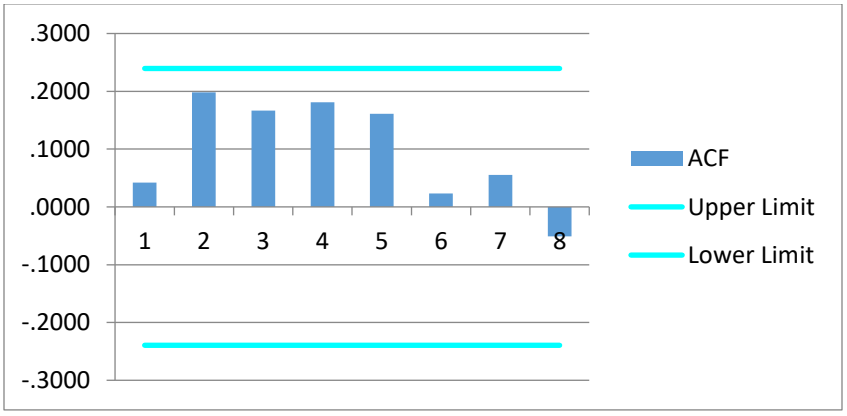
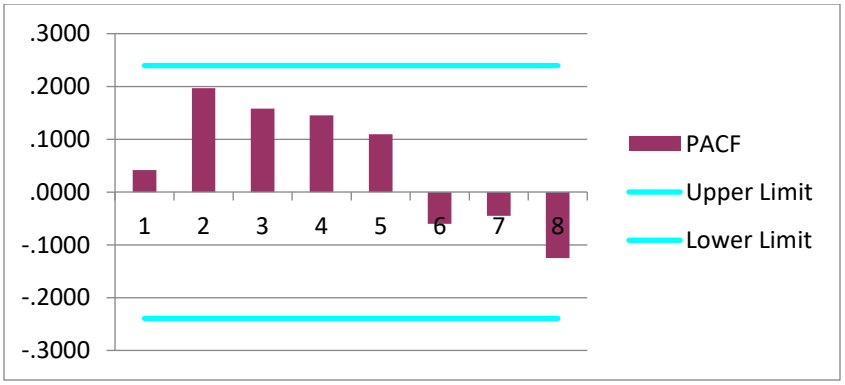
Collin DeVore
Honors Contract

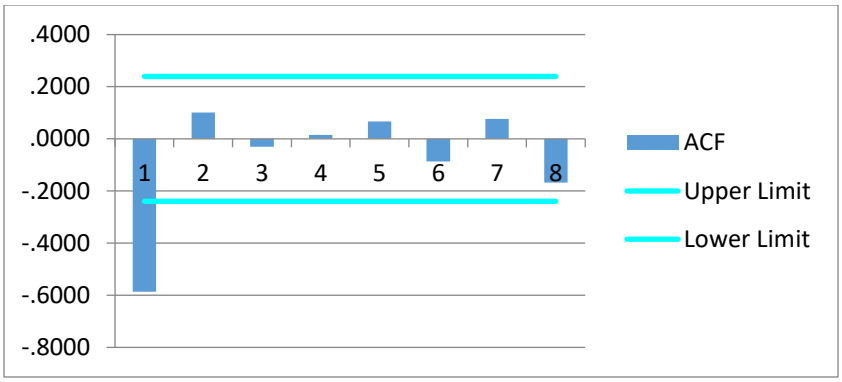
For my honors contract I forecasted profit for the airline industry. I used quarterly data from 2000 to 2016. I obtained this data from the United States Bureau of Transportation. The first step in forecasting this data was to analyze the correlograms in order to see the evidence of trend or seasonality. The ACF's, in general, do not appear to have any downward trend, since none of the ACF's are significant. However, it could be possible that there is a slight trend within the data that is hard to see from the ACF's alone. The partial autocorrelation functions, or PACF's, are likewise not statistically significant since they all fall between the upper and lower bounds. The ACF's and the PACF's appear to show a pattern that may be fairly consistent with an autoregressive model. There may also be seasonality within the data, since people tend to travel and visit relatives using air travel seasonally. Seasonality has been tested for by first-differencing the data, with the first-difference ACF's and PACF's appearing below the regular ACF and PACF models on the next page. Upon first- differencing the data, the first ACF becomes statistically significant. The eighth ACF also becomes more significant, though not yet statistically significant, while the others appear to decrease in value. For the PACF's, it appears that the first three columns, and, arguably the fourth, become statistically significant. Meanwhile, the eighth PACF appears to become more statistically significant, while the rest of the PACF's become less significant than they were before the first differencing. While it is difficult to tell the reason as to why these correlograms look the way that they do, it could be possible that there is some sort of slight cyclicality within the data. This would explain why, in general, the data appears to decrease around the middle of the correlogram and then begin to increase again.

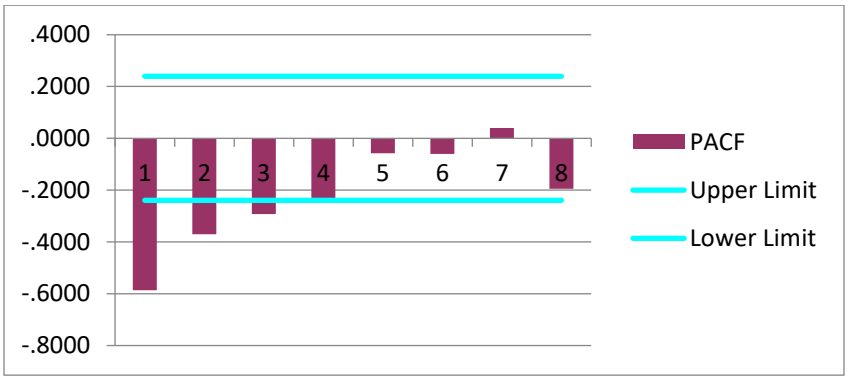
In addition to the knowledge gained by the analysis of the correlogram, there are large spikes within the data, which occur in the fourth quarter of 2005 and the first quarter of 2006.

This could be attributable to many occurrences, such as a policy change or a result of war. The drop could also be attributable to the tightening of security following the September 11 attacks, while the rise could be result of people temporarily postponing their flights in the fourth quarter of 2005, leading to an increase in flight in the first quarter of 2006. Whatever the case, if these outliers are not accounted for within the data, it could lead to problems within the forecasts, thus skewing the results.

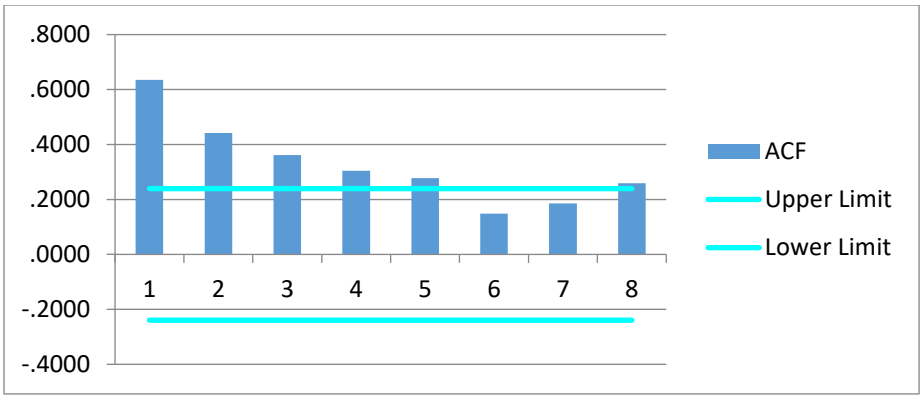








After each forecast I performed a sensitivity analysis in order to better understand what may have occurred during the initial analysis and how to better account for the errors. This data has the two largest spikes averaged out and is then normalized by adding $11,599,703 to every value. The ACF's and PACF's are shown below, with the first differenced ACF's and PACF's shown below them. For the ACF's, there appears to be some trend shown in this data, since they slowly decrease and show the first five columns as significant, along with the last column. The ACF's, on the other hand, decrease quickly and show only the first column as significant. The first-differenced ACF's, however, show only the first and last column as significant, and the first-differenced PACF's show the first and sixth column as significant.


.8000
.6000
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1
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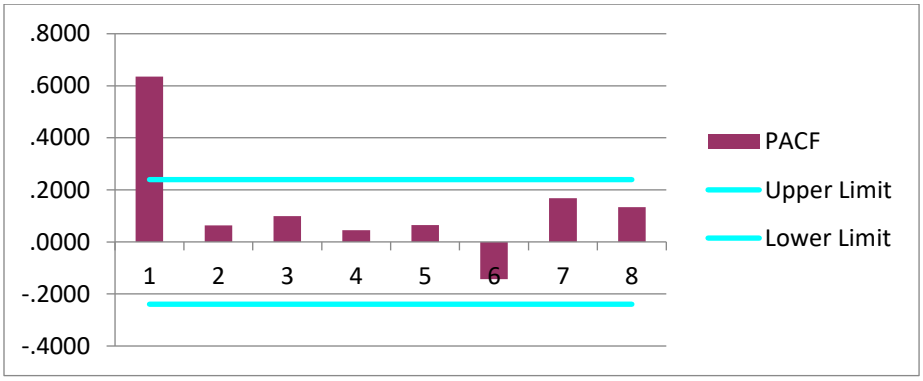
7
8
ACF
Upper Limit
Lower Limit


.8000
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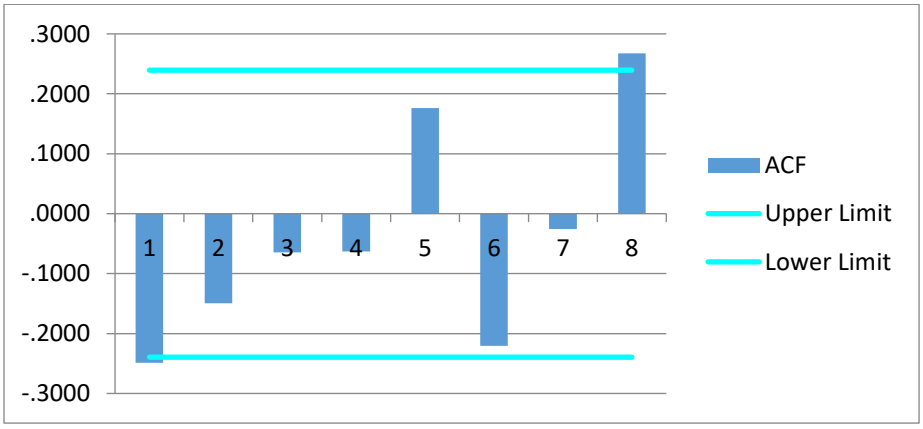
PACF
Upper Limit
Lower Limit


.3000
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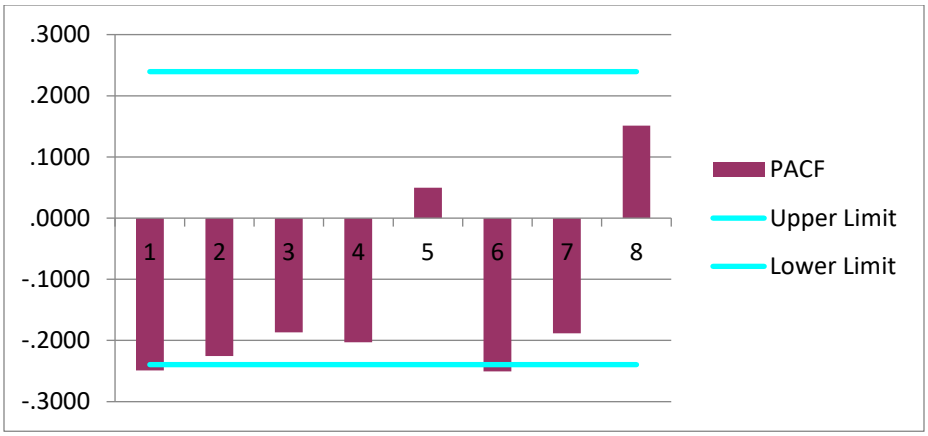
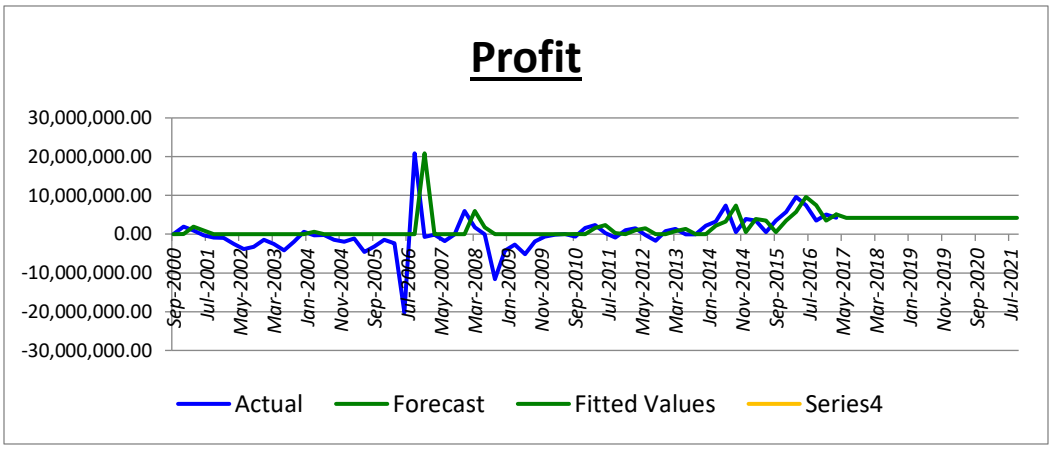
ACF
Upper Limit
Lower Limit



Naïve No-Change Model



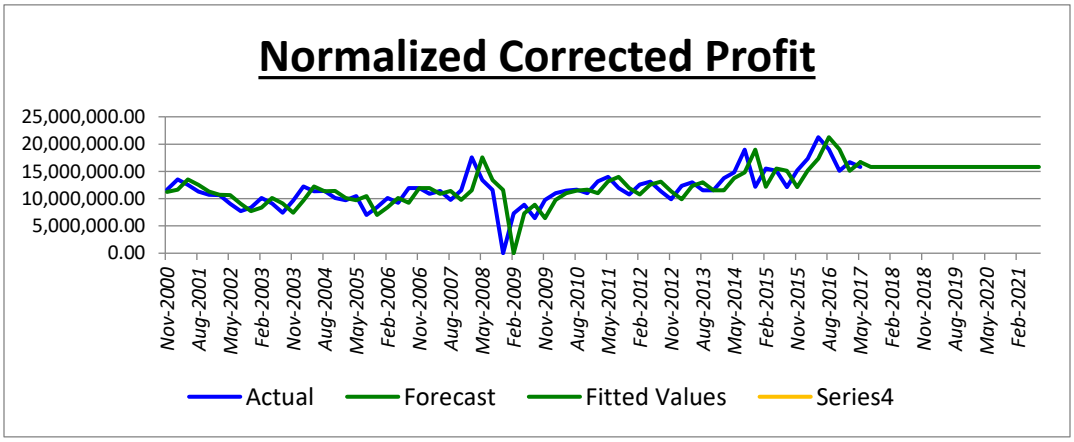
Audit Trail - Statistics

Accuracy Measures	Value
AIC	2,265.27
BIC	2,267.48
MAPE	334.57%
Sum Squared Error (SSE)	################
R-Square	0.00%
Adjusted R-Square	0.00%
Root Mean Square Error	5,236,403.21

Method Statistics	Value
Method Selected	Moving Average
Average Periods	1

Forecast Statistics	Value
Mean	153,806.61
Standard Deviation	4,854,380.18

For my first forecast I forecasted a naïve no-change model by setting the average periods of the moving average model to one. This should produce a forecast that is shifted by one period, but, due to the fact that ForecastX has difficulty recording negative numbers, only the top half of the model was accounted for. This resulted in a RMSE (root mean square error) of 5,236,403.21 and a MAPE (mean absolute percent error) of 334.57%. This suggests that this model is highly inaccurate. It also has an R-square of 0%, suggesting that none of the variance is accounted for in this model. The main reason that this model is not very accurate is due to the fact that the negative values of the model are missing. This is an important factor in the first half of the data, which stays mostly below the $0 profit line. It may also be affected by the sharp decreases and increases within the data, which would increase the inaccuracies the farther an observation is away from the previous observation.



Audit Trail - Statistics

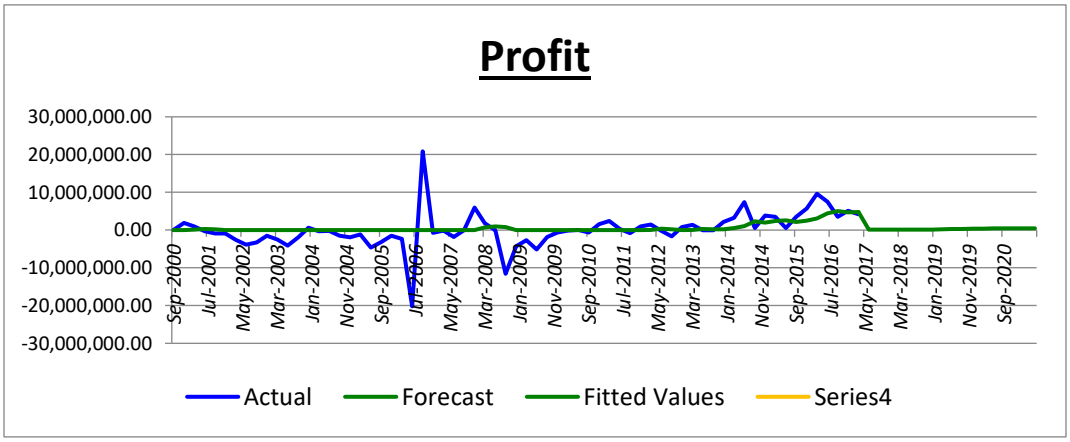
Accuracy Measures	Value
AIC	2,178.53
BIC	2,180.73
MAPE	16.03%
Sum Squared Error (SSE)	###############
R-Square	29.36%
Adjusted R-Square	29.36%
Root Mean Square Error	2,740,960.88

Method Statistics	Value
Method Selected	Moving Average
Average Periods	1

Forecast Statistics	Value
Mean	11,753,509.61
Standard Deviation	3,285,729.92

After the initial analysis of the naïve no-change model, I performed a sensitivity analysis in which I averaged the values of the two large spikes in order to take their influence out of the data. This average, which was $335,024, was then entered and forecasted in the place of the large spikes. I then normalized the data by adding the complement of the lowest amount of profit ($11,599,703) to every entry in order to ensure that there were no negative values. In this way, the forecasts can be better predicted by subtracting $11,599,703 to any or all values once the data has been forecasted. This should ensure that ForecastX will forecast the whole series, rather than dropping the negative values. This sensitivity analysis lowered the value of the RMSE to 2,740,960.88 and the MAPE to 16.03%. It also raised the R-square to 29.36%. This suggests that the accuracy of the model has almost doubled, which makes sense due to the fact that almost half of the data is negative and was not previously accounted for. This sensitivity analysis levels off at the end, showing a continued value for the forecast of $15,808,202.00.

Moving Average Model



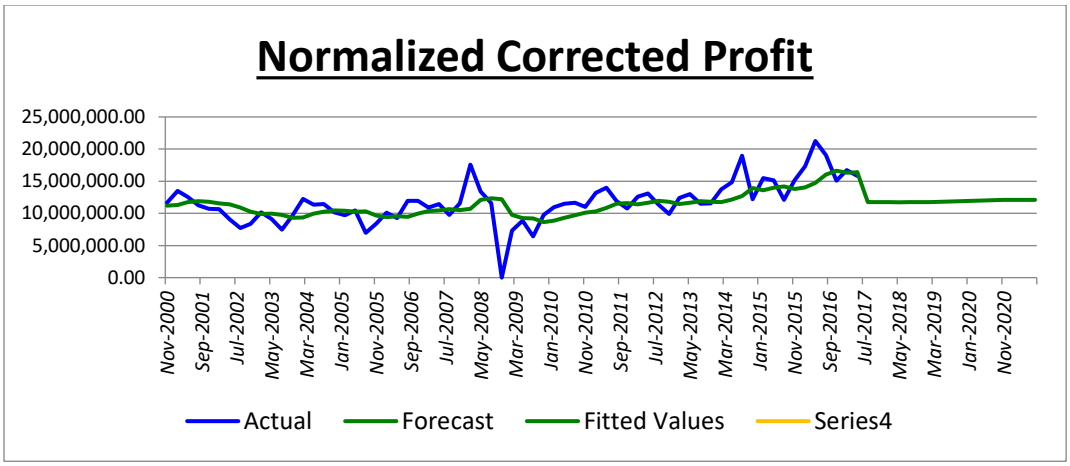
Audit Trail - Statistics

Accuracy Measures	Value
AIC	2,245.01
BIC	2,247.22
MAPE	180.94%
Sum Squared Error (SSE)	###############
R-Square	12.70%
Adjusted R-Square	12.70%
Root Mean Square Error	4,501,662.88

Method Statistics	Value
Method Selected	Moving Average
Average Periods	67

Forecast Statistics	Value
Mean	153,806.61
Standard Deviation	4,854,380.18

The second forecast that I performed was the moving average model. I allowed ForecastX to choose the optimal amount of averaged periods that would result in the least amount of error, which ForecastX chose to be four periods, or quarterly. This model has a MAPE of 180.94% and a RMSE of 4,501,662.88, suggesting that this model is not very accurate for the information given. This model has an R squared value of 12.7%, meaning that it only takes 12.7% of the variance into account. Nonetheless, it does appear to follow the general path that the data takes, especially near the end of the actual data. The reason for this model's inaccuracy may be attributable to the large spikes within the data, which the moving average model does not account for. It could also be due to the fact that the data has a large variance, which would make the moving average model less reliable due to the deviation from the average present within the model. These deviations could be attributed to irregularity, seasonality, cyclicality, or trend. For this reason, it appears that this will not likely be the most accurate model for the data, though it is better than the naïve no-change model without the sensitivity analysis, judging by the RMSE. This model levels off at the end of the actual data, thus predicting that there will be only a small amount of profit after the end of the actual values.



Audit Trail - Statistics

Accuracy Measures	Value
AIC	2,172.28
BIC	2,174.48
MAPE	14.06%
Sum Squared Error (SSE)	###############
R-Square	35.65%
Adjusted R-Square	35.65%
Root Mean Square Error	2,616,019.98

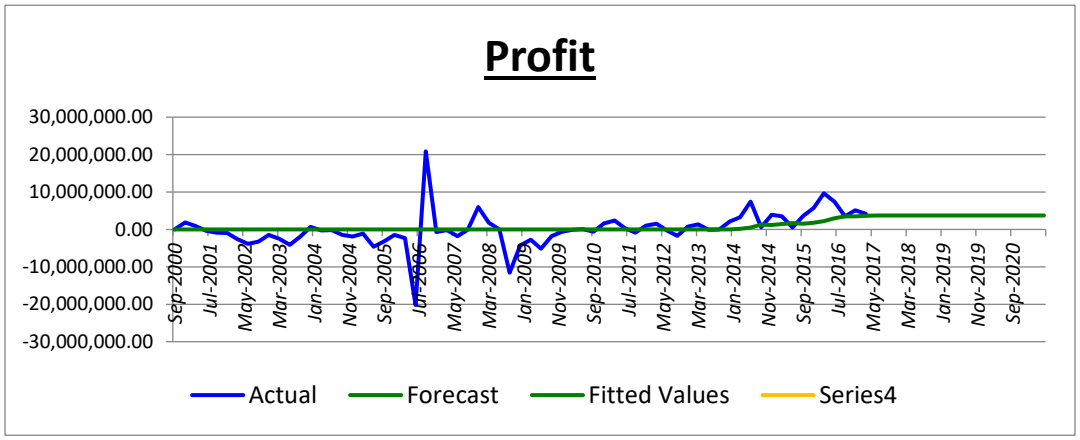
Method Statistics	Value
Method Selected	Moving Average
Average Periods	67

Forecast Statistics	Value
Mean	11,753,509.61
Standard Deviation	3,285,729.92

For this sensitivity analysis, it appears that the RMSE and the MAPE have decreased drastically. This would suggest that the model has become more accurate. The RMSE is now at 2,616,019.98, as compared to the value of 4,501,662.88 from the previous model. Similarly, the MAPE has decreased in value to 14.06%, though it was 180.94% before. The R-square value has risen to 35.65%, whereas before it was at 12.7%. All of this suggests that this model is much more accurate than the original model. Furthermore, this new moving average model does not level off towards 0 near the end of the data, and thus likely provides a more accurate forecast after the actual data is done. Nonetheless, it does appear that the moving average model does not account for the spikes in the data as well as other models could. This does, however, appear to be a better model than the naïve no-change sensitivity analysis (RMSE=2,740,960.98), which is

likely due to the fact that the data is erratic at times, spiking quickly and then moving closer towards the average. Since the naïve no-change model estimates the value of the last forecast, it would account better for slower changes than the quick change provided by the airline profits data. For this reason, the moving average sensitivity analysis forecast is more accurate.

