Microsoft Excel: Financial Tools

Microsoft Excel

- Go to the Course Website
- Download and print “Business Analytics – Week 2 Instructions.doc”
- Download “Business Analytics – Week 2 Excel 2013”

Session 2.3: Net present value

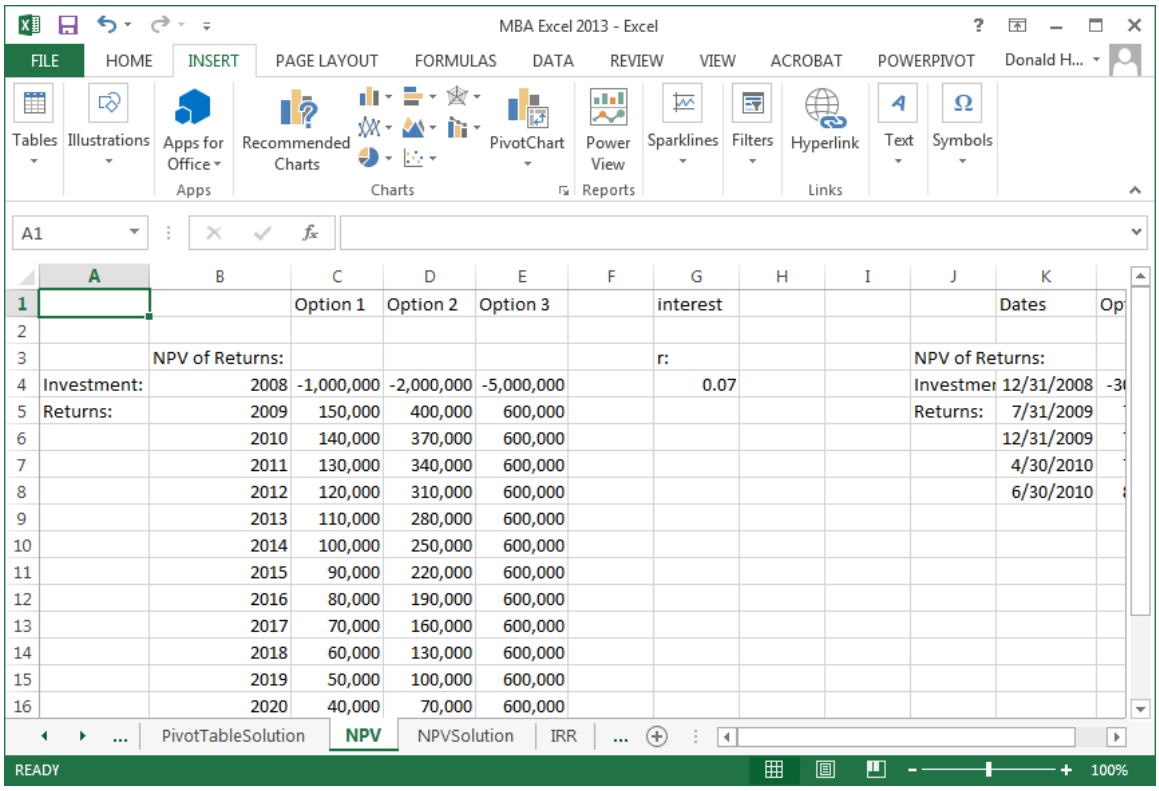
Net present value is used in finance to determine a value of a future stream of money in today’s dollars. Net present value determines what a revenue stream would be worth in today’s dollars. There are two NPV functions: NPV calculates the net present value of a stream of money at regular intervals; XNPV calculates the NPV of a stream of money at irregular intervals.

NPV(rate, range of cells)
XNPV(rate, values, dates)

The NPV calculation assumes that all cash flow is at the end of the period.

In the example below (NPV spreadsheet), investments are entered as negative numbers, returns as positive. Calculate the NPV for Options 1, 2 and 3 and enter the formulas in cells C3, D3, E3.

1. To calculate the NPV of Option 1, in cell C3, enter the formula for NPV.
2. For rate, refer to cell G4
3. For range of cells, highlight the investment and returns (cells C4:C20)
4. Similarly, calculate the NPV for Options 2 and 3



	A	B	C	D	E	F	G	H	I	J	K
1			Option 1	Option 2	Option 3		interest				Dates
2											
3		NPV of Returns:					r:			NPV of Returns:	
4	Investment:	2008	-1,000,000	-2,000,000	-5,000,000		0.07				12/31/2008
5	Returns:	2009	150,000	400,000	600,000						7/31/2009
6		2010	140,000	370,000	600,000						12/31/2009
7		2011	130,000	340,000	600,000						4/30/2010
8		2012	120,000	310,000	600,000						6/30/2010
9		2013	110,000	280,000	600,000						
10		2014	100,000	250,000	600,000						
11		2015	90,000	220,000	600,000						
12		2016	80,000	190,000	600,000						
13		2017	70,000	160,000	600,000						
14		2018	60,000	130,000	600,000						
15		2019	50,000	100,000	600,000						
16		2020	40,000	70,000	600,000						

Now calculate the NPV of Option 4 using the XNPV formula and enter it in cell L3.

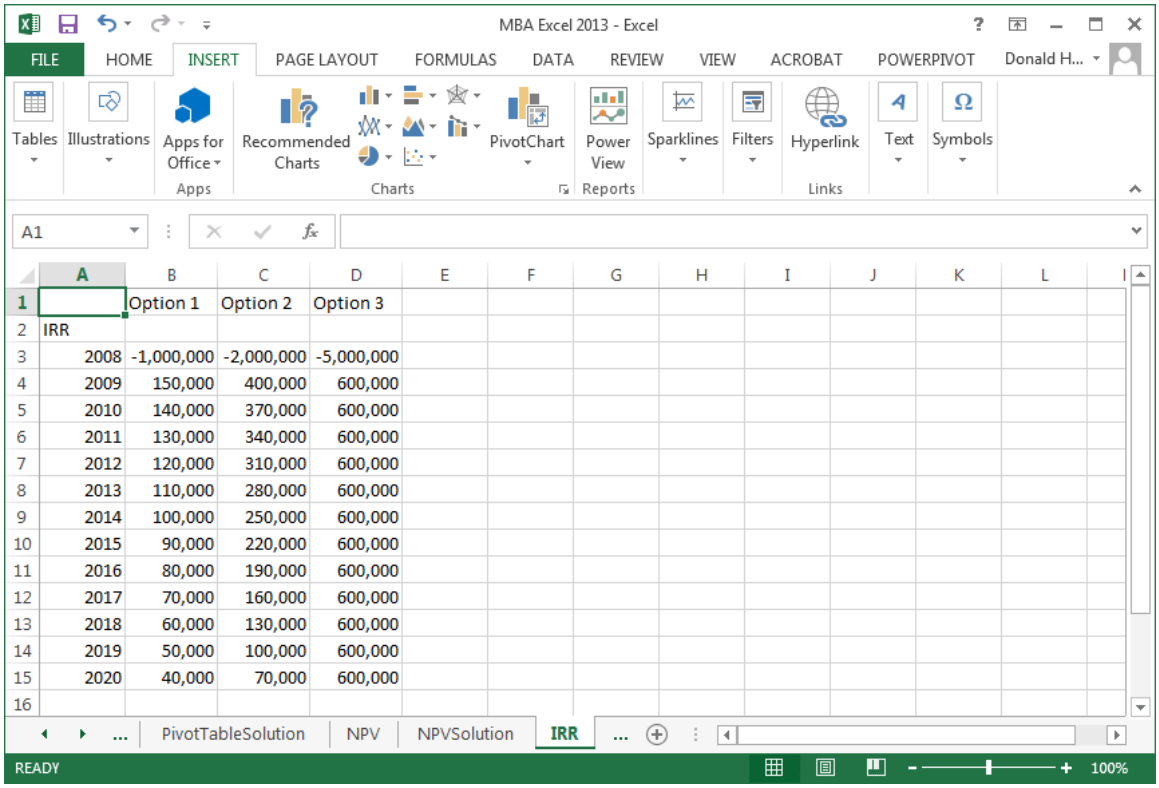
Session 2.4: Internal rate of return

The internal rate of return (IRR) calculates what the interest rate would have to be so that the NPV is zero. In some situations, there is no IRR. The spreadsheet is set up similar to the NPV problem, but investments are listed as negative returns. The function for IRR is:

IRR(data range)

The IRR spreadsheet gives an example of three investment options, revenue streams, and the calculated IRR. A corporation would compare the IRR to the possible returns available elsewhere to determine if a project was worthwhile.

