Using Excel for measurement analysis

- Functions (built in and user defined)
- Average, stdev
- Normdist
- Tinv & Tdist
- Countif
- Frequency
- Slope, intercept, RSQ
- Linest
- Devsq
- Steyx
- Mmult
- Minverse
- User Defined functions

Basic functions

=**average** (num1, num2, …)

=**stdev** (num1, num2, num3, ..)

#	x
1.00	23.80
2.00	24.20
3.00	23.40
4.00	26.20
5.00	25.50
6.00	25.90
7.00	24.80
8.00	26.70
9.00	23.90
10.00	24.30
average	24.87
stdev	1.14

Gauess Normal Distribution

Normdist Function

$$p(x) = \frac{1}{\sigma\sqrt{2\pi}} \exp\left[-\frac{1}{2} \frac{(x - x')^2}{\sigma^2} \right]$$

=**normdist**(x, xmean, sigmma,**True or false**)
If the last parameter is True then the probability from –inf to x is found (-∞ <P<= x)
If the last parameter is false then the probability density at x is found (p(x))

Example: the probability for x between – ∞ to x=27, with xmean=25 and sigmma=1 is given by

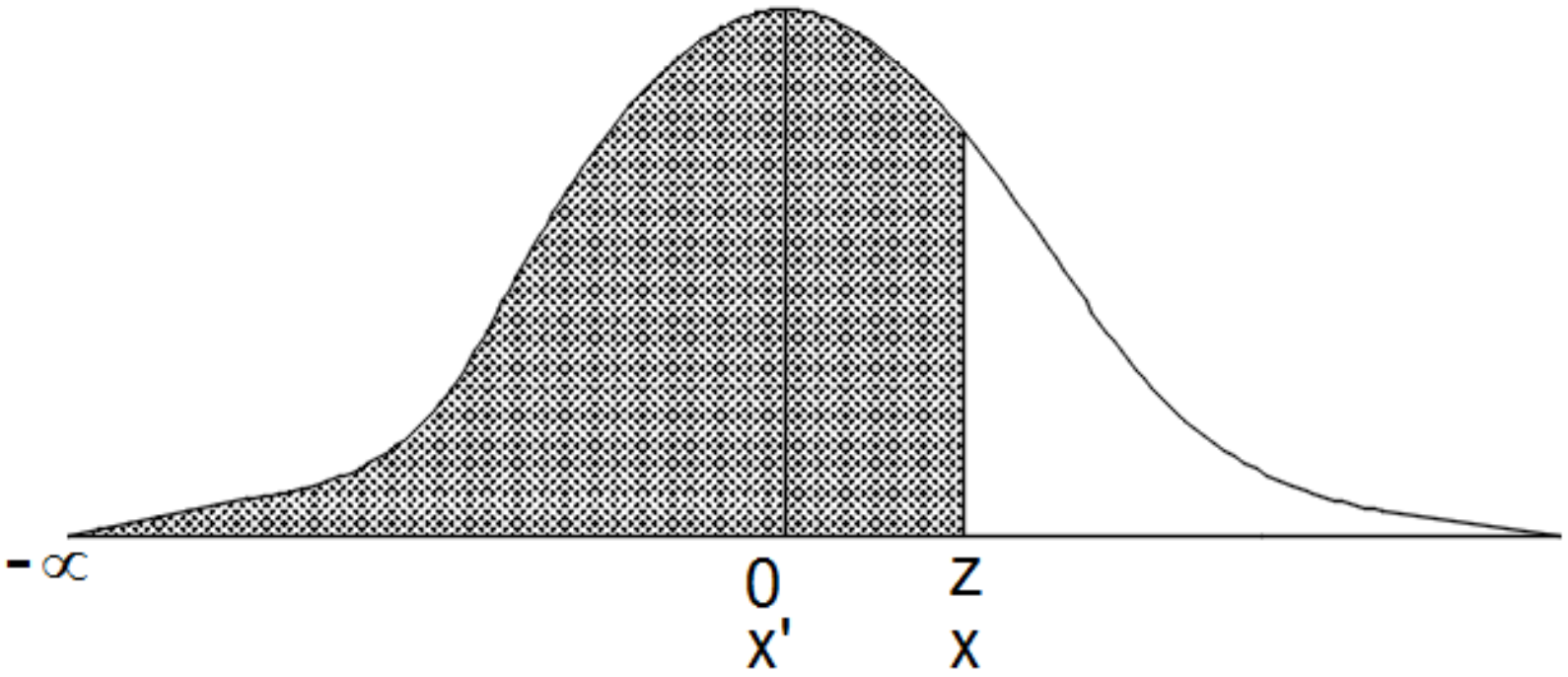
=normdist(27,25,1,True) gives 0.97725

To get the probability from x=xmean to x=27 (half side only)

