins two or more text strings together. It is a very simple function. Its arguments are texts. We simply need to specify the multiple texts that we wish to combine.



	A	B	C	D	E	F	G	H	I
1	First Name	Middle Name	Surname	Full Name					
2	SHILPA	MADHUKAR	AMKAR	=CONCATENATE(A2," ",B2," ",C2)					
3	ANITA	KENNETH	FERNANDES						
4	TANVEER	IQBAL	MANIYAR						
5	MAHESH	GANESH	KAMBALE						
6	ANAND	BABULAL	PRAJAPATI						
7	NALINI	AJAY	NAIK						
8	NAGESH	DINKAR	ENGALE						
9	GANESH	BHAIRU	KAMBLE						
10	ZAHEED	AHMED	SAYED						
11	SONALI	SACHIN	BANE						
12	ASHOK	DEEPAK	DHUMAL						
13	SHERBANO	MOHAMED	SHAIKH						
14	MOHD	AINUL	HASAN						
15	ASHOK	SHANKER	SHINDE						
16	JEETENDRA	VIPRANATH	TRIPATHI						
17	AJAY	RAGHUNATH	SAWANT						
18	AMAR	GOSPAR	RODRIGUES						

CONCATENATE(text1, [text2], [text3], [text4], **[text5]**, [text6], ...)

Fig. 2.6.1: Concatenate Formula

Let us say, we have a list of first names, middle names and surnames. We wish to combine all three and create full names. For this purpose, we can use concatenate. The formula structure is given in the above image. Each of the field values have been specified as different texts in the arguments. Please note that we must also insert space as a separator between two words. Therefore, text2 and text4 have been hard coded in the formula as " ".

Instead of using concatenate function we can also use the symbol '&' (known as ampersand). In that case, the formula will be as shown in Fig 2.6.2:

	A	B	C	D	E
1	First Name	Middle Name	Surname	Full Name (using function)	Full Name (using & symbol)
2	SHILPA	MADHUKAR	AMKAR	SHILPA MADHUKAR AMKAR	=A2&" "&B2&" "&C2
3	ANITA	KENNETH	FERNANDES		
4	TANVEER	IQBAL	MANIYAR		
5	MAHESH	GANESH	KAMBALE		
6	ANAND	BABULAL	PRAJAPATI		
7	NALINI	AJAY	NAIK		
8	NAGESH	DINKAR	ENGALE		
9	GANESH	BHAIRU	KAMBLE		
10	ZAHEED	AHMED	SAYED		
11	SONALI	SACHIN	BANE		
12	ASHOK	DEEPAK	DHUMAL		
13	SHERBANO	MOHAMED	SHAIKH		
14	MOHD	AINUL	HASAN		
15	ASHOK	SHANKER	SHINDE		
16	JEETENDRA	VIPRANATH	TRIPATHI		
17	AJAY	RAGHUNATH	SAWANT		
18	AMAR	GOSPAR	RODRIGUES		

Fig. 2.6.2: Concatenate using '&'

We must put '&' in between two consecutive texts. Needless to mention, we must also include spaces for separating words.

Ultimately, we can extend the formula to all the cells and the final result will be:

	A	B	C	D	E
1	**First Name**	**Middle Name**	**Surname**	**Full Name (using function)**	**Full Name (using & symbol)**
2	SHILPA	MADHUKAR	AMKAR	=CONCATENATE(A2," ",B2," ",C2)	=A2&" "&B2&" "&C2
3	ANITA	KENNETH	FERNANDES	ANITA KENNETH FERNANDES	ANITA KENNETH FERNANDES
4	TANVEER	IQBAL	MANIYAR	TANVEER IQBAL MANIYAR	TANVEER IQBAL MANIYAR
5	MAHESH	GANESH	KAMBALE	MAHESH GANESH KAMBALE	MAHESH GANESH KAMBALE
6	ANAND	BABULAL	PRAJAPATI	ANAND BABULAL PRAJAPATI	ANAND BABULAL PRAJAPATI
7	NALINI	AJAY	NAIK	NALINI AJAY NAIK	NALINI AJAY NAIK
8	NAGESH	DINKAR	ENGALE	NAGESH DINKAR ENGALE	NAGESH DINKAR ENGALE
9	GANESH	BHAIRU	KAMBLE	GANESH BHAIRU KAMBLE	GANESH BHAIRU KAMBLE
10	ZAHEED	AHMED	SAYED	ZAHEED AHMED SAYED	ZAHEED AHMED SAYED
11	SONALI	SACHIN	BANE	SONALI SACHIN BANE	SONALI SACHIN BANE
12	ASHOK	DEEPAK	DHUMAL	ASHOK DEEPAK DHUMAL	ASHOK DEEPAK DHUMAL
13	SHERBANO	MOHAMED	SHAIKH	SHERBANO MOHAMED SHAIKH	SHERBANO MOHAMED SHAIKH
14	MOHD	AINUL	HASAN	MOHD AINUL HASAN	MOHD AINUL HASAN
15	ASHOK	SHANKER	SHINDE	ASHOK SHANKER SHINDE	ASHOK SHANKER SHINDE
16	JEETENDRA	VIPRANATH	TRIPATHI	JEETENDRA VIPRANATH TRIPATHI	JEETENDRA VIPRANATH TRIPATHI
17	AJAY	RAGHUNATH	SAWANT	AJAY RAGHUNATH SAWANT	AJAY RAGHUNATH SAWANT
18	AMAR	GOSPAR	RODRIGUES	AMAR GOSPAR RODRIGUES	AMAR GOSPAR RODRIGUES

Fig. 2.6.3: Final output

2.6.2 Exact Function

We may come across several situations where we would like to compare two values and check whether they are alike. If they are numeric values we can calculate the difference between the two. If the difference is zero then the numbers are alike. However, when those two values are text strings, then we cannot perform any mathematical operations on them. In such cases, we can make use of exact function.

Exact compares two text strings and returns true or false. True means the texts are alike and false means they are not. Let us compare the values generated in the previous example using concatenate function and '&' symbol.

	A	B	C	D	E	F
1	First Name	Middle Name	Surname	Full Name (using function)	Full Name (using & symbol)	Whether Alike?
2	SHILPA	MADHUKAR	AMKAR	SHILPA MADHUKAR AMKAR	SHILPA MADHUKAR AMKAR	=EXACT(D2,E2)
3	ANITA	KENNETH	FERNANDES	ANITA KENNETH FERNANDES	ANITA KENNETH FERNANDES	EXACT(text1, **text2**)
4	TANVEER	IQBAL	MANIYAR	TANVEER IQBAL MANIYAR	TANVEER IQBAL MANIYAR	TRUE
5	MAHESH	GANESH	KAMBALE	MAHESH GANESH KAMBALE	MAHESH GANESH KAMBALE	TRUE
6	ANAND	BABULAL	PRAJAPATI	ANAND BABULAL PRAJAPATI	ANAND BABULAL PRAJAPATI	TRUE
7	NALINI	AJAY	NAIK	NALINI AJAY NAIK	NALINI AJAY NAIK	TRUE
8	NAGESH	DINKAR	ENGALE	NAGESH DINKAR ENGALE	NAGESH DINKAR ENGALE	TRUE
9	GANESH	BHAIRU	KAMBLE	GANESH BHAIRU KAMBLE	GANESH BHAIRU KAMBLE	TRUE
10	ZAHEED	AHMED	SAYED	ZAHEED AHMED SAYED	ZAHEED AHMED SAYED	TRUE
11	SONALI	SACHIN	BANE	SONALI SACHIN BANE	SONALI SACHIN BANE	TRUE
12	ASHOK	DEEPAK	DHUMAL	ASHOK DEEPAK DHUMAL	ASHOK DEEPAK DHUMAL	TRUE
13	SHERBANO	MOHAMED	SHAIKH	SHERBANO MOHAMED SHAIKH	SHERBANO MOHAMED SHAIKH	TRUE
14	MOHD	AINUL	HASAN	MOHD AINUL HASAN	MOHD AINUL HASAN	TRUE
15	ASHOK	SHANKER	SHINDE	ASHOK SHANKER SHINDE	ASHOK SHANKER SHINDE	TRUE
16	JEETENDRA	VIPRANATH	TRIPATHI	JEETENDRA VIPRANATH TRIPATHI	JEETENDRA VIPRANATH TRIPATHI	TRUE
17	AJAY	RAGHUNATH	SAWANT	AJAY RAGHUNATH SAWANT	AJAY RAGHUNATH SAWANT	TRUE
18	AMAR	GOSPAR	RODRIGUES	AMAR GOSPAR RODRIGUES	AMAR GOSPAR RODRIGUES	TRUE

Fig. 2.6.4: Exact

Please note that Exact function is case-sensitive. Therefore, if the texts are otherwise same but cases are different, then Exact will return false. If you wish to perform a non case-sensitive comparison, consider the trick demonstrated in the Fig 2.6.5

	A	B	C	D	E	F
1	First Name	Middle Name	Surname	Full Name (using function)	Full Name (using & symbol)	Whether Alike?
2	SHILPA	MADHUKAR	AMKAR	SHILPA MADHUKAR AMKAR	Shilpa Madhukar Amkar	=D2=E2
3	ANITA	KENNETH	FERNANDES	ANITA KENNETH FERNANDES	Anita Kenneth Fernandes	TRUE
4	TANVEER	IQBAL	MANIYAR	TANVEER IQBAL MANIYAR	Tanveer Iqbal Maniyar	TRUE
5	MAHESH	GANESH	KAMBALE	MAHESH GANESH KAMBALE	Mahesh Ganesh Kambale	TRUE
6	ANAND	BABULAL	PRAJAPATI	ANAND BABULAL PRAJAPATI	Anand Babulal Prajapati	TRUE
7	NALINI	AJAY	NAIK	NALINI AJAY NAIK	Nalini Ajay Naik	TRUE
8	NAGESH	DINKAR	ENGALE	NAGESH DINKAR ENGALE	Nagesh Dinkar Engale	TRUE
9	GANESH	BHAIRU	KAMBLE	GANESH BHAIRU KAMBLE	Ganesh Bhairu Kamble	TRUE
10	ZAHEED	AHMED	SAYED	ZAHEED AHMED SAYED	Zaheed Ahmed Sayed	TRUE
11	SONALI	SACHIN	BANE	SONALI SACHIN BANE	Sonali Sachin Bane	TRUE
12	ASHOK	DEEPAK	DHUMAL	ASHOK DEEPAK DHUMAL	Ashok Deepak Dhumal	TRUE
13	SHERBANO	MOHAMED	SHAIKH	SHERBANO MOHAMED SHAIKH	Sherbano Mohamed Shaikh	TRUE
14	MOHD	AINUL	HASAN	MOHD AINUL HASAN	Mohd Ainul Hasan	TRUE
15	ASHOK	SHANKER	SHINDE	ASHOK SHANKER SHINDE	Ashok Shanker Shinde	TRUE
16	JEETENDRA	VIPRANATH	TRIPATHI	JEETENDRA VIPRANATH TRIPATHI	Jeetendra Vipranath Tripathi	TRUE
17	AJAY	RAGHUNATH	SAWANT	AJAY RAGHUNATH SAWANT	Ajay Raghunath Sawant	TRUE
18	AMAR	GOSPAR	RODRIGUES	AMAR GOSPAR RODRIGUES	Amar Gospar Rodrigues	TRUE

Fig. 2.6.5: Alternative where cases don't match

If we wish to compare D2 and E2 cells, simply type =D2=E2 in, say, F2 cell. If the two cells are alike, this formula will return true. This will happen even if the cases don't match.

2.7 Lookup & Reference Functions

Lookup and reference functions are very commonly used by auditors. In terms of frequency of usage, this category may easily score over the rest of the categories. Let's learn some of the useful functions from this category:

2.7.1 Vlookup Function

This is the most frequently used function from Lookup & Reference category. Vlookup searches for a value in first column of a data/table_array and if it's found, it returns a corresponding value from the same row but another column. It can be better understood with the help of an example:

	A	B	C	D	E	F	G	H	I	J	K	L
1	SYMBOL	SERIES	OPEN	HIGH	LOW	CLOSE	LAST			Plot closing prices beside following:		
2	MRF	EQ	13372	13474.2	13252.2	13283.35	13286					
3	SBIN	N5	11450.16	11518	11450.16	11516	11516			ACC		
4	SBIN	N3	11005	11288	10985.72	11088.99	11088.99			AMBUJACEM		
5	SBIN	N1	11000	11000	10730.16	10730.16	10730.16			ASIANPAINT		
6	BOSCHLTD	EQ	9219.95	9239.95	9170.1	9214.6	9179			AXISBANK		
7	TIDEWATER	EQ	8130	8176	8073.65	8124.3	8150			BAJAJ-AUTO		
8	NESTLEIND	EQ	4878.9	4878.9	4791	4797.55	4808			BANKBARODA		
9	SHREECEM	EQ	4476.05	4523.75	4366	4401.9	4366			BHEL		
10	ASIANPAINT	EQ	4275	4340	4275	4333.2	4327.3			BPCL		
11	ORISSAMINE	EQ	4195	4243	4150.1	4195.15	4188			BHARTIARTL		
12	3MINDIA	EQ	4222	4750	3999	4035.35	4026			BOSCHLTD		
13	GSKCONS	EQ	3831.65	3834.9	3802	3806.75	3805			CAIRN		
14	TTKPRESTIG	EQ	3804	3977	3465	3492.15	3475.2			CIPLA		
15	PAGEIND	EQ	3389.95	3419	3389.95	3402.45	3400			COALINDIA		
16	GODFRYPHLP	EQ	3344	3399.95	3300	3325.15	3359.9			DRREDDY		
17	OFSS	EQ	3314.8	3360	3280	3321.25	3330			GAIL		
18	GRASIM	EQ	3047	3090.9	3005	3079.1	3067			GRASIM		

Fig. 2.7.1: Vlookup Example

Say, we wish to plot beside every value of column J a corresponding value from column F. We can of course make use of find feature i.e. Ctrl + F and one by one find each value of column J in column A, copy corresponding value from column F and then paste it back in front of column J. However, that will be time consuming, some omissions or errors may creep in and definitely it will be a boring process the moment the number of items exceed a reasonable limit.

A better solution in such a case is to make use of vlookup function. It will do the same thing what we discussed above in case of find, but it will do it much faster, thereby making the whole process scalable.

To insert this function, type '=vlookup(' in cell K3.

J	K	L	M	N
Plot closing prices beside following:				
ACC	=VLOOKUP(			
AMBUJACEM	VLOOKUP(**lookup_value**, table_array, col_index_num, [range_lookup])			

Fig. 2.7.2: Arguments of Vlookup

There are four arguments for Vlookup function, viz. lookup value, table array, col index number and range lookup. Lookup value is the value we need to search. Table array is a rectangular array of data where we need to search the lookup value. *The search of the lookup value is always performed in the left most column of the table array.* Col index number is the column number belonging to the same table array, from which a corresponding value needs to be retrieved. All these three arguments are mandatory. Final argument is range lookup, which is an optional argument. It asks for true or false, true meaning approximate matching of lookup value and false meaning exact matching of lookup values.

If range lookup is not specified, the default value is true. However, in almost all the cases of Vlookup we are actually required to go for an exact match of lookup values. Hence it is advisable to specify the range lookup as applicable.

In our case, lookup value will be J3 cell i.e. ACC, table array will be the columns A to F (as we want ACC to be searched in Column A), Col index number will be 6 (since we wish to retrieve the closing price from column F which is the 6th column) and range lookup will be false (as we wish to match the lookup values exactly).

At this juncture, your formula should look like as shown in Fig 2.7.3.

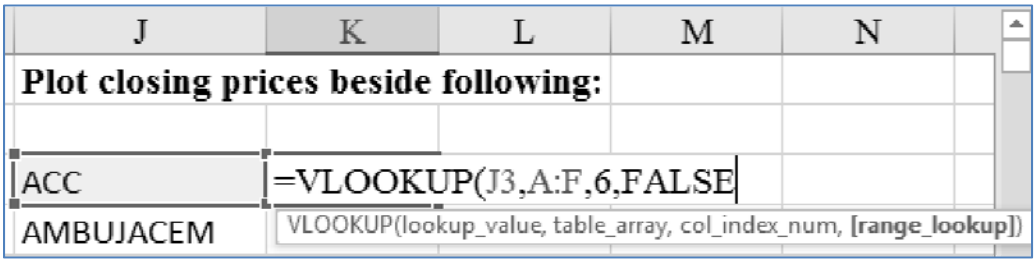


Fig. 2.7.3: Construction of Vlookup formula

Then close the bracket and press enter. You will get a value like below:

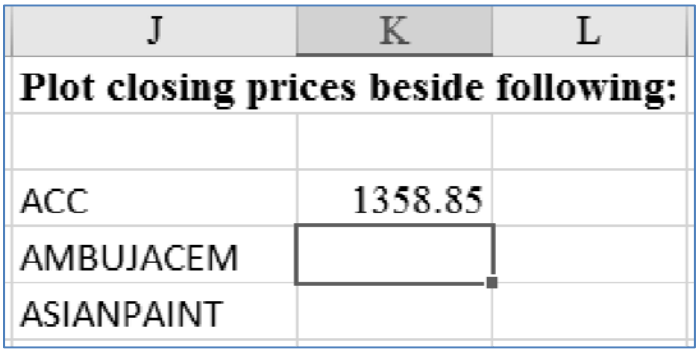
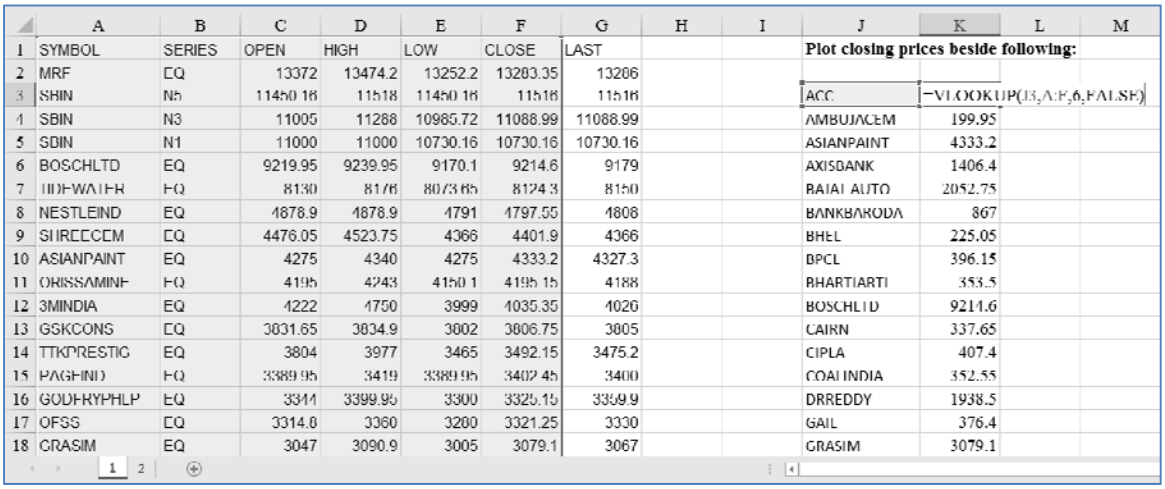


Fig. 2.7.4: Result of Vlookup formula

Drag the formula in cell K3 till the end of the column. And voilà, your job is done!



	A	B	C	D	E	F	G	H	I	J	K	L	M
1	SYMBOL	SERIES	OPEN	HIGH	LOW	CLOSE	LAST			Plot closing prices beside following:			
2	MRF	EQ	13372	13474.2	13252.2	13283.35	13286						
3	SBIN	N5	11450.16	11518	11450.16	11516	11516			ACC	=VLOOKUP(J3,A:F,6,FALSE)		
4	SBIN	N3	11005	11288	10985.72	11088.99	11088.99			AMBUJACEM	199.95		
5	SBIN	N1	11000	11000	10730.16	10730.16	10730.16			ASIANPAINT	4333.2		
6	BOSCHLTD	EQ	9219.95	9239.95	9170.1	9214.6	9179			AXISBANK	1406.4		
7	IDEWATER	EQ	8130	8176	8073.65	8124.3	8150			BAJAJ AUTO	2052.75		
8	NESTLEIND	EQ	4878.9	4878.9	4791	4797.55	4808			BANKBARODA	867		
9	SIRECCEM	EQ	4476.05	4523.75	4366	4401.9	4366			BHEL	225.05		
10	ASIANPAINT	EQ	4275	4340	4275	4333.2	4327.3			BPCL	396.15		
11	ORISSAMINE	EQ	4195	4243	4150.1	4195.15	4188			BHARTIARTI	353.5		
12	3MINDIA	EQ	4222	4750	3999	4035.35	4026			BOSCHLTD	9214.6		
13	GSKCONS	EQ	3831.65	3834.9	3802	3806.75	3805			CAIRN	337.65		
14	TTKPRESTIG	EQ	3804	3977	3465	3492.15	3475.2			CIPLA	407.4		
15	PAGEIND	EQ	3389.95	3419	3389.95	3402.45	3400			COALINDIA	352.55		
16	GODFRYPHLP	EQ	3341	3399.95	3300	3325.15	3359.9			DRREDDY	1938.5		
17	OFSS	EQ	3314.8	3360	3280	3321.25	3330			GAIL	376.4		
18	GRASIM	EQ	3047	3090.9	3005	3079.1	3067			GRASIM	3079.1		

Fig. 2.7.5: Vlookup formula extended to all cells

Points to be noted about vlookup:

1. It is called vlookup because it performs a vertical lookup in the leftmost column of the table array. V stands for vertical.
2. Lookup value is the value which is to be searched in table array.
3. The search is always performed in the leftmost column of the table array. Therefore, we must start defining our table from that column where we expect the lookup value to reside.
4. The column index number should be the relative position of the result column vis a vis the leftmost column. For example, if our table starts at E column and the result column is G, we will put the column index number as 3 (It will be incorrect if you think that G is the 7th column in the sheet and hence put it as 7).

When do we use the range_lookup as true???

If you have been using vlookup for some time now, you might've wondered about this. Almost invariably, we end up specifying the range_lookup as false (or if you prefer, you may even put it as 0. In excel, true is denoted by 1 and false is denoted by 0). So the million-dollar question is, why at all did excel create this last parameter???

Let's take another example to understand where we can (and must) specify the range lookup as true.

	A	B	C	D	E	F	G	H
1	Plot the commission rate in front of each salesman.					Commission table		
2								
3	Salesman	Sales	Commission Rate?			Sales from	Sales till	Commission Rate
4	Palmer, Terry	41,639				0	5,000	0
5	Nicholson, Lee	56,469				5,000	15,000	1%
6	Jensen, Kristina	43,302				15,000	25,000	3%
7	Randall, Yvonne	28,122				25,000	35,000	5%
8	Cole, Elbert	78,644				35,000	45,000	6%
9	Allen, Thomas	75,511				45,000	55,000	7%
10	Hoover, Evangeline	42,909				55,000	65,000	8%
11	House, Paul	52,255				65,000	75,000	10%
12	Hernandez, Glenn	54,972				75,000	85,000	11%
13	Sullivan, Robert	42,401				85,000	95,000	12%
14	Hicks, Monica	49,882				95,000	Infinity	13%
15	Banks, Ryan	25,901						
16	Lucas, John	51,437						
17	Durham, Troy	75,717						
18	Moreno, Christopher	25,187						

Fig. 2.7.6: Vlookup – 2nd Example

We have a situation wherein we have a dump of salesmen who have made varying amounts of sales. They are eligible for varying rates of commissions, based upon a table which is marked in yellow. We need to plot the commission rate in front of each salesman.

This is another eligible case for vlookup. If we plot the formula in cell C4, the lookup value will be B4, table array can be column F to column H and column index number will be 3. However, if we specify the range lookup as false, we will not get a single rate plotted. Instead, we will get the ugly looking #N/A errors!

	A	B	C	D	E	F	G	H
1	Plot the commission rate in front of each salesman.					Commission table		
2								
3	Salesman	Sales	Commission Rate?			Sales from	Sales till	Commission Rate
4	Palmer, Terry	41,639	=VLOOKUP(B4,F:H,3,FALSE)			0	5,000	0
5	Nicholson, Lee	56,469	#N/A			5,000	15,000	1%
6	Jensen, Kristina	43,302	#N/A			15,000	25,000	3%
7	Randall, Yvonne	28,122	#N/A			25,000	35,000	5%
8	Cole, Elbert	78,644	#N/A			35,000	45,000	6%
9	Allen, Thomas	75,511	#N/A			45,000	55,000	7%
10	Hoover, Evangeline	42,909	#N/A			55,000	65,000	8%
11	House, Paul	52,255	#N/A			65,000	75,000	10%
12	Hernandez, Glenn	54,972	#N/A			75,000	85,000	11%
13	Sullivan, Robert	42,401	#N/A			85,000	95,000	12%
14	Hicks, Monica	49,882	#N/A			95,000	Infinity	13%
15	Banks, Ryan	25,901	#N/A					
16	Lucas, John	51,437	#N/A					
17	Durham, Troy	75,717	#N/A					
18	Moreno, Christopher	25,187	#N/A					

Fig. 2.7.7: Construction of Vlookup formula – using range lookup as false

So instead of range lookup being false, let's specify it as true. Thereafter, drag the formula till the end and you will see that now we can see all the applicable commission rates, neatly plotted along the sales!

	A	B	C	D	E	F	G	H
1	**Plot the commission rate in front of each salesman.**					**Commission table**		
2								
3	**Salesman**	**Sales**	**Commission Rate?**			**Sales from**	**Sales till**	**Commission Rate**
4	Palmer, Terry	41,639	=VLOOKUP(B4,F:H,3,TRUE)			0	5,000	0
5	Nicholson, Lee	56,469	8%			5,000	15,000	1%
6	Jensen, Kristina	43,302	6%			15,000	25,000	3%
7	Randall, Yvonne	28,122	5%			25,000	35,000	5%
8	Cole, Elbert	78,644	11%			35,000	45,000	6%
9	Allen, Thomas	75,511	11%			45,000	55,000	7%
10	Hoover, Evangeline	42,909	6%			55,000	65,000	8%
11	House, Paul	52,255	7%			65,000	75,000	10%
12	Hernandez, Glenn	54,972	7%			75,000	85,000	11%
13	Sullivan, Robert	42,401	6%			85,000	95,000	12%
14	Hicks, Monica	49,882	7%			95,000	Infinity	13%
15	Banks, Ryan	25,901	5%					
16	Lucas, John	51,437	7%					
17	Durham, Troy	75,717	11%					
18	Moreno, Christopher	25,187	5%					

1 2

Fig. 2.7.8: Construction of Vlookup formula – using range lookup as true – desired results are obtained

Let's understand how this works. As discussed earlier, if we specify range lookup as true, excel is going to perform an approximate match. The first lookup value is 41639. We are trying to perform a lookup column F (as it's the leftmost column of our table array). Since this column essentially provides ranges like 0 to 5000, 5000 to 15000, 15000 to 25000 etc.; it is unlikely that we will ever get the result by specifying an exact match. Thus we get the #N/A errors.

However, when we specify an approximate match, excel tries to check whether any value in the leftmost column exceeds the lookup value. For instance, in the 1st example, 45000 exceeds 41639. So then it comes one row back and matches 41639 with 35000 (approximately) and accordingly, plots the result value as 6%. For this, inherently excel requires that the table should be sorted in ascending order on the basis of the leftmost column (Thankfully, in our case it was already sorted!).

You may argue that 41639 is closer to 45000 than 35000 so why doesn't excel approximately match 41639 with 45000 instead of 35000? Well. the way it has been designed actually helps us. Let's not forget that we are using approximate match for performing a lookup for ranges of values. So if your salesman is making sales of 44900, you should logically pay him commission @ 6% i.e. the rate applicable to the range 35000-45000. The fact that it is just an inch away from 45000 won't make you round it off to 45000 and hence award him a commission of 7%.

To summarize, if you want to decide whether to use TRUE/FALSE in range_lookup just ask yourself this question, "Is my lookup_value being searched in a slab/range of numbers (like 1 to 100 ,101 to 200)?" if yes, then write true else write false. It is safe to assume that since only numbers can be searched in slabs, you will never write TRUE when your lookup value is a text.

2.7.2 HLOOKUP Function

This function is very similar to Vlookup. You may visualize Hlookup as a horizontal Vlookup. In fact, the 'H' in Hlookup stands for horizontal.

Hlookup is suitable when the fields of the table array are placed row wise. The arguments are Hlookup are almost the same as Vlookup. They are look up value, table array, row index number and range lookup. Since the fields are placed horizontally, instead of column index number we have row index number. The rest of the arguments are just the same.

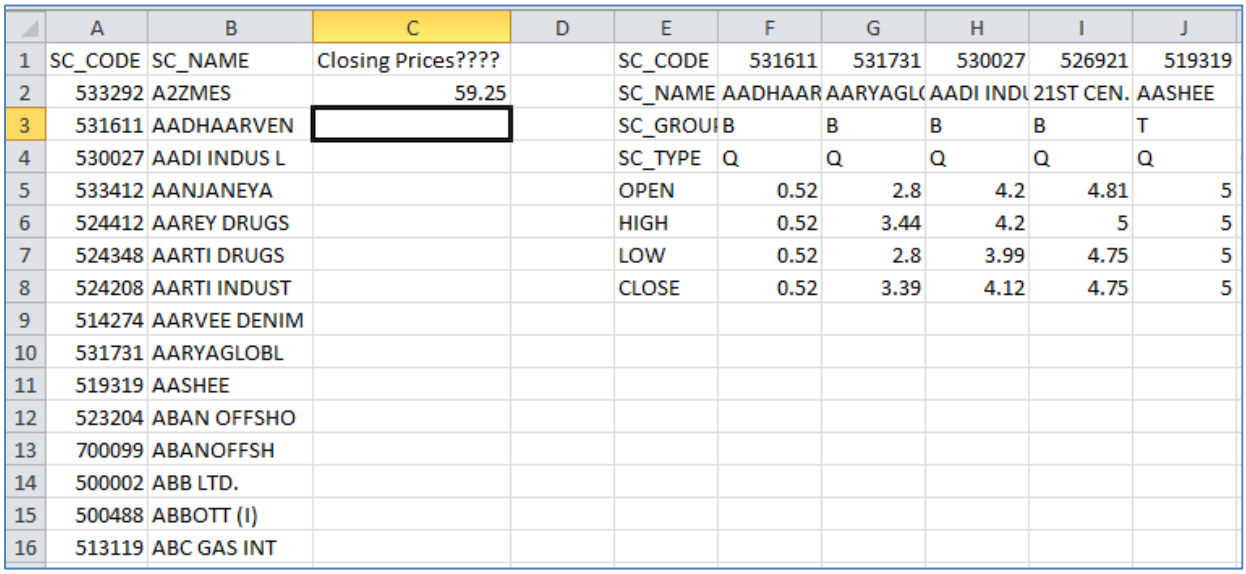
	A	B	C	D	E	F	G	H	I	J
1	SC_CODE	SC_NAME	Closing Prices????		SC_CODE	531611	531731	530027	526921	519319
2	533292	A2ZMES	=HLOOKUP(A2,$E$1:$AI$8,8,FALSE)		AADHAAR	AARYAGL(	AADI INDU	21ST CEN.	AASHEE	
3	531611	AADHAARVEN	HLOOKUP(lookup_value, table_array, row_index_num, **[range_lookup]**)					B	T	
4	530027	AADI INDUS L			SC_TYPE	Q	Q	Q	Q	Q
5	533412	AANJANEYA			OPEN	0.52	2.8	4.2	4.81	5
6	524412	AAREY DRUGS			HIGH	0.52	3.44	4.2	5	5
7	524348	AARTI DRUGS			LOW	0.52	2.8	3.99	4.75	5
8	524208	AARTI INDUST			CLOSE	0.52	3.39	4.12	4.75	5
9	514274	AARVEE DENIM								
10	531731	AARYAGLOBL								
11	519319	AASHEE								
12	523204	ABAN OFFSHO								
13	700099	ABANOFFSH								
14	500002	ABB LTD.								
15	500488	ABBOTT (I)								
16	513119	ABC GAS INT								

Fig. 2.7.9: Construction of Hlookup formula

In the above figure, Closing prices are to be obtained for different securities. The security codes are given in Column A. The data is available in the range E1:AI8. You may note that the different fields (SC Code, SC Type, Open, High etc) are placed along the rows. Therefore, Hlookup function has been applied.

The lookup value is A2 and table array is the range E1:AI8. '$' symbols are used to fix the range. Since the desired field, Close, is in the eighth row of the table array, the row index number has been specified as 8. Finally, the range lookup is false.

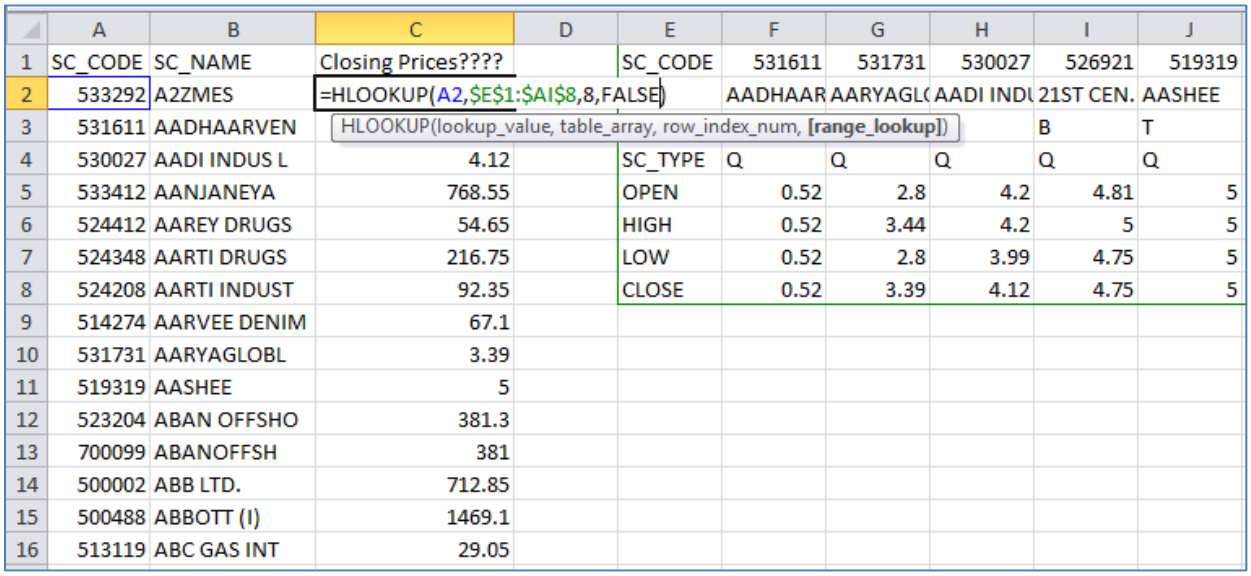
On pressing enter, the output is as shown in Fig 2.7.10.



	A	B	C	D	E	F	G	H	I	J
1	SC_CODE	SC_NAME	Closing Prices????		SC_CODE	531611	531731	530027	526921	519319
2	533292	A2ZMES	59.25		SC_NAME	AADHAAR	AARYAGL(	AADI INDU	21ST CEN.	AASHEE
3	531611	AADHAARVEN			SC_GROUI	B	B	B	B	T
4	530027	AADI INDUS L			SC_TYPE	Q	Q	Q	Q	Q
5	533412	AANJANEYA			OPEN	0.52	2.8	4.2	4.81	5
6	524412	AAREY DRUGS			HIGH	0.52	3.44	4.2	5	5
7	524348	AARTI DRUGS			LOW	0.52	2.8	3.99	4.75	5
8	524208	AARTI INDUST			CLOSE	0.52	3.39	4.12	4.75	5
9	514274	AARVEE DENIM								
10	531731	AARYAGLOBL								
11	519319	AASHEE								
12	523204	ABAN OFFSHO								
13	700099	ABANOFFSH								
14	500002	ABB LTD.								
15	500488	ABBOTT (I)								
16	513119	ABC GAS INT								

Fig. 2.7.10: Result of Hlookup formula

This formula may be dragged for all the cells and the final output for all the values is:



	A	B	C	D	E	F	G	H	I	J
1	SC_CODE	SC_NAME	Closing Prices????		SC_CODE	531611	531731	530027	526921	519319
2	533292	A2ZMES	=HLOOKUP(A2,$E$1:$AI$8,8,FALSE)			AADHAAR	AARYAGL(	AADI INDU	21ST CEN.	AASHEE
3	531611	AADHAARVEN							B	T
4	530027	AADI INDUS L	4.12		SC_TYPE	Q	Q	Q	Q	Q
5	533412	AANJANEYA	768.55		OPEN	0.52	2.8	4.2	4.81	5
6	524412	AAREY DRUGS	54.65		HIGH	0.52	3.44	4.2	5	5
7	524348	AARTI DRUGS	216.75		LOW	0.52	2.8	3.99	4.75	5
8	524208	AARTI INDUST	92.35		CLOSE	0.52	3.39	4.12	4.75	5
9	514274	AARVEE DENIM	67.1							
10	531731	AARYAGLOBL	3.39							
11	519319	AASHEE	5							
12	523204	ABAN OFFSHO	381.3							
13	700099	ABANOFFSH	381							
14	500002	ABB LTD.	712.85							
15	500488	ABBOTT (I)	1469.1							
16	513119	ABC GAS INT	29.05							

HLOOKUP(lookup_value, table_array, row_index_num, **[range_lookup]**)

Fig. 2.7.11: Hlookup formula extended to all the cells

2.7.3 Index Function

Index function returns the value or reference at the intersection of a specified row and column, from an array. It has two sets of arguments. First set has three arguments, viz. *array, row number and column number*. Second set has four arguments, viz. *reference, row number, column number and area number*. If three arguments are specified then 1st set is used. If 4 arguments are specified then the 2nd set is used. Array / reference and row number are mandatory arguments while column number and area number are optional.

Let us have a look at a simple example:

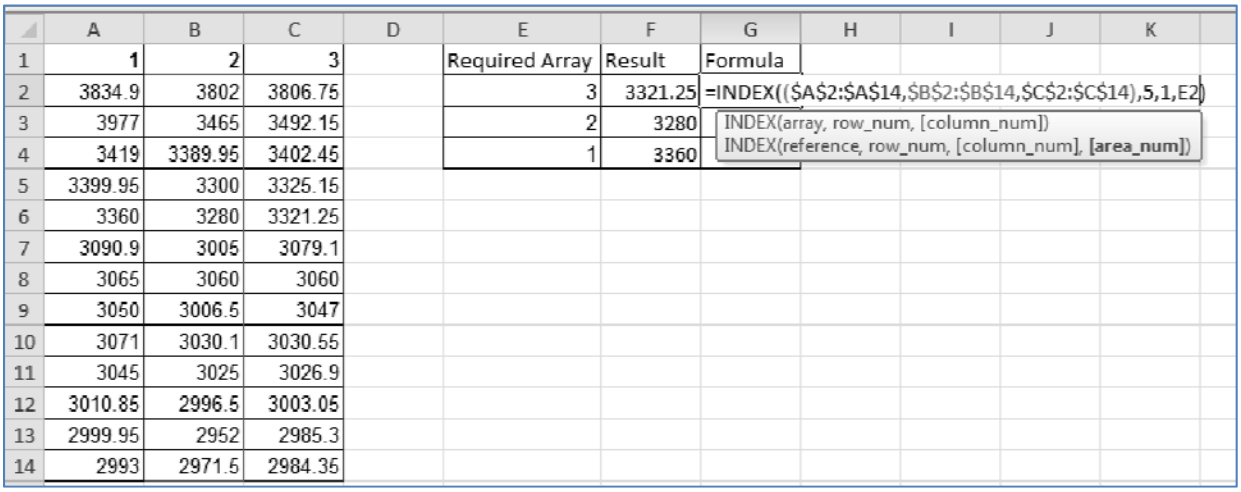
	A	B	C	D	E	F	G
1	SYMBOL	SERIES	OPEN	HIGH	LOW	CLOSE	LAST
2	GSKCONS	EQ	3831.65	3834.9	3802	3806.75	3805
3	TTKPRESTIG	EQ	3804	3977	3465	3492.15	3475.2
4	PAGEIND	EQ	3389.95	3419	3389.95	3402.45	3400
5	GODFRYPHLP	EQ	3344	3399.95	3300	3325.15	3359.9
6	OFSS	EQ	3314.8	3360	3280	3321.25	3330
7	GRASIM	EQ	3047	3090.9	3005	3079.1	3067
8	CRMFGETF	EQ	3065	3065	3060	3060	3060
9	BSLGOLDETF	EQ	3015	3050	3006.5	3047	3047
10	IDBIGOLD	EQ	3045.1	3071	3030.1	3030.55	3030.55
11	MGOLD	EQ	3045	3045	3025	3026.9	3027
12	HDFCMFGETF	EQ	3000	3010.85	2996.5	3003.05	3000
13	IPGETF	EQ	2975	2999.95	2952	2985.3	2994.95
14	AXISGOLD	EQ	2985.15	2993	2971.5	2984.35	2989.8
15							
16							
17	Formula	=INDEX(A1:G14,3,5)					
18		INDEX(array, row_num, **[column_num]**)					
19		INDEX(reference, row_num, **[column_num]**, [area_num])					
20							
21	Result	3465					

Fig. 2.7.12: Index – 1st three arguments

Suppose we wish to obtain the value at the intersection of the 3rd row and 5th column of the above table. We can use index function for this. We will use the 1st set of arguments. Specify array as the range A1:G14, row number as 3 and column number as 5. We get the answer as 3465.

The construction of the formula is given in Cell B17 and the result is given in cell B21.

Now let us consider a situation where we wish to locate values dynamically from different arrays. That's where we can use the second set of arguments of Index function.



	A	B	C	D	E	F	G	H	I	J	K
1	1	2	3		Required Array	Result	Formula				
2	3834.9	3802	3806.75		3	3321.25	=INDEX(($A$2:$A$14,$B$2:$B$14,$C$2:$C$14),5,1,E2)				
3	3977	3465	3492.15		2	3280					
4	3419	3389.95	3402.45		1	3360					
5	3399.95	3300	3325.15								
6	3360	3280	3321.25								
7	3090.9	3005	3079.1								
8	3065	3060	3060								
9	3050	3006.5	3047								
10	3071	3030.1	3030.55								
11	3045	3025	3026.9								
12	3010.85	2996.5	3003.05								
13	2999.95	2952	2985.3								
14	2993	2971.5	2984.35								

INDEX(array, row_num, [column_num])
INDEX(reference, row_num, [column_num], **[area_num]**)

Fig. 2.7.13: Index – All four arguments

Suppose we have 3 sets of values, enlisted in columns A, B and C. We wish to obtain values dynamically from these lists. We can achieve that using index function. Specify the three ranges in the 1st argument i.e. reference, enclosed in round brackets and separated by comma. Say, we wish to obtain 5th value from each list. So specify row number as 5. Since there is only one column in each of the ranges, specify column number as 1 or it may even be omitted. Finally, specify area number as a reference to required array.

As the area number changes, we get values from different ranges. The formula construction is shown in cell G2 and the results are shown in cells F2:F4.

The row number, column number and area number arguments need not be constant values. They themselves may be references to other cells or other functions. Thus, we may design intelligent formulas using index function.

Finally, think of INDEX as

INDEX(data, row, column) or

INDEX((multiple dataset), row, column, sr num of data set)

Where row and column will always act as co-ordinates to get data from intersection.

2.7.4 Match

This function is somewhat similar to Vlookup. Like Vlookup, match searches for a lookup value inside an array. However, instead of returning a corresponding value, it returns the position or ranking of the lookup value inside the array.

Match has three arguments viz. lookup value, lookup array and match type. Lookup value and lookup array are mandatory while match type is optional.

	A	B	C	D	E	F	G
1	SC_CODE	SC_NAME					
2	533292	A2ZMES					
3	531611	AADHAARVEN					
4	530027	AADI INDUS L					
5	533412	AANJANEYA					
6	524412	AAREY DRUGS					
7	524348	AARTI DRUGS					
8	524208	AARTI INDUST					
9	514274	AARVEE DENIM					
10	531731	AARYAGLOBL					
11	519319	AASHEE					
12	523204	ABAN OFFSHO					
13	700099	ABANOFFSH					
14	500002	ABB LTD.					
15	500488	ABBOTT (I)					
16	513119	ABC GAS INT					
17							
18							
19	Lookup Value	Result	Formula				
20	524208	8	=MATCH(A20,A1:A16,0)				
21			MATCH(lookup_value, lookup_array, **[match_type]**)				

Fig. 2.7.14: Match

In the above Fig 2.7.14, suppose we wish to search for the value 524208 in the range A1:A16 and ascertain its position in that range. For this, we can use match function. Specify lookup value as 524208 (i.e. A20 cell) and lookup array as A1:A16. Match type allows either of the three values; less than, greater than or exact match. We will select exact match.

Since 524208 is the eighth cell in the range A1:A16, the output for this formula is 8. The result is shown in the cell B20 and the formula is shown in the cell C20.

Match is often used inside other functions to construct powerful formulas. Let us see one example in the next section.

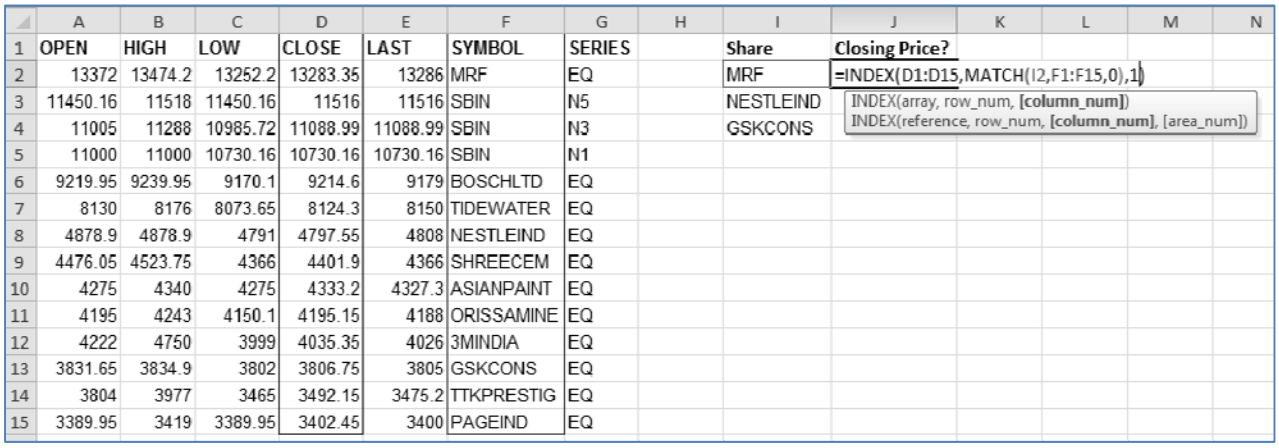
Please note the second parameter of Match is lookup_array and not table_array, meaning you can select only one row or one column to be searched, if you select a table you will mostly end up with N/A error even if the data exists in the table.

2.7.5 Index and Match Combo Function

Vlookup function doesn't support right to left lookup i.e. it doesn't allow the lookup column in the table array to be on the right side of the column from which we wish to fetch values. The way Vlookup is designed, the lookup

column has to be the left most column of the table array. This sometimes creates a lot of difficulty as we are required to perform right to left lookup.

In these situations, we may combine index function and match function to create a synthetic Vlookup. The best part about this combination is that it overcomes the constraint of left to right lookup only.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	OPEN	HIGH	LOW	CLOSE	LAST	SYMBOL	SERIES		Share	Closing Price?				
2	13372	13474.2	13252.2	13283.35	13286	MRF	EQ		MRF	=INDEX(D1:D15,MATCH(I2,F1:F15,0),1)				
3	11450.16	11518	11450.16	11516	11516	SBIN	N5		NESTLEIND					
4	11005	11288	10985.72	11088.99	11088.99	SBIN	N3		GSKCONS					
5	11000	11000	10730.16	10730.16	10730.16	SBIN	N1							
6	9219.95	9239.95	9170.1	9214.6	9179	BOSCHLTD	EQ							
7	8130	8176	8073.65	8124.3	8150	TIDEWATER	EQ							
8	4878.9	4878.9	4791	4797.55	4808	NESTLEIND	EQ							
9	4476.05	4523.75	4366	4401.9	4366	SHREECEM	EQ							
10	4275	4340	4275	4333.2	4327.3	ASIANPAINT	EQ							
11	4195	4243	4150.1	4195.15	4188	ORISSAMINE	EQ							
12	4222	4750	3999	4035.35	4026	3MINDIA	EQ							
13	3831.65	3834.9	3802	3806.75	3805	GSKCONS	EQ							
14	3804	3977	3465	3492.15	3475.2	TTKPRESTIG	EQ							
15	3389.95	3419	3389.95	3402.45	3400	PAGEIND	EQ							

Fig. 2.7.14: Index Match – Arguments of Index function

In the above image, we need to search the lookup from column I in column F and obtain the corresponding prices from column D. However, column F is on the right side of column D. Hence, we cannot use vlookup here. Therefore, Index Match combination becomes relevant.

To obtain the closing prices for the shares listed in column I, insert index function in cell J2. The array for index will be the result vector i.e. column D values. In place of row number argument, insert Match function. Now Match has its own arguments. Specify lookup value as I2 cell, lookup array as column F values and match type as exact match. Then close the Match function.

On closing Match function, we return back to Index function. Specify the column number of Index as 1 or it may even be omitted.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	OPEN	HIGH	LOW	CLOSE	LAST	SYMBOL	SERIES		Share	Closing Price?					
2	13372	13474.2	13252.2	13283.35	13286	MRF	EQ		MRF	=INDEX(D1:D15,MATCH(I2,F1:F15,0),1)					
3	11450.16	11518	11450.16	11516	11516	SBIN	N5		NESTLEIND						
4	11005	11288	10985.72	11088.99	11088.99	SBIN	N3		GSKCONS						
5	11000	11000	10730.16	10730.16	10730.16	SBIN	N1								
6	9219.95	9239.95	9170.1	9214.6	9179	BOSCHLTD	EQ								
7	8130	8176	8073.65	8124.3	8150	TIDEWATER	EQ								
8	4878.9	4878.9	4791	4797.55	4808	NESTLEIND	EQ								
9	4476.05	4523.75	4366	4401.9	4366	SHREECEM	EQ								
10	4275	4340	4275	4333.2	4327.3	ASIANPAINT	EQ								
11	4195	4243	4150.1	4195.15	4188	ORISSAMINE	EQ								
12	4222	4750	3999	4035.35	4026	3MINDIA	EQ								
13	3831.65	3834.9	3802	3806.75	3805	GSKCONS	EQ								
14	3804	3977	3465	3492.15	3475.2	TTKPRESTIG	EQ								
15	3389.95	3419	3389.95	3402.45	3400	PAGEIND	EQ								

Fig. 2.7.15: Index Match – Arguments of Match function

Now when we close the Index function and press enter, we get the desired output. We may copy paste the formula and extend it to other cells.

	A	B	C	D	E	F	G	H	I	J
1	OPEN	HIGH	LOW	CLOSE	LAST	SYMBOL	SERIES		Share	Closing Price?
2	13372	13474.2	13252.2	13283.35	13286	MRF	EQ		MRF	13283.35
3	11450.16	11518	11450.16	11516	11516	SBIN	N5		NESTLEIND	4797.55
4	11005	11288	10985.72	11088.99	11088.99	SBIN	N3		GSKCONS	3806.75
5	11000	11000	10730.16	10730.16	10730.16	SBIN	N1			
6	9219.95	9239.95	9170.1	9214.6	9179	BOSCHLTD	EQ			
7	8130	8176	8073.65	8124.3	8150	TIDEWATER	EQ			
8	4878.9	4878.9	4791	4797.55	4808	NESTLEIND	EQ			
9	4476.05	4523.75	4366	4401.9	4366	SHREECEM	EQ			
10	4275	4340	4275	4333.2	4327.3	ASIANPAINT	EQ			
11	4195	4243	4150.1	4195.15	4188	ORISSAMINE	EQ			
12	4222	4750	3999	4035.35	4026	3MINDIA	EQ			
13	3831.65	3834.9	3802	3806.75	3805	GSKCONS	EQ			
14	3804	3977	3465	3492.15	3475.2	TTKPRESTIG	EQ			
15	3389.95	3419	3389.95	3402.45	3400	PAGEIND	EQ			

Fig. 2.7.16: Index Match – Results

Index Match combination has the following advantages:

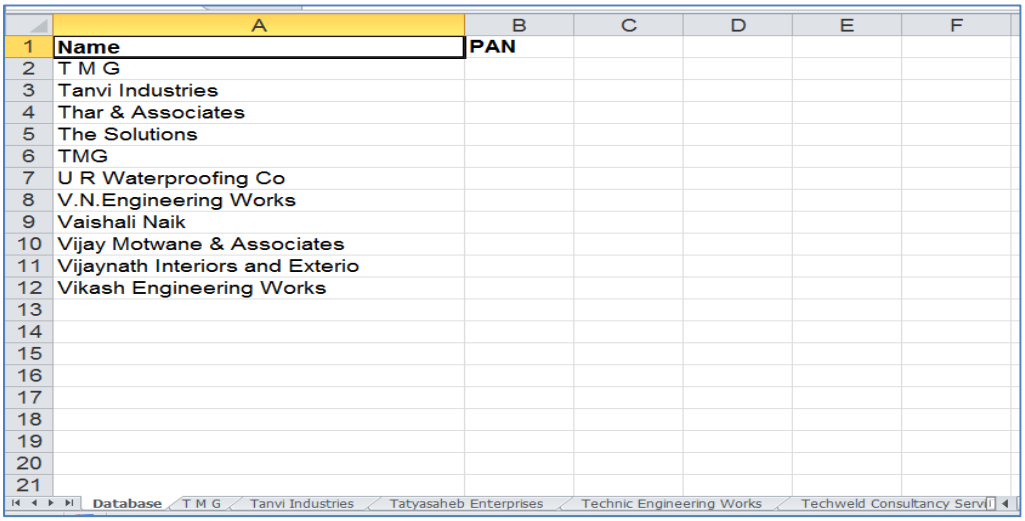
1. It avoids data redundancy which happens if we decide to use Vlookup by copy-pasting the target column to the right side of the lookup column.
2. It performs right to left lookup
3. It can also be used as hlookup. Thus a single combination may replace two functions.
4. The processing requirement is lower as compared to Vlookup.

2.7.6 Indirect Function

This function returns the reference specified by a text. Sometimes, we may build certain references using concatenate or some other functions. These references are stored as text strings by excel. If we wish to use these references as 'references' in our formulas, we must use Indirect function.

Indirect function has two arguments, viz. reference text and A1. Reference text will be the reference generated by other functions or formulas (which has been stored as text). A1 is an optional argument. It lets you specify whether the said reference is in A1 format or R1C1 format. Normally, our references are in A1 format and that is the default value for this argument. Thus, we may omit specifying this argument in almost all the cases.

Consider the following problem as shown in Fig 2.7.17

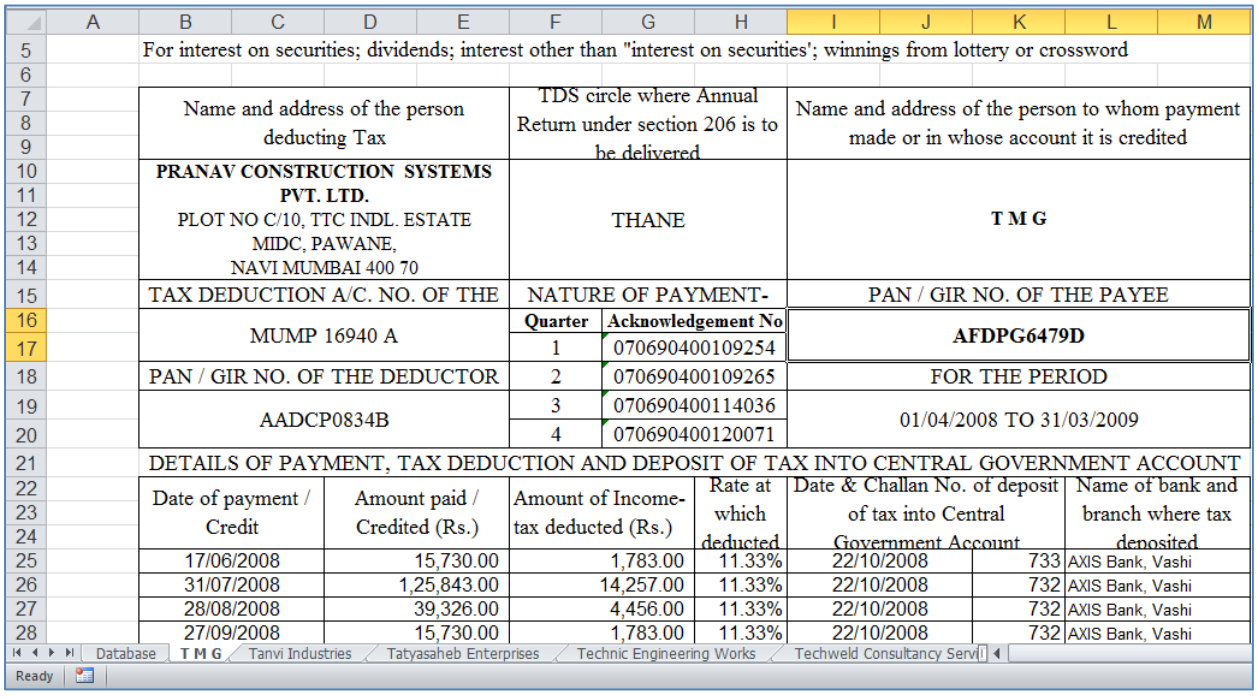


	A	B	C	D	E	F
1	**Name**	**PAN**				
2	T M G					
3	Tanvi Industries					
4	Thar & Associates					
5	The Solutions					
6	TMG					
7	U R Waterproofing Co					
8	V.N.Engineering Works					
9	Vaishali Naik					
10	Vijay Motwane & Associates					
11	Vijaynath Interiors and Exterio					
12	Vikash Engineering Works					
13						
14						
15						
16						
17						
18						
19						
20						
21						

Database | T M G | Tanvi Industries | Tatyasaheb Enterprises | Technic Engineering Works | Techweld Consultancy Servi

Fig. 2.7.17: Problem

We have a list of clients against which we wish to plot their respective PANs. There are dedicated worksheets for different clients and their PANs are available in those sheets. The structure of each worksheet is uniform as given below in Fig 2.7.17.



For interest on securities; dividends; interest other than "interest on securities'; winnings from lottery or crossword

Name and address of the person deducting Tax	TDS circle where Annual Return under section 206 is to be delivered	Name and address of the person to whom payment made or in whose account it is credited
PRANAV CONSTRUCTION SYSTEMS PVT. LTD. PLOT NO C/10, TTC INDL. ESTATE MIDC, PAWANE, NAVI MUMBAI 400 70	THANE	**T M G**
TAX DEDUCTION A/C. NO. OF THE	NATURE OF PAYMENT-	PAN / GIR NO. OF THE PAYEE
MUMP 16940 A	**Quarter** / **Acknowledgement No**: 1 — 070690400109254	**AFDPG6479D**
PAN / GIR NO. OF THE DEDUCTOR	2 — 070690400109265	FOR THE PERIOD
AADCP0834B	3 — 070690400114036; 4 — 070690400120071	01/04/2008 TO 31/03/2009

DETAILS OF PAYMENT, TAX DEDUCTION AND DEPOSIT OF TAX INTO CENTRAL GOVERNMENT ACCOUNT

Date of payment / Credit	Amount paid / Credited (Rs.)	Amount of Income-tax deducted (Rs.)	Rate at which deducted	Date & Challan No. of deposit of tax into Central Government Account		Name of bank and branch where tax deposited
17/06/2008	15,730.00	1,783.00	11.33%	22/10/2008	733	AXIS Bank, Vashi
31/07/2008	1,25,843.00	14,257.00	11.33%	22/10/2008	732	AXIS Bank, Vashi
28/08/2008	39,326.00	4,456.00	11.33%	22/10/2008	732	AXIS Bank, Vashi
27/09/2008	15,730.00	1,783.00	11.33%	22/10/2008	732	AXIS Bank, Vashi

Database | T M G | Tanvi Industries | Tatyasaheb Enterprises | Technic Engineering Works | Techweld Consultancy Servi

Ready

Fig. 2.7.17: Worksheet structure

We may observe that PAN is available in I16 cell. This is true for all the worksheets. The challenge is how we can have dynamic references to all the worksheets so that we can pull the PANs from I16 cells of different worksheets, using a single formula?

First, we must build a formula to derive the cell reference. If I refer to the I16 cell of a sheet, say, T M G, it produces the following reference.

	A	B	C
1	**Name**	**PAN**	
2	T M G	='T M G'!I16	
3	Tanvi Industries		

Fig. 2.7.18: Reference to a cell in a different sheet

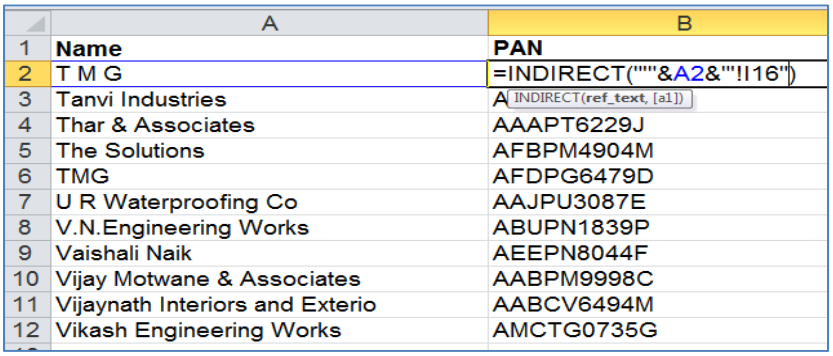
We cannot copy paste this formula everywhere as it will keep showing the same PAN for all (coming from T M G sheet). Here sheet reference should be a variable. For this, we can make use of concatenate function. We will use '&' symbols.

	A	B
1	**Name**	**PAN**
2	T M G	="'"&A2&"'!I16"
3	Tanvi Industries	'Tanvi Industries'!I16
4	Thar & Associates	'Thar & Associates'!I16
5	The Solutions	'The Solutions'!I16
6	TMG	'TMG'!I16
7	U R Waterproofing Co	'U R Waterproofing Co'!I16
8	V.N.Engineering Works	'V.N.Engineering Works'!I16
9	Vaishali Naik	'Vaishali Naik'!I16
10	Vijay Motwane & Associates	'Vijay Motwane & Associates'!I16
11	Vijaynath Interiors and Exterio	'Vijaynath Interiors and Exterio'!I16
12	Vikash Engineering Works	'Vikash Engineering Works'!I16

Fig. 2.7.18: Reference generated by concatenate

As per the syntax, we must have a single inverted comma before the sheet name and '!I16 after the sheet name. The same has been achieved using concatenate, as shown above.

However, this reference is still in text format. We need to obtain the values which are residing on these references. For this purpose, we must use indirect function.



	A	B
1	**Name**	**PAN**
2	T M G	=INDIRECT(""&A2&"'!I16")
3	Tanvi Industries	A INDIRECT(ref_text, [a1])
4	Thar & Associates	AAAPT6229J
5	The Solutions	AFBPM4904M
6	TMG	AFDPG6479D
7	U R Waterproofing Co	AAJPU3087E
8	V.N.Engineering Works	ABUPN1839P
9	Vaishali Naik	AEEPN8044F
10	Vijay Motwane & Associates	AABPM9998C
11	Vijaynath Interiors and Exterio	AABCV6494M
12	Vikash Engineering Works	AMCTG0735G

Fig. 2.7.18: Indirect

The reference generated using concatenate has been enclosed in Indirect function. This finally pulls off the PANs from different worksheets.

Think of INDIRECT function as call forwarding. You "call" a cell reference, that cell_reference gives you reference to another cell, your "call" thus gets forwarded to that new cell reference.