In cell B2, enter the formula for IRR of Option 1. Similarly, calculate the IRR for Options 2 and 3 in cells C2 and D2.



	A	B	C	D
1		Option 1	Option 2	Option 3
2	IRR			
3	2008	-1,000,000	-2,000,000	-5,000,000
4	2009	150,000	400,000	600,000
5	2010	140,000	370,000	600,000
6	2011	130,000	340,000	600,000
7	2012	120,000	310,000	600,000
8	2013	110,000	280,000	600,000
9	2014	100,000	250,000	600,000
10	2015	90,000	220,000	600,000
11	2016	80,000	190,000	600,000
12	2017	70,000	160,000	600,000
13	2018	60,000	130,000	600,000
14	2019	50,000	100,000	600,000
15	2020	40,000	70,000	600,000
16				

Microsoft Excel: Statistics

Session 2.5: Data Analysis Add-in

The statistics options are available as an add-in to Excel. The steps to add it are:

1. In Excel, click on the File tab, then Options
2. Click on Add-Ins
3. Click Analysis TookPak Add-in, then Go
4. Check the box for Analysis ToolPak, then OK

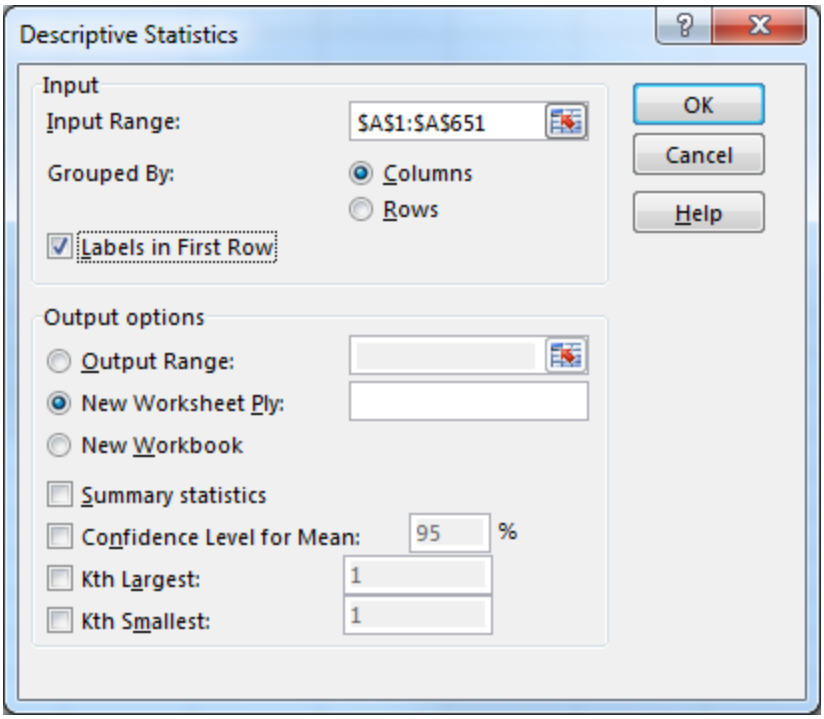
Session 2.6: Data Analysis: Descriptive statistics

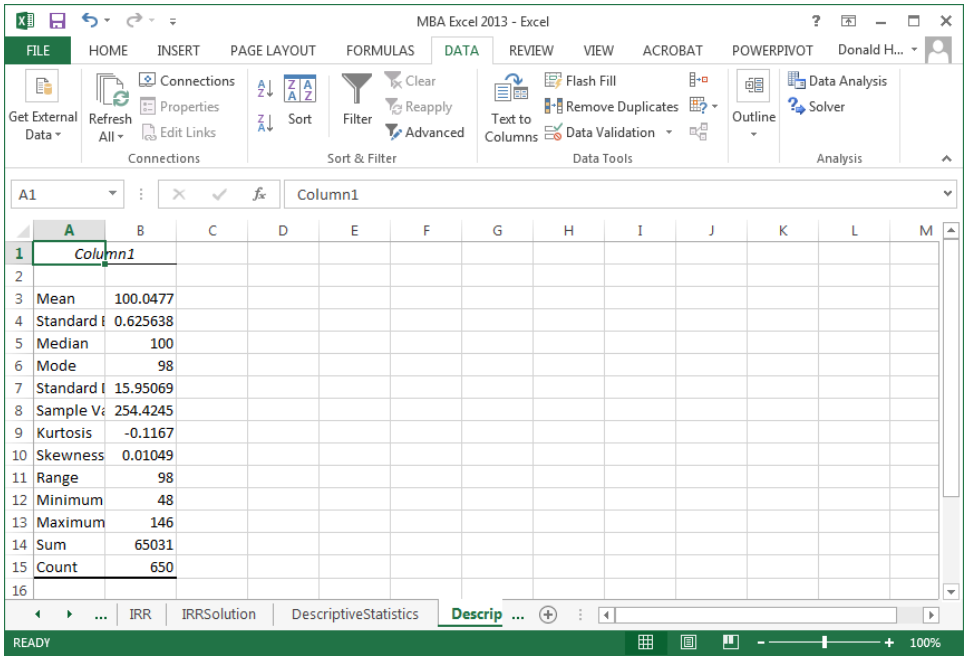
Use the DescriptiveStatistics spreadsheet tab for this exercise.
There are a number of descriptive statistics that can be automatically generated, including:

- Mean: arithmetic average
- Median: middle point in distribution
- Mode: most common value (highest frequency of occurrence)
- Kurtosis: is the data peaked higher or lower than normal?
- Skewness; is the peak shifted left or right?
- Standard deviation: measure of spread
- Range: highest value minus lowest value

To calculate the descriptive statistics:

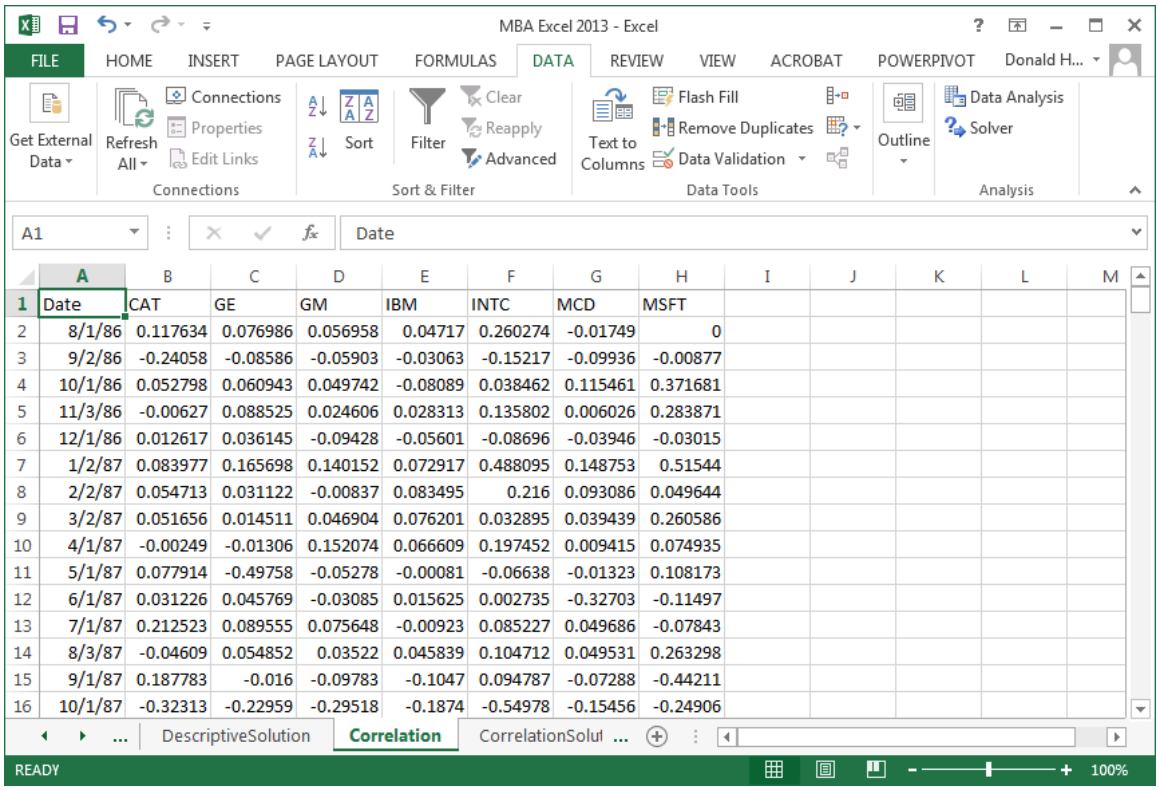
1. Click on the data tab, then data analysis, descriptive statistics, and OK.
2. Enter the input range for the IQ data; if you include the header, click on Labels in first row.
3. Check Summary Statistics, then OK



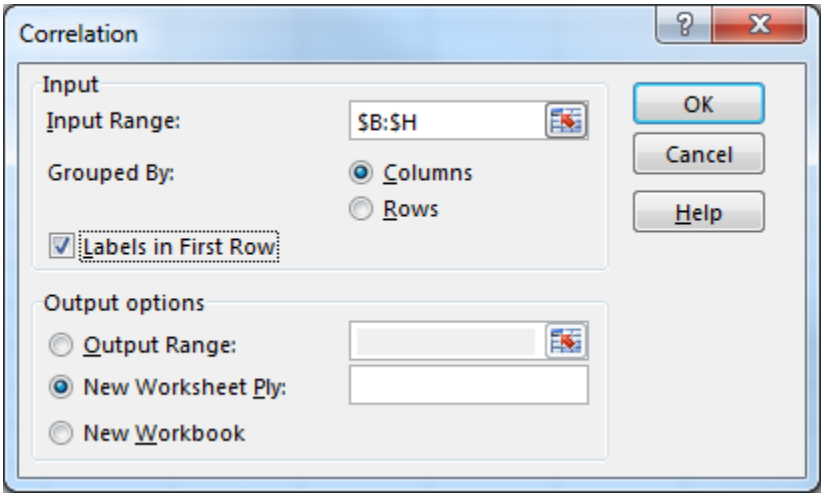


Session 2.7: Correlations

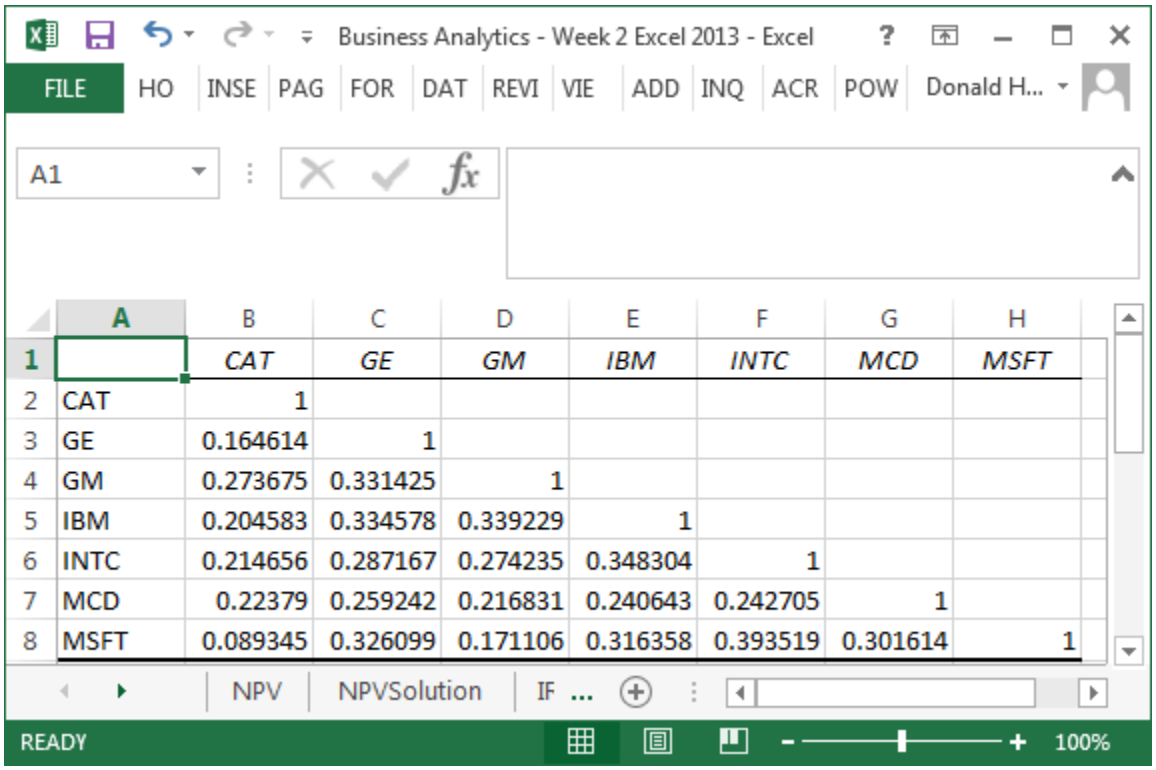
Correlation analysis identifies how two or more variables are related. For this exercise, use the Correlation spreadsheet. This spreadsheet records the upward or downward movement of stock by month.



The stocks listed are Caterpillar, General Electric, General Motors, IBM, Intel, McDonalds and Microsoft. Click on the data tab, data analysis, correlation, then OK. Highlight columns B through H, group by columns, check Labels in First Row, then OK.



The result is shown below. A positive correlation means that when one variable increases, the other increases. A negative correlation means that when one increases, the other decreases.