Simple Exponential Smoothing Model



Audit Trail - Statistics

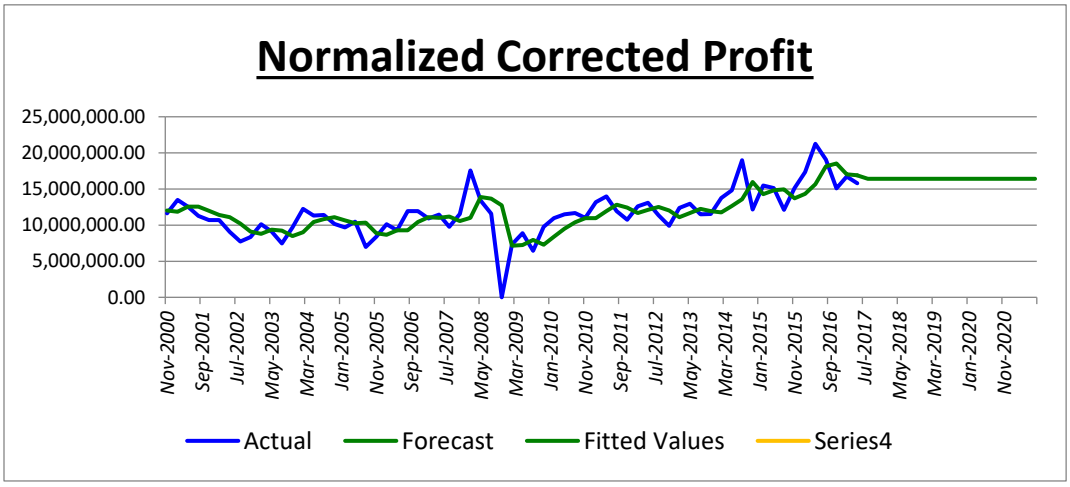
Accuracy Measures	Value
AIC	2,246.22
BIC	2,248.42
MAPE	95.01%
Sum Squared Error (SSE)	###############
R-Square	11.12%
Adjusted R-Square	11.12%
Root Mean Square Error	4,542,340.61

Method Statistics	Value
Method Selected	Simple Exponential Smoothing
Level	0.11

Forecast Statistics	Value
Mean	153,806.61
Standard Deviation	4,854,380.18

The next model that I used in order to forecast the data was the simple exponential smoothing model. This model has a MAPE of 95.01% and a RMSE of 4,542,340.61, even though the R squared is only 11.12%. This suggests that the simple exponential smoothing model

may not be any more accurate than the moving average model, since the RMSE is higher for the simple exponential smoothing model than it is for the original naïve no-change model and the moving average model, and the R squared is slightly lower for the simple exponential smoothing model than it is for the moving average model. The MAPE for this model is lower than the MAPE for the naïve no-change model and the moving average model, though the MAPE may not always be as accurate as the RMSE when determining the more accurate graph. The inaccuracies within this model may be attributable to irregularity, seasonality, cyclicality, and trend within the data, which neither this model nor the previous models truly account for. This idea is supported by the fact that many people who use air travel tend to leave during the summer months or the holidays, and others are sometimes known to cancel their flights just before the plane takes off, leading to airlines overbooking their flights and causing irregularity within the data. Furthermore, some years have less political and international stress caused by such factors as policy and war, leading to more overseas flights. This could cause some cyclicality, along with the fact that the planes will need more maintenance as they reach a certain age. Trend could occur as new breakthroughs in flight are discovered, flight becomes available to more people, or as new planes are created in order to fit the rising demand.



Audit Trail - Statistics

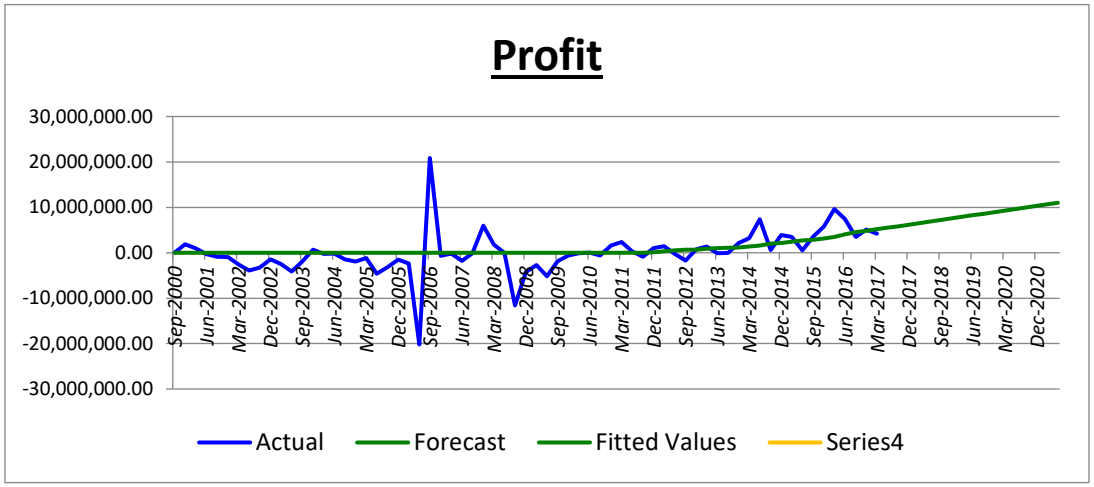
Accuracy Measures	Value
AIC	2,169.58
BIC	2,171.79
MAPE	13.33%
Sum Squared Error (SSE)	###############
R-Square	38.19%
Adjusted R-Square	38.19%
Root Mean Square Error	2,563,963.98

Method Statistics	Value
Method Selected	Simple Exponential Smoothing
Level	0.44

Forecast Statistics	Value
Mean	11,753,509.61
Standard Deviation	3,285,729.92

After the analysis of the simple exponential smoothing model was complete, I performed a sensitivity analysis in which I forecasted the normalized data with the two largest spikes averaged out. In this new simple exponential smoothing model, the RMSE decreases from 4,542,340.61 to 2,563,963.98, and the MAPE decreases from 95.01% to 13.33%, suggesting that this may be a more accurate model, since both the RMSE and the MAPE have decreased drastically. This model is also more accurate than the sensitivity analysis of the naïve no-change model, which has a RMSE of 2,740,960.88 and a MAPE of 29.36%, and the moving average model, which has a RMSE of 2,616,019.98 and a MAPE of 14.06%. This is likely due to the fact that the exponential smoothing model corrects quickly for pasts errors, allowing it to adjust to more erratic, higher variance data, unlike the other two models, which do not adjust to their own errors.

Holt's Double Exponential Smoothing Model



Audit Trail - Statistics

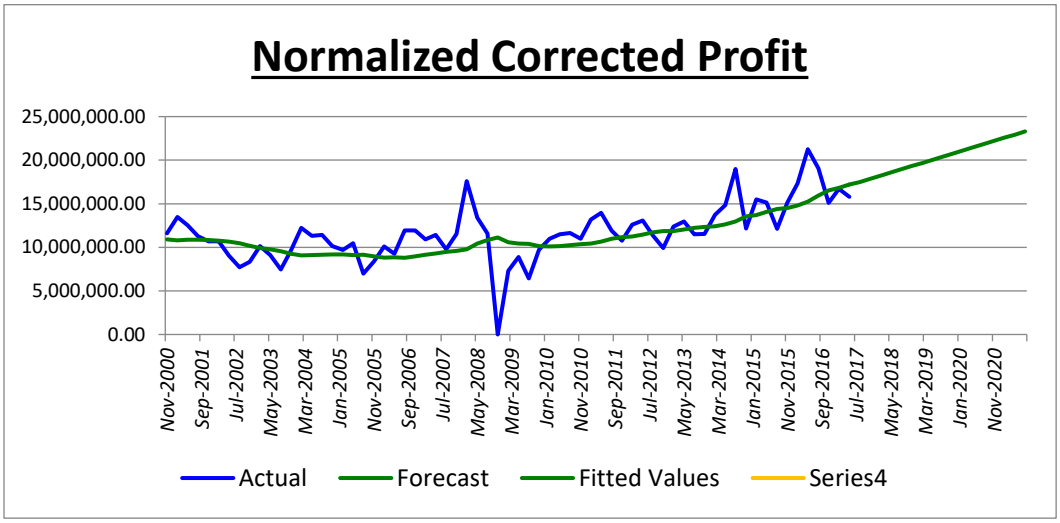
Accuracy Measures	Value
AIC	2,245.13
BIC	2,249.54
MAPE	151.75%
Sum Squared Error (SSE)	###############
R-Square	15.12%
Adjusted R-Square	13.82%
Root Mean Square Error	4,438,796.13

Method Statistics	Value
Method Selected	Double Holt
Level	0.04
Trend	0.31

Forecast Statistics	Value
Mean	153,806.61
Standard Deviation	4,854,380.18

Holt's Double Exponential Smoothing model was the next model used in order to forecast this data. ForecastX was allowed to choose the value that seasonality would take in order to minimize errors for this model. The model has a MAPE of 151.75% and a RMSE of 4,438,796.13, suggesting that it is more accurate than both the original moving average model and the original simple exponential smoothing model. The MAPE may be higher than the MAPE of the simple exponential smoothing model, though, as explained earlier, the accuracy of this measure is difficult to interpret, especially since the double exponential smoothing model accounts for 15.12% of the data as compared to the 11.12% for the simple exponential

smoothing model. These values are obtained from the R squared. This would suggest that there is some seasonality within the data, which would make sense due to the fact that many people take vacation during the summer and travel more during the school breaks and holidays. For this reason, the model would likely account for a greater amount of travel during the summer and winter months, which appears to be supported by the peaks and troughs within the data. There appears to be further evidence of a slight trend within the data, which is given the value of 0.31. This is interesting due to the lack of evidence within the correlogram of a trend. The double exponential smoothing model suggests a rise in air travel after the data provided ends, unlike the other models.



Audit Trail - Statistics

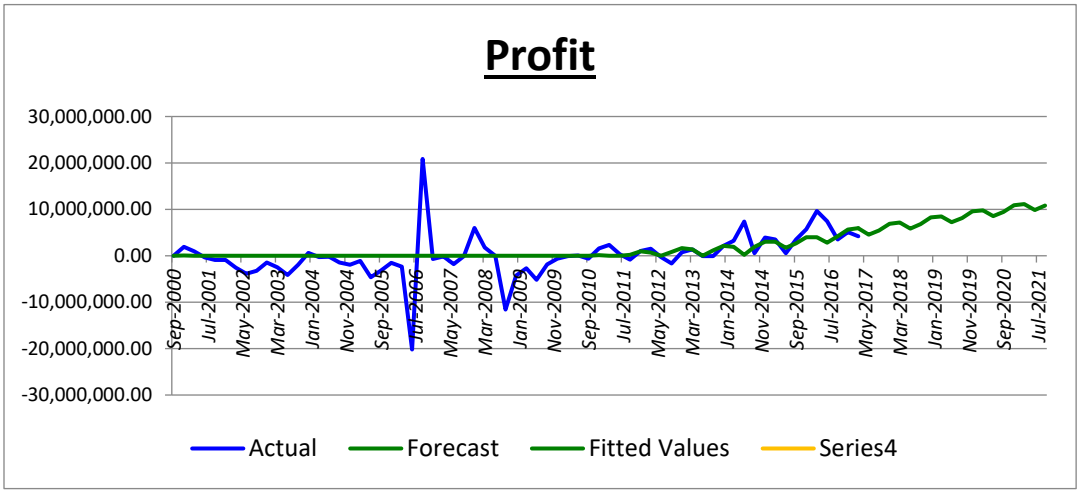
Accuracy Measures	Value
AIC	2,174.30
BIC	2,178.71
MAPE	14.67%
Sum Squared Error (SSE)	################
R-Square	35.63%
Adjusted R-Square	34.64%
Root Mean Square Error	2,616,460.49

Method Statistics	Value
Method Selected	Double Holt
Level	0.06
Trend	0.22

Forecast Statistics	Value
Mean	11,753,509.61
Standard Deviation	3,285,729.92

After this initial forecast I performed a sensitivity analysis on the data for Holt's double exponential smoothing model. In this model, the RMSE decreased from 4,438,796.13 to 2,616,460.49, while the MAPE decreased from 151.75% to 14.67%. The R-square increased from 15.12% to 35.63%. Nevertheless, this model is not quite as accurate as the sensitivity analysis of the moving average model (RMSE=2,616,019.98) nor is it as accurate as the sensitivity analysis of the simple exponential smoothing model (RMSE=2,563,963.98). This suggests that there is not much seasonality present within the data that the Holt's double exponential smoothing model can use in order to better forecast, thus making models without seasonality more accurate to forecast the airline industry's profit. This is further evidenced by the fact that the audit trail provided by ForecastX does not mention the seasonal indices, indicating that the effect of seasonality is likely too small to mention. Most likely, however, judging by the original Holt's double exponential smoothing forecast, there is seasonality within the data, but the trend of the normalized forecast offsets the calculations for the seasonality. If this is true, there may be better estimates that are possible using other models. The correlogram of the sensitivity analyses also showed evidence for trend. While this model might not have been as accurate as the sensitivity analyses for the moving average and the simple exponential smoothing models, it was more accurate than the sensitivity analysis for the naïve no-change model (RMSE=2,740,960.88). This is probably due to the fact that Holt's double exponential smoothing model corrects for past errors.

Holt- Winters Exponential Smoothing Model



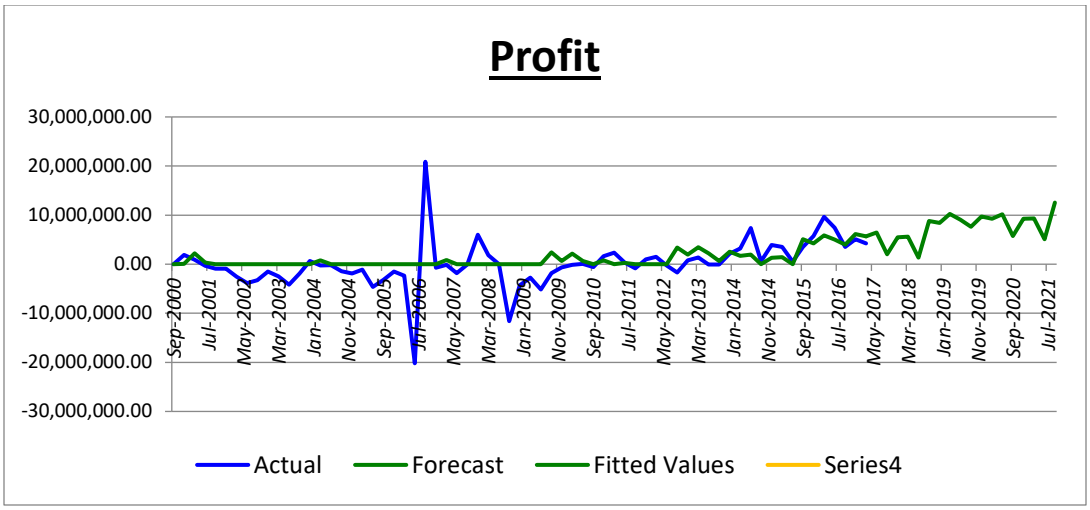
Audit Trail - Statistics

Accuracy Measures	Value
AIC	2,247.55
BIC	2,254.16
MAPE	129.10%
Sum Squared Error (SSE)	###############
R-Square	14.59%
Adjusted R-Square	11.92%
Root Mean Square Error	4,452,730.65

Method Statistics	Value
Method Selected	Holt Winters
Level	0.02
Seasonal	0.07
Trend	0.57
Decomposition type	Additive

Seasonal Indexes	Value
Index 1	-310,330.86
Index 2	659,247.27
Index 3	166,688.37
Index 4	-515,604.79

Forecast Statistics	Value
Mean	153,806.61
Standard Deviation	4,854,380.18



Audit Trail - Statistics

Accuracy Measures	Value
AIC	2,247.90
BIC	2,254.51
MAPE	216.72%
Sum Squared Error (SSE)	###############
R-Square	14.14%
Adjusted R-Square	11.46%
Root Mean Square Error	4,464,429.58

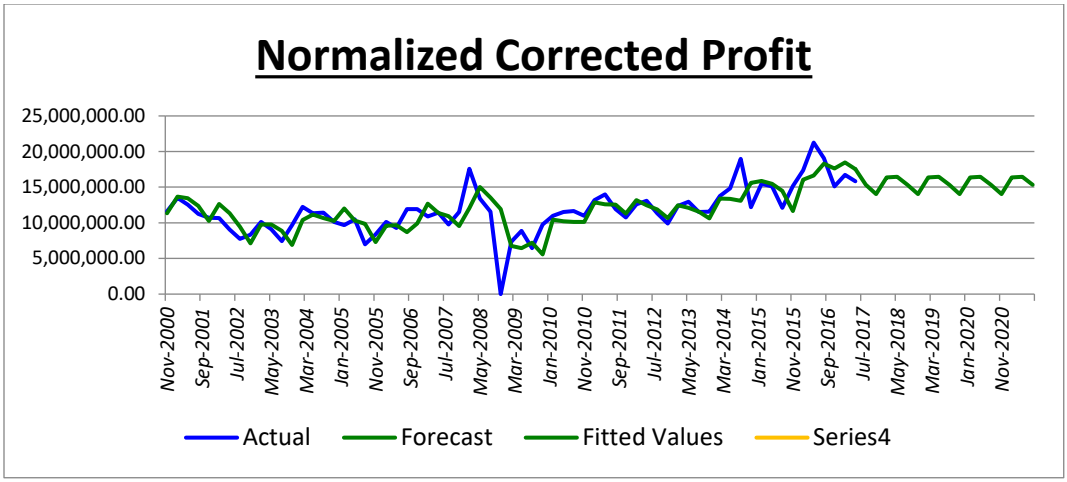
Forecast Statistics	Value
Mean	153,806.61
Standard Deviation	4,854,380.18

Method Statistics	Value
Method Selected	Holt Winters
Level	0.03
Seasonal	0.10
Trend	0.31
Decomposition type	Additive

Seasonal Indexes	Value
Index 1	1,133,418.75
Index 2	1,323,279.89
Index 3	3,502,167.14
Index 4	1,814,002.27
Index 5	-600,185.73
Index 6	1,091,437.25
Index 7	239,633.58
Index 8	1,572,255.88
Index 9	-3,751,386.65
Index 10	-538,223.92
Index 11	-825,970.86
Index 12	-4,960,427.62

The Holt-Winters exponential smoothing model is the next model in the analysis of the airline data. This was the model chosen by ForecastX that most accurately forecasts the data, though there appears to be a flaw in the forecast. When the Holt-Winters exponential smoothing

model is selected as the forecast method, the MAPE is 129.1% and the RMSE 4,452,730.65 with an R squared of 14.59%, with seasonal indices of -310,330.86; 659,247.27; 166,688.37; and -515,604.79 for each quarter respectively. When using the Procast function of ForecastX, however, twelve seasonal indices are taken, suggesting that ForecastX believes that treating the data as monthly data would be more beneficial than treating it as quarterly data. This occurs even if quarterly data is chosen, as long as ForecastX is allowed to choose the seasonality of the model. If the seasonality is set to four, however, and ForecastX is allowed to choose the model, the Procast function becomes a Holt's double exponential smoothing model, which was mentioned previously. This shows that the Procast of the Holt-Winters exponential smoothing model is most likely not accurate. The Procast function of the model has a MAPE of 216.72% and a RMSE of 4,464,429.58, along with an R squared of 14.14%. Since this data is likely flawed, however, the Procast function can be omitted from the comparisons of the data, though it is pictured below the regular Holt- Winters exponential smoothing model graph in order to show the differences between the two. The four indices of the Holt- Winters exponential smoothing model suggest that there is less travel during the winter months from October to March, whereas travel picks up during the summer months, from April to September, suggesting that many more people travel for summer vacation than for winter vacation and that the vacations are scattered throughout the late spring to early fall. Similar to the original Holt's double exponential smoothing model, the forecast shows a continuous increase after the actual data ends. This forecast should be more accurate, however, since the increase follows the seasonal indices.



Audit Trail - Statistics

Accuracy Measures	Value
AIC	2,164.86
BIC	2,171.48
MAPE	12.21%
Sum Squared Error (SSE)	###############
R-Square	45.73%
Adjusted R-Square	44.04%
Root Mean Square Error	2,402,377.27

Method Statistics	Value
Method Selected	Holt Winters
Level	0.57
Seasonal	0.16
Trend	0.00
Decomposition type	Additive

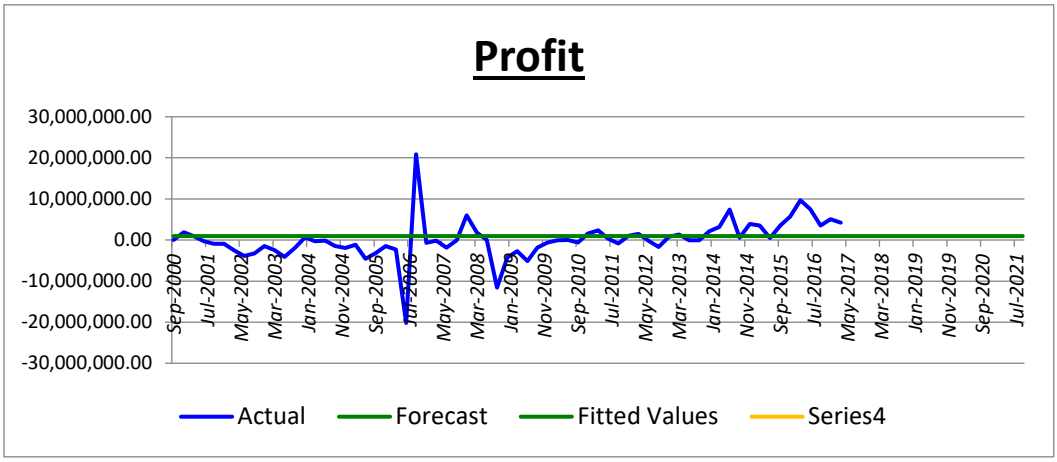
Seasonal Indexes	Value
Index 1	-1,430,574.21
Index 2	740,029.94
Index 3	624,211.99
Index 4	66,332.28

Forecast Statistics	Value
Mean	11,753,509.61
Standard Deviation	3,285,729.92

The sensitivity analysis for the Holt-Winters exponential smoothing model showed a decrease in the RMSE from 4,452,730.65 to 2,402,377.27, and a decrease in the MAPE from 216.72% to 12.21%. The R-square has also risen from 14.14% to 45.73%, more than tripling the amount of variation accounted for within the model. When compared to the other four sensitivity analyses mentioned previously, this model is the most accurate, with the smallest RMSE and the largest MAPE and R-Square so far. This suggests that there is both seasonality and trend within

the data, but the seasonality can be better calculated if the trend is accounted for. This makes sense, due to the waves of seasonality that occur in the second half of the model and the fact that the correlogram for the normalized data showed evidence of a trend. For this reason, the Holt-Winters exponential smoothing model better accounts for this than previous sensitivity analysis models. It is also suggested by ForecastX to be the best model to use for the sensitivity analyses.