=normdist(27,25,1,True)-0.5 gives 0.4772 (as table 4.3)

You can generate table 4.3 in your textbook

Using Excel Normdis function



Values in Table 4.3=Values from excel function normdis(x,x_mean,sigmma,True)-0.5

Tinv function

T estimator

Tinv(1-P,v)

To get the t estimator based on the probability and degree of freedom v. P is a fraction

Example:

=Tinv((1-0.9),10) is found to be 1.812

$t_{10,0.9}$=1.812

You can generate Table 4.4 in your book

Tdist function

T estimator

tdist(t,v,tails)

To find the probability minus 1 (i.e 1-P) if t estimator and the degree of freedom are given

Tails=2 for **two sided distribution as we have in our textbook**

Example: Assume t=1.771, v=13, Tails=2 then

=tdist(1.771,13,2) gives 0.1 or the probability P=1-0.1=0.9

Countif function

To count based on condition

For example count the number of students who have scored 60 or less

=Countif (Range,”<60”)

Notice that the condition is written between quotes

=countif(A2:A16,”<60”)

The answer is 4 students

Data
60
70
80
90
100
80
60
50
40
100
90
40
50
60
70

Frequency function

Frequency (data, bins)

Example: Since we have 3 bins then we have **four intervals**. Select 4 column cells and type:

=frequency(A2:A16,B2:B4)