	A	B	C	D	E	F	G	H
1		*CAT*	*GE*	*GM*	*IBM*	*INTC*	*MCD*	*MSFT*
2	CAT	1						
3	GE	0.164614	1					
4	GM	0.273675	0.331425	1				
5	IBM	0.204583	0.334578	0.339229	1			
6	INTC	0.214656	0.287167	0.274235	0.348304	1		
7	MCD	0.22379	0.259242	0.216831	0.240643	0.242705	1	
8	MSFT	0.089345	0.326099	0.171106	0.316358	0.393519	0.301614	1

Session 2.9: Univariate Linear Regression

Regression Assumptions

Regression is a technique that attempts to measure the relationship between and outcome variable (dependent) and explanatory variables (independent). To use linear regression, there are three key assumptions

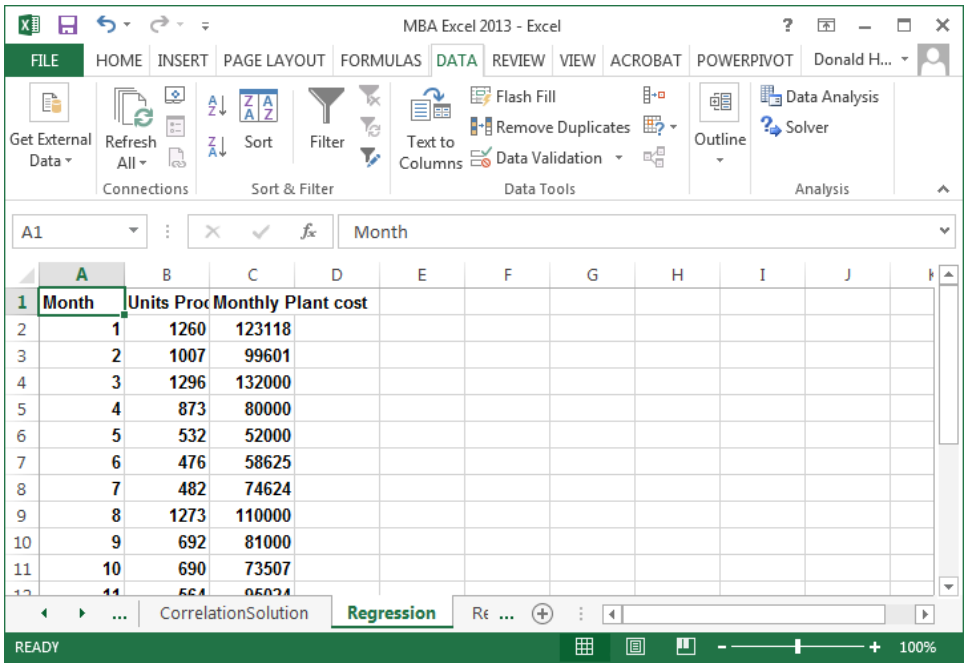
1. relationship between x and y is linear
2. the x's are fixed numbers, not random variables (non-stochastic), not related to each other, i.e., independent: $Corr(X_i,X_j)=0$
3. the error terms:
    a. have zero mean and constant variance: $E(\varepsilon_i) = 0$, $V(\varepsilon_i) = \sigma^2$
    b. the error terms are independent: $Cov(\varepsilon_i,\varepsilon_j) = 0$
    c. the error terms are normally distributed $\sim N(0,\sigma^2)$

Violation of these assumptions requires the use of more sophisticated techniques.

Straight line relationships

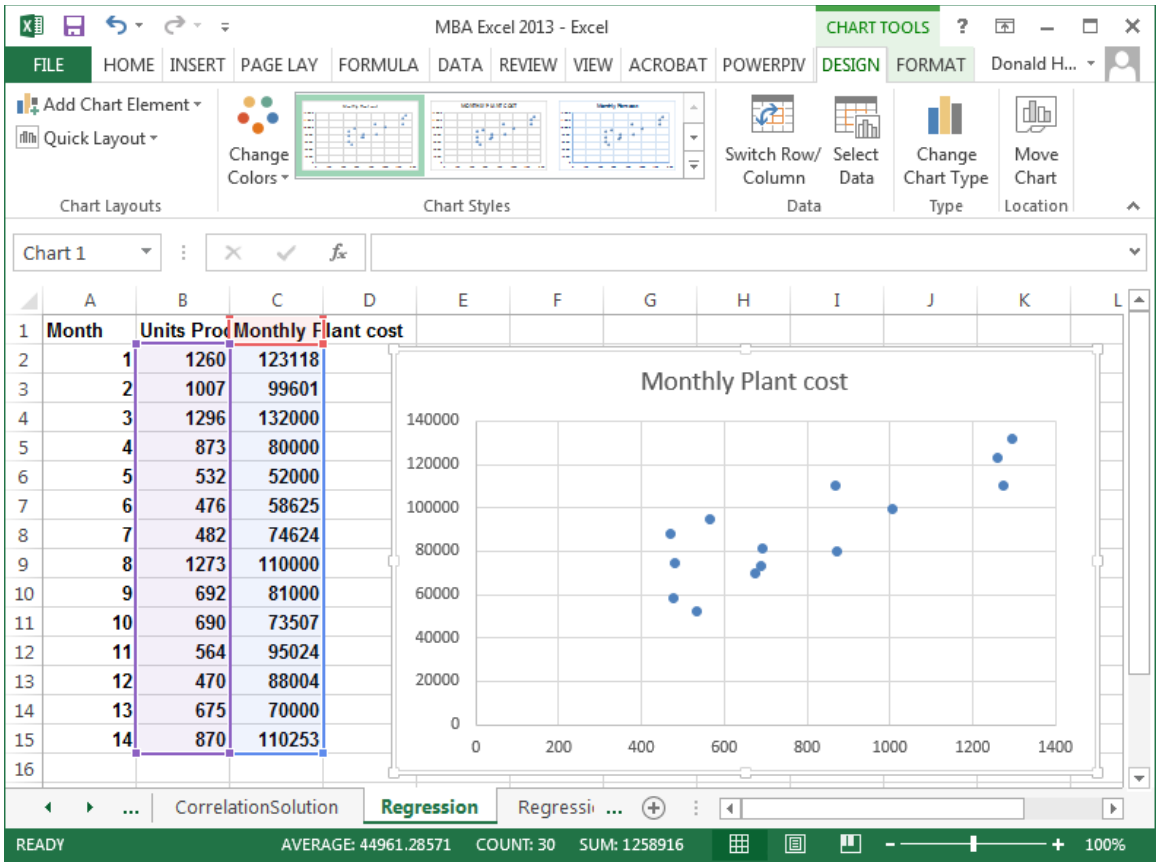
When you want to determine if there is a straight line relationship in statistics, you can run a regression. Excel has the ability to perform regression analysis. For example, if you wanted to model the relationship between items produced and factory costs, you could estimate the linear relationship. Units produced would be called the independent variable; production costs would be the dependent variable. The output, costs, depends on the input, number of units produced.

For this example, use the Regression spreadsheet.



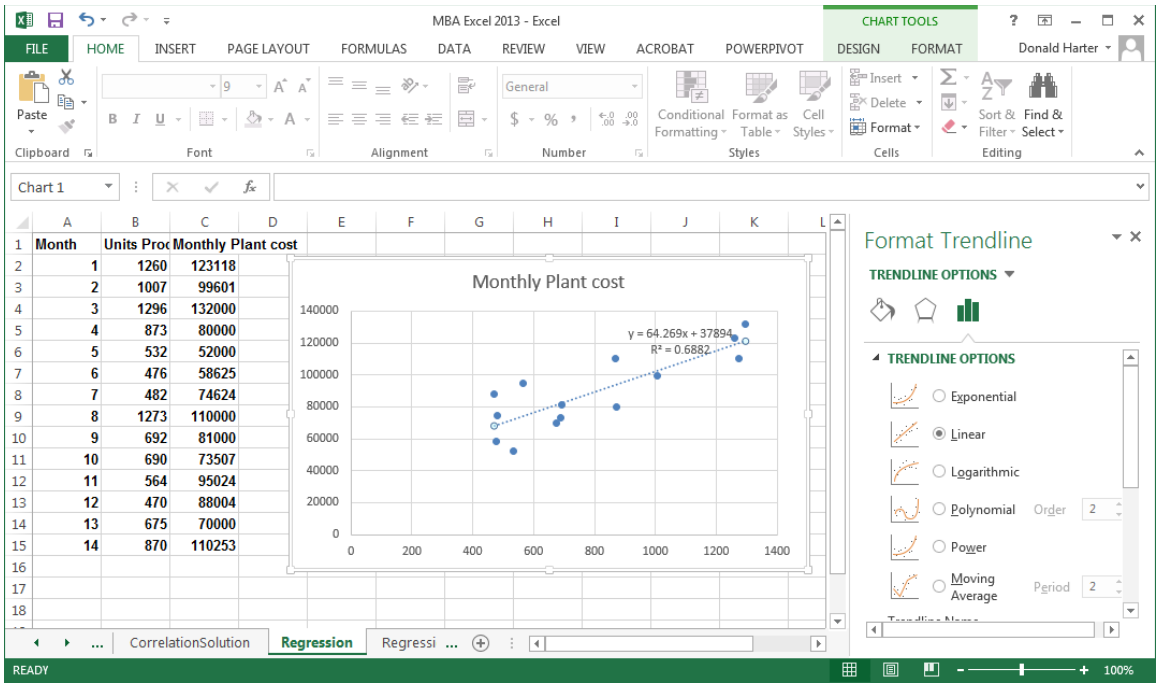
Let's first draw a scatterplot to see what the data looks like.