Adaptive Response Exponential Smoothing Model



Audit Trail - Statistics

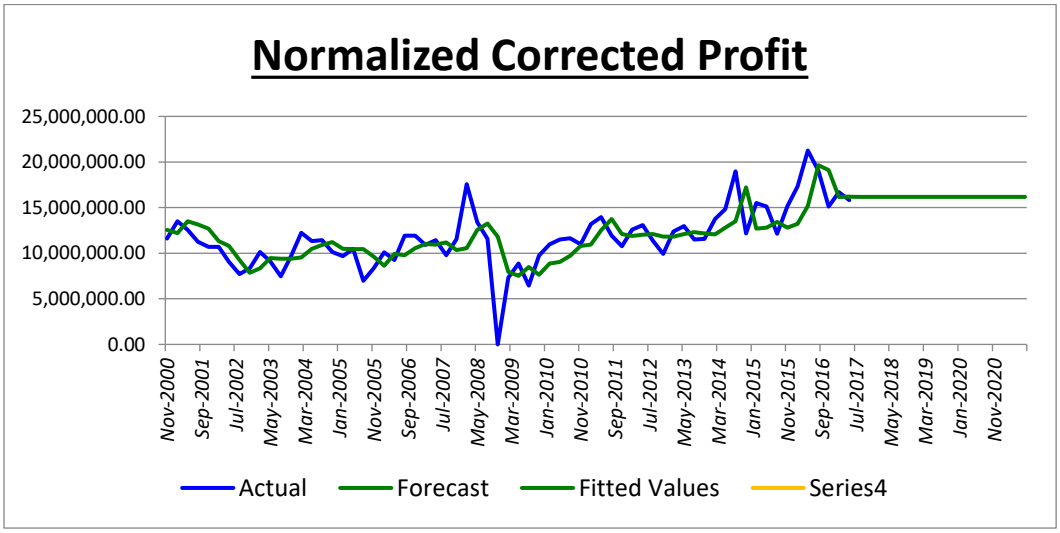
Accuracy Measures	Value
AIC	2,255.93
BIC	2,258.14
MAPE	375.76%
Sum Squared Error (SSE)	###############
R-Square	0.00%
Adjusted R-Square	0.00%
Root Mean Square Error	4,883,912.37

Forecast Statistics	Value
Mean	153,806.61
Standard Deviation	4,854,380.18

Method Statistics	Value
Method Selected	Adaptive Exponential Smoothing
Beta	0.00

The last exponential smoothing model that was used in order to analyze the data was the adaptive-response exponential smoothing model. The MAPE of this model is 375.76% while the

RMSE is 4,883,912.37, which is the second highest RMSE and MAPE that has been analyzed so far. The only model with a higher RMSE and MAPE is the original naïve no-change model, in which the model could not account for change much. The adaptive response exponential smoothing graph also accounts for 0% of the data, according to the value of the R-squared. This suggests that ForecastX could not provide an accurate adaptive response exponential smoothing model for the data. Furthermore, the beta provided is given a value of 0, and every single forecast is 953,375 while the actual data moves around it. This is not a very accurate forecast method, since it appears that ForecastX may have taken an overall average for the entire forecast in order to obtain a result. Due to the fact that there is no evidence of a large change or jump in the middle of the data, and there is evidence of seasonality and a possible slight trend that may or may not be significant, the adaptive-response exponential smoothing model would not have been the optimal choice in order to forecast the data provided in the first place.



Audit Trail - Statistics

Accuracy Measures	Value
AIC	2,171.36
BIC	2,173.57
MAPE	13.95%
Sum Squared Error (SSE)	###############
R-Square	36.52%

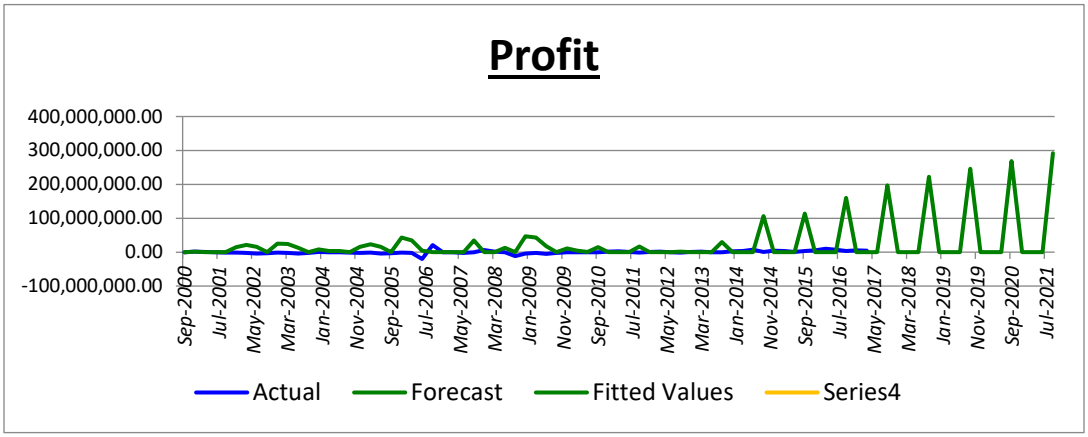
Forecast Statistics	Value
Mean	11,753,509.61
Standard Deviation	3,285,729.92

Adjusted R-Square	36.52%
Root Mean Square Error	2,598,257.10

Method Statistics	**Value**
Method Selected	Adaptive Exponential Smoothing
Beta	0.36

This sensitivity analysis yielded a decrease from 4,883,912.37 to 2,598,257.1, and a decrease in the MAPE from 375.76% to 13.95%. It also yielded an increase of the R-square from 0% to 36.52%, suggesting that the forecast was not able to account for any of the data in the original forecast model, but was able to once the data was normalized and the large spikes were averaged. This may have been due to the fact that the original forecast did not show negative values, which may have been necessary for the adaptive response exponential smoothing model to work. With this in mind, this model works better than the sensitivity analyses of the original naïve no-change model (RMSE=2,740,960.88), the moving average model (RMSE=2,616,019.98) and Holt's double exponential smoothing model (RMSE=2,616,460.49), but worse than the simple exponential smoothing model (RMSE=2,563,963.98) and the Holt-Winters exponential smoothing model (RMSE=2,402,377.27). This is most likely due to the fact that the adaptive response exponential smoothing model is good at adjusting for errors, whereas the naïve no-change model, the moving average model, and Holt's double exponential smoothing model are not as efficient at correcting for past errors. Simple exponential smoothing is better than adaptive response exponential smoothing, however, and the Holt-Winters exponential smoothing model is better at correcting for past errors if both trend and seasonality are present, leading to a more accurate forecast.

Linear Decomposition Model



Audit Trail - Statistics

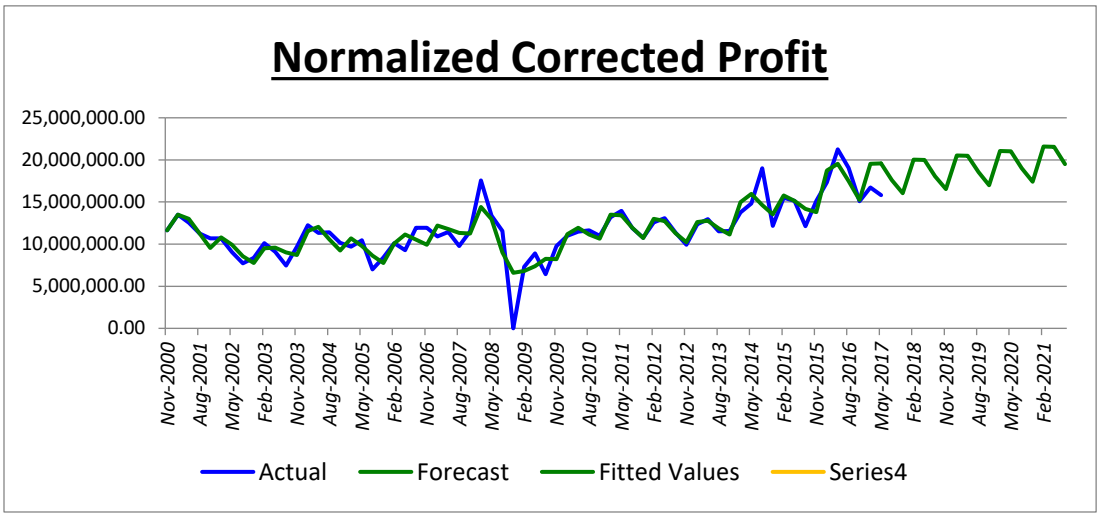
Accuracy Measures	Value
AIC	2,506.48
BIC	2,510.89
MAPE	3613.29%
Sum Squared Error (SSE)	###############
R-Square	0.00%
Adjusted R-Square	0.00%
Root Mean Square Error	31,210,425.39

Forecast Statistics	Value
Mean	153,806.61
Standard Deviation	4,854,380.18

Method Statistics	Value
Method Selected	Decomposition Trend (Linear)
Basic Method	Regression
Decomposition type	Multiplicative

After the exponential smoothing models were completed, a linear decomposition model was used in order to ascertain whether or not it would fit the data better. The linear decomposition model proved to be an even less accurate model than the original naïve no-change model due to the MAPE of 3,613.29% and the RMSE of 31,210,425.39. It also has an R square of 0%. After the end of the actual data, the forecast of the linear decomposition model becomes erratic, suggesting that the sales revenue rises continuously every four months, while the other months stay at zero. Analyzing the actual data given previously, it appears that this forecast does not forecast the data well, and is thus not accurate. The inaccuracies in this data can most likely be attributed to the strong seasonal indices of -9.17, -5.85, 27.84, and -8.83. Due to the sharp

irregularity within this data and the many outliers present, using a centered moving average in order to identify seasonal indices, trends, and cyclical tendencies would lead to many inaccuracies and overcompensation among the forecasts, since the data is stronger in the positive direction than it is in the negative direction. It would further cause inaccuracies due to the sharp increases and decreases within sales revenue that would make large centered moving averages. Large centered moving averages would cause inaccurate trends, cyclical indices, and seasonal indices. This would create highly inaccurate forecasts. It does appear, however, that there is a cyclical tendency or trend within the data, though previous models have not accounted for it and this model does not accurately adjust for it. The tail of the actual data appears to follow some sort of cyclical tendency that is moving up, while the beginning of the data appears to be following a cycle that is going downward.



Audit Trail - Statistics

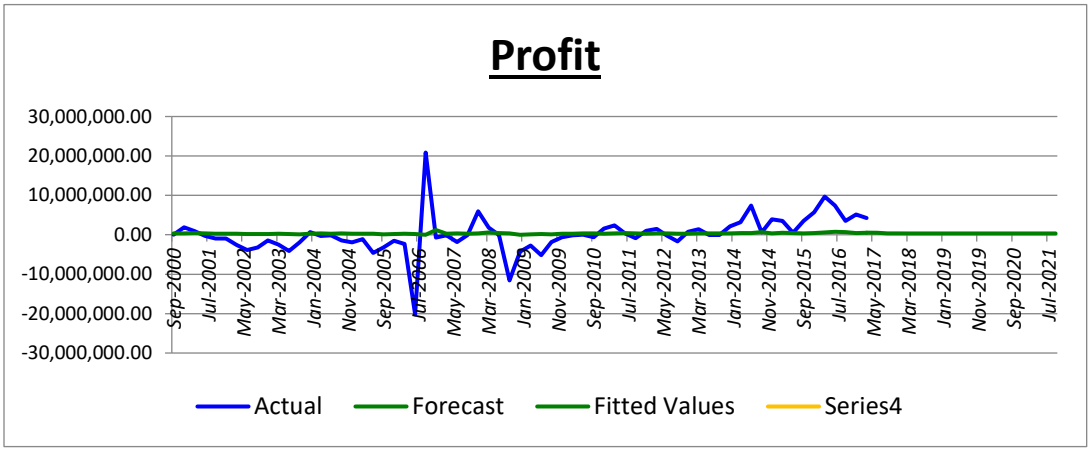
Accuracy Measures	Value
AIC	2,103.10
BIC	2,107.51
MAPE	8.20%
Sum Squared Error (SSE)	###############
R-Square	77.76%
Adjusted R-Square	77.41%
Root Mean Square Error	1,538,037.13

Forecast Statistics	Value
Mean	11,753,509.61
Standard Deviation	3,285,729.92

Method Statistics	Value
Method Selected	Decomposition Trend (Linear)
Basic Method	Regression
Decomposition type	Multiplicative

This sensitivity analysis decreased the value of the RMSE from 31,210,425.39 to 1,538,037.13, and decreased the value of the MAPE from 3,613.29% to 8.2%. The R-square also increases from 0% to 77.76%. All of this suggests that this is the most accurate model that has been examined so far, though it had been the most inaccurate model examined before the sensitivity analysis. The fact that this is the most accurate so far is not surprising, however, since time-series decomposition is generally the most accurate in-sample forecast due to that fact that it accounts for cyclicality. This may suggest that the forecast that occurs after the airline profit data provided is not as accurate as some of the others, though it would be difficult to test without the data that will be present in later years. Nonetheless, this model has estimated the effect of the seasonality, trend, and cyclicality present within the data. As the audit report shows, this model has the highest error near the larger spikes, suggesting that the model has trouble adjusting for them, which may help to explain part of the reason why this model was so inaccurate before this sensitivity analysis. Another reason seems to be that almost all of the cyclicality is accounted for during the sensitivity analysis, but much of it could not be accounted for in the original model.

Box- Jenkins Model

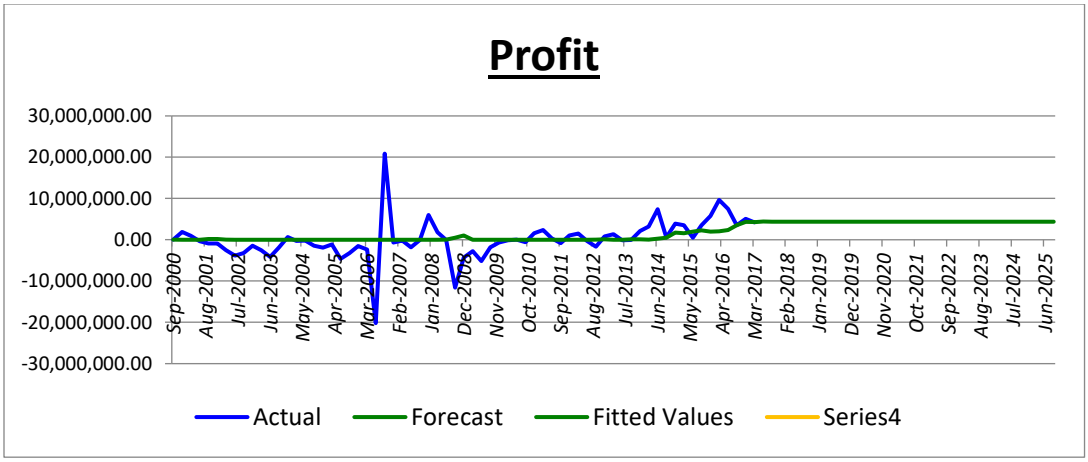


Audit Trail - Statistics

Accuracy Measures	Value
AIC	2,255.15
BIC	2,259.56
MAPE	189.02%
Sum Squared Error (SSE)	###############
R-Square	1.42%
Adjusted R-Square	0.00%
Root Mean Square Error	4,783,652.85

Forecast Statistics	Value
Mean	153,806.61
Standard Deviation	4,854,380.18
Ljung-Box	13.94

Method Statistics	Value
Method Selected	Box Jenkins ARIMA(1,0,0) *
Model Selected	(0,0,0)
T-Test For Non Seasonal AR	0.34
T-Test For Constant	0.56



Audit Trail - Statistics

Accuracy Measures	Value
AIC	2,255.37
BIC	2,266.39
MAPE	101.43%
Sum Squared Error (SSE)	###############
R-Square	9.58%
Adjusted R-Square	3.75%
Root Mean Square Error	4,581,410.86

Method Statistics	Value
Method Selected	Box Jenkins
Model Selected	ARIMA(3,1,2) * (0,0,0)
T-Test For Non Seasonal AR	-0.06
T-Test For Non Seasonal AR	-0.05
T-Test For Non Seasonal AR	-0.10
T-Test For Non Seasonal MA	0.05
T-Test For Non Seasonal MA	0.03

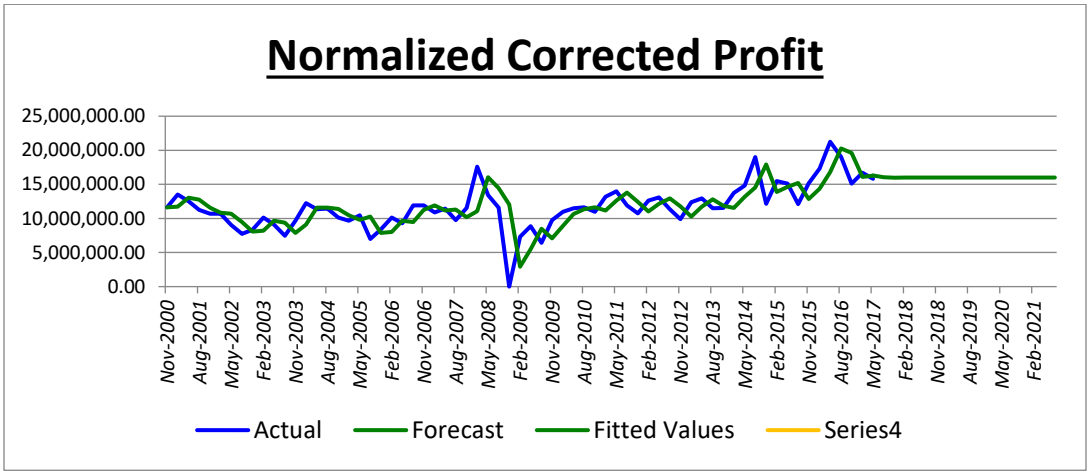
Forecast Statistics	Value
Mean	153,806.61
Standard Deviation	4,854,380.18
Ljung-Box	7.04

A Box- Jenkins model was the next model used in order to forecast the data. ForecastX was allowed to choose the values for the autoregressive, stationarity, and moving average model for both the seasonal and the non-seasonal component. ForecastX chose a non-seasonal autoregressive (AR(1)) model with a MAPE of 189.02% and a RMSE of 4,783,652.85. It also has a Ljung- Box of 13.49. Since every value is insignificant in regards to the ACF's and the PACF's, it would make sense that this would not be an ARIMA model, since there is no evidence of a trend that would cause the need for a first-differencing of the data. With an R-square of 1.42%, it appears as though ForecastX may have chosen a model based more on optimization than on traditional analysis of the ACF's and PACF's, since there were no significant ACF's or PACF's with which to work. This is shown in the slight movement of the forecast, though, for the most part, the forecast stays around the value of zero. The high error within the data could also be attributable to the fact that an ARMA model and an autoregressive model would most likely not work with this data, even though the AR model was chosen. This is due to the fact that it is unlikely that previous values of the sales revenue for the airline industry

have much effect on the current values. The sales revenue might be slightly prone to staying near previous values, since subtle and slight trends may emerge in the short run that may last less than a year. There is also the idea that policy changes among airlines or government could create temporary trend, or even trends in which an area is frequently visited or left. Other than this, there may not be much reason to assume that previous values effect current values. It is possible, however, that the autoregressive model could exhibit less error than the moving average model if there is stationarity present within the data.

Another possible reason for the error within the data is the absence of white noise, which suggests that there is a pattern within the errors. This idea is given evidence by the fact that the $Q_{Calculated}$ is 13.94, while the $Q_{Critical}$ is 19.675 with an α equal to 0.05. This data shows that there is evidence of white noise within the data. As such, it would be best to either adjust this model or to try a different model in the hopes that the pattern within the errors would be minimized. This may not be likely, since ForecastX optimized this forecast on its own. Nonetheless, a different model should be tested in order to provide evidence of accuracy. For this second Box- Jenkins model, it appears that there may be a need for any first differencing, since the values of the ACF's and PACF's become more significant after first differencing, and so there may be some trend present. After first differencing, the first ACF becomes significant, along with the first three PACF's. This suggests that this could be an ARIMA (3,1,2) model. This new model has a MAPE of 101.43% and an RMSE of 4,581,410.86 as compared to the MAPE of 189.02% and RMSE of 4,783,652.85 from the previous AR (1) model. The ARIMA (3,1,2) model also has an R-squared of 9.58% as compared to the R-squared of 1.42% of the AR (1) model. For this model, the $Q_{Calculated}$ is 7.04, while the $Q_{Critical}$ is 14.067, giving evidence that there is white noise within the errors of the data. This model is more accurate than the original naïve no-change

model (RMSE=5,236,403.21), the adaptive-response exponential smoothing model (RMSE= 4,883,912.37, R squared= 0%) and the linear decomposition model (RMSE= 31,210,425.39, R squared= 0%), though it is not as accurate as the moving average model (RMSE= 4,501,662.88, R squared= 12.7%), the simple exponential smoothing model (RMSE= 4,542,340.61, R squared= 11.12%), Holt's double exponential smoothing model (RMSE= 4,438,796.13, R squared= 15.12%), and the Holt- Winters exponential smoothing model (RMSE= 4,452,730.65, R squared= 14.59%). This fact suggests that simply averaging the data or correcting for errors would create a more accurate model, especially one that corrects for seasonality. So far, it appears that Holt's double exponential smoothing model is the most accurate of the original models with which to use.



Audit Trail - Statistics

Accuracy Measures	Value
AIC	2,174.17
BIC	2,176.37
MAPE	15.29%
Sum Squared Error (SSE)	###############
R-Square	33.81%
Adjusted R-Square	33.81%
Root Mean Square Error	2,653,217.56

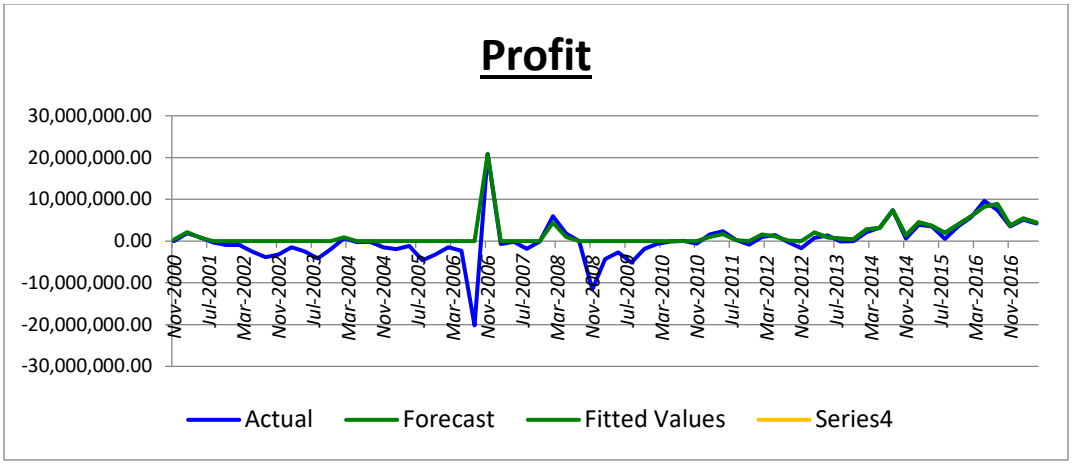
Method Statistics	Value
Method Selected	Box Jenkins
Model Selected	ARIMA(1,1,0) * (0,0,0)

Forecast Statistics	Value
Mean	11,753,509.61
Standard Deviation	3,285,729.92
Ljung-Box	22.06

T-Test For Non Seasonal AR -2.10

The ACF's of the sensitivity analysis data decrease slowly while still having multiple columns maintain significance. This suggests that there is trend in the data, so the first-differenced data must be analyzed instead. The ACF's of the first-differenced models appear to show one initial significant column, and the PACF's show one initial significant column followed by values that appear to become even less significant. This coincides with the first differenced AR(1) model, which is also known as the ARIMA (1,1,0) model. Allowing ForecastX to choose the values of the Box Jenkins model gives the same result. In order to check for white noise, a hypothesis test was used. The Ljung-Box (Q calculated) statistic provided by ForecastX yielded a value of Q=22.06, while the Q critical value was calculated to be 19.675, providing evidence that there is no white noise present within the errors of the data. For this reason, it is unlikely that a better model can be made. This Box-Jenkins model raised the RMSE to 2,653,217.56, the MAPE to 15.29%, and the R-square to 33.81%. Among the sensitivity analyses, however, this model is least accurate model that has been analyzed, besides the naïve no-change model. This could be due to the presence of the lagged values and the fact that this model does not correct for past errors as well as other models, resulting in slower correction for each value of the model.