2.8 Logical Functions

These functions help in decision making using various logics. While performing audits, at times we need to make calculations based on various conditions. These functions help us doing that.

2.8.1 IF Function

If function is the leading logical function. This is fundamental to most of the audit processes as somewhere or the other, we are bound to come across condition based working.

If function has three arguments viz. logical test, value if true and value if false. If the logical test is satisfied then the value if true is executed else the value if false is executed.

Let us assume a hypothetical situation wherein we are auditing bonuses paid to employees. For this, we wish to compute the bonuses by ourselves and then compare with the auditee's figures. Bonus @10% is payable to an employee is if he generates minimum sales of Rs 2 Lakhs.

	A	B	C	D	E	F	G
1	Employee ID	Sales	Bonus			Pay Bonus @	10%
2	1		=IF(B2>=$G$3,B2*$G$1,0)			Provided:	
3	2	197	IF(logical_test, [value_if_true], [value_if_false])			Min Sales	2,00,000
4	3	120000					
5	4	334000					
6	5	244000					
7	6	385000					
8	7	327000					
9	8	309000					
10	9	176000					
11	10	161000					

Fig. 2.8.1: If function

The situation has been presented in the above image. If function is inserted in C2 cell. The logical test is defined as sales value of an employee (B2 cell) being greater than or equal to the minimum sales ($G$3 cell). If this holds true, then the sales value is to be multiplied by the bonus rate ($G$1 cell).

'$' symbols are used to fix the cells.

This formula yields Rs 37,400 for the 1st employee as his sales are exceeding Rs 2 Lakhs and thus, 10% of Rs 3,74,000 equals Rs 37,400.

The formula may then be extended to other cells too.

	A	B	C	D	E	F	G
1	Employee ID	Sales	Bonus			Pay Bonus @	10%
2	1		=IF(B2>=$G$3,B2*$G$1,0)			Provided:	
3	2	197	IF(logical_test, [value_if_true], [value_if_false])			Min Sales	2,00,000
4	3	120000	0				
5	4	334000	33400				
6	5	244000	24400				
7	6	385000	38500				
8	7	327000	32700				
9	8	309000	30900				
10	9	176000	0				
11	10	161000	0				

Fig. 2.8.2: If function – final output

2.8.2 And & Or Function

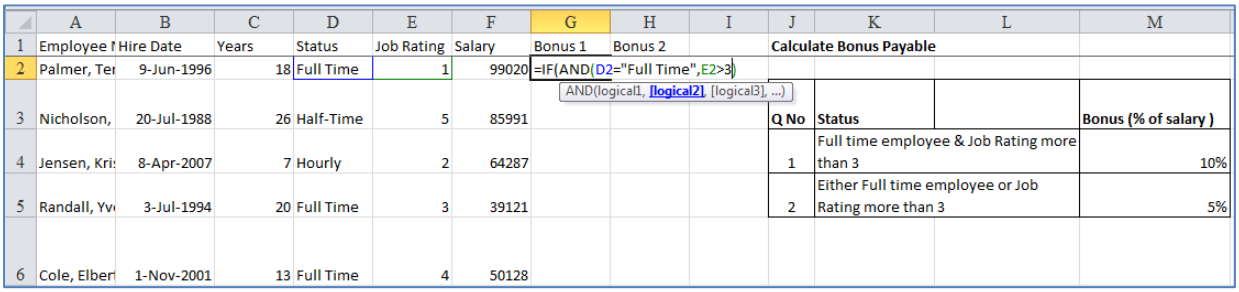
These two functions are highly similar. Hence, we can consider them together. Sometimes, there are multiple conditions, based on which calculations are to be made. Such calculations are required to be made when all conditions are satisfied or any one condition is satisfied. In such cases we can make use of these functions.

Use And function when all the conditions are to be satisfied. On the other hand, use Or function when any one condition is to be satisfied.

Let us consider another situation, where again bonuses are to be paid. But this time, there are multiple conditions to be satisfied.

1. The employee needs to be a full time employee
2. He should have a job rating of more than 3

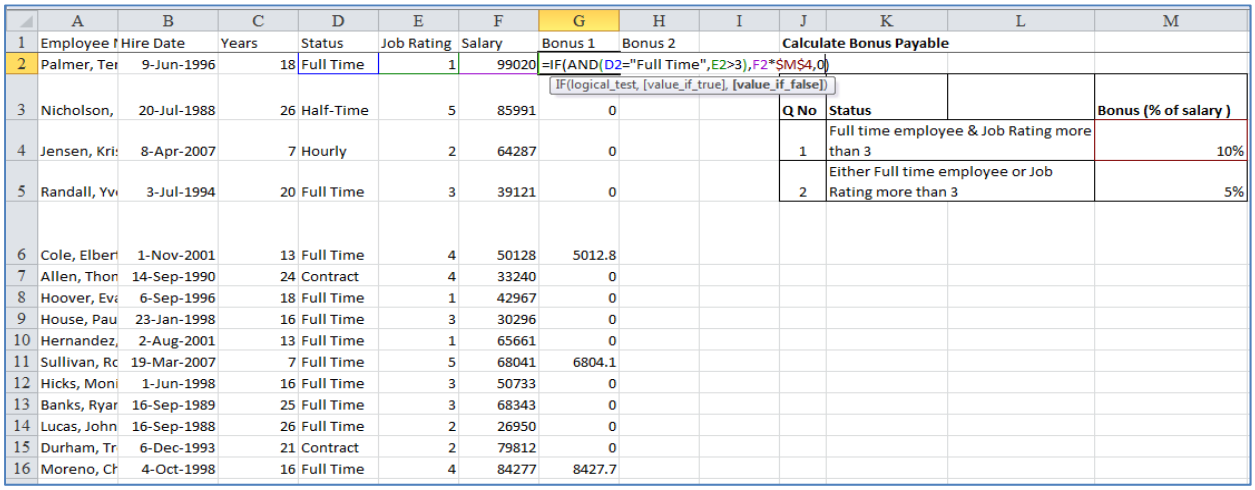
When both the above conditions are to be satisfied, then And function should be used. This function should be used as a part of the logical test argument of If function.



	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Employee N	Hire Date	Years	Status	Job Rating	Salary	Bonus 1	Bonus 2		Calculate Bonus Payable			
2	Palmer, Ter	9-Jun-1996	18	Full Time	1	99020	=IF(AND(D2="Full Time",E2>3)						
							AND(logical1, [logical2], [logical3], ...)						
3	Nicholson,	20-Jul-1988	26	Half-Time	5	85991				Q No	Status		Bonus (% of salary)
4	Jensen, Kris	8-Apr-2007	7	Hourly	2	64287				1	Full time employee & Job Rating more than 3		10%
5	Randall, Yv	3-Jul-1994	20	Full Time	3	39121				2	Either Full time employee or Job Rating more than 3		5%
6	Cole, Elbert	1-Nov-2001	13	Full Time	4	50128							

Fig. 2.8.3: And function

In the above Fig 2.8.3, we can see that **And** function has been inserted inside If function. The logical test of If function is the combination of two logicals specified in And function; namely D2 = “Full Time” and E2 > 3. If and only if both these logicals are satisfied, then the value if true of the If function will be executed.

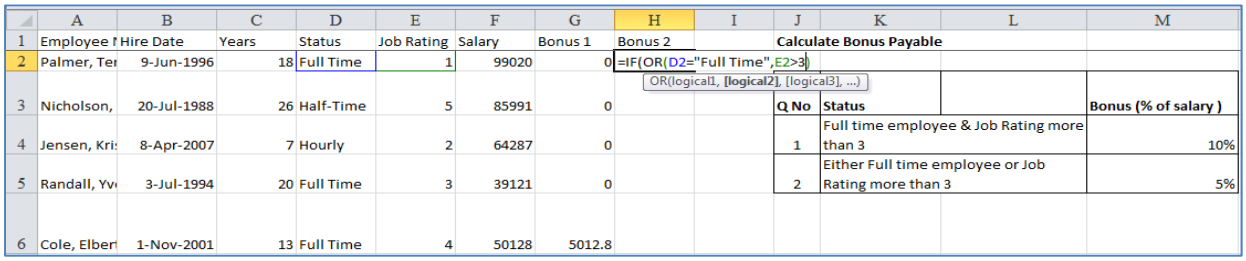


	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Employee N	Hire Date	Years	Status	Job Rating	Salary	Bonus 1	Bonus 2		Calculate Bonus Payable			
2	Palmer, Ter	9-Jun-1996	18	Full Time	1	99020	=IF(AND(D2="Full Time",E2>3),F2*$M$4,0)						
							IF(logical_test, [value_if_true], [value_if_false])						
3	Nicholson,	20-Jul-1988	26	Half-Time	5	85991	0			Q No	Status		Bonus (% of salary)
4	Jensen, Kris	8-Apr-2007	7	Hourly	2	64287	0			1	Full time employee & Job Rating more than 3		10%
5	Randall, Yv	3-Jul-1994	20	Full Time	3	39121	0			2	Either Full time employee or Job Rating more than 3		5%
6	Cole, Elbert	1-Nov-2001	13	Full Time	4	50128	5012.8						
7	Allen, Thon	14-Sep-1990	24	Contract	4	33240	0						
8	Hoover, Eva	6-Sep-1996	18	Full Time	1	42967	0						
9	House, Pau	23-Jan-1998	16	Full Time	3	30296	0						
10	Hernandez,	2-Aug-2001	13	Full Time	1	65661	0						
11	Sullivan, Ro	19-Mar-2007	7	Full Time	5	68041	6804.1						
12	Hicks, Moni	1-Jun-1998	16	Full Time	3	50733	0						
13	Banks, Ryar	16-Sep-1989	25	Full Time	3	68343	0						
14	Lucas, John	16-Sep-1988	26	Full Time	2	26950	0						
15	Durham, Tr	6-Dec-1993	21	Contract	2	79812	0						
16	Moreno, Ch	4-Oct-1998	16	Full Time	4	84277	8427.7						

Fig. 2.8.4: If function containing And function

Above Fig 2.8.4 as shows the complete formula. If the logical test (built with the help of And function) is satisfied then salary will be multiplied by bonus percentage (F2 * $M$4) else it will be zero. This formula is extended to the subsequent cells as well.

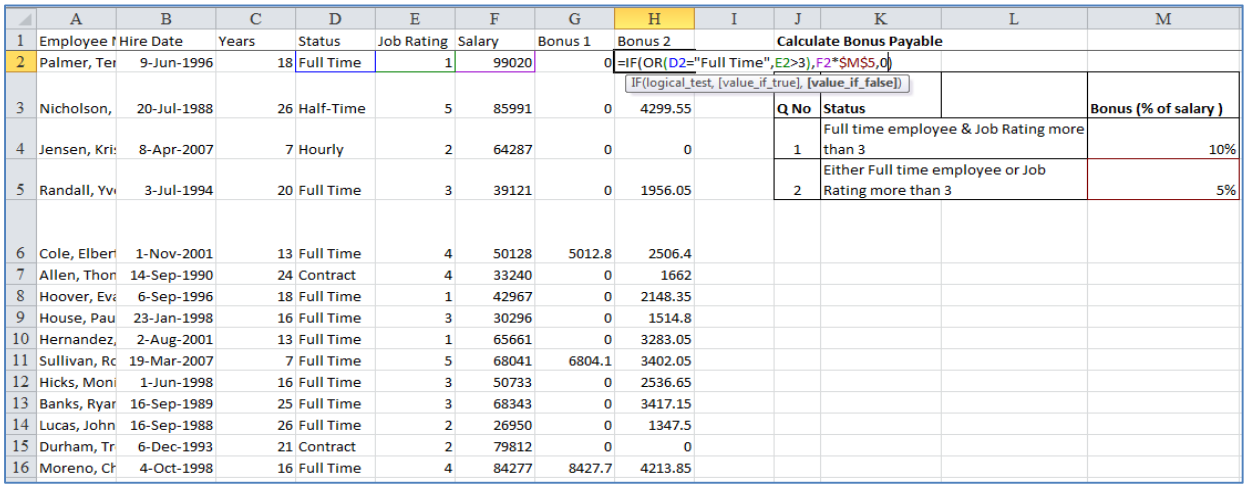
Now let us consider the same situation with the same conditions. How to calculate bonus if we it is to be paid on the satisfaction of any one condition? For this, we should use Or function. Like And function, Or function should also be used as a part of the logical test argument of If function.



	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Employee N	Hire Date	Years	Status	Job Rating	Salary	Bonus 1	Bonus 2		Calculate Bonus Payable			
2	Palmer, Ter	9-Jun-1996	18	Full Time	1	99020	0	=IF(OR(D2="Full Time",E2>3)					
								OR(logical1, **[logical2]**, [logical3], ...)					
3	Nicholson,	20-Jul-1988	26	Half-Time	5	85991	0			Q No	Status		Bonus (% of salary)
4	Jensen, Kris	8-Apr-2007	7	Hourly	2	64287	0			1	Full time employee & Job Rating more than 3		10%
5	Randall, Yv	3-Jul-1994	20	Full Time	3	39121	0			2	Either Full time employee or Job Rating more than 3		5%
6	Cole, Elbert	1-Nov-2001	13	Full Time	4	50128	5012.8						

Fig. 2.8.5: Or function

This looks almost the same like And function. But the effect will be different. Even if any one condition is satisfied, the evaluation of Or function will be true and hence value if true of the If function will be executed.



	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Employee N	Hire Date	Years	Status	Job Rating	Salary	Bonus 1	Bonus 2		Calculate Bonus Payable			
2	Palmer, Ter	9-Jun-1996	18	Full Time	1	99020	0	=IF(OR(D2="Full Time",E2>3),F2*$M$5,0)					
								IF(logical_test, [value_if_true], **[value_if_false]**)					
3	Nicholson,	20-Jul-1988	26	Half-Time	5	85991	0	4299.55		Q No	Status		Bonus (% of salary)
4	Jensen, Kris	8-Apr-2007	7	Hourly	2	64287	0	0		1	Full time employee & Job Rating more than 3		10%
5	Randall, Yv	3-Jul-1994	20	Full Time	3	39121	0	1956.05		2	Either Full time employee or Job Rating more than 3		5%
6	Cole, Elbert	1-Nov-2001	13	Full Time	4	50128	5012.8	2506.4					
7	Allen, Thon	14-Sep-1990	24	Contract	4	33240	0	1662					
8	Hoover, Eva	6-Sep-1996	18	Full Time	1	42967	0	2148.35					
9	House, Pau	23-Jan-1998	16	Full Time	3	30296	0	1514.8					
10	Hernandez,	2-Aug-2001	13	Full Time	1	65661	0	3283.05					
11	Sullivan, Rc	19-Mar-2007	7	Full Time	5	68041	6804.1	3402.05					
12	Hicks, Moni	1-Jun-1998	16	Full Time	3	50733	0	2536.65					
13	Banks, Ryar	16-Sep-1989	25	Full Time	3	68343	0	3417.15					
14	Lucas, John	16-Sep-1988	26	Full Time	2	26950	0	1347.5					
15	Durham, Tr	6-Dec-1993	21	Contract	2	79812	0	0					
16	Moreno, Ch	4-Oct-1998	16	Full Time	4	84277	8427.7	4213.85					

Fig. 2.8.6: If function containing Or function

Above image shows the complete formula. If any one condition is satisfied then salary will be multiplied by bonus percentage (F2 * $M$5) else it will be zero. This formula is extended to the subsequent cells as well.

We can see that many more persons are getting paid bonuses as Or function tends to generate true more number of times as compared to And function.

2.8.3 NOT Function

Not function is a negation function. It negates the logical evaluation and produces the opposite result. In simple words, Not function will convert true into false and false into true.

It is a very simple function with a single argument, logical. Whatever logical is supplied, Not function generates the opposite of the evaluation of that logical.

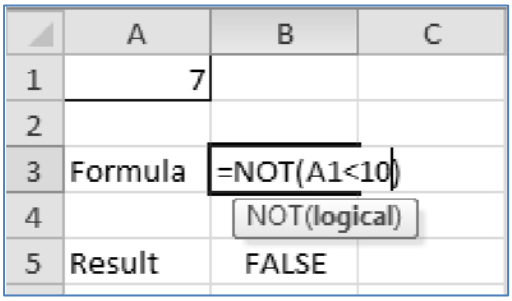


Fig. 2.8.7: Not function

In the above Fig 2.8.7, the logical is A1 < 10. Since A1 contains 7, this logical gets evaluated to True. However, this logical is enclosed inside Not function. Therefore, the evaluation of the complete formula is False.

The structure of the formula is shown in B3 cell and the result is shown in B5 cell.

2.8.4 IFERROR Function

Iferror is a brilliant function introduced in Excel 2007! This function may be viewed as a special case of If function. It has two arguments, value and value if error. If the 1st value generates an error of any kind (eg. #N/A, #REF!, #VALUE!, #DIV/0! etc.), then the value if error will be executed. If it doesn't generate any error, then the 1st value itself will be executed.

	A	B	C	D
1	**Construct a single formula to plot NSE prices and if share is not listed on NSE, to plot BSE prices**			
2				
3	**NSE/BSE Symbol/Scrip Code**	**Scrip Name**	**Formula**	**Result**
4	502015	ASSSTONE	=VLOOKUP(A4,NSE!A:F,6,FALSE)	#N/A
5	CERA	CERA	=VLOOKUP(A5,NSE!A:F,6,FALSE)	445.55
6	532284	TCFCFIN	=VLOOKUP(A6,NSE!A:F,6,FALSE)	#N/A
7	BHEL	BHEL	=VLOOKUP(A7,NSE!A:F,6,FALSE)	225.05
8	RELIANCE	RELIANCE	=VLOOKUP(A8,NSE!A:F,6,FALSE)	890
9	SBIN	SBIN	=VLOOKUP(A9,NSE!A:F,6,FALSE)	2469.85
10	TATAMOTORS	TATAMOTORS	=VLOOKUP(A10,NSE!A:F,6,FALSE)	328.95
11	TATASTEEL	TATASTEEL	=VLOOKUP(A11,NSE!A:F,6,FALSE)	418.7
12	BHEL	BHEL	=VLOOKUP(A12,NSE!A:F,6,FALSE)	225.05
13	HDFC	HDFC	=VLOOKUP(A13,NSE!A:F,6,FALSE)	807.6
14	LT	LT	=VLOOKUP(A14,NSE!A:F,6,FALSE)	1527.7
15	MARUTI	MARUTI	=VLOOKUP(A15,NSE!A:F,6,FALSE)	1494.1
16	ONGC	ONGC	=VLOOKUP(A16,NSE!A:F,6,FALSE)	314.45
17	BAJAJELEC	BAJAJELEC	=VLOOKUP(A17,NSE!A:F,6,FALSE)	204.95
18	JYOTHYLAB	JYOTHYLAB	=VLOOKUP(A18,NSE!A:F,6,FALSE)	153.55
19	SESAGOA	SESAGOA	=VLOOKUP(A19,NSE!A:F,6,FALSE)	189.65
20	TATACHEM	TATACHEM	=VLOOKUP(A20,NSE!A:F,6,FALSE)	371.3
21	BHEL	BHEL	=VLOOKUP(A21,NSE!A:F,6,FALSE)	225.05
22	JYOTHYLAB	JYOTHYLAB	=VLOOKUP(A22,NSE!A:F,6,FALSE)	153.55
23	MARUTI	MARUTI	=VLOOKUP(A23,NSE!A:F,6,FALSE)	1494.1
24	ONGC	ONGC	=VLOOKUP(A24,NSE!A:F,6,FALSE)	314.45

1 NSE BSE

Fig. 2.8.8: Vlookup returning errors at some place

Above Fig 2.8.8 shows a workbook with 3 worksheets. There are shares listed on NSE and BSE. We wish to perform a valuation of these shares by plotting the corresponding prices from exchanges in front of the shares. For this, vlookup on NSE has been inserted. For most of the shares, this formula works. But there are a couple of shares which are listed only on BSE, not on NSE. They bear #N/A errors in front of them.

To do valuation for these shares, we need to apply a vlookup on BSE worksheet as well. Thus, some shares may require a lookup on one sheet while some shares may require a lookup on another. To solve this issue, we can use iferror function.

	A	B	C	D
1	**Construct a single formula to plot NSE prices and if share is not listed on NSE, to plot BSE prices**			
2				
3	**NSE/BSE Symbol/Scrip Code**	**Scrip Name**	**Formula**	**Result**
4	502015	ASSSTONE	=IFERROR(VLOOKUP(A4,NSE!A:F,6,FALSE),VLOOKUP(A4,BSE!A:H,8,FALSE))	25.25
5	CERA	CERA	=IFERROR(VLOOKUP(A5,NSE!A:F,6,FALSE),VLOOKUP(A5,BSE!A:H,8,FALSE))	445.55
6	532284	TCFCFIN	=IFERROR(value, value_if_error) NSE!A:F,6,FALSE),VLOOKUP(A6,BSE!A:H,8,FALSE))	14.45
7	BHEL	BHEL	=IFERROR(VLOOKUP(A7,NSE!A:F,6,FALSE),VLOOKUP(A7,BSE!A:H,8,FALSE))	225.05
8	RELIANCE	RELIANCE	=IFERROR(VLOOKUP(A8,NSE!A:F,6,FALSE),VLOOKUP(A8,BSE!A:H,8,FALSE))	890
9	SBIN	SBIN	=IFERROR(VLOOKUP(A9,NSE!A:F,6,FALSE),VLOOKUP(A9,BSE!A:H,8,FALSE))	2469.85
10	TATAMOTORS	TATAMOTOR	=IFERROR(VLOOKUP(A10,NSE!A:F,6,FALSE),VLOOKUP(A10,BSE!A:H,8,FALSE))	328.95
11	TATASTEEL	TATASTEEL	=IFERROR(VLOOKUP(A11,NSE!A:F,6,FALSE),VLOOKUP(A11,BSE!A:H,8,FALSE))	418.7
12	BHEL	BHEL	=IFERROR(VLOOKUP(A12,NSE!A:F,6,FALSE),VLOOKUP(A12,BSE!A:H,8,FALSE))	225.05
13	HDFC	HDFC	=IFERROR(VLOOKUP(A13,NSE!A:F,6,FALSE),VLOOKUP(A13,BSE!A:H,8,FALSE))	807.6
14	LT	LT	=IFERROR(VLOOKUP(A14,NSE!A:F,6,FALSE),VLOOKUP(A14,BSE!A:H,8,FALSE))	1527.7
15	MARUTI	MARUTI	=IFERROR(VLOOKUP(A15,NSE!A:F,6,FALSE),VLOOKUP(A15,BSE!A:H,8,FALSE))	1494.1
16	ONGC	ONGC	=IFERROR(VLOOKUP(A16,NSE!A:F,6,FALSE),VLOOKUP(A16,BSE!A:H,8,FALSE))	314.45
17	BAJAJELEC	BAJAJELEC	=IFERROR(VLOOKUP(A17,NSE!A:F,6,FALSE),VLOOKUP(A17,BSE!A:H,8,FALSE))	204.95
18	JYOTHYLAB	JYOTHYLAB	=IFERROR(VLOOKUP(A18,NSE!A:F,6,FALSE),VLOOKUP(A18,BSE!A:H,8,FALSE))	153.55
19	SESAGOA	SESAGOA	=IFERROR(VLOOKUP(A19,NSE!A:F,6,FALSE),VLOOKUP(A19,BSE!A:H,8,FALSE))	189.65
20	TATACHEM	TATACHEM	=IFERROR(VLOOKUP(A20,NSE!A:F,6,FALSE),VLOOKUP(A20,BSE!A:H,8,FALSE))	371.3
21	BHEL	BHEL	=IFERROR(VLOOKUP(A21,NSE!A:F,6,FALSE),VLOOKUP(A21,BSE!A:H,8,FALSE))	225.05
22	JYOTHYLAB	JYOTHYLAB	=IFERROR(VLOOKUP(A22,NSE!A:F,6,FALSE),VLOOKUP(A22,BSE!A:H,8,FALSE))	153.55
23	MARUTI	MARUTI	=IFERROR(VLOOKUP(A23,NSE!A:F,6,FALSE),VLOOKUP(A23,BSE!A:H,8,FALSE))	1494.1
24	ONGC	ONGC	=IFERROR(VLOOKUP(A24,NSE!A:F,6,FALSE),VLOOKUP(A24,BSE!A:H,8,FALSE))	314.45

1 NSE BSE

Fig. 2.8.9: Iferror function

As we can see in the above image, Iferror function has been used. Value is the 1st Vlookup on NSE while Value if error is the 2nd Vlookup on BSE. Whenever the Vlookup on NSE generates #N/A error, Vlookup on BSE gets applied. Thus, this single formula fetches prices for all the shares.

2.9 Statistical Functions

MS Excel provides an extensive range of functions to generate various statistics. Here we will have a look at some functions from this category which could be helpful from auditing point of view.

2.9.1 COUNTA Function

Counting of values is a fundamental activity while performing audit. We use Count function for counting purpose. However, we must bear in mind that Count function only counts numbers. If we wish to count text values, errors, cells with spaces etc; then Count function cannot be used. In such situations, we must use Counta function.

Counta counts all non-blank cells in a range of cells. As long as the cell is filled (either with number, text, error or with space), it will be counted.

	A	B	C	D
1	scheme_name	Formula	=COUNTA(A2:A155)	
2	IDFC ALL SEASONS BOND FUND	Result	154	
3	IDFC ALL SEASONS BOND FUND			
4	IDFC ALL SEASONS BOND FUND			
5	IDFC ARBITRAGE FUND			
6	IDFC ARBITRAGE FUND			
7	IDFC ARBITRAGE FUND			
8	IDFC ARBITRAGE FUND			
9	IDFC ARBITRAGE FUND			
10	IDFC ARBITRAGE FUND			
11	IDFC ARBITRAGE FUND			
12	IDFC ARBITRAGE FUND			
13	IDFC ARBITRAGE FUND			
14	IDFC ARBITRAGE FUND			
15	IDFC ARBITRAGE FUND			
16	IDFC ARBITRAGE FUND			
17	IDFC ARBITRAGE FUND			
18	IDFC ARBITRAGE FUND			
19	IDFC ARBITRAGE FUND			
20	IDFC ARBITRAGE FUND			
21	IDFC ARBITRAGE FUND			
22	IDFC ARBITRAGE PLUS FUND			
23	IDFC ARBITRAGE PLUS FUND			
24	IDFC ARBITRAGE PLUS FUND			
25	IDFC ARBITRAGE PLUS FUND			

Fig. 2.9.1: Counta function

In the above example, Counta function counts the number of non-blank cells in the range A2:A155. The result is 154. The construction of the formula is given in cell C1 and the result is given in the cell C2.

2.9.2 COUNTBLANK Function

Countblank function is the reverse of Counta function. It counts all the blank cells in a range of cells. This could be used in detecting cells which have inadvertently remained blank or where data entry is incomplete.

It is a very simple function with only one argument, range.

	E	F	G	H	I	J
	gross_int		Formula	=COUNTBLANK(E1:E15)		
	0.00		Result	4		
	0.00					
	0.00					
	0.00					
	0.00					
	0.00					
	0.00					
	0.00					
	0.00					
	0.00					

Fig. 2.9.2: Countblank function

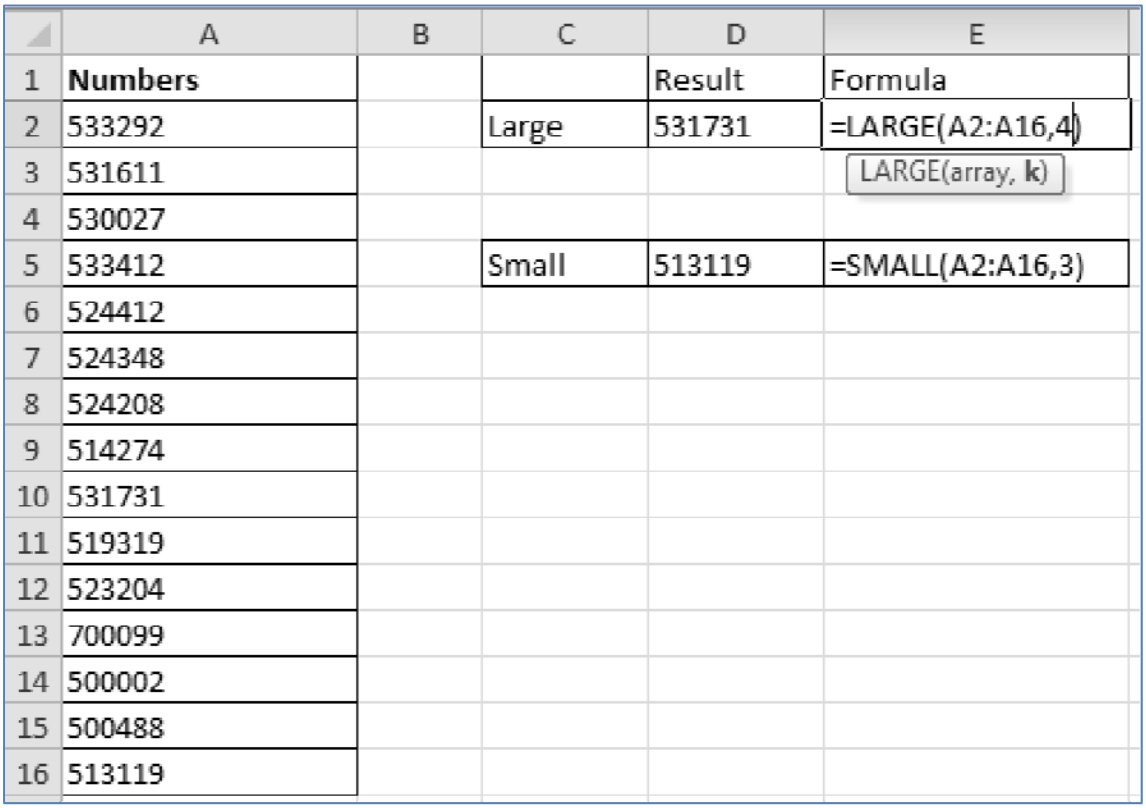
Consider the above example. Suppose we wish to ascertain the number of blank cells in the range E1 to E15. We can use Countblank function for this. The answer is 4. The construction of the formula is given in cell H1 and the result is given in the cell H2.

2.9.3 LARGE & SMALL Function

This function returns the k^{th} largest number from a list of numbers. Sometimes we are required to fetch 3^{rd} largest or 5^{th} largest value. For that, this function is very useful.

Similarly, we have Small function. This will return the k^{th} smallest number from a list of numbers.

The arguments for both the functions are same. There are two arguments, array and k. Array is the list of numbers. K is kth largest or smallest number that we desire.



	A	B	C	D	E
1	**Numbers**			Result	Formula
2	533292		Large	531731	=LARGE(A2:A16,4)
3	531611				LARGE(array, **k**)
4	530027				
5	533412		Small	513119	=SMALL(A2:A16,3)
6	524412				
7	524348				
8	524208				
9	514274				
10	531731				
11	519319				
12	523204				
13	700099				
14	500002				
15	500488				
16	513119				

Fig. 2.9.3: Large and Small functions

In the above Fig 2.9.3, there is a list of numbers in Column A. Suppose, we wish to ascertain the 4th largest and 3rd smallest value. That can be achieved using Large and Small functions. The formula constructions are shown in E2 and E5 cells while the results are shown in D2 and D5 cells.

Thus, these are some leading functions of each category. There are many more functions which may prove themselves to be useful, depending on the situation. Therefore, you must keep learning new functions from the functions library.

2.10 Summary

MS Excel has a rich library of functions, divided into various categories like Financial, Logical, Text, Date & Time etc. It helps if we learn the major functions from this library.

To begin with, we should be able to distinguish between a function and a formula. Function is a preset calculation methodology developed by Microsoft. Formula is a structure of calculation developed by a user, which may or may not involve functions.

Following is a brief on leading functions from each Category:

Financial Functions

1. NPV – It calculates the Net Present Value for a series of cashflows. You must remember that the initial cashflow should not be included inside the formula. It should be subtracted separately outside the function.
2. IRR – It calculates the Internal Rate of Return for a series of cashflows. Even the initial cash outflow should be included inside the formula.
3. XNPV and XIRR – Similar to above, but these functions are used when the cashflows are not equally spaced. In that case, we use the dates corresponding to each cashflow.
4. DB - It is used for calculating depreciation as per WDV method.

Date & Time Functions

1. Eomonth – It is used to calculate the *month end date* corresponding to a reference date, which could be few months ahead or before.
2. Edate – This function returns the *same day*, few months ahead or before a reference date.
3. Networkdays – It calculates the number of working days in between two dates, excluding weekends and holidays on weekday, if specified
4. Workday – This function is similar to Networkdays. It returns the working day before or after specified number of workdays with respect to a start date, excluding weekends and holidays on weekday, if specified

Math & Trig Functions

1. Mod – It returns the remainder after dividing a number by a divisor
2. Quotient – It is opposite of Mod. It returns the integral part of the answer when a number is divided by a divisor

Text Functions

1. Concatenate – It combines two or more text strings. Either concatenate function may be used or '&' symbol can be used for this purpose.
2. Exact – It is used for comparing two text strings and ascertaining whether they are alike. Exact is case sensitive.

Lookup & Reference Functions

1. Vlookup – It is the most commonly used lookup function. It searches for a value in the left most column of a table array and once found, then returns a corresponding value. Range lookup for Vlookup may be specified as true when a lookup is to be performed in a range of values (eg. 0-100, 100-200 etc).
2. Hlookup – It is almost the same as Vlookup. Only difference it performs a horizontal lookup (i.e. row wise lookup).
3. Index – It returns the value or reference at the intersection of a specified row and column, from an array.

4. Match – It is somewhat similar to Vlookup. It returns the position or ranking of the lookup value inside the array.
5. Indirect - This function returns the reference specified by a text.

Logical Functions

1. If – It contains a logical test. If the test is satisfied then one action is taken else another action is taken.
2. And & Or – They complement the If function. The can combine multiple logicals to form a consolidated logical test of the If function. Use And function if all logicals are required to be satisfied. Use Or function if any one logical is required to be satisfied.
3. Not - It negates the logical evaluation of a statement. It converts true into false and false into true.
4. Iferror – You need to specify two values, an original value and a value if error. If the original value returns an error, the value if error is executed else the original value itself is executed.

Statistical Functions

1. Counta – It counts all non-blank cells
2. Countblank – It is opposite of Counta. It counts all blank cells.
3. Large and Small – They return the largest and the smallest k^{th} number in a list of numbers.

2.11 Multiple Choice Questions (MCQ) for Practice

1. The suitable function to find Net Present Value when cash flows are not equally spaced is:
   (a) NPV
   (b) XNPV
   (c) YNPV
   (d) ZNPV
2. At IRR, the NPV is:
   (a) 0
   (b) Positive
   (c) Negative
   (d) Indeterminate
3. DB function calculates depreciation as per:
   (a) SLM Method
   (b) WDV Method
   (c) Either SLM or WDV, as per user's specification
   (d) Both SLM as well as WDV

4. Rajiv wants to find out the last day of the month corresponding to 03rd November, 2016. Which excel function should he use?
   (a) Edate
   (b) Emonth
   (c) Eodate
   (d) Eomonth
5. Radha wants to find out the number of working days between 05/11/2015 and 06/07/2016. Which function she should use?
   (a) Workday
   (b) Edate
   (c) Networkdays
   (d) Eomonth
6. Mod function returns the following:
   (a) Dividend
   (b) Divisor
   (c) Quotient
   (d) Remainder
7. Sunil wants to join multiple text strings. He faintly remembers that some special symbol can be used for this purpose but he is not sure which symbol. He has approached you to seek guidance. Which symbol will you advise?
   (a) &
   (b) $
   (c) @
   (d) !
8. Exact function
   (a) Is always case sensitive
   (b) Is never case sensitive
   (c) Can be sometimes case sensitive, depending upon user specification
   (d) Can be sometimes case sensitive, depending upon nature of data
9. Vlookup works in the direction:
   (a) Top to bottom

(b) Bottom to top

(c) Left to right

(d) Right to left

10. H in Hlookup stands for:

(a) Heavy

(b) Horizontal

(c) Hierarchical

(d) Historical

11. Which functions may be combined to mimic Vlookup?

(a) Index Match

(b) Indirect Match

(c) Index Indirect

(d) Index Not

12. Which of the following functions return relative position of a value in an array?

(a) Index

(b) Match

(c) Indirect

(d) Iferror

13. Which of the following functions returns the reference specified by a text?

(a) Index

(b) Match

(c) Indirect

(d) Iferror

14. Which of the following functions has two sets of arguments/ways of writing function?

(a) Index

(b) Match

(c) Indirect

(d) Iferror

15. If you wish to combine multiple conditions such that all of them should get satisfied, use:

(a) And function

(b) Or function

(c) Both the functions

(d) Either of the two functions

16. If you wish to combine multiple conditions such that any one of them should get satisfied, use:

(a) And function

(b) Or function

(c) Both the functions

(d) Either of the two functions

17. Counta function counts:

(a) Numbers

(b) Texts

(c) Errors

(d) All of the above

Solutions

1. (b)
2. (a)
3. (b)
4. (d)
5. (c)
6. (d)
7. (a)
8. (a)
9. (c)
10. (b)
11. (a)
12. (b)
13. (c)
14. (a)
15. (a)
16. (b)
17. (d)

CHAPTER

3 FORMULA AUDITING

LEARNING OBJECTIVES

- Be aware about the concept of Formula Auditing.
- Learn the various features available in the Formula Auditing Group
- Study the relevant options of Go To Special Window for Formula Auditing
- Learn some handy tips for better Formula Auditing

3.1 Introduction

An organization compiles financial accounts throughout the year. After the accounts are finalized from the auditee's end, they are sent for audit. Typically, this happens in the month of April or May, in India. The objective is to express an opinion whether the accounts reflect a true and fair view of the state of affairs of the business.

Similarly, once a formula based template is developed in excel, we may wonder whether we have constructed the various structures properly. To satisfy ourselves, we may perform what may be termed as 'Formula Audit'. This helps us in framing an opinion about robustness and integrity of the formulas.

Formula Audit may also be performed for an already built and working structure. This may be done either to have a better understanding of the structures or to ascertain whether any formulas warrant updates or maintenance.

As a part of our financial audits, we develop various formula based structures in excel. If we perform Formula Audit, then we will have more confidence in our working. If there are any anomalies in the formula construction, we can become aware of such anomalies in advance, before raising audit observations or at least before releasing the audit report. If the logic behind some formulas has undergone a change, then we can update such formulas. Thus, Formula Audit is of immense importance to Chartered Accountants. An excel error once cost 24 million USD to a firm called TransAlta, thus highlighting the need for formula auditing.

3.2 Formula Auditing Group

In Excel, we have a dedicated toolset available for the purpose of Formula Audit. It is available in Formulas Tab.

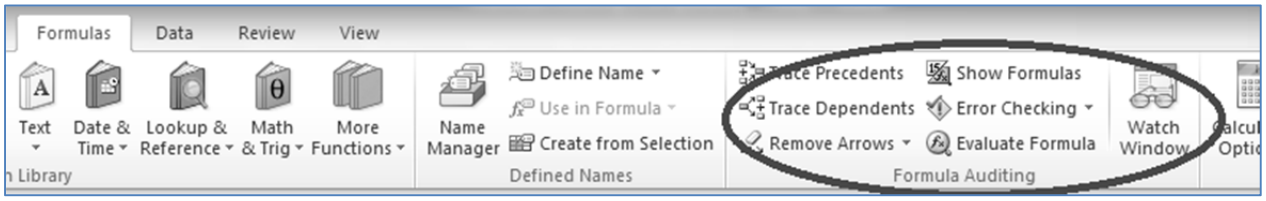


Fig. 3.2.1: Formula Auditing Group

In Fig. 3.2.1, the formula auditing group has been highlighted using oval shape. It contains various features like Trace precedents / dependents, Error Checking, Evaluate Formula etc. Let us now proceed to learn these features in details.

3.3 Studying interrelationships between cells

When we try to audit formulas, sometimes we would like to dig the precedents or the dependents for few cells. This helps us in understanding the interrelationship between the cells better. For this purpose, we can use Trace Precedents and Trace Dependents features from the Formula Auditing Group.

3.3.1 Trace Precedents

A formula generally involves other cell references. Sometimes, we may like to mark them clearly on the worksheet. For this, we can use Trace Precedents feature available in the Formula Auditing Group.

M19 =IF(G19="P","",(SUMIFS($I$1:I18,$B$1:B18,B19,$G$1:G18,"P")-SUMIFS($M$1:M18,$B$1:B18,B19,$G$1:G18,"S"))*H19/(SUMIFS($H$1:H18,$B$1:B18,B19,$G$1:G18,"P")-SUMIFS($H$1:H18,$B$1:B18,B19,$G$1:G18,"S")))

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Conky	NSE/BSE Symbol/Scrip	Scrip Name	Lot No	Lot balanc	Date	TT	Qty	Amount	FIFO COS	FIFO Reali	Lots recd/(	Wt Avg COS	Wt Avg Rea
2	502015	502015	ASSSTONE	1	25	19-Oct-10	P	25	1256					
3	CERA	CERA	CERA	1	7	07-Mar-11	P	20	3292.6			26, 65		
4	532284	532284	TCFCFIN	1	100	03-May-11	P	100	4194					
5	BHEL	BHEL	BHEL	1	0	26-Aug-11	P	5	1767.5			19		
6	RELIAN	RELIANCE	RELIANCE	1	1	26-Aug-11	P	2	1510.14			78		
7	SBIN	SBIN	SBIN	1	0	26-Aug-11	P	1	1940.09			80		
8	TATAM	TATAMOTORS	TATAMOTOR	1	3	26-Aug-11	P	10	1453.6			25, 81		
9	TATAS	TATASTEEL	TATASTEEL	1	4	26-Aug-11	P	4	1764.08					
10	BHEL	BHEL	BHEL	2	5	23-Nov-11	P	10	2568.4			19		
11	HDFC	HDFC	HDFC	1	3	23-Nov-11	P	4	2490.72			67		
12	LT	LT	LT	1	2	23-Nov-11	P	3	4000.17			73		
13	MARUT	MARUTI	MARUTI	1	1	23-Nov-11	P	2	1923.98			21		
14	ONGC	ONGC	ONGC	1	4	23-Nov-11	P	10	2449.8			22, 76		
15	BAJAJE	BAJAJELEC	BAJAJELEC	1	8	31-Jan-12	P	10	1729.4			64		
16	JYOTH	JYOTHYLAB	JYOTHYLAB	1	0	31-Jan-12	P	10	1665.9			20, 72		
17	SESAG	SESAGOA	SESAGOA	1	5	31-Jan-12	P	10	2077.2			23		
18	TATAC	TATACHEM	TATACHEM	1	2	31-Jan-12	P	3	1008.9			24		
19	BHEL	BHEL	BHEL	NA		24-Feb-12	S	10	3046.79	3051.7	-4.91	4, 5	2890.6	156.19
20	JYOTH	JYOTHYLAB	JYOTHYLAB	NA		24-Feb-12	S	5	1009.39	832.95	176.44	8	832.95	176.44
21	MARUT	MARUTI	MARUTI	NA		24-Feb-12	S	1	1273	961.99	311.01	10	961.99	311.01

Fig. 3.3.1: Situation requiring Trace Precedents

Consider the above diagram as shown in Fig 3.3.1. The cell pointer is resting on cell M19. One may notice the long formula which has already been developed in M19 (look at the formula bar). To understand this formula, we may like to mark the precedent cells.

On pressing F2, the precedent cells do get marked, but then we cannot see the result of the cell as shown in Fig 3.3.2.

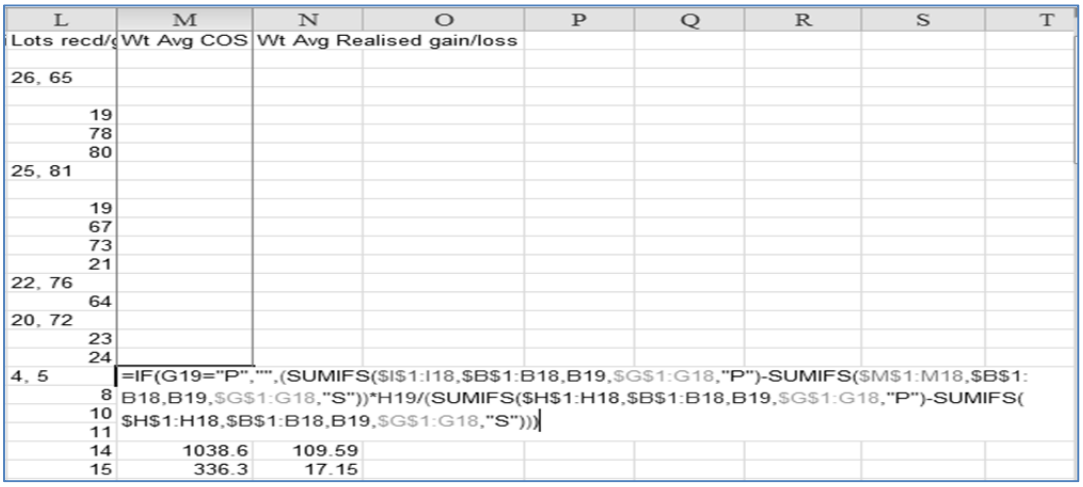


Fig. 3.3.2: On pressing F2

So, to eat the cake and have it too, we may use the Trace Precedents feature.

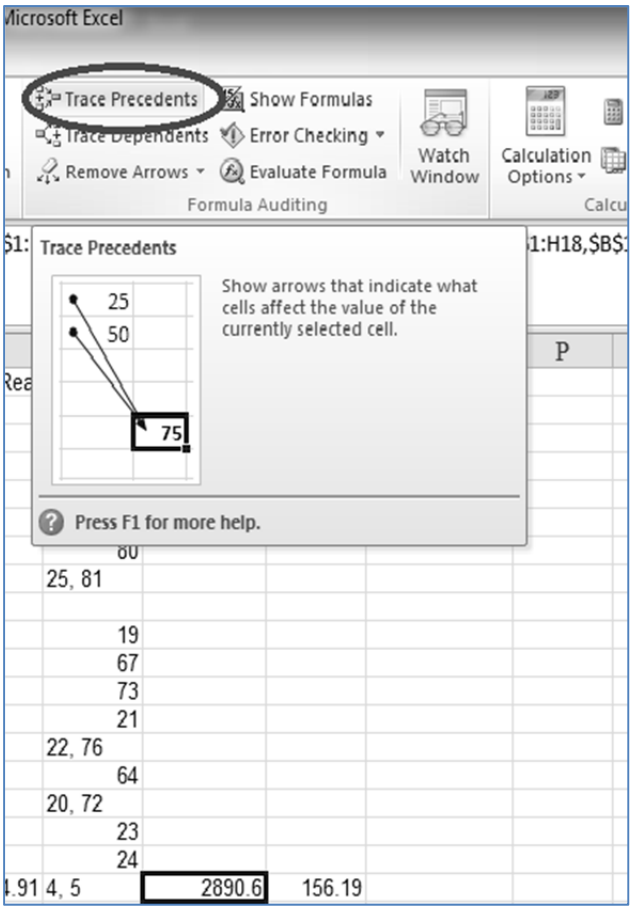
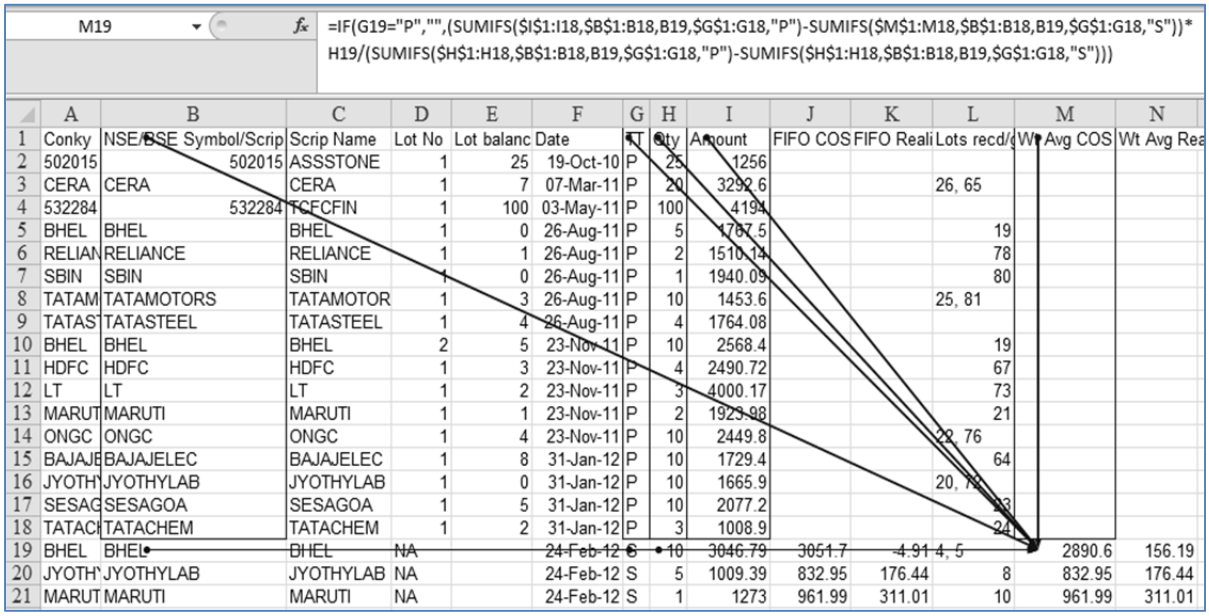


Fig. 3.3.3: Trace Precedents

In the above diagram as shown in Fig 3.3.3, the Trace Precedents feature is highlighted by oval shape. Make sure that your cell pointer is resting on the cell M19 (i.e. the cell for which we wish to study formulas) and then click on Trace Precedents.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Conky	NSE/BSE Symbol/Scrip	Scrip Name	Lot No	Lot balanc	Date	T	Qty	Amount	FIFO COS	FIFO Reali	Lots recd/	Wt Avg COS	Wt Avg Rea
2	502015	502015	ASSSTONE	1	25	19-Oct-10	P	25	1256					
3	CERA	CERA	CERA	1	7	07-Mar-11	P	20	3292.6			26, 65		
4	532284	532284	TCFCFIN	1	100	03-May-11	P	100	4194					
5	BHEL	BHEL	BHEL	1	0	26-Aug-11	P	5	1767.5			19		
6	RELIAN	RELIANCE	RELIANCE	1	1	26-Aug-11	P	2	1510.14			78		
7	SBIN	SBIN	SBIN	1	0	26-Aug-11	P	1	1940.09			80		
8	TATAM	TATAMOTORS	TATAMOTOR	1	3	26-Aug-11	P	10	1453.6			25, 81		
9	TATAST	TATASTEEL	TATASTEEL	1	4	26-Aug-11	P	4	1764.08					
10	BHEL	BHEL	BHEL	2	5	23-Nov-11	P	10	2568.4			19		
11	HDFC	HDFC	HDFC	1	3	23-Nov-11	P	4	2490.72			67		
12	LT	LT	LT	1	2	23-Nov-11	P	3	4000.17			73		
13	MARUT	MARUTI	MARUTI	1	1	23-Nov-11	P	2	1923.98			21		
14	ONGC	ONGC	ONGC	1	4	23-Nov-11	P	10	2449.8			22, 76		
15	BAJAJE	BAJAJELEC	BAJAJELEC	1	8	31-Jan-12	P	10	1729.4			64		
16	JYOTH	JYOTHYLAB	JYOTHYLAB	1	0	31-Jan-12	P	10	1665.9			20, 79		
17	SESAG	SESAGOA	SESAGOA	1	5	31-Jan-12	P	10	2077.2			63		
18	TATACH	TATACHEM	TATACHEM	1	2	31-Jan-12	P	3	1008.9			24		
19	BHEL	BHEL	BHEL	NA		24-Feb-12	S	10	3046.79	3051.7	-4.91	4, 5	2890.6	156.19
20	JYOTH	JYOTHYLAB	JYOTHYLAB	NA		24-Feb-12	S	5	1009.39	832.95	176.44	8	832.95	176.44
21	MARUT	MARUTI	MARUTI	NA		24-Feb-12	S	1	1273	961.99	311.01	10	961.99	311.01

Fig. 3.3.4: Arrows marking the precedent cells

As we can observe in the above diagram, the precedent cells for the cell M19 are marked using arrows. Concurrently, we can read the formula as appearing in the formula bar and also read the result of the formula as appearing in cell M19. Thus, all the necessary inputs for the purpose of studying the formula are visible in front of our eyes.

Now, it is also possible that some of the precedent cells themselves are formulas referring to some other cells. Thus, there could be many more cells which may indirectly affect our target cell. Sometimes, we may wish to mark all such direct or indirect precedents.

In that case, keep clicking the Trace Precedents button till you don't hear a *beep* sound, indicating that further precedents don't exist.

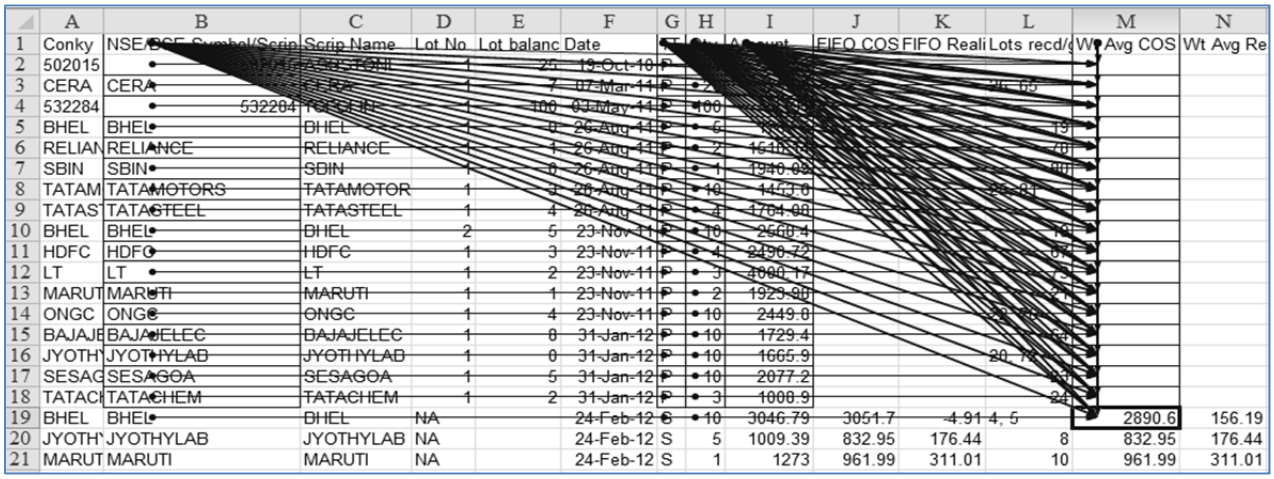


Fig. 3.3.5: All precedent cells marked

In the above diagram as shown in Fig 3.3.5, we can see all the precedent cells marked, either the direct or indirect precedents.

After examining the precedents, if you wish to clear the arrow, use the Remove Arrows feature.

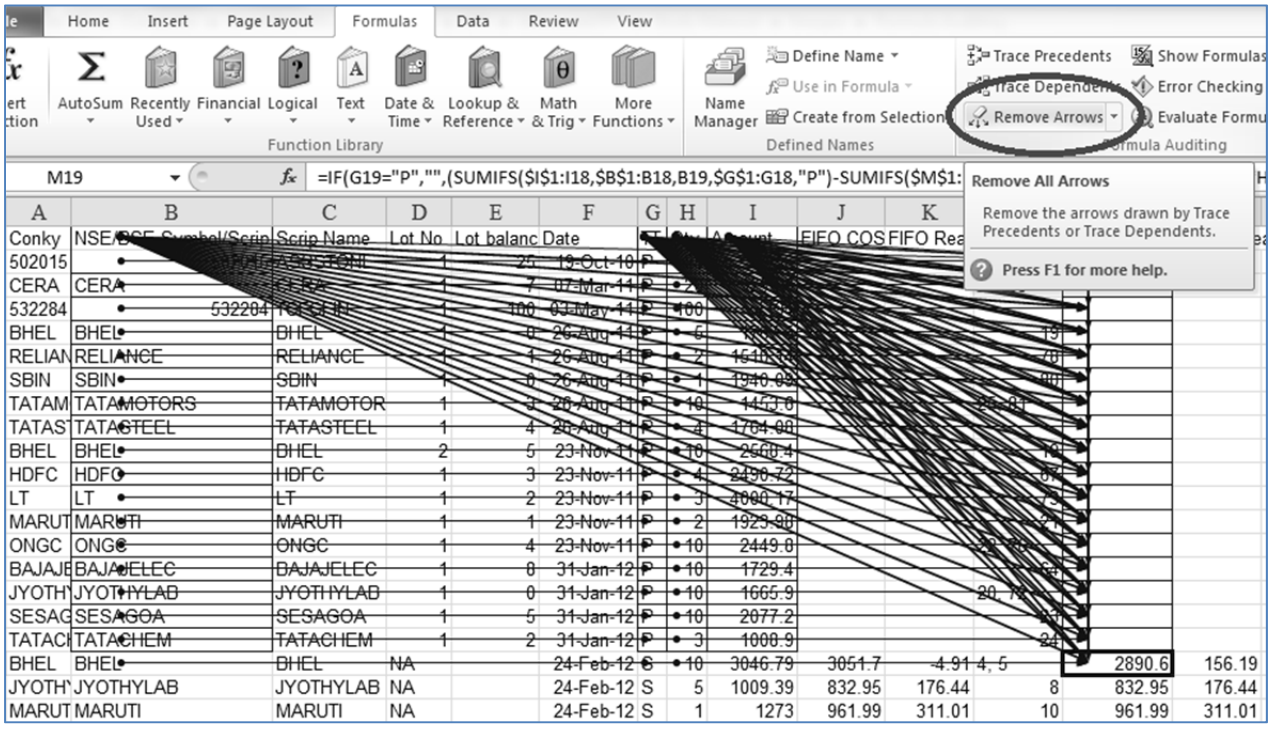


Fig. 3.3.6: Remove Arrows

We can see the Remove Arrows feature highlighted with the help of oval shape. On clicking it, the arrows will go away and we will return back to the view as it was before utilizing Trace Precedents feature.

M19 =IF(G19="P","",(SUMIFS($I$1:I18,$B$1:B18,B19,$G$1:G18,"P")-SUMIFS($M$1:M18,$B$1:B18,B19,$G$1:G18,"S"))*H19/(SUMIFS($H$1:H18,$B$1:B18,B19,$G$1:G18,"P")-SUMIFS($H$1:H18,$B$1:B18,B19,$G$1:G18,"S")))

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Conky	NSE/BSE Symbol/Scrip	Scrip Name	Lot No	Lot balanc	Date	TT	Qty	Amount	FIFO COS	FIFO Reali	Lots recd/(	Wt Avg COS	Wt Avg Rea
2	502015	502015	ASSSTONE	1	25	19-Oct-10	P	25	1256					
3	CERA	CERA	CERA	1	7	07-Mar-11	P	20	3292.6			26, 65		
4	532284	532284	TCFCFIN	1	100	03-May-11	P	100	4194					
5	BHEL	BHEL	BHEL	1	0	26-Aug-11	P	5	1767.5			19		
6	RELIAN	RELIANCE	RELIANCE	1	1	26-Aug-11	P	2	1510.14			78		
7	SBIN	SBIN	SBIN	1	0	26-Aug-11	P	1	1940.09			80		
8	TATAM	TATAMOTORS	TATAMOTOR	1	3	26-Aug-11	P	10	1453.6			25, 81		
9	TATAS	TATASTEEL	TATASTEEL	1	4	26-Aug-11	P	4	1764.08					
10	BHEL	BHEL	BHEL	2	5	23-Nov-11	P	10	2568.4			19		
11	HDFC	HDFC	HDFC	1	3	23-Nov-11	P	4	2490.72			67		
12	LT	LT	LT	1	2	23-Nov-11	P	3	4000.17			73		
13	MARUT	MARUTI	MARUTI	1	1	23-Nov-11	P	2	1923.98			21		
14	ONGC	ONGC	ONGC	1	4	23-Nov-11	P	10	2449.8			22, 76		
15	BAJAJE	BAJAJELEC	BAJAJELEC	1	8	31-Jan-12	P	10	1729.4			64		
16	JYOTH	JYOTHYLAB	JYOTHYLAB	1	0	31-Jan-12	P	10	1665.9			20, 72		
17	SESAG	SESAGOA	SESAGOA	1	5	31-Jan-12	P	10	2077.2			23		
18	TATACI	TATACHEM	TATACHEM	1	2	31-Jan-12	P	3	1008.9			24		
19	BHEL	BHEL	BHEL	NA		24-Feb-12	S	10	3046.79	3051.7	-4.91	4, 5	2890.6	156.19
20	JYOTH	JYOTHYLAB	JYOTHYLAB	NA		24-Feb-12	S	5	1009.39	832.95	176.44	8	832.95	176.44
21	MARUT	MARUTI	MARUTI	NA		24-Feb-12	S	1	1273	961.99	311.01	10	961.99	311.01

Fig. 3.3.7: On clicking Remove Arrows

3.3.2 Trace Dependents

Sometimes, we wish to know dependents on a cell i.e. the cells which may get affected when we modify the value of a cell. This is especially essential when we think of deleting a cell. If a cell is deleted without bothering about tracing its dependents, the dependents cells will lose their input cell and hence will carry *#REF!* Error.