1. Click on the Insert tab
2. Highlight the the cells b1:c15
3. Click on Scatter in the charts group.



Reviewing the chart, it appears that there is a linear relationship. We will therefore perform a linear regression. Click on any data point, right click, then add trendline.

In the Format Trendline, Trendline Options, select Linear, then check the boxes for Display Equation and Display R-squared value.

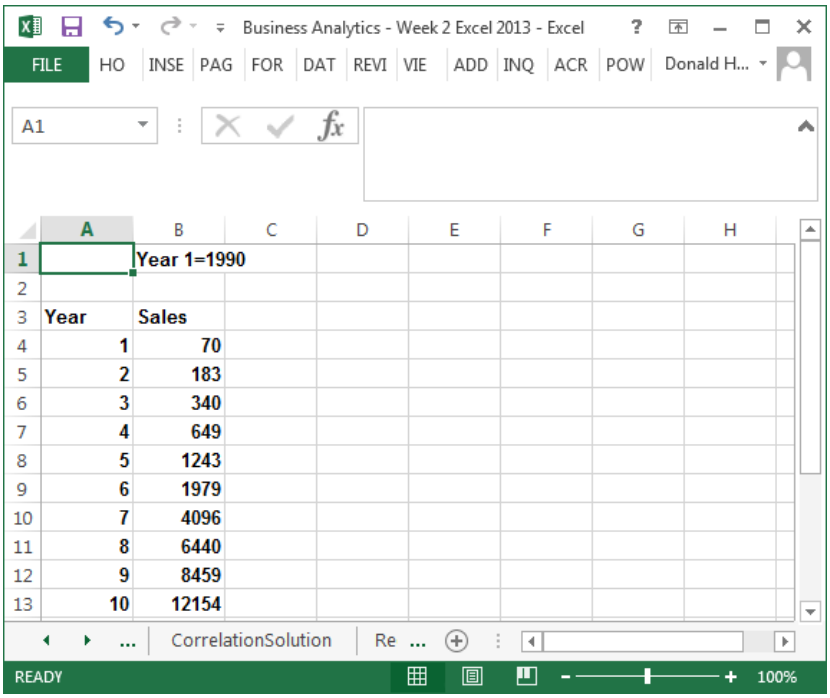


Month	Units Prod	Monthly Plant cost
1	1260	123118
2	1007	99601
3	1296	132000
4	873	80000
5	532	52000
6	476	58625
7	482	74624
8	1273	110000
9	692	81000
10	690	73507
11	564	95024
12	470	88004
13	675	70000
14	870	110253

In the picture above, the coefficient on x is approximately 64. This means that as unit production increases by one, costs increase by $64. What does the number 37,894 represent? What does the $R^2 = 0.6882$ mean?

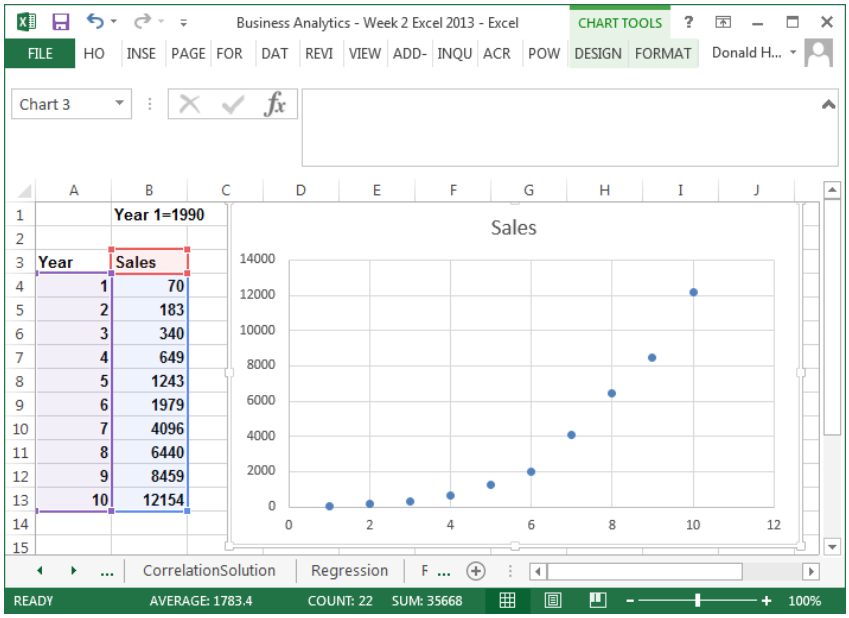
Session 2.10: Exponential regression

Some data relationships are not linear, but grow at an increasing rate. These curves often follow the exponential growth curve. An exponential growth curve will have the same percentage growth per period compounded over time. Use the Exponential spreadsheet.

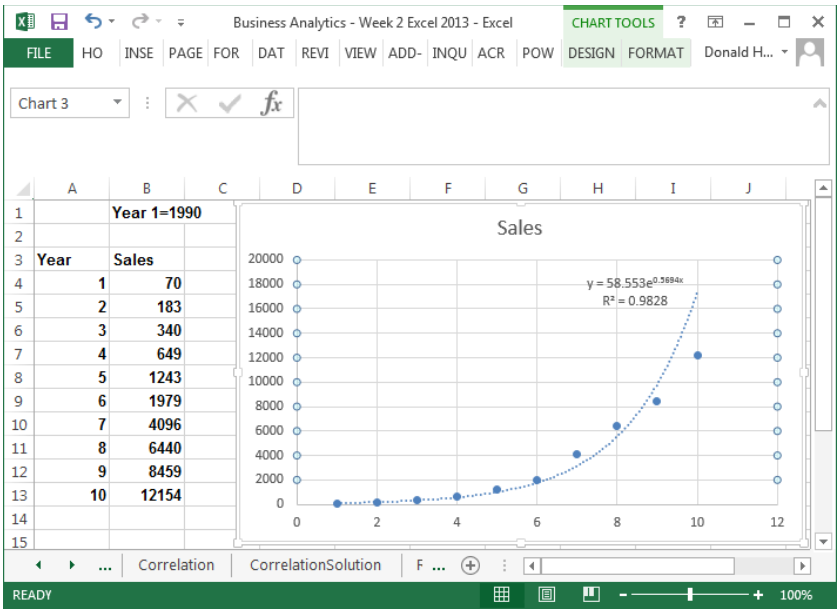


Let's first draw a scatterplot to see what the data looks like.