Regression Model



Multiple Regression -- Result Formula

Profit = 188,381.43 + ((Domestic) * 1.24) + ((Dummy 1) * -4,173,152.25) + ((Dummy 2) * 5,707,265.39)

Audit Trail -- ANOVA Table (Multiple Regression Selected)

Source of variation	SS	df	MS	SEE
Regression	823,866,342,143,918.00	3	274,622,114,047,973.00	
Error	731,424,113,592,336.00	63	11,609,906,564,957.70	3,407,331.30
Total	1,555,290,455,736,250.00	66		

Audit Trail -- Coefficient Table (Multiple Regression Selected)

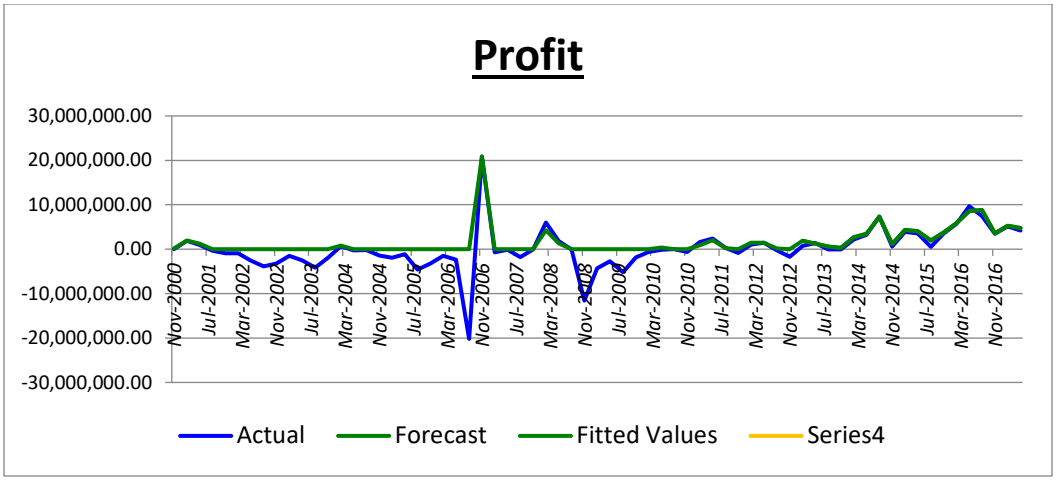
Series Description	Included in model	Coefficient	Standard error	T-test	P-value	Elasticity	Overall F-test
Profit	Dependent	188,381.43	99,837.07	1.89	0.07		1,004.39
Domestic	Yes	1.24	0.04	27.73	0.00	1.21	
Dummy 1	Yes	-4,173,152.25	821,669.38	-5.08	0.00	0.08	
Dummy 2	Yes	5,707,265.39	853,264.90	6.69	0.00	-0.11	

Audit Trail - Statistics

Accuracy Measures	Value
AIC	1,658.97
BIC	1,660.88
MAPE	113.64%
Sum Squared Error (SSE)	722,320,249,000,135.00
R-Square	37.41%
Adjusted R-Square	33.33%
Cochrane-Orcutt	0.31
Root Mean Square Error	3,800,842.67

Forecast Statistics	Value
Durbin Watson (1)	1.37
Mean	-1,028,000.66
Standard Deviation	4,853,187.35

Method Statistics	Value
Method Selected	Multiple Regression



Multiple Regression -- Result Formula

Profit = -1,740.82 + ((Domestic) * 1.24) + ((Dummy 1) * -4,221,475.37) + ((Dummy 2) * 5,959,767.28) + ((Seasonal Dummy 1) * 37,993.46) + ((Seasonal Dummy 2) * 541,450.80) + ((Seasonal Dummy 3) * 170,894.13)

Audit Trail -- ANOVA Table (Multiple Regression Selected)

Source of variation	SS	df	MS	SEE
Regression	826,429,937,797,469.00	6	137,738,322,966,245.00	
Error	728,860,517,938,784.00	60	12,147,675,298,979.70	3,485,351.53
Total	1,555,290,455,736,250.00	66		

Audit Trail -- Coefficient Table (Multiple Regression Selected)

Series Description	Included in model	Coefficient	Standard error	T-test	P-value	Elasticity	Overall F-test
Profit	Dependent	-1,740.82	191,668.50	-0.01	0.99		539.12
Domestic	Yes	1.24	0.05	26.52	0.00	1.21	
Dummy 1	Yes	-4,221,475.37	817,824.30	-5.16	0.00	0.08	
Dummy 2	Yes	5,959,767.28	895,160.87	6.66	0.00	-0.12	
Seasonal Dummy 1	Yes	37,993.46	252,660.61	0.15	0.88	-0.01	
Seasonal Dummy 2	Yes	541,450.80	247,234.45	2.19	0.03	-0.13	
Seasonal Dummy 3	Yes	170,894.13	247,939.20	0.69	0.49	-0.04	

Audit Trail - Statistics

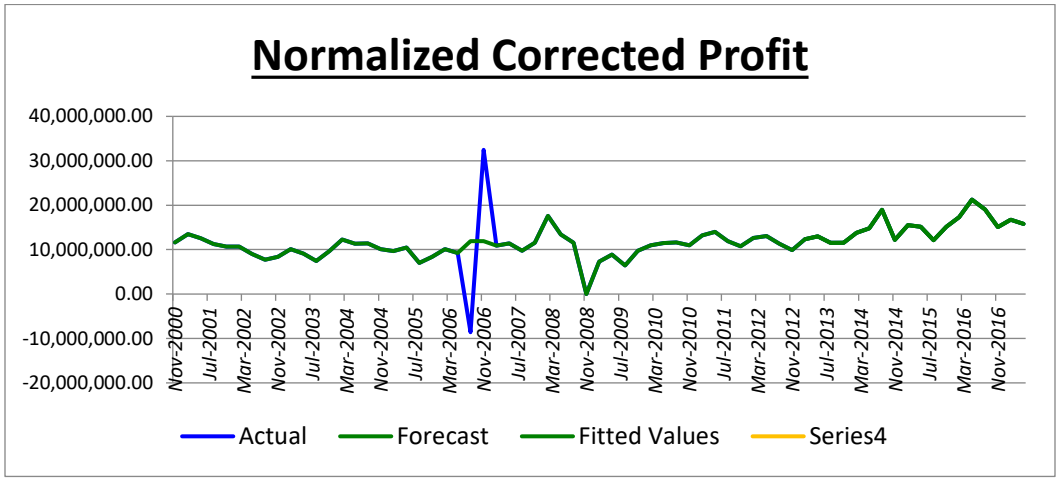
Accuracy Measures	Value
AIC	1,658.92
BIC	1,660.83
MAPE	102.57%
Sum Squared Error (SSE)	721,626,540,310,835.00
R-Square	37.47%
Adjusted R-Square	28.75%
Cochrane-Orcutt	0.31
Root Mean Square Error	3,799,017.08

Forecast Statistics	Value
Mean	-1,028,000.66
Standard Deviation	4,853,187.35

Method Statistics	Value
Method Selected	Multiple Regression

The last forecast that I worked on was the multiple regression forecast. For this forecast, I used domestic airline profits data in order to forecast the total airline sales data. Due to the fact that this regression relied heavily on the use of other data in order to obtain a coefficient, it is not very comparable to the other models. It also cannot forecast beyond the sample due to lack of data. Nonetheless, the regression without the seasonal dummy variables obtained a RMSE of 3,800,842.67 and a MAPE of 113.64%. It also has an R-square of 37.41%. The regression model with the seasonal dummy variables has a RMSE of 3,799,017.08 and a MAPE of 102.57%. It has an R-square of 37.47%. Using the R-square and the RMSE alone, we obtain the two most accurate forecasts that do not have normalized data. Their accuracy is most likely due to the fact that they rely directly on inputs into the total amount of profit that the airline companies make. Performing an overall F-test on the model without the seasonal dummy variables yields an Fcritical value of 1,004.39, and an Fcalculated value between 2.68 and 2.67. Since Fcritical is greater than Fcalculated, the domestic variables and the two dummy variables do not jointly equal zero. This suggests that this regression equation is at least somewhat significant. The next test is the serial correlation test. Since the Durbin-Watson test statistic of 1.32 is lower than the lower value of the Durbin-Watson, the hypothesis that pho=0 can be rejected. The Fcritical value of the F-test for the regression model with seasonal dummy variables is 1.76, while the Fcalculated value is 0.01919078. Since the Fcalculated value is smaller, the null hypothesis that all of these values are jointly insignificant would be rejected. This conclusion is not supported, however by the fact that the regression with seasonal dummy variables has a slightly larger AIC and BIC, though there is a slight increase in R-square. For these purposes, it may be more accurate to use the model that does not have the seasonal dummy variables, since it has more evidence of joint hypothesis significance and a lower AIC and BIC. For the serial correlation

test, this model has a Durbin-Watson test statistic of 1.38, which is lower than the lower value of the Durbin Watson table. This allows for the rejection of the null hypothesis that pho=0.



Multiple Regression -- Result Formula

Normalized Corrected Profit = -11,599,703.00 + ((Normalized Domestic) * 1.00)

Audit Trail - Statistics

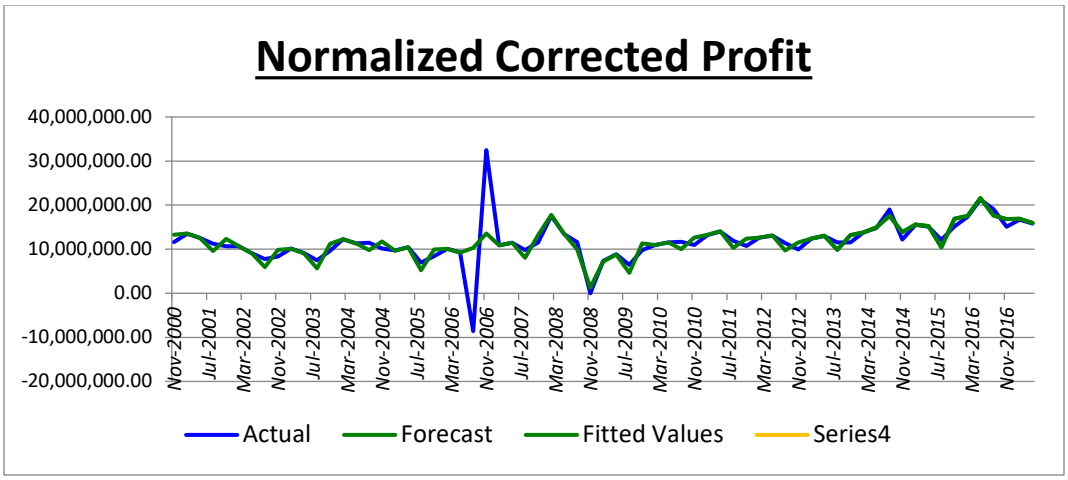
Accuracy Measures	Value
AIC	1,666.68
BIC	1,668.59
MAPE	6.17%
Sum Squared Error (SSE)	842,753,063,883,528.00
R-Square	26.98%
Adjusted R-Square	25.46%
Cochrane-Orcutt	-0.50
Root Mean Square Error	4,105,491.60

Method Statistics	Value
Method Selected	Multiple Regression

Forecast Statistics	Value
Durbin Watson (1)	3.00
Mean	10,571,702.34
Standard Deviation	4,853,187.35

Audit Trail -- ANOVA Table (Multiple Regression Selected)

Source of variation	SS	df	MS	SEE
Regression	712,537,391,852,725.00	1	712,537,391,852,725.00	
Error	842,753,063,883,528.00	65	12,965,431,752,054.30	3,600,754.33
Total	1,555,290,455,736,250.00	66		



Multiple Regression -- Result Formula

Normalized Corrected Profit = -10,720,142.73 + ((Normalized Domestic) * 1.03) + ((Seasonal Dummy 1) * -1,649,238.86) + ((Seasonal Dummy 2) * -1,633,689.84) + ((Seasonal Dummy 3) * -3,304,267.39)

Audit Trail -- ANOVA Table (Multiple Regression Selected)

Source of variation	SS	df	MS	SEE
Regression	758,973,819,087,725.00	4	189,743,454,771,931.00	
Error	796,316,636,648,529.00	62	12,843,816,720,137.60	3,583,827.11
Total	1,555,290,455,736,250.00	66		

Audit Trail -- Coefficient Table (Multiple Regression Selected)

Series Description	Included in model	Coefficient	Standard error	T-test	P-value	Elasticity	Overall F-test
Normalized Corrected Profit	Dependent	-10,720,142.73	5,423,735.67	-1.98	0.05		5.50
Normalized Domestic	Yes	1.03	0.25	4.12	0.00	2.17	
Seasonal Dummy 1	Yes	-1,649,238.86	1,712,395.81	-0.96	0.34	-0.04	
Seasonal Dummy 2	Yes	-1,633,689.84	1,712,079.55	-0.95	0.35	-0.04	
Seasonal Dummy 3	Yes	-3,304,267.39	1,664,920.67	-1.98	0.05	-0.08	

Audit Trail - Statistics

Accuracy Measures	Value
AIC	1,662.48
BIC	1,664.39
MAPE	13.68%
Sum Squared Error (SSE)	774,924,853,883,762.00
R-Square	32.86%
Adjusted R-Square	26.89%
Cochrane-Orcutt	-0.50
Root Mean Square Error	3,936,813.06

Forecast Statistics	Value
Durbin Watson (1)	2.99
Mean	10,571,702.34
Standard Deviation	4,853,187.35

Method Statistics	Value
Method Selected	Multiple Regression

For this sensitivity analysis I added $11,599,703 to every value of the domestic profit column in order to try to normalize it by the same amount that the total profit was normalized by. The sensitivity regression without the seasonal dummy variables gave a RMSE of 4,105,491.6 and a MAPE of 6.17%. Furthermore, it had an R-square of 26.98%. The sensitivity regression with the seasonal dummy variables yielded a RMSE of 3,936,813.06 and a MAPE of 13.68%. It also had an R-square of 32.86%. This shows that neither of these models were as accurate as the original model, nor are any of them as accurate as previous sensitivity analyses, judging by the RMSE and the R-square. This may be due to the regression line catching the general trends of the regression model, but missing the smaller details, which many of the other models would catch. The previous regression models may also catch them, since much of the previous regression models focus on smaller areas, due to the fact that they can only truly forecast the positive values. In order to test these models, it is first important to perform an F-test on the regression that does not have the seasonal dummy variables in order to test the joint significance of the entire model. For this model, the Fcritical is 17.73, whereas the Fcalculated is between the values 3.92 and 4. Since Fcalculated is less than Fcritical, it is safe to reject the null hypothesis that all of the coefficients equal zero. The serial correlation test shows that the Durbin-Watson test statistic of 3 is above four minus the lower value of the Durbin Watson, which allows for the rejection of the null hypothesis that pho=0. The F-test for the values with seasonal dummy variables show that the Fcalculated is 1.80994974, and the Fcritical is between the values 2.68 and 2.76, which allows for the rejection of the null hypothesis that all of the variables are insignificant. This shows that the model with seasonal dummy variables may be more accurate than the model without dummy variables. This idea is supported by the smaller BIC and AIC values of the model with seasonal dummy variables, and the higher R-square. For these reasons,

the model with season dummy variables is likely to be the more accurate model. The correlation test of the model with seasonal dummy variables reveals a Durbin-Watson Statistic of 2.99, which is above four minus the lower value of the Durbin-Watson, showing that the null hypothesis that says pho=0 can be rejected.

References

United States Bureau of Transportation. (n.d.). *Net Income (In Thousands of Dollars $000): All U.S. Carriers-All Regions*. Retrieved from transtats.bts.gov: https://www.transtats.bts.gov/Data_Elements_Financial.aspx?Data=6

Appendix A: Original and Regression Datasets

Year (Quarter)	Profit	Domestic	Dummy 1	Dummy 2	Seasonal Dummy 1	Seasonal Dummy 2	Seasonal Dummy 3
2000 (Q1)	23,702	139,162	0	0	0	0	0
2000 (Q2)	1,899,096	1,570,500	0	0	1	0	0
2000 (Q3)	937,327	548,903	0	0	0	1	0
2000 (Q4)	-327,425	-267,068	0	0	0	0	1
2001 (Q1)	-909,776	-822,384	0	0	0	0	0
2001 (Q2)	-923,115	-744,977	0	0	1	0	0
2001 (Q3)	-2,560,103	-2,232,653	0	0	0	1	0
2001 (Q4)	-3,873,515	-3,404,841	0	0	0	0	1
2002 (Q1)	-3,250,361	-2,621,918	0	0	0	0	0
2002 (Q2)	-1,469,850	-1,298,581	0	0	1	0	0
2002 (Q3)	-2,494,531	-2,351,704	0	0	0	1	0
2002 (Q4)	-4,150,742	-3,056,898	0	0	0	0	1
2003 (Q1)	-1,920,924	-1,085,012	0	0	0	0	0
2003 (Q2)	647,420	606,461	0	0	1	0	0
2003 (Q3)	-265,900	-642,496	0	0	0	1	0
2003 (Q4)	-176,064	-348,536	0	0	0	0	1
2004 (Q1)	-1,456,177	-1,622,122	0	0	0	0	0
2004 (Q2)	-1,915,125	-2,081,851	0	0	1	0	0
2004 (Q3)	-1,123,527	-1,702,368	0	0	0	1	0
2004 (Q4)	-4,609,595	-4,562,813	0	0	0	0	1
2005 (Q1)	-3,207,135	-2,956,735	0	0	0	0	0
2005 (Q2)	-1,487,161	-1,511,275	0	0	1	0	0
2005 (Q3)	-2,333,166	-2,231,293	0	0	0	1	0
2005 (Q4)	20,192,434	13,048,233	1	0	0	0	1
2006 (Q1)	20,862,482	12,049,285	0	1	0	0	0
2006 (Q2)	-694,110	-642,693	0	0	1	0	0
2006 (Q3)	-161,700	-592,826	0	0	0	1	0
2006 (Q4)	-1,820,559	-1,770,107	0	0	0	0	1
2007 (Q1)	-67,019	-488,478	0	0	0	0	0
2007 (Q2)	5,979,562	3,403,274	0	0	1	0	0
2007 (Q3)	1,800,249	626,687	0	0	0	1	0
2007 (Q4)	-21,387	-545,608	0	0	0	0	1
2008 (Q1)	11,599,703	-9,777,777	0	0	0	0	0
2008 (Q2)	-4,276,656	-2,254,820	0	0	1	0	0
2008 (Q3)	-2,718,557	-2,633,833	0	0	0	1	0
2008 (Q4)	-5,154,919	-3,507,540	0	0	0	0	1

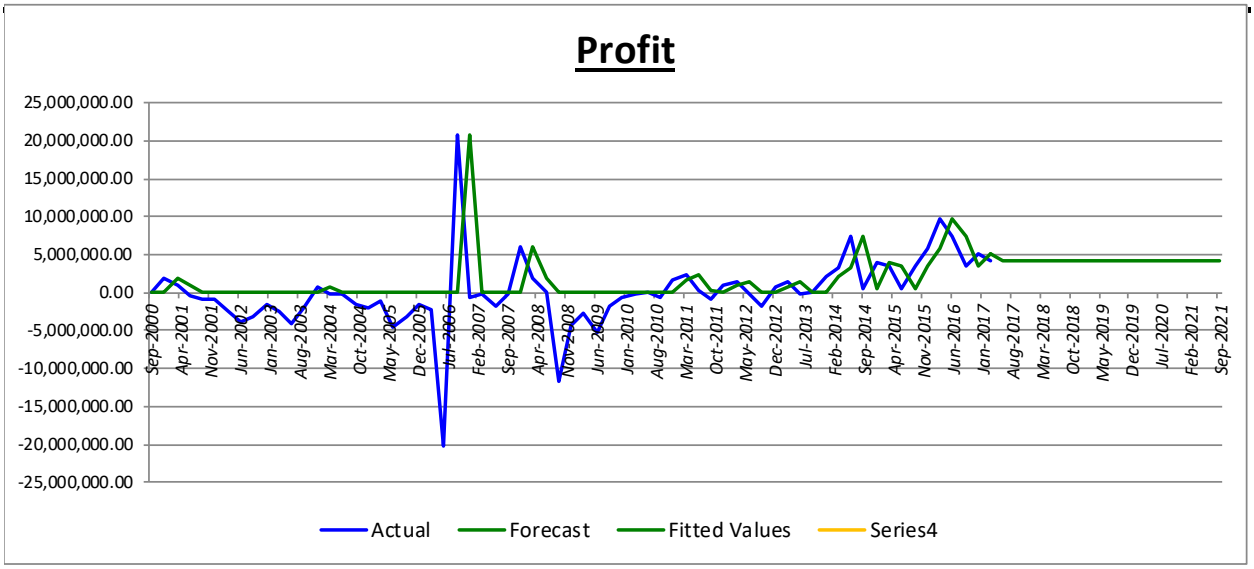
2009 (Q1)	-1,844,758	-1,516,128	0	0	0	0
2009 (Q2)	-628,662	-344,471	0	0	1	0
2009 (Q3)	-102,224	-144,230	0	0	0	1
2009 (Q4)	49,366	-247,244	0	0	0	0
2010 (Q1)	-615,726	-704,121	0	0	0	0
2010 (Q2)	1,595,509	657,279	0	0	1	0
2010 (Q3)	2,369,313	1,178,343	0	0	0	1
2010 (Q4)	316,898	44,633	0	0	0	0
2011 (Q1)	-848,148	-455,423	0	0	0	0
2011 (Q2)	1,003,401	1,152,067	0	0	1	0
2011 (Q3)	1,482,415	761,688	0	0	0	1
2011 (Q4)	-245,480	-17,775	0	0	0	0
2012 (Q1)	-1,691,852	-213,497	0	0	0	0
2012 (Q2)	771,313	1,513,613	0	0	1	0
2012 (Q3)	1,369,708	564,041	0	0	0	1
2012 (Q4)	-85,437	348,019	0	0	0	0
2013 (Q1)	-45,631	227,114	0	0	0	0
2013 (Q2)	2,146,407	2,147,207	0	0	1	0
2013 (Q3)	3,222,741	2,384,395	0	0	0	1
2013 (Q4)	7,387,696	5,763,127	0	0	0	0
2014 (Q1)	571,550	946,419	0	0	0	0
2014 (Q2)	3,892,258	3,504,607	0	0	1	0
2014 (Q3)	3,522,648	2,828,108	0	0	0	1
2014 (Q4)	515,510	1,422,907	0	0	0	0
2015 (Q1)	3,544,778	3,055,897	0	0	0	0
2015 (Q2)	5,736,223	4,681,359	0	0	1	0
2015 (Q3)	9,655,117	6,494,221	0	0	0	1
2015 (Q4)	7,453,235	6,983,328	0	0	0	0
2016 (Q1)	3,500,785	2,861,693	0	0	0	0
2016 (Q2)	5,108,989	4,241,083	0	0	1	0
2016 (Q3)	4,208,499	3,419,888	0	0	0	1