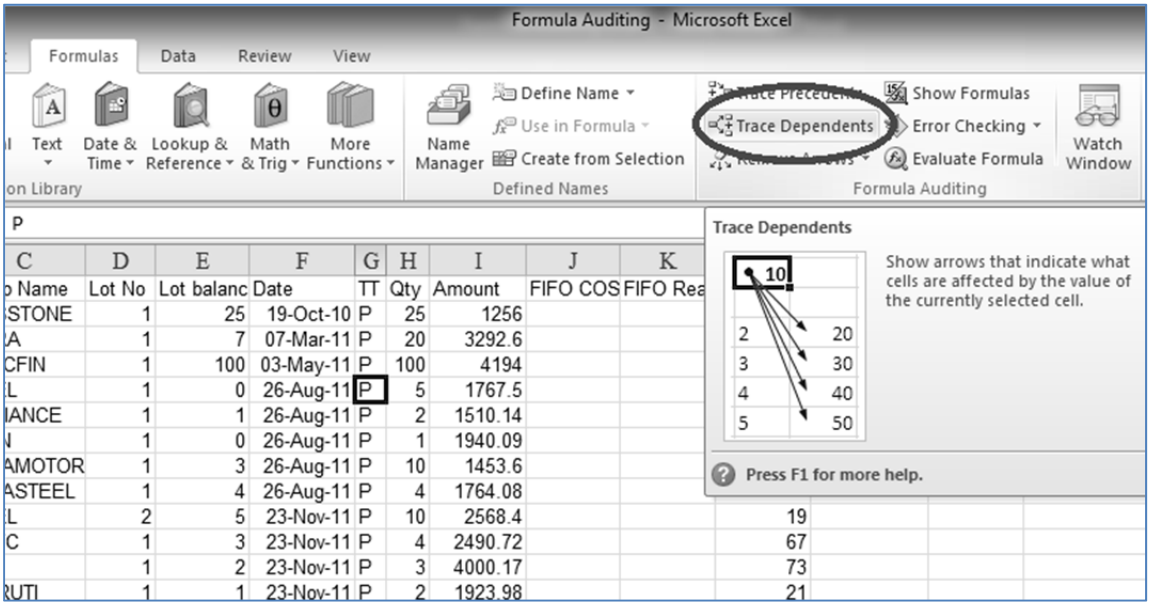
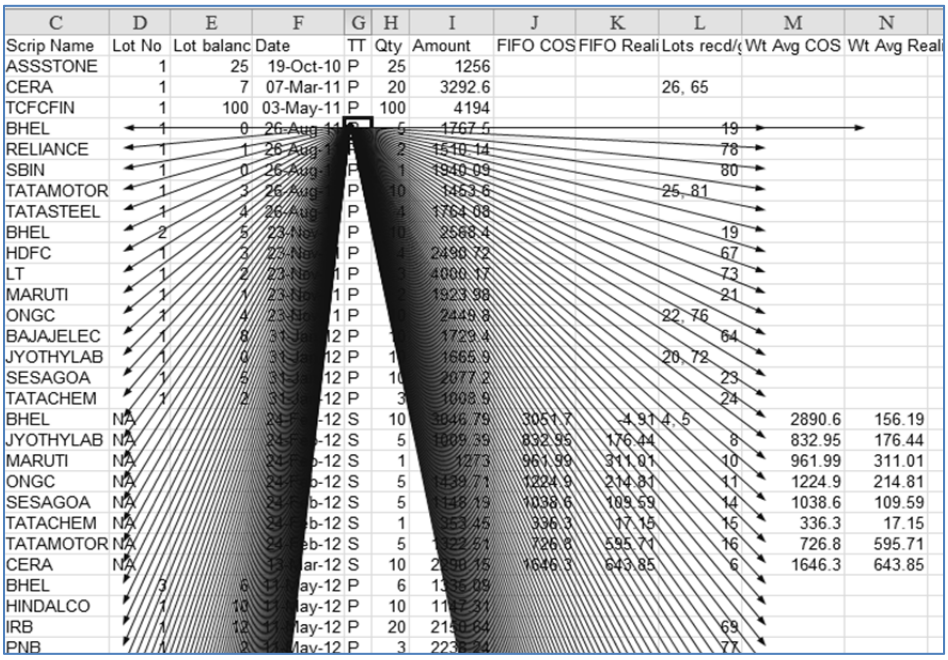


Fig. 3.3.8: Trace Dependents

In the above Fig 3.3.8, the Trace Dependents feature is highlighted by oval shape. Make sure that your cell

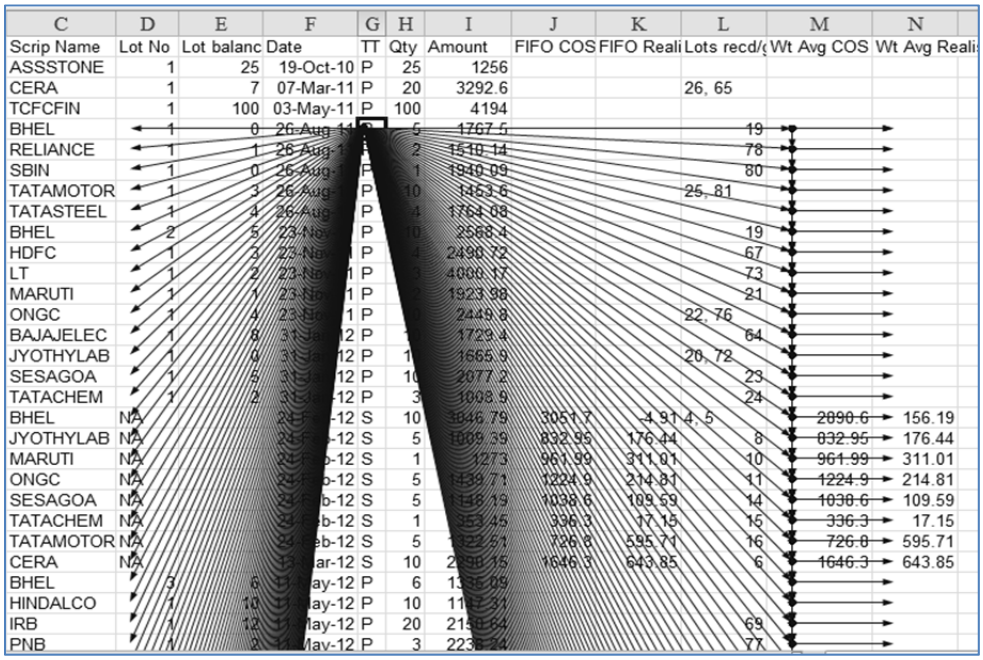
pointer is resting on the target cell (i.e. the cell for which we wish to trace dependents) and then click on Trace Dependents. It may be noted that the target cell itself may or may not contain any formulas.



C	D	E	F	G	H	I	J	K	L	M	N
Scrip Name	Lot No	Lot balanc	Date	TT	Qty	Amount	FIFO COS	FIFO Reali	Lots recd/	Wt Avg COS	Wt Avg Reali
ASSSTONE	1	25	19-Oct-10	P	25	1256					
CERA	1	7	07-Mar-11	P	20	3292.6			26, 65		
TCFCFIN	1	100	03-May-11	P	100	4194					
BHEL	1	0	26-Aug-11	P	5	1767.5			19		
RELIANCE	1	1	26-Aug-11	P	2	1510.14			78		
SBIN	1	0	26-Aug-11	P	1	1940.09			80		
TATAMOTOR	1	3	26-Aug-11	P	10	1453.6			25, 81		
TATASTEEL	1	4	26-Aug-11	P	4	1764.08					
BHEL	2	5	23-Nov-11	P	10	2568.4			19		
HDFC	1	3	23-Nov-11	P	4	2490.72			67		
LT	1	2	23-Nov-11	P	3	4000.17			73		
MARUTI	1	1	23-Nov-11	P	2	1923.98			21		
ONGC	1	4	23-Nov-11	P	1	2449.8			22, 76		
BAJAJELEC	1	8	31-Jan-12	P	7	1729.4			64		
JYOTHYLAB	1	0	31-Jan-12	P	1	1665.9			20, 72		
SESAGOA	1	5	31-Jan-12	P	10	2077.2			23		
TATACHEM	1	2	31-Jan-12	P	3	1008.9			24		
BHEL	NA		24-Feb-12	S	10	3046.79	3051.7	-4.91	4, 5	2890.6	156.19
JYOTHYLAB	NA		24-Feb-12	S	5	1009.39	832.95	176.44	8	832.95	176.44
MARUTI	NA		24-Feb-12	S	1	1273	961.99	311.01	10	961.99	311.01
ONGC	NA		24-Feb-12	S	5	1439.71	1224.9	214.81	11	1224.9	214.81
SESAGOA	NA		24-Feb-12	S	5	1148.19	1038.6	109.59	14	1038.6	109.59
TATACHEM	NA		24-Feb-12	S	1	353.45	336.3	17.15	15	336.3	17.15
TATAMOTOR	NA		24-Feb-12	S	5	1323.51	726.8	595.71	16	726.8	595.71
CERA	NA		31-Mar-12	S	10	2290.15	1646.3	643.85	6	1646.3	643.85
BHEL	3	6	11-May-12	P	6	1336.09					
HINDALCO	1	10	11-May-12	P	10	1117.31					
IRB	1	12	11-May-12	P	20	2159.64			69		
PNB	1	3	11-May-12	P	3	2236.24			77		

Fig. 3.3.9: On clicking Trace Dependents

Above Fig as shown in Fig 3.3.9, the dependent cells marked by arrows, on clicking the Trace Dependents. Similar to Trace Precedents, we can have multi-level tracing of dependents.



C	D	E	F	G	H	I	J	K	L	M	N
Scrip Name	Lot No	Lot balanc	Date	TT	Qty	Amount	FIFO COS	FIFO Reali	Lots recd/	Wt Avg COS	Wt Avg Reali
ASSSTONE	1	25	19-Oct-10	P	25	1256					
CERA	1	7	07-Mar-11	P	20	3292.6			26, 65		
TCFCFIN	1	100	03-May-11	P	100	4194					
BHEL	1	0	26-Aug-11	P	5	1767.5			19		
RELIANCE	1	1	26-Aug-11	P	2	1510.14			78		
SBIN	1	0	26-Aug-11	P	1	1940.09			80		
TATAMOTOR	1	3	26-Aug-11	P	10	1453.6			25, 81		
TATASTEEL	1	4	26-Aug-11	P	4	1764.08					
BHEL	2	5	23-Nov-11	P	10	2568.4			19		
HDFC	1	3	23-Nov-11	P	4	2490.72			67		
LT	1	2	23-Nov-11	P	3	4000.17			73		
MARUTI	1	1	23-Nov-11	P	2	1923.98			21		
ONGC	1	4	23-Nov-11	P	1	2449.8			22, 76		
BAJAJELEC	1	8	31-Jan-12	P	7	1729.4			64		
JYOTHYLAB	1	0	31-Jan-12	P	1	1665.9			20, 72		
SESAGOA	1	5	31-Jan-12	P	10	2077.2			23		
TATACHEM	1	2	31-Jan-12	P	3	1008.9			24		
BHEL	NA		24-Feb-12	S	10	3046.79	3051.7	-4.91	4, 5	2890.6	156.19
JYOTHYLAB	NA		24-Feb-12	S	5	1009.39	832.95	176.44	8	832.95	176.44
MARUTI	NA		24-Feb-12	S	1	1273	961.99	311.01	10	961.99	311.01
ONGC	NA		24-Feb-12	S	5	1439.71	1224.9	214.81	11	1224.9	214.81
SESAGOA	NA		24-Feb-12	S	5	1148.19	1038.6	109.59	14	1038.6	109.59
TATACHEM	NA		24-Feb-12	S	1	353.45	336.3	17.15	15	336.3	17.15
TATAMOTOR	NA		24-Feb-12	S	5	1323.51	726.8	595.71	16	726.8	595.71
CERA	NA		31-Mar-12	S	10	2290.15	1646.3	643.85	6	1646.3	643.85
BHEL	3	6	11-May-12	P	6	1336.09					
HINDALCO	1	10	11-May-12	P	10	1117.31					
IRB	1	12	11-May-12	P	20	2159.64			69		
PNB	1	3	11-May-12	P	3	2236.24			77		

Fig. 3.3.9: On clicking Trace Dependents

You can see that all the levels of dependents, direct as well as indirect, are marked when Trace Dependents button is clicked repeatedly. This keeps happening till no more dependents are traceable, which is indicated by a *beep* sound.

Similar to Trace Precedents, later we can clear the arrows using Remove Arrows feature which has already been discussed above.

3.4 Go To Special for Formula Auditing

Sometimes, Trace Precedents and Dependents generate lot of arrows. This becomes extremely confusing and we may wonder whether there is an alternate way of marking the precedents and dependents. Fortunately, we do have an alternate way of doing this. It is achieved using Go To Special feature.

Go To Special is located in the Home Tab → Editing Group → Find & Select, as shown in Fig 3.4.1.

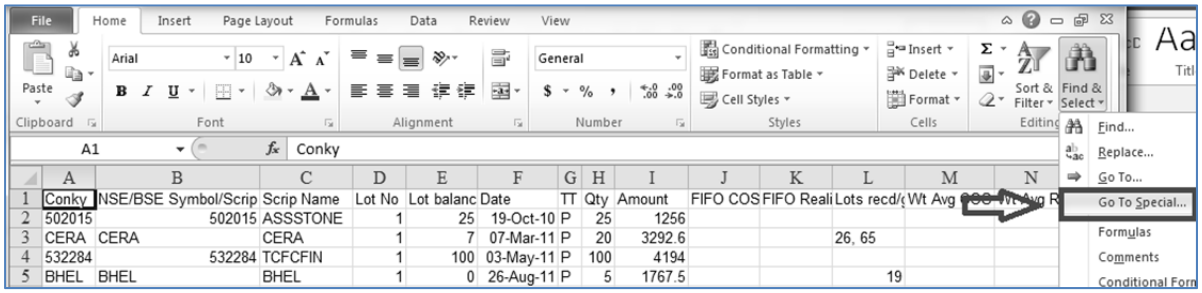


Fig. 3.4.1: Go To Special

On Clicking Go To Special, it opens a window with lots of options, like shown in Fig 3.4.2.

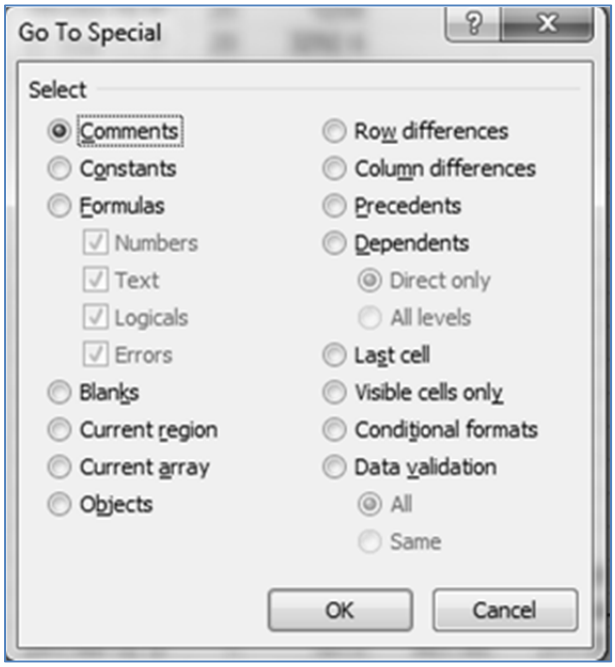


Fig. 3.4.2: Go To Special Window

3.4.1 Trace Precedents – using Go To Special

Keep the cell pointer on the target cell and then open the Go To Special Window. Select the option of Precedents. We also get to choose whether we want to highlight Direct only or All levels. In this example, we will select all levels.

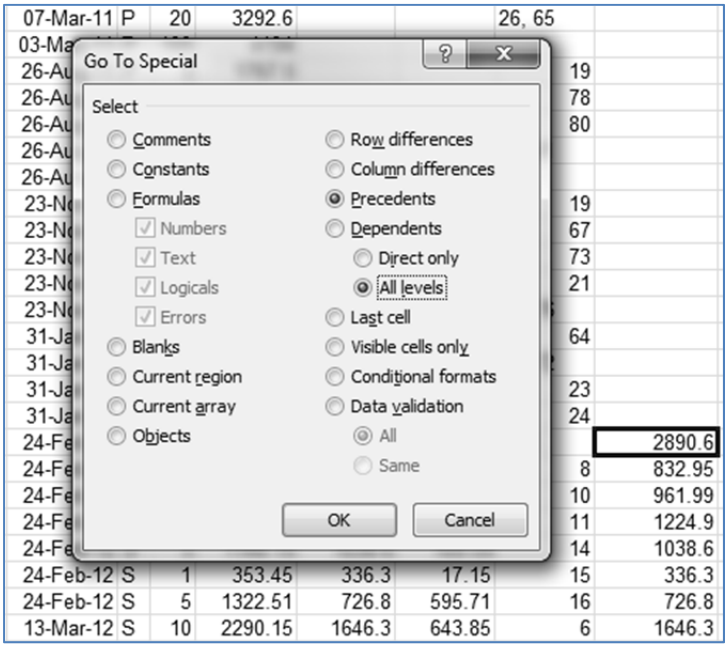


Fig. 3.4.3: Precedents – All levels

On clicking OK, all the Precedents are highlighted, as shown in Fig 3.4.4.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Conky	NSE/BSE Symbol/Scrip	Scrip Name	Lot No	Lot balanc	Date	TT	Qty	Amount	FIFO COS	FIFO Reali	Lots recd/	Wt Avg COS
2	502015	502015	ASSSTONE	1	25	19-Oct-10	P	25	1256				
3	CERA	CERA	CERA	1	7	07-Mar-11	P	20	3292.6			26, 65	
4	532284	532284	TCFCFIN	1	100	03-May-11	P	100	4194				
5	BHEL	BHEL	BHEL	1	0	26-Aug-11	P	5	1767.5			19	
6	RELIAN	RELIANCE	RELIANCE	1	1	26-Aug-11	P	2	1510.14			78	
7	SBIN	SBIN	SBIN	1	0	26-Aug-11	P	1	1940.09			80	
8	TATAM	TATAMOTORS	TATAMOTOR	1	3	26-Aug-11	P	10	1453.6			25, 81	
9	TATAS	TATASTEEL	TATASTEEL	1	4	26-Aug-11	P	4	1764.08				
10	BHEL	BHEL	BHEL	2	5	23-Nov-11	P	10	2568.4			19	
11	HDFC	HDFC	HDFC	1	3	23-Nov-11	P	4	2490.72			67	
12	LT	LT	LT	1	2	23-Nov-11	P	3	4000.17			73	
13	MARUT	MARUTI	MARUTI	1	1	23-Nov-11	P	2	1923.98			21	
14	ONGC	ONGC	ONGC	1	4	23-Nov-11	P	10	2449.8			22, 76	
15	BAJAJE	BAJAJELEC	BAJAJELEC	1	8	31-Jan-12	P	10	1729.4			64	
16	JYOTH	JYOTHYLAB	JYOTHYLAB	1	0	31-Jan-12	P	10	1665.9			20, 72	
17	SESAG	SESAGOA	SESAGOA	1	5	31-Jan-12	P	10	2077.2			23	
18	TATACI	TATACHEM	TATACHEM	1	2	31-Jan-12	P	3	1008.9			24	
19	BHEL	BHEL	BHEL	NA		24-Feb-12	S	10	3046.79	3051.7	-4.91	4, 5	2890.6
20	JYOTH	JYOTHYLAB	JYOTHYLAB	NA		24-Feb-12	S	5	1009.39	832.95	176.44	8	832.95

Fig. 3.4.4: Precedents – All levels are highlighted.

This is only a temporary selection and it will disappear once the active cell is moved. If you wish to retain the highlighting permanently, you may assign a fill color at this stage.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Conky	NSE/BSE Symbol/Scrip	Scrip Name	Lot No	Lot balanc	Date	TT	Qty	Amount	FIFO COS	FIFO Reali	Lots recd/	Wt Avg COS
2	502015	502015	ASSSTONE	1	25	19-Oct-10	P	25	1256				
3	CERA	CERA	CERA	1	7	07-Mar-11	P	20	3292.6			26, 65	
4	532284	532284	TCFCFIN	1	100	03-May-11	P	100	4194				
5	BHEL	BHEL	BHEL	1	0	26-Aug-11	P	5	1767.5			19	
6	RELIAN	RELIANCE	RELIANCE	1	1	26-Aug-11	P	2	1510.14			78	
7	SBIN	SBIN	SBIN	1	0	26-Aug-11	P	1	1940.09			80	
8	TATAM	TATAMOTORS	TATAMOTOR	1	3	26-Aug-11	P	10	1453.6			25, 81	
9	TATAS	TATASTEEL	TATASTEEL	1	4	26-Aug-11	P	4	1764.08				
10	BHEL	BHEL	BHEL	2	5	23-Nov-11	P	10	2568.4			19	
11	HDFC	HDFC	HDFC	1	3	23-Nov-11	P	4	2490.72			67	
12	LT	LT	LT	1	2	23-Nov-11	P	3	4000.17			73	
13	MARUT	MARUTI	MARUTI	1	1	23-Nov-11	P	2	1923.98			21	
14	ONGC	ONGC	ONGC	1	4	23-Nov-11	P	10	2449.8			22, 76	
15	BAJAJE	BAJAJELEC	BAJAJELEC	1	8	31-Jan-12	P	10	1729.4			64	
16	JYOTH	JYOTHYLAB	JYOTHYLAB	1	0	31-Jan-12	P	10	1665.9			20, 72	
17	SESAG	SESAGOA	SESAGOA	1	5	31-Jan-12	P	10	2077.2			23	
18	TATACI	TATACHEM	TATACHEM	1	2	31-Jan-12	P	3	1008.9			24	
19	BHEL	BHEL	BHEL	NA		24-Feb-12	S	10	3046.79	3051.7	-4.91	4, 5	2890.6
20	JYOTH	JYOTHYLAB	JYOTHYLAB	NA		24-Feb-12	S	5	1009.39	832.95	176.44	8	832.95

Fig. 3.4.5: Precedents – All levels are highlighted using a fill color.

You can see, once a fill color is given, it stays permanently on the cells and doesn't disappear even if the cell pointer is moved elsewhere.

3.4.2 Trace Dependents – using Go To Special

Similarly we can highlight the dependents using Go To Special. Keep the cell pointer on the target cell and then open the Go To Special Window. Select the option of Dependents. You may select Direct only or All levels, as desired.

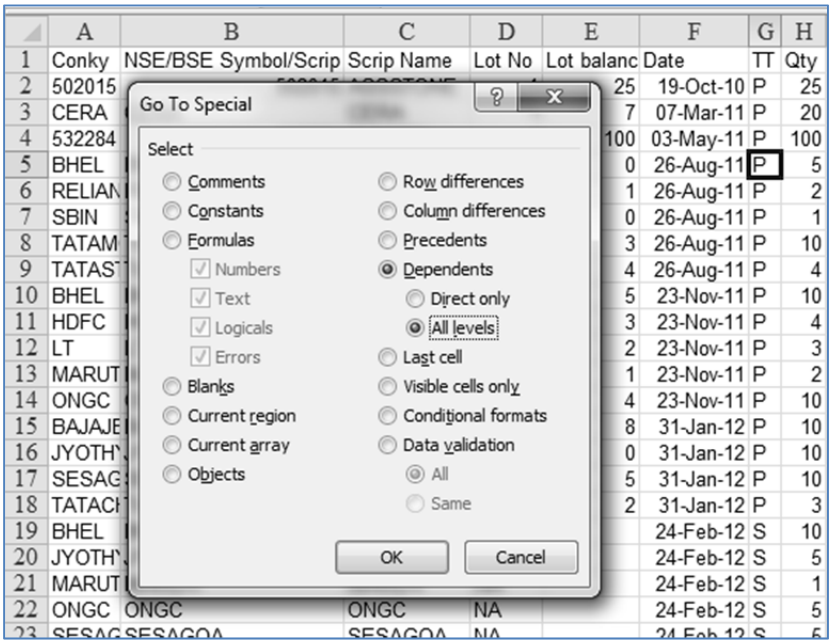


Fig. 3.4.6: Dependents – All levels

On clicking OK button, the dependents at all levels will highlighted:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Conky	NSE/BSE Symbol/Scrip	Scrip Name	Lot No	Lot balanc	Date	TT	Qty	Amount	FIFO COS	FIFO Reali	Lots recd/	Wt Avg COS	Wt Avg Re
2	502015	502015	ASSSTONE	1	25	19-Oct-10	P	25	1256					
3	CERA	CERA	CERA	1	7	07-Mar-11	P	20	3292.6			26, 65		
4	532284	532284	TCFCFIN	1	100	03-May-11	P	100	4194					
5	BHEL	BHEL	BHEL	1	0	26-Aug-11	P	5	1767.5			19		
6	RELIAN	RELIANCE	RELIANCE	1	1	26-Aug-11	P	2	1510.14			78		
7	SBIN	SBIN	SBIN	1	0	26-Aug-11	P	1	1940.09			80		
8	TATAM	TATAMOTORS	TATAMOTOR	1	3	26-Aug-11	P	10	1453.6			25, 81		
9	TATAS	TATASTEEL	TATASTEEL	1	4	26-Aug-11	P	4	1764.08					
10	BHEL	BHEL	BHEL	2	5	23-Nov-11	P	10	2568.4			19		
11	HDFC	HDFC	HDFC	1	3	23-Nov-11	P	4	2490.72			67		
12	LT	LT	LT	1	2	23-Nov-11	P	3	4000.17			73		
13	MARUT	MARUTI	MARUTI	1	1	23-Nov-11	P	2	1923.98			21		
14	ONGC	ONGC	ONGC	1	4	23-Nov-11	P	10	2449.8			22, 76		
15	BAJAJE	BAJAJELEC	BAJAJELEC	1	8	31-Jan-12	P	10	1729.4			64		
16	JYOTH	JYOTHYLAB	JYOTHYLAB	1	0	31-Jan-12	P	10	1665.9			20, 72		
17	SESAG	SESAGOA	SESAGOA	1	5	31-Jan-12	P	10	2077.2			23		
18	TATACI	TATACHEM	TATACHEM	1	2	31-Jan-12	P	3	1008.9			24		
19	BHEL	BHEL	BHEL	NA		24-Feb-12	S	10	3046.79	3051.7	-4.91	4, 5	2890.6	156.19
20	JYOTH	JYOTHYLAB	JYOTHYLAB	NA		24-Feb-12	S	5	1009.39	832.95	176.44	8	832.95	176.44
21	MARUT	MARUTI	MARUTI	NA		24-Feb-12	S	1	1273	961.99	311.01	10	961.99	311.01
22	ONGC	ONGC	ONGC	NA		24-Feb-12	S	5	1439.71	1224.9	214.81	11	1224.9	214.81
23	SESAG	SESAGOA	SESAGOA	NA		24-Feb-12	S	5	1148.19	1038.6	109.59	14	1038.6	109.59
24	TATACI	TATACHEM	TATACHEM	NA		24-Feb-12	S	1	353.45	336.3	17.15	15	336.3	17.15
25	TATAM	TATAMOTORS	TATAMOTOR	NA		24-Feb-12	S	5	1322.51	726.8	595.71	16	726.8	595.71
26	CERA	CERA	CERA	NA		13-Mar-12	S	10	2290.15	1646.3	643.85	6	1646.3	643.85
27	BHEL	BHEL	BHEL	3	6	11-May-12	P	6	1335.09					
28	HINDAL	HINDALCO	HINDALCO	1	10	11-May-12	P	10	1147.31					
29	IRB	IRB	IRB	1	12	11-May-12	P	20	2150.64			69		
30	PNB	PNB	PNB	1	2	11-May-12	P	3	2238.24			77		

Fig. 3.4.7: Dependents – All levels highlighted

Of course, like Precedents we can obtain permanent marking by applying a fill color.

Note: None of the tools in excel can highlight precedents or dependents from other worksheets or workbooks. This remains as a limitation in excel.

3.4.3 Highlighting all cells containing formulas – using Go To Special

In addition to highlighting precedents and dependents, Go To Special can also highlight all cells containing formulas.

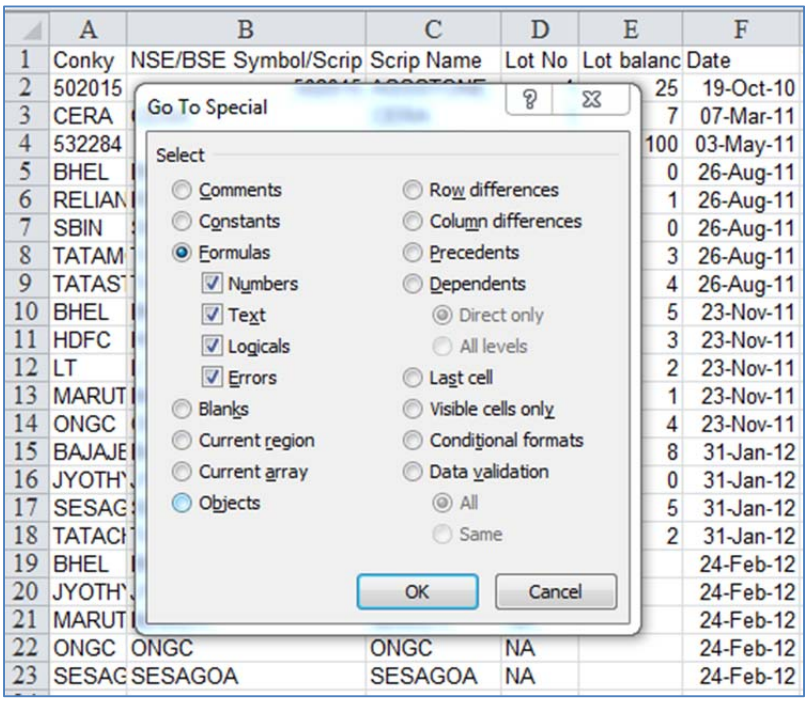
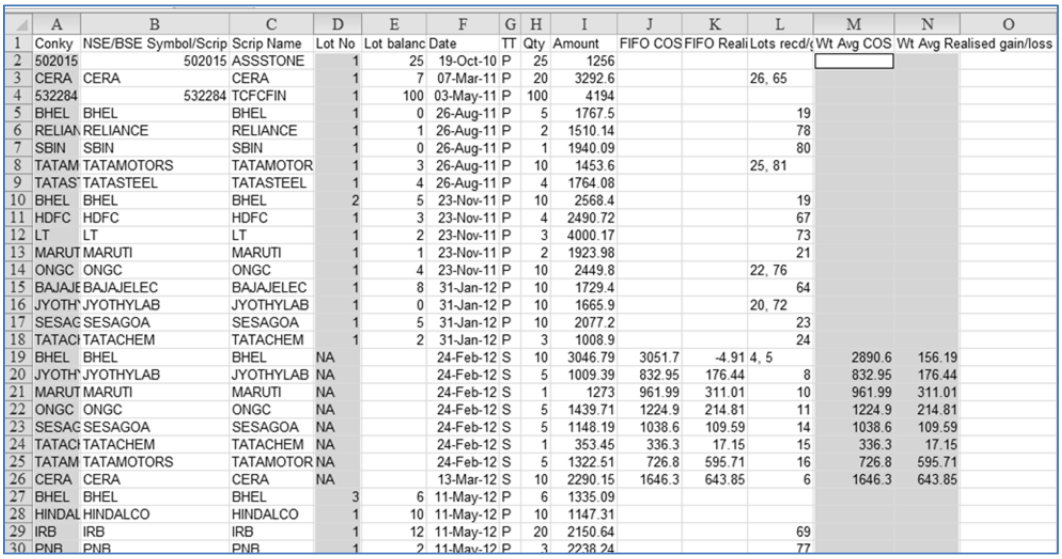


Fig. 3.4.8: Selecting all formulas

Activate the Go To Special Window. Then select Formulas, as shown above. We also get the option of highlighting formulas which yield any or all out of numbers, text, logicals and errors. Presently, we will let all of them be selected. On pressing OK, we get the following result:



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Conky	NSE/BSE Symbol/Scrip	Scrip Name	Lot No	Lot balanc	Date	TT	Qty	Amount	FIFO COS	FIFO Reali	Lots recd/(	Wt Avg COS	Wt Avg Realised gain/loss	
2	502015	502015	ASSSTONE	1	25	19-Oct-10	P	25	1256						
3	CERA	CERA	CERA	1	7	07-Mar-11	P	20	3292.6			26, 65			
4	532284	532284	TCFCFIN	1	100	03-May-11	P	100	4194						
5	BHEL	BHEL	BHEL	1	0	26-Aug-11	P	5	1767.5			19			
6	RELIAN	RELIANCE	RELIANCE	1	1	26-Aug-11	P	2	1510.14			78			
7	SBIN	SBIN	SBIN	1	0	26-Aug-11	P	1	1940.09			80			
8	TATAM	TATAMOTORS	TATAMOTOR	1	3	26-Aug-11	P	10	1453.6			25, 81			
9	TATAS	TATASTEEL	TATASTEEL	1	4	26-Aug-11	P	4	1764.08						
10	BHEL	BHEL	BHEL	2	5	23-Nov-11	P	10	2568.4			19			
11	HDFC	HDFC	HDFC	1	3	23-Nov-11	P	4	2490.72			67			
12	LT	LT	LT	1	2	23-Nov-11	P	3	4000.17			73			
13	MARUT	MARUTI	MARUTI	1	1	23-Nov-11	P	2	1923.98			21			
14	ONGC	ONGC	ONGC	1	4	23-Nov-11	P	10	2449.8			22, 76			
15	BAJAJE	BAJAJELEC	BAJAJELEC	1	8	31-Jan-12	P	10	1729.4			64			
16	JYOTH	JYOTHYLAB	JYOTHYLAB	1	0	31-Jan-12	P	10	1665.9			20, 72			
17	SESAG	SESAGOA	SESAGOA	1	5	31-Jan-12	P	10	2077.2			23			
18	TATACI	TATACHEM	TATACHEM	1	2	31-Jan-12	P	3	1008.9			24			
19	BHEL	BHEL	BHEL	NA		24-Feb-12	S	10	3046.79	3051.7	-4.91	4, 5	2890.6	156.19	
20	JYOTH	JYOTHYLAB	JYOTHYLAB	NA		24-Feb-12	S	5	1009.39	832.95	176.44	8	832.95	176.44	
21	MARUT	MARUTI	MARUTI	NA		24-Feb-12	S	1	1273	961.99	311.01	10	961.99	311.01	
22	ONGC	ONGC	ONGC	NA		24-Feb-12	S	5	1439.71	1224.9	214.81	11	1224.9	214.81	
23	SESAG	SESAGOA	SESAGOA	NA		24-Feb-12	S	5	1148.19	1038.6	109.59	14	1038.6	109.59	
24	TATACI	TATACHEM	TATACHEM	NA		24-Feb-12	S	1	353.45	336.3	17.15	15	336.3	17.15	
25	TATAM	TATAMOTORS	TATAMOTOR	NA		24-Feb-12	S	5	1322.51	726.8	595.71	16	726.8	595.71	
26	CERA	CERA	CERA	NA		13-Mar-12	S	10	2290.15	1646.3	643.85	6	1646.3	643.85	
27	BHEL	BHEL	BHEL	3	6	11-May-12	P	6	1335.09						
28	HINDAL	HINDALCO	HINDALCO	1	10	11-May-12	P	10	1147.31						
29	IRB	IRB	IRB	1	12	11-May-12	P	20	2150.64			69			
30	PNB	PNB	PNB	1	2	11-May-12	P	3	2238.24			77			

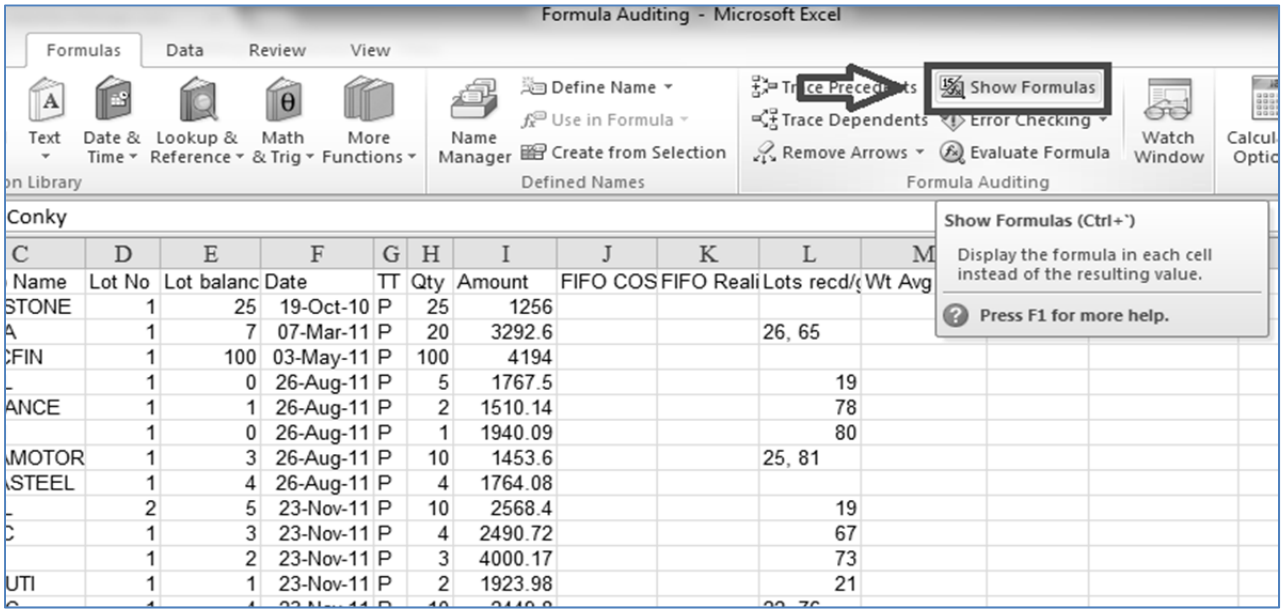
Fig. 3.4.9: All formulas highlighted

3.5 Showing all Formulas

As the cells containing formulas get highlighted in front of us, we may become curious about the formulas contained in these cells. We may like to examine each of them. This may reveal us the nature of each formula and can also help us in identifying inconsistencies or other errors, if any.

The basic method of checking the formulas is to visit each and every cell and press F2. However, this could be highly time consuming and in any case, we cannot have an apples-to-apples comparison.

A better technique would be to use the Show Formulas feature in the Formula Auditing Group as shown in Fig 3.5.1.



C	D	E	F	G	H	I	J	K	L	M
Name	Lot No	Lot balanc	Date	TT	Qty	Amount	FIFO COS	FIFO Reali	Lots recd/(	Wt Avg
STONE	1	25	19-Oct-10	P	25	1256				
A	1	7	07-Mar-11	P	20	3292.6			26, 65	
CFIN	1	100	03-May-11	P	100	4194				
_	1	0	26-Aug-11	P	5	1767.5			19	
ANCE	1	1	26-Aug-11	P	2	1510.14			78	
	1	0	26-Aug-11	P	1	1940.09			80	
MOTOR	1	3	26-Aug-11	P	10	1453.6			25, 81	
STEEL	1	4	26-Aug-11	P	4	1764.08				
_	2	5	23-Nov-11	P	10	2568.4			19	
C	1	3	23-Nov-11	P	4	2490.72			67	
	1	2	23-Nov-11	P	3	4000.17			73	
UTI	1	1	23-Nov-11	P	2	1923.98			21	

Fig. 3.5.1: Show Formulas

On clicking the Show Formulas button, all the formulas in the entire worksheet open up as shown in Fig 3.5.2.

	A	B	C	D	E
1	Conky	NSE/BSE Symbol/Scrip Code	Scrip Name	Lot No	Lot balance
2	=IF(B2<>C2,B2&" "&C2,B2)	502015	ASSSTONE	=IF(G2="P",COUNTIFS($B$1:B1,B2,$G$1:G1,"P")+1,"NA")	25
3	=IF(B3<>C3,B3&" "&C3,B3)	CERA	CERA	=IF(G3="P",COUNTIFS($B$1:B2,B3,$G$1:G2,"P")+1,"NA")	7
4	=IF(B4<>C4,B4&" "&C4,B4)	532284	TCFCFIN	=IF(G4="P",COUNTIFS($B$1:B3,B4,$G$1:G3,"P")+1,"NA")	100
5	=IF(B5<>C5,B5&" "&C5,B5)	BHEL	BHEL	=IF(G5="P",COUNTIFS($B$1:B4,B5,$G$1:G4,"P")+1,"NA")	0
6	=IF(B6<>C6,B6&" "&C6,B6)	RELIANCE	RELIANCE	=IF(G6="P",COUNTIFS($B$1:B5,B6,$G$1:G5,"P")+1,"NA")	1
7	=IF(B7<>C7,B7&" "&C7,B7)	SBIN	SBIN	=IF(G7="P",COUNTIFS($B$1:B6,B7,$G$1:G6,"P")+1,"NA")	0
8	=IF(B8<>C8,B8&" "&C8,B8)	TATAMOTORS	TATAMOTORS	=IF(G8="P",COUNTIFS($B$1:B7,B8,$G$1:G7,"P")+1,"NA")	3
9	=IF(B9<>C9,B9&" "&C9,B9)	TATASTEEL	TATASTEEL	=IF(G9="P",COUNTIFS($B$1:B8,B9,$G$1:G8,"P")+1,"NA")	4
10	=IF(B10<>C10,B10&" "&C10,B10)	BHEL	BHEL	=IF(G10="P",COUNTIFS($B$1:B9,B10,$G$1:G9,"P")+1,"NA")	5
11	=IF(B11<>C11,B11&" "&C11,B11)	HDFC	HDFC	=IF(G11="P",COUNTIFS($B$1:B10,B11,$G$1:G10,"P")+1,"NA")	3
12	=IF(B12<>C12,B12&" "&C12,B12)	LT	LT	=IF(G12="P",COUNTIFS($B$1:B11,B12,$G$1:G11,"P")+1,"NA")	2
13	=IF(B13<>C13,B13&" "&C13,B13)	MARUTI	MARUTI	=IF(G13="P",COUNTIFS($B$1:B12,B13,$G$1:G12,"P")+1,"NA")	1
14	=IF(B14<>C14,B14&" "&C14,B14)	ONGC	ONGC	=IF(G14="P",COUNTIFS($B$1:B13,B14,$G$1:G13,"P")+1,"NA")	4
15	=IF(B15<>C15,B15&" "&C15,B15)	BAJAJELEC	BAJAJELEC	=IF(G15="P",COUNTIFS($B$1:B14,B15,$G$1:G14,"P")+1,"NA")	8
16	=IF(B16<>C16,B16&" "&C16,B16)	JYOTHYLAB	JYOTHYLAB	=IF(G16="P",COUNTIFS($B$1:B15,B16,$G$1:G15,"P")+1,"NA")	0
17	=IF(B17<>C17,B17&" "&C17,B17)	SESAGOA	SESAGOA	=IF(G17="P",COUNTIFS($B$1:B16,B17,$G$1:G16,"P")+1,"NA")	5
18	=IF(B18<>C18,B18&" "&C18,B18)	TATACHEM	TATACHEM	=IF(G18="P",COUNTIFS($B$1:B17,B18,$G$1:G17,"P")+1,"NA")	2
19	=IF(B19<>C19,B19&" "&C19,B19)	BHEL	BHEL	=IF(G19="P",COUNTIFS($B$1:B18,B19,$G$1:G18,"P")+1,"NA")	
20	=IF(B20<>C20,B20&" "&C20,B20)	JYOTHYLAB	JYOTHYLAB	=IF(G20="P",COUNTIFS($B$1:B19,B20,$G$1:G19,"P")+1,"NA")	
21	=IF(B21<>C21,B21&" "&C21,B21)	MARUTI	MARUTI	=IF(G21="P",COUNTIFS($B$1:B20,B21,$G$1:G20,"P")+1,"NA")	
22	=IF(B22<>C22,B22&" "&C22,B22)	ONGC	ONGC	=IF(G22="P",COUNTIFS($B$1:B21,B22,$G$1:G21,"P")+1,"NA")	
23	=IF(B23<>C23,B23&" "&C23,B23)	SESAGOA	SESAGOA	=IF(G23="P",COUNTIFS($B$1:B22,B23,$G$1:G22,"P")+1,"NA")	
24	=IF(B24<>C24,B24&" "&C24,B24)	TATACHEM	TATACHEM	=IF(G24="P",COUNTIFS($B$1:B23,B24,$G$1:G23,"P")+1,"NA")	
25	=IF(B25<>C25,B25&" "&C25,B25)	TATAMOTORS	TATAMOTORS	=IF(G25="P",COUNTIFS($B$1:B24,B25,$G$1:G24,"P")+1,"NA")	
26	=IF(B26<>C26,B26&" "&C26,B26)	CERA	CERA	=IF(G26="P",COUNTIFS($B$1:B25,B26,$G$1:G25,"P")+1,"NA")	
27	=IF(B27<>C27,B27&" "&C27,B27)	BHEL	BHEL	=IF(G27="P",COUNTIFS($B$1:B26,B27,$G$1:G26,"P")+1,"NA")	6
28	=IF(B28<>C28,B28&" "&C28,B28)	HINDALCO	HINDALCO	=IF(G28="P",COUNTIFS($B$1:B27,B28,$G$1:G27,"P")+1,"NA")	10
29	=IF(B29<>C29,B29&" "&C29,B29)	IRB	IRB	=IF(G29="P",COUNTIFS($B$1:B28,B29,$G$1:G28,"P")+1,"NA")	12
30	=IF(B30<>C30,B30&" "&C30,B30)	PNB	PNB	=IF(G30="P",COUNTIFS($B$1:B29,B30,$G$1:G29,"P")+1,"NA")	2

Fig. 3.5.2: Show Formulas - applied

One can study all the formulas at once. As we rest the cell pointer on a cell, it highlights the immediate precedents automatically, thus making it easier to study a formula. If one observes the formulas closely, he may even spot errors or inconsistencies in the formulas.

To return back to the normal view, click on Show Formulas button once more.

Shortcut for show formulas options is Ctrl ~ .This may come handy.

3.6 Error Checking

Using Show Formulas, we can trace errors. However, for this we rely on the keen observation of the user. It is quite possible that we fail to spot some errors. Therefore, Microsoft has developed a dedicated tool for tracking down the errors. This tool is called as 'Error Checking' as shown in Fig 3.6.1.

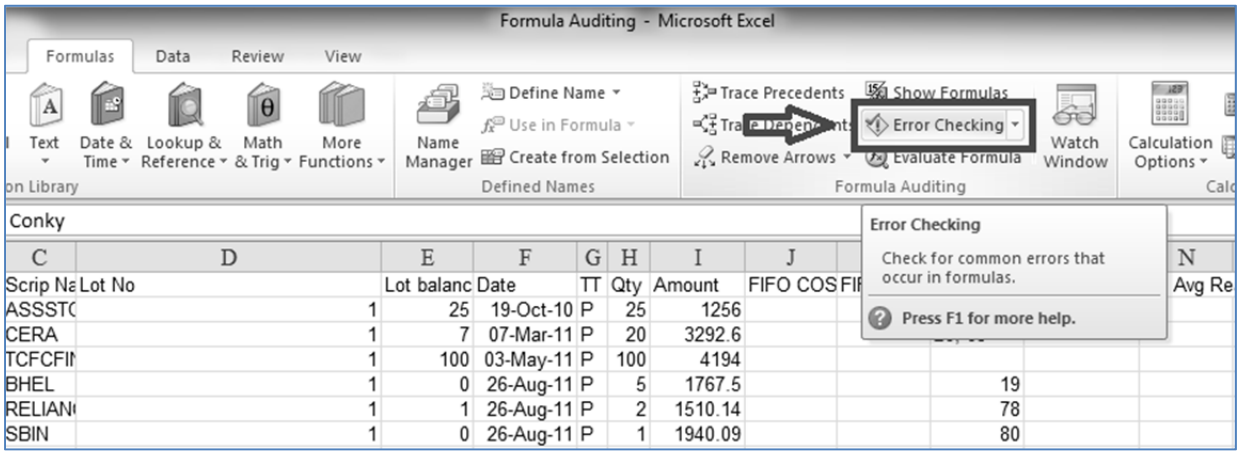


Fig. 3.6.1: Error Checking

On clicking Error Checking, MS Excel runs through the formulas in the worksheet and identifies the common errors that may creep in while constructing formula based templates.

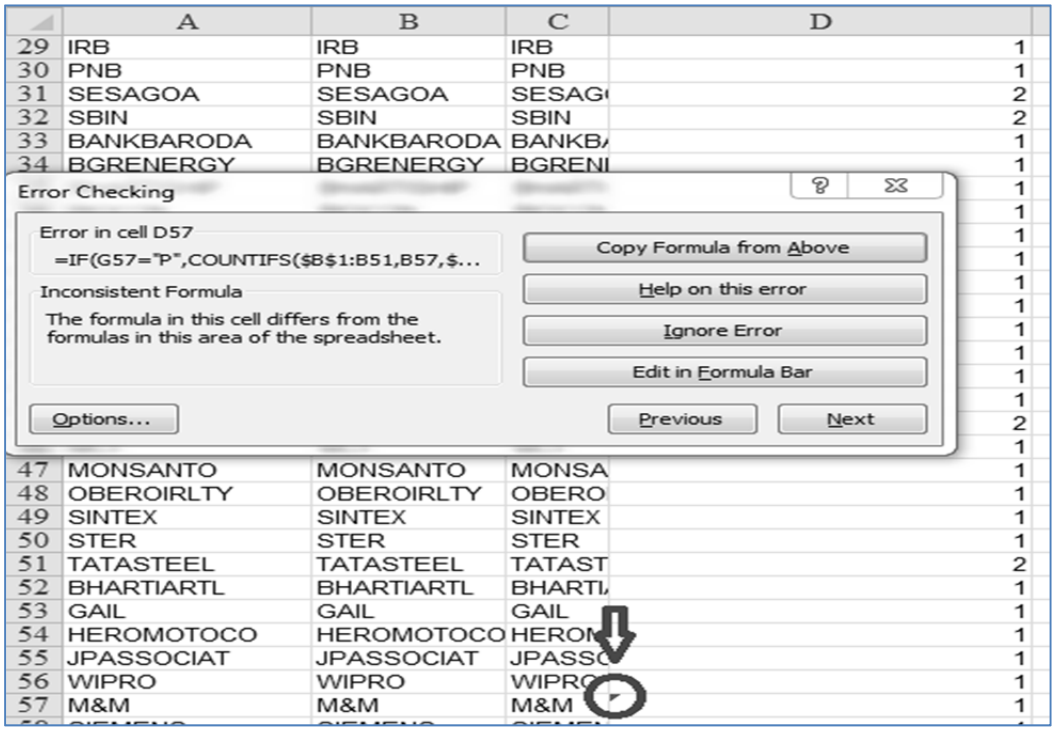
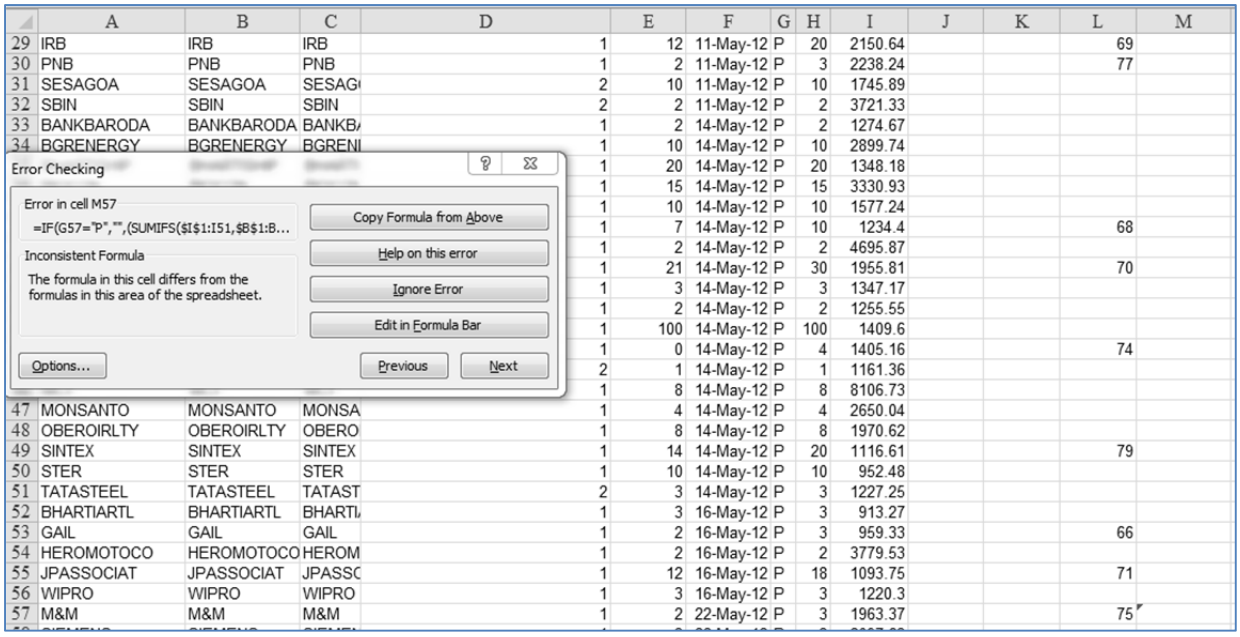


Fig. 3.6.2: Error Checking

For example, on pressing Error Checking, excel may flash an error like the one shown in the above diagram. The error is present in D57 cell and one may note a green colored triangular comment mark on the top left hand corner of cell D57 (highlighted using circular shape).

Excel shows the formula as contained in the formula and also describes the nature of the error briefly. It suggests an action to rectify the error. It also offers other options like help on error, ignore error etc. Thus, this tool provides lot of value in checking errors.



	A	B	C	D	E	F	G	H	I	J	K	L	M
29	IRB	IRB	IRB	1	12	11-May-12	P	20	2150.64			69	
30	PNB	PNB	PNB	1	2	11-May-12	P	3	2238.24			77	
31	SESAGOA	SESAGOA	SESAG	2	10	11-May-12	P	10	1745.89				
32	SBIN	SBIN	SBIN	2	2	11-May-12	P	2	3721.33				
33	BANKBARODA	BANKBARODA	BANKB	1	2	14-May-12	P	2	1274.67				
34	BGRENERGY	BGRENERGY	BGRENI	1	10	14-May-12	P	10	2899.74				
				1	20	14-May-12	P	20	1348.18				
				1	15	14-May-12	P	15	3330.93				
				1	10	14-May-12	P	10	1577.24				
				1	7	14-May-12	P	10	1234.4			68	
				1	2	14-May-12	P	2	4695.87				
				1	21	14-May-12	P	30	1955.81			70	
				1	3	14-May-12	P	3	1347.17				
				1	2	14-May-12	P	2	1255.55				
				1	100	14-May-12	P	100	1409.6				
				1	0	14-May-12	P	4	1405.16			74	
				2	1	14-May-12	P	1	1161.36				
				1	8	14-May-12	P	8	8106.73				
47	MONSANTO	MONSANTO	MONSA	1	4	14-May-12	P	4	2650.04				
48	OBEROIRLTY	OBEROIRLTY	OBERO	1	8	14-May-12	P	8	1970.62				
49	SINTEX	SINTEX	SINTEX	1	14	14-May-12	P	20	1116.61			79	
50	STER	STER	STER	1	10	14-May-12	P	10	952.48				
51	TATASTEEL	TATASTEEL	TATAST	2	3	14-May-12	P	3	1227.25				
52	BHARTIARTL	BHARTIARTL	BHARTI	1	3	16-May-12	P	3	913.27				
53	GAIL	GAIL	GAIL	1	2	16-May-12	P	3	959.33			66	
54	HEROMOTOCO	HEROMOTOCO	HEROM	1	2	16-May-12	P	2	3779.53				
55	JPASSOCIAT	JPASSOCIAT	JPASSC	1	12	16-May-12	P	18	1093.75			71	
56	WIPRO	WIPRO	WIPRO	1	3	16-May-12	P	3	1220.3				
57	M&M	M&M	M&M	1	2	22-May-12	P	3	1963.37			75	

Fig. 3.6.3: Other errors in the worksheet

After the first error is checked, this tool runs through all the errors in the worksheet, one by one. This allows the user to take suitable action on each error.

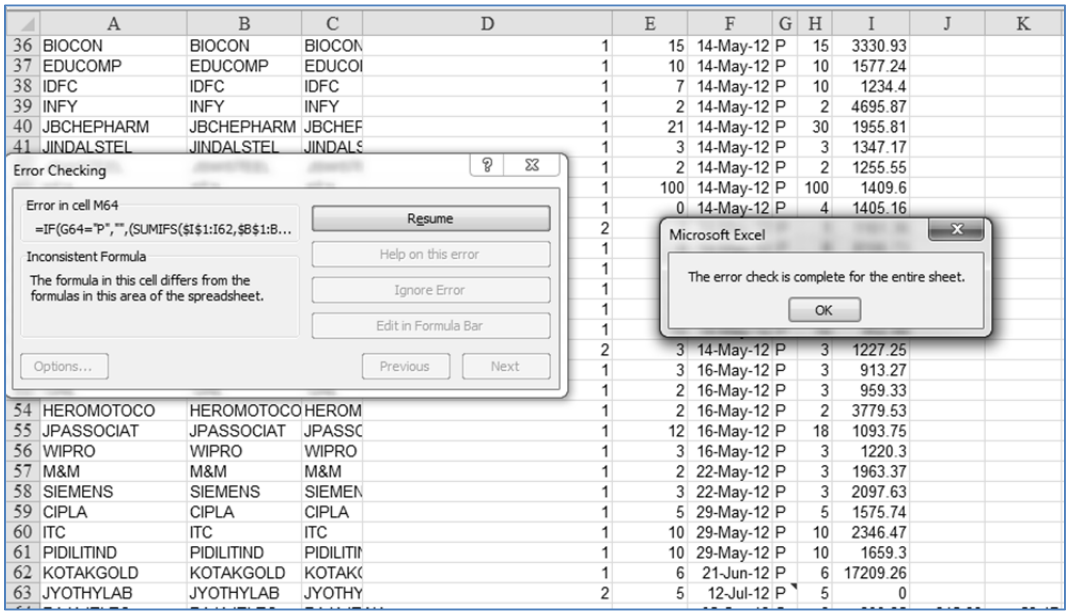


Fig. 3.6.4: Error check is complete

After all errors are identified and acted upon, excel flashes that the error check is complete for the sheet.

Note: Error Checking only identifies certain common errors. Needless to say, *it will not identify errors in the logic behind formula construction.*

3.7 Evaluate Formula

We are often required to use excel files containing formula structures developed by other colleagues. We may go through the formulas build by them but we may not understand them at once. Alternately, we ourselves may have developed a formula structure in the past but now we may not be sure about the logic. In such cases, we may like to observe the step-by-step execution of the formula and deduce the logic behind the formula.

Keeping this requirement in mind, Microsoft has developed the feature of Evaluate Formula.

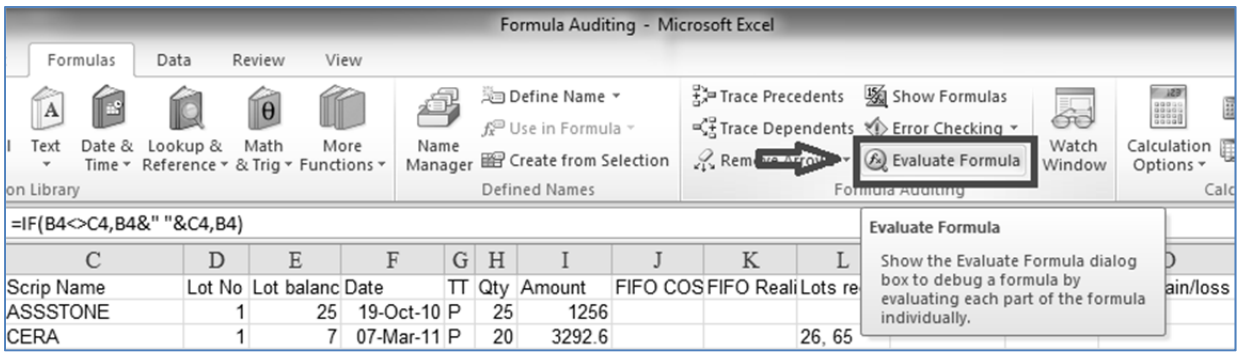


Fig. 3.7.1: Evaluate Formula

This tool lets a user execute the formula in a piece meal manner, thus letting him pause and understand the role played by each component of the formula and how those parts integrate to generate the desired result.

A4 | =IF(B4<>C4,B4&" "&C4,B4)

	A	B	C	D	E
1	Conky	NSE/BSE Symt	Scrip Name	Lot No	Lot balanc
2	502015 ASSSTONE	502015	ASSSTONE	1	25
3	CERA	CERA	CERA	1	7
4	532284 TCFCFIN	532284	TCFCFIN	1	100
5	BHEL	BHEL	BHEL	1	0
6	RELIANCE	RELIANCE	RELIANCE	1	1
7	SBIN	SBIN	SBIN	1	0

Fig. 3.7.2: Example

Let us consider the formula contained in cell A4 in the above diagram. The formula is displayed in the formula bar. It starts with an If function and somewhere inside that a concatenate of few components has been achieved, using '&' symbol.

Say, you haven't understood the formula by reading it from left to right and you are not sure how it returns the value *'532284 TCFCFIN'*. Especially, when many other cells in column A are identical to the corresponding cells in columns B and C. Thus, you may desire evaluating the formula step-by-step. For this, click on the 'Evaluate Formula' feature in the Formula Auditing Group. It will flash a window as shown in Fig 3.7.3

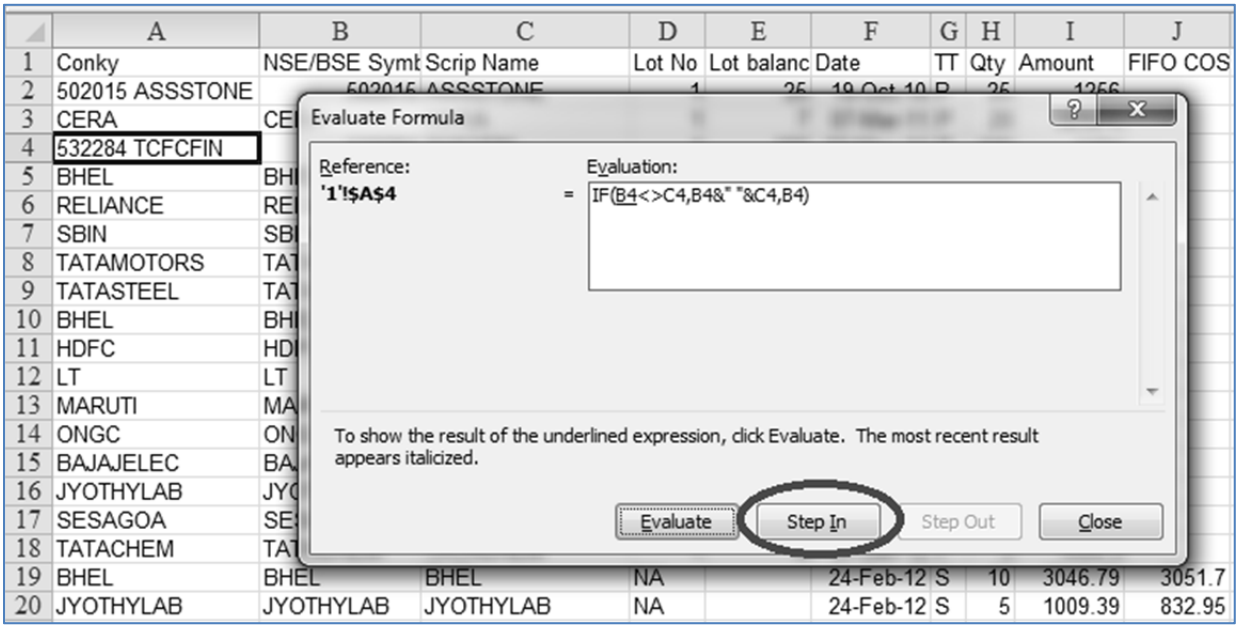


Fig. 3.7.3: Evaluate Formula Window

The window shows the entire formula expression as contained in the cell. This expression will be evaluated in a piecemeal manner. You may notice that *B4* in the expression is underlined, which indicates that B4 will be evaluated as soon as the 'Evaluate' button is clicked. We also have a Step in button (highlighted using oval shape). This button lets us understand the value contained in the cell reference about to be evaluated. Click on Step In.

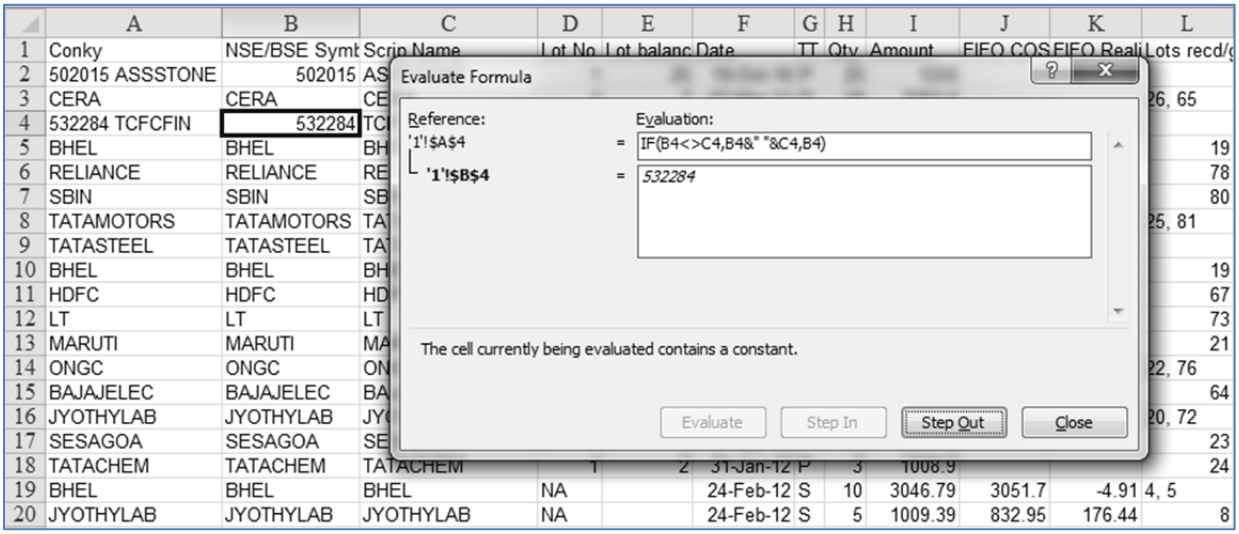


Fig. 3.7.4: Step In

On clicking Step In, we can see that another section opens up below the expression, which displays the value contained in cell B4 (i.e. 532284). The cell pointer also moves to B4 cell. After this, to return back to the expression, click Step Out.