1. Click on the Insert tab
2. Highlight the the cells a3:b13
3. Click on Scatter in the charts group.

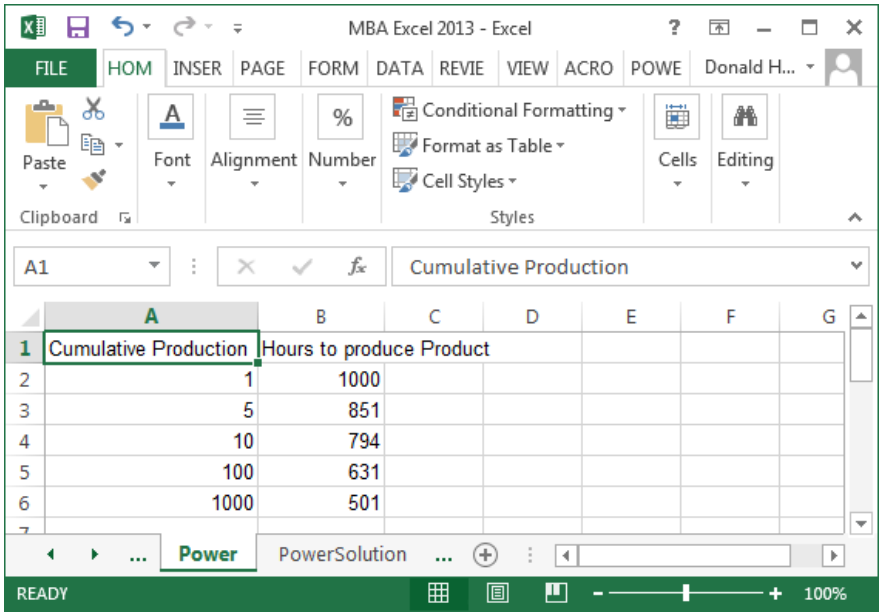


This data definitely does not look linear. So let's use the exponential curve. Click on any data point, right click, then add trendline. Select exponential, display equation and display R-squared, then Close.

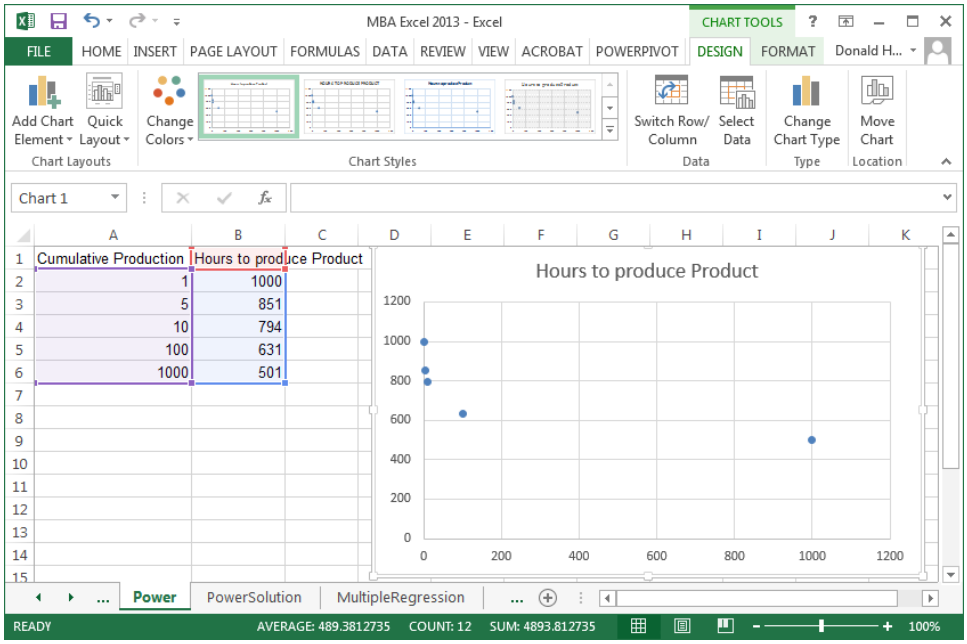


Session 2.11: Power regression

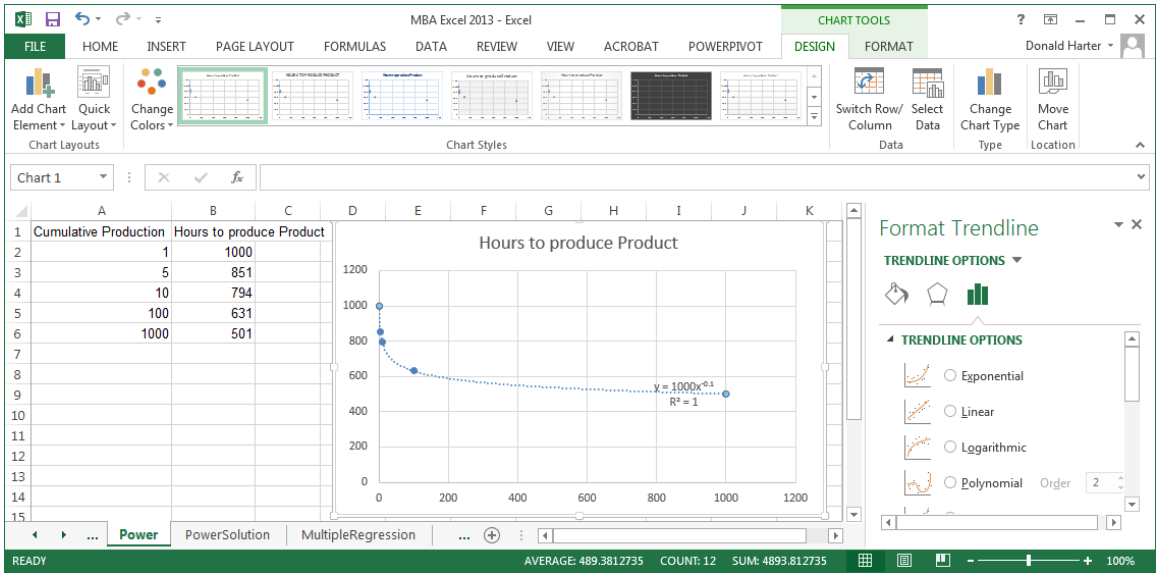
The power curve allows you to examine economies of scale and diseconomies of scale. Economies of scale means that you become more efficient as volume increases. Diseconomies of scale means that you become less efficient as volume increases. Use the Power spreadsheet.



Let's graph as before. Click on Insert, Scatter.

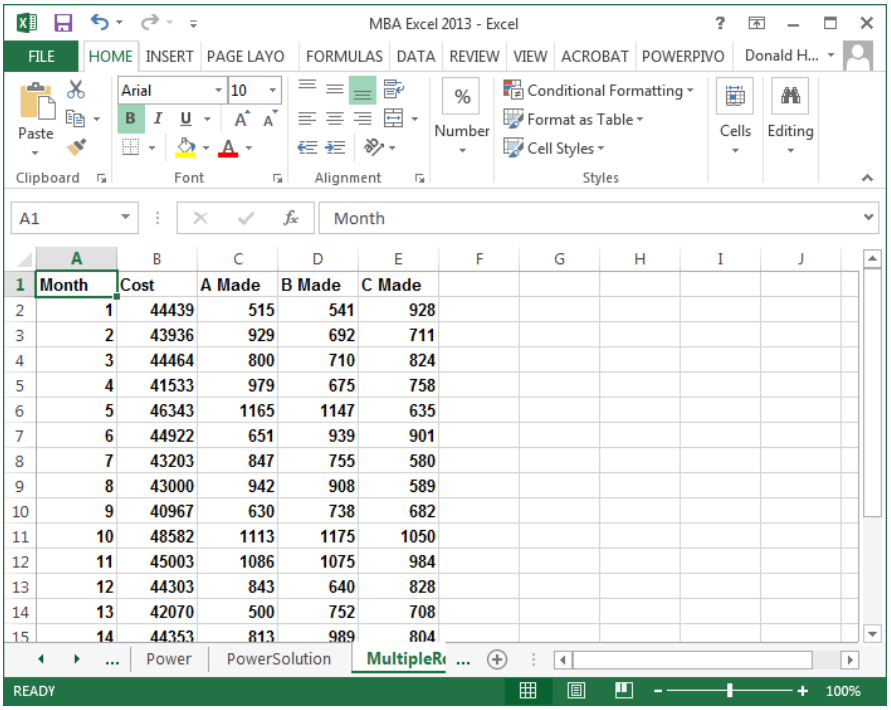


Now click on any data point in the graph, right click, add trendline. Click on Power, display equation, display R-squared.