You have to hit Cntl_shift_return

You will get the following results

7
4
2
2

Data
60
70
80
90
100
80
60
50
40
100
90
40
50
60
70

Bin
60
80
90

Frequency function-Continue

The meaning of the frequency results are

Data
60
70
80
90
100
80
60
50
40
100
90
40
50
60
70

Bin
60
80
90

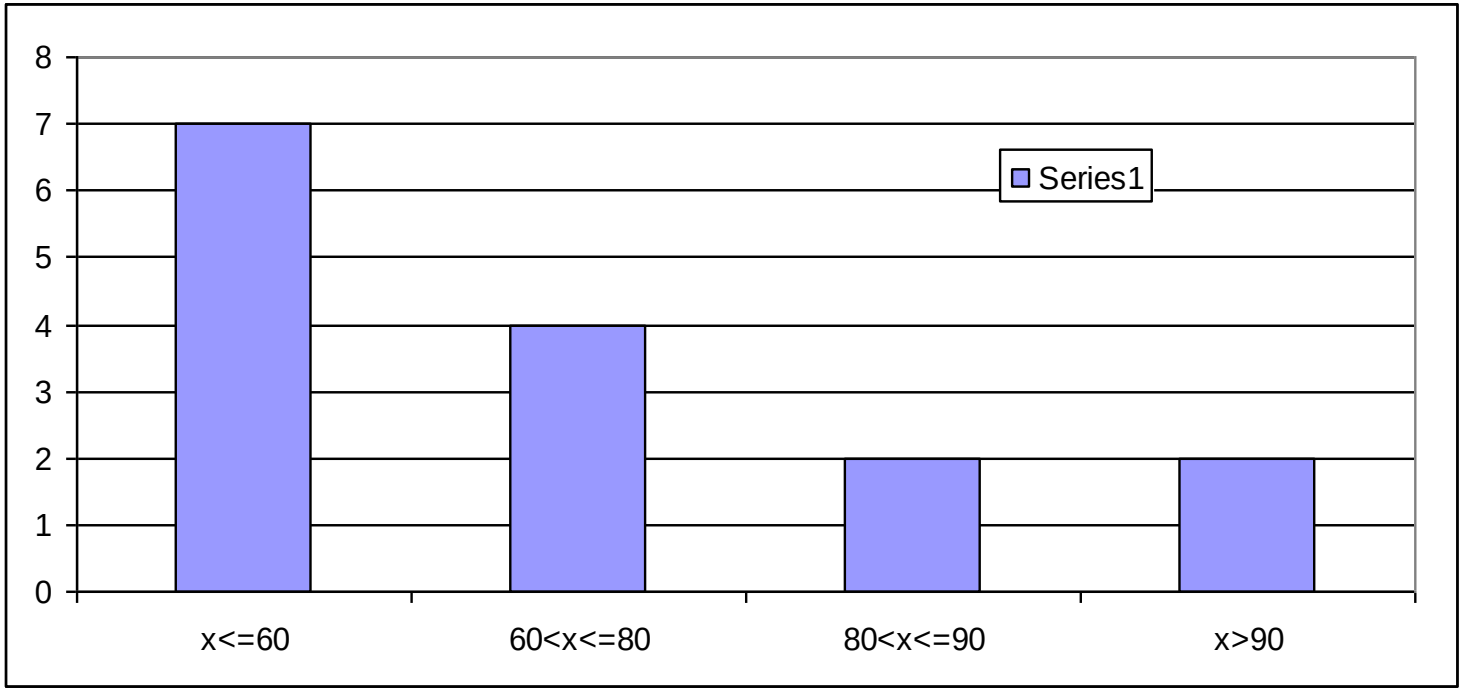
7
4
2
2

4 rows

7	There are 7 data points less than or equal 60
4	There are 4 data points less than or equal 80 and greater than 60
2	There are 2 data points less than or equal 90 and greater than 80
2	There are 2 data points greater than or equal to 90

Histogram

Bin	
60	7
80	4
90	2
	2



Slope, intercept and R^2 for a line

A	B

x	y
2	2.3
3	4.5
4	6.7
5	9.8
6	12.3
7	15.4

=Slope (y values, x values)

=intercept(y values, x values)

=rsq(y values, x values)

=slope(B2:B7,A2:A7)=2.628

=intercept(B2:B7,A2:A7)=-3.3285

=rsq(B2:B7,A2:A7)=0.995

Line statistics

x	y
2	2.3
3	4.5
4	6.7
5	9.8
6	12.3
7	15.4

Linest function

=Linest(y values, x values, const, stat)

const and stat are logical

const=true then calculate b

const=false then force b to be zero

stat=true then calculate addition regression statistics

stat=false then only calculate the slope m, and the intercept b

Example on using linest function

x	y
2	2.3
3	4.5
4	6.7
5	9.8
6	12.3
7	15.4

Select 5 rows and 2 column cells and type the function

=linest(y_values,x_values,true,true) then hit ctrl_shift and return together since this is an array operation. You will get the values shown. The first two values are the slope and the intercept. i.e. the slope=2.628, and the intercept is -3.3285. See Excel help function for more information about this function

2.628571	-3.32857
0.084997	0.409106
0.995835	0.355568
956.3842	4
120.9143	0.505714

Devsq Function

Sum of squares of deviation between y and mean y

$$SSy = \sum_i (y_i - \bar{y})^2$$

Notice that the standard of deviation is

$$S_y = \sqrt{\frac{(y_i - \bar{y})^2}{N-1}} = \sqrt{\frac{SSy}{N-1}}$$

STEYX Function

Standard error of y(x)

$$s_{yx} = \sqrt{\frac{\sum_i (y_i - y_{ci})^2}{v}}$$

$$v = N - (m + 1)$$

$$y_c \pm t_{v,P} s_{yx} \left[\frac{1}{N} + \frac{(x_i - \bar{x})^2}{\sum_i (x_i - \bar{x})^2} \right]^{1/2}$$

When the variation in x is neglected then

$$y_c \pm t_{v,P} s_{yx}$$

STEYX Function

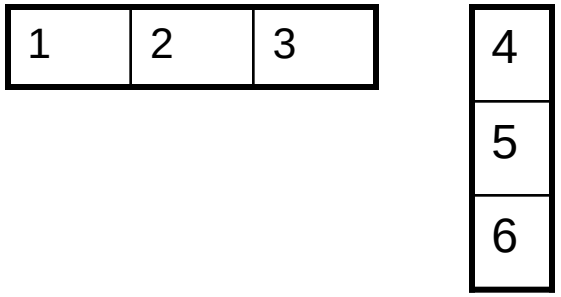
=steyx(y vales, x values)

=steyx(A2:A7),(B2:B7)

=0.031804

x	y
2	2.3
3	4.5
4	6.7
5	9.8
6	12.3
7	15.4

Matrix operations



To multiply a row by a column do the following

Select a cell and type

=mmult(B2:D:2,F1:F3)

and hit cntl_shift and return . You will get 32

Solving simultaneous equations

It is required to solve the following simultaneous system of equation

It is required to find the values of x, y and z

$$\begin{bmatrix} 2 & 4 & 6 \\ 2 & 3 & 7 \\ 6 & -2 & 8 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 20 \\ 20.5 \\ 19 \end{bmatrix}$$

Example

1-Type the above values in a sheet starting with say D20

2-Select one columns with three rows and type

=mmult(minverse(D20:F23),H20:H22). Type cntl_shift_return.