Appendix B: Normalized and Regression Dataset

Year (Quarter)	Normalized Corrected Profit	Normalized Domestic	Seasonal Dummy 1	Seasonal Dummy 2	Seasonal Dummy 3
2000 (Q1)	11,623,405	23,223,108	0	0	0
2000 (Q2)	13,498,799	25,098,502	1	0	0
2000 (Q3)	12,537,030	24,136,733	0	1	0
2000 (Q4)	11,272,278	22,871,981	0	0	1
2001 (Q1)	10,689,927	22,289,630	0	0	0
2001 (Q2)	10,676,588	22,276,291	1	0	0
2001 (Q3)	9,039,600	20,639,303	0	1	0
2001 (Q4)	7,726,188	19,325,891	0	0	1
2002 (Q1)	8,349,342	19,949,045	0	0	0
2002 (Q2)	10,129,853	21,729,556	1	0	0
2002 (Q3)	9,105,172	20,704,875	0	1	0
2002 (Q4)	7,448,961	19,048,664	0	0	1
2003 (Q1)	9,678,779	21,278,482	0	0	0
2003 (Q2)	12,247,123	23,846,826	1	0	0
2003 (Q3)	11,333,803	22,933,506	0	1	0
2003 (Q4)	11,423,639	23,023,342	0	0	1
2004 (Q1)	10,143,526	21,743,229	0	0	0
2004 (Q2)	9,684,578	21,284,281	1	0	0
2004 (Q3)	10,476,176	22,075,879	0	1	0
2004 (Q4)	6,990,108	18,589,811	0	0	1
2005 (Q1)	8,392,568	19,992,271	0	0	0
2005 (Q2)	10,112,542	21,712,245	1	0	0
2005 (Q3)	9,266,537	20,866,240	0	1	0
2005 (Q4)	-8,592,731	23,534,430	0	0	1
2006 (Q1)	32,462,185	23,534,430	0	0	0
2006 (Q2)	10,905,593	22,505,296	1	0	0
2006 (Q3)	11,438,003	23,037,706	0	1	0
2006 (Q4)	9,779,144	21,378,847	0	0	1
2007 (Q1)	11,532,684	23,132,387	0	0	0
2007 (Q2)	17,579,265	29,178,968	1	0	0
2007 (Q3)	13,399,952	24,999,655	0	1	0
2007 (Q4)	11,578,316	23,178,019	0	0	1
2008 (Q1)	0	11,599,703	0	0	0
2008 (Q2)	7,323,047	18,922,750	1	0	0
2008 (Q3)	8,881,146	20,480,849	0	1	0
2008 (Q4)	6,444,784	18,044,487	0	0	1

2009 (Q1)	9,754,945	21,354,648	0	0	0
2009 (Q2)	10,971,041	22,570,744	1	0	0
2009 (Q3)	11,497,479	23,097,182	0	1	0
2009 (Q4)	11,649,069	23,248,772	0	0	1
2010 (Q1)	10,983,977	22,583,680	0	0	0
2010 (Q2)	13,195,212	24,794,915	1	0	0
2010 (Q3)	13,969,016	25,568,719	0	1	0
2010 (Q4)	11,916,601	23,516,304	0	0	1
2011 (Q1)	10,751,555	22,351,258	0	0	0
2011 (Q2)	12,603,104	24,202,807	1	0	0
2011 (Q3)	13,082,118	24,681,821	0	1	0
2011 (Q4)	11,354,223	22,953,926	0	0	1
2012 (Q1)	9,907,851	21,507,554	0	0	0
2012 (Q2)	12,371,016	23,970,719	1	0	0
2012 (Q3)	12,969,411	24,569,114	0	1	0
2012 (Q4)	11,514,266	23,113,969	0	0	1
2013 (Q1)	11,554,072	23,153,775	0	0	0
2013 (Q2)	13,746,110	25,345,813	1	0	0
2013 (Q3)	14,822,444	26,422,147	0	1	0
2013 (Q4)	18,987,399	30,587,102	0	0	1
2014 (Q1)	12,171,253	23,770,956	0	0	0
2014 (Q2)	15,491,961	27,091,664	1	0	0
2014 (Q3)	15,122,351	26,722,054	0	1	0
2014 (Q4)	12,115,213	23,714,916	0	0	1
2015 (Q1)	15,144,481	26,744,184	0	0	0
2015 (Q2)	17,335,926	28,935,629	1	0	0
2015 (Q3)	21,254,820	32,854,523	0	1	0
2015 (Q4)	19,052,938	30,652,641	0	0	1
2016 (Q1)	15,100,488	26,700,191	0	0	0
2016 (Q2)	16,708,692	28,308,395	1	0	0
2016 (Q3)	15,808,202	27,407,905	0	1	0

Appendix C: Naïve No-Change Model



Forecast -- Moving Average Selected		
		Forecast
Date	Quarterly	Annual
Jun-2017	4,208,499.00	
Sep-2017	4,208,499.00	
Dec-2017	4,208,499.00	12,625,497.00
Mar-2018	4,208,499.00	
Jun-2018	4,208,499.00	
Sep-2018	4,208,499.00	
Dec-2018	4,208,499.00	16,833,996.00
Mar-2019	4,208,499.00	
Jun-2019	4,208,499.00	
Sep-2019	4,208,499.00	
Dec-2019	4,208,499.00	16,833,996.00
Mar-2020	4,208,499.00	
Jun-2020	4,208,499.00	
Sep-2020	4,208,499.00	
Dec-2020	4,208,499.00	16,833,996.00
Mar-2021	4,208,499.00	
Jun-2021	4,208,499.00	
Sep-2021	4,208,499.00	
Total	75,752,982.00	
Avg	4,208,499.00	15,781,871.25
Max	4,208,499.00	16,833,996.00
Min	4,208,499.00	12,625,497.00

Summary Comments	
The forecast has an average error of	334.57%
The data has a standard deviation of	4,854,380.18
The forecast exceeds the accuracy of a simple average by	0.00%

Audit Trail - Summary Analysis

Audit Trail - Historical Versus Fitted Analysis

Series:Profit

Dates	Original Data	Fitted Data	Error	Series % Change	Forecast % Change	Cumulative Error	Cumulative MAPE
Sep-2000	23,702.00	0.00	23,702.00			23,702.00	100.00%
Dec-2000	1,899,096.00	23,702.00	1,875,394.00	7912.39%	2370200.00%	949,548.00	74.69%
Mar-2001	937,327.00	1,899,096.00	-961,769.00	-50.64%	7912.39%	312,442.33	61.19%
Jun-2001	-327,425.00	937,327.00	-1,264,752.00	-134.93%	-50.64%	-81,856.25	70.04%
Sep-2001	-909,776.00	0.00	-909,776.00	177.86%	-100.00%	-247,440.20	60.03%
Dec-2001	-923,115.00	0.00	-923,115.00	1.47%	0.00%	-360,052.67	52.80%
Mar-2002	-2,560,103.00	0.00	-2,560,103.00	177.33%	0.00%	-674,345.57	47.30%
Jun-2002	-3,873,515.00	0.00	-3,873,515.00	51.30%	0.00%	-1,074,241.75	42.95%
Sep-2002	-3,250,361.00	0.00	-3,250,361.00	-16.09%	0.00%	-1,316,032.78	39.41%
Dec-2002	-1,469,850.00	0.00	-1,469,850.00	-54.78%	0.00%	-1,331,414.50	36.47%
Mar-2003	-2,494,531.00	0.00	-2,494,531.00	69.71%	0.00%	-1,437,152.36	33.98%
Jun-2003	-4,150,742.00	0.00	-4,150,742.00	66.39%	0.00%	-1,663,284.83	31.84%
Sep-2003	-1,920,924.00	0.00	-1,920,924.00	-53.72%	0.00%	-1,683,103.23	29.99%
Dec-2003	647,420.00	0.00	647,420.00	-133.70%	0.00%	-1,516,637.29	28.35%
Mar-2004	-265,900.00	647,420.00	-913,320.00	-141.07%	64742000.00%	-1,476,416.13	27.99%
Jun-2004	-176,064.00	0.00	-176,064.00	-33.79%	-100.00%	-1,395,144.13	26.63%
Sep-2004	-1,456,177.00	0.00	-1,456,177.00	727.07%	0.00%	-1,398,734.29	25.41%
Dec-2004	-1,915,125.00	0.00	-1,915,125.00	31.52%	0.00%	-1,427,422.67	24.31%
Mar-2005	-1,123,527.00	0.00	-1,123,527.00	-41.33%	0.00%	-1,411,428.16	23.31%
Jun-2005	-4,609,595.00	0.00	-4,609,595.00	310.28%	0.00%	-1,571,336.50	22.39%
Sep-2005	-3,207,135.00	0.00	-3,207,135.00	-30.42%	0.00%	-1,649,231.67	21.55%
Dec-2005	-1,487,161.00	0.00	-1,487,161.00	-53.63%	0.00%	-1,641,864.82	20.78%
Mar-2006	-2,333,166.00	0.00	-2,333,166.00	56.89%	0.00%	-1,671,921.39	20.06%
Jun-2006	-20,192,434.00	0.00	-20,192,434.00	765.45%	0.00%	-2,443,609.42	19.40%
Sep-2006	20,862,482.00	0.00	20,862,482.00	-203.32%	0.00%	-1,511,365.76	18.79%
Dec-2006	-694,110.00	20,862,482.00	-21,556,592.00	-103.33%	###############	-2,282,336.00	22.66%
Mar-2007	-161,700.00	0.00	-161,700.00	-76.70%	-100.00%	-2,203,793.93	21.96%
Jun-2007	-1,820,559.00	0.00	-1,820,559.00	1025.89%	0.00%	-2,190,106.96	21.30%
Sep-2007	-67,019.00	0.00	-67,019.00	-96.32%	0.00%	-2,116,897.03	20.68%
Dec-2007	5,979,562.00	0.00	5,979,562.00	-9022.19%	0.00%	-1,847,015.07	20.10%
Mar-2008	1,800,249.00	5,979,562.00	-4,179,313.00	-69.89%	597956200.00%	-1,922,250.48	19.70%
Jun-2008	-21,387.00	1,800,249.00	-1,821,636.00	-101.19%	-69.89%	-1,919,106.28	27.40%
Sep-2008	-11,599,703.00	0.00	-11,599,703.00	54137.17%	-100.00%	-2,212,457.70	26.66%
Dec-2008	-4,276,656.00	0.00	-4,276,656.00	-63.13%	0.00%	-2,273,169.41	25.96%
Mar-2009	-2,718,557.00	0.00	-2,718,557.00	-36.43%	0.00%	-2,285,894.77	25.30%
Jun-2009	-5,154,919.00	0.00	-5,154,919.00	89.62%	0.00%	-2,365,589.89	24.68%
Sep-2009	-1,844,758.00	0.00	-1,844,758.00	-64.21%	0.00%	-2,351,513.35	24.08%
Dec-2009	-628,662.00	0.00	-628,662.00	-65.92%	0.00%	-2,306,175.16	23.52%
Mar-2010	-102,224.00	0.00	-102,224.00	-83.74%	0.00%	-2,249,663.59	22.98%
Jun-2010	49,366.00	0.00	49,366.00	-148.29%	0.00%	-2,192,187.85	22.47%
Sep-2010	-615,726.00	49,366.00	-665,092.00	-1347.27%	4936600.00%	-2,154,941.61	21.99%
Dec-2010	1,595,509.00	0.00	1,595,509.00	-359.13%	-100.00%	-2,065,645.17	21.52%
Mar-2011	2,369,313.00	1,595,509.00	773,804.00	48.50%	159550900.00%	-1,999,611.47	21.04%
Jun-2011	316,898.00	2,369,313.00	-2,052,415.00	-86.62%	48.50%	-2,000,811.55	20.89%
Sep-2011	-848,148.00	316,898.00	-1,165,046.00	-367.64%	-86.62%	-1,982,238.98	20.50%
Dec-2011	1,003,401.00	0.00	1,003,401.00	-218.30%	-100.00%	-1,917,333.76	20.10%
Mar-2012	1,482,415.00	1,003,401.00	479,014.00	47.74%	100340100.00%	-1,866,347.64	19.69%
Jun-2012	-245,480.00	1,482,415.00	-1,727,895.00	-116.56%	47.74%	-1,863,463.21	19.58%
Sep-2012	-1,691,852.00	0.00	-1,691,852.00	589.20%	-100.00%	-1,859,960.94	19.22%
Dec-2012	771,313.00	0.00	771,313.00	-145.59%	0.00%	-1,807,335.46	18.88%
Mar-2013	1,369,708.00	771,313.00	598,395.00	77.58%	77131300.00%	-1,760,164.27	18.53%
Jun-2013	-85,437.00	1,369,708.00	-1,455,145.00	-106.24%	77.58%	-1,754,298.52	18.80%
Sep-2013	-45,631.00	0.00	-45,631.00	-46.59%	-100.00%	-1,722,059.51	18.48%
Dec-2013	2,146,407.00	0.00	2,146,407.00	-4803.84%	0.00%	-1,650,421.24	18.17%
Mar-2014	3,222,741.00	2,146,407.00	1,076,334.00	50.15%	214640700.00%	-1,600,843.87	17.85%
Jun-2014	7,387,696.00	3,222,741.00	4,164,955.00	129.24%	50.15%	-1,497,883.18	17.55%
Sep-2014	571,550.00	7,387,696.00	-6,816,146.00	-92.26%	129.24%	-1,591,186.04	17.61%
Dec-2014	3,892,258.00	571,550.00	3,320,708.00	581.00%	-92.26%	-1,506,498.21	17.33%
Mar-2015	3,522,648.00	3,892,258.00	-369,610.00	-9.50%	581.00%	-1,487,228.92	17.04%
Jun-2015	515,510.00	3,522,648.00	-3,007,138.00	-85.37%	-9.50%	-1,512,560.73	16.92%
Sep-2015	3,544,778.00	515,510.00	3,029,268.00	587.63%	-85.37%	-1,438,104.52	16.67%
Dec-2015	5,736,223.00	3,544,778.00	2,191,445.00	61.82%	587.63%	-1,379,563.40	16.41%
Mar-2016	9,655,117.00	5,736,223.00	3,918,894.00	68.32%	61.82%	-1,295,460.90	16.16%
Jun-2016	7,453,235.00	9,655,117.00	-2,201,882.00	-22.81%	68.32%	-1,309,623.73	15.91%
Sep-2016	3,500,785.00	7,453,235.00	-3,952,450.00	-53.03%	-22.81%	-1,350,282.60	15.69%

Dec-2016	5,108,989.00	3,500,785.00	1,608,204.00	45.94%	-53.03%	-1,305,457.05	15.46%
Mar-2017	4,208,499.00	5,108,989.00	-900,490.00	-17.63%	45.94%	-1,299,412.76	15.24%
Avg	153,806.61	1,453,219.37	-1,299,412.76	744.40%	50120068.79%	-1,573,063.29	26.90%
Max	20,862,482.00	20,862,482.00	20,862,482.00	54137.17%	##########	949,548.00	100.00%
Min	-20,192,434.00	0.00	-21,556,592.00	-9022.19%	-100.00%	-2,443,609.42	15.24%
StDev	4,854,380.18	3,214,336.22	5,110,901.62	6869.29%	267062532.90%	651,504.93	15.62%
Var	##########	##########	##########	471871.17%	##########	##########	2.44%
Median	-102,224.00	0.00	-1,123,527.00	-38.88%	0.00%	-1,649,231.67	21.52%

Audit Trail - Statistics

Accuracy Measures	Value
AIC	2,265.27
BIC	2,267.48
MAPE	334.57%
Sum Squared Error (SSE)	##########
R-Square	0.00%
Adjusted R-Square	0.00%
Root Mean Square Error	5,236,403.21

Method Statistics	Value
Method Selected	Moving Average
Average Periods	1

Forecast Statistics	Value
Mean	153,806.61
Standard Deviation	4,854,380.18

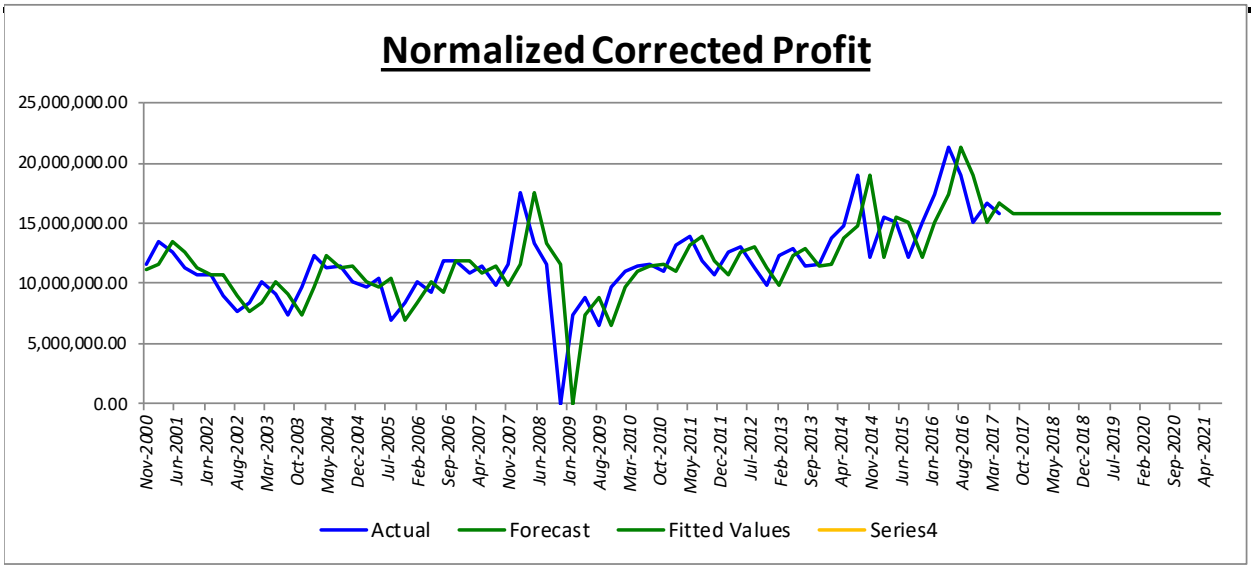
ForecastX Configuration Parameters

Item	Value
Data range selected	[Transportation Data for Forecasting.xlsx]Sheet1'!$A$1:$B$68
Time scale for data	Quarterly
Periods to forecast	18.00
Seasonal Length	
Replace Outliers Activated	No
Replace Outliers Standard Deviations	
Replace Outliers Forecasting Technique	
Replace Missing Values	No
Replace Missing Values (Lower Limit)	
Replace Missing Values (Upper Limit)	
Remove Leading Zeroes	Yes
Remove Trailing Zeroes	No
Use Holdback Evaluation	No
Holdback Evaluation Period	
Apply Tracking Signal	No
Apply Tracking Signal (Under Forecast Percentage)	
Apply Tracking Signal (Over Forecast Percentage)	
Forecast Method Selected	Moving Average

Report Details

Run Date: 3/20/2017 4:25:02 PM
Author: Collin
Note:

Appendix D: Naïve No Change Sensitivity Analysis



Forecast -- Moving Average Selected		
		Forecast
Date	Quarterly	Annual
Aug-2017	15,808,202.00	
Nov-2017	15,808,202.00	31,616,404.00
Feb-2018	15,808,202.00	
May-2018	15,808,202.00	
Aug-2018	15,808,202.00	
Nov-2018	15,808,202.00	63,232,808.00
Feb-2019	15,808,202.00	
May-2019	15,808,202.00	
Aug-2019	15,808,202.00	
Nov-2019	15,808,202.00	63,232,808.00
Feb-2020	15,808,202.00	
May-2020	15,808,202.00	
Aug-2020	15,808,202.00	
Nov-2020	15,808,202.00	63,232,808.00
Feb-2021	15,808,202.00	
May-2021	15,808,202.00	
Aug-2021	15,808,202.00	
Total	268,739,434.00	
Avg	15,808,202.00	55,328,707.00
Max	15,808,202.00	63,232,808.00
Min	15,808,202.00	31,616,404.00

Summary Comments	
The forecast has an average error of	16.03%
The data has a standard deviation of	3,285,729.92
The forecast exceeds the accuracy of a simple average by	29.36%