Session 2.12: Multivariate regression

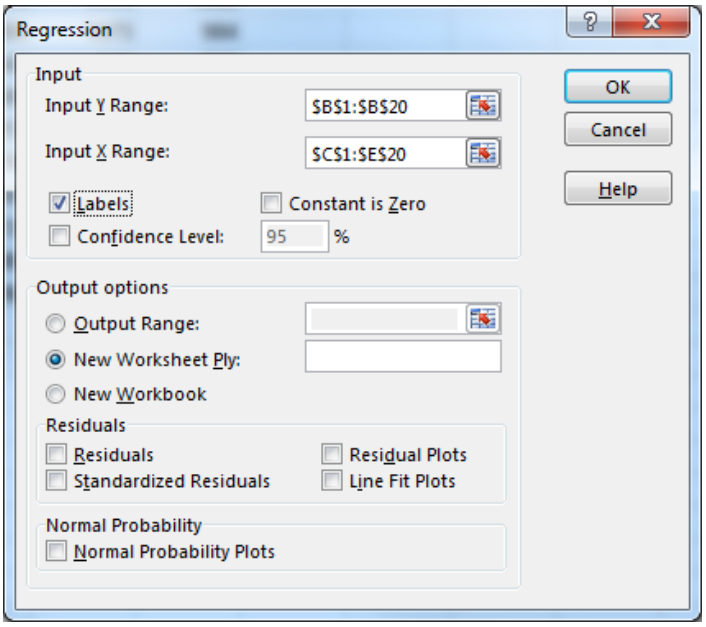
When we reviewed linear regression earlier, we only had one independent variable. Multiple regression includes several independent variables. Use the Multiple Regression spreadsheet.

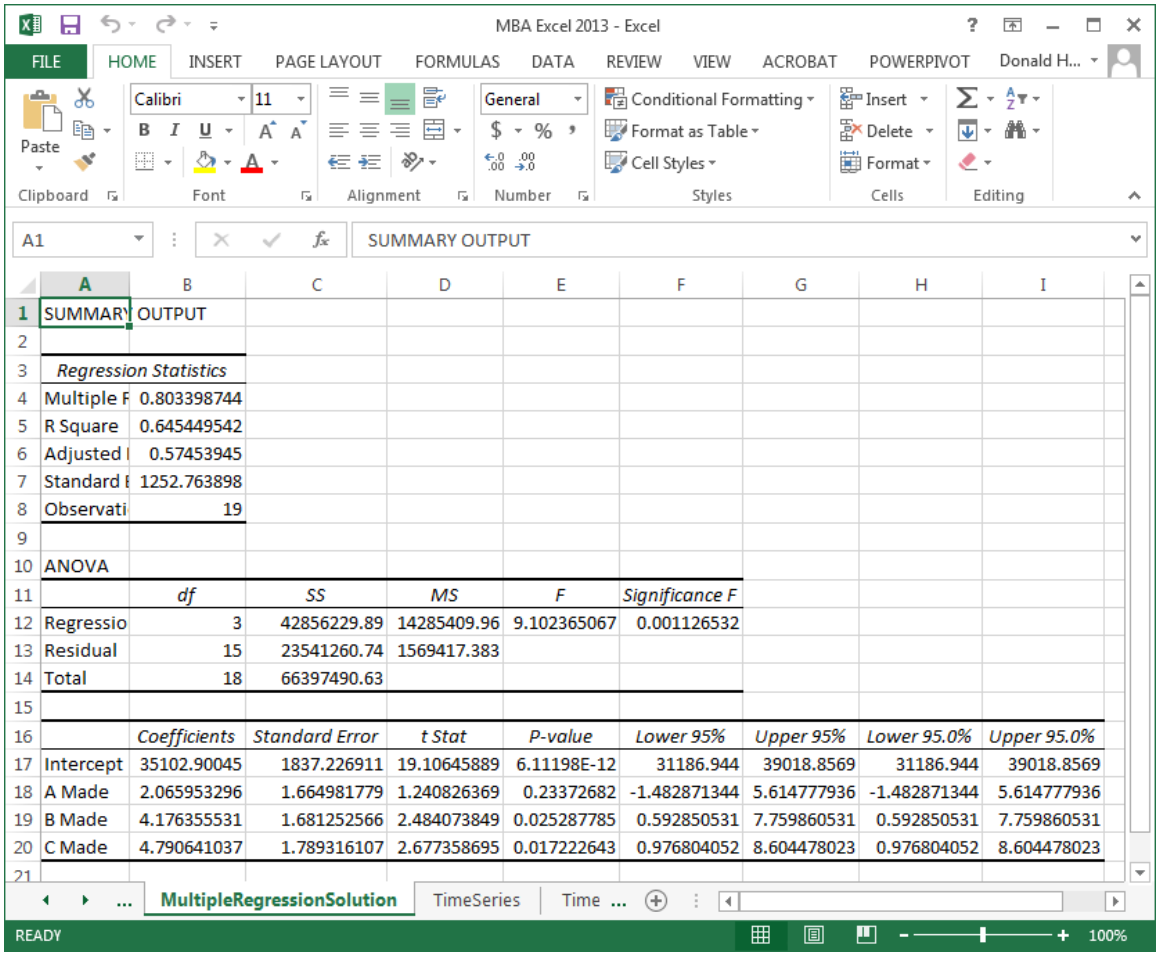


	A	B	C	D	E
1	Month	Cost	A Made	B Made	C Made
2	1	44439	515	541	928
3	2	43936	929	692	711
4	3	44464	800	710	824
5	4	41533	979	675	758
6	5	46343	1165	1147	635
7	6	44922	651	939	901
8	7	43203	847	755	580
9	8	43000	942	908	589
10	9	40967	630	738	682
11	10	48582	1113	1175	1050
12	11	45003	1086	1075	984
13	12	44303	843	640	828
14	13	42070	500	752	708
15	14	44353	813	989	804

To run a multiple regression:

1. Click on the data tab, data analysis, regression, then OK.
2. For the Y-range, highlight the values in the B column for cost
3. For the X-range, highlight the values in the C, D, and E columns.
4. If you included the headings at the top of the columns, click labels.