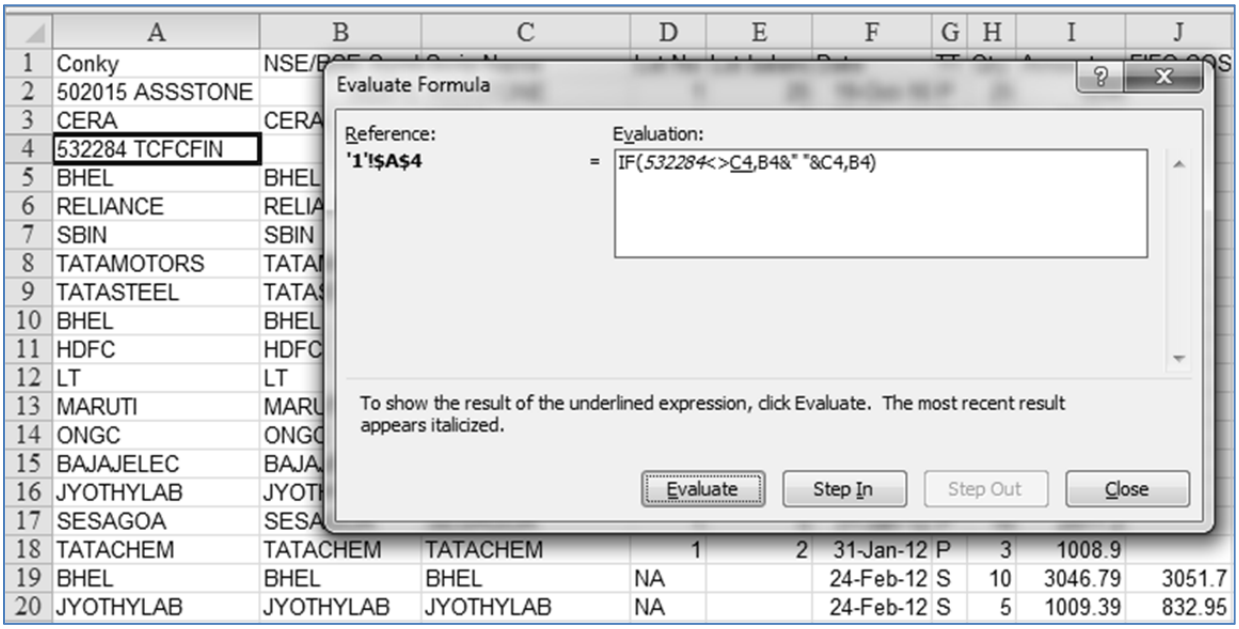


Fig. 3.7.5: On Stepping Out

B4 cell in the expression is now replaced by its value, 532284. The cell pointer also returns back to A4 cell. The next part about to be executed is *C4*, which is underlined. Click Evaluate.

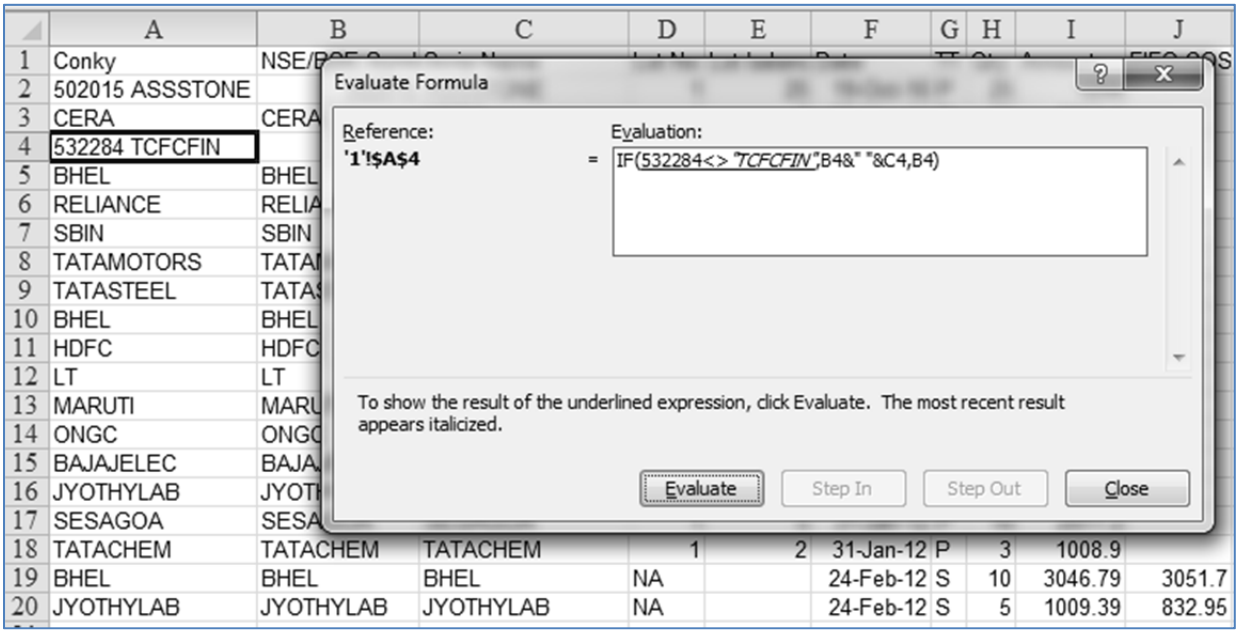


Fig. 3.7.6: Next part to be evaluated

C4 is now replaced by TCFCFIN. Now the next part to be evaluated is *532284* <> *"TCFCFIN"*. Click Evaluate.

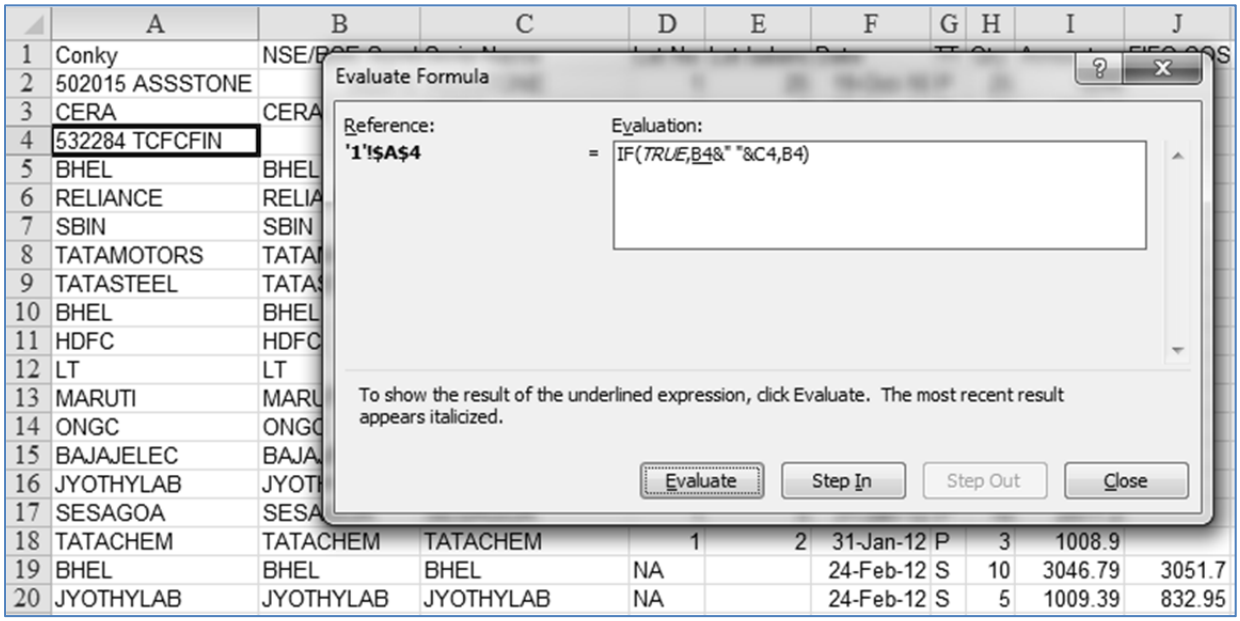


Fig. 3.7.7: Evaluation of statement

The part which was evaluated just now was a statement. Since it was a true statement, it has been replaced by TRUE. Now the next part is again B4 cell. Click Evaluate.

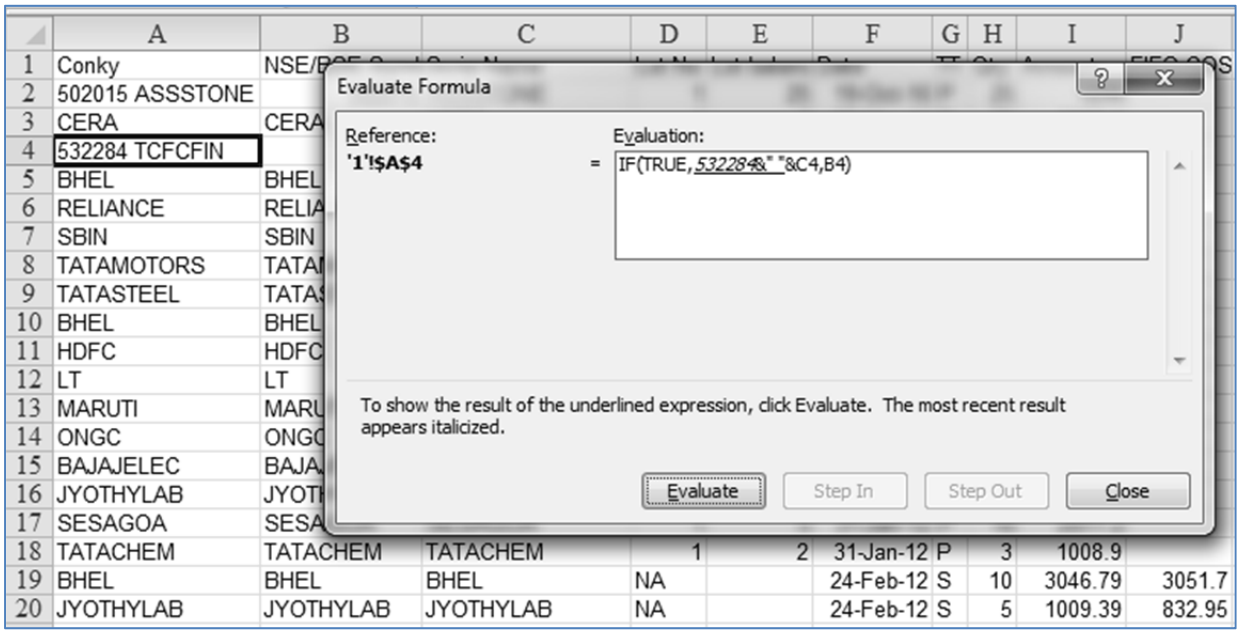


Fig. 3.7.8: B4 evaluated

We can see that B4 is replaced by its value. Now the next part to be evaluated is the concatenate between this value and space. Click Evaluate.

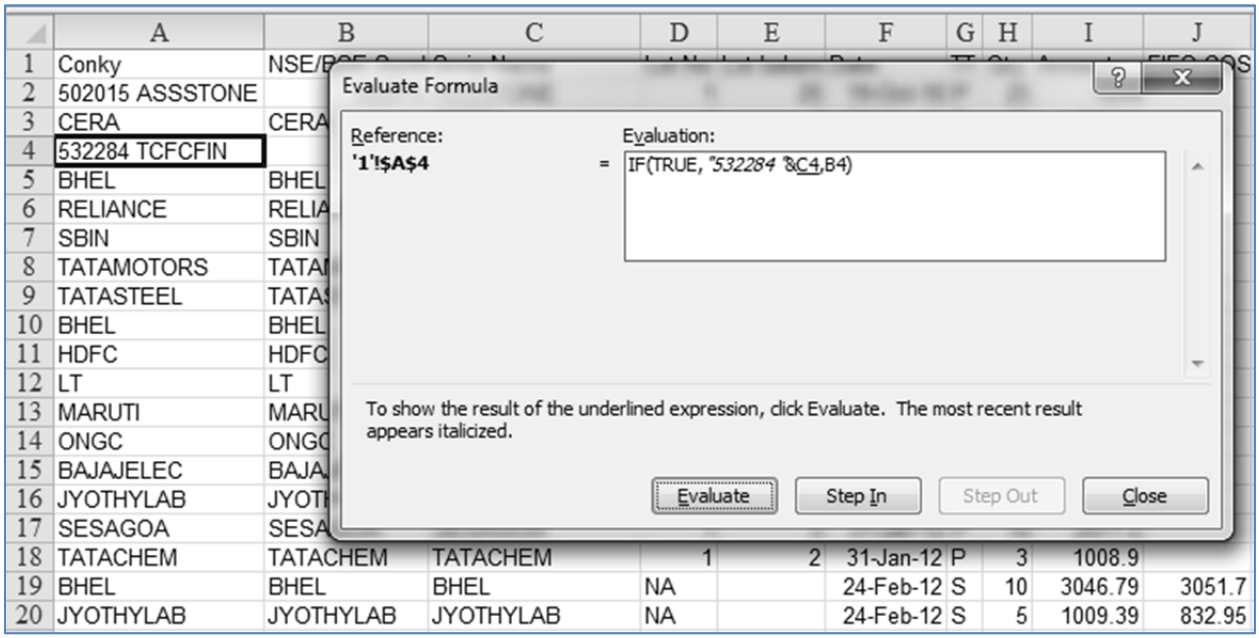


Fig. 3.7.9: Concatenate

We can clearly see the space after 532284. Now C4 will be evaluated again. Click Evaluate.

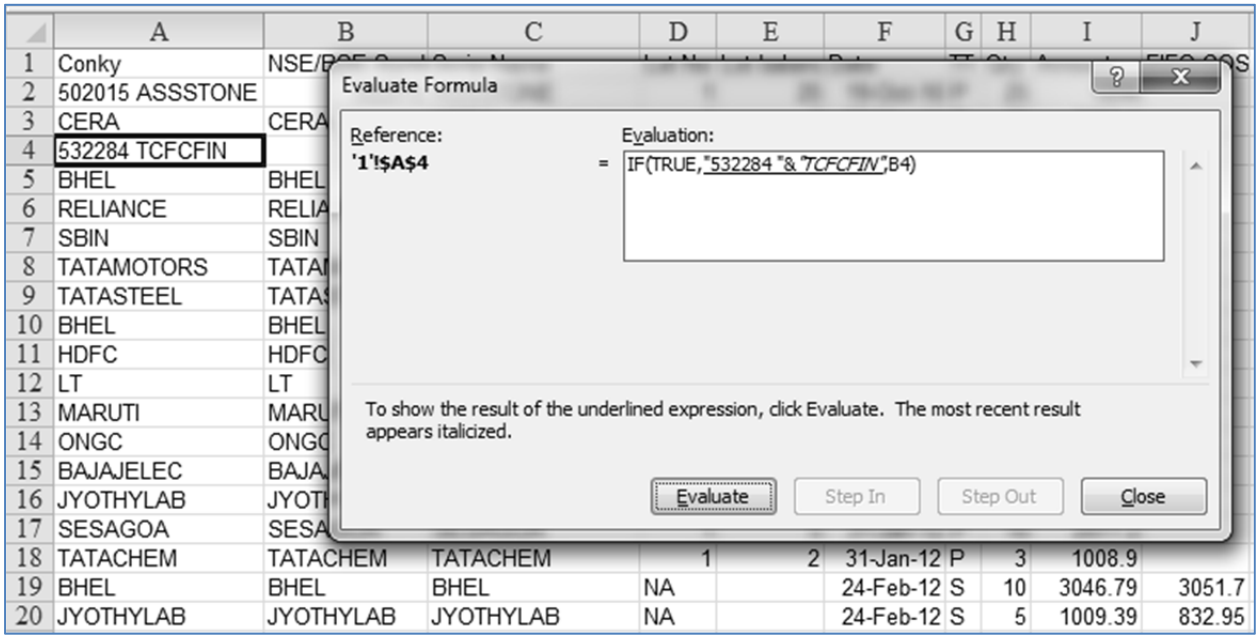


Fig. 3.7.10: C4 evaluated

C4 is replaced by TCFCFIN. Now the whole underlined matter is about to be evaluated. Click Evaluate.

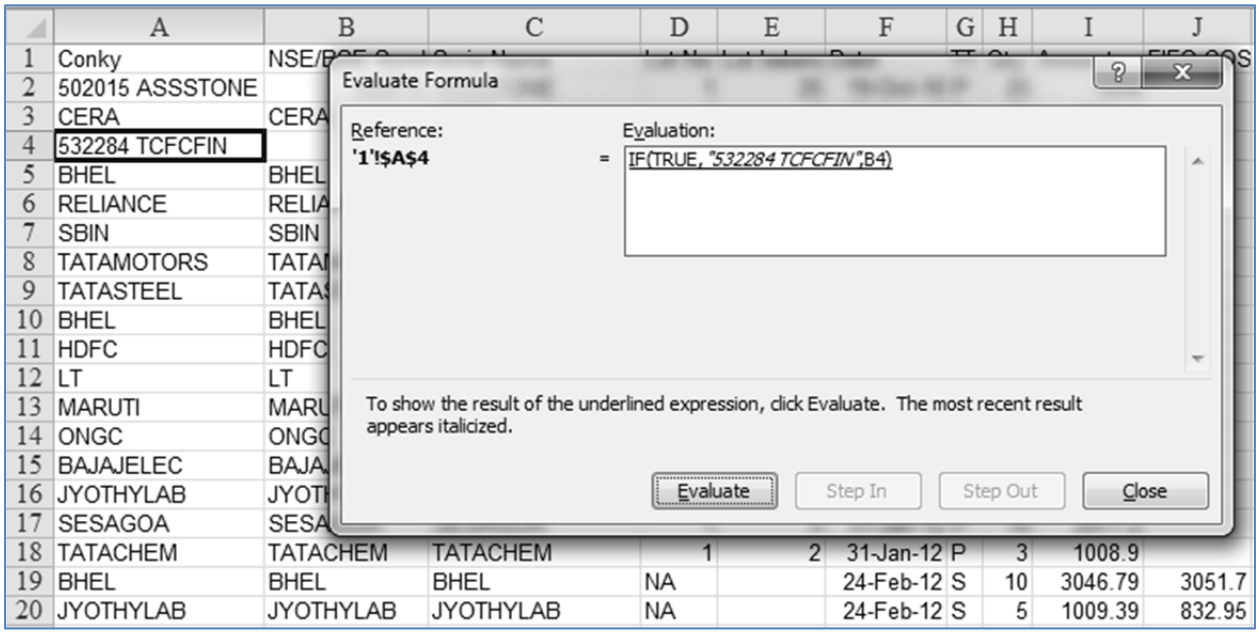


Fig. 3.7.11: 2nd Concatenate

We can see that the 2nd and final concatenate works out to be *532284 TCFCFIN*. Now, the formula appears to be much simpler. It stands out as an IF function; where the logical test has been evaluated as TRUE, 532284

TCFCFIN in place of the value if true and B4 cell in place of the value if false. Since the evaluation of the logical test is true, excel doesn't waste time in evaluating B4. You may notice that the whole IF formula is underlined and will be evaluated at once now.

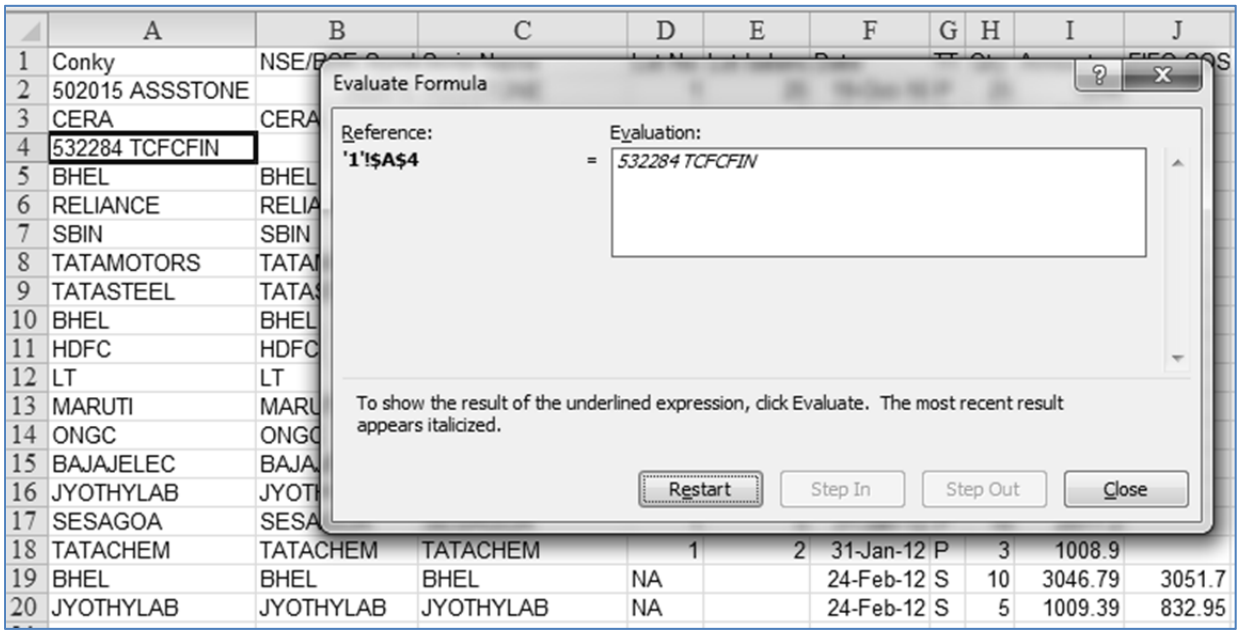
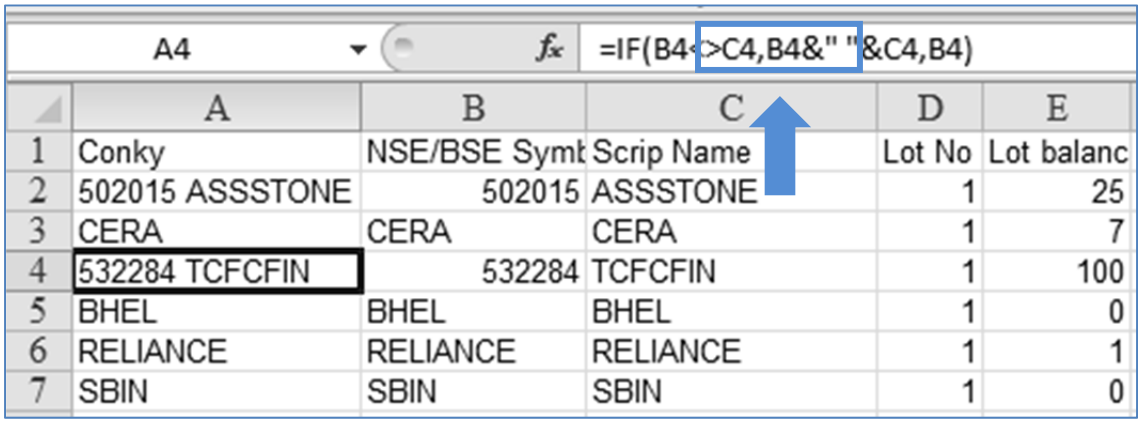


Fig. 3.7.11: Final Evaluation

Thus, excel discards B4 and presents the value if true i.e. 532284 TCFCFIN as the final result. Now, it's possible that despite this step-by-step evaluation, you may not have understood the formula completely. In that case, excel lets you have the opportunity of doing the whole evaluation once more. For this, you need to click the Restart button. You can have as many rounds of evaluation as you wish, till you are not completely satisfied!

3.8 Evaluate Formula using F9 key

The Evaluate Formula feature we learnt in the previous section carries out a slow motion evaluation of the entire formula. On the other hand, if we want a quick evaluation of only one of the parts of the formula, we can make use of F9 key.

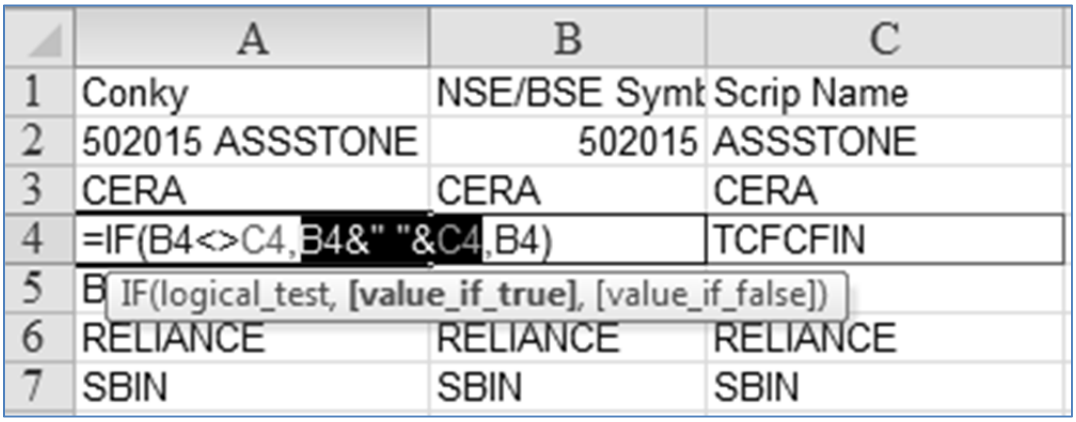


	A	B	C	D	E
1	Conky	NSE/BSE Symt	Scrip Name	Lot No	Lot balanc
2	502015 ASSSTONE	502015	ASSSTONE	1	25
3	CERA	CERA	CERA	1	7
4	532284 TCFCFIN	532284	TCFCFIN	1	100
5	BHEL	BHEL	BHEL	1	0
6	RELIANCE	RELIANCE	RELIANCE	1	1
7	SBIN	SBIN	SBIN	1	0

Fig. 3.8.1: Same Example

Let's consider the same example again. The complete formula appears in the formula bar. Suppose, you have understood the broad logic of the formula but you are not quite sure about the evaluation of the concatenate part (highlighted in rectangular shape above).

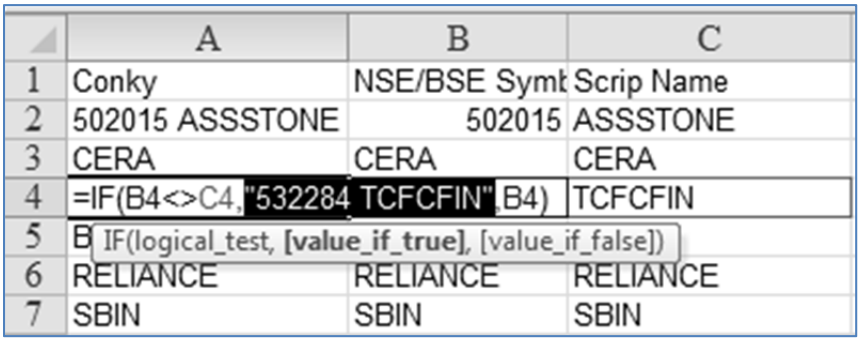
In such a case, press F2 and highlight the said part, as shown below:



	A	B	C
1	Conky	NSE/BSE Symt	Scrip Name
2	502015 ASSSTONE	502015	ASSSTONE
3	CERA	CERA	CERA
4	=IF(B4<>C4,B4&" "&C4,B4)		TCFCFIN
5	B		
6	RELIANCE	RELIANCE	RELIANCE
7	SBIN	SBIN	SBIN

Fig. 3.8.2: Highlight relevant part

Then press F9. This will evaluate only the highlighted portion.



	A	B	C
1	Conky	NSE/BSE Symt	Scrip Name
2	502015 ASSSTONE	502015	ASSSTONE
3	CERA	CERA	CERA
4	=IF(B4<>C4,"532284 TCFCFIN",B4)		TCFCFIN
5	B		
6	RELIANCE	RELIANCE	RELIANCE
7	SBIN	SBIN	SBIN

Fig. 3.8.3: Partial evaluation

To evaluate the complete formula, don't highlight any portion. Simply go inside the cell (by pressing F2) and then press F9.

	A	B
1	Conky	NSE/BSE Symt
2	502015 ASSSTONE	502015
3	CERA	CERA
4	532284 TCFCFIN	
5	BHEL	BHEL
6	RELIANCE	RELIANCE
7	SBIN	SBIN

Fig. 3.8.4: Complete evaluation

Caution: After evaluation using F9, exit the cell by pressing Esc key. If you press enter, the evaluated portion stays inside the cell and to that extent, you lose your formula!

3.9 Formula Auditing Tips

There are some commonly found errors which may inadvertently creep in. You should carefully watch out for them. These errors may not be detected by the Error Checking feature. Let us have a look at them:

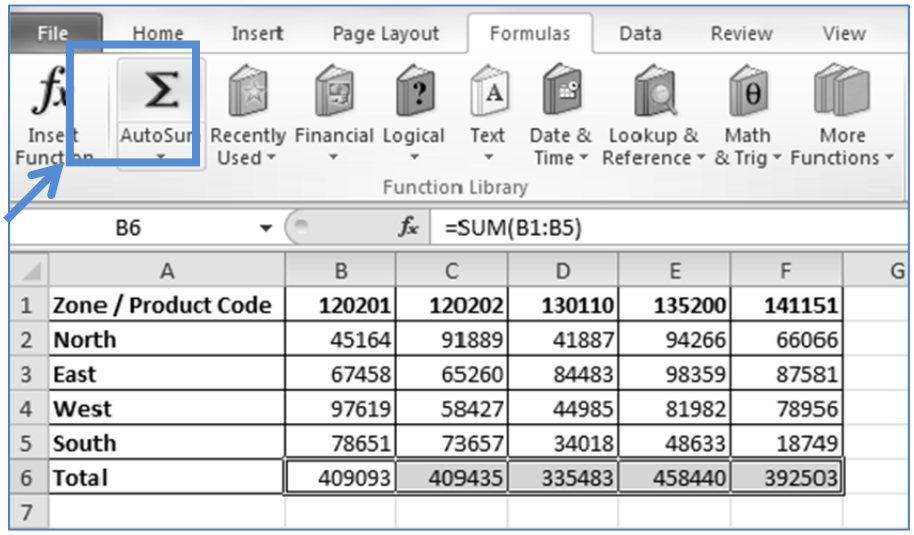
3.9.1 Numeric Headings Included in AutoSum Totals

	A	B	C	D	E	F
1	**Zone / Product Code**	**120201**	**120202**	**130110**	**135200**	**141151**
2	**North**	45164	91889	41887	94266	66066
3	**East**	67458	65260	84483	98359	87581
4	**West**	97619	58427	44985	81982	78956
5	**South**	78651	73657	34018	48633	18749
6	**Total**					

Fig. 3.9.1: Numeric Product Codes

Look at the above diagram. It shows zone wise sales of some products, represented by their codes. You may note that the product codes are numeric.

Totals for all the zones together are desired in row 6. If you highlight the cells as shown above and use Autosum (highlighted using rectangular shape), we will get totals as shown in Fig 3.9.2.



	A	B	C	D	E	F	G
1	**Zone / Product Code**	**120201**	**120202**	**130110**	**135200**	**141151**	
2	**North**	45164	91889	41887	94266	66066	
3	**East**	67458	65260	84483	98359	87581	
4	**West**	97619	58427	44985	81982	78956	
5	**South**	78651	73657	34018	48633	18749	
6	**Total**	409093	409435	335483	458440	392503	
7							

Fig. 3.9.2: Wrong Totals

These totals are wrong, as the Autosum has included the first row values as well, which are in fact the headers. This is clearly evident from the formula bar.

	A	B	C	D	E	F
1	**Zone / Product Code**	**120201**	**120202**	**130110**	**135200**	**141151**
2	**North**	45164	91889	41887	94266	66066
3	**East**	67458	65260	84483	98359	87581
4	**West**	97619	58427	44985	81982	78956
5	**South**	78651	73657	34018	48633	18749
6	**Total**	=SUM(B2:B5)		205373	323240	251352

Fig. 3.9.3: Right Totals

To obtain the right totals, we need to rectify the formulas and make sure that the first row is excluded from the range of cells getting added.

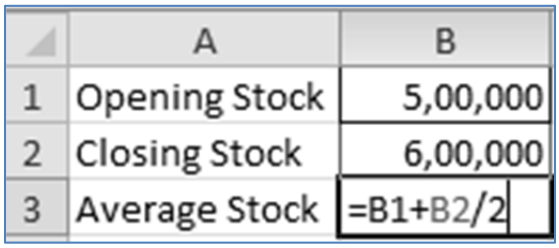
3.9.2 Ignoring Order of Operations

This is a fundamental principle behind evaluating mathematical expressions, whether or not excel is used. Nonetheless, quite often, one fails to recognize it. Look at the following example in Fig 3.9.4.

	A	B
1	Opening Stock	5,00,000
2	Closing Stock	6,00,000
3	Average Stock	8,00,000

Fig. 3.9.4: Wrong Average Stock

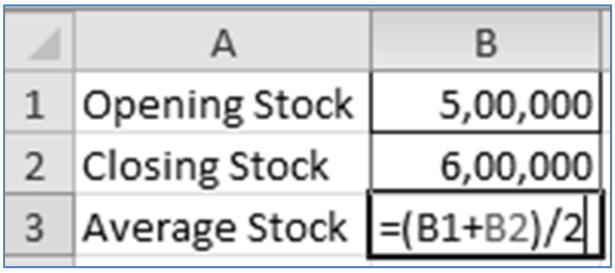
Your assistant has calculated average stock, based on opening stock and closing stock. When you examine the figures, you may immediately note that the average stock is more than both the opening as well as closing stock. Average or Arithmetic mean can never exceed the highest value in the sample. Thus, you are perplexed how come your assistant has calculated such a figure.



	A	B
1	Opening Stock	5,00,000
2	Closing Stock	6,00,000
3	Average Stock	=B1+B2/2

Fig. 3.9.5: Root Cause

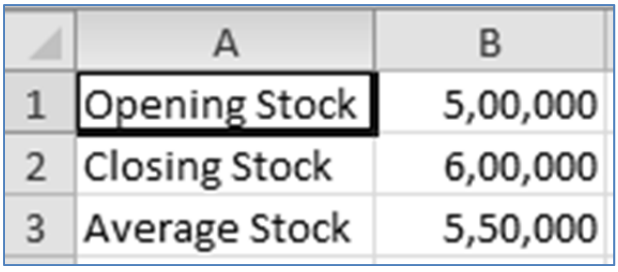
If you look at the underlying formula you may immediately spot the error. Your assistant has assumed that excel calculates from left to right and has accordingly constructed his formula. However, this is wrong.



	A	B
1	Opening Stock	5,00,000
2	Closing Stock	6,00,000
3	Average Stock	=(B1+B2)/2

Fig. 3.9.6: Correct formula

You may rectify the situation by putting B1 + B2 inside a pair of brackets. Alternately, you may also consider using average function. This should fix the issue. Thus, the right average value is 5, 50,000.



	A	B
1	Opening Stock	5,00,000
2	Closing Stock	6,00,000
3	Average Stock	5,50,000

Fig. 3.9.7: Correct formula

In general, one must remember the following order of calculation which is followed by excel (or almost every other software, for that matter):

Brackets → Exponents →Division → Multiplication →Addition →Subtraction

It is easy to remember this sequence using the acronym BEDMAS.

3.9.3 Beware of Reset Error Indicators

Sometimes some common errors may occur while developing some formulas in excel. Such errors are indicated by green colored triangle at the top left hand corner of the cell.

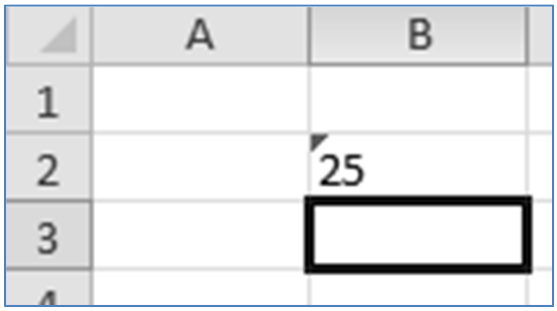


Fig. 3.9.8: Error indicated by green triangle

However, if one prefers, he may decide to ignore this error as shown in Fig 3.9.9.

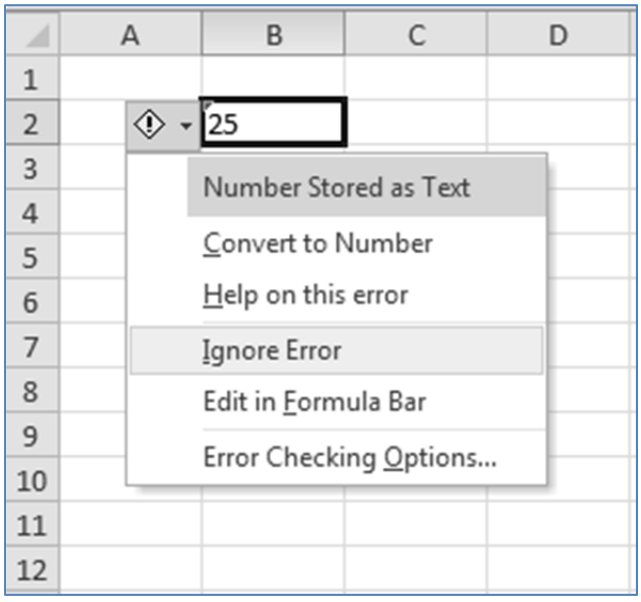


Fig. 3.9.9: Ignore Error

This will remove the green triangle as shown in Fig 3.9.10.

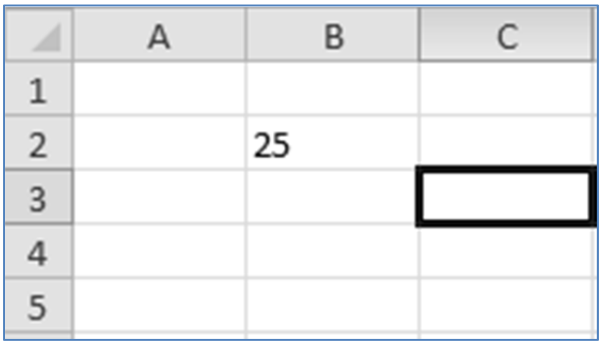


Fig. 3.9.10: Green triangle removed

However, this is a potentially dangerous situation as the cell no more appears to be bearing any errors. Therefore, you may actually like to get the green triangle back. In that case, we can use the *Reset Ignored Errors* feature. For this, click on File → Options as shown in Fig 3.9.11.

Fig. 3.9.11: File → Options

This will open the excel options. Select Formulas. On the right hand side, you will notice Reset Ignored Errors.

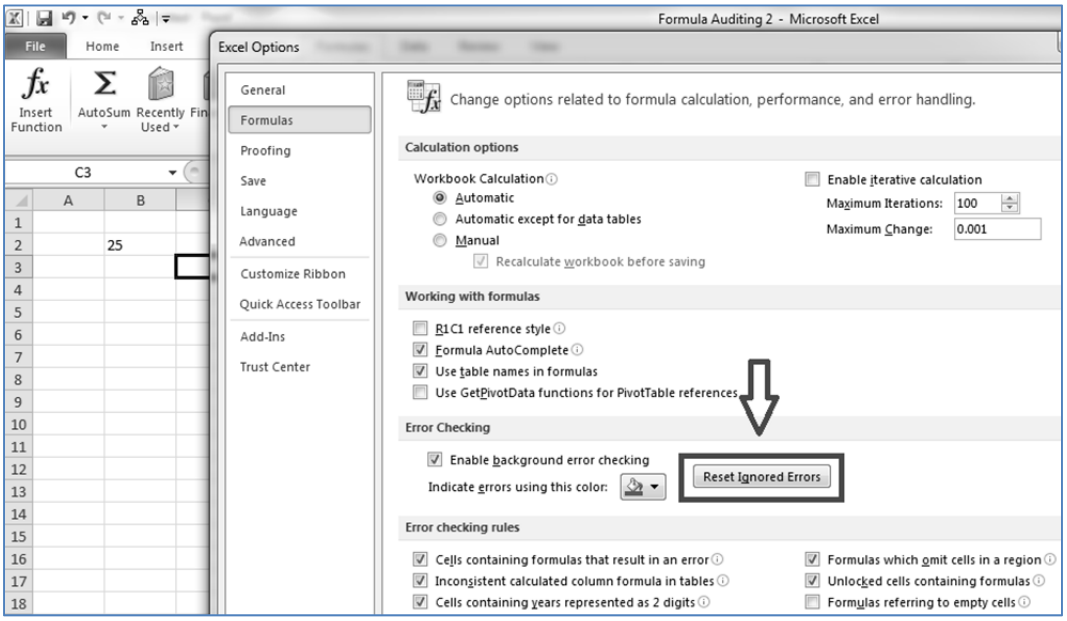


Fig. 3.9.12: Reset Ignored Errors

Now click on this button. This will bring back the green triangle.

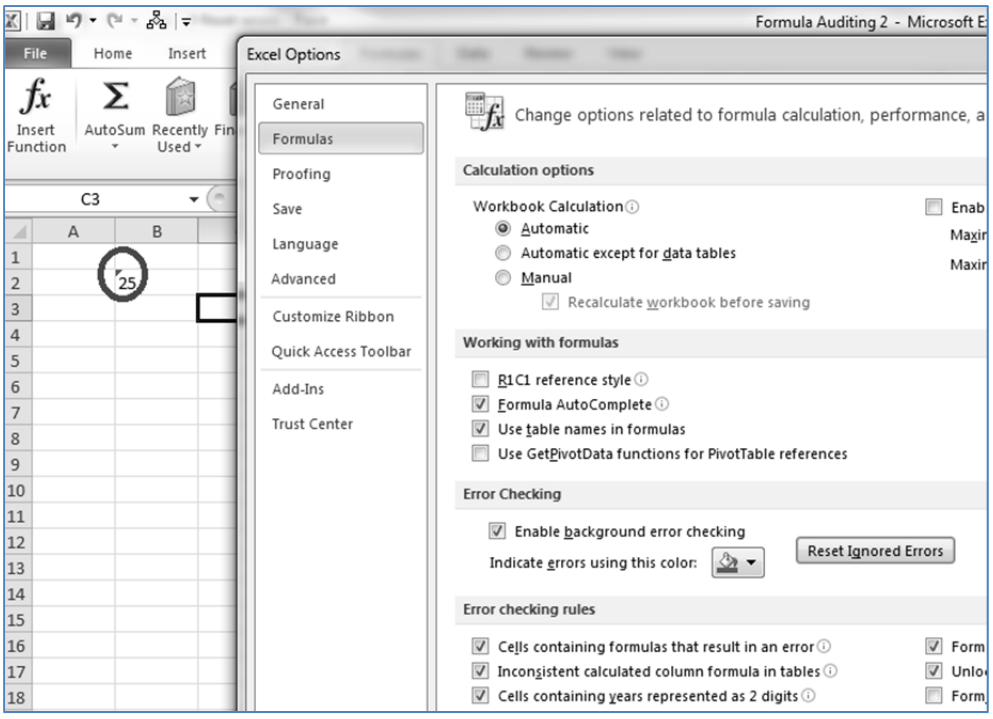


Fig. 3.9.13: Error Indicator is back

Note: It is difficult to trace the errors by using the green triangle indicator. A better idea is to use the Error Checking feature. This is, of course, assuming that errors are reset in the first place.

3.10 SUMMARY

After creating a formula based template, we may like to test our formulas for integrity and robustness. In that case, we can use the Formula Auditing Group, present in the Formulas Tab of excel. This tab carries various features like the following

1. Trace Precedents / Dependents – Use this feature to trace the precedent cells (cells used as inputs for the active cell) or dependent cells (other cells which use the active cell as input). Precedents and dependents can be traced at direct or multiple levels. These are marked in the worksheet using arrows.
2. Remove arrows – This is used to clear the arrows generated while using Trace Precedents / Dependents.
3. Show Formulas – This opens up the worksheet and shows all the formulas in the sheet.
4. Error Checking – Use this feature to trace common errors crept in while constructing formulas and rectify them. Of course, this will not highlight errors in formulas thanks to incorrect logic.
5. Evaluate Formula–This lets us evaluate a formula slowly and steadily so that we can observe how it progresses and reaches to the result. This is extremely handy tool for understanding long and complex formulas, especially developed by others.

In addition to the Formula Auditing Group, we have some more tools at our disposal for formula auditing purpose like:

1. Trace Precedents / Dependents using Go To Special – We can use Go To Special to highlight precedents and dependents. This tool selects such cells. Thereafter, we can permanently mark these cells by changing their formatting features.
2. Highlighting all formulas using Go To Special – Again, this tool can let us select all the formulas present in the worksheet. If required, we can also specify whether we would like to focus on formulas yielding only numbers, texts, logicals etc
3. Evaluating a formula using F9 – By using F9 key, we can get a partial or complete evaluation of the formula, inside the formula bar. This is supposed to give us a quick idea of the evaluation. However, while exiting the cell, one must remember to press Esc key. If enter key is used, the evaluation stays in the formula.

Finally, some tips may be kept in mind while dealing with formula based structures:

1. Be careful when you have numeric column headings. While using Autosum feature, they may get added in your totals.
2. One must remember the order in which mathematical operations are carried out. The acronym BEDMAS may help us to remember the order *Brackets → Exponents →Division → Multiplication →Addition →Subtraction*
3. Someone may remove error indicators put by excel, in the form of green triangle. Those can be restored by visiting File → Options →Formulas →Reset Ignored Errors.

3.11 Multiple Choice Questions (MCQ) for Practice

1. The Formula Auditing Group is present in the _____ tab:
   (a) Insert
   (b) View
   (c) Review
   (d) Formulas
2. Trace Precedents will trace the cells which:
   (a) Use active cell as input
   (b) Are inputs for the active cell
   (c) Are independent of the active cell
   (d) None of the above
3. Trace Dependents will trace the cells which:
   (a) Use active cell as input
   (b) Are inputs for the active cell
   (c) Are independent of the active cell
   (d) None of the above
4. Which shape is used by Trace Precedents and Dependents to mark cells?
   (a) Arrow
   (b) Triangle
   (c) Circles
   (d) Diamonds
5. Virat has come across a formula which he finds extremely confusing. He would like to work out each part of the formula step-by-step till he arrives at the final result. Which feature can he use?
   (a) Formula Audit
   (b) Trace Dependent
   (c) Evaluate Formula
   (d) F9 key
6. Sania has a formula in front of her. She wants to quickly evaluate one small portion of the formula. She doesn't intend to understand the complete flow of the formula. Which tool can she use?
   (a) Formula Audit
   (b) Trace Dependent
   (c) Evaluate Formula

(d) F9 key

7. Which of the following operators will be executed first?
   (a) Addition
   (b) Multiplication
   (c) Exponents
   (d) Division
8. Which of the following operators will be executed last?
   (a) Addition
   (b) Multiplication
   (c) Exponents
   (d) Division
9. Errors are highlighted by excel using:
   (a) Green triangles
   (b) Red triangles
   (c) Green squares
   (d) Red squares
10. To reset ignored errors, we must visit:
   (a) Error Checking
   (b) File → Options → Formulas
   (c) Both a and b are needed
   (d) Either a or b, as per your choice
11. We cannot effectively trace the precedents / dependents from other worksheets or workbooks.
   (a) This statement is always true
   (b) This statement is false. This feature is available by default in all versions of excel.
   (c) Depends on the version of excel
   (d) By default no, but is possible if we make suitable changes in excel options.
12. Which of the following tools can trace precedents / dependents?
   (a) Formula Auditing Group
   (b) Go To Special
   (c) Both of them
   (d) None of them
13. To look at all the formulas in a worksheet at once, which feature can be used?

(a) Display Formulas

(b) Show Formulas

(c) Express Formulas

(d) Open Formulas

14. Which of the following errors will not be traced by Error Checking?

(a) Inconsistent manner of defining formulas

(b) Errors like #N/A, #REF! etc

(c) Numbers stored as text

(d) Error in the logic of defining the formula

15. Go To Special is located in the _____ tab:

(a) Formulas

(b) Home

(c) File

(d) Insert

Solutions

1. (d)
2. (b)
3. (a)
4. (a)
5. (c)
6. (d)
7. (c)
8. (a)
9. (a)
10. (b)
11. (a)
12. (c)
13. (b)
14. (d)
15. (b)

CHAPTER

4

DATA ANALYSIS USING MS EXCEL

LEARNING OBJECTIVES

- Be aware about the need for Data Analysis.
- Learn the various tools available for Data Analysis
- Study Pivot Tables in Depth
- Go through some practical case studies

4.1 Introduction

The core function of MS Excel as a software is data analysis. Excel helps us in deriving information out of raw data.

As auditors, we come across lot of financial data in excel. We need to study this data extensively without which we cannot give assurance about the auditee's financial accounts. We need to derive some important statistics, categorise date, perform aging analysis, remove duplicates, detect gaps, consolidate data etc. For doing these activities, we can use excel very productively.

Let us now see how we can do this effectively using excel.

4.2 Duplicates

Quite often, we come across list of values which we feel may contain duplicate values. We would like to mark such duplicate values and may also like to remove them.

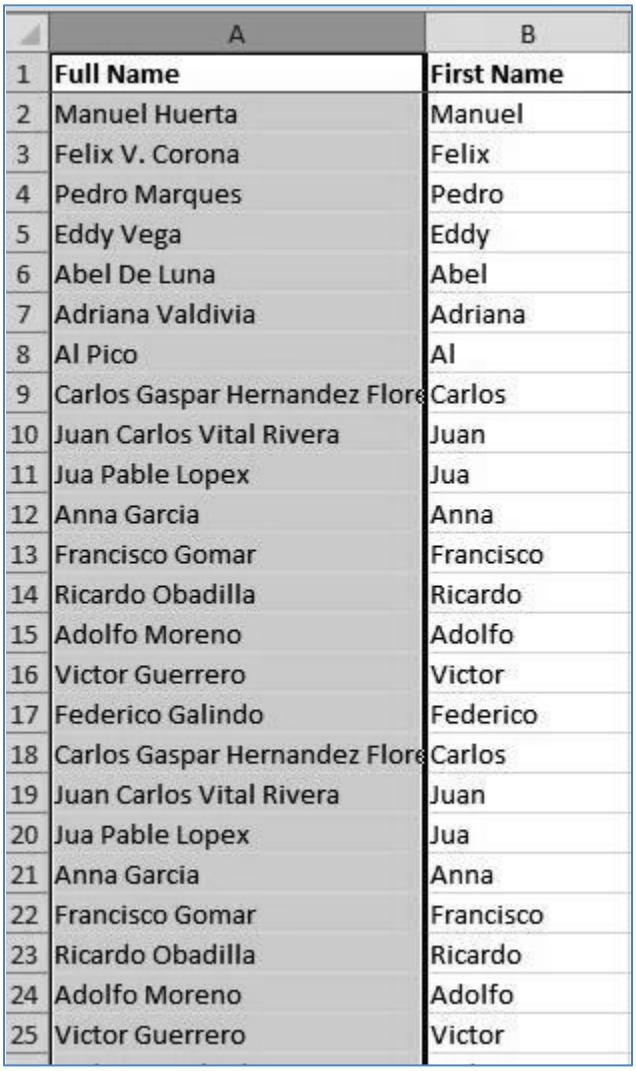
4.2.1 Mark Duplicates

	A	B	C	D	E
1	**Full Name**	**First Name**	**Last Name**	**company**	**add 1**
2	Manuel Huerta	Manuel	Huerta	Huerta Promotions	4635 Border Village Rd
3	Felix V. Corona	Felix	Corona	Corona Prom/Corona Ranch	2066 West Cambridge Ave.
4	Pedro Marques	Pedro	Marques	Empresa Marques	Capri & Fiesta/Radio
5	Eddy Vega	Eddy	Vega	Aztian Promotios	2323-D.S. Old Missouri Rd
6	Abel De Luna	Abel	Luna	Luna Management LLC	1200 W. Venice Blvd
7	Adriana Valdivia	Adriana	Valdivia	Empresa Valdivia	1725 Broadway St
8	Al Pico	Al	Pico	Pico Promotions	1366 Maine Ave
9	Carlos Gaspar Hernandez Flore	Carlos	Flores	Rep/ Artisticas De Monteciaro LLC	McAllen
10	Juan Carlos Vital Rivera	Juan	Rivera	Los Valedores De La Sierra	Leon
11	Jua Pable Lopex	Jua	Lopex	Disoos Gama	San Antonio
12	Anna Garcia	Anna	Garcia	Garcia Promotions	San Jose
13	Francisco Gomar	Francisco	Gomar	Guranatos Promotions Inc..	Rancho Gucamonga
14	Ricardo Obadilla	Ricardo	Obadilla	RB Music	Lakewood
15	Adolfo Moreno	Adolfo	Moreno	RB Music	Lakewood
16	Victor Guerrero	Victor	Guerrero	Promocicnes Guerrero	Wimauma
17	Federico Galindo	Federico	Galindo	Denver CO	
18	Carlos Gaspar Hernandez Flore	Carlos	Flores	Rep/ Artisticas De Monteciaro LLC	McAllen
19	Juan Carlos Vital Rivera	Juan	Rivera	Los Valedores De La Sierra	Leon
20	Jua Pable Lopex	Jua	Lopex	Disoos Gama	San Antonio
21	Anna Garcia	Anna	Garcia	Garcia Promotions	San Jose
22	Francisco Gomar	Francisco	Gomar	Guranatos Promotions Inc..	Rancho Gucamonga
23	Ricardo Obadilla	Ricardo	Obadilla	RB Music	Lakewood
24	Adolfo Moreno	Adolfo	Moreno	RB Music	Lakewood
25	Victor Guerrero	Victor	Guerrero	Promocicnes Guerrero	Wimauma

Fig. 4.2.1: Data

Consider the data as shown in Fig 4.2.1. We feel some records have got duplicated. We would like to highlight such records. There can be a variety of ways of doing this. We will presently make use of conditional formatting.

Highlight the range of cells where you feel duplicate values may be present. In our case, we will highlight Column A as shown in Fig 4.2.2.



	A	B
1	**Full Name**	**First Name**
2	Manuel Huerta	Manuel
3	Felix V. Corona	Felix
4	Pedro Marques	Pedro
5	Eddy Vega	Eddy
6	Abel De Luna	Abel
7	Adriana Valdivia	Adriana
8	Al Pico	Al
9	Carlos Gaspar Hernandez Flore	Carlos
10	Juan Carlos Vital Rivera	Juan
11	Jua Pable Lopex	Jua
12	Anna Garcia	Anna
13	Francisco Gomar	Francisco
14	Ricardo Obadilla	Ricardo
15	Adolfo Moreno	Adolfo
16	Victor Guerrero	Victor
17	Federico Galindo	Federico
18	Carlos Gaspar Hernandez Flore	Carlos
19	Juan Carlos Vital Rivera	Juan
20	Jua Pable Lopex	Jua
21	Anna Garcia	Anna
22	Francisco Gomar	Francisco
23	Ricardo Obadilla	Ricardo
24	Adolfo Moreno	Adolfo
25	Victor Guerrero	Victor

Fig. 4.2.2: Column A highlighted

Then apply conditional formatting. It is located in the Home tab → Styles group as shown in Fig 4.2.3.

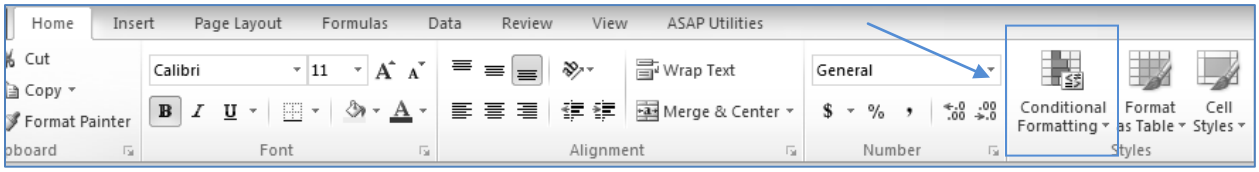


Fig. 4.2.3: Conditional Formatting

Click on conditional formatting and then click on highlight cell rules. There select Duplicate values as shown in Fig 4.2.4.

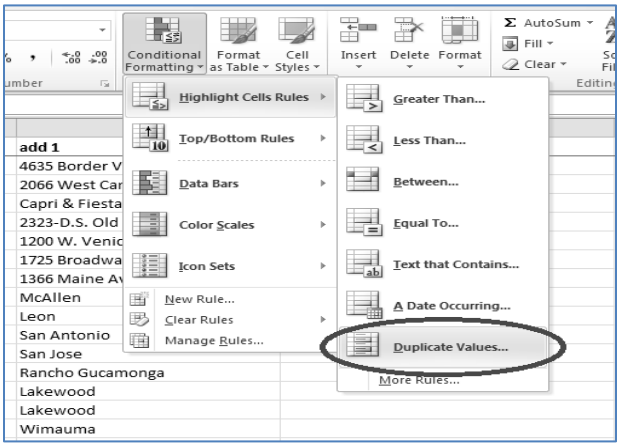


Fig. 4.2.4: Conditional Formatting → Duplicate Values

A small window comes up. Here we get to select whether we would like to mark the duplicate values or we would like to mark unique values. Presently we will select duplicate values as shown in Fig 4.2.5.

Fig. 4.2.5: Duplicate or Unique

Then we can select the manner of formatting cells. We may either select one of the standard ways of formatting given by MS Excel or we may customize it. Right now, we will select '*Light Red Fill with Dark Red Text*' as shown in Fig 4.2.6.

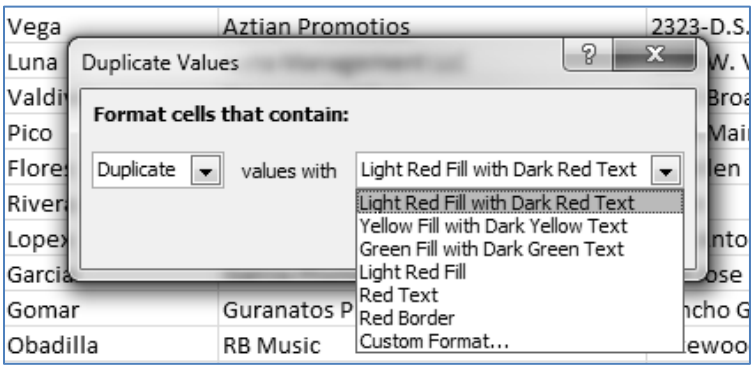


Fig. 4.2.6: Light Red Fill with Dark Red Text

Now we can see that all the records with duplicate values are marked in red colour. Alternately, we could've also marked only the unique values as shown in Fig 4.2.7.

	A	B
1	Full Name	First Name
2	Manuel Huerta	Manuel
3	Felix V. Corona	Felix
4	Pedro Marques	Pedro
5	Eddy Vega	Eddy
6	Abel De Luna	Abel
7	Adriana Valdivia	Adriana
8	Al Pico	Al
9	Carlos Gaspar Hernandez Flore	Carlos
10	Juan Carlos Vital Rivera	Juan
11	Jua Pable Lopex	Jua
12	Anna Garcia	Anna
13	Francisco Gomar	Francisco
14	Ricardo Obadilla	Ricardo
15	Adolfo Moreno	Adolfo
16	Victor Guerrero	Victor
17	Federico Galindo	Federico
18	Carlos Gaspar Hernandez Flore	Carlos
19	Juan Carlos Vital Rivera	Juan
20	Jua Pable Lopex	Jua
21	Francisco Gomar	Francisco
22	Ricardo Obadilla	Ricardo
23	Adolfo Moreno	Adolfo
24	Michael M. Felix	Michael
25	Pedro Rodriquez H	Pedro

Fig. 4.2.7: Duplicate values highlighted

4.2.2 Remove Duplicates

The above process will only mark the duplicates. If we wish to remove the duplicate values, then we need to make use of another feature called 'Remove Duplicates'. This is a dedicated feature introduced in Excel 2007 only to remove the duplicate values.

Go to Data tab → Data Tools group and click on Remove Duplicates as shown in Fig 4.2.8.

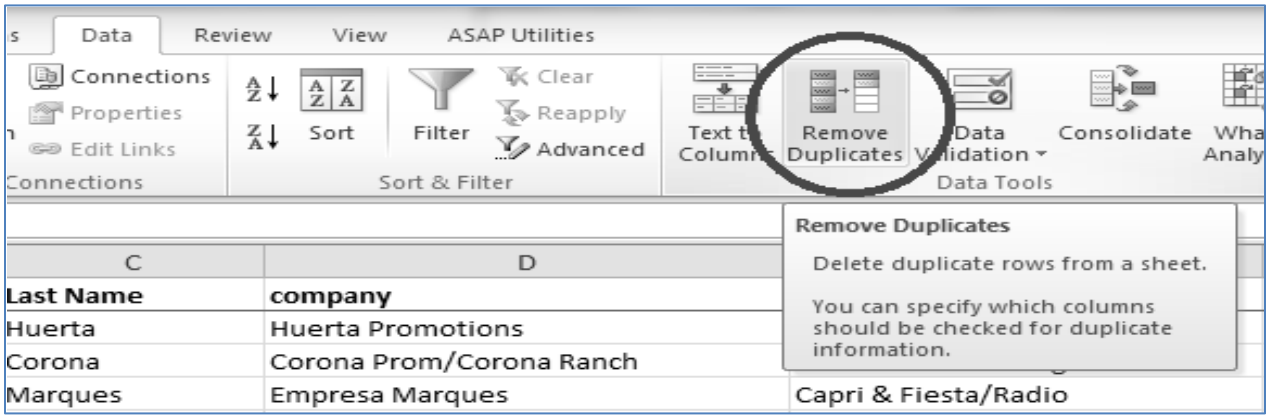


Fig. 4.2.8: Remove duplicates

A small window comes up. First of all, check whether the checkbox of '*My data has headers*' is rightly or wrongly, ticked or unticked.

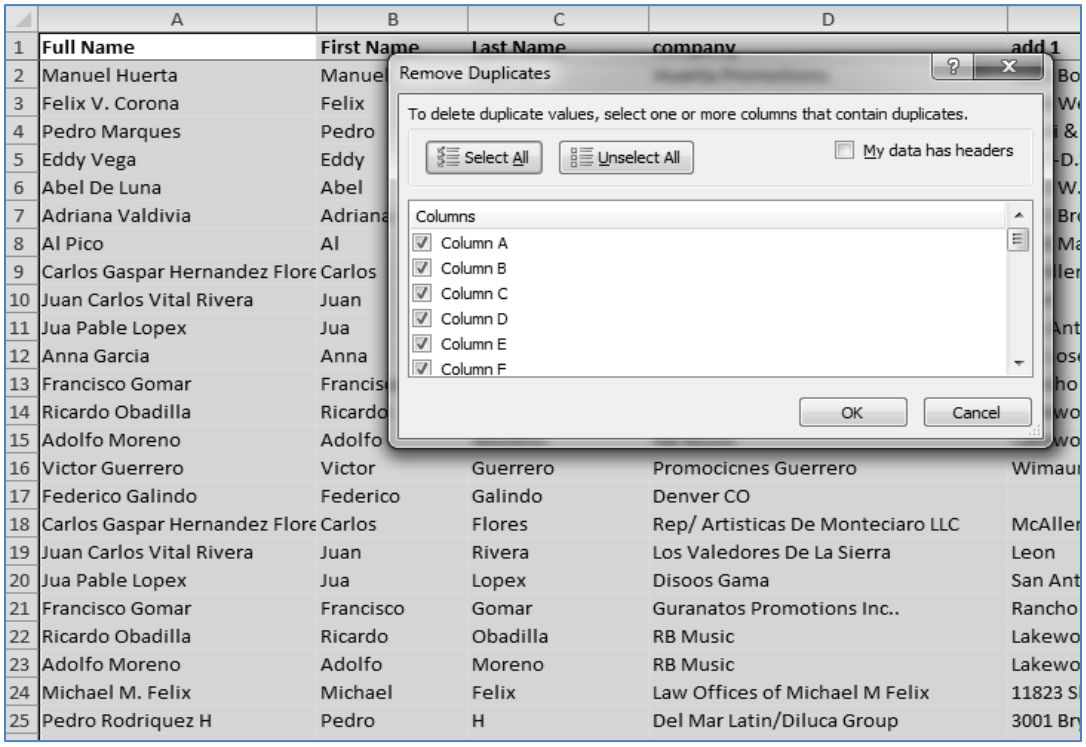


Fig. 4.2.8: My data has headers – not ticked

In our case, we can see that it has been wrongly unticked. So let us tick it now.