Audit Trail - Summary Analysis

Audit Trail - Historical Versus Fitted Analysis

Series:Normalized Corrected Profit

Dates	Original Data	Fitted Data	Error	Series % Change	Forecast % Change	Cumulative Error	Cumulative MAPE
Nov-2000	11,623,405.00	11,217,377.16	406,027.84			406,027.84	3.49%
Feb-2001	13,498,799.00	11,623,405.00	1,875,394.00	16.13%	3.62%	1,140,710.92	5.22%
May-2001	12,537,030.00	13,498,799.00	-961,769.00	-7.12%	16.13%	439,884.28	4.33%
Aug-2001	11,272,278.00	12,537,030.00	-1,264,752.00	-10.09%	-7.12%	13,725.21	3.95%
Nov-2001	10,689,927.00	11,272,278.00	-582,351.00	-5.17%	-10.09%	-105,490.03	3.38%
Feb-2002	10,676,588.00	10,689,927.00	-13,339.00	-0.12%	-5.17%	-90,131.53	2.82%
May-2002	9,039,600.00	10,676,588.00	-1,636,988.00	-15.33%	-0.12%	-311,111.02	2.79%
Aug-2002	7,726,188.00	9,039,600.00	-1,313,412.00	-14.53%	-15.33%	-436,398.65	2.70%
Nov-2002	8,349,342.00	7,726,188.00	623,154.00	8.07%	-14.53%	-318,670.57	2.49%
Feb-2003	10,129,853.00	8,349,342.00	1,780,511.00	21.33%	8.07%	-108,752.42	2.42%
May-2003	9,105,172.00	10,129,853.00	-1,024,681.00	-10.12%	21.33%	-192,018.65	2.29%
Aug-2003	7,448,961.00	9,105,172.00	-1,656,211.00	-18.19%	-10.12%	-314,034.68	2.26%
Nov-2003	9,678,779.00	7,448,961.00	2,229,818.00	29.93%	-18.19%	-118,353.70	2.22%
Feb-2004	12,247,123.00	9,678,779.00	2,568,344.00	26.54%	29.93%	73,553.27	2.17%
May-2004	11,333,803.00	12,247,123.00	-913,320.00	-7.46%	26.54%	7,761.72	2.06%
Aug-2004	11,423,639.00	11,333,803.00	89,836.00	0.79%	-7.46%	12,891.36	1.93%
Nov-2004	10,143,526.00	11,423,639.00	-1,280,113.00	-11.21%	0.79%	-63,167.72	1.86%
Feb-2005	9,684,578.00	10,143,526.00	-458,948.00	-4.52%	-11.21%	-85,155.51	1.77%
May-2005	10,476,176.00	9,684,578.00	791,598.00	8.17%	-4.52%	-39,010.59	1.70%
Aug-2005	6,990,108.00	10,476,176.00	-3,486,068.00	-33.28%	8.17%	-211,363.46	1.74%
Nov-2005	8,392,568.00	6,990,108.00	1,402,460.00	20.06%	-33.28%	-134,514.72	1.70%
Feb-2006	10,112,542.00	8,392,568.00	1,719,974.00	20.49%	20.06%	-50,219.78	1.65%
May-2006	9,266,537.00	10,112,542.00	-846,005.00	-8.37%	20.49%	-84,819.14	1.60%
Aug-2006	11,934,727.00	9,266,537.00	2,668,190.00	28.79%	-8.37%	29,889.58	1.57%
Nov-2006	11,934,727.00	11,934,727.00	0.00	0.00%	28.79%	28,693.99	1.51%
Feb-2007	10,905,593.00	11,934,727.00	-1,029,134.00	-8.62%	0.00%	-11,991.70	1.47%
May-2007	11,438,003.00	10,905,593.00	532,410.00	4.88%	-8.62%	8,171.33	1.42%
Aug-2007	9,779,144.00	11,438,003.00	-1,658,859.00	-14.50%	4.88%	-51,365.47	1.39%
Nov-2007	11,532,684.00	9,779,144.00	1,753,540.00	17.93%	-14.50%	10,872.65	1.36%
Feb-2008	17,579,265.00	11,532,684.00	6,046,581.00	52.43%	17.93%	212,062.93	1.35%
May-2008	13,399,952.00	17,579,265.00	-4,179,313.00	-23.77%	52.43%	70,405.64	1.34%
Aug-2008	11,578,316.00	13,399,952.00	-1,821,636.00	-13.59%	-23.77%	11,279.34	1.31%
Nov-2008	0.00	11,578,316.00	-11,578,316.00	-100.00%	-13.59%	-339,920.52	1.27%
Feb-2009	7,323,047.00	0.00	7,323,047.00	732304700.00%	-100.00%	-114,539.12	1.32%
May-2009	8,881,146.00	7,323,047.00	1,558,099.00	21.28%	732304700.00%	-66,749.46	1.30%
Aug-2009	6,444,784.00	8,881,146.00	-2,436,362.00	-27.43%	21.28%	-132,572.03	1.29%
Nov-2009	9,754,945.00	6,444,784.00	3,310,161.00	51.36%	-27.43%	-39,525.19	1.28%
Feb-2010	10,971,041.00	9,754,945.00	1,216,096.00	12.47%	51.36%	-6,482.53	1.26%
May-2010	11,497,479.00	10,971,041.00	526,438.00	4.80%	12.47%	7,182.10	1.23%
Aug-2010	11,649,069.00	11,497,479.00	151,590.00	1.32%	4.80%	10,792.30	1.20%
Nov-2010	10,983,977.00	11,649,069.00	-665,092.00	-5.71%	1.32%	-5,692.69	1.17%
Feb-2011	13,195,212.00	10,983,977.00	2,211,235.00	20.13%	-5.71%	47,091.31	1.15%
May-2011	13,969,016.00	13,195,212.00	773,804.00	5.86%	20.13%	63,991.60	1.13%
Aug-2011	11,916,601.00	13,969,016.00	-2,052,415.00	-14.69%	5.86%	15,891.45	1.11%
Nov-2011	10,751,555.00	11,916,601.00	-1,165,046.00	-9.78%	-14.69%	-10,351.60	1.09%
Feb-2012	12,603,104.00	10,751,555.00	1,851,549.00	17.22%	-9.78%	30,124.50	1.08%
May-2012	13,082,118.00	12,603,104.00	479,014.00	3.80%	17.22%	39,675.34	1.06%
Aug-2012	11,354,223.00	13,082,118.00	-1,727,895.00	-13.21%	3.80%	2,850.95	1.04%
Nov-2012	9,907,851.00	11,354,223.00	-1,446,372.00	-12.74%	-13.21%	-26,725.02	1.02%
Feb-2013	12,371,016.00	9,907,851.00	2,463,165.00	24.86%	-12.74%	23,072.78	1.01%
May-2013	12,969,411.00	12,371,016.00	598,395.00	4.84%	24.86%	34,353.60	0.99%
Aug-2013	11,514,266.00	12,969,411.00	-1,455,145.00	-11.22%	4.84%	5,709.40	0.98%
Nov-2013	11,554,072.00	11,514,266.00	39,806.00	0.35%	-11.22%	6,352.73	0.96%
Feb-2014	13,746,110.00	11,554,072.00	2,192,038.00	18.97%	0.35%	46,828.39	0.95%
May-2014	14,822,444.00	13,746,110.00	1,076,334.00	7.83%	18.97%	65,546.67	0.93%
Aug-2014	18,987,399.00	14,822,444.00	4,164,955.00	28.10%	7.83%	138,750.39	0.92%
Nov-2014	12,171,253.00	18,987,399.00	-6,816,146.00	-35.90%	28.10%	16,734.66	0.93%
Feb-2015	15,491,961.00	12,171,253.00	3,320,708.00	27.28%	-35.90%	73,699.72	0.92%
May-2015	15,122,351.00	15,491,961.00	-369,610.00	-2.39%	27.28%	66,186.00	0.90%
Aug-2015	12,115,213.00	15,122,351.00	-3,007,138.00	-19.89%	-2.39%	14,963.93	0.89%
Nov-2015	15,144,481.00	12,115,213.00	3,029,268.00	25.00%	-19.89%	64,378.75	0.88%
Feb-2016	17,335,926.00	15,144,481.00	2,191,445.00	14.47%	25.00%	98,686.27	0.87%
May-2016	21,254,820.00	17,335,926.00	3,918,894.00	22.61%	14.47%	159,324.49	0.86%
Aug-2016	19,052,938.00	21,254,820.00	-2,201,882.00	-10.36%	22.61%	122,430.64	0.85%
Nov-2016	15,100,488.00	19,052,938.00	-3,952,450.00	-20.74%	-10.36%	59,740.17	0.85%

Feb-2017	16,708,692.00	15,100,488.00	1,608,204.00	10.65%	-20.74%	83,201.74	0.84%
May-2017	15,808,202.00	16,708,692.00	-900,490.00	-5.39%	10.65%	68,519.77	0.82%
Avg	11,753,509.61	11,684,989.84	68,519.77	11095527.02%	11095527.16%	5,416.15	1.61%
Max	21,254,820.00	21,254,820.00	7,323,047.00	732304700.00%	732304700.00%	1,140,710.92	5.22%
Min	0.00	0.00	-11,578,316.00	-100.00%	-100.00%	-436,398.65	0.82%
StDev	3,285,729.92	3,247,539.25	2,760,784.62	90140477.22%	90140477.20%	200,092.72	0.89%
Var	###############	###############	###############	###############	###############	###############	0.01%
Median	11,514,266.00	11,497,479.00	89,836.00	0.57%	1.06%	10,792.30	1.30%

Audit Trail - Statistics

Accuracy Measures	Value
AIC	2,178.53
BIC	2,180.73
MAPE	16.03%
Sum Squared Error (SSE)	###############
R-Square	29.36%
Adjusted R-Square	29.36%
Root Mean Square Error	2,740,960.88

Forecast Statistics	Value
Mean	11,753,509.61
Standard Deviation	3,285,729.92

Method Statistics	Value
Method Selected	Moving Average
Average Periods	1

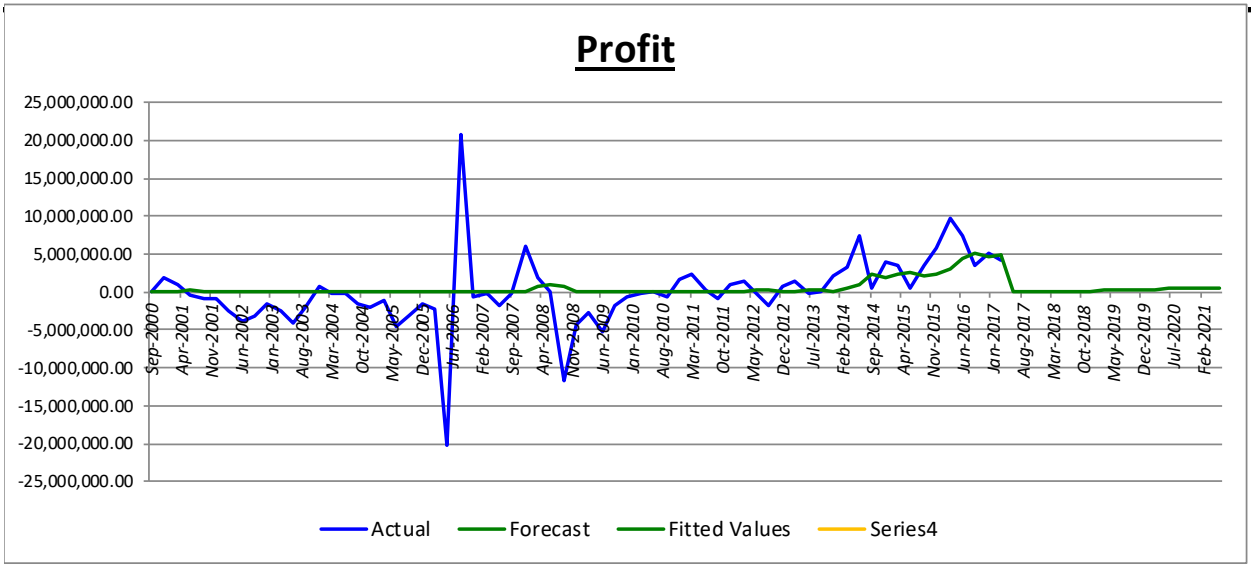
ForecastX Configuration Parameters

Item	Value
Data range selected	[Transportation Data for Forecasting.xlsx]Sheet1'!$K$1:$L$68
Time scale for data	Quarterly
Periods to forecast	17.00
Seasonal Length	
Replace Outliers Activated	No
Replace Outliers Standard Deviations	
Replace Outliers Forecasting Technique	
Replace Missing Values	No
Replace Missing Values (Low er Limit)	
Replace Missing Values (Upper Limit)	
Remove Leading Zeroes	Yes
Remove Trailing Zeroes	No
Use Holdback Evaluation	No
Holdback Evaluation Period	
Apply Tracking Signal	No
Apply Tracking Signal (Under Forecast Percentage)	
Apply Tracking Signal (Over Forecast Percentage)	
Forecast Method Selected	Moving Average

Report Details

Run Date: 5/4/2017 7:02:01 PM
Author: Collin
Note:

Appendix E: Moving Average Model



Forecast -- Moving Average Selected		
		Forecast
Date	Quarterly	Annual
Jun-2017	153,806.61	
Sep-2017	155,748.47	
Dec-2017	129,728.36	439,283.44
Mar-2018	117,674.65	
Jun-2018	124,317.93	
Sep-2018	139,752.16	
Dec-2018	155,615.85	537,360.59
Mar-2019	196,148.97	
Jun-2019	256,890.22	
Sep-2019	309,237.26	
Dec-2019	335,790.80	1,098,067.25
Mar-2020	378,034.41	
Jun-2020	445,628.08	
Sep-2020	480,949.76	
Dec-2020	478,465.13	1,783,077.38
Mar-2021	489,575.05	
Jun-2021	499,509.97	
Total	4,846,873.68	
Avg	285,110.22	964,447.17
Max	499,509.97	1,783,077.38
Min	117,674.65	439,283.44

Summary Comments	
The forecast has an average error of	180.94%
The data has a standard deviation of	4,854,380.18
The forecast exceeds the accuracy of a simple average by	12.70%

Audit Trail - Summary Analysis

Audit Trail - Historical Versus Fitted Analysis

Series:Profit

Dates	Original Data	Fitted Data	Error	Series % Change	Forecast % Change	Cumulative Error	Cumulative MAPE
Sep-2000	23,702.00	0.00	23,702.00			23,702.00	100.00%
Dec-2000	1,899,096.00	0.00	1,899,096.00	7912.39%	0.00%	961,399.00	75.00%
Mar-2001	937,327.00	135,820.96	801,506.04	-50.64%	13582096.15%	908,101.35	59.50%
Jun-2001	-327,425.00	296,122.17	-623,547.17	-134.93%	118.02%	525,189.22	56.53%
Sep-2001	-909,776.00	171,412.74	-1,081,188.74	177.86%	-42.11%	203,913.63	49.98%
Dec-2001	-923,115.00	0.00	-923,115.00	1.47%	-100.00%	16,075.52	44.42%
Mar-2002	-2,560,103.00	0.00	-2,560,103.00	177.33%	0.00%	-351,949.98	40.12%
Jun-2002	-3,873,515.00	0.00	-3,873,515.00	51.30%	0.00%	-792,145.61	36.67%
Sep-2002	-3,250,361.00	0.00	-3,250,361.00	-16.09%	0.00%	-1,065,280.65	33.83%
Dec-2002	-1,469,850.00	0.00	-1,469,850.00	-54.78%	0.00%	-1,105,737.59	31.44%
Mar-2003	-2,494,531.00	0.00	-2,494,531.00	69.71%	0.00%	-1,231,991.53	29.41%
Jun-2003	-4,150,742.00	0.00	-4,150,742.00	66.39%	0.00%	-1,475,220.74	27.66%
Sep-2003	-1,920,924.00	0.00	-1,920,924.00	-53.72%	0.00%	-1,509,505.61	26.12%
Dec-2003	647,420.00	0.00	647,420.00	-133.70%	0.00%	-1,355,439.49	24.76%
Mar-2004	-265,900.00	0.00	-265,900.00	-141.07%	0.00%	-1,282,803.52	23.56%
Jun-2004	-176,064.00	0.00	-176,064.00	-33.79%	0.00%	-1,213,632.30	22.48%
Sep-2004	-1,456,177.00	0.00	-1,456,177.00	727.07%	0.00%	-1,227,899.64	21.50%
Dec-2004	-1,915,125.00	0.00	-1,915,125.00	31.52%	0.00%	-1,266,078.83	20.61%
Mar-2005	-1,123,527.00	0.00	-1,123,527.00	-41.33%	0.00%	-1,258,576.10	19.81%
Jun-2005	-4,609,595.00	0.00	-4,609,595.00	310.28%	0.00%	-1,426,127.04	19.07%
Sep-2005	-3,207,135.00	0.00	-3,207,135.00	-30.42%	0.00%	-1,510,936.95	18.38%
Dec-2005	-1,487,161.00	0.00	-1,487,161.00	-53.63%	0.00%	-1,509,856.22	17.76%
Mar-2006	-2,333,166.00	0.00	-2,333,166.00	56.89%	0.00%	-1,545,652.30	17.17%
Jun-2006	-20,192,434.00	0.00	-20,192,434.00	765.45%	0.00%	-2,322,601.54	16.63%
Sep-2006	20,862,482.00	0.00	20,862,482.00	-203.32%	0.00%	-1,395,198.19	16.13%
Dec-2006	-694,110.00	0.00	-694,110.00	-103.33%	0.00%	-1,368,233.26	15.65%
Mar-2007	-161,700.00	0.00	-161,700.00	-76.70%	0.00%	-1,323,546.85	15.21%
Jun-2007	-1,820,559.00	0.00	-1,820,559.00	1025.89%	0.00%	-1,341,297.28	14.80%
Sep-2007	-67,019.00	0.00	-67,019.00	-96.32%	0.00%	-1,297,356.65	14.40%
Dec-2007	5,979,562.00	0.00	5,979,562.00	-9022.19%	0.00%	-1,054,792.70	14.03%
Mar-2008	1,800,249.00	743,104.66	1,057,144.34	-69.89%	74310466.21%	-986,665.69	13.64%
Jun-2008	-21,387.00	954,533.53	-975,920.53	-101.19%	28.45%	-986,329.91	17.67%
Sep-2008	-11,599,703.00	759,349.42	-12,359,052.42	54137.17%	-20.45%	-1,330,957.86	17.24%
Dec-2008	-4,276,656.00	0.00	-4,276,656.00	-63.13%	-100.00%	-1,417,596.04	16.81%
Mar-2009	-2,718,557.00	0.00	-2,718,557.00	-36.43%	0.00%	-1,454,766.36	16.42%
Jun-2009	-5,154,919.00	0.00	-5,154,919.00	89.62%	0.00%	-1,557,548.37	16.04%
Sep-2009	-1,844,758.00	0.00	-1,844,758.00	-64.21%	0.00%	-1,565,310.80	15.68%
Dec-2009	-628,662.00	0.00	-628,662.00	-65.92%	0.00%	-1,540,662.14	15.33%
Mar-2010	-102,224.00	0.00	-102,224.00	-83.74%	0.00%	-1,503,779.11	15.01%
Jun-2010	49,366.00	0.00	49,366.00	-148.29%	0.00%	-1,464,950.49	14.69%
Sep-2010	-615,726.00	0.00	-615,726.00	-1347.27%	0.00%	-1,444,237.69	14.39%
Dec-2010	1,595,509.00	0.00	1,595,509.00	-359.13%	0.00%	-1,371,862.77	14.11%
Mar-2011	2,369,313.00	0.00	2,369,313.00	48.50%	0.00%	-1,284,858.69	13.83%
Jun-2011	316,898.00	0.00	316,898.00	-86.62%	0.00%	-1,248,455.12	13.57%
Sep-2011	-848,148.00	0.00	-848,148.00	-367.64%	0.00%	-1,239,559.41	13.32%
Dec-2011	1,003,401.00	0.00	1,003,401.00	-218.30%	0.00%	-1,190,799.40	13.08%
Mar-2012	1,482,415.00	55,868.42	1,426,546.58	47.74%	5586841.52%	-1,135,111.19	12.84%
Jun-2012	-245,480.00	341,177.73	-586,657.73	-116.56%	510.68%	-1,123,685.08	12.68%
Sep-2012	-1,691,852.00	223,846.19	-1,915,698.19	589.20%	-34.39%	-1,139,848.61	12.47%
Dec-2012	771,313.00	0.00	771,313.00	-145.59%	-100.00%	-1,101,625.38	12.26%
Mar-2013	1,369,708.00	26,827.84	1,342,880.16	77.58%	2682783.89%	-1,053,693.90	12.06%
Jun-2013	-85,437.00	295,403.87	-380,840.87	-106.24%	1001.11%	-1,040,754.41	11.99%
Sep-2013	-45,631.00	219,235.70	-264,866.70	-46.59%	-25.78%	-1,026,115.02	11.97%
Dec-2013	2,146,407.00	166,262.36	1,980,144.64	-4803.84%	-24.16%	-970,443.55	11.78%
Mar-2014	3,222,741.00	562,291.29	2,660,449.71	50.15%	238.20%	-904,427.31	11.59%
Jun-2014	7,387,696.00	1,094,381.23	6,293,314.77	129.24%	94.63%	-775,896.20	11.41%
Sep-2014	571,550.00	2,353,044.18	-1,781,494.18	-92.26%	115.01%	-793,538.27	11.31%
Dec-2014	3,892,258.00	1,996,745.35	1,895,512.65	581.00%	-15.14%	-747,175.32	11.13%
Mar-2015	3,522,648.00	2,375,847.88	1,146,800.12	-9.50%	18.99%	-715,074.04	10.95%
Jun-2015	515,510.00	2,605,207.90	-2,089,697.90	-85.37%	9.65%	-737,984.44	10.88%
Sep-2015	3,544,778.00	2,187,268.32	1,357,509.68	587.63%	-16.04%	-703,632.08	10.71%
Dec-2015	5,736,223.00	2,458,770.26	3,277,452.74	61.82%	12.41%	-639,421.03	10.55%
Mar-2016	9,655,117.00	3,114,260.81	6,540,856.19	68.32%	26.66%	-525,448.38	10.40%
Jun-2016	7,453,235.00	4,422,432.04	3,030,802.96	-22.81%	42.01%	-469,881.95	10.25%
Sep-2016	3,500,785.00	5,028,592.64	-1,527,807.64	-53.03%	13.71%	-486,157.73	10.10%
Dec-2016	5,108,989.00	4,723,031.11	385,957.89	45.94%	-6.08%	-472,943.86	9.95%
Mar-2017	4,208,499.00	4,800,222.69	-591,723.69	-17.63%	1.63%	-474,716.69	9.81%
Avg	153,806.61	628,523.30	-474,716.69	744.40%	1457029.31%	-1,003,274.54	20.90%
Max	20,862,482.00	5,028,592.64	20,862,482.00	54137.17%	74310466.21%	961,399.00	100.00%
Min	-20,192,434.00	0.00	-20,192,434.00	-9022.19%	-100.00%	-2,322,601.54	9.81%
StDev	4,854,380.18	1,292,358.32	4,510,348.46	6869.29%	9285899.30%	584,390.47	16.15%

Var	###############	###############	###############	471871.17%	###############	###############	2.61%
Median	-102,224.00	0.00	-591,723.69	-38.88%	0.00%	-1,139,848.61	15.21%

Audit Trail - Statistics

Accuracy Measures	Value
AIC	2,245.01
BIC	2,247.22
MAPE	180.94%
Sum Squared Error (SSE)	###############
R-Square	12.70%
Adjusted R-Square	12.70%
Root Mean Square Error	4,501,662.88

Forecast Statistics	Value
Mean	153,806.61
Standard Deviation	4,854,380.18

Method Statistics	Value
Method Selected	Moving Average
Average Periods	67

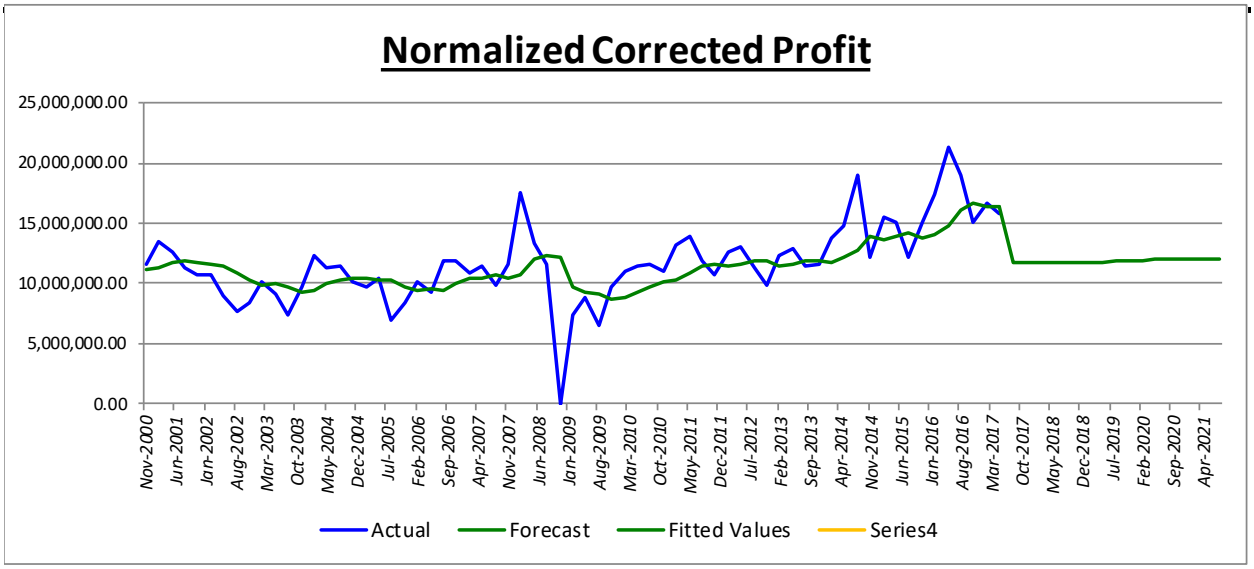
ForecastX Configuration Parameters

Item	Value
Data range selected	[Transportation Data for Forecasting.xlsx]Sheet1'!$A$1:$B$68
Time scale for data	Quarterly
Periods to forecast	17.00
Seasonal Length	
Replace Outliers Activated	No
Replace Outliers Standard Deviations	
Replace Outliers Forecasting Technique	
Replace Missing Values	No
Replace Missing Values (Lower Limit)	
Replace Missing Values (Upper Limit)	
Remove Leading Zeroes	Yes
Remove Trailing Zeroes	No
Use Holdback Evaluation	No
Holdback Evaluation Period	
Apply Tracking Signal	No
Apply Tracking Signal (Under Forecast Percentage)	
Apply Tracking Signal (Over Forecast Percentage)	
Forecast Method Selected	Moving Average

