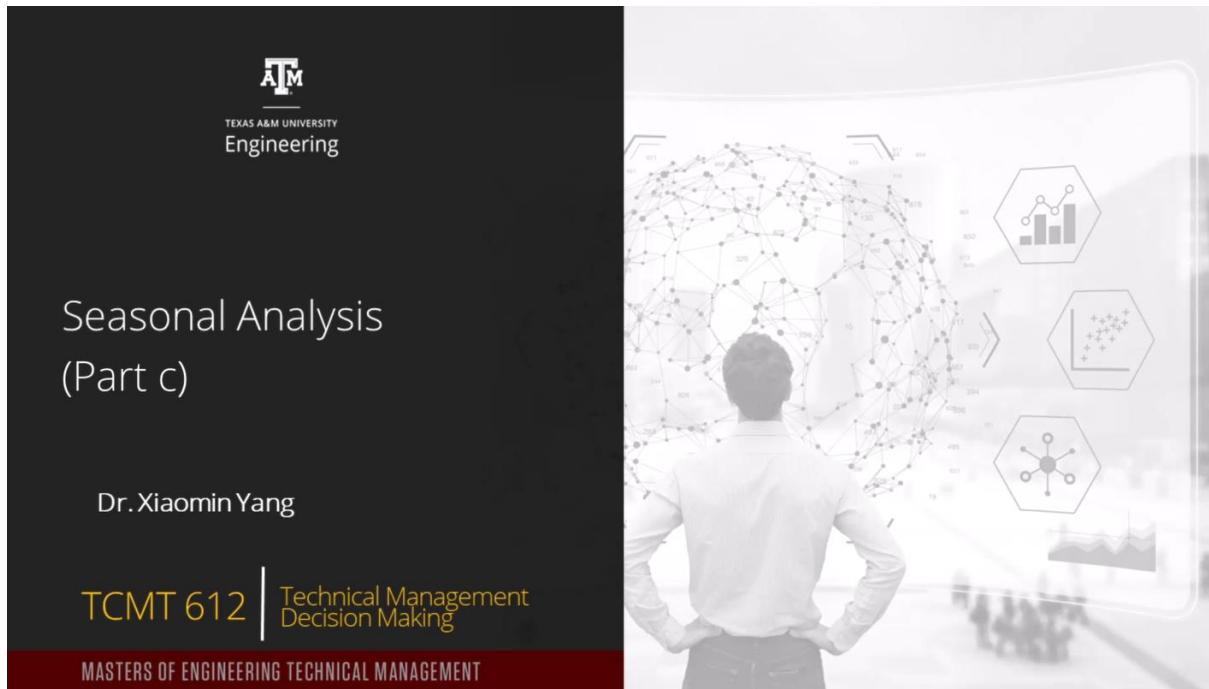


M6L6c. Seasonal Analysis

Slide #1



The slide cover is divided into two main sections. The left section is a dark grey/black rectangle containing the Texas A&M University Engineering logo at the top, followed by the title "Seasonal Analysis (Part c)" in white, the name "Dr. Xiaomin Yang" in white, and the course information "TCMT 612 | Technical Management Decision Making" in yellow and white. At the bottom of this section is a red banner with the text "MASTERS OF ENGINEERING TECHNICAL MANAGEMENT" in white. The right section is a light grey image showing a person from behind, standing with hands on hips, looking at a large screen. The screen displays a complex network diagram on the left and several hexagonal icons on the right, each containing a different data visualization (bar chart, line graph, network diagram, and area chart).

ATM
TEXAS A&M UNIVERSITY
Engineering

Seasonal Analysis
(Part c)

Dr. Xiaomin Yang

TCMT 612 | Technical Management
Decision Making

MASTERS OF ENGINEERING TECHNICAL MANAGEMENT

Slide #2

Seasonal Indices

$$\text{Seasonal index}_{\text{Jan}} = \frac{\text{Actual sale}_{\text{Jan}}}{(\text{Average sale}_{\text{July 2016} - \text{June 2017}} + \text{Average sale}_{\text{Aug 2016} - \text{July 2017}})/2}$$

Year	Month	Monthly sale (\$)	Annual trend (\$)	Seasonal index
2016	Jan	2,080	\$2,102	0.99
2016	Feb	2,064	\$2,177	0.95
2016	Mar	2,055	\$2,311	1.00
2016	Apr	2,124	\$2,248	0.95
2016	May	2,172	\$2,381	1.00
2016	Jun	2,261	\$2,517	0.90
2016	Jul	2,340	\$2,651	0.89
2016	Aug	2,440	\$2,787	1.10
2016	Sep	2,700	\$2,922	1.13
2016	Oct	2,900	\$2,957	0.95
2016	Nov	2,891	\$2,909	1.00
2016	Dec	2,442	\$2,927	0.97
2017	Jan	2,442	\$2,968	0.95
2017	Feb	2,440	\$2,999	0.95
2017	Mar	2,850	\$2,933	1.00
2017	Apr	2,523	\$2,967	0.95
2017	May	2,884	\$2,961	1.00
2017	Jun	2,813	\$2,737	0.96
2017	Jul	2,487	\$2,971	0.90
2017	Aug	3,024	\$2,807	1.10
2017	Sep	3,148	\$2,945	1.13
2017	Oct	2,712	\$2,879	0.95
2017	Nov	3,087	\$2,913	1.00
2017	Dec	2,808	\$2,947	0.97