Then we can select the column(s) which may contain duplicate values. Click on *'Unselect All'* button and then select the *Full name* column a shown in Fig 4.2.9.

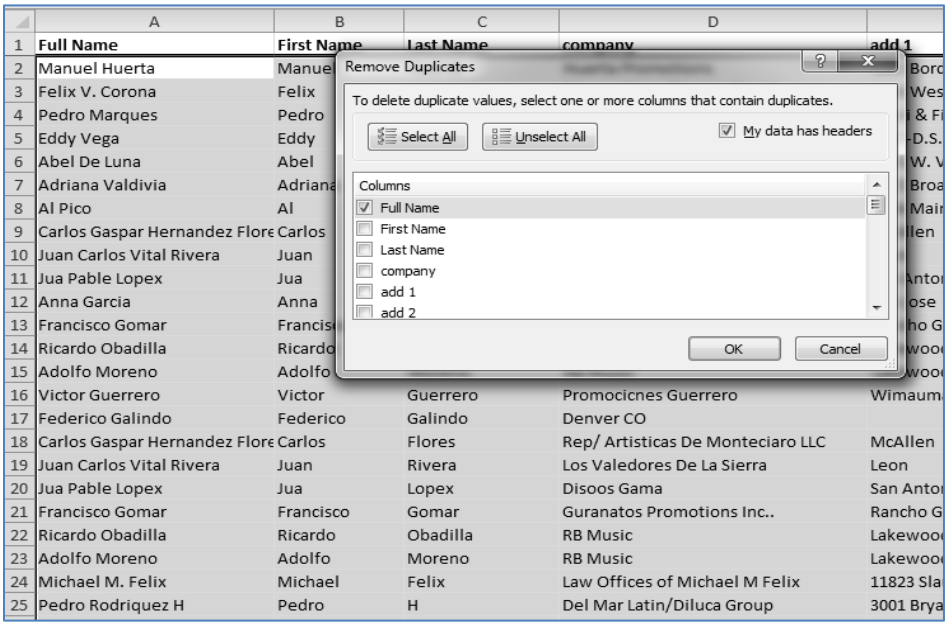
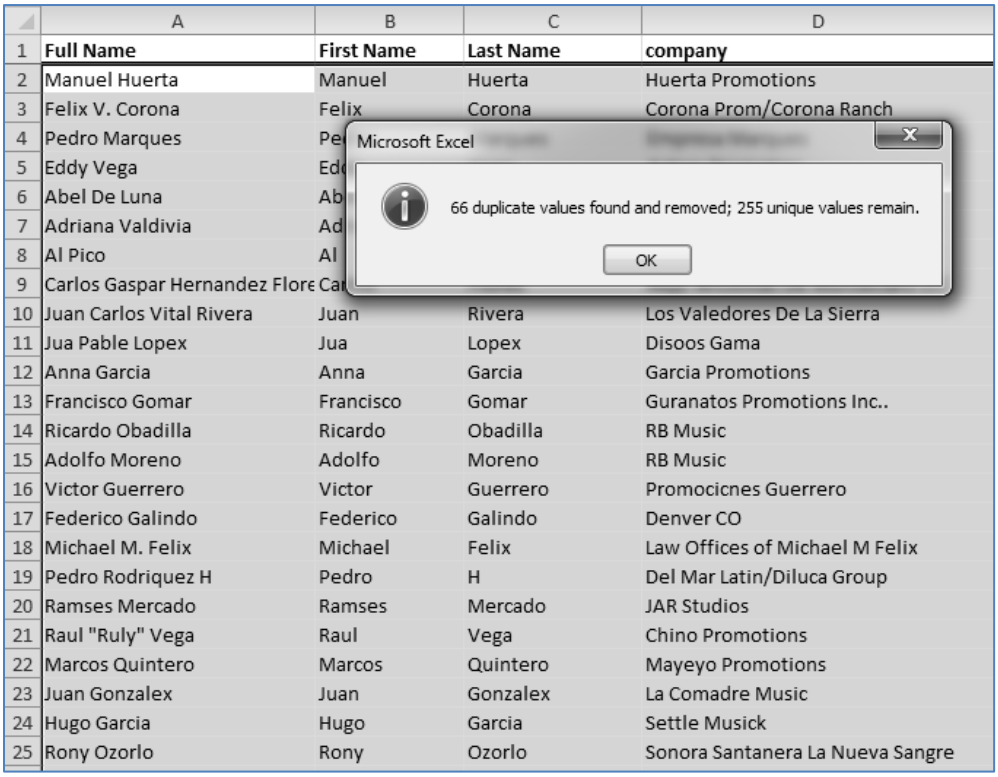


Fig. 4.2.9: Full Name ticked

Thereafter, click on OK button. We will get a report about the duplicate values removed as shown in Fig 4.210.



	A	B	C	D
1	Full Name	First Name	Last Name	company
2	Manuel Huerta	Manuel	Huerta	Huerta Promotions
3	Felix V. Corona	Felix	Corona	Corona Prom/Corona Ranch
4	Pedro Marques	Pe		
5	Eddy Vega	Ed		
6	Abel De Luna	Ab		
7	Adriana Valdivia	Ad		
8	Al Pico	Al		
9	Carlos Gaspar Hernandez Flore	Ca		
10	Juan Carlos Vital Rivera	Juan	Rivera	Los Valedores De La Sierra
11	Jua Pable Lopex	Jua	Lopex	Disoos Gama
12	Anna Garcia	Anna	Garcia	Garcia Promotions
13	Francisco Gomar	Francisco	Gomar	Guranatos Promotions Inc..
14	Ricardo Obadilla	Ricardo	Obadilla	RB Music
15	Adolfo Moreno	Adolfo	Moreno	RB Music
16	Victor Guerrero	Victor	Guerrero	Promocicnes Guerrero
17	Federico Galindo	Federico	Galindo	Denver CO
18	Michael M. Felix	Michael	Felix	Law Offices of Michael M Felix
19	Pedro Rodriquez H	Pedro	H	Del Mar Latin/Diluca Group
20	Ramses Mercado	Ramses	Mercado	JAR Studios
21	Raul "Ruly" Vega	Raul	Vega	Chino Promotions
22	Marcos Quintero	Marcos	Quintero	Mayeyo Promotions
23	Juan Gonzalex	Juan	Gonzalex	La Comadre Music
24	Hugo Garcia	Hugo	Garcia	Settle Musick
25	Rony Ozorlo	Rony	Ozorlo	Sonora Santanera La Nueva Sangre

Fig. 4.2.10: Duplicate values removed

Now we can work on the unique values only.

4.3 Sort

The data that we receive for audit purpose may not be arranged in the order that we desire. In such cases, we would like to arrange the records in the data in the order that may be suitable to us.

	A	B	C	D	E
1	Serial No.	Name	PAN	Date of Payment / Credit	Amount paid/ Credited
2	1	Adhunik Transport Organisation Ltd	AAACA4457G	24-04-08	8,500
3	1	Apoorva Enterprises	Blank	13-07-08	26,292
4	1	Budhrani Builders Pvt Ltd	AAACB7057K	01-10-08	10,52,028
5	1	Hotel Ekveera (Mahape)	AKDPR6145A	01-01-09	48,994
6	2	Adhunik Transport Organisation Ltd	AAACA4457G	30-05-08	1,450
7	2	Gordon Woodroffe Logistics Limited	AABCG3353N	01-10-08	2,28,847
8	2	Nandu Patil	PANNOTAVBL	01-01-09	30,200
9	3	Adhunik Transport Organisation Ltd	AAACA4457G	25-06-08	8,500
10	3	Cyrus Engineering	PANNOTAVBL	01-01-09	3,230
11	3	Rockwell Heat Treatment Pvt Ltd	AABCR7800H	01-10-08	15,784
12	4	Adhunik Transport Organisation Ltd	AAACA4457G	07-07-08	3,500
13	4	Adhunik Transport Organisation Ltd	AAACA4457G	01-10-08	32,330
14	4	D R Sharma	BAUPS4442R	19-08-08	1,50,000
15	4	H.R.Enterprises	PANNOTAVBL	01-01-09	5,139
16	4	Rosemount Shipping I Pvt Ltd	AAACR8617D	26-04-08	1,05,132
17	5	Adhunik Transport Organisation Ltd	AAACA4457G	13-07-08	3,000
18	5	D R Sharma	BAUPS4442R	14-09-08	1,50,000
19	5	Group 7 Guards (India) Pvt. Ltd.	AABCG5762F	01-10-08	5,75,529
20	5	HAIKO LOGISTCIS INDIA PVT LTD	AABCH5242H	25-06-08	1,09,203
21	5	Rajog Enterprises	AAHPR3516R	01-01-09	37,487

Fig. 4.3.1: Data

Consider the data in the above diagram. We can see records arranged in a random order. We may like to arrange them in a different order, say, first on the basis of 'Name', then on 'Date of Payment / Credit' and then on 'Amount paid/ Credited'. For this purpose, we can use the sort feature. Sort is located in the Data tab → Sort & Filter group as shown Fig 4.3.2.

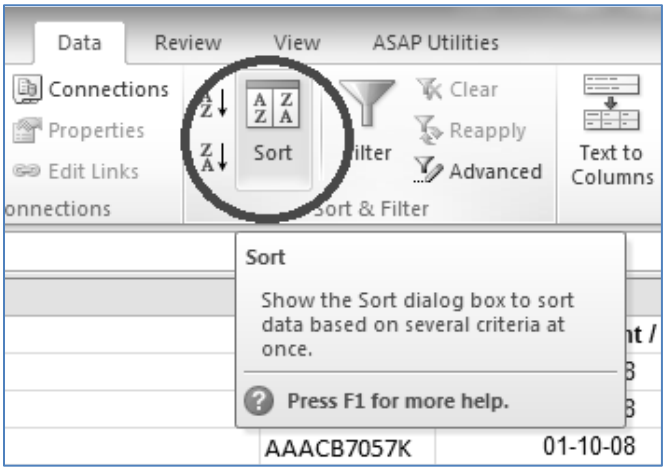
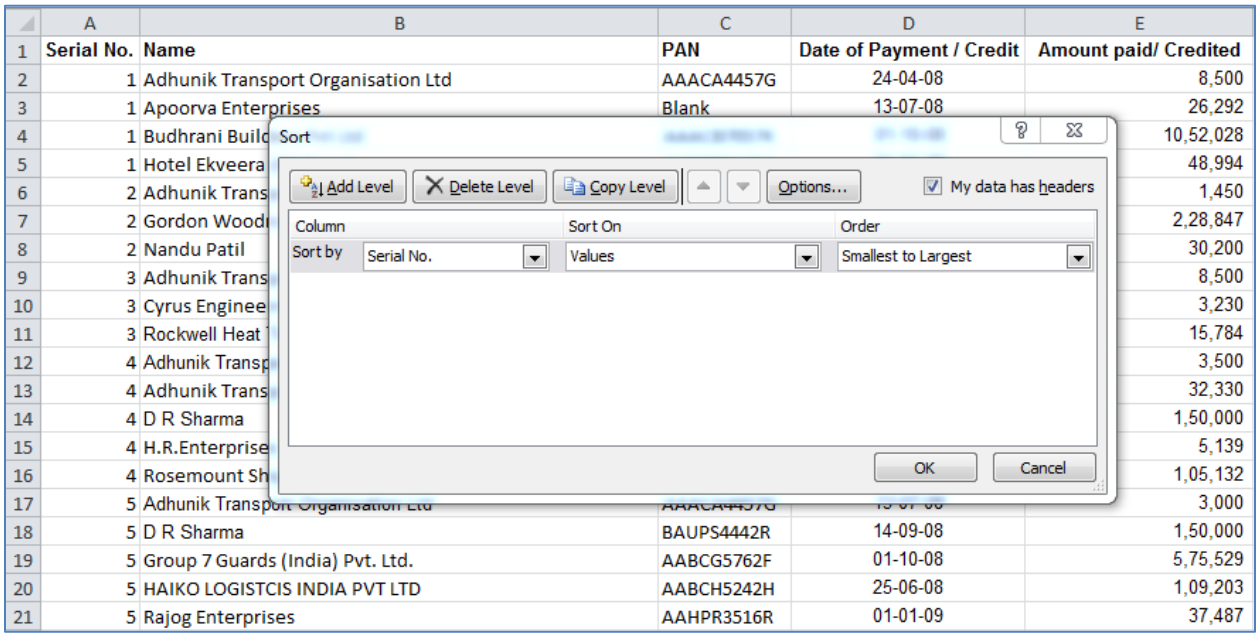


Fig. 4.3.2: Duplicate values removed

Click on the sort button. The sort window opens up. Similar to Remove Duplicates feature, check whether the checkbox of '*My data has headers*' is rightly or wrongly, ticked or unticked. Here it is already rightly ticked.



	A	B	C	D	E
1	Serial No.	Name	PAN	Date of Payment / Credit	Amount paid/ Credited
2	1	Adhunik Transport Organisation Ltd	AAACA4457G	24-04-08	8,500
3	1	Apoorva Enterprises	Blank	13-07-08	26,292
4	1	Budhrani Build			10,52,028
5	1	Hotel Ekveera			48,994
6	2	Adhunik Trans			1,450
7	2	Gordon Woodl			2,28,847
8	2	Nandu Patil			30,200
9	3	Adhunik Trans			8,500
10	3	Cyrus Enginee			3,230
11	3	Rockwell Heat			15,784
12	4	Adhunik Transp			3,500
13	4	Adhunik Trans			32,330
14	4	D R Sharma			1,50,000
15	4	H.R.Enterprise			5,139
16	4	Rosemount Sh			1,05,132
17	5	Adhunik Transport Organisation Ltd			3,000
18	5	D R Sharma	BAUPS4442R	14-09-08	1,50,000
19	5	Group 7 Guards (India) Pvt. Ltd.	AABCG5762F	01-10-08	5,75,529
20	5	HAIKO LOGISTCIS INDIA PVT LTD	AABCH5242H	25-06-08	1,09,203
21	5	Rajog Enterprises	AAHPR3516R	01-01-09	37,487

Fig. 4.3.3: Sort Window

Click on the dropdown of 'Sort by' and select 'Name'. We are desirous of a multi-level sort. Thus, click on 'Add Level' Button to add further levels as shown in Fig 4.34.

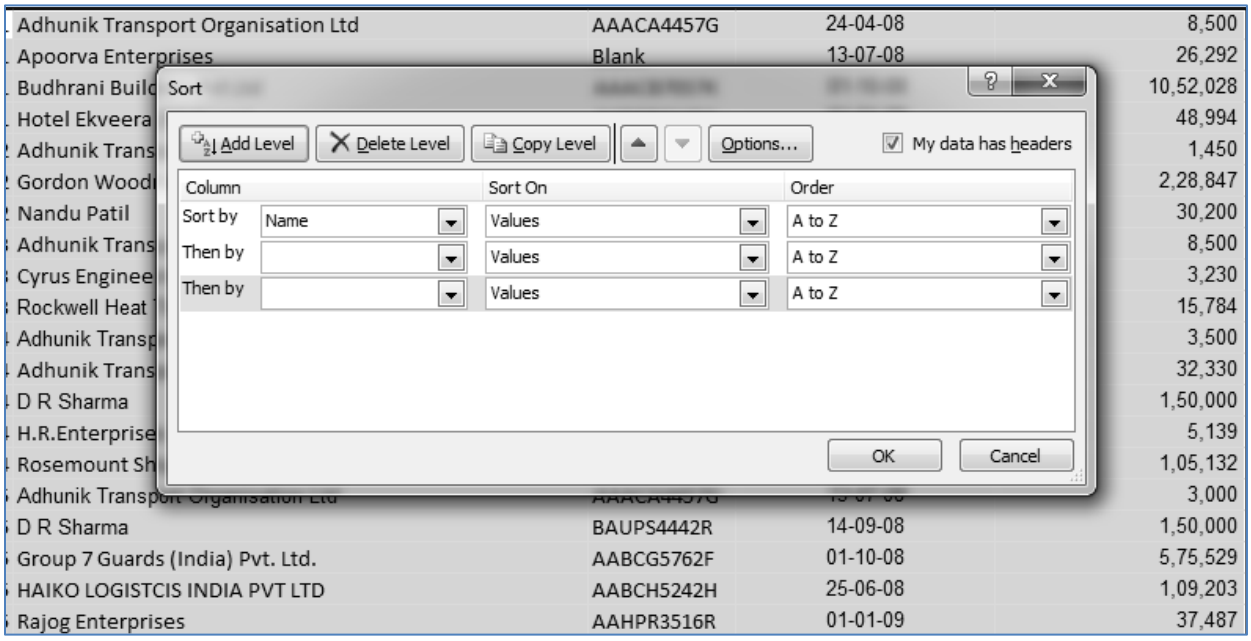


Fig. 4.3.4: Sort Levels added

Specify the other two fields i.e. 'Date of Payment / Credit' and 'Amount paid/ Credited'. The final window will be as shown in Fig 4.3.5.

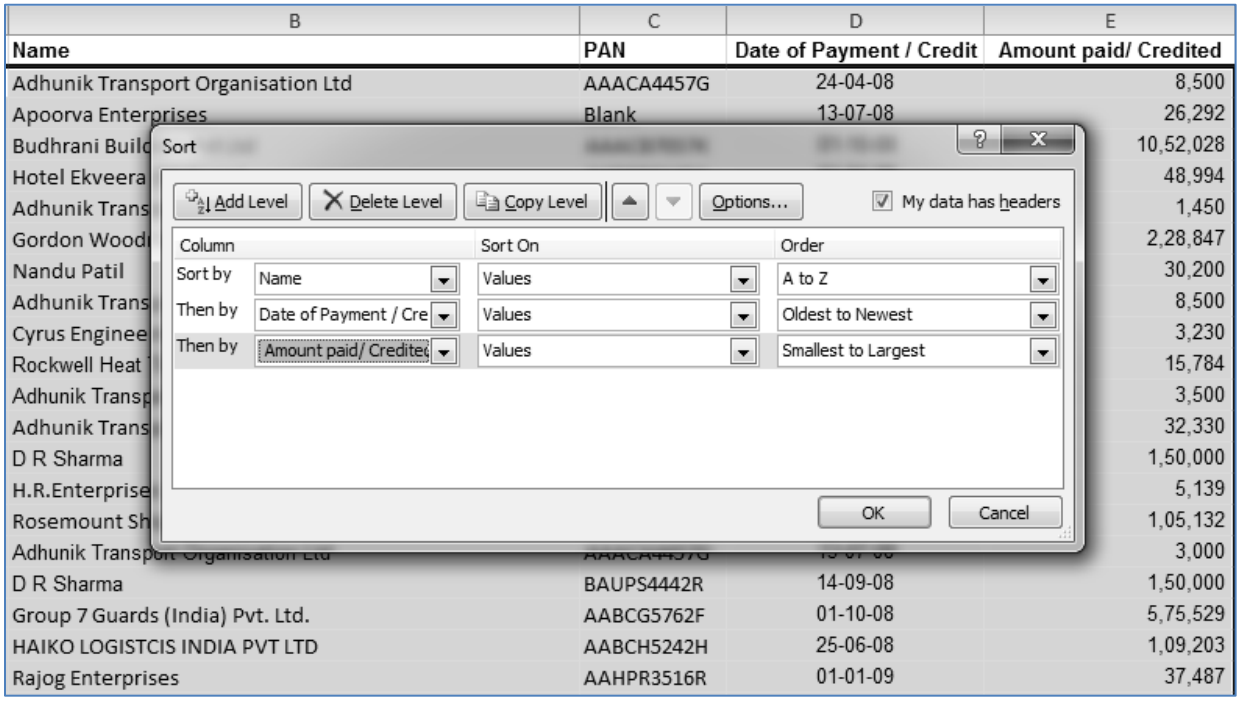


Fig. 4.3.5: Sort – All Levels specified

Now click on OK button to sort the data. After sort, the data appears as shown in Fig 4.3.6.

	A	B	C	D	E
1	Serial No.	Name	PAN	Date of Payment / Credit	Amount paid/ Credited
2	21	A-1 Rewind Motors & Electrical Works	PANNOTAVBL	17-01-09	1,352
3	82	A-1 Rewind Motors & Electrical Works	PANNOTAVBL	06-02-09	1,248
4	131	A-1 Wood Packers	APMPK4505M	04-03-09	42,000
5	81	ABEC LTD	AAGCA25058L	17-11-08	1,30,362
6	120	ABEC LTD	AAGCA25058L	24-03-09	2,21,000
7	9	Abhay Enterprises	BJOPS0486A	04-01-09	2,654
8	83	Abhay Enterprises	BJOPS0486A	07-02-09	25,033
9	187	Abhay Enterprises	BJOPS0486A	31-03-09	56,103
10	177	AddRec Solutions Pvt. Ltd		13-11-08	1,68,473
11	1	Adhunik Transport Organisation Ltd	AAACA4457G	24-04-08	8,500
12	2	Adhunik Transport Organisation Ltd	AAACA4457G	30-05-08	1,450
13	3	Adhunik Transport Organisation Ltd	AAACA4457G	25-06-08	8,500
14	4	Adhunik Transport Organisation Ltd	AAACA4457G	07-07-08	3,500
15	5	Adhunik Transport Organisation Ltd	AAACA4457G	13-07-08	3,000
16	6	Adhunik Transport Organisation Ltd	AAACA4457G	18-08-08	14,045
17	4	Adhunik Transport Organisation Ltd	AAACA4457G	01-10-08	32,330
18	48	Adhunik Transport Organisation Ltd	AAACA4457G	01-11-08	17,520
19	45	Adhunik Transport Organisation Ltd	AAACA4457G	10-01-09	14,045
20	111	Adhunik Transport Organisation Ltd	AAACA4457G	01-03-09	72,240
21	112	Akshay Transport	ALFPP2792J	30-04-08	1,67,600
22	113	Akshay Transport	ALFPP2792J	30-05-08	2,23,240
23	114	Akshay Transport	ALFPP2792J	30-06-08	1,01,500
24	115	Akshay Transport	ALFPP2792J	31-08-08	2,32,220
25	34	Akshay Transport	ALFPP2792J	16-10-08	66,380

Fig. 4.3.6: Data is sorted

4.4 Filters

Often, we would like to short-list records out of a big dataset, on the basis of some or the other criteria. This lets us focus on one portion of the dataset at a time. For this purpose, the most suitable tool will be filters.

Filters are available in Data Tab → Sort & Filter Group as shown in Fig 4.4.1

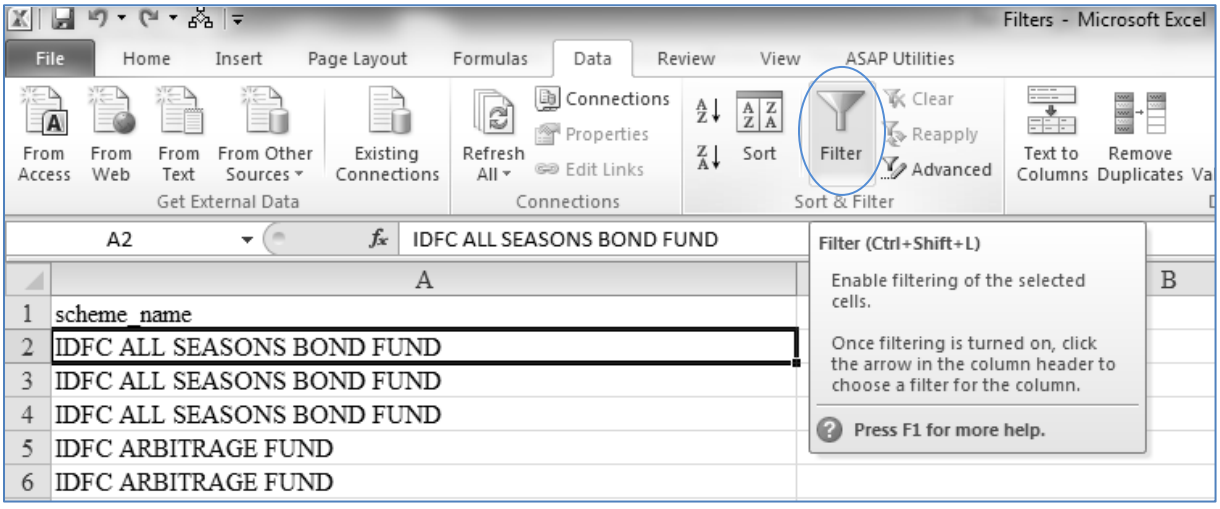


Fig. 4.4.1: Filter

Filters may be classified into three categories; text filters, numeric filters and date filters. Let us study them one after the other:

4.4.1 Text Filters

Consider the following data.

	A
1	scheme_name
2	IDFC ALL SEASONS BOND FUND
3	IDFC ALL SEASONS BOND FUND
4	IDFC ALL SEASONS BOND FUND
5	IDFC ARBITRAGE FUND
6	IDFC ARBITRAGE FUND
7	IDFC ARBITRAGE FUND
8	IDFC ARBITRAGE FUND
9	IDFC ARBITRAGE FUND
10	IDFC ARBITRAGE FUND
11	IDFC ARBITRAGE FUND
12	IDFC ARBITRAGE FUND
13	IDFC ARBITRAGE FUND
14	IDFC ARBITRAGE FUND
15	IDFC ARBITRAGE FUND
16	IDFC ARBITRAGE FUND
17	IDFC ARBITRAGE FUND
18	IDFC ARBITRAGE FUND
19	IDFC ARBITRAGE FUND
20	IDFC ARBITRAGE FUND
21	IDFC ARBITRAGE FUND
22	IDFC ARBITRAGE PLUS FUND
23	IDFC ARBITRAGE PLUS FUND
24	IDFC ARBITRAGE PLUS FUND

Fig. 4.4.2: Data

We would like to apply filters and short list it based on various criteria. For that, go to Data Tab → Sort & Filter Group and click on Filters. Dropdown buttons will appear on top of the header as shown in Fig 4.4.3.

	A
1	scheme_name
2	IDFC ALL SEASONS BOND FUND
3	IDFC ALL SEASONS BOND FUND
4	IDFC ALL SEASONS BOND FUND
5	IDFC ARBITRAGE FUND
6	IDFC ARBITRAGE FUND
7	IDFC ARBITRAGE FUND
8	IDFC ARBITRAGE FUND
9	IDFC ARBITRAGE FUND

Fig. 4.4.3: Filter Dropdown

Click on the drop down button. It will let you tick and untick values. Untick *(Select All)* and tick say, IDFC ARBITRAGE PLUS FUND as shown in Fig 4.4.4.

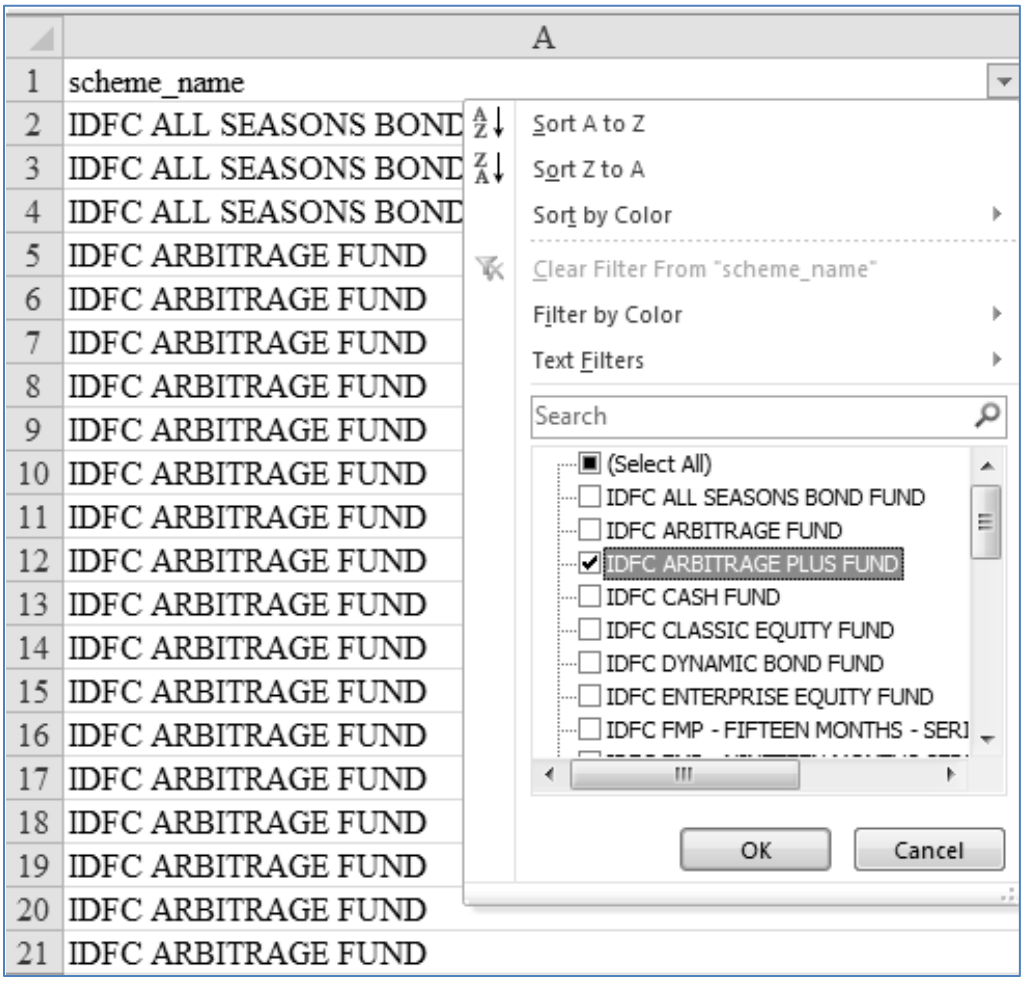


Fig. 4.4.4: IDFC ARBITRAGE PLUS FUND ticked

Press OK. Now Only IDFC ARBITRAGE PLUS FUND values are visible.

	A
1	scheme_name
22	IDFC ARBITRAGE PLUS FUND
23	IDFC ARBITRAGE PLUS FUND
24	IDFC ARBITRAGE PLUS FUND
25	IDFC ARBITRAGE PLUS FUND
26	IDFC ARBITRAGE PLUS FUND
27	IDFC ARBITRAGE PLUS FUND
28	IDFC ARBITRAGE PLUS FUND
29	IDFC ARBITRAGE PLUS FUND
30	IDFC ARBITRAGE PLUS FUND
31	IDFC ARBITRAGE PLUS FUND
32	IDFC ARBITRAGE PLUS FUND
33	IDFC ARBITRAGE PLUS FUND
34	IDFC ARBITRAGE PLUS FUND
35	IDFC ARBITRAGE PLUS FUND
36	IDFC ARBITRAGE PLUS FUND
37	IDFC ARBITRAGE PLUS FUND
38	IDFC ARBITRAGE PLUS FUND
39	IDFC ARBITRAGE PLUS FUND
40	IDFC ARBITRAGE PLUS FUND
41	IDFC ARBITRAGE PLUS FUND
42	IDFC ARBITRAGE PLUS FUND
156	

Fig. 4.4.5: Only IDFC ARBITRAGE PLUS FUND values

This ticking and unticking options are available in case of numeric and date filters also. We can see that the row numbers are blue in colour. This is a very obvious indicator that the list is a filtered list.

To see all the records once more, go to Data Tab → Sort & Filter Group and click on Clear button a shown in Fig 4.4.6.

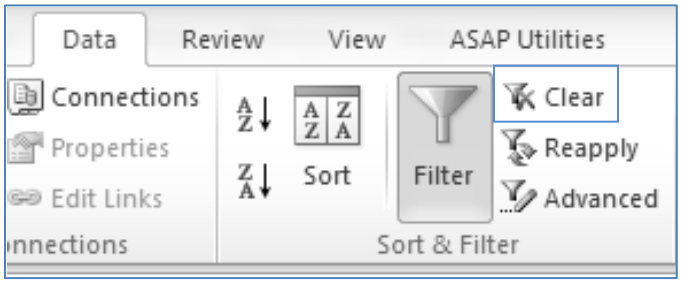


Fig. 4.4.6: Clear Button

In Excel 2010, a new search window has been incorporated in filters which enhances filtering experience a lot!

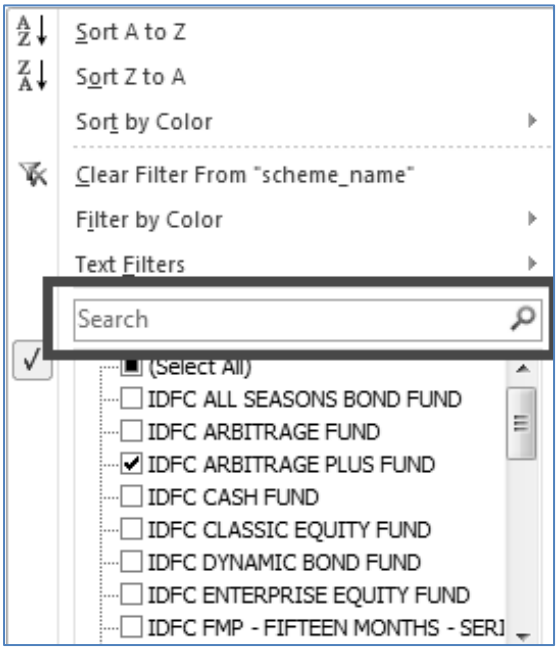


Fig. 4.4.7: Search Window

We can type matter in this window and get the data filtered. For example, suppose we are interested in all schemes containing 'Equity'. In that case, type 'Equity' in the search window as shown in Fig 4.4.8.

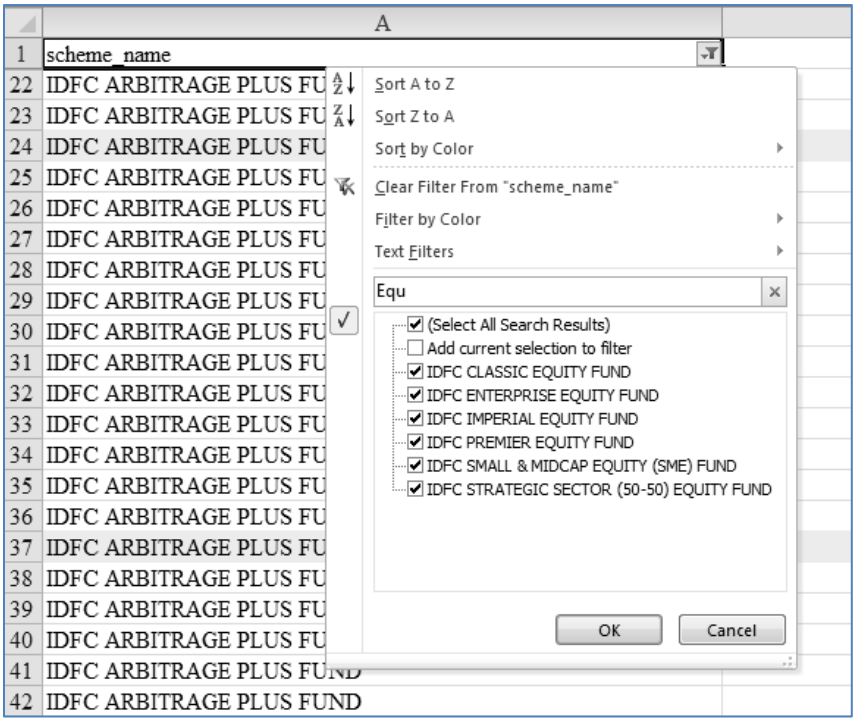


Fig. 4.4.8: Equ in Search Window

Even before completing the spelling, all the schemes containing 'Equity' appear. Press OK.

	A
1	scheme_name
46	IDFC CLASSIC EQUITY FUND
47	IDFC CLASSIC EQUITY FUND
48	IDFC CLASSIC EQUITY FUND
55	IDFC ENTERPRISE EQUITY FUND
56	IDFC ENTERPRISE EQUITY FUND
57	IDFC ENTERPRISE EQUITY FUND
69	IDFC IMPERIAL EQUITY FUND
70	IDFC IMPERIAL EQUITY FUND
71	IDFC IMPERIAL EQUITY FUND
103	IDFC PREMIER EQUITY FUND
104	IDFC PREMIER EQUITY FUND
105	IDFC PREMIER EQUITY FUND
106	IDFC PREMIER EQUITY FUND
107	IDFC PREMIER EQUITY FUND
108	IDFC SMALL & MIDCAP EQUITY (SME) FUND
109	IDFC SMALL & MIDCAP EQUITY (SME) FUND
110	IDFC SMALL & MIDCAP EQUITY (SME) FUND
111	IDFC SMALL & MIDCAP EQUITY (SME) FUND
112	IDFC SMALL & MIDCAP EQUITY (SME) FUND
113	IDFC SMALL & MIDCAP EQUITY (SME) FUND
114	IDFC SMALL & MIDCAP EQUITY (SME) FUND
115	IDFC SMALL & MIDCAP EQUITY (SME) FUND
116	IDFC STRATEGIC SECTOR (50-50) EQUITY FUND

Fig. 4.4.9: All Equity Schemes

Quite often, we mark important values by using colour. Later, we may desire obtaining a list of all such values together. For this purpose, again filters can be used. Click on the filter drop down button, filter by colour and select yellow colour as shown in Fig 4.410.

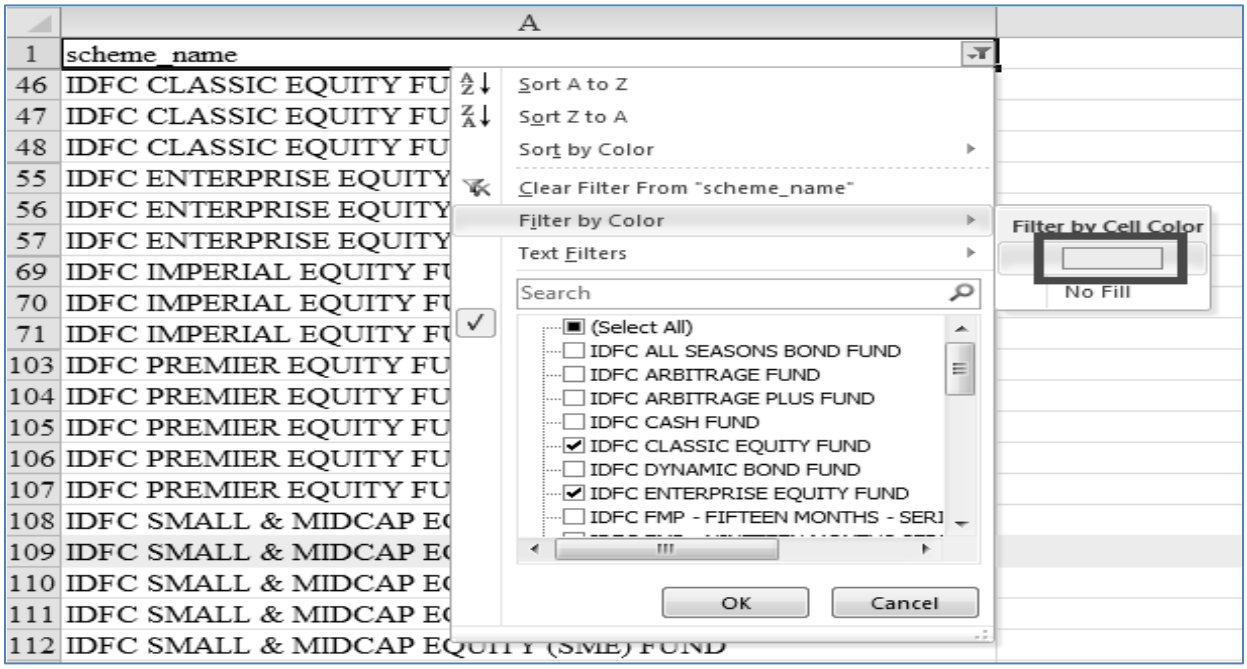


Fig. 4.4.10: Filter by Colour

On clicking yellow colour, we get all the yellow marked records as shown in Fig 4.4.11.

	A
1	scheme_name
24	IDFC ARBITRAGE PLUS FUND
37	IDFC ARBITRAGE PLUS FUND
58	IDFC FMP - FIFTEEN MONTHS - SERIES 3
82	IDFC MONEY MANAGER FUND - TREASURY PLAN
109	IDFC SMALL & MIDCAP EQUITY (SME) FUND
122	IDFC SUPER SAVER INCOME FUND - INVESTMENT PLAN
135	IDFC SUPER SAVER INCOME FUND - SHORT TERM PLAN
147	IDFC SUPER SAVER INCOME FUND - SHORT TERM PLAN
152	IDFC TAX SAVER FUND-ELSS
156	

Fig. 4.4.11: Yellow coloured records

We have lot of text filters options too.

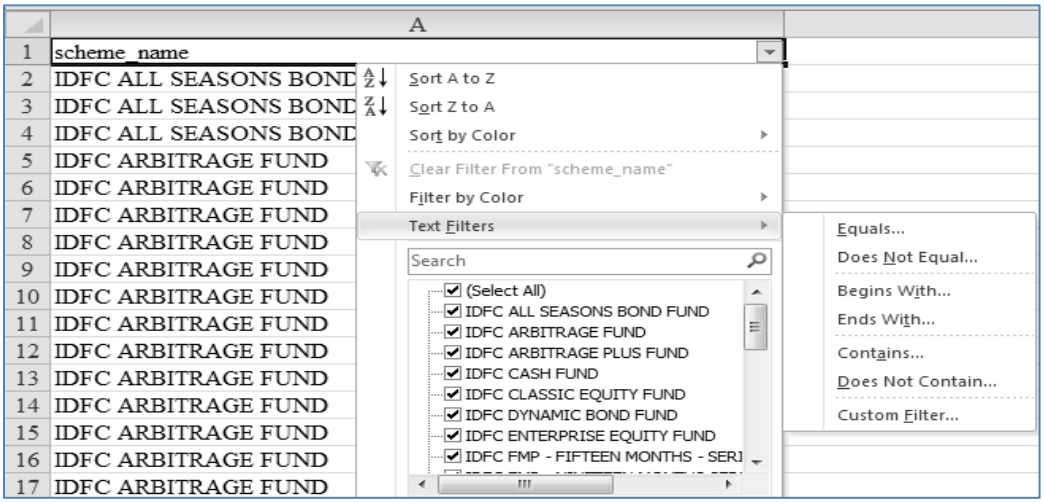


Fig. 4.4.12: Other text filter options

There are options like begins with, ends with, contains, does not contain etc. We can use these options judiciously. We can also combine any two of these using custom filter and achieve the required filtering. You are advised to practice these options.

4.4.2 Numeric Filters

Numeric filters get applied in case of fields containing numbers. In numeric filters, we have the options of ticking – unticking values and filter by colour, similar to text filters. However, we rather make heavy use of the number filter options. Let's have a look at them.

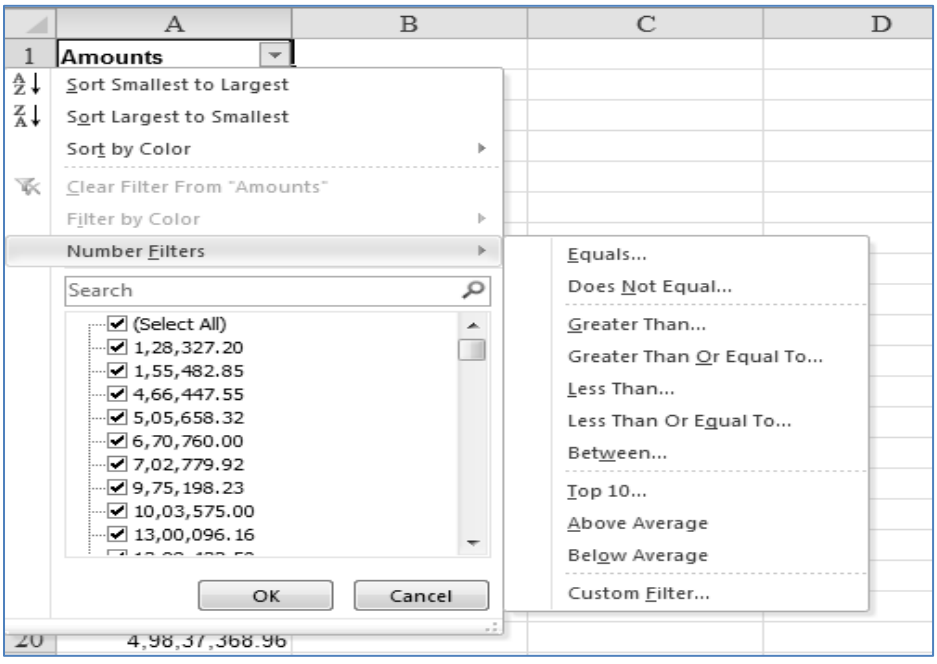


Fig. 4.4.13: Number Filters

We can perform filtering using greater than, less, between etc. option. Top 10 option allows let us filter for the top 10 values. However, top 10 need not be 'top 10' always. Instead of top, we can select bottom. Instead of 10 we can specify other numbers. Instead of number of items we can specify percentages. Thus, we have lot of flexibility in top 10.

We can also use above average and below average. Finally, we can combine any two criteria by using custom filter as shown in Fig 4.4.13.

4.4.3 Date Filters

Date filters get applied in case of fields containing dates. In date filters, we have the options of filter by colour and ticking – unticking values, similar to text filters. But there is one difference.

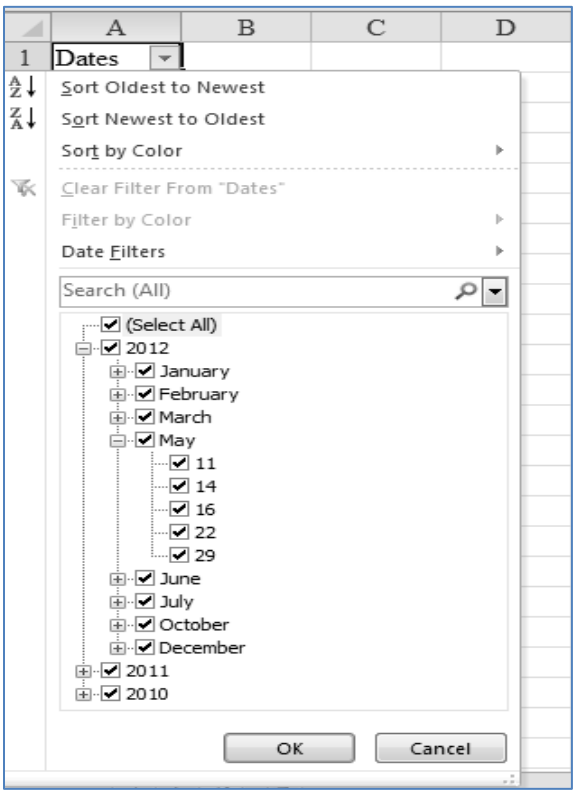


Fig. 4.4.14: Hierarchy in Dates

There is a tree structure for the dates. As dates follow a hierarchy of Year → Month → Day, we can do ticking – unticking at different levels. If a year is unticked, then all the dates in that year will be unticked. This is extremely convenient. Nevertheless, we rather make heavy use of the date filter options. Let's have a look at them.

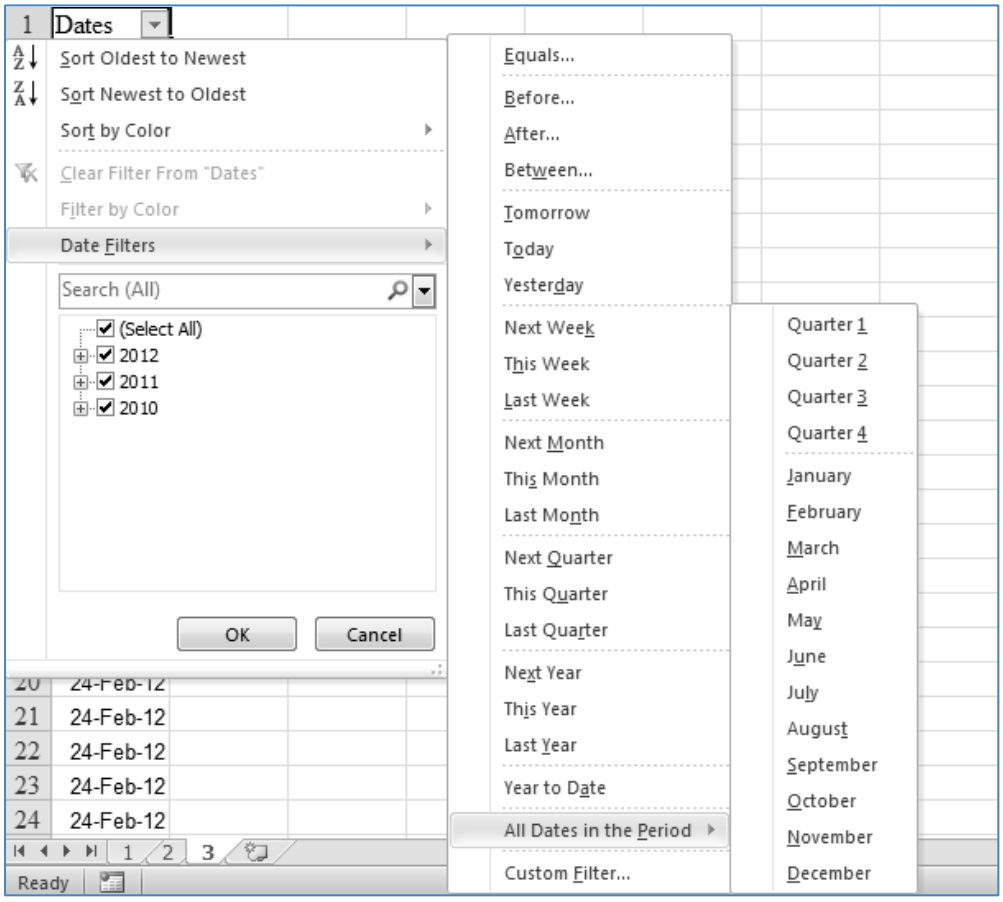


Fig. 4.4.15: Date Filters

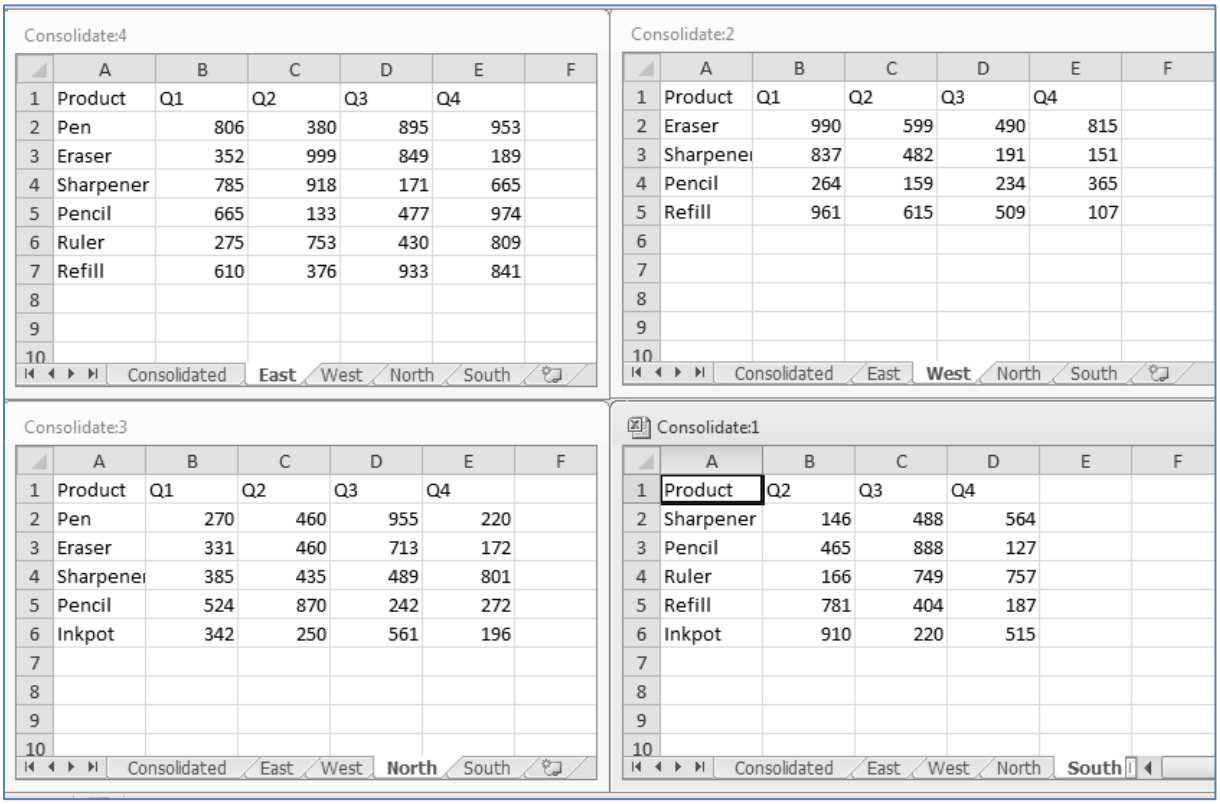
We can do filtering for before, after or between two dates. This is similar to greater than, less than, between etc. in numeric filters. We can filter for today, tomorrow, yesterday; this week, next week, last week; etc. We can also obtain year to date records. One of the most fascinating filters is 'All Dates in the Period'. Here we can obtain records for different months or quarters, irrespective of years.

Finally, we can again combine multiple criteria by using custom filters.

Excel filters have a wide variety. You are advised to study them carefully.

4.5 Consolidation of Data

Sometimes we come across data which is distributed across multiple worksheets. In such cases, we would like to bring the data in all such worksheets together. One may immediately think of using copy paste. Unfortunately, the headers don't always match. Therefore, we need a little more intelligent tool which will consolidate data based on the headers.



Consolidate:4

	A	B	C	D	E	F
1	Product	Q1	Q2	Q3	Q4	
2	Pen	806	380	895	953	
3	Eraser	352	999	849	189	
4	Sharpener	785	918	171	665	
5	Pencil	665	133	477	974	
6	Ruler	275	753	430	809	
7	Refill	610	376	933	841	
8						
9						
10						

Consolidated | East | West | North | South

Consolidate:2

	A	B	C	D	E	F
1	Product	Q1	Q2	Q3	Q4	
2	Eraser	990	599	490	815	
3	Sharpener	837	482	191	151	
4	Pencil	264	159	234	365	
5	Refill	961	615	509	107	
6						
7						
8						
9						
10						

Consolidated | East | West | North | South

Consolidate:3

	A	B	C	D	E	F
1	Product	Q1	Q2	Q3	Q4	
2	Pen	270	460	955	220	
3	Eraser	331	460	713	172	
4	Sharpener	385	435	489	801	
5	Pencil	524	870	242	272	
6	Inkpot	342	250	561	196	
7						
8						
9						
10						

Consolidated | East | West | North | South

Consolidate:1

	A	B	C	D	E	F
1	Product	Q2	Q3	Q4		
2	Sharpener	146	488	564		
3	Pencil	465	888	127		
4	Ruler	166	749	757		
5	Refill	781	404	187		
6	Inkpot	910	220	515		
7						
8						
9						
10						

Consolidated | East | West | North | South

Fig. 4.5.1: Different worksheets with varying headings

In the above diagram, we can see 4 worksheets representing 4 zones of the country. In each sheet, the row headers (Products) and column headers (Quarters) are varying. We would like to consolidate the data in these 4 worksheets into a single worksheet.

For this we can use a feature called Consolidate. It is available in Data Tab → Data Tools Group as shown in Fig 4.5.2

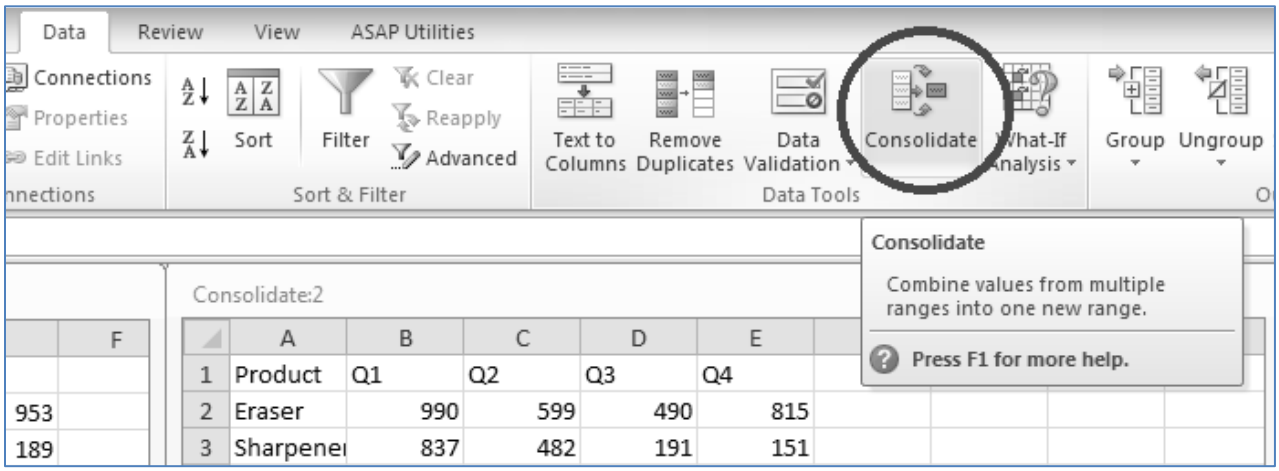


Fig. 4.5.2: Consolidate

To consolidate your data, go to the destination sheet and keep the cell pointer on the cell where you would like to place your output. Then click on Consolidate button. It will flash a window.

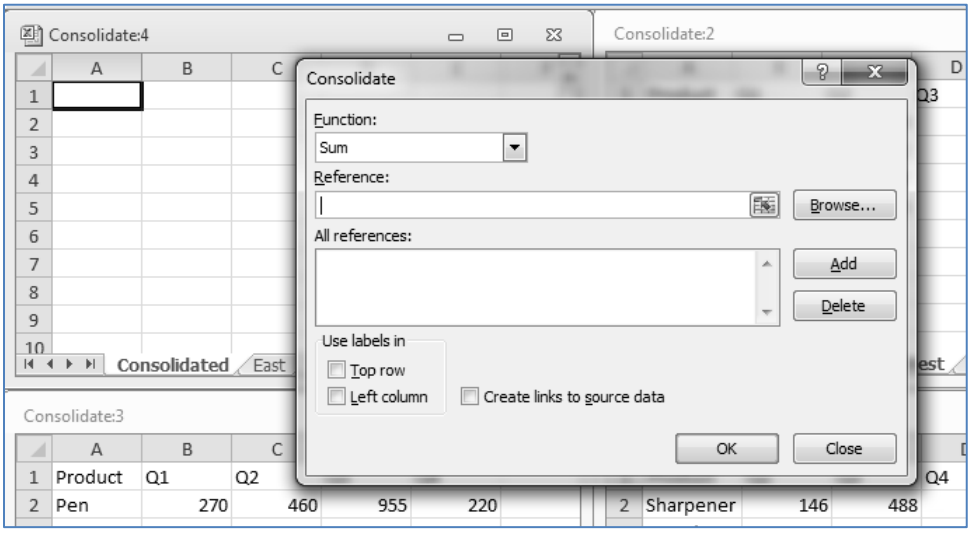


Fig. 4.5.2: Consolidate Window

It will ask for references. Here, one by one, we need to specify the ranges which we wish to consolidate. Visit each worksheet, highlight the range and click on Add button as shown in Fig 4.5.3.

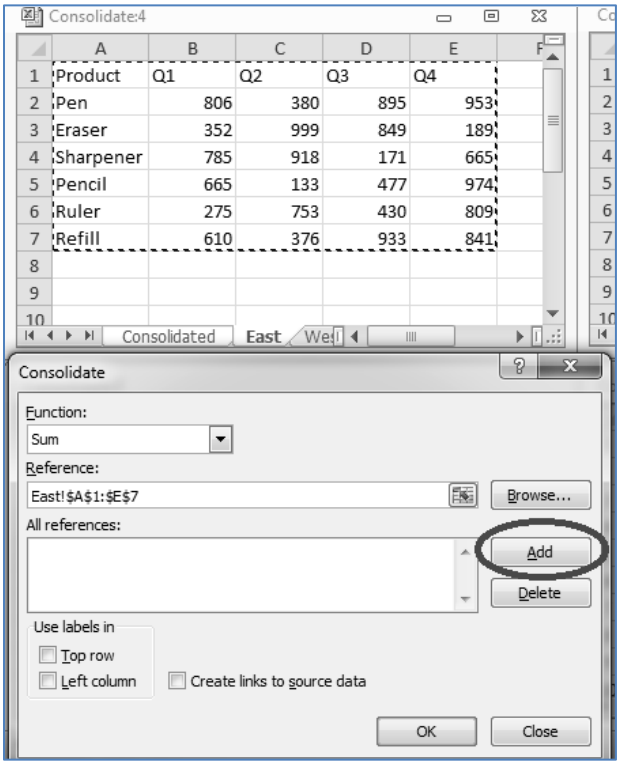


Fig. 4.5.3: Adding References

Like this, visit all the sheets one by one, highlight the ranges and keep adding them. Tick *use labels in top row and left column*. Also tick *Create links to source data*. Finally, the Consolidate window appears as shown in Fig 4.5.4.