Report Details

Run Date: 3/13/2017 6:15:50 PM
Author: Collin
Note:

Appendix F: Sensitivity Analysis of Moving Average Model



Forecast -- Moving Average Selected		
		Forecast
Date	Quarterly	Annual
Aug-2017	11,753,509.61	
Nov-2017	11,755,451.47	23,508,961.08
Feb-2018	11,729,431.36	
May-2018	11,717,377.65	
Aug-2018	11,724,020.93	
Nov-2018	11,739,455.16	46,910,285.10
Feb-2019	11,755,318.85	
May-2019	11,795,851.97	
Aug-2019	11,856,593.22	
Nov-2019	11,908,940.26	47,316,704.31
Feb-2020	11,935,493.80	
May-2020	11,977,737.41	
Aug-2020	12,045,331.08	
Nov-2020	12,080,652.76	48,039,215.05
Feb-2021	12,078,168.13	
May-2021	12,089,278.05	
Aug-2021	12,099,212.97	
Total	202,041,824.68	
Avg	11,884,813.22	41,443,791.38
Max	12,099,212.97	48,039,215.05
Min	11,717,377.65	23,508,961.08

Summary Comments	
The forecast has an average error of	14.06%
The data has a standard deviation of	3,285,729.92
The forecast exceeds the accuracy of a simple average by	35.65%

Audit Trail - Summary Analysis

Audit Trail - Historical Versus Fitted Analysis

Series:Normalized Corrected Profit

Dates	Original Data	Fitted Data	Error	Series % Change	Forecast % Change	Cumulative Error	Cumulative MAPE
Nov-2000	11,623,405.00	11,217,377.16	406,027.84			406,027.84	3.49%
Feb-2001	13,498,799.00	11,298,582.73	2,200,216.27	16.13%	0.72%	1,303,122.05	5.82%
May-2001	12,537,030.00	11,738,625.98	798,404.02	-7.12%	3.89%	1,134,882.71	4.59%
Aug-2001	11,272,278.00	11,898,306.79	-626,028.79	-10.09%	1.36%	694,654.83	3.79%
Nov-2001	10,689,927.00	11,773,101.03	-1,083,174.03	-5.17%	-1.05%	339,089.06	3.44%
Feb-2002	10,676,588.00	11,556,466.22	-879,878.22	-0.12%	-1.84%	135,927.85	3.09%
May-2002	9,039,600.00	11,380,490.58	-2,340,890.58	-15.33%	-1.52%	-217,903.36	3.18%
Aug-2002	7,726,188.00	10,912,312.46	-3,186,124.46	-14.53%	-4.11%	-588,930.99	3.43%
Nov-2002	8,349,342.00	10,275,087.57	-1,925,745.57	8.07%	-5.84%	-737,465.95	3.33%
Feb-2003	10,129,853.00	9,889,938.46	239,914.54	21.33%	-3.75%	-639,727.90	3.02%
May-2003	9,105,172.00	9,937,921.37	-832,749.37	-10.12%	0.49%	-657,275.30	2.82%
Aug-2003	7,448,961.00	9,771,371.49	-2,322,410.49	-18.19%	-1.68%	-796,036.57	2.80%
Nov-2003	9,678,779.00	9,306,889.39	371,889.61	29.93%	-4.75%	-706,196.09	2.61%
Feb-2004	12,247,123.00	9,381,267.31	2,865,855.69	26.54%	0.80%	-451,049.54	2.54%
May-2004	11,333,803.00	9,954,438.45	1,379,364.55	-7.46%	6.11%	-329,021.93	2.43%
Aug-2004	11,423,639.00	10,230,311.36	1,193,327.64	0.79%	2.77%	-233,875.09	2.32%
Nov-2004	10,143,526.00	10,468,976.89	-325,450.89	-11.21%	2.33%	-239,261.90	2.19%
Feb-2005	9,684,578.00	10,403,886.71	-719,308.71	-4.52%	-0.62%	-265,931.16	2.09%
May-2005	10,476,176.00	10,260,024.97	216,151.03	8.17%	-1.38%	-240,558.42	1.99%
Aug-2005	6,990,108.00	10,303,255.18	-3,313,147.18	-33.28%	0.42%	-394,187.86	2.01%
Nov-2005	8,392,568.00	9,640,625.74	-1,248,057.74	20.06%	-6.43%	-434,848.33	1.95%
Feb-2006	10,112,542.00	9,391,014.19	721,527.81	20.49%	-2.59%	-382,285.77	1.87%
May-2006	9,266,537.00	9,535,319.75	-268,782.75	-8.37%	1.54%	-377,350.86	1.80%
Aug-2006	11,934,727.00	9,481,563.20	2,453,163.80	28.79%	-0.56%	-259,412.75	1.76%
Nov-2006	11,934,727.00	9,972,195.96	1,962,531.04	0.00%	5.17%	-170,535.00	1.71%
Feb-2007	10,905,593.00	10,364,702.17	540,890.83	-8.62%	3.94%	-143,172.47	1.65%
May-2007	11,438,003.00	10,472,880.34	965,122.66	4.88%	1.04%	-102,124.50	1.60%
Aug-2007	9,779,144.00	10,665,904.87	-886,760.87	-14.50%	1.84%	-130,147.23	1.56%
Nov-2007	11,532,684.00	10,488,552.69	1,044,131.31	17.93%	-1.66%	-89,654.86	1.52%
Feb-2008	17,579,265.00	10,697,378.96	6,881,886.04	52.43%	1.99%	142,729.83	1.51%
May-2008	13,399,952.00	12,073,756.16	1,326,195.84	-23.77%	12.87%	180,906.16	1.47%
Aug-2008	11,578,316.00	12,338,995.33	-760,679.33	-13.59%	2.20%	151,481.61	1.43%
Nov-2008	0.00	12,186,859.47	-12,186,859.47	-100.00%	-1.23%	-222,407.51	1.39%
Feb-2009	7,323,047.00	9,749,487.57	-2,426,440.57	732304700.00%	-20.00%	-287,232.02	1.38%
May-2009	8,881,146.00	9,264,199.46	-383,053.46	21.28%	-4.98%	-289,969.77	1.34%
Aug-2009	6,444,784.00	9,187,588.77	-2,742,804.77	-27.43%	-0.83%	-358,104.08	1.34%
Nov-2009	9,754,945.00	8,639,027.81	1,115,917.19	51.36%	-5.97%	-318,265.66	1.31%
Feb-2010	10,971,041.00	8,862,211.25	2,108,829.75	12.47%	2.58%	-254,394.73	1.29%
May-2010	11,497,479.00	9,283,977.20	2,213,501.80	4.80%	4.76%	-191,115.33	1.27%
Aug-2010	11,649,069.00	9,726,677.56	1,922,391.44	1.32%	4.77%	-138,277.66	1.24%
Nov-2010	10,983,977.00	10,111,155.85	872,821.15	-5.71%	3.95%	-113,616.72	1.22%
Feb-2011	13,195,212.00	10,285,720.08	2,909,491.92	20.13%	1.73%	-41,637.94	1.20%
May-2011	13,969,016.00	10,867,618.46	3,101,397.54	5.86%	5.66%	31,455.91	1.19%
Aug-2011	11,916,601.00	11,487,897.97	428,703.03	-14.69%	5.71%	40,484.25	1.16%
Nov-2011	10,751,555.00	11,573,638.58	-822,083.58	-9.78%	0.75%	21,316.08	1.14%
Feb-2012	12,603,104.00	11,409,221.86	1,193,882.14	17.22%	-1.42%	46,806.64	1.12%
May-2012	13,082,118.00	11,647,998.29	1,434,119.71	3.80%	2.09%	76,323.94	1.10%
Aug-2012	11,354,223.00	11,934,822.23	-580,599.23	-13.21%	2.46%	62,638.04	1.08%
Nov-2012	9,907,851.00	11,818,702.38	-1,910,851.38	-12.74%	-0.97%	22,362.75	1.07%
Feb-2013	12,371,016.00	11,436,532.11	934,483.89	24.86%	-3.23%	40,605.17	1.05%
May-2013	12,969,411.00	11,623,428.89	1,345,982.11	4.84%	1.63%	66,200.80	1.03%
Aug-2013	11,514,266.00	11,892,625.31	-378,359.31	-11.22%	2.32%	57,651.57	1.01%
Nov-2013	11,554,072.00	11,816,953.45	-262,881.45	0.35%	-0.64%	51,603.77	0.99%
Feb-2014	13,746,110.00	11,764,377.16	1,981,732.84	18.97%	-0.44%	87,346.90	0.98%
May-2014	14,822,444.00	12,160,723.73	2,661,720.27	7.83%	3.37%	134,153.69	0.97%
Aug-2014	18,987,399.00	12,693,067.78	6,294,331.22	28.10%	4.38%	244,156.86	0.96%
Nov-2014	12,171,253.00	13,951,934.02	-1,780,681.02	-35.90%	9.92%	208,633.39	0.95%
Feb-2015	15,491,961.00	13,595,797.82	1,896,163.18	27.28%	-2.55%	237,728.73	0.94%
May-2015	15,122,351.00	13,975,030.46	1,147,320.54	-2.39%	2.79%	253,145.54	0.92%
Aug-2015	12,115,213.00	14,204,494.56	-2,089,281.56	-19.89%	1.64%	214,105.09	0.91%
Nov-2015	15,144,481.00	13,786,638.25	1,357,842.75	25.00%	-2.94%	232,854.89	0.90%
Feb-2016	17,335,926.00	14,058,206.80	3,277,719.20	14.47%	1.97%	281,965.60	0.89%
May-2016	21,254,820.00	14,713,750.64	6,541,069.36	22.61%	4.66%	381,316.46	0.88%
Aug-2016	19,052,938.00	16,021,964.51	3,030,973.49	-10.36%	8.89%	422,717.35	0.87%
Nov-2016	15,100,488.00	16,628,159.21	-1,527,671.21	-20.74%	3.78%	392,711.37	0.86%

Feb-2017	16,708,692.00	16,322,624.97	386,067.03	10.65%	-1.84%	392,610.70	0.85%
May-2017	15,808,202.00	16,399,838.37	-591,636.37	-5.39%	0.47%	377,920.44	0.84%
Avg	11,753,509.61	11,375,589.17	377,920.44	11095527.02%	0.68%	-28,870.71	1.77%
Max	21,254,820.00	16,628,159.21	6,881,886.04	732304700.00%	12.87%	1,303,122.05	5.82%
Min	0.00	8,639,027.81	-12,186,859.47	-100.00%	-20.00%	-796,036.57	0.84%
StDev	3,285,729.92	1,887,264.14	2,608,114.83	90140477.22%	4.51%	386,296.36	1.01%
Var	###############	###############	###############	###############	0.20%	###############	0.01%
Median	11,514,266.00	11,217,377.16	428,703.03	0.57%	0.92%	21,316.08	1.38%

Audit Trail - Statistics

Accuracy Measures	Value
AIC	2,172.28
BIC	2,174.48
MAPE	14.06%
Sum Squared Error (SSE)	###############
R-Square	35.65%
Adjusted R-Square	35.65%
Root Mean Square Error	2,616,019.98

Method Statistics	Value
Method Selected	Moving Average
Average Periods	67

Forecast Statistics	Value
Mean	11,753,509.61
Standard Deviation	3,285,729.92

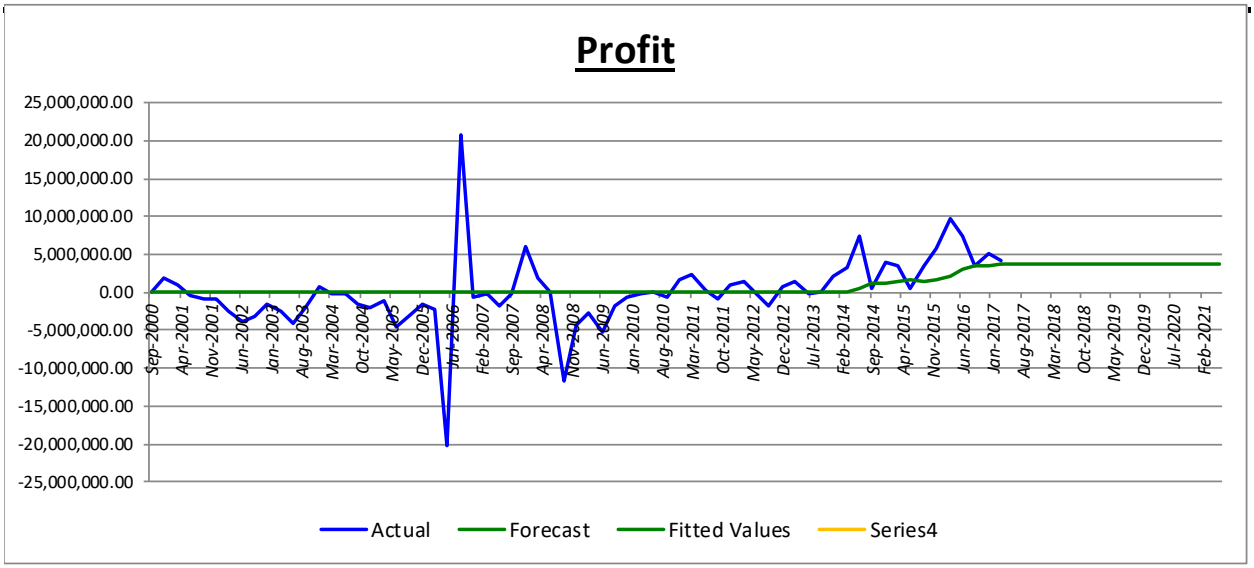
ForecastX Configuration Parameters

Item	Value
Data range selected	[Transportation Data for Forecasting.xlsx]Sheet1'!$A$1:$B$68
Time scale for data	Quarterly
Periods to forecast	17.00
Seasonal Length	
Replace Outliers Activated	No
Replace Outliers Standard Deviations	
Replace Outliers Forecasting Technique	
Replace Missing Values	No
Replace Missing Values (Lower Limit)	
Replace Missing Values (Upper Limit)	
Remove Leading Zeroes	Yes
Remove Trailing Zeroes	No
Use Holdback Evaluation	No
Holdback Evaluation Period	
Apply Tracking Signal	No
Apply Tracking Signal (Under Forecast Percentage)	
Apply Tracking Signal (Over Forecast Percentage)	
Forecast Method Selected	Moving Average

Report Details

Run Date: 5/3/2017 10:24:33 PM
Author: Collin
Note:

Appendix G: Simple Exponential Smoothing Model



Forecast -- Exponential Smoothing Selected		
		Forecast
Date	Quarterly	Annual
Jun-2017	3,716,523.61	
Sep-2017	3,716,523.61	
Dec-2017	3,716,523.61	11,149,570.82
Mar-2018	3,716,523.61	
Jun-2018	3,716,523.61	
Sep-2018	3,716,523.61	
Dec-2018	3,716,523.61	14,866,094.42
Mar-2019	3,716,523.61	
Jun-2019	3,716,523.61	
Sep-2019	3,716,523.61	
Dec-2019	3,716,523.61	14,866,094.42
Mar-2020	3,716,523.61	
Jun-2020	3,716,523.61	
Sep-2020	3,716,523.61	
Dec-2020	3,716,523.61	14,866,094.42
Mar-2021	3,716,523.61	
Jun-2021	3,716,523.61	
Total	63,180,901.30	
Avg	3,716,523.61	13,936,963.52
Max	3,716,523.61	14,866,094.42
Min	3,716,523.61	11,149,570.82

Summary Comments	
The forecast has an average error of	95.01%
The data has a standard deviation of	4,854,380.18
The forecast exceeds the accuracy of a simple average by	11.12%

Audit Trail - Summary Analysis

Audit Trail - Historical Versus Fitted Analysis

Series:Profit

Dates	Original Data	Fitted Data	Error	Series % Change	Forecast % Change	Cumulative Error	Cumulative MAPE
Sep-2000	23,702.00	0.00	23,702.00			23,702.00	100.00%
Dec-2000	1,899,096.00	0.00	1,899,096.00	7912.39%	0.00%	961,399.00	75.00%
Mar-2001	937,327.00	0.00	937,327.00	-50.64%	0.00%	953,375.00	61.11%
Jun-2001	-327,425.00	0.00	-327,425.00	-134.93%	0.00%	633,175.00	52.08%
Sep-2001	-909,776.00	0.00	-909,776.00	177.86%	0.00%	324,584.80	45.67%
Dec-2001	-923,115.00	0.00	-923,115.00	1.47%	0.00%	116,634.83	40.83%
Mar-2002	-2,560,103.00	0.00	-2,560,103.00	177.33%	0.00%	-265,756.29	37.04%
Jun-2002	-3,873,515.00	0.00	-3,873,515.00	51.30%	0.00%	-716,726.13	33.97%
Sep-2002	-3,250,361.00	0.00	-3,250,361.00	-16.09%	0.00%	-998,241.11	31.43%
Dec-2002	-1,469,850.00	0.00	-1,469,850.00	-54.78%	0.00%	-1,045,402.00	29.29%
Mar-2003	-2,494,531.00	0.00	-2,494,531.00	69.71%	0.00%	-1,177,141.00	27.45%
Jun-2003	-4,150,742.00	0.00	-4,150,742.00	66.39%	0.00%	-1,424,941.08	25.86%
Sep-2003	-1,920,924.00	0.00	-1,920,924.00	-53.72%	0.00%	-1,463,093.62	24.46%
Dec-2003	647,420.00	0.00	647,420.00	-133.70%	0.00%	-1,312,342.64	23.23%
Mar-2004	-265,900.00	0.00	-265,900.00	-141.07%	0.00%	-1,242,579.80	22.12%
Jun-2004	-176,064.00	0.00	-176,064.00	-33.79%	0.00%	-1,175,922.56	21.13%
Sep-2004	-1,456,177.00	0.00	-1,456,177.00	727.07%	0.00%	-1,192,408.12	20.23%
Dec-2004	-1,915,125.00	0.00	-1,915,125.00	31.52%	0.00%	-1,232,559.06	19.42%
Mar-2005	-1,123,527.00	0.00	-1,123,527.00	-41.33%	0.00%	-1,226,820.53	18.67%
Jun-2005	-4,609,595.00	0.00	-4,609,595.00	310.28%	0.00%	-1,395,959.25	17.99%
Sep-2005	-3,207,135.00	0.00	-3,207,135.00	-30.42%	0.00%	-1,482,205.71	17.36%
Dec-2005	-1,487,161.00	0.00	-1,487,161.00	-53.63%	0.00%	-1,482,430.95	16.78%
Mar-2006	-2,333,166.00	0.00	-2,333,166.00	56.89%	0.00%	-1,519,419.43	16.24%
Jun-2006	-20,192,434.00	0.00	-20,192,434.00	765.45%	0.00%	-2,297,461.71	15.73%
Sep-2006	20,862,482.00	0.00	20,862,482.00	-203.32%	0.00%	-1,371,063.96	15.26%
Dec-2006	-694,110.00	0.00	-694,110.00	-103.33%	0.00%	-1,345,027.27	14.82%
Mar-2007	-161,700.00	0.00	-161,700.00	-76.70%	0.00%	-1,301,200.33	14.41%
Jun-2007	-1,820,559.00	0.00	-1,820,559.00	1025.89%	0.00%	-1,319,748.86	14.03%
Sep-2007	-67,019.00	0.00	-67,019.00	-96.32%	0.00%	-1,276,551.28	13.66%
Dec-2007	5,979,562.00	0.00	5,979,562.00	-9022.19%	0.00%	-1,034,680.83	13.32%
Mar-2008	1,800,249.00	0.00	1,800,249.00	-69.89%	0.00%	-943,231.48	12.99%
Jun-2008	-21,387.00	0.00	-21,387.00	-101.19%	0.00%	-914,423.84	12.68%
Sep-2008	-11,599,703.00	0.00	-11,599,703.00	54137.17%	0.00%	-1,238,220.18	12.39%
Dec-2008	-4,276,656.00	0.00	-4,276,656.00	-63.13%	0.00%	-1,327,585.94	12.11%
Mar-2009	-2,718,557.00	0.00	-2,718,557.00	-36.43%	0.00%	-1,367,327.97	11.85%
Jun-2009	-5,154,919.00	0.00	-5,154,919.00	89.62%	0.00%	-1,472,538.83	11.60%
Sep-2009	-1,844,758.00	0.00	-1,844,758.00	-64.21%	0.00%	-1,482,598.81	11.36%
Dec-2009	-628,662.00	0.00	-628,662.00	-65.92%	0.00%	-1,460,126.79	11.13%
Mar-2010	-102,224.00	0.00	-102,224.00	-83.74%	0.00%	-1,425,308.77	10.91%
Jun-2010	49,366.00	0.00	49,366.00	-148.29%	0.00%	-1,388,441.90	10.70%
Sep-2010	-615,726.00	0.00	-615,726.00	-1347.27%	0.00%	-1,369,595.17	10.49%
Dec-2010	1,595,509.00	0.00	1,595,509.00	-359.13%	0.00%	-1,298,997.45	10.30%
Mar-2011	2,369,313.00	0.00	2,369,313.00	48.50%	0.00%	-1,213,687.91	10.12%
Jun-2011	316,898.00	0.00	316,898.00	-86.62%	0.00%	-1,178,901.86	9.94%
Sep-2011	-848,148.00	0.00	-848,148.00	-367.64%	0.00%	-1,171,551.78	9.77%
Dec-2011	1,003,401.00	0.00	1,003,401.00	-218.30%	0.00%	-1,124,270.20	9.60%
Mar-2012	1,482,415.00	0.00	1,482,415.00	47.74%	0.00%	-1,068,808.81	9.44%
Jun-2012	-245,480.00	0.00	-245,480.00	-116.56%	0.00%	-1,051,656.13	9.29%
Sep-2012	-1,691,852.00	0.00	-1,691,852.00	589.20%	0.00%	-1,064,721.35	9.14%
Dec-2012	771,313.00	0.00	771,313.00	-145.59%	0.00%	-1,028,000.66	9.00%
Mar-2013	1,369,708.00	0.00	1,369,708.00	77.58%	0.00%	-980,986.76	8.86%
Jun-2013	-85,437.00	0.00	-85,437.00	-106.24%	0.00%	-963,764.65	8.73%
Sep-2013	-45,631.00	0.00	-45,631.00	-46.59%	0.00%	-946,441.38	8.60%
Dec-2013	2,146,407.00	0.00	2,146,407.00	-4803.84%	0.00%	-889,166.41	8.47%
Mar-2014	3,222,741.00	148,833.37	3,073,907.63	50.15%	14883337.10%	-817,110.52	8.35%
Jun-2014	7,387,696.00	480,534.05	6,907,161.95	129.24%	222.87%	-679,177.08	8.23%
Sep-2014	571,550.00	1,225,875.36	-654,325.36	-92.26%	155.11%	-678,741.08	8.12%
Dec-2014	3,892,258.00	1,155,268.11	2,736,989.89	581.00%	-5.76%	-619,849.17	8.00%
Mar-2015	3,522,648.00	1,450,612.51	2,072,035.49	-9.50%	25.57%	-574,224.01	7.88%
Jun-2015	515,510.00	1,674,202.70	-1,158,692.70	-85.37%	15.41%	-583,965.15	7.82%
Sep-2015	3,544,778.00	1,549,169.94	1,995,608.06	587.63%	-7.47%	-541,677.07	7.70%
Dec-2015	5,736,223.00	1,764,512.96	3,971,710.04	61.82%	13.90%	-468,880.50	7.60%
Mar-2016	9,655,117.00	2,193,094.13	7,462,022.87	68.32%	24.29%	-342,993.14	7.49%
Jun-2016	7,453,235.00	2,998,309.63	4,454,925.37	-22.81%	36.72%	-268,025.67	7.39%
Sep-2016	3,500,785.00	3,479,033.83	21,751.17	-53.03%	16.03%	-263,567.56	7.28%
Dec-2016	5,108,989.00	3,481,380.97	1,627,608.03	45.94%	0.07%	-234,913.39	7.18%
Mar-2017	4,208,499.00	3,657,013.67	551,485.33	-17.63%	5.04%	-223,176.09	7.07%
Avg	153,806.61	376,982.70	-223,176.09	744.40%	225512.71%	-924,678.63	18.33%
Max	20,862,482.00	3,657,013.67	20,862,482.00	54137.17%	14883337.10%	961,399.00	100.00%
Min	-20,192,434.00	0.00	-20,192,434.00	-9022.19%	-7.47%	-2,297,461.71	7.07%
StDev	4,854,380.18	916,071.45	4,571,095.61	6869.29%	1832011.20%	604,225.12	16.68%