Where minverse means matrix inverse

Solving simultaneous equations

The results will be

1
1.5
2

Which are the values of x , y and z

User defined functions

To access the visual basic editor

tools→macros →visual basic editor

Or just type Alt-F11

You will see the visual basic

Go to insert and insert a module

You can view the project ad see that a module is added to the project. In the module now you can add functions and subroutines

User defined functions

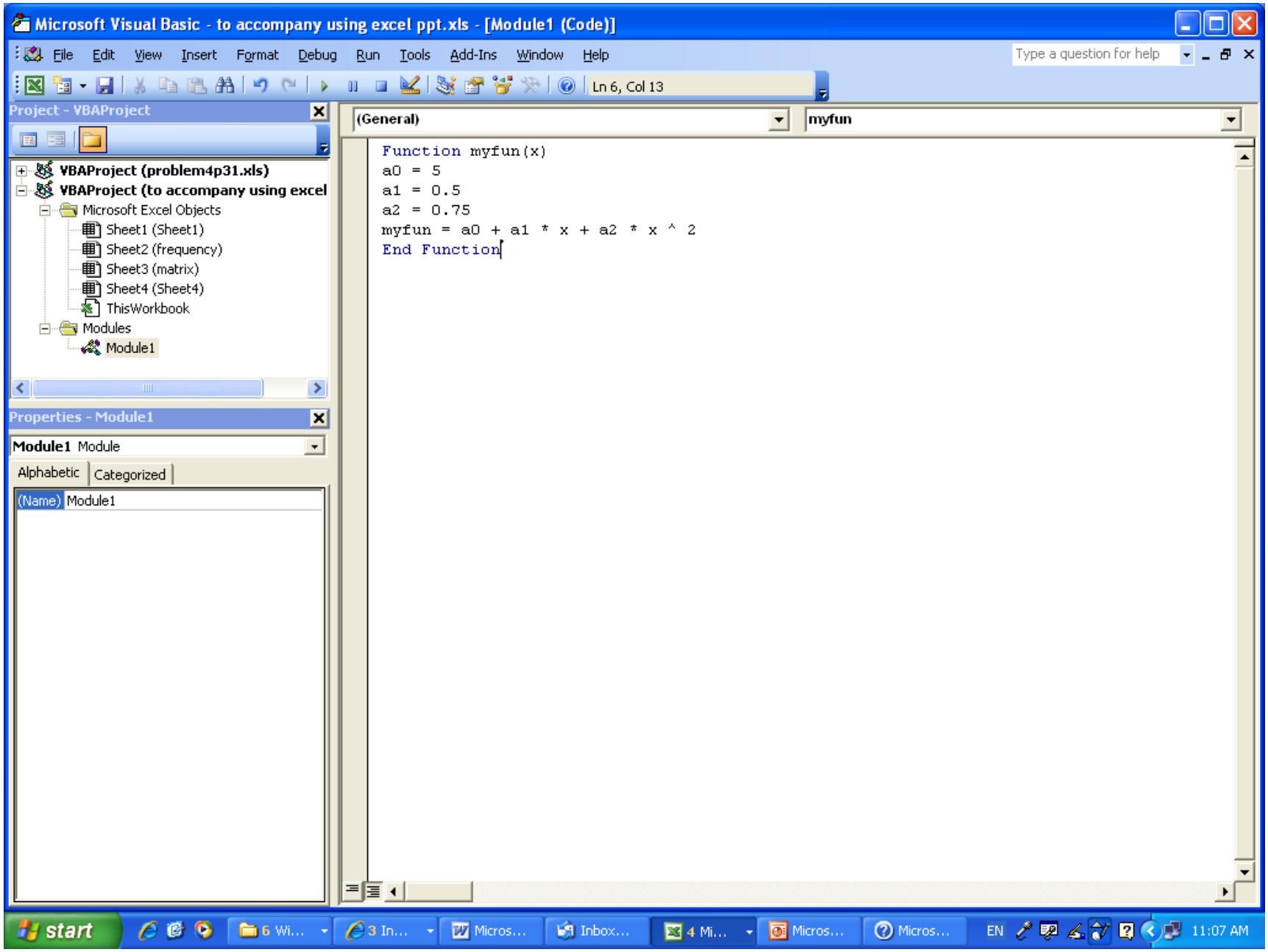
Suppose we want to add a function that do the followings

$$y = a_0 + a_1 x + a_2 x^2$$

```
Function myfun(x)
a0=5
a1=0.5
a2=0.75
myfun=a0+a1*x+a2*x^2
End function
```

Now you can go to the excel sheet and type =myfun(1) the answer will be 6.25

User defined functions



User defined functions