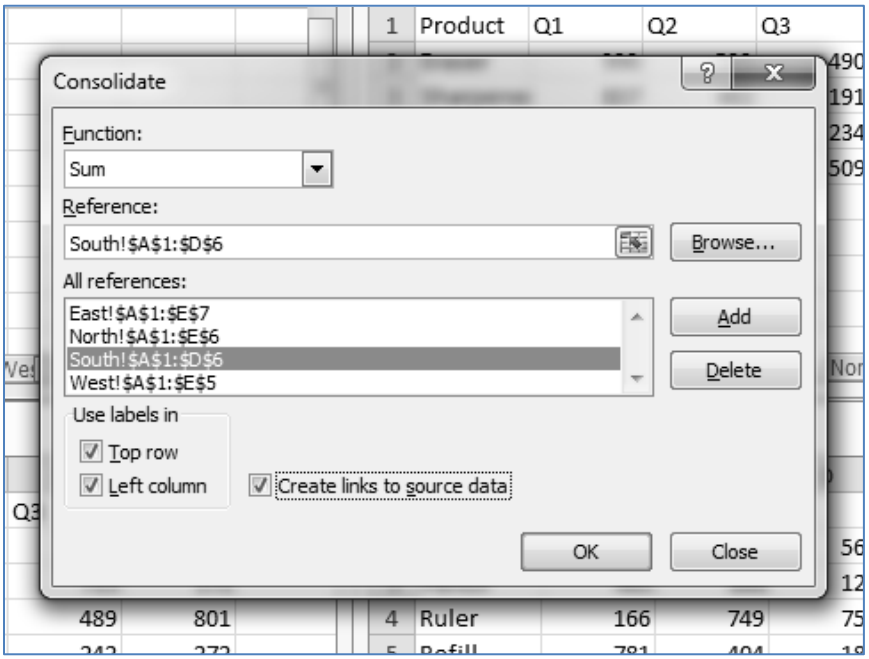


Fig. 4.5.4: All references added

At the end, press OK. The data will be consolidated and will appear as shown in 4.5.5

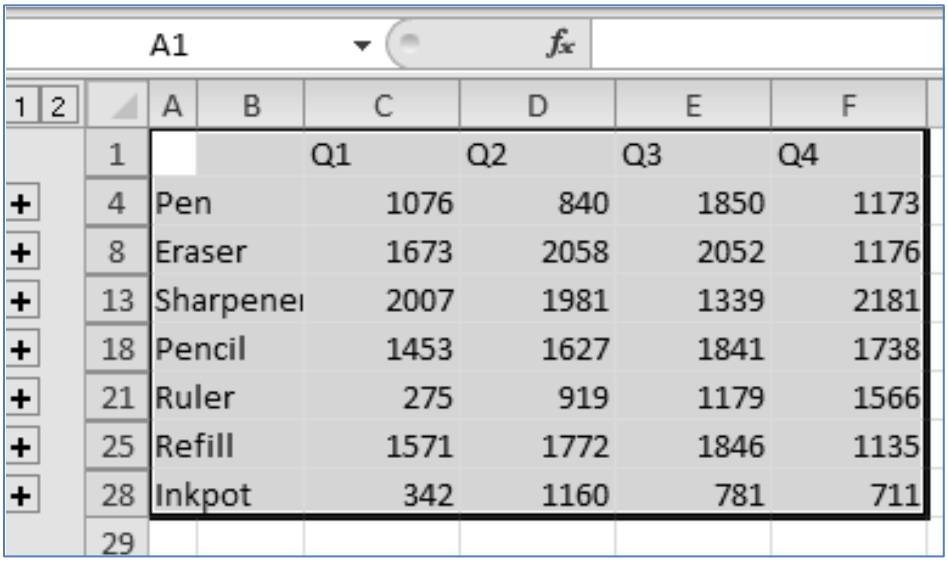
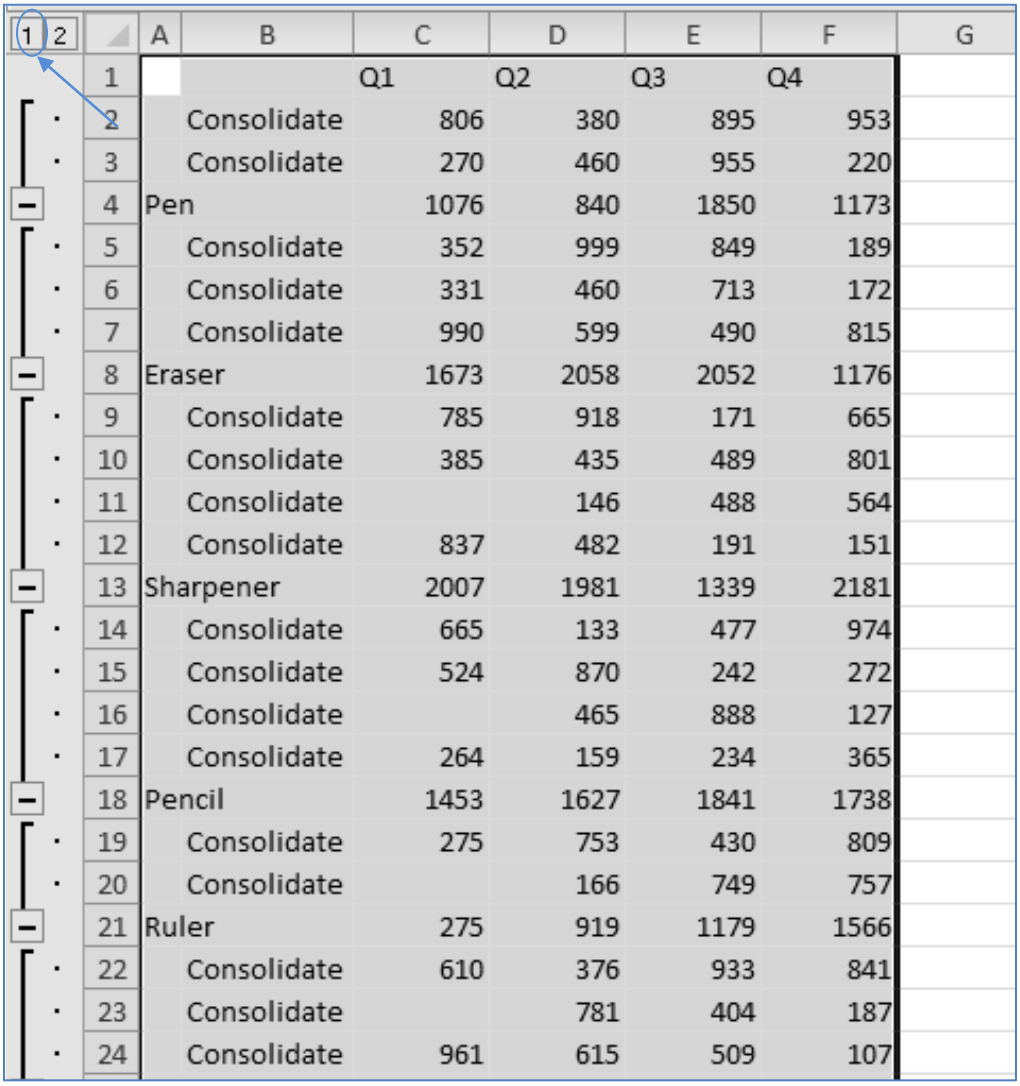


Fig. 4.5.5: All data consolidated

These are the subtotals across all worksheet. If we wish to view the individual values, we can clik on the level 2, as it appears on the top left hand corner as shown in Fig 4.5.6.



	A	B	C	D	E	F	G
1			Q1	Q2	Q3	Q4	
2		Consolidate	806	380	895	953	
3		Consolidate	270	460	955	220	
4		Pen	1076	840	1850	1173	
5		Consolidate	352	999	849	189	
6		Consolidate	331	460	713	172	
7		Consolidate	990	599	490	815	
8		Eraser	1673	2058	2052	1176	
9		Consolidate	785	918	171	665	
10		Consolidate	385	435	489	801	
11		Consolidate		146	488	564	
12		Consolidate	837	482	191	151	
13		Sharpener	2007	1981	1339	2181	
14		Consolidate	665	133	477	974	
15		Consolidate	524	870	242	272	
16		Consolidate		465	888	127	
17		Consolidate	264	159	234	365	
18		Pencil	1453	1627	1841	1738	
19		Consolidate	275	753	430	809	
20		Consolidate		166	749	757	
21		Ruler	275	919	1179	1566	
22		Consolidate	610	376	933	841	
23		Consolidate		781	404	187	
24		Consolidate	961	615	509	107	

Fig. 4.5.6: Data at Level 2

Unfortunately, Consolidate doesn't present the source sheet names in front of the values. Instead, it plots the workbook's name itself.

4.6 Pivot Tables

It is one of the most powerful features of excel for data analysis. As you advance in excel proficiency, sooner or later you are bound to use Pivot Tables for efficient data analysis. Even though it's highly effective, quite ironically, it is also one of the most user friendly features of excel. It's a vast and fascinating topic. Let's explore it a bit now.

4.6.1 Preparing Your Data for Analyzing

For using Pivot Tables, we need to have a dataset in rectangular format (also known as flat format) i.e. the data should be composed of fields placed in columns and records placed in rows. Thus, it should assume a rectangular shape. Also, every column should have a heading. If there are no headings, excel cannot create a Pivot Table.

	A	B	C	D	E	F	G	H	I	J	K	L
1	scheme_name	scheme_scheme	asset_type	security	security_na	units	rate	nett_val	pur_sal	value_date	Settlement	deal_broke
2	IDFC ALL SEASONS BOND FUND	SCASBF	CBL1	CBLO/0810(	CBLO - 08C	52,00,370.41	100.00	52,00,370.41	Sal	8-Oct-09	8-Oct-09	DIRECT
3	IDFC ALL SEASONS BOND FUND	SCASBF	CBL1	CBLO/0910(	CBLO - 09C	55,00,418.90	99.99	55,00,000.00	Pur	8-Oct-09	8-Oct-09	DIRECT
4	IDFC ALL SEASONS BOND FUND	SCASBF	MFU	108756	IDFC-Money	34,783.75	0.00	5,05,658.32	Sal	8-Oct-09	00-Jan-00	DIRECT
5	IDFC ARBITRAGE FUND	SCAF	CBL1	CBLO/0810(	CBLO - 08C	16,65,11,860.30	100.00	16,65,11,860.30	Sal	8-Oct-09	8-Oct-09	DIRECT
6	IDFC ARBITRAGE FUND	SCAF	CBL1	CBLO/0910(	CBLO - 09C	17,10,12,180.80	99.99	17,10,00,000.00	Pur	8-Oct-09	8-Oct-09	DIRECT
7	IDFC ARBITRAGE FUND	SCAF	EQU	HPEC01	HINDUSTAN	3,900.00	391.80	15,25,488.73	Sal	8-Oct-09	12-Oct-09	UTISEC
8	IDFC ARBITRAGE FUND	SCAF	EQU	INFS02	Infosys Tech	45,000.00	2,220.61	10,00,82,369.50	Pur	8-Oct-09	9-Oct-09	CLSA
9	IDFC ARBITRAGE FUND	SCAF	EQU	JAAS02	Jaiprakash A	6,429.00	238.06	15,27,996.13	Sal	8-Oct-09	12-Oct-09	KOTAK
10	IDFC ARBITRAGE FUND	SCAF	EQU	JAAS02	Jaiprakash A	75,696.00	241.86	1,82,77,637.33	Sal	8-Oct-09	12-Oct-09	KOTAK
11	IDFC ARBITRAGE FUND	SCAF	EQU	RCOV01	RELIANCE	88,845.00	252.08	2,24,32,927.10	Pur	8-Oct-09	9-Oct-09	QUANTBRO
12	IDFC ARBITRAGE FUND	SCAF	EQU	RCOV01	RELIANCE	1,07,855.00	252.65	2,72,94,434.83	Pur	8-Oct-09	9-Oct-09	QUANTBRO
13	IDFC ARBITRAGE FUND	SCAF	EQU	ULCC01	ULTRATECH	800.00	839.83	6,70,760.00	Sal	8-Oct-09	12-Oct-09	HDFCSEC0
14	IDFC ARBITRAGE FUND	SCAF	EQU	ULCC01	ULTRATECH	45,200.00	840.10	3,79,10,029.52	Sal	8-Oct-09	12-Oct-09	HDFCSEC0
15	IDFC ARBITRAGE FUND	SCAF	EQU	ZEET02	Zee Entertai	14,000.00	243.41	34,02,175.20	Sal	8-Oct-09	12-Oct-09	QUANTBRO
16	IDFC ARBITRAGE FUND	SCAF	FUT	HPEC01NSE	OCT2009FU	3,900.00	391.48	15,26,755.23	Pur	8-Oct-09	29-Oct-09	UTISEC
17	IDFC ARBITRAGE FUND	SCAF	FUT	ZEET02NSE	OCT2009FU	14,000.00	243.17	34,04,350.60	Pur	8-Oct-09	29-Oct-09	QUANTBRO
18	IDFC ARBITRAGE FUND	SCAF	FUT	JAAS01NSE	OCT2009FU	82,125.00	241.60	1,98,41,556.04	Pur	8-Oct-09	29-Oct-09	KOTAK
19	IDFC ARBITRAGE FUND	SCAF	FUT	ULCC01NSE	OCT2009FU	46,000.00	839.31	3,86,08,278.40	Pur	8-Oct-09	29-Oct-09	HDFCSEC0
20	**IDFC ARBITRAGE FUND**	**SCAF**	**FUT**	**RCOV01NSE**	**OCT2009F**	**1,96,700.00**	**253.37**	**4,98,37,368.96**	**Sal**	**8-Oct-09**	**29-Oct-09**	**QUANTBRO**
21	IDFC ARBITRAGE FUND	SCAF	FUT	INFS02NSE	OCT2009FU	45,000.00	2,216.26	9,97,31,680.16	Sal	8-Oct-09	29-Oct-09	CLSA
22	IDFC ARBITRAGE PLUS FUND	SCAF-PLUS	CBL1	CBLO/0810(	CBLO - 08C	9,94,07,080.55	100.00	9,94,07,080.55	Sal	8-Oct-09	8-Oct-09	DIRECT
23	IDFC ARBITRAGE PLUS FUND	SCAF-PLUS	CBL1	CBLO/0910(	CBLO - 09C	13,90,09,901.40	99.99	13,90,00,000.00	Pur	8-Oct-09	8-Oct-09	DIRECT
24	IDFC ARBITRAGE PLUS FUND	SCAF-PLUS	EQU	CIPL03	CIPLA LIMI	9,00,000.00	289.50	26,09,79,908.00	Pur	8-Oct-09	9-Oct-09	JFIB

Fig. 4.6.1: Data

In the above diagram, we can see that fields like *Scheme_name, Asset_type, Units, rate, nett_val* etc are placed in columns. The records are given in rows. Every column has a heading. Thus, this data is in flat format and hence can be analyzed using Pivot Tables.

4.6.2 Creating Pivot Table

Pivot Table is available in the Insert Tab → Tables Group as shown in Fig 4.6.2.

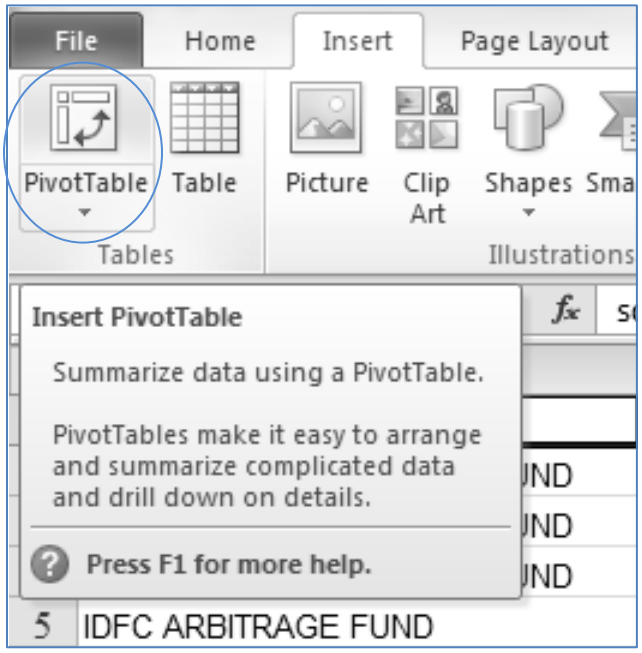


Fig. 4.6.2: Pivot Table

Click on Pivot Table button. It opens an interactive wizard.

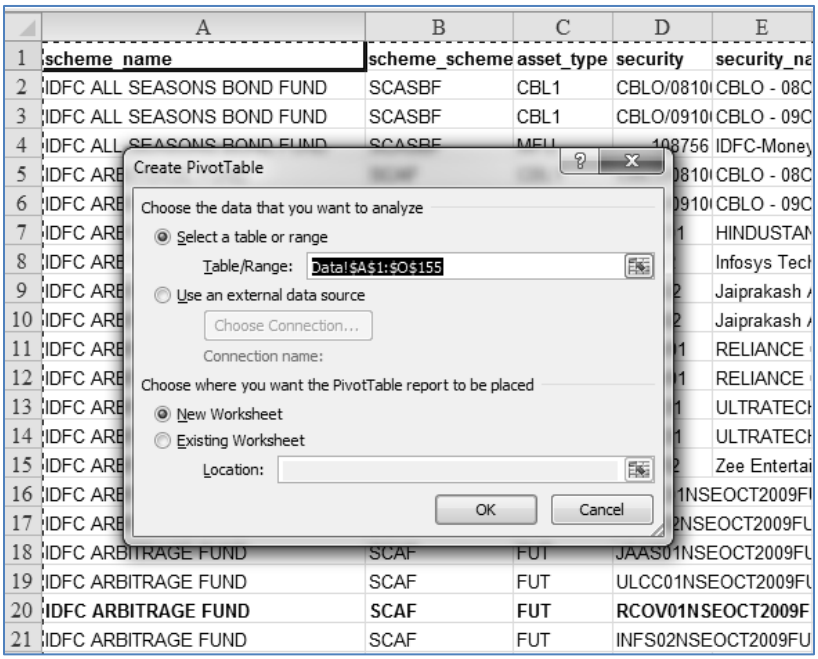


Fig. 4.6.3: Create Pivot Table Window

First of all, we need to specify the data that we wish to analyze. Either we can specify a table or a range of cells. By default, excel considers the region around the active cell. Alternately, we can also use an external data source.

Then we need to specify where to place the PivotTable report. We can either place it in a new worksheet or an existing worksheet. Pivot Table, as we will discover later, is highly dynamic in nature and quickly changes its dimensions. Thus, generally it's advisable to place it in a new worksheet. That is also the default option.

Make changes if necessary and then click on OK button.

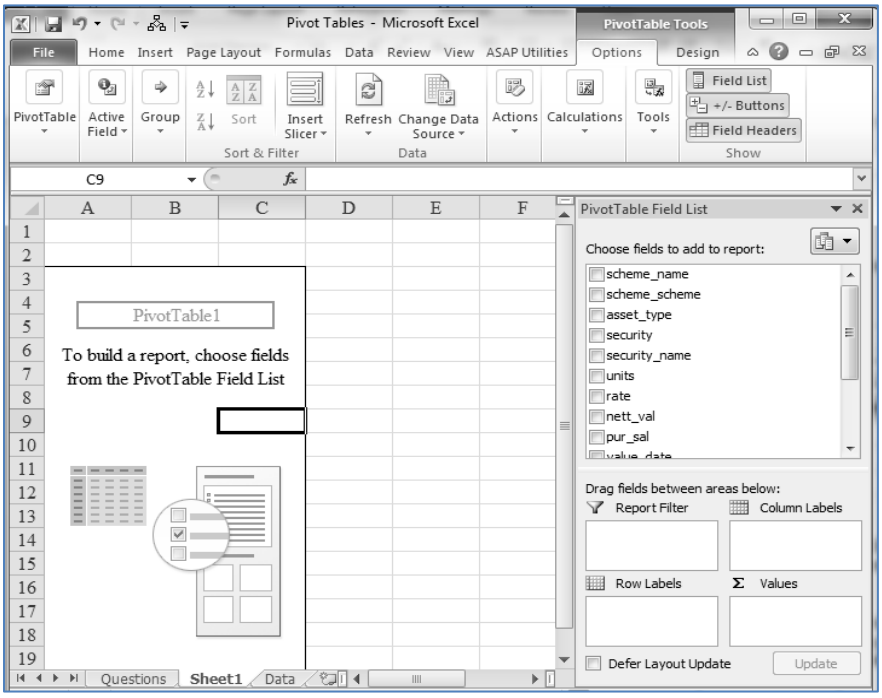


Fig. 4.6.4: Blank Pivot Table

This inserts a new worksheet and shows the Pivot Table layout (which is presently blank). There is a field list on the right hand side of the worksheet and enlists different fields. It also has four sections; Report Filter, Column Labels, Row Labels and Values.

4.6.3 Adding Fields to Pivot Table

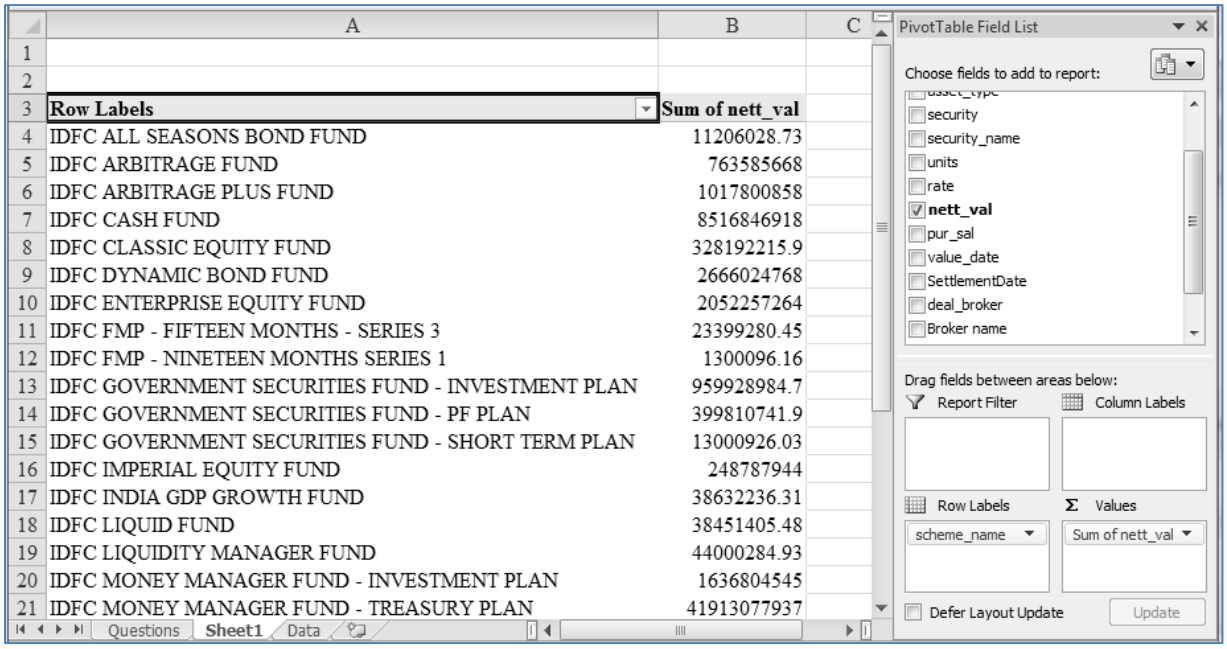
As written in the instruction in the above diagram, we need to choose fields from the Pivot Table field list and drop them in one of the four sections so that we can build a report.

The fields are to be dropped in the proper section based on the following logic:

1. Report Filter – Drop fields in report filters if you wish to filter the Pivot Table
2. Column Labels – Drop fields over here so that the values of the fields become column labels
3. Row Labels - Drop fields over here so that the values of the fields become column labels
4. Values - Drop fields over here so that computations like sum, count, min, max etc. can be done on the values of such fields.

Thus, row labels and column labels will be the outline or the framework of the report while values will be the main body. Accordingly, we may decide which column should be dropped where.

Presently, let us put *scheme_name* in Row Labels and *net_val* in Column Labels.



Row Labels	Sum of nett_val
IDFC ALL SEASONS BOND FUND	11206028.73
IDFC ARBITRAGE FUND	763585668
IDFC ARBITRAGE PLUS FUND	1017800858
IDFC CASH FUND	8516846918
IDFC CLASSIC EQUITY FUND	328192215.9
IDFC DYNAMIC BOND FUND	2666024768
IDFC ENTERPRISE EQUITY FUND	2052257264
IDFC FMP - FIFTEEN MONTHS - SERIES 3	23399280.45
IDFC FMP - NINETEEN MONTHS SERIES 1	1300096.16
IDFC GOVERNMENT SECURITIES FUND - INVESTMENT PLAN	959928984.7
IDFC GOVERNMENT SECURITIES FUND - PF PLAN	399810741.9
IDFC GOVERNMENT SECURITIES FUND - SHORT TERM PLAN	13000926.03
IDFC IMPERIAL EQUITY FUND	248787944
IDFC INDIA GDP GROWTH FUND	38632236.31
IDFC LIQUID FUND	38451405.48
IDFC LIQUIDITY MANAGER FUND	44000284.93
IDFC MONEY MANAGER FUND - INVESTMENT PLAN	1636804545
IDFC MONEY MANAGER FUND - TREASURY PLAN	41913077937

Fig. 4.6.5: Scheme wise Totals

We can see that a list of scheme has been created by excel in column A and the sum of net value for each of those schemes has been generated in column B. The best part of this is that the entire job of enlisting the unique values of schemes and generating corresponding totals is handled by excel itself.

4.6.4 Changing Field Statistics

It is not necessary that we need to always have sum of a field. We can also obtain other statistics like count, min, max etc. For this, click on the field in the Values section and select the last option Value Field Settings.

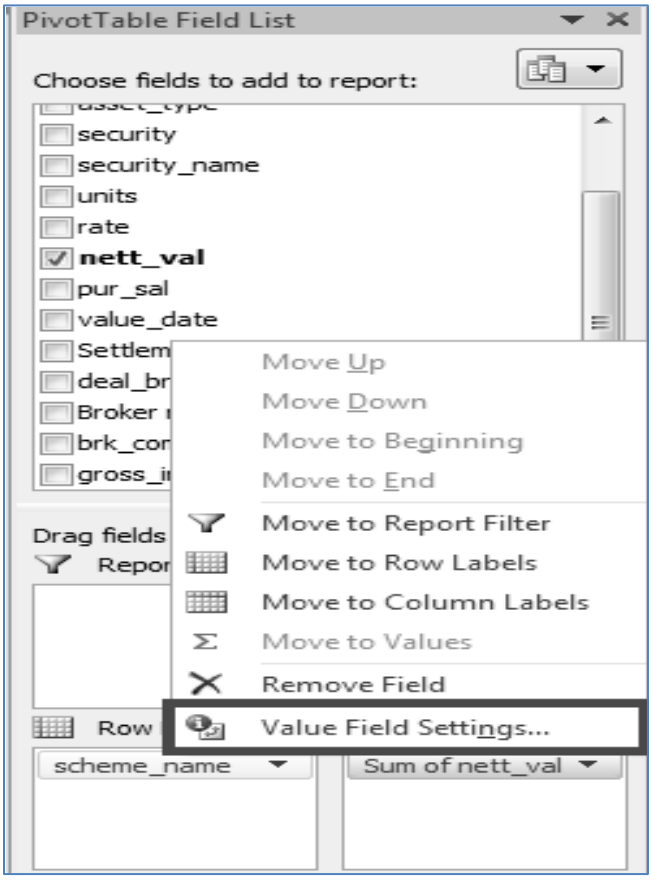


Fig. 4.6.6: Value Field Settings

Then a window appears which lets us select the appropriate statistic. Say, we select Max over there so that can have maximum value for each scheme.

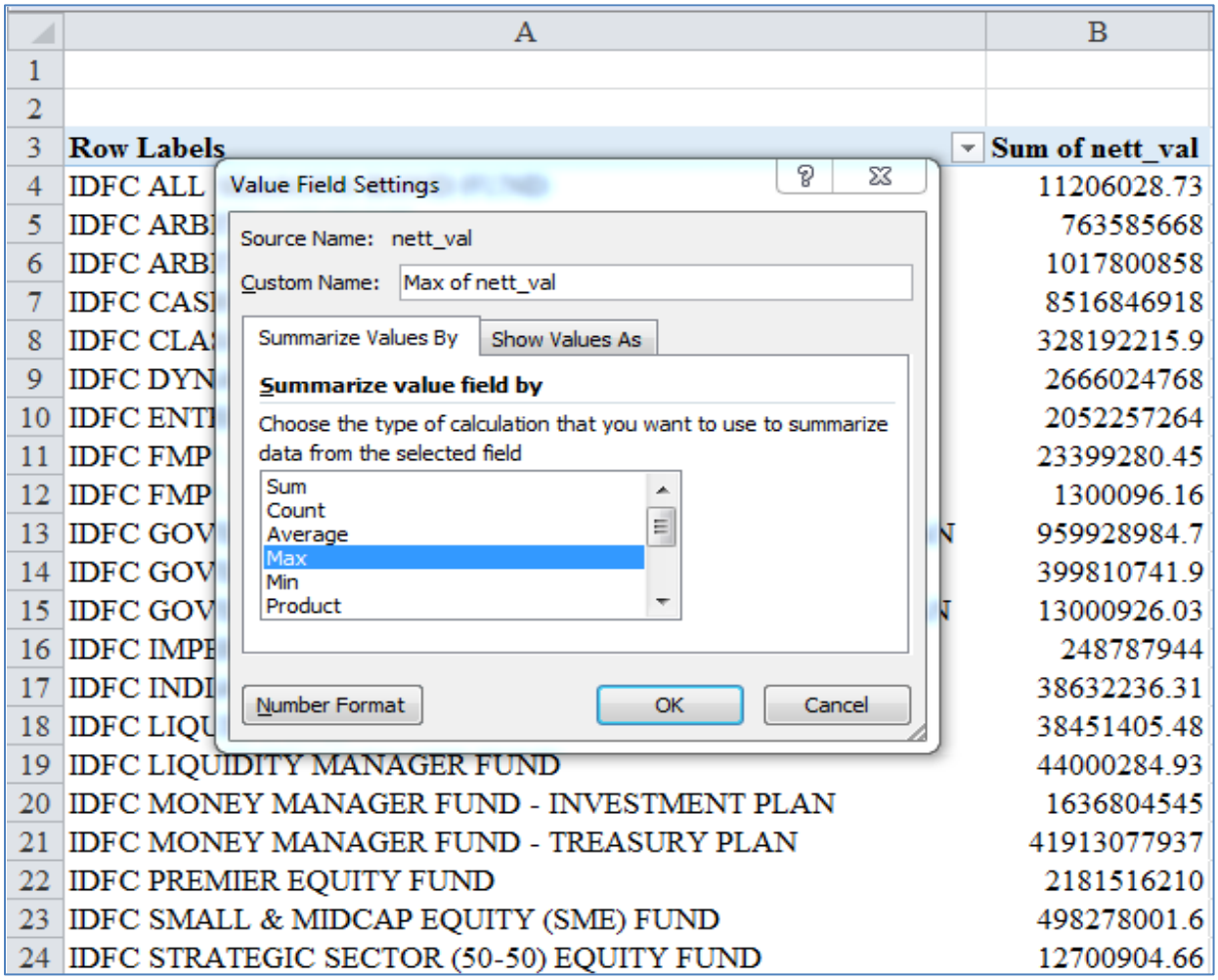
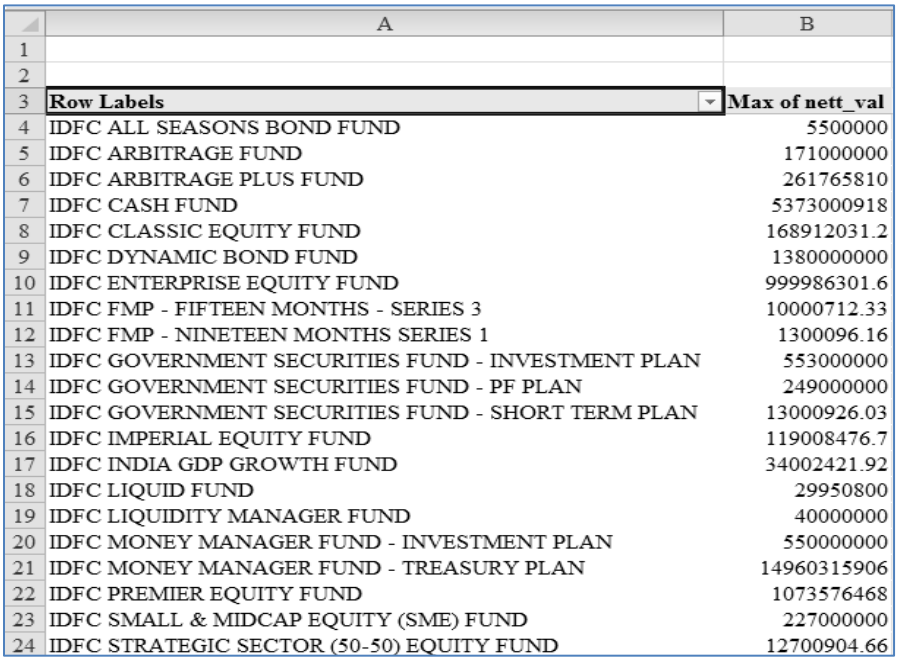


Fig. 4.6.7: Max

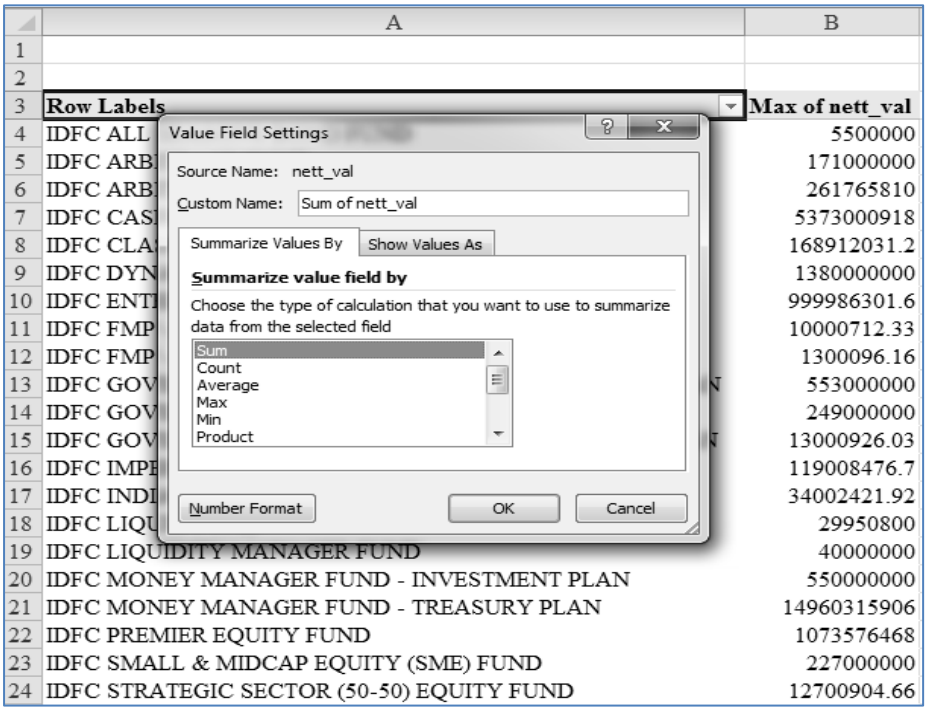
Now click on OK. This will update the values to maximum value for each scheme.



	A	B
1		
2		
3	**Row Labels**	**Max of nett_val**
4	IDFC ALL SEASONS BOND FUND	5500000
5	IDFC ARBITRAGE FUND	171000000
6	IDFC ARBITRAGE PLUS FUND	261765810
7	IDFC CASH FUND	5373000918
8	IDFC CLASSIC EQUITY FUND	168912031.2
9	IDFC DYNAMIC BOND FUND	1380000000
10	IDFC ENTERPRISE EQUITY FUND	999986301.6
11	IDFC FMP - FIFTEEN MONTHS - SERIES 3	10000712.33
12	IDFC FMP - NINETEEN MONTHS SERIES 1	1300096.16
13	IDFC GOVERNMENT SECURITIES FUND - INVESTMENT PLAN	553000000
14	IDFC GOVERNMENT SECURITIES FUND - PF PLAN	249000000
15	IDFC GOVERNMENT SECURITIES FUND - SHORT TERM PLAN	13000926.03
16	IDFC IMPERIAL EQUITY FUND	119008476.7
17	IDFC INDIA GDP GROWTH FUND	34002421.92
18	IDFC LIQUID FUND	29950800
19	IDFC LIQUIDITY MANAGER FUND	40000000
20	IDFC MONEY MANAGER FUND - INVESTMENT PLAN	550000000
21	IDFC MONEY MANAGER FUND - TREASURY PLAN	14960315906
22	IDFC PREMIER EQUITY FUND	1073576468
23	IDFC SMALL & MIDCAP EQUITY (SME) FUND	227000000
24	IDFC STRATEGIC SECTOR (50-50) EQUITY FUND	12700904.66

Fig. 4.6.8: Scheme wise Max

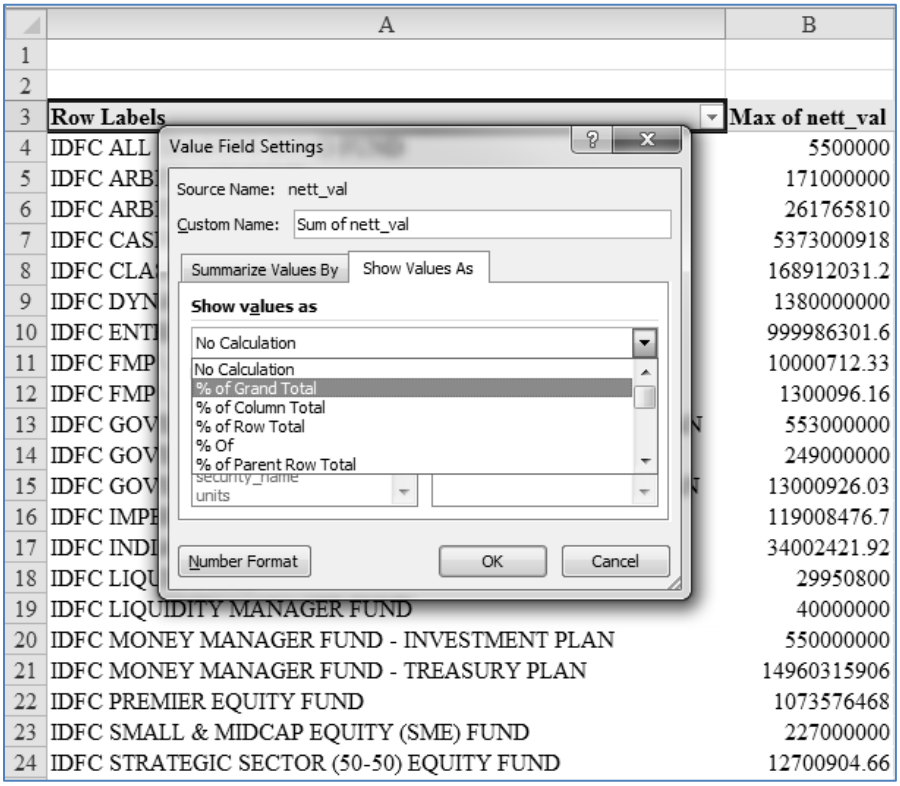
We can also express the values in a variety of ways. Activate the window of Value Field Settings once more. Select Sum once more.



	A	B
1		
2		
3	**Row Labels**	**Max of nett_val**
4	IDFC ALL	5500000
5	IDFC ARB	171000000
6	IDFC ARB	261765810
7	IDFC CAS	5373000918
8	IDFC CLA	168912031.2
9	IDFC DYN	1380000000
10	IDFC ENT	999986301.6
11	IDFC FMP	10000712.33
12	IDFC FMP	1300096.16
13	IDFC GOV	553000000
14	IDFC GOV	249000000
15	IDFC GOV	13000926.03
16	IDFC IMP	119008476.7
17	IDFC INDI	34002421.92
18	IDFC LIQ	29950800
19	IDFC LIQUIDITY MANAGER FUND	40000000
20	IDFC MONEY MANAGER FUND - INVESTMENT PLAN	550000000
21	IDFC MONEY MANAGER FUND - TREASURY PLAN	14960315906
22	IDFC PREMIER EQUITY FUND	1073576468
23	IDFC SMALL & MIDCAP EQUITY (SME) FUND	227000000
24	IDFC STRATEGIC SECTOR (50-50) EQUITY FUND	12700904.66

Fig. 4.6.9: Back to Sum

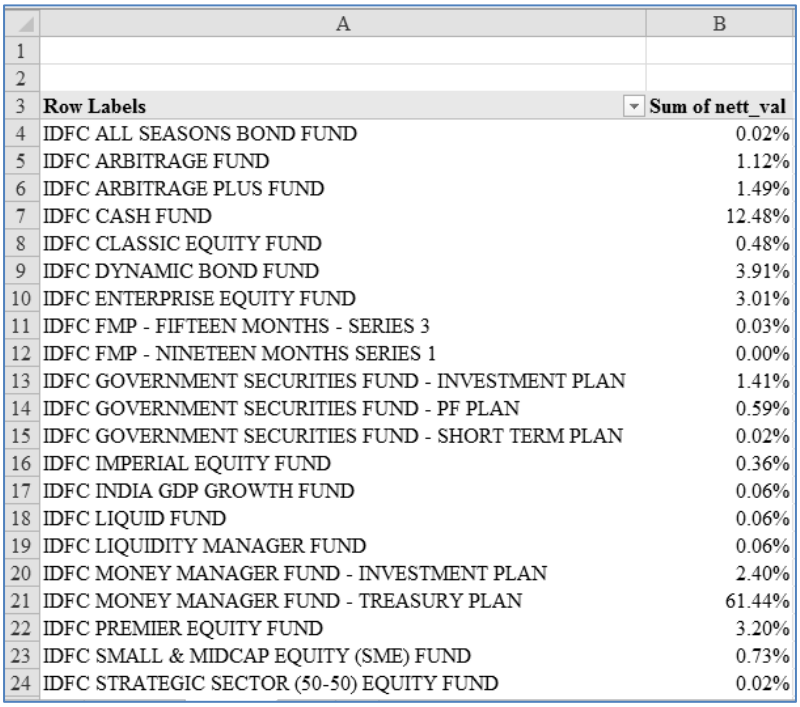
Then click on *Show Values As* tab. There default value is No Calculation. But you may select any of the multiple values available. Select % of Grand Total.



	A	B
1		
2		
3	Row Labels	Max of nett_val
4	IDFC ALL	5500000
5	IDFC ARB	171000000
6	IDFC ARB	261765810
7	IDFC CAS	5373000918
8	IDFC CLA	168912031.2
9	IDFC DYN	1380000000
10	IDFC ENT	999986301.6
11	IDFC FMP	10000712.33
12	IDFC FMP	1300096.16
13	IDFC GOV	553000000
14	IDFC GOV	249000000
15	IDFC GOV	13000926.03
16	IDFC IMP	119008476.7
17	IDFC IND	34002421.92
18	IDFC LIQ	29950800
19	IDFC LIQUIDITY MANAGER FUND	40000000
20	IDFC MONEY MANAGER FUND - INVESTMENT PLAN	550000000
21	IDFC MONEY MANAGER FUND - TREASURY PLAN	14960315906
22	IDFC PREMIER EQUITY FUND	1073576468
23	IDFC SMALL & MIDCAP EQUITY (SME) FUND	227000000
24	IDFC STRATEGIC SECTOR (50-50) EQUITY FUND	12700904.66

Fig. 4.6.10: % of Grand Total

Press OK. We can see that the absolute figures of sum have got converted into percentages.



	A	B
1		
2		
3	**Row Labels**	**Sum of nett_val**
4	IDFC ALL SEASONS BOND FUND	0.02%
5	IDFC ARBITRAGE FUND	1.12%
6	IDFC ARBITRAGE PLUS FUND	1.49%
7	IDFC CASH FUND	12.48%
8	IDFC CLASSIC EQUITY FUND	0.48%
9	IDFC DYNAMIC BOND FUND	3.91%
10	IDFC ENTERPRISE EQUITY FUND	3.01%
11	IDFC FMP - FIFTEEN MONTHS - SERIES 3	0.03%
12	IDFC FMP - NINETEEN MONTHS SERIES 1	0.00%
13	IDFC GOVERNMENT SECURITIES FUND - INVESTMENT PLAN	1.41%
14	IDFC GOVERNMENT SECURITIES FUND - PF PLAN	0.59%
15	IDFC GOVERNMENT SECURITIES FUND - SHORT TERM PLAN	0.02%
16	IDFC IMPERIAL EQUITY FUND	0.36%
17	IDFC INDIA GDP GROWTH FUND	0.06%
18	IDFC LIQUID FUND	0.06%
19	IDFC LIQUIDITY MANAGER FUND	0.06%
20	IDFC MONEY MANAGER FUND - INVESTMENT PLAN	2.40%
21	IDFC MONEY MANAGER FUND - TREASURY PLAN	61.44%
22	IDFC PREMIER EQUITY FUND	3.20%
23	IDFC SMALL & MIDCAP EQUITY (SME) FUND	0.73%
24	IDFC STRATEGIC SECTOR (50-50) EQUITY FUND	0.02%

Fig. 4.6.11: Scheme wise Percentages

These all are percentages of the grand total value. Now come back to absolute figures by again selecting No calculation.

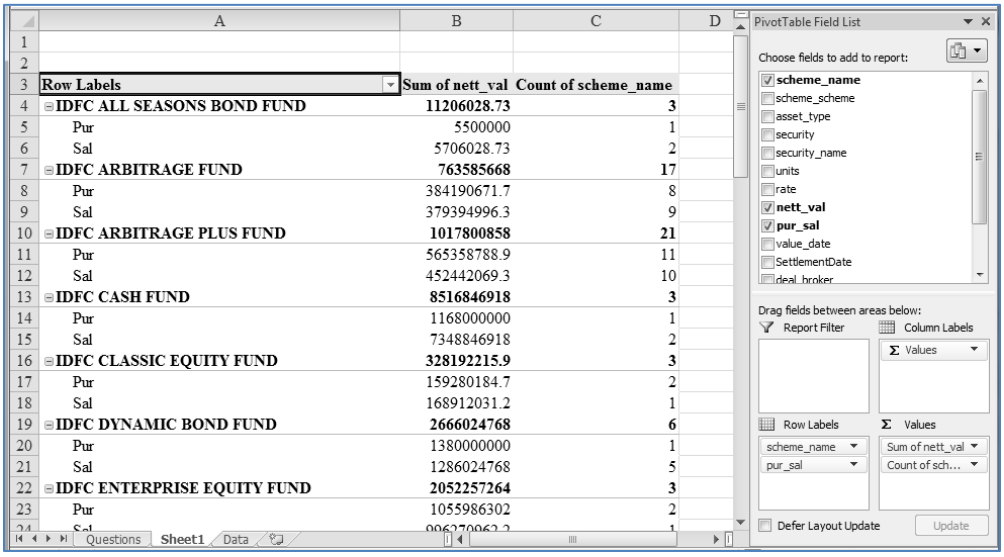
	A	B
1		
2		
3	**Row Labels**	**Sum of nett_val**
4	IDFC ALL SEASONS BOND FUND	11206028.73
5	IDFC ARBITRAGE FUND	763585668
6	IDFC ARBITRAGE PLUS FUND	1017800858
7	IDFC CASH FUND	8516846918
8	IDFC CLASSIC EQUITY FUND	328192215.9
9	IDFC DYNAMIC BOND FUND	2666024768
10	IDFC ENTERPRISE EQUITY FUND	2052257264
11	IDFC FMP - FIFTEEN MONTHS - SERIES 3	23399280.45
12	IDFC FMP - NINETEEN MONTHS SERIES 1	1300096.16
13	IDFC GOVERNMENT SECURITIES FUND - INVESTMENT PLAN	959928984.7
14	IDFC GOVERNMENT SECURITIES FUND - PF PLAN	399810741.9
15	IDFC GOVERNMENT SECURITIES FUND - SHORT TERM PLAN	13000926.03
16	IDFC IMPERIAL EQUITY FUND	248787944
17	IDFC INDIA GDP GROWTH FUND	38632236.31
18	IDFC LIQUID FUND	38451405.48
19	IDFC LIQUIDITY MANAGER FUND	44000284.93
20	IDFC MONEY MANAGER FUND - INVESTMENT PLAN	1636804545
21	IDFC MONEY MANAGER FUND - TREASURY PLAN	41913077937
22	IDFC PREMIER EQUITY FUND	2181516210
23	IDFC SMALL & MIDCAP EQUITY (SME) FUND	498278001.6
24	IDFC STRATEGIC SECTOR (50-50) EQUITY FUND	12700904.66

Fig. 4.6.12: Back to absolute values

4.6.5 Showing Two or More Fields in the Data Area

Till now we have used only one field each in Row Labels and Values sections. We can involve multiple fields, if we wish to. Say, we would like to see the values scheme wise but broken separately for purchase and sales. We would also like to see the number of trades i.e. count of scheme names.

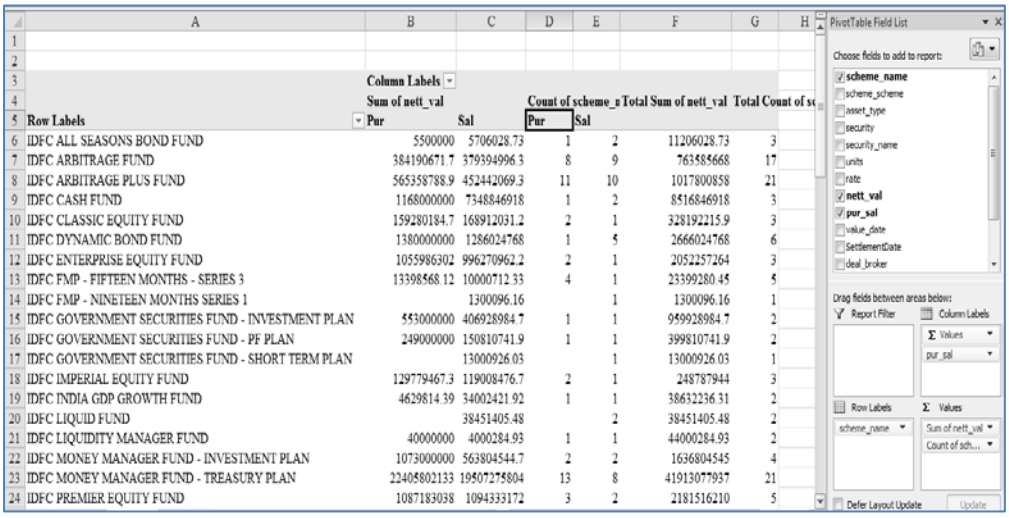
For this drag and drop *pur_sal* field into Row Labels and *scheme_name* field in values segment. The resultant output will be as shown in Fig 4.6.13



Row Labels	Sum of nett_val	Count of scheme_name
IDFC ALL SEASONS BOND FUND	**11206028.73**	**3**
Pur	5500000	1
Sal	5706028.73	2
IDFC ARBITRAGE FUND	**763585668**	**17**
Pur	384190671.7	8
Sal	379394996.3	9
IDFC ARBITRAGE PLUS FUND	**1017800858**	**21**
Pur	565358788.9	11
Sal	452442069.3	10
IDFC CASH FUND	**8516846918**	**3**
Pur	1168000000	1
Sal	7348846918	2
IDFC CLASSIC EQUITY FUND	**328192215.9**	**3**
Pur	159280184.7	2
Sal	168912031.2	1
IDFC DYNAMIC BOND FUND	**2666024768**	**6**
Pur	1380000000	1
Sal	1286024768	5
IDFC ENTERPRISE EQUITY FUND	**2052257264**	**3**
Pur	1055986302	2

Fig. 4.6.13: Multiple fields

One great part about Pivot Tables is that we can fine tune the layout as per our choice. For example, if we feel that a better presentation can be achieved by showing Pur and Sal along the columns, we simply need to drag and move *pur_sal* from Row Labels to Column Labels as shown in Fig 4.6.14.



	Column Labels						
	Sum of nett_val		Count of scheme_n		Total Sum of nett_val	Total Count of sc	
Row Labels	Pur	Sal	Pur	Sal			
IDFC ALL SEASONS BOND FUND	5500000	5706028.73	1	2	11206028.73	3	
IDFC ARBITRAGE FUND	384190671.7	379394996.3	8	9	763585668	17	
IDFC ARBITRAGE PLUS FUND	565358788.9	452442069.3	11	10	1017800858	21	
IDFC CASH FUND	1168000000	7348846918	1	2	8516846918	3	
IDFC CLASSIC EQUITY FUND	159280184.7	168912031.2	2	1	328192215.9	3	
IDFC DYNAMIC BOND FUND	1380000000	1286024768	1	5	2666024768	6	
IDFC ENTERPRISE EQUITY FUND	1055986302	996270962.2	2	1	2052257264	3	
IDFC FMP - FIFTEEN MONTHS - SERIES 3	13398568.12	10000712.33	4	1	23399280.45	5	
IDFC FMP - NINETEEN MONTHS SERIES 1		1300096.16		1	1300096.16	1	
IDFC GOVERNMENT SECURITIES FUND - INVESTMENT PLAN	553000000	406928984.7	1	1	959928984.7	2	
IDFC GOVERNMENT SECURITIES FUND - PF PLAN	249000000	150810741.9	1	1	399810741.9	2	
IDFC GOVERNMENT SECURITIES FUND - SHORT TERM PLAN		13000926.03		1	13000926.03	1	
IDFC IMPERIAL EQUITY FUND	129779467.3	119008476.7	2	1	248787944	3	
IDFC INDIA GDP GROWTH FUND	4629814.39	34002421.92	1	1	38632236.31	2	
IDFC LIQUID FUND		38451405.48		2	38451405.48	2	
IDFC LIQUIDITY MANAGER FUND	40000000	4000284.93	1	1	44000284.93	2	
IDFC MONEY MANAGER FUND - INVESTMENT PLAN	1073000000	563804544.7	2	2	1636804545	4	
IDFC MONEY MANAGER FUND - TREASURY PLAN	22405802133	19507275804	13	8	41913077937	21	
IDFC PREMIER EQUITY FUND	1087183038	1094333172	3	2	2181516210	5	

Fig. 4.6.14: Pur and Sal in Columns

We may also consider presenting Pur and Sal as main columns and Sum and Count as sub columns. In that case, click on *pur_sal* in Column Labels and then click on Move up.

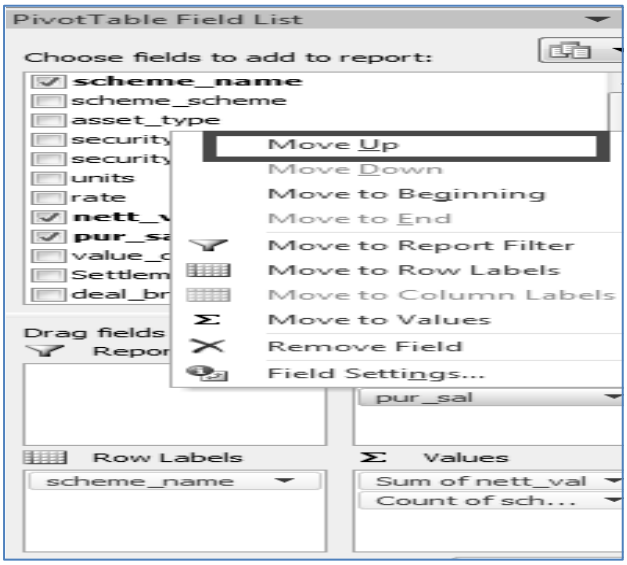
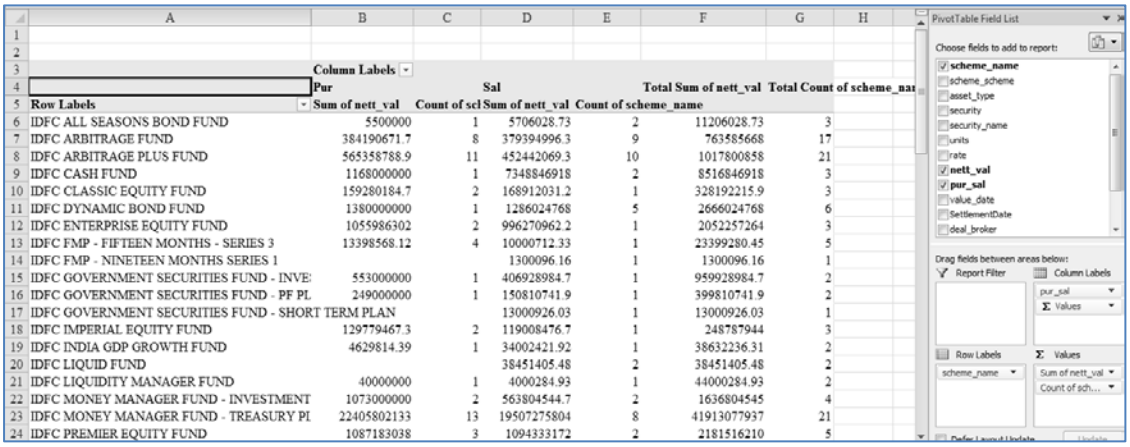


Fig. 4.6.15: Move Up

The resultant output is as shown in Fig 4.6.16:



	A	B	C	D	E	F	G	H
1								
2								
3		Column Labels						
4		Pur		Sal		Total Sum of nett_val	Total Count of scheme_nar	
5	Row Labels	Sum of nett_val	Count of scl	Sum of nett_val	Count of scheme_name			
6	IDFC ALL SEASONS BOND FUND	5500000	1	5706028.73	2	11206028.73	3	
7	IDFC ARBITRAGE FUND	384190671.7	8	379394996.3	9	763585668	17	
8	IDFC ARBITRAGE PLUS FUND	565358788.9	11	452442069.3	10	1017800858	21	
9	IDFC CASH FUND	1168000000	1	7348846918	2	8516846918	3	
10	IDFC CLASSIC EQUITY FUND	159280184.7	2	168912031.2	1	328192215.9	3	
11	IDFC DYNAMIC BOND FUND	1380000000	1	1286024768	5	2666024768	6	
12	IDFC ENTERPRISE EQUITY FUND	1055986302	2	996270962.2	1	2052257264	3	
13	IDFC FMP - FIFTEEN MONTHS - SERIES 3	13398568.12	4	10000712.33	1	23399280.45	5	
14	IDFC FMP - NINETEEN MONTHS SERIES 1			1300096.16	1	1300096.16	1	
15	IDFC GOVERNMENT SECURITIES FUND - INVE	553000000	1	406928984.7	1	959928984.7	2	
16	IDFC GOVERNMENT SECURITIES FUND - PF PL	249000000	1	150810741.9	1	399810741.9	2	
17	IDFC GOVERNMENT SECURITIES FUND - SHORT TERM PLAN			13000926.03	1	13000926.03	1	
18	IDFC IMPERIAL EQUITY FUND	129779467.3	2	119008476.7	1	248787944	3	
19	IDFC INDIA GDP GROWTH FUND	4629814.39	1	34002421.92	1	38632236.31	2	
20	IDFC LIQUID FUND			38451405.48	2	38451405.48	2	
21	IDFC LIQUIDITY MANAGER FUND	40000000	1	4000284.93	1	44000284.93	2	
22	IDFC MONEY MANAGER FUND - INVESTMENT	1073000000	2	563804544.7	2	1636804545	4	
23	IDFC MONEY MANAGER FUND - TREASURY PL	22405802133	13	19507275804	8	41913077937	21	
24	IDFC PREMIER EQUITY FUND	1087183038	3	1094333172	2	2181516210	5	

Fig. 4.6.16: Pur Sal Moved Up

This feature of swiftly changing the layout of a table is known as 'pivoting'. We can do pivoting very easily using Pivot Tables. Therefore, they are known as 'Pivot' Tables.

4.6.6 Eliminating Blank Cells from the Data Section

In the above diagram we can see that there are many blank cells (For e.g., cell B14). In place of blanks, we may like to show 0. This can be achieved by changing Pivot Table options.

At the top, there is the pink coloured PivotTable Tools Tab. It in turn contains Options Tab. Go to Options Tab → Pivot Table Group → Options → Options

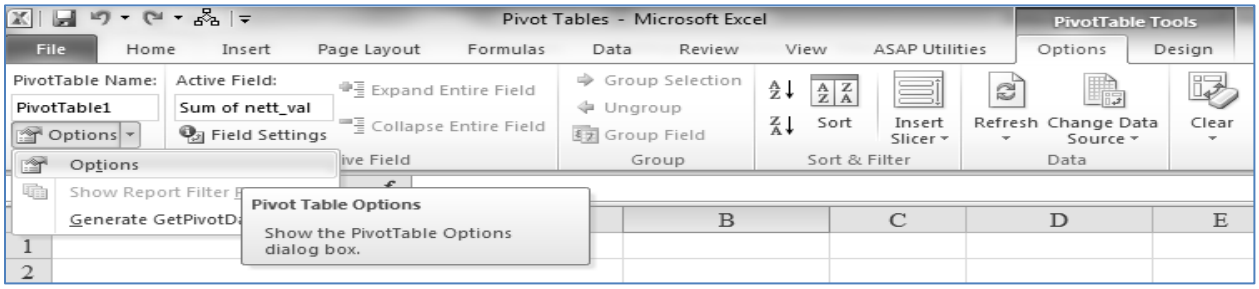


Fig. 4.6.17: Pivot Table Options

On clicking Options, we see the Pivot Table Options window. In its Layout & Format Tab → Format section, there is a check box saying *For empty cells Show*. There enter 0.

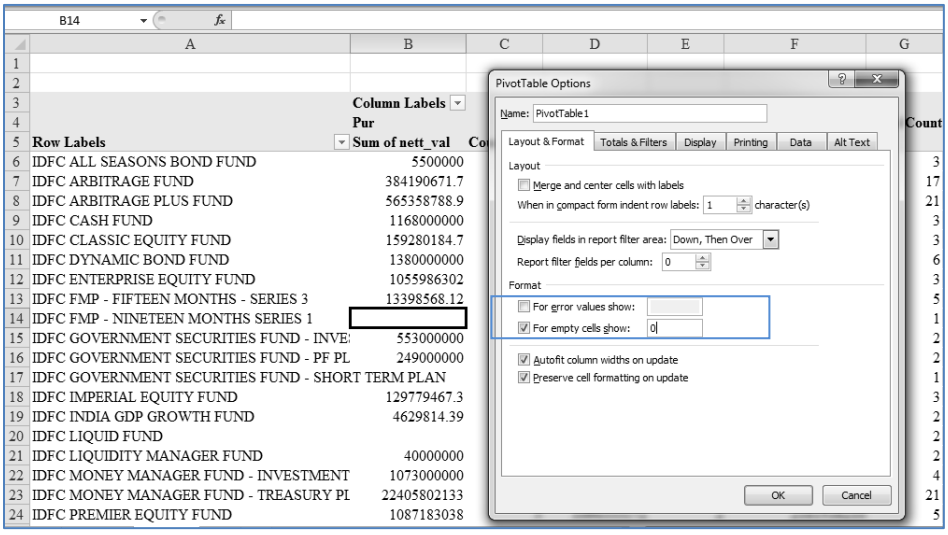


Fig. 4.6.18: Zero for blanks

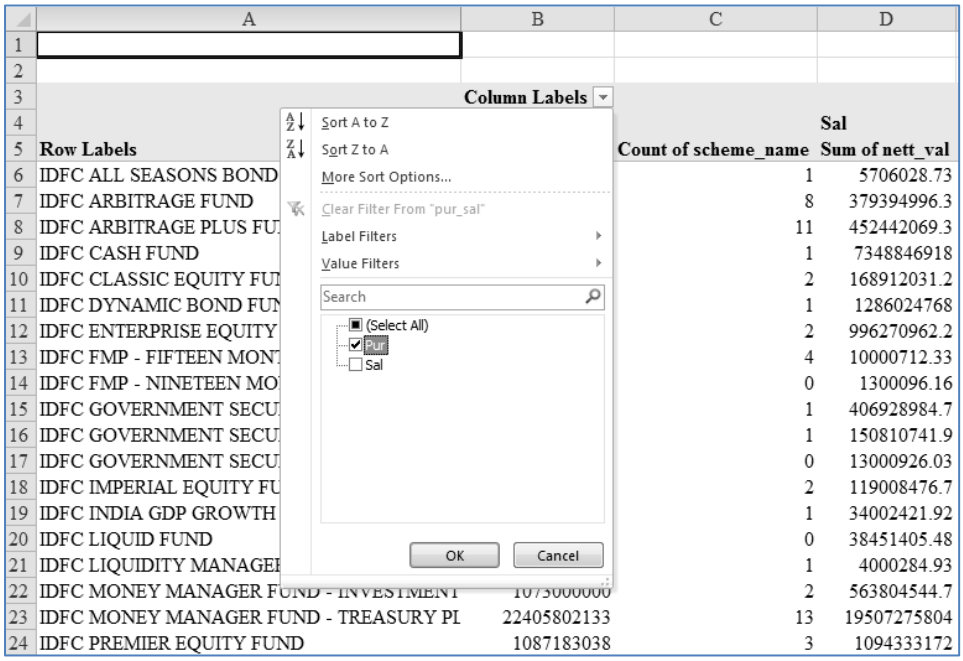
Click OK. We can see that all the blank cells are now replaced by 0.

