

M6L5. Regression Analysis

Slide #1

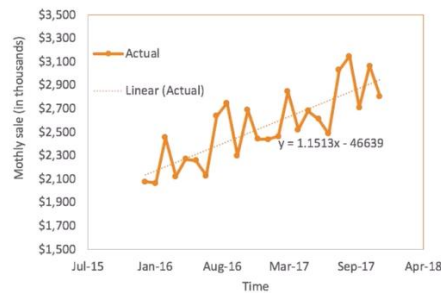
The slide cover is split into two main sections. The left section has a dark background with white and yellow text. It features the Texas A&M University Engineering logo at the top, followed by the title 'Regression Analysis' in a large white font. Below the title is the name 'Dr. Xiaomin Yang'. At the bottom, it says 'TCMT 612' in yellow, followed by 'Technical Management Decision Making' in white, and a red banner at the very bottom with the text 'MASTERS OF ENGINEERING TECHNICAL MANAGEMENT' in white. The right section is a light gray image showing a person from behind, looking at a large, complex network diagram that resembles a molecular structure or a data network. To the right of the person, there are several hexagonal icons containing different types of charts and graphs, including a bar chart, a scatter plot, and a line graph.

In this topic, we will discuss forecasting using the regression method.

Slide #2

Forecasting: Regression Method

Time	Monthly sale (in thousands)
Jan-16	\$ 2,080
Feb-16	\$ 2,068
Mar-16	\$ 2,455
Apr-16	\$ 2,124
May-16	\$ 2,272
Jun-16	\$ 2,261
Jul-16	\$ 2,130
Aug-16	\$ 2,640
Sep-16	\$ 2,750
Oct-16	\$ 2,300
Nov-16	\$ 2,691
Dec-16	\$ 2,442
Jan-17	\$ 2,442
Feb-17	\$ 2,466
Mar-17	\$ 2,850
Apr-17	\$ 2,523
May-17	\$ 2,684
Jun-17	\$ 2,613
Jul-17	\$ 2,487
Aug-17	\$ 3,034
Sep-17	\$ 3,148
Oct-17	\$ 2,712
Nov-17	\$ 3,067
Dec-17	\$ 2,808



A practical method to forecast the trend

MS Excel provides multiple trend regression options

If your business experiences obvious upward or downward trends, regression is a practical forecasting method that we can use to forecast future performance based on historical trend.

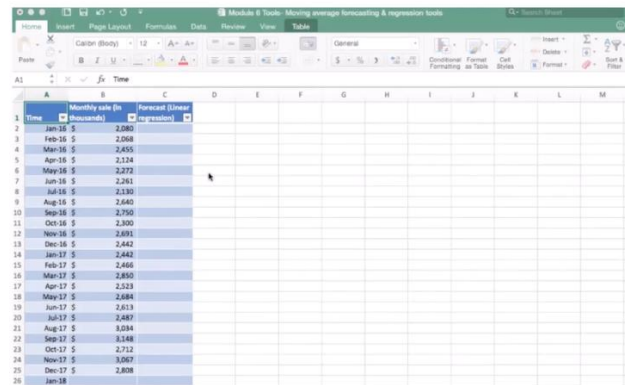
Regression analysis is a modeling technique for analyzing the relationship between two variables, in this case, monthly sale and time.

Microsoft Excel provides multiple easy to use trend regression options.

Rather than discussing the underlying statistics principles of the regression analysis, we will focus on how to use regression tools to forecast the trend, simply because the tool is very intuitive to use.