Month	12 month moving average	Seasonal index
Jul	\$2,398	0.90
Aug	\$2,398	1.10
Sep	\$2,451	1.13
Oct	\$2,454	0.95
Nov	\$2,498	1.00
Dec	\$2,500	0.97
Jan	\$2,509	0.95
Feb	\$2,500	0.95
Mar	\$2,623	1.00
Apr	\$2,657	0.95
May	\$2,680	1.00
Jun	\$2,721	0.96

12 month moving average around January:

Cell (I14) formula= (AVERAGE(C8:C19)+AVERAGE(C9:C20))/2

Seasonal index of January:

Cell (J14) formula =C14/I14

We built a seasonal forecasting model with Microsoft Excel. This is the interface of Excel.

Column A is the month of the year, column B is the month label, and column C is the monthly sale. The units are in thousands of dollars.

Column D is the annual trend that we got from the linear regression, and column E is the seasonal index of each month. It is calculated in the table at the right side. The table in columns H through J is the seasonal index table.

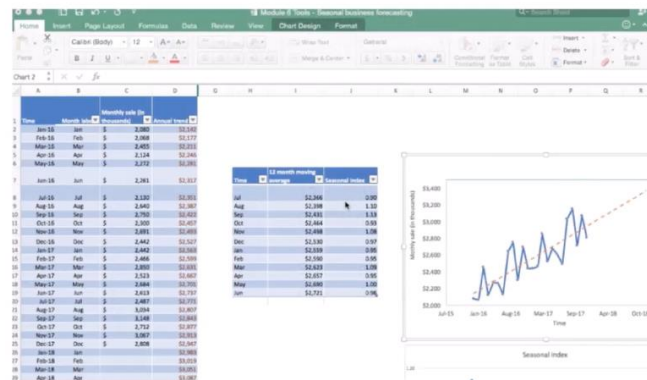
Column I is the 12-month moving average for each month, and column J includes the seasonal index of each month.

The formulas of those cells in column I and J are shown at the right side. For example, row 14 represents the month of January. The formula of I14 is the average number of two 12 month moving windows.

The seasonal index of January is calculated with the formula in J14. The formula is the seasonal index equals to the actual sale in January divided by the 12-month moving average number.

Slide #3

Seasonal model demo



This video clip shows how you can build the seasonal forecasting model with Microsoft Excel.

You can find the model in the resource folder on Canvas.

Again, I do not expect you to build a model from scratch.

I expect you to understand how to build a model and how to use the model to do the seasonal forecasting.

Seasonal Business Forecasting Model.

We start with the trend analysis, like what we discussed in the previous lecture.

So we use the linear regression function of Excel to calculate the trend line. Seasonal Column D is the number of the trendline analysis.

The trendline analysis tells us the long-term performance of the product, the annual growth rate of the sale of the OCT machine.

After that, we're going to calculate the seasonal index of each month, and this table shows the calculation of the seasonal index.

Let's look at January, and see that this column captures the moving average of a 12 month window.

We use the average of two windows to calculate the January moving average sale because there are 12 months and January is not in the exact middle.

So one window is between July 2016 and June 2017. The other window is between August 2016 and July 2017.

The average of the two moving average windows is the denominator of the index calculation and the seasonal index calculation is the actual sale in January divided by the moving average of those two 12 month windows.

We use the same formula to calculate the seasonal index of each month.

This chart shows the seasonal index.

Clearly it shows that in August and September, the sale is more than the index number in other months.

So this seasonal index reflects the fluctuation of monthly sale on top of the general long term trend.

Now let's put the seasonal index and the long-term trend together.

So this column shows the seasonal index of each month.

We use the VLOOKUP table function to load the seasonal index into this table for each month.

Then, we use the multiplication of the long-term trend by the seasonal index to forecast the seasonal performance of the OCT machine.

This chart shows the forecast results.

The solid lines are the monthly sales in the past two years, and this dotted line is the annual growth trend, which tells us the long-term performance of the product.

And those are the forecasted numbers in the next year.

So clearly, the pattern of each month's sale is very similar to the pattern in previous months.

And those are the forecasted numbers in the next year.

So clearly, the pattern of each month's sale is very similar to the pattern in previous months.

So this method can tell us the long term trend and also the short term fluctuation of the sale.

This Excel table is how we do the forecast.

It's very simple but it creates a lot of business insight from this forecasting.

And that is what we want you to learn, the practical use of a tool, and also how to use the forecast to generate the business insights, in addition to how to predict the performance in the future.