	A	B	C	D	E
1					
2					
3		Column Labels			
4		Pur		Sal	
5	Row Labels	Sum of nett_val	Count of scheme_name	Sum of nett_val	Count of scheme_name
6	IDFC ALL SEASONS BOND FUND	5500000	1	5706028.73	2
7	IDFC ARBITRAGE FUND	384190671.7	8	379394996.3	9
8	IDFC ARBITRAGE PLUS FUND	565358788.9	11	452442069.3	10
9	IDFC CASH FUND	1168000000	1	7348846918	2
10	IDFC CLASSIC EQUITY FUND	159280184.7	2	168912031.2	1
11	IDFC DYNAMIC BOND FUND	1380000000	1	1286024768	5
12	IDFC ENTERPRISE EQUITY FUND	1055986302	2	996270962.2	1
13	IDFC FMP - FIFTEEN MONTHS - SERIES 3	13398568.12	4	10000712.33	1
14	IDFC FMP - NINETEEN MONTHS SERIES 1	0	0	1300096.16	1
15	IDFC GOVERNMENT SECURITIES FUND - INVE	553000000	1	406928984.7	1
16	IDFC GOVERNMENT SECURITIES FUND - PF PL	249000000	1	150810741.9	1
17	IDFC GOVERNMENT SECURITIES FUND - SHOR	0	0	13000926.03	1
18	IDFC IMPERIAL EQUITY FUND	129779467.3	2	119008476.7	1
19	IDFC INDIA GDP GROWTH FUND	4629814.39	1	34002421.92	1
20	IDFC LIQUID FUND	0	0	38451405.48	2
21	IDFC LIQUIDITY MANAGER FUND	40000000	1	4000284.93	1
22	IDFC MONEY MANAGER FUND - INVESTMENT	1073000000	2	563804544.7	2
23	IDFC MONEY MANAGER FUND - TREASURY PL	22405802133	13	19507275804	8
24	IDFC PREMIER EQUITY FUND	1087183038	3	1094333172	2

Fig. 4.6.19: Blank cells now replaced by 0

4.6.7 Using Filters of Row / Column Labels

Suppose we wish to see selected row / column label values. In that case, we can use the filters given over there. For example, let us say we are interested only in purchase details. We can select Pur from the dropdown filter button given on Column Labels.



Row Labels		Count of scheme_name	Sal Sum of nett_val
IDFC ALL SEASONS BOND		1	5706028.73
IDFC ARBITRAGE FUND		8	379394996.3
IDFC ARBITRAGE PLUS FU		11	452442069.3
IDFC CASH FUND		1	7348846918
IDFC CLASSIC EQUITY FU		2	168912031.2
IDFC DYNAMIC BOND FU		1	1286024768
IDFC ENTERPRISE EQUITY		2	996270962.2
IDFC FMP - FIFTEEN MON		4	10000712.33
IDFC FMP - NINETEEN MO		0	1300096.16
IDFC GOVERNMENT SECU		1	406928984.7
IDFC GOVERNMENT SECU		1	150810741.9
IDFC GOVERNMENT SECU		0	13000926.03
IDFC IMPERIAL EQUITY FU		2	119008476.7
IDFC INDIA GDP GROWTH		1	34002421.92
IDFC LIQUID FUND		0	38451405.48
IDFC LIQUIDITY MANAGE		1	4000284.93
IDFC MONEY MANAGER FUND - INVESTMENT	1073000000	2	563804544.7
IDFC MONEY MANAGER FUND - TREASURY PL	22405802133	13	19507275804
IDFC PREMIER EQUITY FUND	1087183038	3	1094333172

Fig. 4.6.20: Column Label Filters

On pressing OK, we can see that Sal details have vanished.

Row Labels	Column Labels: Pur Sum of nett_val	Count of scheme_name	Total Sum of nett_val	Total Count of scheme_name
IDFC ALL SEASONS BOND FUND	5500000	1	5500000	1
IDFC ARBITRAGE FUND	384190671.7	8	384190671.7	8
IDFC ARBITRAGE PLUS FUND	565358788.9	11	565358788.9	11
IDFC CASH FUND	1168000000	1	1168000000	1
IDFC CLASSIC EQUITY FUND	159280184.7	2	159280184.7	2
IDFC DYNAMIC BOND FUND	1380000000	1	1380000000	1
IDFC ENTERPRISE EQUITY FUND	1055986302	2	1055986302	2
IDFC FMP - FIFTEEN MONTHS - SERIES 3	13398568.12	4	13398568.12	4
IDFC GOVERNMENT SECURITIES FUND - INVESTMENT PLAN	553000000	1	553000000	1
IDFC GOVERNMENT SECURITIES FUND - PF PLAN	249000000	1	249000000	1
IDFC IMPERIAL EQUITY FUND	129779467.3	2	129779467.3	2
IDFC INDIA GDP GROWTH FUND	4629814.39	1	4629814.39	1
IDFC LIQUIDITY MANAGER FUND	40000000	1	40000000	1
IDFC MONEY MANAGER FUND - INVESTMENT PLAN	1073000000	2	1073000000	2
IDFC MONEY MANAGER FUND - TREASURY PLAN	22405802133	13	22405802133	13
IDFC PREMIER EQUITY FUND	1087183038	3	1087183038	3
IDFC SMALL & MIDCAP EQUITY (SME) FUND	282100187	4	282100187	4
IDFC SUPER SAVER INCOME FUND - INVESTMENT PLAN	1101000000	1	1101000000	1
IDFC SUPER SAVER INCOME FUND - MEDIUM TERM PLAN	312752722.2	3	312752722.2	3

Fig. 4.6.21: Filtered List

We may do a similar thing in case of Row Labels. Say, we want to see details only for IDFC All Seasons Bond Fund, IDFC Dynamic Bond Fund and IDFC Cash Fund. We can select these values from the filter dropdown on Row Labels.

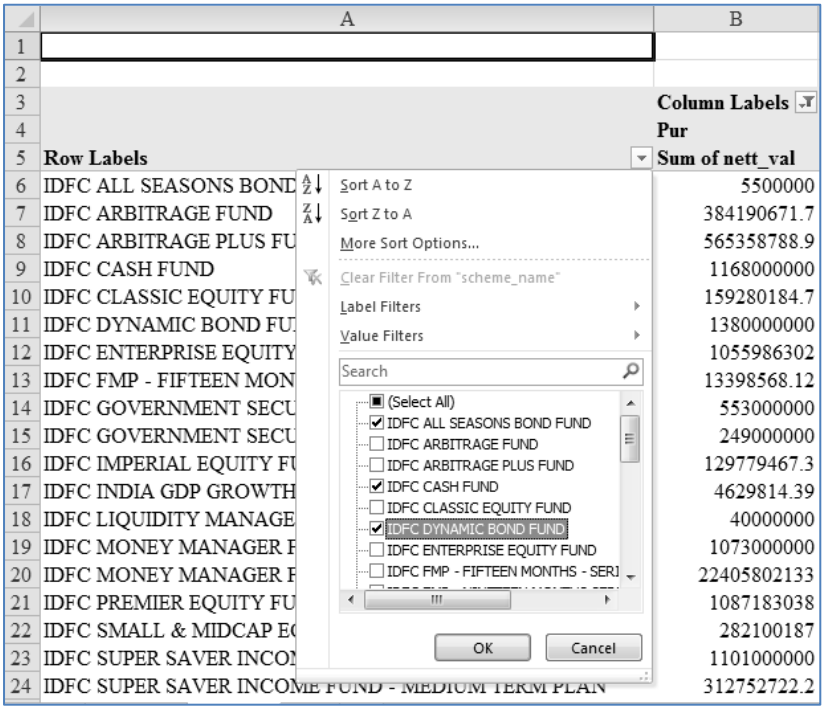


Fig. 4.6.22: Filter on Row Labels

Press OK and now we can see only selected data.

Row Labels	Column Labels / Pur / Sum of nett_val	Count of scheme_name	Total Sum of nett_val	Total Count of scheme_name
IDFC ALL SEASONS BOND FUND	5500000	1	5500000	1
IDFC CASH FUND	1168000000	1	1168000000	1
IDFC DYNAMIC BOND FUND	1380000000	1	1380000000	1
Grand Total	**2553500000**	**3**	**2553500000**	**3**

Fig. 4.6.23: Filtered List

To see 100% of the data click on Select All in both the filters.

4.6.8 Top 5 Values

We may also be interested in knowing the top values in the data. For this, we can use the Top 10 feature in the filters. Click on the filter dropdown of Row Labels, select Value filters and then select Top 10.

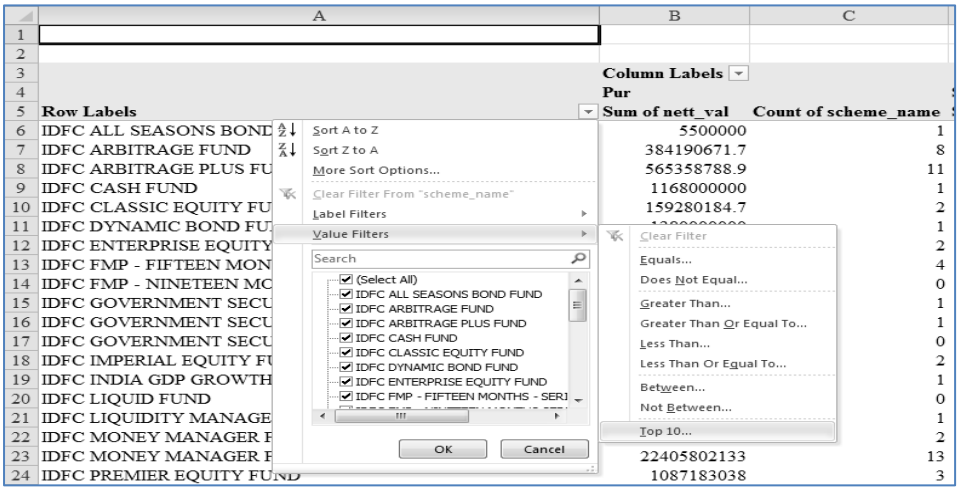


Fig. 4.6.24: Top 10

The Top 10 window opens up. Even though it says 'Top 10', it need not be the top ten values. We can select top 7, top 5 or even top 3 values. Presently, we will specify top 5.

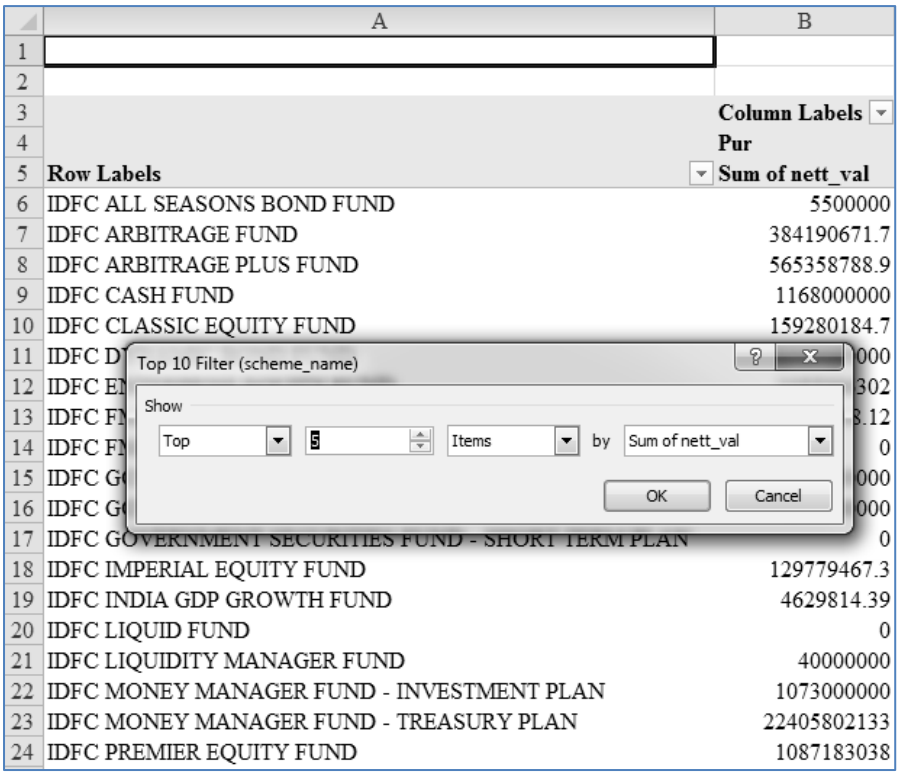


Fig. 4.6.25: Top 5 items

Press OK and you can see the top 5 values of net_val field.

	A	B	C	D	E
1					
2					
3		Column Labels			
4		Pur		Sal	
5	Row Labels	Sum of nett_val	Count of scheme_name	Sum of nett_val	Count of scheme_name
6	IDFC CASH FUND	1168000000	1	7348846918	2
7	IDFC DYNAMIC BOND FUND	1380000000	1	1286024768	5
8	IDFC MONEY MANAGER FUND - TREASURY PLAN	22405802133	13	19507275804	8
9	IDFC PREMIER EQUITY FUND	1087183038	3	1094333172	2
10	IDFC SUPER SAVER INCOME FUND - SHORT TERM PLAN	863707967.8	6	1376089993	13
11	**Grand Total**	**26904693138**	**24**	**30612570655**	**30**
12					

Fig. 4.6.26: Top 5 items - result

Note: We have lot of flexibility in Top 10. We can change top to bottom, 10 to any number and Item to percentage.

4.6.9 Report Filters

This kind of filtering is OK when we wish to filter one or more values present in the Pivot Table. But sometimes we come across a situation where we are required to apply filter on the entire table based on a field which is actually not a part of the Pivot Table. In such a case, we can make use of Report Filters.

Say, in the above data, we wish to apply filters on the basis of asset_type field which in fact is not a part of the Pivot Table. Drag asset_type and put it in Report Filter section.

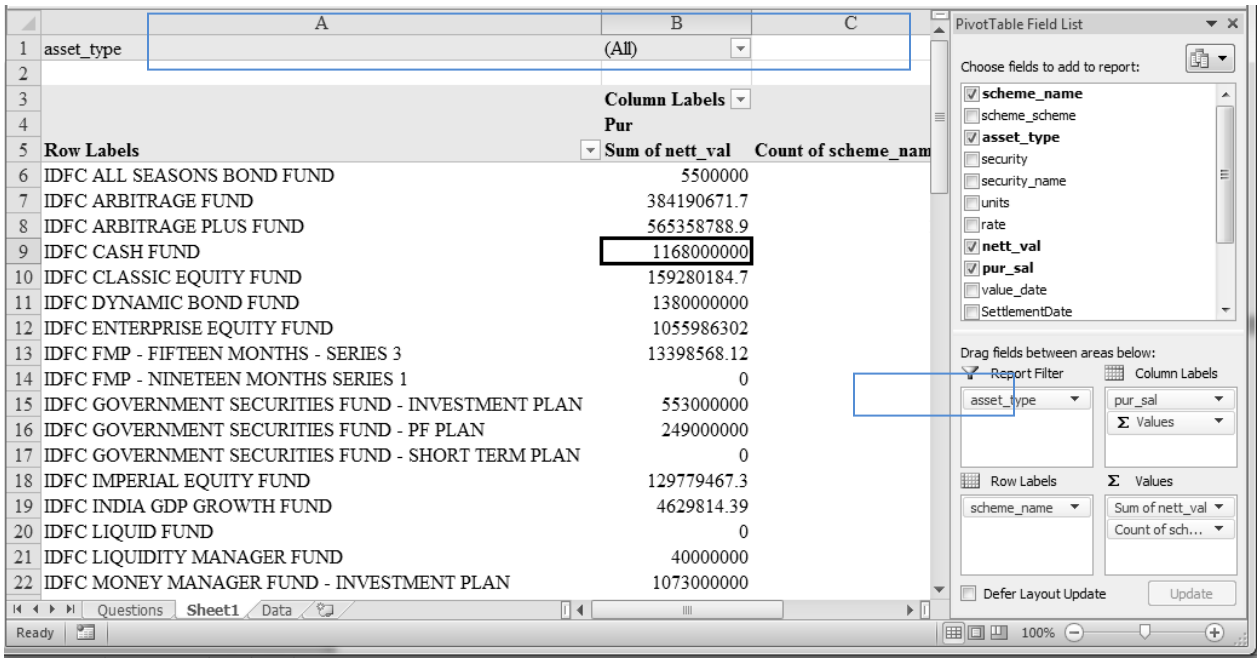


Fig. 4.6.27: Report filter

We can see that the phrase *asset_type* is entered in cell A1 and *(All)* is entered in the cell B1. It also has a dropdown button.

We can click on this dropdown and select values. Suppose, we wish to apply filter on the table based on the asset type as Equity. So we can select the value Equ as shown in Fig 4.6.28.

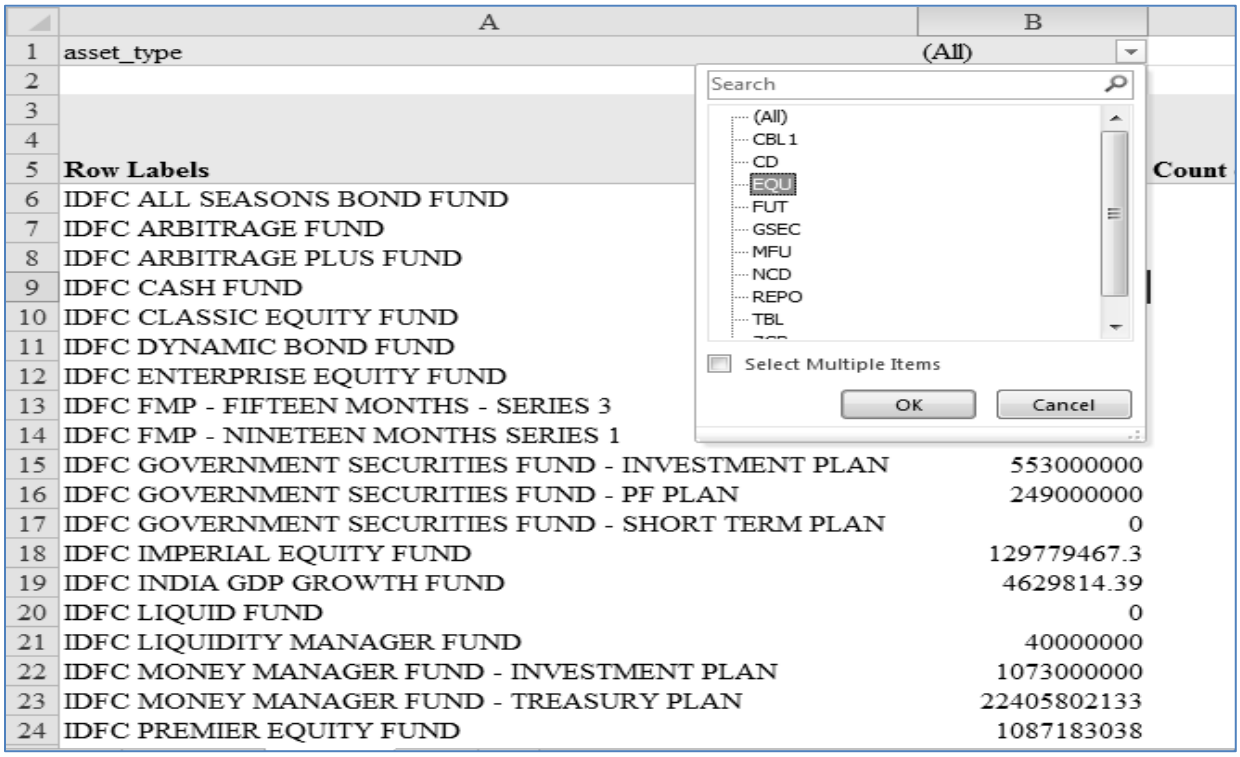


Fig. 4.6.28: EQU

Press OK and we can see that the table now shows only those values which correspond to equity as the asset type. Cell B1 shows 'EQU'.

	A	B	C	D	E
1	asset_type	EQU			
2					
3		Column Labels			
4		Pur		Sal	
5	Row Labels	Sum of nett_val	Count of scheme_name	Sum of nett_val	Count of scheme_name
6	IDFC ARBITRAGE FUND	149809731.4	3	63314086.91	6
7	IDFC ARBITRAGE PLUS FUND	260979908	1	81371447.53	5
8	IDFC CLASSIC EQUITY FUND	30280184.72	1	0	0
9	IDFC INDIA GDP GROWTH FUND	4629814.39	1	0	0
10	IDFC PREMIER EQUITY FUND	0	0	20756704.4	1
11	IDFC SMALL & MIDCAP EQUITY (SME) FUND	55100187	3	26164280.31	3
12	IDFC TAX ADVANTAGE FUND	1864880.05	2	0	0
13	IDFC TAX SAVER FUND-ELSS	5217740.97	5	0	0
14	**Grand Total**	**507882446.6**	**16**	**191606519.2**	**15**
15					

Fig. 4.6.29: EQU result

We can multi-select too. Suppose, we are interested in Equity, non-convertible debentures, futures, repo and government securities. Click on drop down and tick 'select multiple items. The values will now have checkboxes before them. Tick all the values mentioned above.

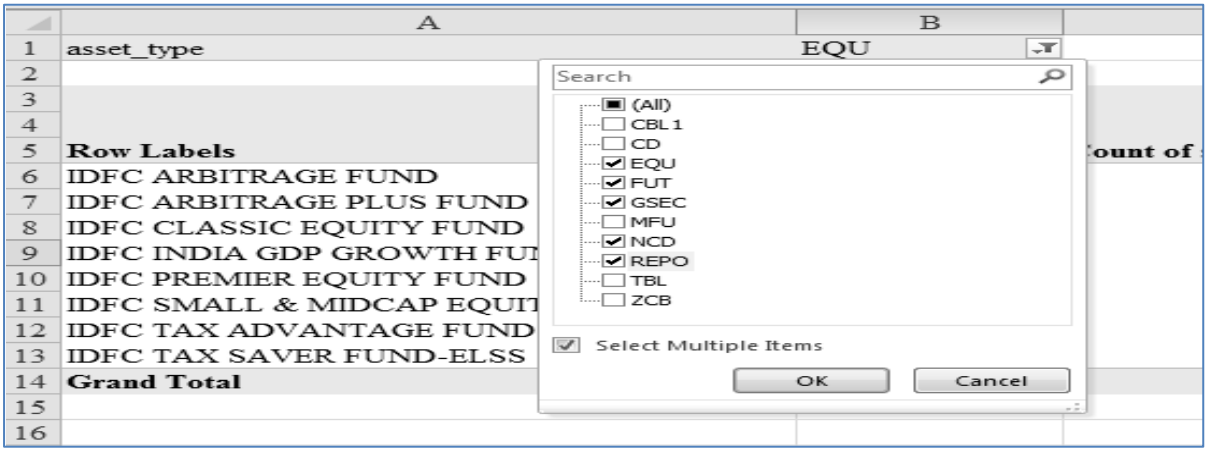


Fig. 4.6.30: Select Multiple Items

Press OK. We can see *Multiple Items* written in the cell B1. The resultant output will be as shown in Fig 4.6.31.

asset_type	(Multiple Items)			
	Column Labels			
	Pur		Sal	
Row Labels	Sum of nett_val	Count of scheme_name	Sum of nett_val	Count of scheme_name
IDFC ARBITRAGE FUND	213190671.7	7	212883136	8
IDFC ARBITRAGE PLUS FUND	351834460.9	8	353034988.7	9
IDFC CLASSIC EQUITY FUND	30280184.72	1	0	0
IDFC DYNAMIC BOND FUND	0	0	144211314.6	4
IDFC FMP - FIFTEEN MONTHS - SERIES 3	1662392.12	1	0	0
IDFC INDIA GDP GROWTH FUND	4629814.39	1	0	0
IDFC MONEY MANAGER FUND - TREASURY PLAN	167727125.8	3	1662392.12	1
IDFC PREMIER EQUITY FUND	20388503.1	1	20756704.4	1
IDFC SMALL & MIDCAP EQUITY (SME) FUND	55100187	3	26164280.31	3
IDFC SUPER SAVER INCOME FUND - INVESTMENT PLAN	0	0	210632218.9	4
IDFC SUPER SAVER INCOME FUND - MEDIUM TERM PLAN	197752722.2	2	197922722.2	2
IDFC SUPER SAVER INCOME FUND - SHORT TERM PLAN	863707967.8	6	858638816.5	11
IDFC TAX ADVANTAGE FUND	1864880.05	2	0	0
IDFC TAX SAVER FUND-ELSS	5217740.97	5	0	0
Grand Total	**1913356651**	**40**	**2025906574**	**43**

Fig. 4.6.31: Multiple Items - result

To see 100% of the data click on (All) in the dropdown. To remove the Report Filter, click on asset_type in Report filter section and click on Remove Field.

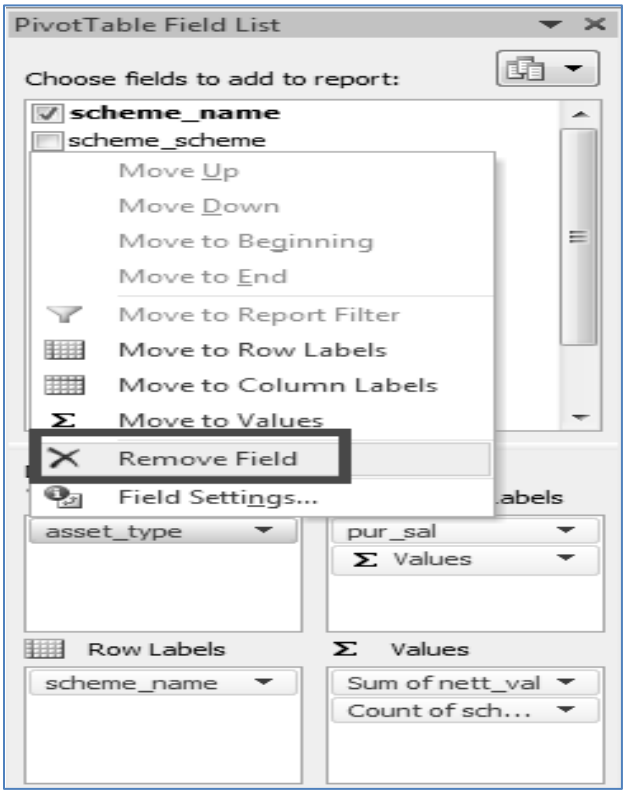


Fig. 4.6.32: Remove Field

4.6.10 Drilling Down To See Detail

We may become curious about one or the other figure generated by Pivot Table. We may like to obtain the underlying records for that value. This can be done very easily in Pivot Table.

	A	B	C
1	asset_type	(All)	
2			
3		Column Labels	
4		Pur	
5	Row Labels	Sum of nett_val	Count of scheme_name
6	IDFC ALL SEASONS BOND FUND	5500000	1
7	IDFC ARBITRAGE FUND	384190671.7	8
8	IDFC ARBITRAGE PLUS FUND	565358788.9	11
9	IDFC CASH FUND	1168000000	1
10	IDFC CLASSIC EQUITY FUND	159280184.7	2
11	IDFC DYNAMIC BOND FUND	1380000000	1
12	IDFC ENTERPRISE EQUITY FUND	1055986302	2
13	IDFC FMP - FIFTEEN MONTHS - SERIES 3	13398568.12	4

Fig. 4.6.33: Curious about a figure

In the above diagram, suppose we find the number 565358788.89 as generated by Pivot Table (marked with cell pointer) interesting. We wish to go through the underlying records which make up this value. In that case, simply double click on this number.

	A	B	C	D	E	F	G	H	I	J	K	L
1	scheme_name	scheme_scheme	asset_type	security	security_name	units	rate	nett_val	pur_sal	value_date	SettlementDate	deal_broker
2	IDFC ARBITRAC	SCAF-PLUS	FUT	ULCC01NSEOCT2009FUT		30800	839.69	25862415	Pur	08-10-09	29-10-09	MOTILAL
3	IDFC ARBITRAC	SCAF-PLUS	FUT	IREL01NSEOCT2009FUT		72800	283.31	20625128	Pur	08-10-09	29-10-09	MACQUARIE
4	IDFC ARBITRAC	SCAF-PLUS	FUT	IREL01NSEOCT2009FUT		65000	283.18	18406824	Pur	08-10-09	29-10-09	UTISEC
5	IDFC ARBITRAC	SCAF-PLUS	FUT	JAAS01NSEOCT2009FUT		68625	241.38	16564792	Pur	08-10-09	29-10-09	MACQUARIE
6	IDFC ARBITRAC	SCAF-PLUS	FUT	LARS02NSEOCT2009FUT		2800	1632.25	4570290	Pur	08-10-09	29-10-09	MOTILAL
7	IDFC ARBITRAC	SCAF-PLUS	FUT	HPEC01NSEOCT2009FUT		6500	395.76	2572463	Pur	08-10-09	29-10-09	EMKAYGLOB
8	IDFC ARBITRAC	SCAF-PLUS	FUT	NIFDEC06FUNSEOCT2009I		450	5005.87	2252641	Pur	08-10-09	29-10-09	MANFIN
9	IDFC ARBITRAC	SCAF-PLUS	ZCB	CIFI250	Citicorp Finance In	660000	109.59	72332436	Pur	08-10-09	09-10-09	LKPSL
10	IDFC ARBITRAC	SCAF-PLUS	ZCB	CIFI250	Citicorp Finance In	20000	109.59	2191892	Pur	08-10-09	09-10-09	LKPSL
11	IDFC ARBITRAC	SCAF-PLUS	EQU	CIPL03	CIPLA LIMITED	900000	289.5	2.61E+08	Pur	08-10-09	09-10-09	JFIB
12	IDFC ARBITRAC	SCAF-PLUS	CBL1	CBLO/091(	CBLO - 09OCT2(	1.39E+08	99.99	1.39E+08	Pur	08-10-09	08-10-09	DIRECT
13												

Fig. 4.6.34: Underlying records opened in a new sheet

The underlying records open up in a new worksheet as shown above.

4.6.11 Pivot Tables and Recalculation

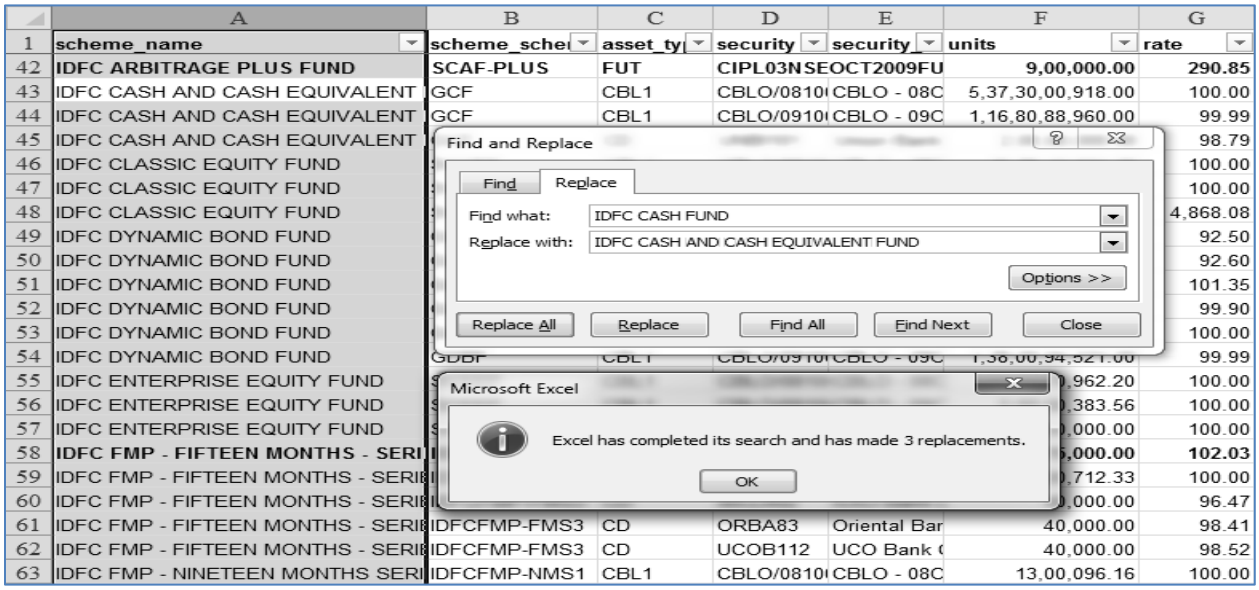
One unfortunate thing about Pivot Tables is that it doesn't automatically update itself when the underlying undergoes a change. This is because excel copies the underlying data in its memory, in order to save time in updating the Pivot Table. Therefore, for any change in the data, we must remember to 'Refresh' Pivot Table.

Consider the Pivot Table as shown in the earlier diagrams. One of the Row Labels is IDFC Cash Fund. Suppose, we realize at a later point that the scheme has undergone a name change, hence the revised name for the scheme is now IDFC Cash & Cash Equivalent Fund. This we may update in our data.

	A	B	C	D	E	F	G
1	scheme_name	scheme_schel	asset_ty	security	security_	units	rate
42	IDFC ARBITRAGE PLUS FUND	SCAF-PLUS	FUT	CIPL03NSEOCT2009FU		9,00,000.00	290.85
43	IDFC CASH FUND	GCF	CBL1	CBLO/0810(	CBLO - 08C	5,37,30,00,918.00	100.00
44	IDFC CASH FUND	GCF	CBL1	CBLO/0910(	CBLO - 09C	1,16,80,88,960.00	99.99
45	IDFC CASH FUND						98.79
46	IDFC CLASSIC EQUITY FUND						100.00
47	IDFC CLASSIC EQUITY FUND						100.00
48	IDFC CLASSIC EQUITY FUND						4,868.08
49	IDFC DYNAMIC BOND FUND						92.50
50	IDFC DYNAMIC BOND FUND						92.60
51	IDFC DYNAMIC BOND FUND						101.35
52	IDFC DYNAMIC BOND FUND						99.90
53	IDFC DYNAMIC BOND FUND						100.00
54	IDFC DYNAMIC BOND FUND						99.99
55	IDFC ENTERPRISE EQUITY FUND	SCEEF	CBL1	CBLO/0810(	CBLO - 08C	99,62,70,962.20	100.00
56	IDFC ENTERPRISE EQUITY FUND	SCEEF	CBL1	CBLO/0910(	CBLO - 09C	5,60,00,383.56	100.00

Fig. 4.6.35: Changes in records

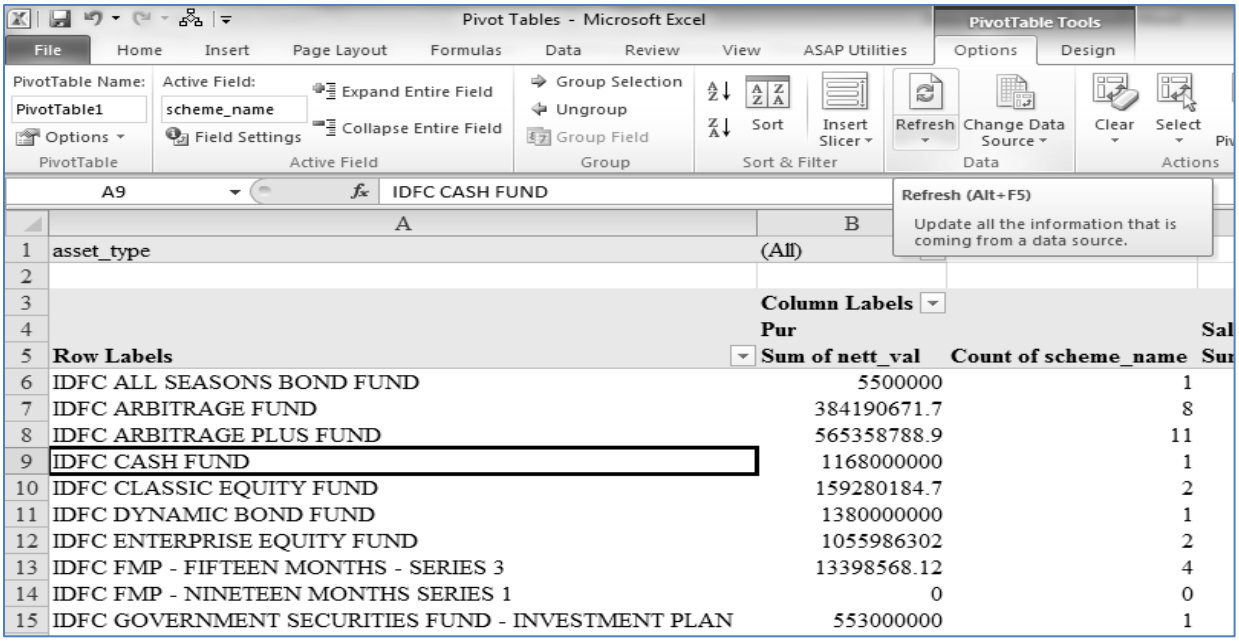
As shown in the above diagram, we may use Find and Replace feature to replace all occurrences of 'IDFC CASH FUND' with 'IDFC CASH AND CASH EQUIVALENT FUND'. Thus, the values in data get updated.



	A	B	C	D	E	F	G
1	scheme_name	scheme_sche	asset_ty	security	security_	units	rate
42	IDFC ARBITRAGE PLUS FUND	SCAF-PLUS	FUT	CIPL03NSE	OCT2009FU	9,00,000.00	290.85
43	IDFC CASH AND CASH EQUIVALENT	GCF	CBL1	CBLO/0810	CBLO - 08C	5,37,30,00,918.00	100.00
44	IDFC CASH AND CASH EQUIVALENT	GCF	CBL1	CBLO/0910	CBLO - 09C	1,16,80,88,960.00	99.99
45	IDFC CASH AND CASH EQUIVALENT						98.79
46	IDFC CLASSIC EQUITY FUND						100.00
47	IDFC CLASSIC EQUITY FUND						100.00
48	IDFC CLASSIC EQUITY FUND						4,868.08
49	IDFC DYNAMIC BOND FUND						92.50
50	IDFC DYNAMIC BOND FUND						92.60
51	IDFC DYNAMIC BOND FUND						101.35
52	IDFC DYNAMIC BOND FUND						99.90
53	IDFC DYNAMIC BOND FUND						100.00
54	IDFC DYNAMIC BOND FUND						99.99
55	IDFC ENTERPRISE EQUITY FUND						100.00
56	IDFC ENTERPRISE EQUITY FUND						100.00
57	IDFC ENTERPRISE EQUITY FUND						100.00
58	IDFC FMP - FIFTEEN MONTHS - SERI						102.03
59	IDFC FMP - FIFTEEN MONTHS - SERI						100.00
60	IDFC FMP - FIFTEEN MONTHS - SERI						96.47
61	IDFC FMP - FIFTEEN MONTHS - SERI	IDFCFMP-FMS3	CD	ORBA83	Oriental Bar	40,000.00	98.41
62	IDFC FMP - FIFTEEN MONTHS - SERI	IDFCFMP-FMS3	CD	UCOB112	UCO Bank (	40,000.00	98.52
63	IDFC FMP - NINETEEN MONTHS SERI	IDFCFMP-NMS1	CBL1	CBLO/0810	CBLO - 08C	13,00,096.16	100.00

Fig. 4.6.36: Replacements done

However, the Pivot Table will not get updated automatically. For that, Go to Pivot Table Tools → Options Tab → Data Group → Refresh



	A	B	C	D
1	asset_type	(All)		
2				
3		Column Labels		
4		Pur		Sal
5	Row Labels	Sum of nett_val	Count of scheme_name	Sur
6	IDFC ALL SEASONS BOND FUND	5500000	1	
7	IDFC ARBITRAGE FUND	384190671.7	8	
8	IDFC ARBITRAGE PLUS FUND	565358788.9	11	
9	IDFC CASH FUND	1168000000	1	
10	IDFC CLASSIC EQUITY FUND	159280184.7	2	
11	IDFC DYNAMIC BOND FUND	1380000000	1	
12	IDFC ENTERPRISE EQUITY FUND	1055986302	2	
13	IDFC FMP - FIFTEEN MONTHS - SERIES 3	13398568.12	4	
14	IDFC FMP - NINETEEN MONTHS SERIES 1	0	0	
15	IDFC GOVERNMENT SECURITIES FUND - INVESTMENT PLAN	553000000	1	

Fig. 4.6.37: Pivot Table still showing old values

On clicking Refresh, we can see that the scheme name has now got updated.

	A	B
1	asset_type	(All)
2		
3		Column Labels
4		Pur
5	Row Labels	Sum of nett_val
6	IDFC ALL SEASONS BOND FUND	5500000
7	IDFC ARBITRAGE FUND	384190671.7
8	IDFC ARBITRAGE PLUS FUND	565358788.9
9	IDFC CASH AND CASH EQUIVALENT FUND	1168000000
10	IDFC CLASSIC EQUITY FUND	159280184.7
11	IDFC DYNAMIC BOND FUND	1380000000
12	IDFC ENTERPRISE EQUITY FUND	1055986302
13	IDFC FMP - FIFTEEN MONTHS - SERIES 3	13398568.12
14	IDFC FMP - NINETEEN MONTHS SERIES 1	0
15	IDFC GOVERNMENT SECURITIES FUND - INVESTMENT PLAN	553000000
16	IDFC GOVERNMENT SECURITIES FUND - PF PLAN	249000000
17	IDFC GOVERNMENT SECURITIES FUND - SHORT TERM PLAN	0
18	IDFC IMPERIAL EQUITY FUND	129779467.3
19	IDFC INDIA GDP GROWTH FUND	4629814.39
20	IDFC LIQUID FUND	0
21	IDFC LIQUIDITY MANAGER FUND	40000000
22	IDFC MONEY MANAGER FUND - INVESTMENT PLAN	1073000000
23	IDFC MONEY MANAGER FUND - TREASURY PLAN	22405802133

Fig. 4.6.38: Pivot Table Refreshed

4.6.12 Limitations of Pivot Tables

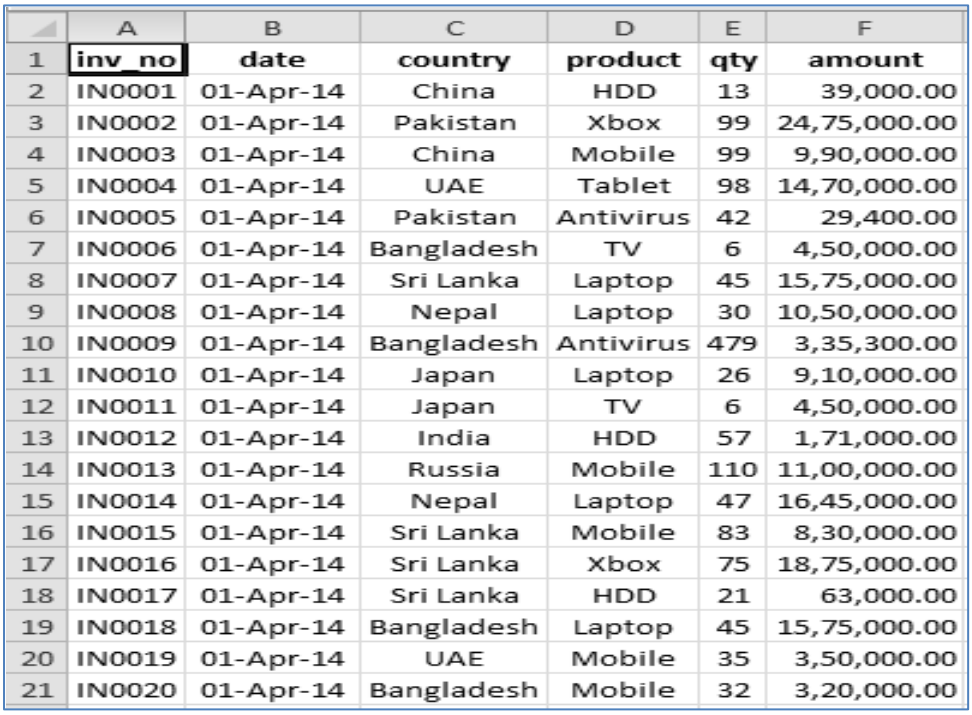
While Pivot Tables are a fascinating tool of data analysis, they suffer from few limitations:

1. We cannot insert rows or columns in between a Pivot Table report.
2. Pivot Tables don't auto-update themselves. We need to refresh them.
3. The data needs to be in rectangular i.e. flat format
4. If the number of records are very large, Pivot Tables may respond slowly

We've looked at few tools of data analysis. Now let's look at some practical case studies where we can apply the tools of data analysis.

4.7 Gap Detection

We know that key documents like invoice numbers should be serially numbered. However, sometimes there may be some invoices which could be 'missing'. In other words, gaps may exist in between two numbers. We can detect gaps by bringing together some tools in excel.



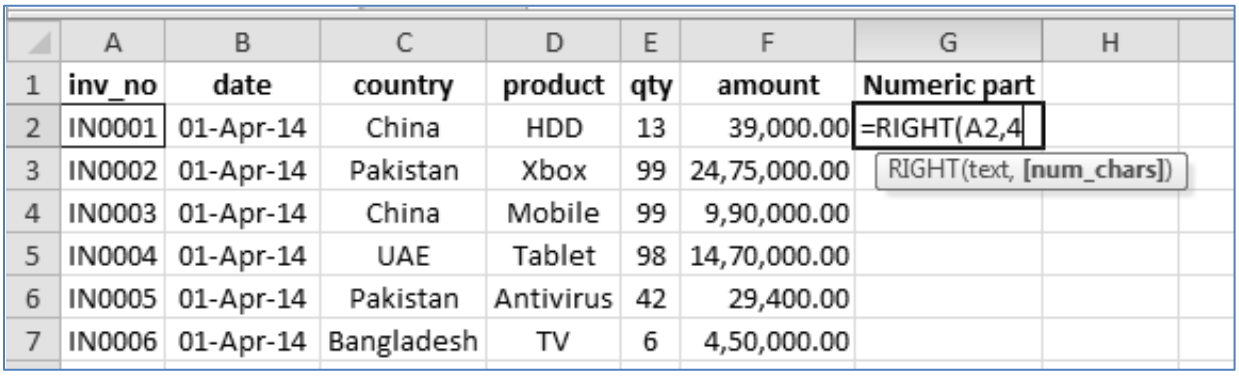
	A	B	C	D	E	F
1	inv_no	date	country	product	qty	amount
2	IN0001	01-Apr-14	China	HDD	13	39,000.00
3	IN0002	01-Apr-14	Pakistan	Xbox	99	24,75,000.00
4	IN0003	01-Apr-14	China	Mobile	99	9,90,000.00
5	IN0004	01-Apr-14	UAE	Tablet	98	14,70,000.00
6	IN0005	01-Apr-14	Pakistan	Antivirus	42	29,400.00
7	IN0006	01-Apr-14	Bangladesh	TV	6	4,50,000.00
8	IN0007	01-Apr-14	Sri Lanka	Laptop	45	15,75,000.00
9	IN0008	01-Apr-14	Nepal	Laptop	30	10,50,000.00
10	IN0009	01-Apr-14	Bangladesh	Antivirus	479	3,35,300.00
11	IN0010	01-Apr-14	Japan	Laptop	26	9,10,000.00
12	IN0011	01-Apr-14	Japan	TV	6	4,50,000.00
13	IN0012	01-Apr-14	India	HDD	57	1,71,000.00
14	IN0013	01-Apr-14	Russia	Mobile	110	11,00,000.00
15	IN0014	01-Apr-14	Nepal	Laptop	47	16,45,000.00
16	IN0015	01-Apr-14	Sri Lanka	Mobile	83	8,30,000.00
17	IN0016	01-Apr-14	Sri Lanka	Xbox	75	18,75,000.00
18	IN0017	01-Apr-14	Sri Lanka	HDD	21	63,000.00
19	IN0018	01-Apr-14	Bangladesh	Laptop	45	15,75,000.00
20	IN0019	01-Apr-14	UAE	Mobile	35	3,50,000.00
21	IN0020	01-Apr-14	Bangladesh	Mobile	32	3,20,000.00

Fig. 4.7.1: Data

Consider the above data. At a cursory glance, we may get an impression that all the invoice numbers are serially numbered. However, this may or may not be completely true. We may like to test whether any gaps exist.

Ideally, we could've simply extracted difference between two consecutive invoice numbers. This would work where we have purely numeric invoice numbers. But over here, we have alphanumeric invoice numbers. Thus, we cannot calculate the difference directly. We need to separate the numeric part first.

If we observe closely, we can see that all the invoice numbers are exactly six characters long and that only the first two characters are alphabets, rest four are numbers. Thus, we can use right function and extract the numeric part.



	A	B	C	D	E	F	G	H
1	inv_no	date	country	product	qty	amount	Numeric part	
2	IN0001	01-Apr-14	China	HDD	13	39,000.00	=RIGHT(A2,4	
3	IN0002	01-Apr-14	Pakistan	Xbox	99	24,75,000.00		
4	IN0003	01-Apr-14	China	Mobile	99	9,90,000.00		
5	IN0004	01-Apr-14	UAE	Tablet	98	14,70,000.00		
6	IN0005	01-Apr-14	Pakistan	Antivirus	42	29,400.00		
7	IN0006	01-Apr-14	Bangladesh	TV	6	4,50,000.00		

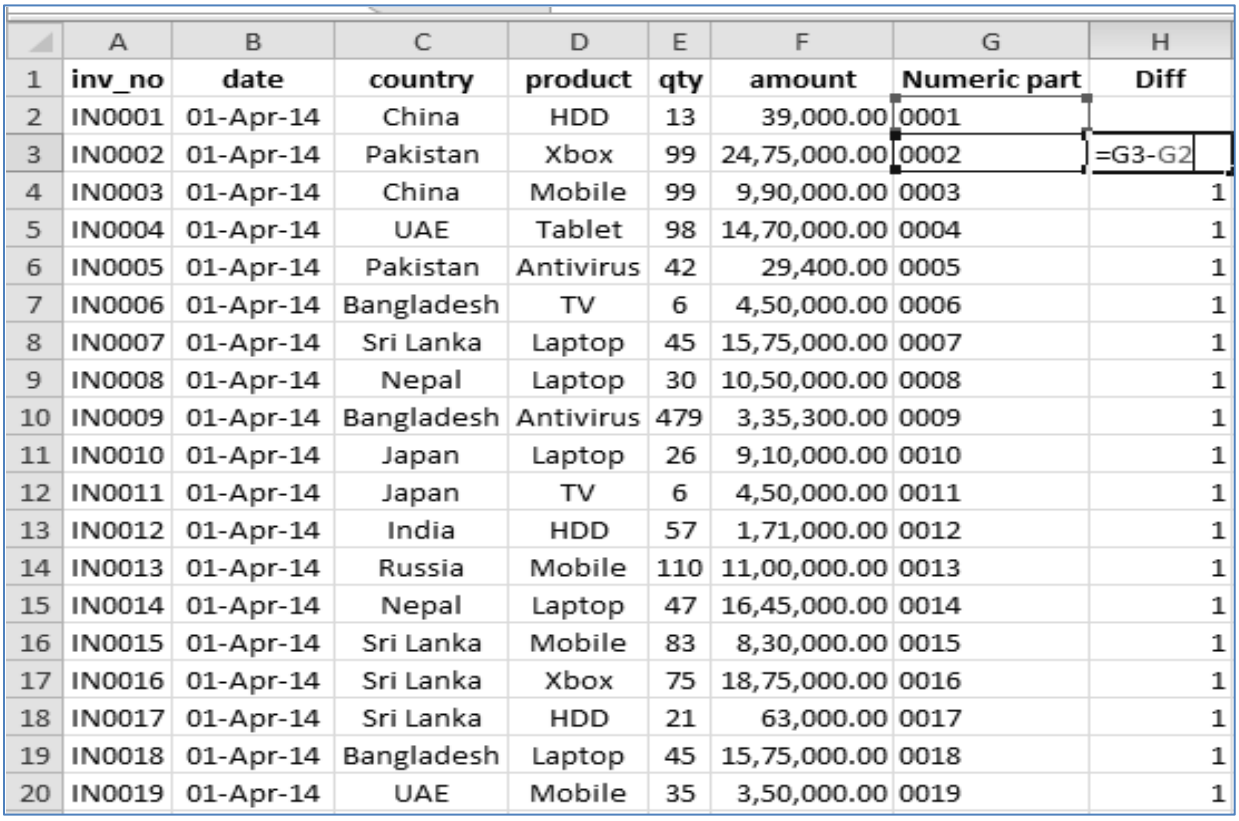
Fig. 4.7.2: Right Function

Drag the formula till the bottom. Then we will get a series of numbers.

	A	B	C	D	E	F	G
1	**inv_no**	**date**	**country**	**product**	**qty**	**amount**	**Numeric part**
2	IN0001	01-Apr-14	China	HDD	13	39,000.00	0001
3	IN0002	01-Apr-14	Pakistan	Xbox	99	24,75,000.00	0002
4	IN0003	01-Apr-14	China	Mobile	99	9,90,000.00	0003
5	IN0004	01-Apr-14	UAE	Tablet	98	14,70,000.00	0004
6	IN0005	01-Apr-14	Pakistan	Antivirus	42	29,400.00	0005
7	IN0006	01-Apr-14	Bangladesh	TV	6	4,50,000.00	0006
8	IN0007	01-Apr-14	Sri Lanka	Laptop	45	15,75,000.00	0007
9	IN0008	01-Apr-14	Nepal	Laptop	30	10,50,000.00	0008
10	IN0009	01-Apr-14	Bangladesh	Antivirus	479	3,35,300.00	0009
11	IN0010	01-Apr-14	Japan	Laptop	26	9,10,000.00	0010
12	IN0011	01-Apr-14	Japan	TV	6	4,50,000.00	0011
13	IN0012	01-Apr-14	India	HDD	57	1,71,000.00	0012
14	IN0013	01-Apr-14	Russia	Mobile	110	11,00,000.00	0013
15	IN0014	01-Apr-14	Nepal	Laptop	47	16,45,000.00	0014
16	IN0015	01-Apr-14	Sri Lanka	Mobile	83	8,30,000.00	0015
17	IN0016	01-Apr-14	Sri Lanka	Xbox	75	18,75,000.00	0016
18	IN0017	01-Apr-14	Sri Lanka	HDD	21	63,000.00	0017
19	IN0018	01-Apr-14	Bangladesh	Laptop	45	15,75,000.00	0018
20	IN0019	01-Apr-14	UAE	Mobile	35	3,50,000.00	0019
21	IN0020	01-Apr-14	Bangladesh	Mobile	32	3,20,000.00	0020

Fig. 4.7.3: Numeric Part

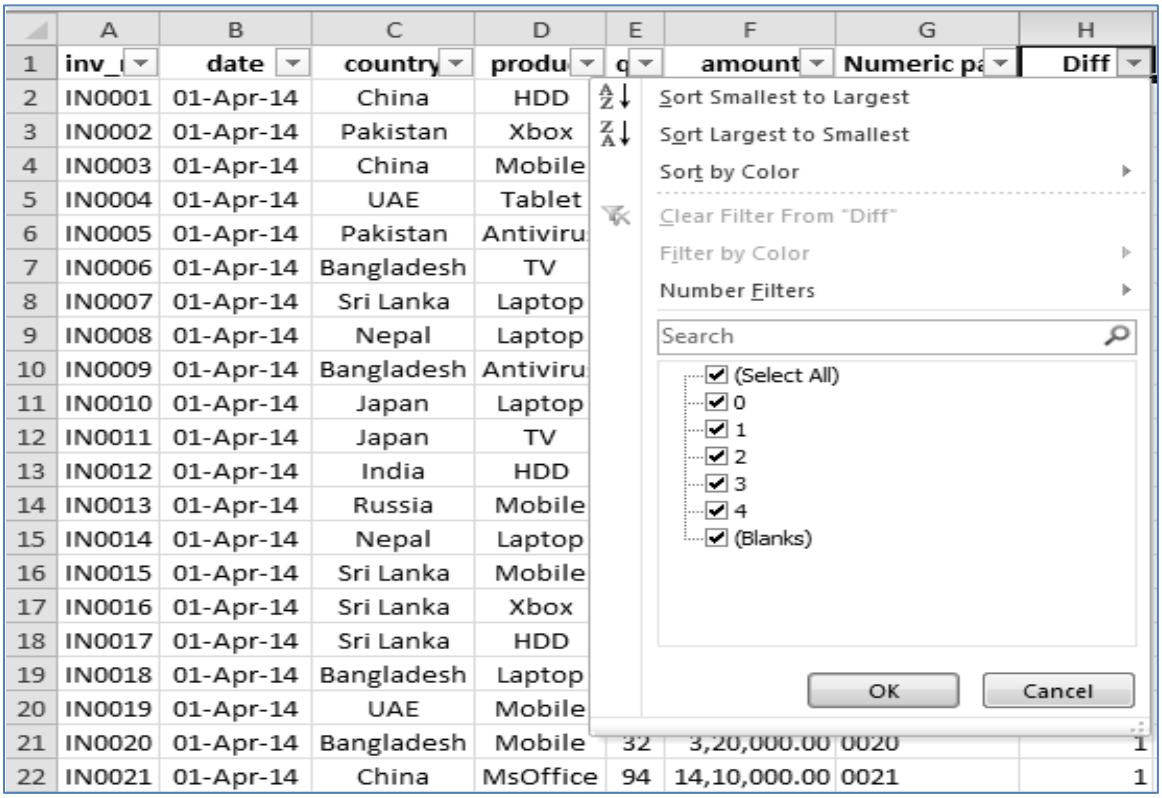
The numbers may carry prefix 0s, but that is alright. Now derive the difference between the two consecutive numeric parts. It they are serially ordered, the difference should be one.



	A	B	C	D	E	F	G	H
1	inv_no	date	country	product	qty	amount	Numeric part	Diff
2	IN0001	01-Apr-14	China	HDD	13	39,000.00	0001	
3	IN0002	01-Apr-14	Pakistan	Xbox	99	24,75,000.00	0002	=G3-G2
4	IN0003	01-Apr-14	China	Mobile	99	9,90,000.00	0003	1
5	IN0004	01-Apr-14	UAE	Tablet	98	14,70,000.00	0004	1
6	IN0005	01-Apr-14	Pakistan	Antivirus	42	29,400.00	0005	1
7	IN0006	01-Apr-14	Bangladesh	TV	6	4,50,000.00	0006	1
8	IN0007	01-Apr-14	Sri Lanka	Laptop	45	15,75,000.00	0007	1
9	IN0008	01-Apr-14	Nepal	Laptop	30	10,50,000.00	0008	1
10	IN0009	01-Apr-14	Bangladesh	Antivirus	479	3,35,300.00	0009	1
11	IN0010	01-Apr-14	Japan	Laptop	26	9,10,000.00	0010	1
12	IN0011	01-Apr-14	Japan	TV	6	4,50,000.00	0011	1
13	IN0012	01-Apr-14	India	HDD	57	1,71,000.00	0012	1
14	IN0013	01-Apr-14	Russia	Mobile	110	11,00,000.00	0013	1
15	IN0014	01-Apr-14	Nepal	Laptop	47	16,45,000.00	0014	1
16	IN0015	01-Apr-14	Sri Lanka	Mobile	83	8,30,000.00	0015	1
17	IN0016	01-Apr-14	Sri Lanka	Xbox	75	18,75,000.00	0016	1
18	IN0017	01-Apr-14	Sri Lanka	HDD	21	63,000.00	0017	1
19	IN0018	01-Apr-14	Bangladesh	Laptop	45	15,75,000.00	0018	1
20	IN0019	01-Apr-14	UAE	Mobile	35	3,50,000.00	0019	1

Fig. 4.7.4: Difference

The best way to check whether the numbers are 1 or no is through filters. Apply filters and check for the different values.



	A	B	C	D	E	F	G	H
1	inv_	date	country	produ	q	amount	Numeric pa	Diff
2	IN0001	01-Apr-14	China	HDD				
3	IN0002	01-Apr-14	Pakistan	Xbox				
4	IN0003	01-Apr-14	China	Mobile				
5	IN0004	01-Apr-14	UAE	Tablet				
6	IN0005	01-Apr-14	Pakistan	Antiviru				
7	IN0006	01-Apr-14	Bangladesh	TV				
8	IN0007	01-Apr-14	Sri Lanka	Laptop				
9	IN0008	01-Apr-14	Nepal	Laptop				
10	IN0009	01-Apr-14	Bangladesh	Antiviru				
11	IN0010	01-Apr-14	Japan	Laptop				
12	IN0011	01-Apr-14	Japan	TV				
13	IN0012	01-Apr-14	India	HDD				
14	IN0013	01-Apr-14	Russia	Mobile				
15	IN0014	01-Apr-14	Nepal	Laptop				
16	IN0015	01-Apr-14	Sri Lanka	Mobile				
17	IN0016	01-Apr-14	Sri Lanka	Xbox				
18	IN0017	01-Apr-14	Sri Lanka	HDD				
19	IN0018	01-Apr-14	Bangladesh	Laptop				
20	IN0019	01-Apr-14	UAE	Mobile				
21	IN0020	01-Apr-14	Bangladesh	Mobile	32	3,20,000.00	0020	1
22	IN0021	01-Apr-14	China	MsOffice	94	14,10,000.00	0021	1

Fig. 4.7.5: All Differences

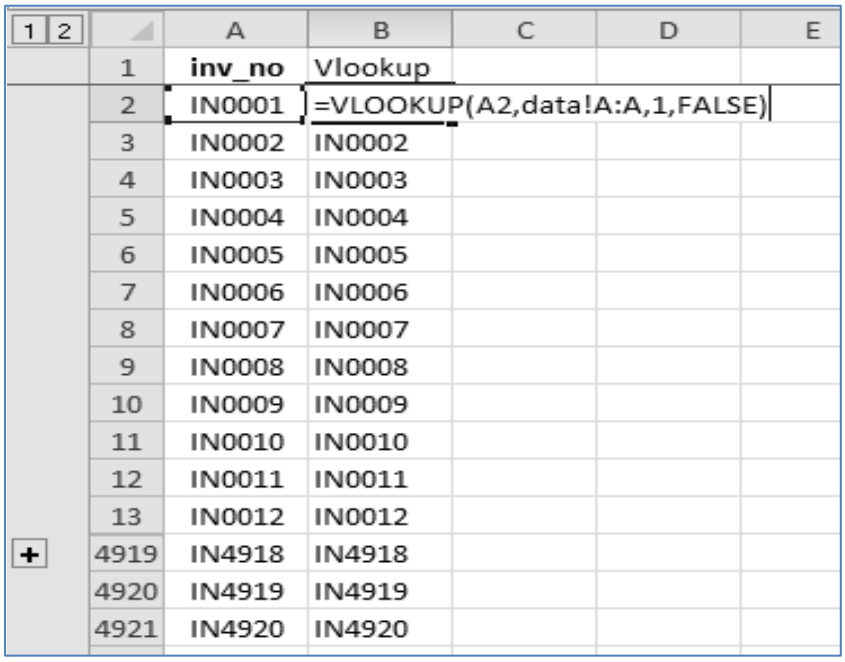
On applying filters, we can see that there are many numbers other than 1. Thus, sometimes one invoice is missing and sometimes more. Therefore, we can conclude that there are gaps in this data. There are also instances of repetition of invoice numbers which is suggested by 0.

If we want a list of the missing invoice numbers, we can make use of Vlookup function. For this, note the smallest and biggest invoice numbers. Accordingly generate a list of all the invoice numbers in this range in another worksheet (You may use fill handle for this!).

	A
1	inv_no
2	IN0001
3	IN0002
4	IN0003
5	IN0004
6	IN0005
7	IN0006
8	IN0007
9	IN0008
10	IN0009
11	IN0010
12	IN0011
13	IN0012
4919	IN4918
4920	IN4919
4921	IN4920

Fig. 4.7.6: List of all Invoices

Above is the list of all invoice numbers, between IN0001 to IN4920. Now apply Vlookup function on the original data.