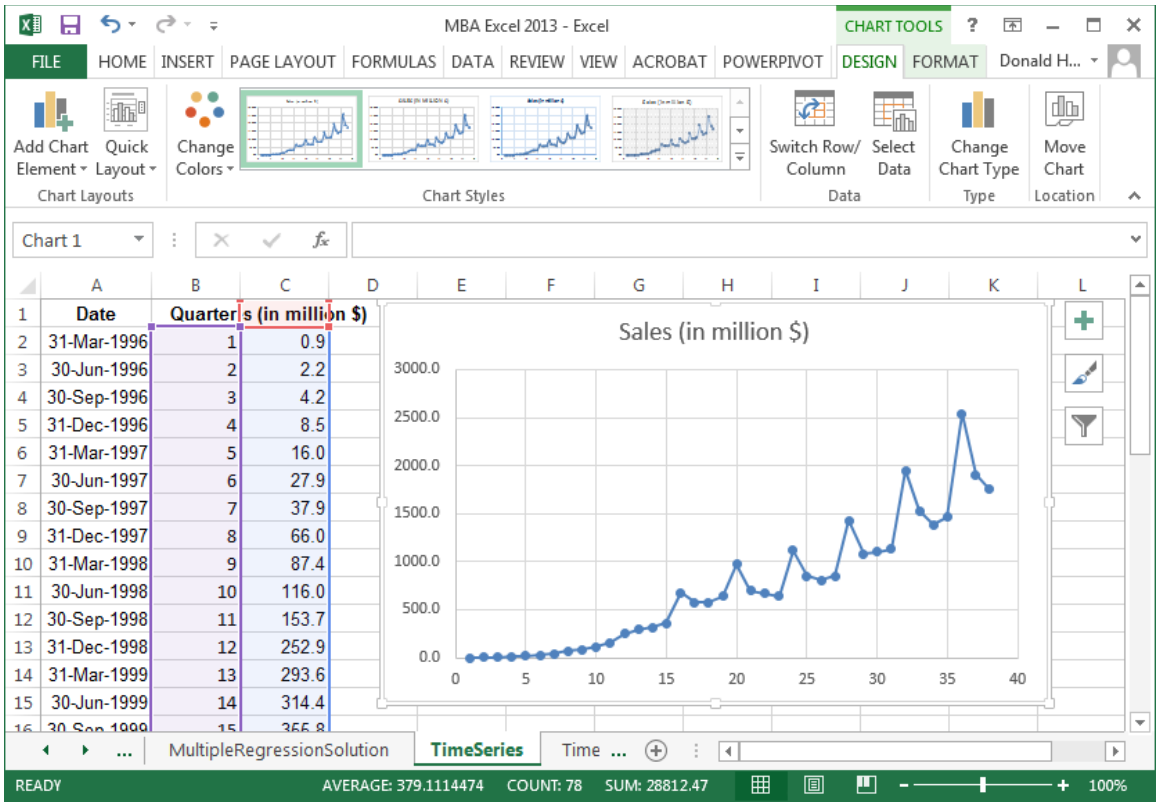


	A	B	C	D	E	F	G	H	I
1	SUMMARY	OUTPUT							
2									
3	*Regression Statistics*								
4	Multiple F	0.803398744							
5	R Square	0.645449542							
6	Adjusted I	0.57453945							
7	Standard E	1252.763898							
8	Observati	19							
9									
10	ANOVA								
11		*df*	*SS*	*MS*	*F*	*Significance F*			
12	Regressio	3	42856229.89	14285409.96	9.102365067	0.001126532			
13	Residual	15	23541260.74	1569417.383					
14	Total	18	66397490.63						
15									
16		*Coefficients*	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
17	Intercept	35102.90045	1837.226911	19.10645889	6.11198E-12	31186.944	39018.8569	31186.944	39018.8569
18	A Made	2.065953296	1.664981779	1.240826369	0.23372682	-1.482871344	5.614777936	-1.482871344	5.614777936
19	B Made	4.176355531	1.681252566	2.484073849	0.025287785	0.592850531	7.759860531	0.592850531	7.759860531
20	C Made	4.790641037	1.789316107	2.677358695	0.017222643	0.976804052	8.604478023	0.976804052	8.604478023
21									

Session 2.13: Time series moving average regression

Time series problems have data where one data point is dependent on the previous data point. For example, the closing price of Microsoft stock can be tracked day by day. Today's price is dependent on yesterday's price. This dependency from one day to the next, or one time period to the next, is a characteristic of time series data.

Often there is so much variation in time series data that it's hard to see trends. Seasonality also masks a trend. Seasonality is variations in data due to high or low points that occur at regular intervals. Create a scatter plot for the Amazon data using the Time Series spreadsheet. For this scatter plot, select the option to connect the dots.

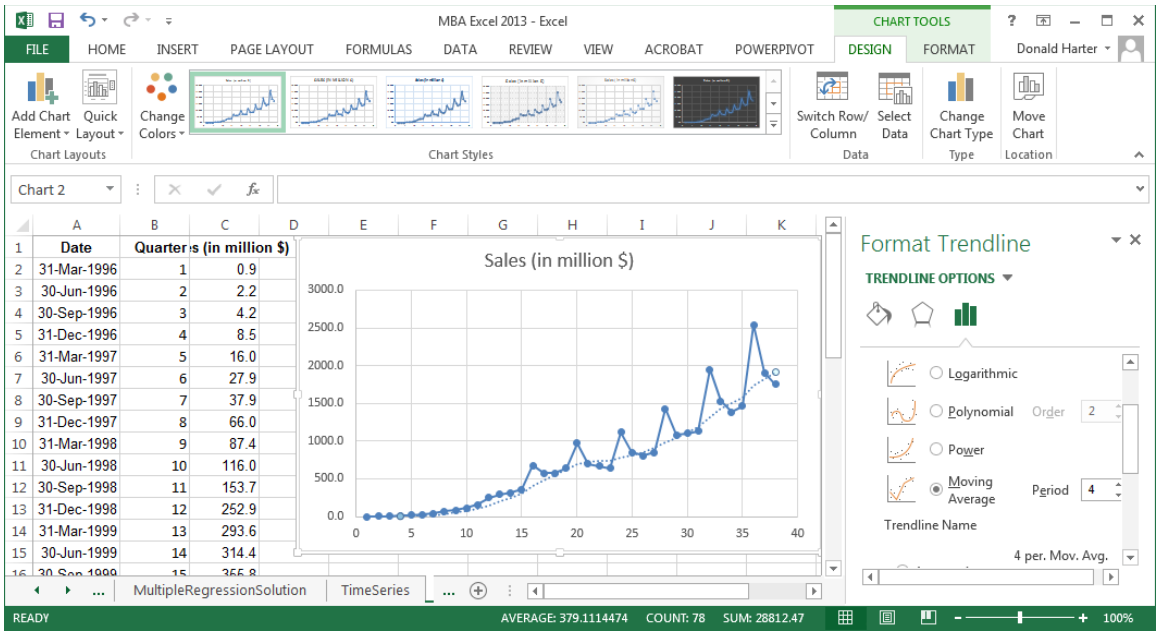


	A	B	C
1	Date	Quarters (in million $)	
2	31-Mar-1996	1	0.9
3	30-Jun-1996	2	2.2
4	30-Sep-1996	3	4.2
5	31-Dec-1996	4	8.5
6	31-Mar-1997	5	16.0
7	30-Jun-1997	6	27.9
8	30-Sep-1997	7	37.9
9	31-Dec-1997	8	66.0
10	31-Mar-1998	9	87.4
11	30-Jun-1998	10	116.0
12	30-Sep-1998	11	153.7
13	31-Dec-1998	12	252.9
14	31-Mar-1999	13	293.6
15	30-Jun-1999	14	314.4

Notice that there is seasonality in the data. Amazon sales tend to peak during the fourth quarter of each year due to holiday sales. However, this seasonality masks the true trend. A moving average helps to see the trend.

To add a moving average line, follow these steps:

1. Right click on a data point.
2. Click on Add Trendline
3. Click the checkbox for moving average. Since we have quarterly data, let's identify the number of periods as four.



	Date	Quarters (in million $)	
2	31-Mar-1996	1	0.9
3	30-Jun-1996	2	2.2
4	30-Sep-1996	3	4.2
5	31-Dec-1996	4	8.5
6	31-Mar-1997	5	16.0
7	30-Jun-1997	6	27.9
8	30-Sep-1997	7	37.9
9	31-Dec-1997	8	66.0
10	31-Mar-1998	9	87.4
11	30-Jun-1998	10	116.0
12	30-Sep-1998	11	153.7
13	31-Dec-1998	12	252.9
14	31-Mar-1999	13	293.6
15	30-Jun-1999	14	314.4

The moving average line is superimposed on the graph. It's now very clear what the trend looks like when a moving average accounts for seasonality.