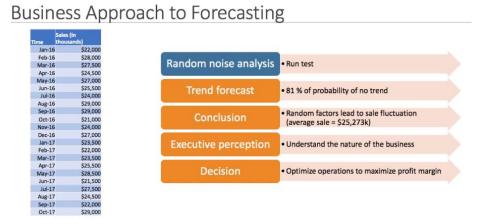# M6L2d. Random Noise vs Trend

Slide #1

Slide #2

I will add the runs test conclusion to the business forecasting approach.

I would expect the following outcome and the communication.

I am going to show both the method that I used for forecasting and the conclusion I got from the forecasting analysis.

We did a random noise analysis or runs test analysis.

From the runs test, we conclude that there is 80% of probability that the sales data is not a function of time.

Basically, that means that there is no correlation between the sale and the time.

We can draw the conclusion that random factors lead to the monthly sale fluctuation, and the average monthly sale is $25,233,000.

Also, I would recommend to the management to do some studies to understand the nature of the business, to understand what factors contribute to the stable performance of the sales.
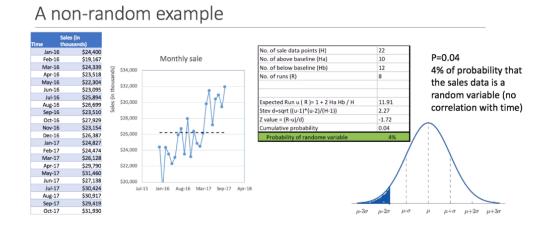
At the end, I expect my management to make some decisions to optimize the operation and maximize the profit margin.

If the sale is instable, the market is instable.

We need to reduce our cost so that we can increase our profit and improve our profit margin.

The conclusion of this business analysis is different from the previous linear regression type of analysis because in the business forecasting case, we need to check our assumption, and if our assumption is correct, we can draw a totally different conclusion from our forecasting analysis.

Slide #3

Let us look at another example.

The leftmost table shows a new set of sales data.

When we plot the data into a chart, clearly there is an upward trend of sale.

When the trend is obvious, it is not necessary to conduct the runs time analysis.

For the purpose of illustrating the runs test method, I still use the Excel tool to perform a runs test.

The number of runs is eight, and from the normal distribution analysis, we know that there is only 4% of probability that the sales data is a random variable, or sales is not a function of time.
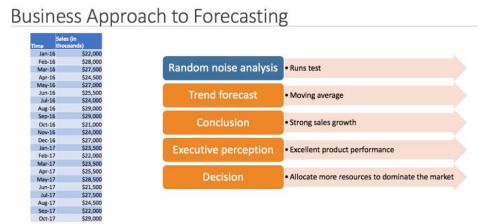
Let me emphasize again that if the trend of the data set is obvious, it is not necessary to perform a runs test analysis.

On the other hand, if the trend is not obvious, I strongly recommend a runs test analysis before conducting a trend analysis.

In this case, the trend is very clear and the runs test confirmed that the chance of sales data is not a function of time is only 4%.

It is a very low number, which means that the monthly sale is a strong function of time and it is appropriate to use trend forecasting models, such as time series, moving average analysis, or linear regression model to do the forecasting of future sale based on the historical trend.

Slide #4

Business Approach to Forecasting

Time	Sales (in thousands)
Jan-16	$22,000
Feb-16	$28,000
Mar-16	$27,500
Apr-16	$24,500
May-16	$27,000
Jun-16	$25,500
Jul-16	$24,000
Aug-16	$29,000
Sep-16	$29,000
Oct-16	$21,000
Nov-16	$24,000
Dec-16	$27,000
Jan-17	$23,500
Feb-17	$22,000
Mar-17	$23,500
Apr-17	$25,500
May-17	$28,500
Jun-17	$21,500
Jul-17	$27,500
Aug-17	$24,500
Sep-17	$22,000
Oct-17	$29,000

- Random noise analysis • Runs test
- Trend forecast • Moving average
- Conclusion • Strong sales growth
- Executive perception • Excellent product performance
- Decision • Allocate more resources to dominate the market

To incorporate the runs test into the forecasting process, I would recommend the following steps to do the forecast.

First, do a random noise analysis.

Basically, means the runs test, even though in this case, is not necessary, but we still want to confirm that the sale is a function of time.

After that, we will do a trend analysis.

We can use moving average method for short term forecasting, and a linear regression for a long-term trend type of forecasting.

We will talk about both models in the next lectures, and we can draw the conclusion from the forecasting.

There is a strong sales growth trend.

From the linear regression method, we can calculate the annual sale growth rate.

Our conclusion is that the product performance is excellent, the growth rate is consistent, and the sales growth is strong.

I also expect our management would make decisions to allocate more resources to this product so that we can dominate the market.

I expect you to learn from those two examples about how to use forecasting method to draw business insight from historical data and help you and your management make the appropriate decisions based on your forecasting of the trend.

Slide #5

Runs test summary

If the trend of historical data is NOT obvious, "Runs test" is recommended

Purpose of runs test: to decide whether a data set is from a random process

Definition of Runs: the number of groups of observations that are above or below the baseline

Method of runs test: normal distribution probability analysis

Tools of runs test: Excel tool on Canvas

Below is a quick summary of the runs test analysis.

First, when do we need to conduct a runs test analysis?

When the trend of historical data is not obvious, runs test is recommended. On the other hand, if the trend is clear, there is no need to conduct the runs test.

Second, the purpose of the runs test is to decide whether a set of data is from a random process. The definition of runs is the number of groups of data that are above or below the baseline.

Each circle in the right chart is a run and the baseline is the average of sale. The method of runs test, normal distribution probability analysis, is used to calculate the probability of data randomness. I do not expect you to dig too deep into the statistics theory, rather, I advise you to learn when, why, and how to use Excel tools to perform the runs test analysis.

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