Slide #3

Forecasting: Regression Method Demo



Time	Monthly sales (\$ thousands)	Forecast (thousands)
Jan-16	3,080	
Feb-16	2,968	
Mar-16	2,615	
Apr-16	2,124	
May-16	2,272	
Jun-16	2,251	
Jul-16	2,130	
Aug-16	2,640	
Sep-16	2,750	
Oct-16	2,300	
Nov-16	2,691	
Dec-16	2,442	
Jan-17	2,442	
Feb-17	2,446	
Mar-17	2,850	
Apr-17	2,523	
May-17	2,684	
Jun-17	2,613	
Jul-17	2,487	
Aug-17	3,034	
Sep-17	3,148	
Oct-17	2,712	
Nov-17	3,007	
Dec-17	2,808	
Jan-18		

The video clip demonstrates how to calculate the trend with the chart and linear regression function of Microsoft Excel.

How to use Microsoft Excel to build a linear regression forecasting model.

This is the monthly sale data of the OCT machine.

First, select the sales data and then insert chart.

This plot shows the historical sales data in the past 24 months.

Right click on the data and add trend line.

We use linear and we can display the equation on the chart.

Now this shows us the linear regression.

Also to do the forecast, we need to calculate the monthly sale using the equation from the linear regression.

For example, this cell is equal to January times 1.1513 minus 46639.

This gives us the forecast of the monthly sale based on the linear regression.

The video clip demonstrates how to forecast future sales from the equation from the linear regression tool that Microsoft Excel provides.

We are going to use Microsoft Excel to build a forecasted chart.

So, due to a standard format of forecasting, select the data, including extra data and your forecasted data.

Click insert, then scatter with straight line.

Because this is forecasted data, typically we use a dotted line to represent forecasted data.

Also, we remove markers for the forecasted data.

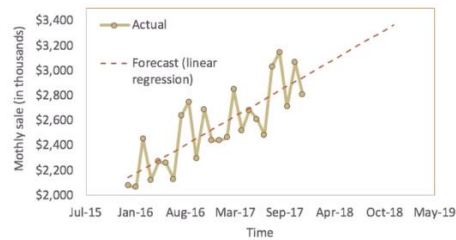
That is the standard presentation of forecasted data.

Change the title to monthly sale.

Slide #4

Forecasting: Regression Analysis Method

Time	Monthly sale (in thousands)	Forecast (Linear regression)
Jan-16	2,080	\$2,142
Feb-16	2,008	\$2,177
Mar-16	2,455	\$2,211
Apr-16	2,124	\$2,246
May-16	2,272	\$2,281
Jun-16	2,301	\$2,317
Jul-16	2,130	\$2,353
Aug-16	2,640	\$2,387
Sep-16	2,790	\$2,422
Oct-16	2,300	\$2,457
Nov-16	2,891	\$2,491
Dec-16	2,442	\$2,527
Jan-17	2,442	\$2,563
Feb-17	2,406	\$2,599
Mar-17	2,850	\$2,635
Apr-17	2,523	\$2,667
May-17	2,684	\$2,702
Jun-17	2,613	\$2,737
Jul-17	2,487	\$2,772
Aug-17	3,024	\$2,807
Sep-17	3,148	\$2,843
Oct-17	2,712	\$2,877
Nov-17	3,407	\$2,912
Dec-17	2,808	\$2,947
Jan-18		\$2,983
Feb-18		\$3,019
Mar-18		\$3,055
Apr-18		\$3,091
May-18		\$3,126
Jun-18		\$3,157
Jul-18		\$3,192
Aug-18		\$3,227
Sep-18		\$3,263
Oct-18		\$3,297
Nov-18		\$3,333
Dec-18		\$3,368



Business insights:
\$5m per year sale growth

Forecast: \$5m sale growth (15% upward trend) between 2017 and 2018

Seasonal fluctuation contributes to the monthly fluctuation

The linear function represents the relationship between monthly sales and the time.

With Microsoft Excel, the regression analysis is very simple and intuitive.

However, we can derive very useful business trend insight from the regression method.

In this case, the linear regression analysis tells us the annual sales growth was 5 million dollars.

Between 2016 and 2017, the annual growth is consistent for the following years also, so we can use the same annual growth number to forecast the monthly sales in 2018.

The linear regression method is useful for the forecasting of long-term trends of business performance.