	A	B	C	D	E
1	inv_no	Vlookup			
2	IN0001	=VLOOKUP(A2,data!A:A,1,FALSE)			
3	IN0002	IN0002			
4	IN0003	IN0003			
5	IN0004	IN0004			
6	IN0005	IN0005			
7	IN0006	IN0006			
8	IN0007	IN0007			
9	IN0008	IN0008			
10	IN0009	IN0009			
11	IN0010	IN0010			
12	IN0011	IN0011			
13	IN0012	IN0012			
4919	IN4918	IN4918			
4920	IN4919	IN4919			
4921	IN4920	IN4920			

Fig. 4.7.7: Vlookup

If there are gaps, the Vlookup will return #N/A error. Apply filters and check for #N/A as shown in Fig 4.7.8.

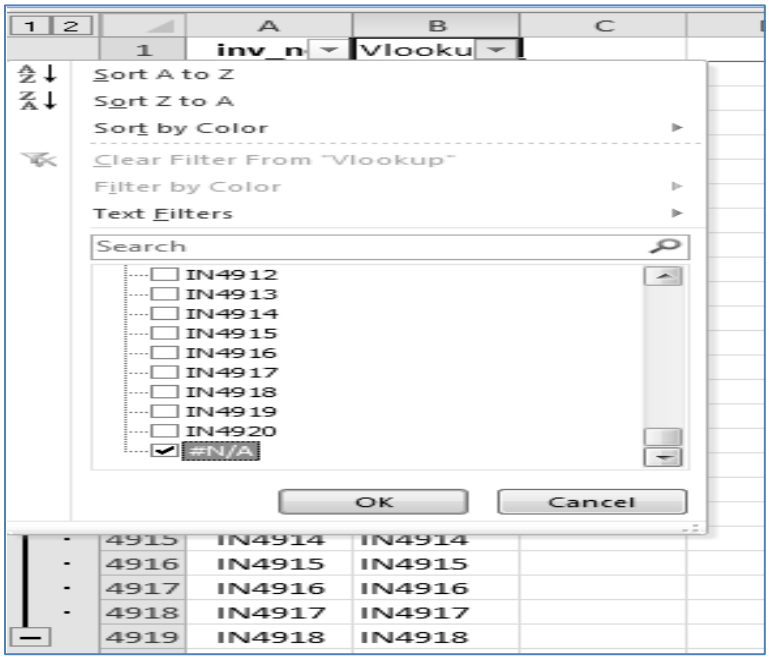


Fig. 4.7.8: Filter on #N/A

Clearly there are #N/A errors. Press OK button and retrieve all such values.

1	2		A	B
		1	inv_n	Vlooku
	·	129	IN0128	#N/A
	·	215	IN0214	#N/A
	·	327	IN0326	#N/A
	·	425	IN0424	#N/A
	·	468	IN0467	#N/A
	·	469	IN0468	#N/A
	·	470	IN0469	#N/A
	·	537	IN0536	#N/A
	·	1117	IN1116	#N/A
	·	1118	IN1117	#N/A
	·	1119	IN1118	#N/A
	·	1181	IN1180	#N/A
	·	1279	IN1278	#N/A
	·	1393	IN1392	#N/A
	·	1505	IN1504	#N/A
	·	1922	IN1921	#N/A
	·	1953	IN1952	#N/A
	·	1966	IN1965	#N/A
	·	2332	IN2331	#N/A
	·	2444	IN2443	#N/A
	·	2920	IN2919	#N/A
	·	3466	IN3465	#N/A
	·	3487	IN3486	#N/A
	·	3488	IN3487	#N/A

Fig. 4.7.9: Missing Invoices

Now this is the list of all missing invoice numbers.

4.8 Benford's Law

This is one the most famous tools used in modern day Forensic Audits. Benford's Law is also known as the law of first digit. This is because it is based on the first digits of numbers. It was propounded by Frank Benford in 1938.

4.8.1 Concept

Conventional probability says that the probability of a particular digit being the 1st digit of a number is 1/9 i.e. 0.1111. It remains the same for any other digit (except 0 which cannot be the 1st digit). Thus all the digits are equi-probable for being the 1st digit of a number.

However, Frank Benford observed that in real life the numbers behave in a different way. The probability of 1st digit being 1 is the highest among all digits. After that, 2 is most probable, after that 3 is most probable and so on. The probability of 9 is the least among all digits. He did extensive research on various unrelated datasets;

including lengths of rivers, molecular weights, physical constants, death rates and even the list of all numbers in a copy of Reader's Digest! Thereafter, he laid down the following table of probabilities:

First Digit	Probability
1	0.30103
2	0.17609
3	0.12494
4	0.09691
5	0.07918
6	0.06695
7	0.05799
8	0.05115
9	0.04576

These probabilities are given by the formula: $P\ (n) = \log_{10}(1 + \frac{1}{n})$

Where n is the leading digit or the first digit of a number.

4.8.2 Benford's Law and Forensic Audits

Benford's Law was used for the first time in Forensic Audits by Dr Mark Nigrini in 1993, when he unearthed a fraud involving bogus payments. Those payments didn't adhere to the pattern suggested by Benford's Law and hence aroused the suspicion of Dr Nigrini. Eventually, they were found out to be fraudulent payments.

Today, this Law is used by every sleuth dealing with numbers, to test whether the numbers appear to be genuine or they appear to be cooked up. Please note that if the numbers deviate from the pattern suggested by the Law, it is not a conclusive evidence of a fraud. It could still be a genuine list. Thus, it is merely an indicator of a possible fraud or what is termed as a 'Red Flag'!

4.8.3 Applying Benford's Law using Excel

We can apply Benford's Law on a data in excel. Consider the following data as shown in Fig 4.8.1.

	A	B	C	D
1	VendorNum	Date	InvNum	Amount
2	2001	02-01-10	4242J10	25.19
3	2001	02-01-10	7810J10	25.86
4	2001	02-01-10	3830I10	26.57
5	2001	02-01-10	9514J10	27.83
6	2001	02-01-10	6296J10	28.09
7	2001	02-01-10	5884J10	28.34
8	2001	02-01-10	6908J10	32.12
9	2001	02-01-10	6882J10	34.22
10	2001	02-01-10	2104J10	34.97
11	2001	02-01-10	0496J10	36.08
12	2001	02-01-10	4325J10	37.31
13	2001	02-01-10	8045J10	38.68
14	2001	02-01-10	4697J10	40.55
15	2001	02-01-10	4812J10	41.79
16	2001	02-01-10	8185J10	42.56
17	2001	02-01-10	6585J10	46.64
18	2001	02-01-10	5611J10	49.00
19	2001	02-01-10	6726J10	49.91
20	2001	02-01-10	3822J10	50.38
21	2001	02-01-10	4410J10	55.22
22	2001	02-01-10	5101J10	55.29
23	2001	02-01-10	2445J10	59.00
24	2001	02-01-10	3281J10	59.56
25	2001	02-01-10	5280J10	63.66

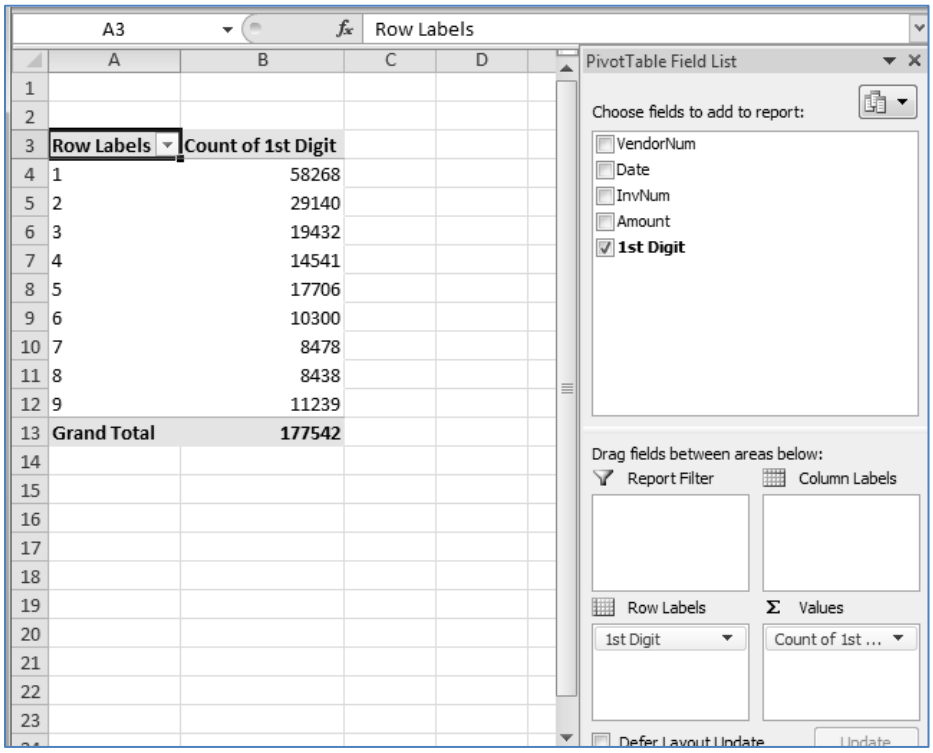
Fig. 4.8.1: Data

Above details are purchase details of an organization, from various vendors. We would like to check whether this data conforms to Benford's Law. For this purpose, we need to extract the first digit of every number. We can use left function for this as shown in Fig 4.8.2.

	A	B	C	D	E
1	VendorNum	Date	InvNum	Amount	1st Digit
2	2001	02-01-10	4242J10	25.19	=LEFT(D2,1)
3	2001	02-01-10	7810J10	25.86	2
4	2001	02-01-10	3830I10	26.57	2
5	2001	02-01-10	9514J10	27.83	2
6	2001	02-01-10	6296J10	28.09	2
7	2001	02-01-10	5884J10	28.34	2
8	2001	02-01-10	6908J10	32.12	3
9	2001	02-01-10	6882J10	34.22	3
10	2001	02-01-10	2104J10	34.97	3
11	2001	02-01-10	0496J10	36.08	3
12	2001	02-01-10	4325J10	37.31	3
13	2001	02-01-10	8045J10	38.68	3
14	2001	02-01-10	4697J10	40.55	4
15	2001	02-01-10	4812J10	41.79	4
16	2001	02-01-10	8185J10	42.56	4
17	2001	02-01-10	6585J10	46.64	4
18	2001	02-01-10	5611J10	49.00	4
19	2001	02-01-10	6726J10	49.91	4
20	2001	02-01-10	3822J10	50.38	5
21	2001	02-01-10	4410J10	55.22	5
22	2001	02-01-10	5101J10	55.29	5
23	2001	02-01-10	2445J10	59.00	5
24	2001	02-01-10	3281J10	59.56	5

Fig. 4.8.2: Left Function

Then we can use Pivot Tables and extract a count of the 1st digit.



Row Labels	Count of 1st Digit
1	58268
2	29140
3	19432
4	14541
5	17706
6	10300
7	8478
8	8438
9	11239
Grand Total	177542

Fig. 4.8.3: Pivot Table on 1st Digit Count

For comparison purpose, we can convert these absolute numbers into percentages, using Value Field Settings → Show Numbers As → % of Grand Total (Discussed above in Pivot Tables section)

Row Labels	Count of 1st Digit
1	32.82%
2	16.41%
3	10.95%
4	8.19%
5	9.97%
6	5.80%
7	4.78%
8	4.75%
9	6.33%
Grand Total	100.00%

Fig. 4.8.4: Pivot Table on 1st Digit %

Thus, we get the above percentages. Now we can plot the Benford's Law percentages. For this purpose, we can use the formula stated above i.e. $P\ (n) = \log_{10}(1 + \frac{1}{n})$. To achieve this, we can use Log10 function in excel. Thereafter, format the cells as percentage with two decimals.

	A	B	C	D
1				
2				
3	**Row Labels**	**Count of 1st Digit**	BL %	
4	1	32.82%	=LOG10(1+1/A4)	
5	2	16.41%	17.61%	
6	3	10.95%	12.49%	
7	4	8.19%	9.69%	
8	5	9.97%	7.92%	
9	6	5.80%	6.69%	
10	7	4.78%	5.80%	
11	8	4.75%	5.12%	
12	9	6.33%	4.58%	
13	**Grand Total**	**100.00%**		

Fig. 4.8.5: BenFord's Law %

The percentages on the original data are almost similar to Benford's percentages. Thus, we may conclude that apparently the numbers in this data are genuine numbers.

Note: The conclusion is highly subjective in nature. Someone else may feel the difference in digit 5 and corresponding difference in digit 9 as significant and may try to investigate them in further details.

4.9 Aging Analysis

Aging analysis involves breaking down inventories, receivables etc. into categories based upon number of days since the current asset has come into existence. As these current assets become old they warrant asset provisioning or even a write off. Thus, aging analysis is very important from auditing perspective.

The biggest challenge in aging analysis lies in categorizing current asset values. Let us see how that can be achieved with the help of excel.

	A	B	C
1	Customer ID	Date of Sale	Amount
2	1	15-Jan-17	22304
3	2	15-Jan-17	50806
4	1	08-Apr-17	89039
5	1	10-May-17	31069
6	2	23-Feb-17	52936
7	3	29-Jan-17	68252
8	3	19-Feb-17	55569
9	1	30-Mar-17	29435
10	2	23-Feb-17	84216
11	1	09-Feb-17	5129
12	1	09-May-17	25624
13	3	29-Apr-17	96923
14	6	23-Mar-17	43423
15	5	21-May-17	29233
16	4	27-Feb-17	37885
17	4	30-May-17	90869
18	6	08-Mar-17	70026
19	9	06-Jun-17	47854
20	8	09-May-17	53761
21	1	30-May-17	45144

Fig. 4.9.1: Data

Consider the above diagram. It lays down outstanding receivables. The date of sale is also mentioned. Based on the date of sale and today's date, we can derive the age of the receivable and hence categorise it.

For this, we will dedicate a cell to write today's date. If preferred, we can even use the function Today().

	A	B	C
1	Today's Date	=TODAY()	
2			
3	Customer ID	Date of Sale	Amount
4	1	15-Jan-17	22304
5	2	15-Jan-17	50806
6	1	08-Apr-17	89039
7	1	10-May-17	31069
8	2	23-Feb-17	52936
9	3	29-Jan-17	68252
10	3	19-Feb-17	55569
11	1	30-Mar-17	29435

Fig. 4.9.2: Today

Then find out age of each receivable. For this, compute the difference between today's date and the date of sale for each receivable.

	A	B	C	D
1	Today's Date	15-06-17		
2				
3	**Customer ID**	**Date of Sale**	**Amount**	**Age (days)**
4	1	15-Jan-17	22304	=$B$1-B4
5	2	15-Jan-17	50806	151
6	1	08-Apr-17	89039	68
7	1	10-May-17	31069	36
8	2	23-Feb-17	52936	112
9	3	29-Jan-17	68252	137
10	3	19-Feb-17	55569	116
11	1	30-Mar-17	29435	77
12	2	23-Feb-17	84216	112
13	1	09-Feb-17	5129	126
14	1	09-May-17	25624	37
15	3	29-Apr-17	96923	47
16	6	23-Mar-17	43423	84
17	5	21-May-17	29233	25
18	4	27-Feb-17	37885	108
19	4	30-May-17	90869	16
20	6	08-Mar-17	70026	99
21	9	06-Jun-17	47854	9
22	8	09-May-17	53761	37
23	1	30-May-17	45144	16

Fig. 4.9.3: Age of Receivables

You may note the '$' symbols used while referring to the cell B1. This ensures that cell B1 is fixed while the formula is copied till the bottom.

Thereafter, create categories of ages and accordingly put headings. Following categories are considered here:

	A	B	C	D	E	F	G	H	I
1	Today's Date	15-06-17							
2									
3	**Customer ID**	**Date of Sale**	**Amount**	**Age (days)**	**Not Due**	**45 - 59**	**60 - 74**	**75 - 89**	**>= 90**
4	1	15-Jan-17	22304	151					
5	2	15-Jan-17	50806	151					
6	1	08-Apr-17	89039	68					

Fig. 4.9.4: Categories

Now comes the most challenging part. How to categorise the receivables? For this, we will make use of different formulas involving if function. Let's consider the formula for 'Not Due' category. Put the following formula:

	A	B	C	D	E	F
1	Today's Date	15-06-17				
2						
3	**Customer ID**	**Date of Sale**	**Amount**	**Age (days)**	**Not Due**	**45 - 59**
4	1	15-Jan-17	22304	151	=IF(D4<45,C4,0)	
5	2	15-Jan-17	50806	151		
6	1	08-Apr-17	89039	68		
7	1	10-May-17	31069	36		
8	2	23-Feb-17	52936	112		
9	3	29-Jan-17	68252	137		
10	3	19-Feb-17	55569	116		
11	1	30-Mar-17	29435	77		
12	2	23-Feb-17	84216	112		
13	1	09-Feb-17	5129	126		
14	1	09-May-17	25624	37		
15	3	29-Apr-17	96923	47		
16	6	23-Mar-17	43423	84		
17	5	21-May-17	29233	25		
18	4	27-Feb-17	37885	108		
19	4	30-May-17	90869	16		
20	6	08-Mar-17	70026	99		
21	9	06-Jun-17	47854	9		
22	8	09-May-17	53761	37		
23	1	30-May-17	45144	16		

Fig. 4.9.5: If Function

It's a simple formula which considers whether the age is less than 45 days or no. Now we will put the formula for the category '45-59' which is as shown in Fig 4.9.6.

	A	B	C	D	E	F	G	H
1	Today's Date	15-06-17						
2								
3	**Customer ID**	**Date of Sale**	**Amount**	**Age (days)**	**Not Due**	**45 - 59**	**60 - 74**	**75 - 89**
4	1	15-Jan-17	22304	151	0	=IF(AND(D4>=45,D4<60),C4,0)		
5	2	15-Jan-17	50806	151	0	0		
6	1	08-Apr-17	89039	68	0	0		
7	1	10-May-17	31069	36	31069	0		
8	2	23-Feb-17	52936	112	0	0		
9	3	29-Jan-17	68252	137	0	0		
10	3	19-Feb-17	55569	116	0	0		
11	1	30-Mar-17	29435	77	0	0		
12	2	23-Feb-17	84216	112	0	0		
13	1	09-Feb-17	5129	126	0	0		
14	1	09-May-17	25624	37	25624	0		
15	3	29-Apr-17	96923	47	0	96923		
16	6	23-Mar-17	43423	84	0	0		
17	5	21-May-17	29233	25	29233	0		
18	4	27-Feb-17	37885	108	0	0		
19	4	30-May-17	90869	16	90869	0		
20	6	08-Mar-17	70026	99	0	0		
21	9	06-Jun-17	47854	9	47854	0		
22	8	09-May-17	53761	37	53761	0		
23	1	30-May-17	45144	16	45144	0		

Fig. 4.9.6: If Function with And

Here a slightly complex formula is used. The age is checked whether it is *greater than or equal to 45 days* as well as *less than 60 days* or no.

Similarly, we can put the other formulas for other categories and derive totals. Our categorization is over!

	A	B	C	D	E	F	G	H	I
1	Today's Date	15-06-17							
2					IF(D2<45,C2,0)	IF(AND(D2>=45,D2<60),C2,0)	IF(AND(D2>=60,D2<75),C2,0)	IF(AND(D2>=75,D2<90),C2,0)	IF(D2>=90,C2,0)
3	**Customer ID**	**Date of Sale**	**Amount**	**Age (days)**	**Not Due**	**45 - 59**	**60 - 74**	**75 - 89**	**>= 90**
4	1	15-Jan-17	22304	151	0	0	0	0	22304
5	2	15-Jan-17	50806	151	0	0	0	0	50806
6	1	08-Apr-17	89039	68	0	0	89039	0	0
7	1	10-May-17	31069	36	31069	0	0	0	0
8	2	23-Feb-17	52936	112	0	0	0	0	52936
9	3	29-Jan-17	68252	137	0	0	0	0	68252
10	3	19-Feb-17	55569	116	0	0	0	0	55569
11	1	30-Mar-17	29435	77	0	0	0	29435	0
12	2	23-Feb-17	84216	112	0	0	0	0	84216
13	1	09-Feb-17	5129	126	0	0	0	0	5129
14	1	09-May-17	25624	37	25624	0	0	0	0
15	3	29-Apr-17	96923	47	0	96923	0	0	0
16	6	23-Mar-17	43423	84	0	0	0	43423	0
17	5	21-May-17	29233	25	29233	0	0	0	0
18	4	27-Feb-17	37885	108	0	0	0	0	37885
19	4	30-May-17	90869	16	90869	0	0	0	0
20	6	08-Mar-17	70026	99	0	0	0	0	70026
21	9	06-Jun-17	47854	9	47854	0	0	0	0
22	8	09-May-17	53761	37	53761	0	0	0	0
23	1	30-May-17	45144	16	45144	0	0	0	0
24									
25	Total		**1029497**		**323554**	**96923**	**89039**	**72858**	**447123**

Fig. 4.9.7: All Formulas

Now that the categorization is over, we can perform the analysis. Huge numbers as well as amount of receivables are due for more than 90 days. Therefore, the auditee must take strict action and recover those receivables.

4.10 Statistical Analysis

We may carry out some statistical analysis to understand our data better. For this, there is an add-in available in excel, known as Analysis Toolpak. This add-in makes statistical analysis quick and smooth, thus saving valuable time and efforts.

This add-in lurks in the background. We must activate it first, without which we cannot use it. Click on File → Options. In the Options window, click on Add-ins as shown in Fig 4.10.1.

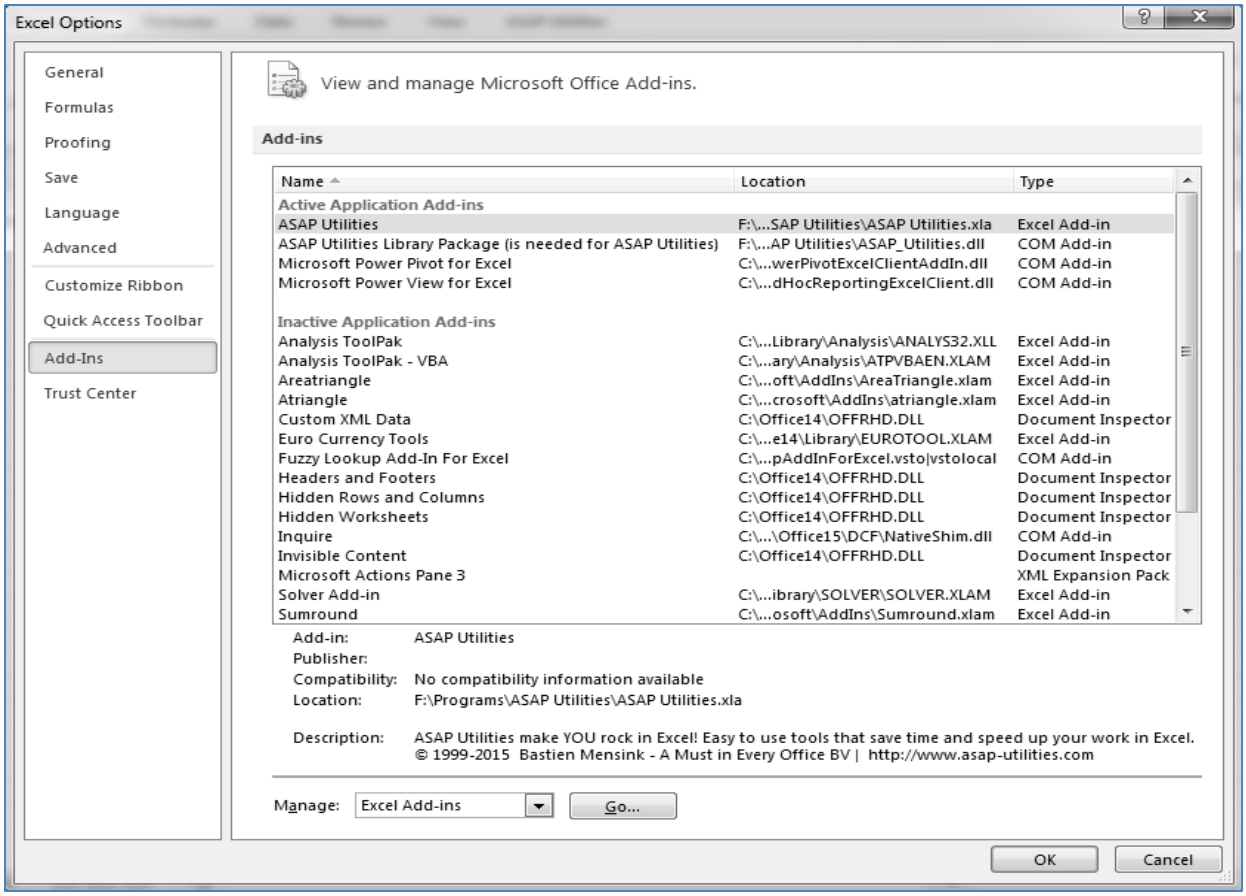


Fig. 4.10.1: Add-Ins

Click on Go button beside Excel Add-ins. Add-ins window appears as shown in Fig 4.10.2

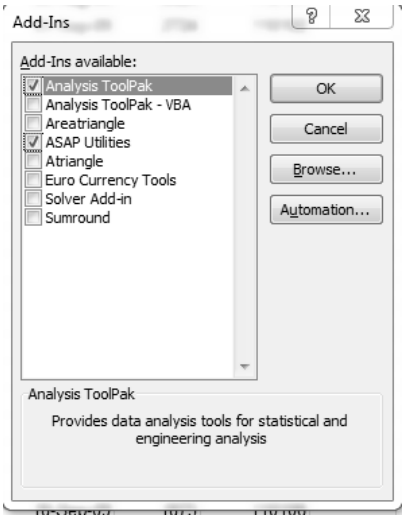


Fig. 4.10.2: Analysis ToolPak

Tick Analysis ToolPak and press OK. Then visit Data Tab. You will see a new group added to the tab called Analysis as shown in Fig 4.10.3.

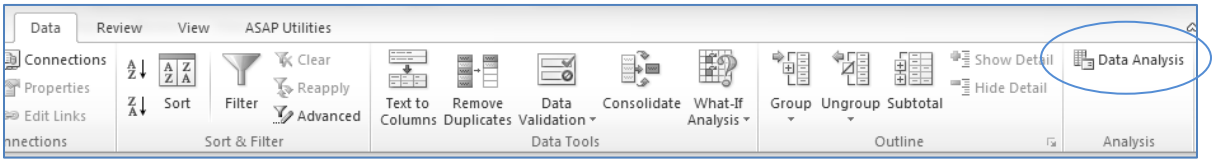


Fig. 4.10.3: Analysis Group

We can do statistical analysis using this group.

4.10.1 Sampling

As a part of audit, many times we are required to work on a sample. Say, we have got a list of bank account numbers and we wish to draw a sample out of it for audit. Instead of drawing out sample manually (thus losing randomness), we can let excel draw the sample for us. This will remove bias, if any.

	A
1	Bank A/cs
2	6045582597
3	7348738949
4	3164610104
5	6244174577
6	4282834392
7	7113799506
8	8644184950
9	2186258812
10	6690500262
11	9978928130
12	3391045582
998	6442535846
999	3044711363
1000	4992545084
1001	3685848652

Fig. 4.10.4: Data

Above is a list of 1000 bank account numbers. We would like to draw a sample of 200 accounts. For this, we can use the Data Analysis feature. Click on Data Tab → Analysis Group → Data Analysis.

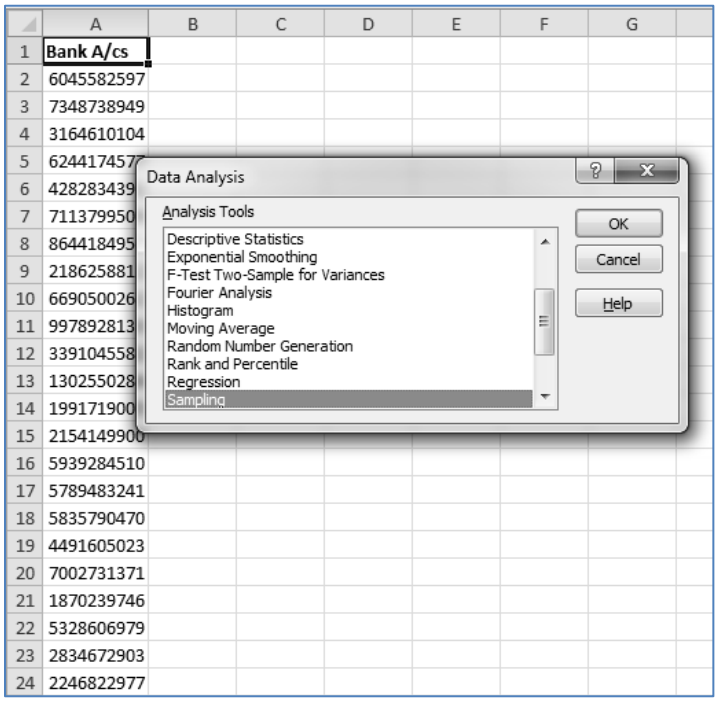


Fig. 4.10.5: Sampling

The Data Analysis window opens up. Select Sampling and press OK as shown in Fig 4.10.6.

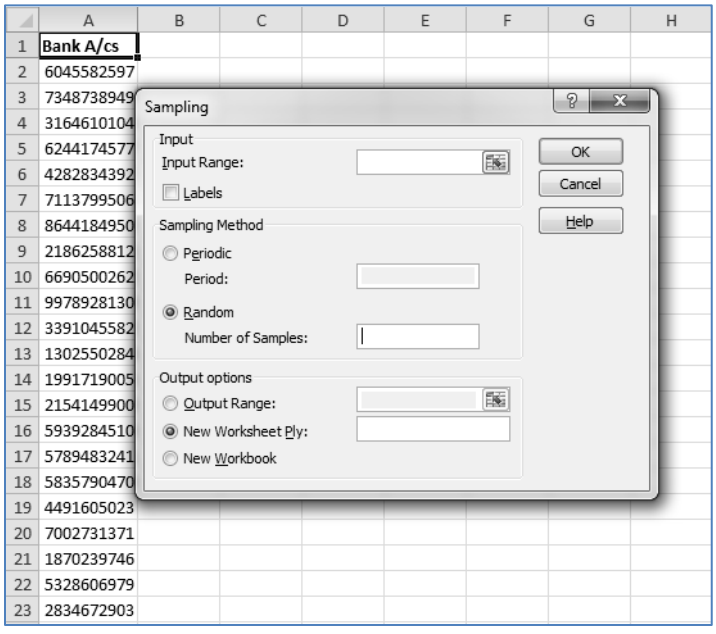


Fig. 4.10.6: Sampling Window

Sampling window opens as shown in Fig 4.10.7. It is a simple interactive window which captures basic details and gives you the output. Specify input range as A1 to A1001, Tick labels and No of samples (sample size) as 200.

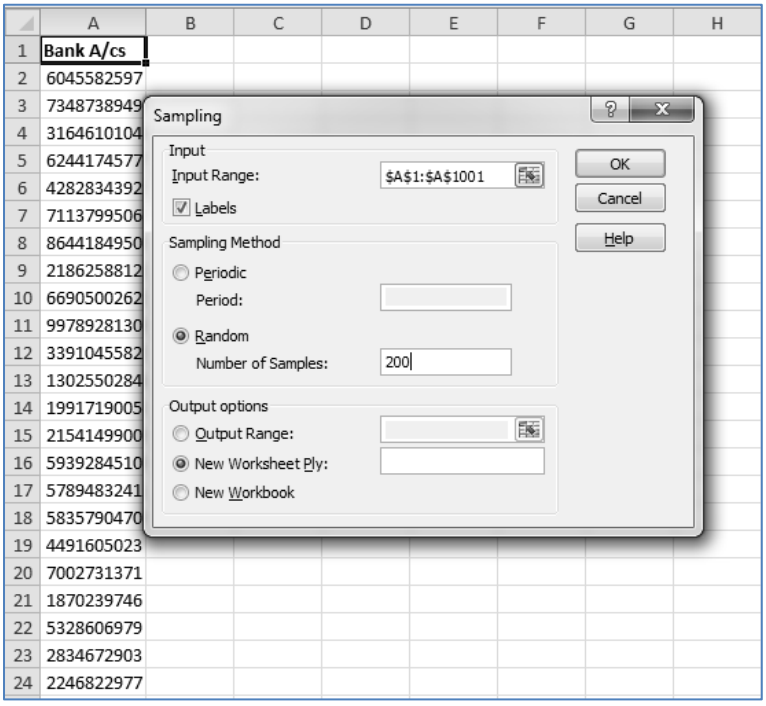


Fig. 4.10.7: Inputs of Sampling

Press OK. The random sample will be generated and will be placed in a new worksheet.

	A
1	1083130485
2	7513289184
3	1269651530
4	3164481966
5	7365260359
6	8813601409
7	6971808409
8	7104722060
9	7182707130
10	1942614864
11	1597394978
198	8069437854
199	2873989480
200	5791782051

Fig. 4.10.8: Sample

4.10.2 Stratification

'Strata' means groups or categories. It is the plural of the Latin word 'stratum'. Stratification involves breaking heterogeneous data into homogenous groups called as strata. This is a pre-requisite for sampling where the data is not homogenous. Instead of taking out sample directly from the entire population, we can first divide the data into homogenous strata and then draw out sample elements from each 'strata'.

The procedure for stratification is very similar to the aging analysis that we carried out earlier. Consider the following data as shown in Fig 4.10.9.

	A	B	C
1	Customer ID	Date of Sale	Amount
2	1	15-Jan-17	22304
3	2	15-Jan-17	50806
4	1	08-Apr-17	89039
5	1	10-May-17	31069
6	2	23-Feb-17	52936
7	3	29-Jan-17	68252
8	3	19-Feb-17	55569
9	1	30-Mar-17	29435
10	2	23-Feb-17	84216
11	1	09-Feb-17	5129
12	1	09-May-17	25624
13	3	29-Apr-17	96923
14	6	23-Mar-17	43423
15	5	21-May-17	29233
16	4	27-Feb-17	37885
17	4	30-May-17	90869
18	6	08-Mar-17	70026
19	9	06-Jun-17	47854
20	8	09-May-17	53761
21	1	30-May-17	45144

Fig. 4.10.9: Data

Say, we would like to categorise this data into Very Small, Small, Moderate, Large and Very Large. For this purpose the category limits may be as follows:

1. Very Small – 0 to 20,000
2. Small – 20,001 to 40,000
3. Moderate – 40,001 to 60,000
4. Large – 60,001 to 80,000
5. Very Large – 80,001 to 1,00,000

What may naturally spring to our minds is to use IF function (similar to the way we used in case of aging analysis). We can definitely achieve stratification using IF function. It will involve use of multiple IFs nested one inside the other for each category. In fact, one IF less than the total number of categories. Since we are considering 5 categories, we will need 4 IFs.

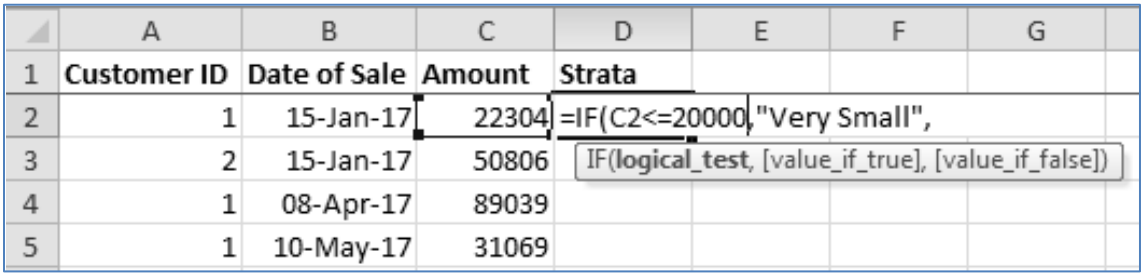


Fig. 4.10.10: First IF function

Above diagram as shown in Fig 4.10.10, the construction of the 1st IF. Its *logical test* checks whether the number is less than or equal to 20,000. If yes, it will be categorised as 'Very Small'. Now in place of the *value if false* of the IF function, we will have to put the 2nd IF.

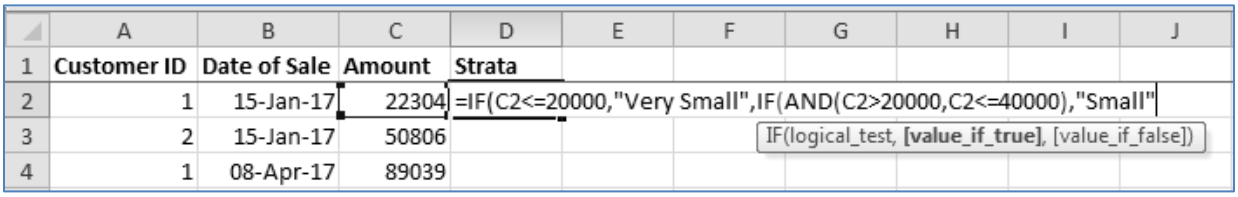
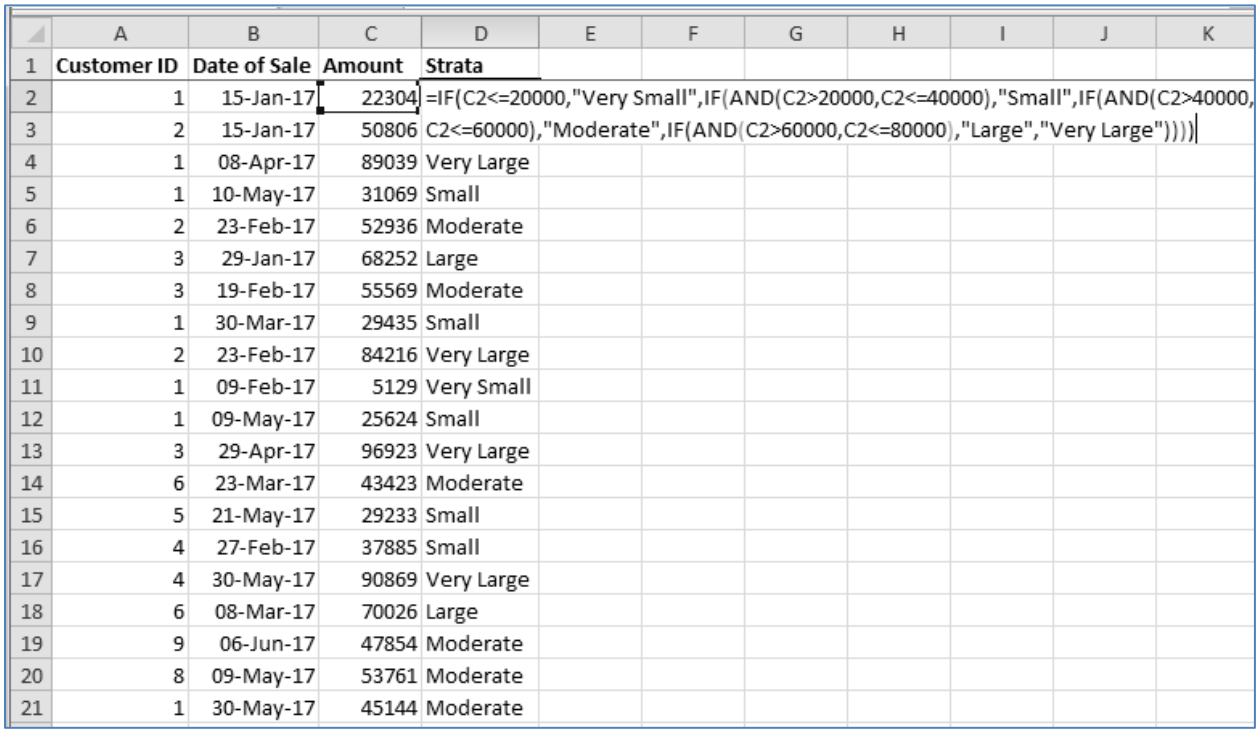


Fig. 4.10.11: Second IF Function

In the 2nd IF, in place of the *logical test* argument, use AND function. This will enable us to categorise all values *greater than 20,000* but *less than or equal to 40,000*. If yes, it will be categorised as 'Small'. In place of the *value if false* argument, we will have to put the 3rd IF. Likewise, we can continue and can construct the entire formula.



	A	B	C	D	E	F	G	H	I	J	K
1	Customer ID	Date of Sale	Amount	Strata							
2	1	15-Jan-17	22304	=IF(C2<=20000,"Very Small",IF(AND(C2>20000,C2<=40000),"Small",IF(AND(C2>40000,							
3	2	15-Jan-17	50806	C2<=60000),"Moderate",IF(AND(C2>60000,C2<=80000),"Large","Very Large"))))							
4	1	08-Apr-17	89039	Very Large							
5	1	10-May-17	31069	Small							
6	2	23-Feb-17	52936	Moderate							
7	3	29-Jan-17	68252	Large							
8	3	19-Feb-17	55569	Moderate							
9	1	30-Mar-17	29435	Small							
10	2	23-Feb-17	84216	Very Large							
11	1	09-Feb-17	5129	Very Small							
12	1	09-May-17	25624	Small							
13	3	29-Apr-17	96923	Very Large							
14	6	23-Mar-17	43423	Moderate							
15	5	21-May-17	29233	Small							
16	4	27-Feb-17	37885	Small							
17	4	30-May-17	90869	Very Large							
18	6	08-Mar-17	70026	Large							
19	9	06-Jun-17	47854	Moderate							
20	8	09-May-17	53761	Moderate							
21	1	30-May-17	45144	Moderate							

Fig. 4.10.12: Complete Formula

We can see that the formula has turned out to be extremely long and tedious. It is bound to become further complex if more categories are to added. Therefore, we may wonder whether there exists a better solution. Fortunately, there exists a simpler way!

In the earlier chapter on Functions, we had learnt about Vlookup function. More specifically, we had discussed the situations where we can define the range lookup argument of Vlookup as true. (If your memory eludes you, quickly visit those pages and refresh your memory).

We will now use the Vlookup function and will achieve the same output, albeit in a much cleaner way. Firstly, let us make a table outlining all the categories in our minds.

G	H	I
From	To	Category
0	20000	Very Small
20001	40000	Small
40001	60000	Moderate
60001	80000	Large
80001	100000	Very Large

Fig. 4.10.13: Category Table

Now let's apply Vlookup. Consider the following formula:

	A	B	C	D	E	F	G	H	I
1	Customer ID	Date of Sale	Amount	Strata			From	To	Category
2	1	15-Jan-17	22304	=VLOOKUP(C2,$G$1:$I$6,3		TRUE)	0	20000	Very Small
3	2	15-Jan-17	50806				20001	40000	Small
4	1	08-Apr-17	89039				40001	60000	Moderate
5	1	10-May-17	31069				60001	80000	Large
6	2	23-Feb-17	52936				80001	100000	Very Large
7	3	29-Jan-17	68252						

Fig. 4.10.14: Vlookup Formula

It is a simple formula involving a single Vlookup with no other complex combination of functions. We have fixed the *table array* by using dollar symbols. Also note that the last argument is defined as TRUE (approximate match). This is imperative; otherwise we will get #N/A errors.

The final output is as shown in Fig 4.10.15

	A	B	C	D	E	F	G	H	I
1	Customer ID	Date of Sale	Amount	Strata			From	To	Category
2	1	15-Jan-17	22304	=VLOOKUP(C2,$G$1:$I$6,3,TRUE)			0	20000	Very Small
3	2	15-Jan-17	50806	Moderate			20001	40000	Small
4	1	08-Apr-17	89039	Very Large			40001	60000	Moderate
5	1	10-May-17	31069	Small			60001	80000	Large
6	2	23-Feb-17	52936	Moderate			80001	100000	Very Large
7	3	29-Jan-17	68252	Large					
8	3	19-Feb-17	55569	Moderate					
9	1	30-Mar-17	29435	Small					
10	2	23-Feb-17	84216	Very Large					
11	1	09-Feb-17	5129	Very Small					
12	1	09-May-17	25624	Small					
13	3	29-Apr-17	96923	Very Large					
14	6	23-Mar-17	43423	Moderate					
15	5	21-May-17	29233	Small					
16	4	27-Feb-17	37885	Small					
17	4	30-May-17	90869	Very Large					
18	6	08-Mar-17	70026	Large					
19	9	06-Jun-17	47854	Moderate					
20	8	09-May-17	53761	Moderate					
21	1	30-May-17	45144	Moderate					

Fig. 4.10.15: Final Output using Vlookup

The best part about using Vlookup function rather than nested IF is the scale independence. Whether it's 5 categories or 500 categories, Vlookup can be used with equal ease. The formula remains the same. We can also add new categories or edit existing categories at a later point very easily. All we need to do is to update the table. Thus, this is a much better approach.

Post stratification, now this data can be used for the purpose of sampling using Analysis Toolpak or any other tool. Sample elements should be derived from each distinct strata to make the sample truly representative of the population.

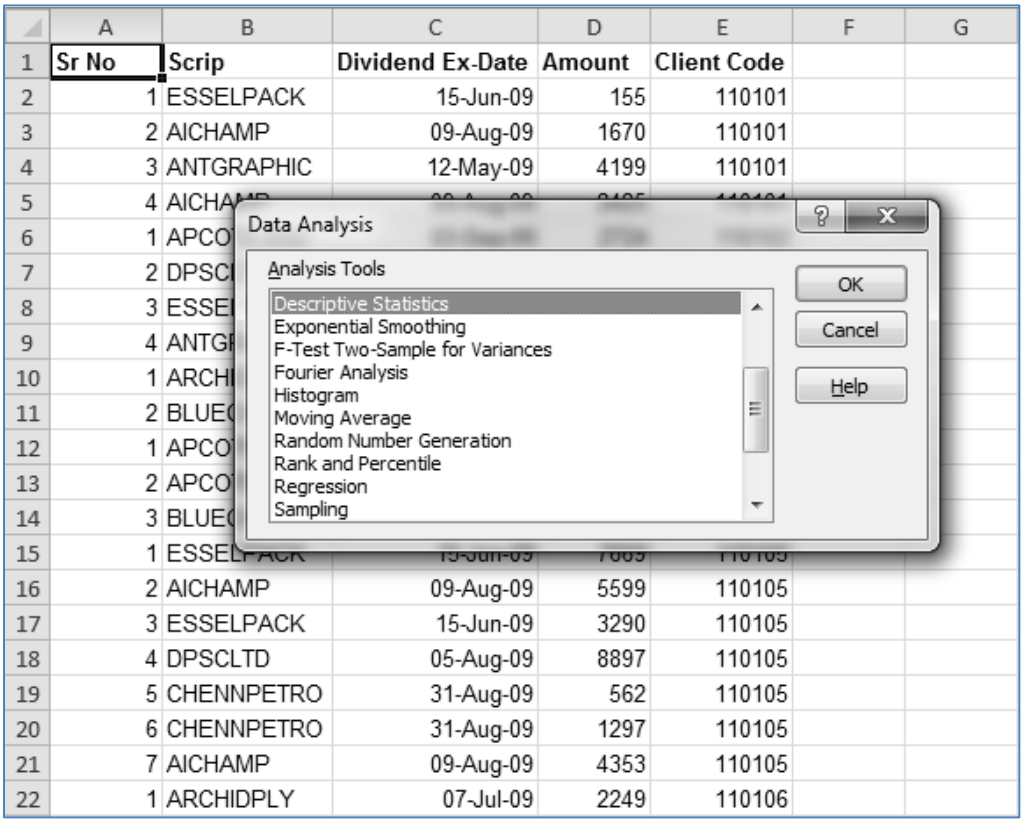
4.10.3 Descriptive Statistics

Suppose we have some data and we wish to calculate a number of basic statistics like mean, median, mode etc. Either we can make use of individual functions one by one and derive them or we can make use of Data Analysis and generate all of them at once. We will use the latter approach now.

	A	B	C	D	E
1	Sr No	Scrip	Dividend Ex-Date	Amount	Client Code
2	1	ESSELPACK	15-Jun-09	155	110101
3	2	AICHAMP	09-Aug-09	1670	110101
4	3	ANTGRAPHIC	12-May-09	4199	110101
5	4	AICHAMP	09-Aug-09	2425	110101
6	1	APCOTEXIND	03-Sep-09	2724	110102
7	2	DPSCLTD	05-Aug-09	1473	110102
8	3	ESSELPACK	15-Jun-09	226	110102
9	4	ANTGRAPHIC	12-May-09	8503	110102
10	1	ARCHIDPLY	07-Jul-09	53	110103
11	2	BLUECHIP	18-Sep-09	9602	110103
12	1	APCOTEXIND	03-Sep-09	1415	110104
13	2	APCOTEXIND	03-Sep-09	7404	110104
14	3	BLUECHIP	18-Sep-09	2950	110104
15	1	ESSELPACK	15-Jun-09	7669	110105
16	2	AICHAMP	09-Aug-09	5599	110105
17	3	ESSELPACK	15-Jun-09	3290	110105
18	4	DPSCLTD	05-Aug-09	8897	110105
19	5	CHENNPETRO	31-Aug-09	562	110105
20	6	CHENNPETRO	31-Aug-09	1297	110105
21	7	AICHAMP	09-Aug-09	4353	110105
22	1	ARCHIDPLY	07-Jul-09	2249	110106
23	2	ANTGRAPHIC	12-May-09	8087	110106
24	3	BLUECHIP	18-Sep-09	1875	110106

Fig. 4.10.16: Data

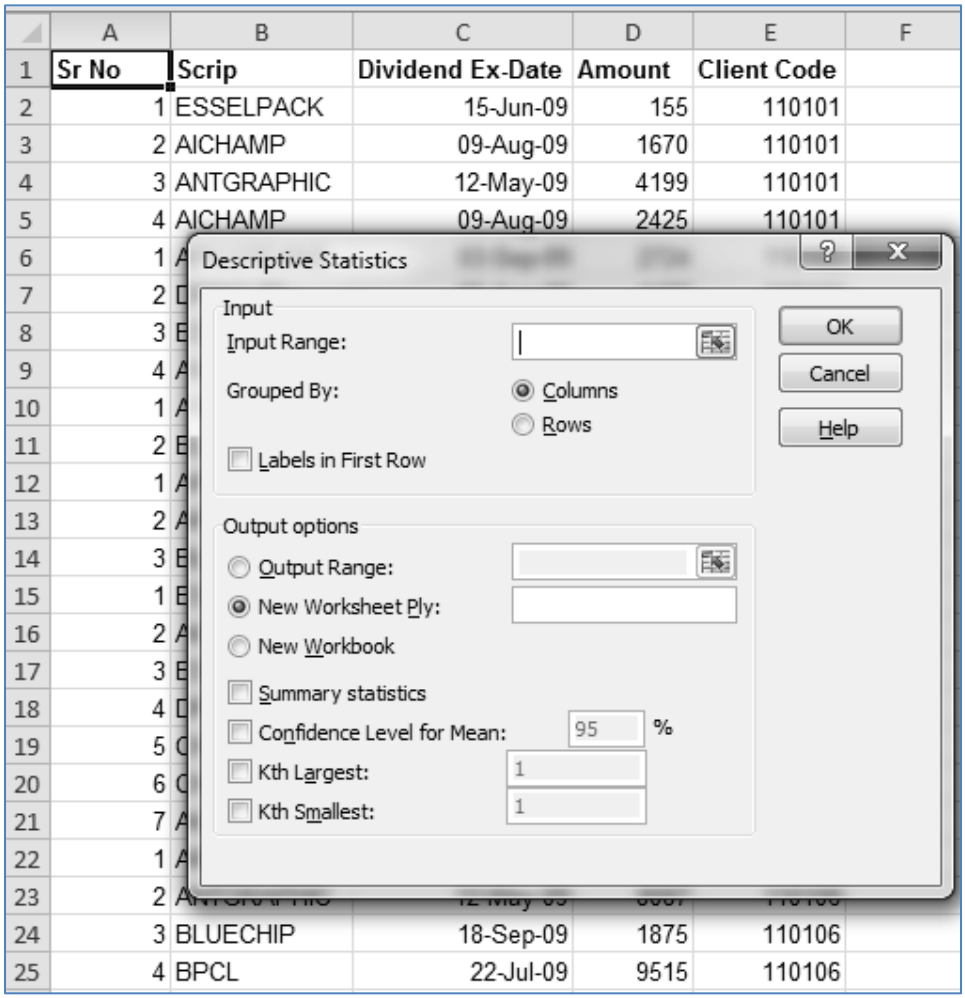
Consider the above diagram. We wish to calculate a number of statistics with respect to Amount column. Click on Data Analysis.



	A	B	C	D	E	F	G
1	Sr No	Scrip	Dividend Ex-Date	Amount	Client Code		
2	1	ESSELPACK	15-Jun-09	155	110101		
3	2	AICHAMP	09-Aug-09	1670	110101		
4	3	ANTGRAPHIC	12-May-09	4199	110101		
5	4	AICHA					
6	1	APCO					
7	2	DPSC					
8	3	ESSE					
9	4	ANTG					
10	1	ARCH					
11	2	BLUE					
12	1	APCO					
13	2	APCO					
14	3	BLUE					
15	1	ESSEL					
16	2	AICHAMP	09-Aug-09	5599	110105		
17	3	ESSELPACK	15-Jun-09	3290	110105		
18	4	DPSCLTD	05-Aug-09	8897	110105		
19	5	CHENNPETRO	31-Aug-09	562	110105		
20	6	CHENNPETRO	31-Aug-09	1297	110105		
21	7	AICHAMP	09-Aug-09	4353	110105		
22	1	ARCHIDPLY	07-Jul-09	2249	110106		

Fig. 4.10.17: Descriptive Statistics

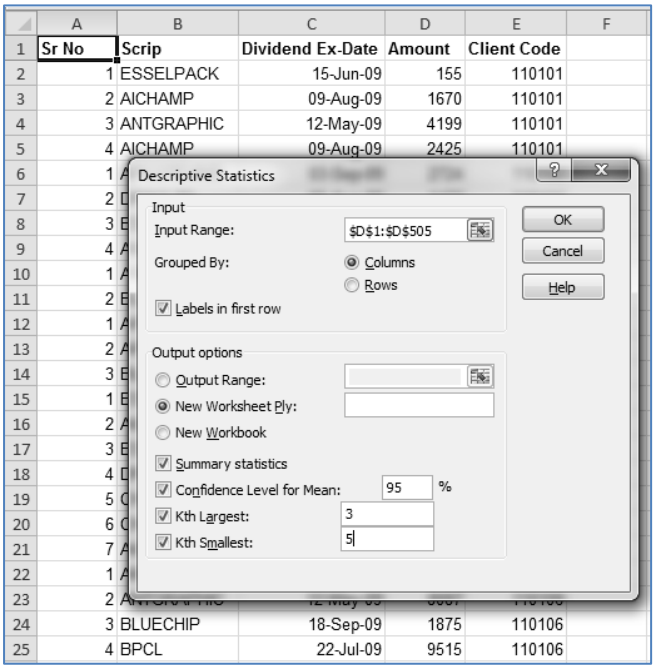
Select Descriptive Statistics and press OK. The Descriptive Statistics Window opens up as shown in Fig 4.10.18



	A	B	C	D	E	F
1	Sr No	Scrip	Dividend Ex-Date	Amount	Client Code	
2	1	ESSELPACK	15-Jun-09	155	110101	
3	2	AICHAMP	09-Aug-09	1670	110101	
4	3	ANTGRAPHIC	12-May-09	4199	110101	
5	4	AICHAMP	09-Aug-09	2425	110101	
24	3	BLUECHIP	18-Sep-09	1875	110106	
25	4	BPCL	22-Jul-09	9515	110106	

Fig. 4.10.18: Descriptive Statistics Window

Specify Input Range as cells D1 to D505. Tick Labels in First Row. Tick Summary statistics, Confidence Level for Mean, Kth Largest and specify 3 and Kth Smallest and specify 5.



	A	B	C	D	E	F
1	Sr No	Scrip	Dividend Ex-Date	Amount	Client Code	
2	1	ESSELPACK	15-Jun-09	155	110101	
3	2	AICHAMP	09-Aug-09	1670	110101	
4	3	ANTGRAPHIC	12-May-09	4199	110101	
5	4	AICHAMP	09-Aug-09	2425	110101	
24	3	BLUECHIP	18-Sep-09	1875	110106	
25	4	BPCL	22-Jul-09	9515	110106	

Fig. 4.10.19: Descriptive Statistics Inputs

Press OK. The statistics are generated in another sheet as shown in Fig 4.10.20.

	A	B	C
1	*Amount*		
2			
3	Mean	4868.099	
4	Standard Error	129.0238	
5	Median	4807.5	
6	Mode	1473	
7	Standard Deviation	2896.578	
8	Sample Variance	8390164	
9	Kurtosis	-1.20377	
10	Skewness	0.081762	
11	Range	9935	
12	Minimum	16	
13	Maximum	9951	
14	Sum	2453522	
15	Count	504	
16	Largest(3)	9922	
17	Smallest(5)	53	
18	Confidence Level(95.0%)	253.492	
19			

Fig. 4.10.20: Result

Similarly, we have many more statistical tools available in Data Analysis like Correlation, Regression, Moving Average, Random Number Generation etc. One may use them as per requirement.

4.11 Summary

Auditor has to deal with data. Thus, data analysis is very important for him. We discussed some tools for Data Analysis. They are as follows:

1. Duplicates using Conditional Formatting – You can highlight duplicate values using Conditional Formatting. However, this will not remove the duplicates.
2. Remove Duplicates – Use this tool to remove the duplicates in the data.
3. Sort – We can arrange the records in ascending or descending manner, using sort feature. We can also achieve multi-level sort.
4. Filters – Filters help in short-listing data, based on some criteria. The rest of the records are temporarily hidden. Filters can be Text, Numeric or Date. Various features are available, based on the category.
5. Consolidate Data – If data exists in multiple worksheets or workbooks, it can be merged together using Consolidate feature. The headings may or may not be in the same order. If required, we can also maintain links with the sources.
6. Pivot Tables – This is one of the most powerful tools for effective data analysis. We can generate a report in a cross tab manner, by using Pivot Tables. Various statistics like Sum, Count etc. can be generated effortlessly. Multiple fields can be involved, thus making it highly useful. We can filter the labels and values or we can use report filters to filter the entire table. We can also drill down summarized values to check the underlying records. However, one must remember that Pivot Table doesn't refresh itself automatically. On the whole, it's a highly capable tool.

Thereafter, we studied some case studies like:

1. Gap Detection – Invoice numbers may contain some gaps. As an auditor, we need to identify gaps, if any. For this, we can use right function and obtain the numeric part. Then find out difference between the consecutive numeric parts. If it is not 1, then we must check. We can also make a complete list of invoices and use Vlookup function to plot the same from original data. If there are #N/A errors, they indicate the missing invoices.
2. Benford's Law – It was propounded by Frank Benford. It says that the probability of first digit being 1 is the most and that it being 9 is the least. These probabilities can be calculated using the formula:

$$P\ (n) = \log_{10}\left(1 + \frac{1}{n}\right)$$

   It was used in the department of Forensic Audits by Dr. Mark Nigrini. We can use excel to test whether a dataset conforms to Benford's Law. For this, extract the first digit of numbers using left function. Then summarize the count of all the first digits. This can be done using Pivot Tables. Convert those absolute counts into percentages. Then compare these percentages with Benford's Law Percentages.
3. Aging Analysis – We can categorise Current Assets like Inventories, Receivables etc. into ages. These ages help us in understanding which current assets we have been holding for long period of time and

perhaps warrant a provision or write off. For this, we first derive age of each receivable by subtracting the date of receivable from today's date. Then we use if function to categorise it.

4. Statistical Analysis – As an auditor we are sometimes required to use statistics. For this, we can make use of an add-in called Analysis ToolPak. It needs to be activated first which can be done by visiting File → Options → Add-ins → Excel Add-ins. This loads a new group in Data Tab called Analysis with Data Analysis feature. Using this, we can perform a variety of analyses. Most relevant for an auditor are sampling and descriptive statistics. Other variations are also available.
5. Stratification – This involves breaking the given data into number of strata or categories. This is very similar to Aging Analysis. Stratification is necessary to divide heterogeneous data into homogenous strata. One may use if function for categorization purpose. This involves using multiple IF functions. Number of IFs required is one less than the number of categories. We need to nest these IFs one inside the other.

   The formula using IF functions can be extremely long and tedious. It could be difficult to understand or edit later. A simpler approach is to make a table of the different categories and use Vlookup function. The range lookup should be TRUE. This achieves the same output and does away with all the demerits of IF functions. After stratification, we can take out samples from each strata.

4.12 Multiple Choice Questions (MCQ) for Practice

1. To mark duplicates we can use _____
   (a) Remove Duplicates
   (b) Conditional Formatting
   (c) Text To Columns
   (d) Analysis ToolPak
2. To eliminate repeated values in a dataset such that it is left with unique values only, we can use:
   (a) Remove Duplicates
   (b) Conditional Formatting
   (c) Text To Columns
   (d) Analysis ToolPak
3. Rajesh says following to Meena:
   1) Sort feature cannot perform multi-level sort
   2) Top 10 in filters can only be used for top 10 values. One cannot change it to top 7.
   What can you say about his statements?
   (a) Both 1 and 2 are right
   (b) 1 is right but 2 is wrong
   (c) 2 is right but 1 is wrong
   (d) Both 1 and 2 are wrong

4. On applying filters, row numbers turn:
   (a) Red
   (b) Blue
   (c) Pink
   (d) Green
5. Records for different months or quarters, irrespective of years, can be obtained using _____ in date filters.
   (a) Year to Date
   (b) All Dates in the Period
   (c) Custom Filter
   (d) None of these
6. Which of the following is not a pre-requisite of Pivot Tables?
   (a) Data should be in rectangular format
   (b) Data should contain headers
   (c) Every cell in the data region should be filled
   (d) Fields should be placed in columns and records in rows
7. We can change Sum of values to Count using _____ in Pivot Tables:
   (a) Value Field Settings
   (b) Show Values As
   (c) Refresh
   (d) Pivot Table Options
8. Which of the following can be used to filter the entire Pivot Table?
   (a) Report Filter
   (b) Label Filter
   (c) Value Filter
   (d) None of these
9. Which of the following can be used to replace blank cells with zero?
   (a) Value Field Settings
   (b) Show Values As
   (c) Refresh
   (d) Pivot Table Options
10. Which of the following can be used to update Pivot Table?

(a) Value Field Settings

(b) Show Values As

(c) Refresh

(d) Pivot Table Options

11. Which of the following is NOT a limitation of Pivot Tables?

(a) We cannot insert rows or columns in between a Pivot Table report

(b) Pivot Tables don't auto-update themselves. We need to refresh them

(c) The data cannot be in rectangular i.e. flat format

(d) If the number of records are very large, Pivot Tables may respond slowly

12. If there are no gaps between invoice numbers, the difference between two consecutive functions should be?

(a) 1

(b) 0

(c) 2

(d) Any value, depends

13. Benford's Law is based on?

(a) 1st digit

(b) Last digit

(c) Middle digit

(d) All digits

14. Which function can be used to calculate probabilities as per Benford's Law?

(a) Log10

(b) Sumif

(c) Fact

(d) Mod

15. The conclusion drawn by using Benford's Law is:

(a) Subjective

(b) Conclusive

(c) Temporary

(d) Illusory

16. Which of the following functions is totally irrelevant for performing aging analysis?

(a) If

(b) And

(c) Left

(d) Today

17. Which add-in performs statistical calculations?

(a) Analysis Tool Pak

(b) Solver

(c) ASAP Utilities

(d) Fuzzy Lookup

18. Stratification of data is done because:

(a) The data is humongous

(b) The data is heterogeneous

(c) The data is homogenous

(d) The data is horrendous

19. Which of these are demerits of using IF function for stratification?

(a) The formula may become very long and tedious

(b) It may be difficult to edit the formula later

(c) It may be difficult to understand the formula later

(d) All of the above

20. While using Vlookup function for stratification purpose, the *range lookup* argument should be:

(a) True

(b) False

(c) Either a or b, as per the situation

(d) Both a and b

Solutions

1. (b)
2. (a)
3. (d)
4. (b)
5. (b)
6. (c)
7. (a)

8. (a)
9. (d)
10. (c)
11. (c)
12. (a)
13. (a)
14. (a)
15. (a)
16. (c)
17. (a)
18. (b)
19. (d)
20. (a)