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ABSTRACT

Applied Excel is powerful to analyze business and marketing data. This paper intends to support business and marketing leaders the benefits of data forecasting with applied Excel. It showed the sale data forecasting for coming seasons. As Excel’s background methods, it showed time series methods such as the FORECAST.ETS And FORECAST.ETS.SEASONALITY methods. And then Sample data ‘forecast functions.xlsx’ was downloaded from Google and was analyzed and viewed. It used Microsoft Excel software version 2016.


1. INTRODUCTION

Nowadays, businesses are competing with others not to lose their market places in local and external regions. To avoid the loss of market places they should use data science technology. This paper used Microsoft Excel’s time series methods. It showed the sale data forecasting for coming seasons that includes three tables, the result of each table, one graph and data analytical view.

1.1. Understanding Time Series Forecasting in Excel[10]

What is time series forecasting, and how does Excel make this task easy to do?

Time series forecasting is all about using existing data to make predictions about future events.

Just as meteorologists can predict the path of a hurricane by its current path, you can use forecasting to spot trends in the data and make an educated guess as to where that data is headed.

1.2. How to Create a Time Series [10]

You would create a time series in pretty much the same way that you would enter data for any purpose in Excel. What makes a time series different than other data series is that the values correspond to different points in time.

For example, suppose you wanted to track the number of students in a particular class from semester to semester over a number of years. Then you would create a time series for enrollment.

1.3. FORECAST.ETS function[1]


Calculates or predicts a future value based on existing (historical) values by using the AAA version of the Exponential Smoothing (ETS) algorithm. The predicted value is a continuation of the historical values in the specified target date, which should be a continuation of the timeline. You can use this function to predict future sales, inventory requirements, or consumer trends.

This function requires the timeline to be organized with a constant step between the different points. For example, that...
2. Methods

FORECAST.ETS function [1]

Syntax

FORECAST.ETS (target_date, values, timeline, [seasonality], [data_completion], [aggregation])

The FORECAST.ETS function syntax has the following arguments:

- **Target_date** Required. The data point for which you want to predict a value. Target date can be date/time or numeric. If the target date is chronologically before the end of the historical timeline, FORECAST.ETS returns the #NUM! error.
- **Values** Required. Values are the historical values, for which you want to forecast the next points.
- **Timeline** Required. The independent array or range of numeric data. The dates in the timeline must have a consistent step between them and can’t be zero. The timeline isn’t required to be sorted, as FORECAST.ETS will sort it implicitly for calculations. If a constant step can’t be identified in the provided timeline, FORECAST.ETS.SEASONALITY will return the #NUM! error. If timeline contains duplicate values, FORECAST.ETS.SEASONALITY will return the #VALUE! error. If the ranges of the timeline and values aren’t of same size, FORECAST.ETS.SEASONALITY will return the #N/A error.
- **Seasonality** Optional. A numeric value. The default value of 1 means Excel detects seasonality automatically for the forecast and uses positive, whole numbers for the length of the seasonal pattern. 0 indicates no seasonality, meaning the prediction will be linear. Positive whole numbers will indicate to the algorithm to use patterns of this length as the seasonality. For any other value, FORECAST.ETS will return the #NUM! error. Maximum supported seasonality is 8,760 (number of hours in a year). Any seasonality above that number will result in the #NUM! error.
- **Data completion** Optional. Although the timeline requires a constant step between data points, FORECAST.ETS supports up to 30% missing data, and will automatically adjust for it. 0 will indicate the algorithm to account for missing points as zeros. The default value of 1 will account for missing points by completing them to be the average of the neighboring points.
- **Aggregation** Optional. Although the timeline requires a constant step between data points, FORECAST.ETS.SEASONALITY will aggregate multiple points which have the same time stamp. The aggregation parameter is a numeric value indicating which method will be used to aggregate several values with the same time stamp. The default value of 0 will use AVERAGE, while other options are SUM, COUNT, COUNTA, MIN, MAX, MEDIAN.

FORECAST.ETS.SEASONALITY function [2]

Syntax

FORECAST.ETS.SEASONALITY (values, timeline, [data_completion], [aggregation])

The FORECAST.ETS.SEASONALITY function syntax has the following arguments:

- **Values** Required. Values are the historical values, for which you want to forecast the next points.
B. Data Forecasting
FORECAST.ETS(target_date, values, timeline, [seasonality], [data_completion], [aggregation])

<table>
<thead>
<tr>
<th>Date</th>
<th>Units sold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan-18</td>
<td>926</td>
</tr>
<tr>
<td>Feb-18</td>
<td>877</td>
</tr>
<tr>
<td>Mar-18</td>
<td>700</td>
</tr>
<tr>
<td>Apr-18</td>
<td>790</td>
</tr>
<tr>
<td>May-18</td>
<td>971</td>
</tr>
<tr>
<td>Jun-18</td>
<td>960</td>
</tr>
</tbody>
</table>

C. Calculate Seasonality
FORECAST.ETS.SEASONALITY(values, timeline, [data_completion], [aggregation])
Seasonality = 12

D. Calculate Statistics
FORECAST.ETS.STAT(values, timeline, statistic_type)
Statistics = 0.001

E. Calculate Confidence, Upper Bound and Lower Bound
Confidence=FORECAST.ETS.CONFINT(target_date, values, timeline)
Upper Bound= Units Sold+Confidence
Lower Bound=Unit Sold-Confidence

<table>
<thead>
<tr>
<th>Date</th>
<th>Units sold</th>
<th>Confidence</th>
<th>Upper Bound</th>
<th>Lower Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan-18</td>
<td>926</td>
<td>226</td>
<td>1,152</td>
<td>700</td>
</tr>
<tr>
<td>Feb-18</td>
<td>877</td>
<td>253</td>
<td>1,130</td>
<td>624</td>
</tr>
<tr>
<td>Mar-18</td>
<td>700</td>
<td>277</td>
<td>978</td>
<td>423</td>
</tr>
<tr>
<td>Apr-18</td>
<td>790</td>
<td>300</td>
<td>1,090</td>
<td>490</td>
</tr>
<tr>
<td>May-18</td>
<td>971</td>
<td>321</td>
<td>1,292</td>
<td>650</td>
</tr>
<tr>
<td>Jun-18</td>
<td>960</td>
<td>341</td>
<td>1,301</td>
<td>619</td>
</tr>
</tbody>
</table>

F. Graph-1: Show actual and forecast data

G. Confidence Internal

H. Analytical View
- As 3(B), (E) and (F), before sale, business leader can know maximum sale and minimum sale in specific time line. So, he can avoid the shortage of goods and waste of goods.
- As 3(C), (D) and (H), can know that data periods is 12 seasons. And then statistics value is 0.001 less than 0.05 and confidence interval is 95%, so the used-data (original data) is significant. So, this data forecasting is actuated.

4. Conclusion
Excel data analysis tools are valuable in social science, business and marketing fields. It is very good for presentation report by graphical design. Business leaders can get their goal with good forecasting result and can avoid the loss of market places in local and global regions by using applied Excel software.

References
[8] Office.com/Excel/Training
[9] Office.com/Excel/Block