Var	###############	###############	###############	471871.17%	###############	###############	2.78%
Median	-102,224.00	0.00	-176,064.00	-38.88%	0.00%	-1,068,808.81	12.11%

Audit Trail - Statistics

Accuracy Measures	Value
AIC	2,246.22
BIC	2,248.42
MAPE	95.01%
Sum Squared Error (SSE)	###############
R-Square	11.12%
Adjusted R-Square	11.12%
Root Mean Square Error	4,542,340.61

Forecast Statistics	Value
Mean	153,806.61
Standard Deviation	4,854,380.18

Method Statistics	Value
Method Selected	Simple Exponential Smoothing
Level	0.11

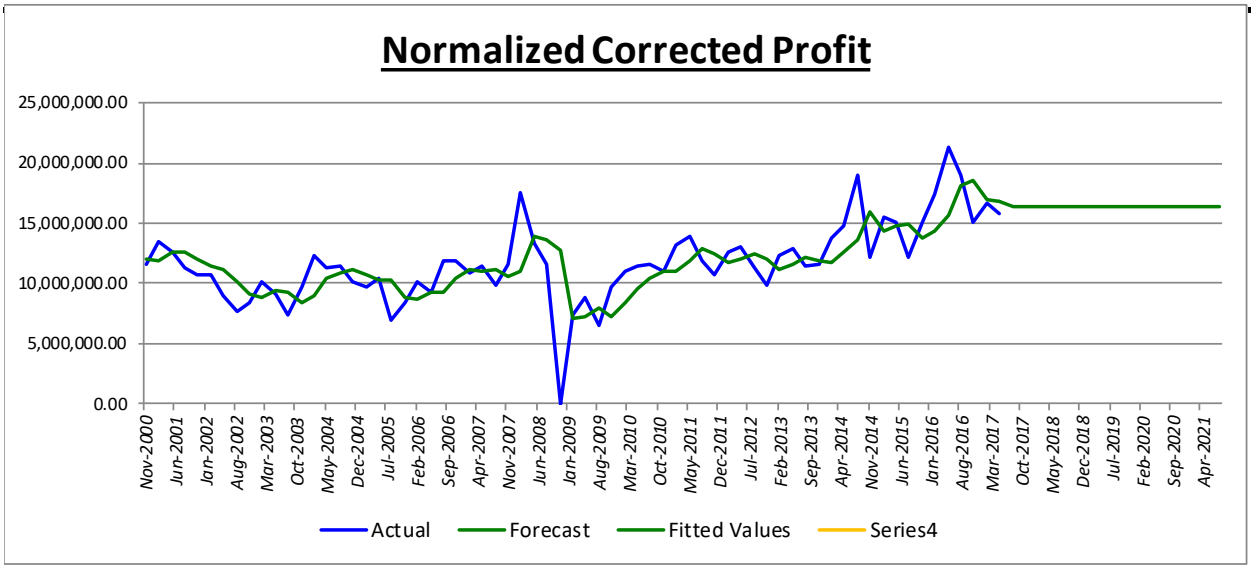
ForecastX Configuration Parameters

Item	Value
Data range selected	[Transportation Data for Forecasting.xlsx]Sheet1'!$A$1:$B$68
Time scale for data	Quarterly
Periods to forecast	17.00
Seasonal Length	
Replace Outliers Activated	No
Replace Outliers Standard Deviations	
Replace Outliers Forecasting Technique	
Replace Missing Values	No
Replace Missing Values (Lower Limit)	
Replace Missing Values (Upper Limit)	
Remove Leading Zeroes	Yes
Remove Trailing Zeroes	No
Use Holdback Evaluation	No
Holdback Evaluation Period	
Apply Tracking Signal	No
Apply Tracking Signal (Under Forecast Percentage)	
Apply Tracking Signal (Over Forecast Percentage)	
Forecast Method Selected	Simple Exponential Smoothing

Report Details

Run Date: 3/13/2017 6:50:15 PM
Author: Collin
Note:

Appendix H: Sensitivity Analysis of the Simple Exponential Smoothing Model



Forecast -- Exponential Smoothing Selected		
		Forecast
Date	Quarterly	Annual
Aug-2017	16,410,697.01	
Nov-2017	16,410,697.01	32,821,394.01
Feb-2018	16,410,697.01	
May-2018	16,410,697.01	
Aug-2018	16,410,697.01	
Nov-2018	16,410,697.01	65,642,788.02
Feb-2019	16,410,697.01	
May-2019	16,410,697.01	
Aug-2019	16,410,697.01	
Nov-2019	16,410,697.01	65,642,788.02
Feb-2020	16,410,697.01	
May-2020	16,410,697.01	
Aug-2020	16,410,697.01	
Nov-2020	16,410,697.01	65,642,788.02
Feb-2021	16,410,697.01	
May-2021	16,410,697.01	
Aug-2021	16,410,697.01	
Total	278,981,849.09	
Avg	16,410,697.01	57,437,439.52
Max	16,410,697.01	65,642,788.02
Min	16,410,697.01	32,821,394.01

Audit Trail - Summary Analysis

Audit Trail - Historical Versus Fitted Analysis

Series:Normalized Corrected Profit

Dates	Original Data	Fitted Data	Error	Series % Change	Forecast % Change	Cumulative Error	Cumulative MAPE
Nov-2000	11,623,405.00	12,031,391.90	-407,986.90			-407,986.90	3.51%
Feb-2001	13,498,799.00	11,851,923.89	1,646,875.11	16.13%	-1.49%	619,444.11	4.81%
May-2001	12,537,030.00	12,576,362.35	-39,332.35	-7.12%	6.11%	399,851.95	3.24%
Aug-2001	11,272,278.00	12,559,060.57	-1,286,782.57	-10.09%	-0.14%	-21,806.68	3.14%
Nov-2001	10,689,927.00	11,993,022.03	-1,303,095.03	-5.17%	-4.51%	-278,064.35	3.00%
Feb-2002	10,676,588.00	11,419,807.85	-743,219.85	-0.12%	-4.78%	-355,590.26	2.69%
May-2002	9,039,600.00	11,092,875.32	-2,053,275.32	-15.33%	-2.86%	-598,116.70	2.77%
Aug-2002	7,726,188.00	10,189,666.81	-2,463,478.81	-14.53%	-8.14%	-831,286.96	2.92%
Nov-2002	8,349,342.00	9,106,015.23	-756,673.23	8.07%	-10.63%	-822,996.55	2.71%
Feb-2003	10,129,853.00	8,773,164.74	1,356,688.26	21.33%	-3.66%	-605,028.07	2.57%
May-2003	9,105,172.00	9,369,953.87	-264,781.87	-10.12%	6.80%	-574,096.60	2.36%
Aug-2003	7,448,961.00	9,253,479.84	-1,804,518.84	-18.19%	-1.24%	-676,631.78	2.34%
Nov-2003	9,678,779.00	8,459,696.00	1,219,083.00	29.93%	-8.58%	-530,807.57	2.23%
Feb-2004	12,247,123.00	8,995,954.40	3,251,168.60	26.54%	6.34%	-260,666.41	2.21%
May-2004	11,333,803.00	10,426,100.24	907,702.76	-7.46%	15.90%	-182,775.14	2.10%
Aug-2004	11,423,639.00	10,825,386.62	598,252.38	0.79%	3.83%	-133,960.92	1.98%
Nov-2004	10,143,526.00	11,088,549.89	-945,023.89	-11.21%	2.43%	-181,670.50	1.90%
Feb-2005	9,684,578.00	10,672,846.44	-988,268.44	-4.52%	-3.75%	-226,481.50	1.83%
May-2005	10,476,176.00	10,238,120.29	238,055.71	8.17%	-4.07%	-202,032.17	1.74%
Aug-2005	6,990,108.00	10,342,837.83	-3,352,729.83	-33.28%	1.02%	-359,567.06	1.77%
Nov-2005	8,392,568.00	8,868,016.56	-475,448.56	20.06%	-14.26%	-365,085.22	1.70%
Feb-2006	10,112,542.00	8,658,873.06	1,453,668.94	20.49%	-2.36%	-282,414.58	1.65%
May-2006	9,266,537.00	9,298,322.70	-31,785.70	-8.37%	7.38%	-271,517.67	1.58%
Aug-2006	11,934,727.00	9,284,340.59	2,650,386.41	28.79%	-0.15%	-149,771.67	1.55%
Nov-2006	11,934,727.00	10,450,210.33	1,484,516.67	0.00%	12.56%	-84,400.13	1.51%
Feb-2007	10,905,593.00	11,103,229.48	-197,636.48	-8.62%	6.25%	-88,755.38	1.45%
May-2007	11,438,003.00	11,016,291.82	421,711.18	4.88%	-0.78%	-69,849.21	1.41%
Aug-2007	9,779,144.00	11,201,796.96	-1,422,652.96	-14.50%	1.68%	-118,163.63	1.37%
Nov-2007	11,532,684.00	10,575,990.84	956,693.16	17.93%	-5.59%	-81,099.60	1.34%
Feb-2008	17,579,265.00	10,996,827.44	6,582,437.56	52.43%	3.98%	141,018.30	1.33%
May-2008	13,399,952.00	13,892,354.20	-492,402.20	-23.77%	26.33%	120,585.38	1.29%
Aug-2008	11,578,316.00	13,675,753.02	-2,097,437.02	-13.59%	-1.56%	51,272.18	1.27%
Nov-2008	0.00	12,753,118.36	-12,753,118.36	-100.00%	-6.75%	-336,739.65	1.23%
Feb-2009	7,323,047.00	7,143,191.16	179,855.84	732304700.00%	-43.99%	-321,545.67	1.20%
May-2009	8,881,146.00	7,222,307.35	1,658,838.65	21.28%	1.11%	-264,963.26	1.18%
Aug-2009	6,444,784.00	7,952,008.42	-1,507,224.42	-27.43%	10.10%	-299,470.51	1.17%
Nov-2009	9,754,945.00	7,289,000.44	2,465,944.56	51.36%	-8.34%	-224,729.56	1.15%
Feb-2010	10,971,041.00	8,373,736.66	2,597,304.34	12.47%	14.88%	-150,465.51	1.14%
May-2010	11,497,479.00	9,516,256.31	1,981,222.69	4.80%	13.64%	-95,806.84	1.12%
Aug-2010	11,649,069.00	10,387,769.83	1,261,299.17	1.32%	9.16%	-61,879.19	1.10%
Nov-2010	10,983,977.00	10,942,598.56	41,378.44	-5.71%	5.34%	-59,360.71	1.07%
Feb-2011	13,195,212.00	10,960,800.39	2,234,411.61	20.13%	0.17%	-4,747.09	1.06%
May-2011	13,969,016.00	11,943,688.35	2,025,327.65	5.86%	8.97%	42,463.95	1.04%
Aug-2011	11,916,601.00	12,834,603.05	-918,002.05	-14.69%	7.46%	20,635.18	1.02%
Nov-2011	10,751,555.00	12,430,786.16	-1,679,231.16	-9.78%	-3.15%	-17,139.63	1.01%
Feb-2012	12,603,104.00	11,692,114.70	910,989.30	17.22%	-5.94%	3,037.09	0.99%
May-2012	13,082,118.00	12,092,846.78	989,271.22	3.80%	3.43%	24,020.80	0.97%
Aug-2012	11,354,223.00	12,528,014.04	-1,173,791.04	-13.21%	3.60%	-933.62	0.95%
Nov-2012	9,907,851.00	12,011,678.97	-2,103,827.97	-12.74%	-4.12%	-43,849.83	0.94%
Feb-2013	12,371,016.00	11,086,233.02	1,284,782.98	24.86%	-7.70%	-17,277.17	0.93%
May-2013	12,969,411.00	11,651,391.97	1,318,019.03	4.84%	5.10%	8,905.11	0.91%
Aug-2013	11,514,266.00	12,231,171.02	-716,905.02	-11.22%	4.98%	-5,052.78	0.90%
Nov-2013	11,554,072.00	11,915,814.03	-361,742.03	0.35%	-2.58%	-11,782.77	0.88%
Feb-2014	13,746,110.00	11,756,688.52	1,989,421.48	18.97%	-1.34%	25,276.57	0.87%
May-2014	14,822,444.00	12,631,808.58	2,190,635.42	7.83%	7.44%	64,646.73	0.86%
Aug-2014	18,987,399.00	13,595,439.97	5,391,959.03	28.10%	7.63%	159,777.31	0.85%
Nov-2014	12,171,253.00	15,967,291.06	-3,796,038.06	-35.90%	17.45%	90,377.04	0.85%
Feb-2015	15,491,961.00	14,297,464.39	1,194,496.61	27.28%	-10.46%	109,413.58	0.84%
May-2015	15,122,351.00	14,822,907.57	299,443.43	-2.39%	3.68%	112,634.43	0.82%
Aug-2015	12,115,213.00	14,954,628.75	-2,839,415.75	-19.89%	0.89%	63,433.59	0.82%
Nov-2015	15,144,481.00	13,705,607.51	1,438,873.49	25.00%	-8.35%	85,981.79	0.80%
Feb-2016	17,335,926.00	14,338,548.83	2,997,377.17	14.47%	4.62%	132,939.78	0.80%
May-2016	21,254,820.00	15,657,055.19	5,597,764.81	22.61%	9.20%	219,683.03	0.79%
Aug-2016	19,052,938.00	18,119,437.51	933,500.49	-10.36%	15.73%	230,836.43	0.78%
Nov-2016	15,100,488.00	18,530,071.96	-3,429,583.96	-20.74%	2.27%	174,522.27	0.77%
Feb-2017	16,708,692.00	17,021,443.58	-312,751.58	10.65%	-8.14%	167,139.33	0.76%
May-2017	15,808,202.00	16,883,868.32	-1,075,666.32	-5.39%	-0.81%	148,589.99	0.75%
Avg	11,753,509.61	11,604,919.62	148,589.99	11095527.02%	1.02%	-111,341.51	1.53%
Max	21,254,820.00	18,530,071.96	6,582,437.56	732304700.00%	26.33%	619,444.11	4.81%
Min	0.00	7,143,191.16	-12,753,118.36	-100.00%	-43.99%	-831,286.96	0.75%
StDev	3,285,729.92	2,508,240.40	2,578,973.15	90140477.22%	9.56%	268,317.79	0.83%

Var	###############	###############	###############	###############	0.91%	###############	0.01%
Median	11,514,266.00	11,201,796.96	179,855.84	0.57%	0.96%	-61,879.19	1.20%

Audit Trail - Statistics

Accuracy Measures	Value
AIC	2,169.58
BIC	2,171.79
MAPE	13.33%
Sum Squared Error (SSE)	###############
R-Square	38.19%
Adjusted R-Square	38.19%
Root Mean Square Error	2,563,963.98

Forecast Statistics	Value
Mean	11,753,509.61
Standard Deviation	3,285,729.92

Method Statistics	Value
Method Selected	Simple Exponential Smoothing
Level	0.44

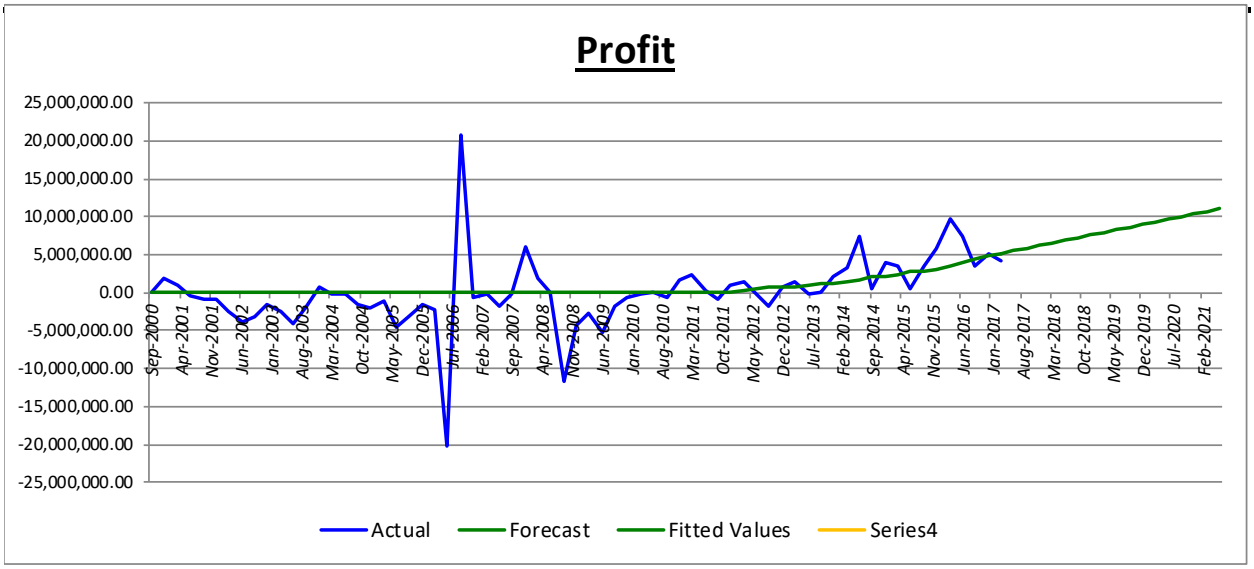
ForecastX Configuration Parameters

Item	Value
Data range selected	[Transportation Data for Forecasting.xlsx]Sheet1'!$A$1:$B$68
Time scale for data	Quarterly
Periods to forecast	17.00
Seasonal Length	
Replace Outliers Activated	No
Replace Outliers Standard Deviations	
Replace Outliers Forecasting Technique	
Replace Missing Values	No
Replace Missing Values (Lower Limit)	
Replace Missing Values (Upper Limit)	
Remove Leading Zeroes	Yes
Remove Trailing Zeroes	No
Use Holdback Evaluation	No
Holdback Evaluation Period	
Apply Tracking Signal	No
Apply Tracking Signal (Under Forecast Percentage)	
Apply Tracking Signal (Over Forecast Percentage)	
Forecast Method Selected	Simple Exponential Smoothing

Report Details

Run Date: 5/3/2017 10:29:55 PM
Author: Collin
Note:

Appendix I: Holt's Double Exponential Smoothing Model



Forecast -- Double Exponential Smoothing-Holt Selected		
		Forecast
Date	Quarterly	Annual
Jun-2017	5,504,192.22	
Sep-2017	5,847,630.99	
Dec-2017	6,191,069.77	17,542,892.98
Mar-2018	6,534,508.54	
Jun-2018	6,877,947.31	
Sep-2018	7,221,386.09	
Dec-2018	7,564,824.86	28,198,666.80
Mar-2019	7,908,263.63	
Jun-2019	8,251,702.40	
Sep-2019	8,595,141.18	
Dec-2019	8,938,579.95	33,693,687.16
Mar-2020	9,282,018.72	
Jun-2020	9,625,457.50	
Sep-2020	9,968,896.27	
Dec-2020	10,312,335.04	39,188,707.53
Mar-2021	10,655,773.81	
Jun-2021	10,999,212.59	
Total	140,278,940.88	
Avg	8,251,702.40	29,655,988.62
Max	10,999,212.59	39,188,707.53
Min	5,504,192.22	17,542,892.98

Summary Comments	
The forecast has an average error of	151.75%
The data has a standard deviation of	4,854,380.18
The forecast exceeds the accuracy of a simple average by	15.12%

Audit Trail - Summary Analysis

Audit Trail - Historical Versus Fitted Analysis

Series:Profit

Dates	Original Data	Fitted Data	Error	Series % Change	Forecast % Change	Cumulative Error	Cumulative MAPE
Sep-2000	23,702.00	0.00	23,702.00			23,702.00	100.00%
Dec-2000	1,899,096.00	0.00	1,899,096.00	7912.39%	0.00%	961,399.00	75.00%
Mar-2001	937,327.00	0.00	937,327.00	-50.64%	0.00%	953,375.00	61.11%
Jun-2001	-327,425.00	0.00	-327,425.00	-134.93%	0.00%	633,175.00	52.08%
Sep-2001	-909,776.00	0.00	-909,776.00	177.86%	0.00%	324,584.80	45.67%
Dec-2001	-923,115.00	0.00	-923,115.00	1.47%	0.00%	116,634.83	40.83%
Mar-2002	-2,560,103.00	0.00	-2,560,103.00	177.33%	0.00%	-265,756.29	37.04%
Jun-2002	-3,873,515.00	0.00	-3,873,515.00	51.30%	0.00%	-716,726.13	33.97%
Sep-2002	-3,250,361.00	0.00	-3,250,361.00	-16.09%	0.00%	-998,241.11	31.43%
Dec-2002	-1,469,850.00	0.00	-1,469,850.00	-54.78%	0.00%	-1,045,402.00	29.29%
Mar-2003	-2,494,531.00	0.00	-2,494,531.00	69.71%	0.00%	-1,177,141.00	27.45%
Jun-2003	-4,150,742.00	0.00	-4,150,742.00	66.39%	0.00%	-1,424,941.08	25.86%
Sep-2003	-1,920,924.00	0.00	-1,920,924.00	-53.72%	0.00%	-1,463,093.62	24.46%
Dec-2003	647,420.00	0.00	647,420.00	-133.70%	0.00%	-1,312,342.64	23.23%
Mar-2004	-265,900.00	0.00	-265,900.00	-141.07%	0.00%	-1,242,579.80	22.12%
Jun-2004	-176,064.00	0.00	-176,064.00	-33.79%	0.00%	-1,175,922.56	21.13%
Sep-2004	-1,456,177.00	0.00	-1,456,177.00	727.07%	0.00%	-1,192,408.12	20.23%
Dec-2004	-1,915,125.00	0.00	-1,915,125.00	31.52%	0.00%	-1,232,559.06	19.42%
Mar-2005	-1,123,527.00	0.00	-1,123,527.00	-41.33%	0.00%	-1,226,820.53	18.67%
Jun-2005	-4,609,595.00	0.00	-4,609,595.00	310.28%	0.00%	-1,395,959.25	17.99%
Sep-2005	-3,207,135.00	0.00	-3,207,135.00	-30.42%	0.00%	-1,482,205.71	17.36%
Dec-2005	-1,487,161.00	0.00	-1,487,161.00	-53.63%	0.00%	-1,482,430.95	16.78%
Mar-2006	-2,333,166.00	0.00	-2,333,166.00	56.89%	0.00%	-1,519,419.43	16.24%
Jun-2006	-20,192,434.00	0.00	-20,192,434.00	765.45%	0.00%	-2,297,461.71	15.73%
Sep-2006	20,862,482.00	0.00	20,862,482.00	-203.32%	0.00%	-1,371,063.96	15.26%
Dec-2006	-694,110.00	0.00	-694,110.00	-103.33%	0.00%	-1,345,027.27	14.82%
Mar-2007	-161,700.00	0.00	-161,700.00	-76.70%	0.00%	-1,301,200.33	14.41%
Jun-2007	-1,820,559.00	0.00	-1,820,559.00	1025.89%	0.00%	-1,319,748.86	14.03%
Sep-2007	-67,019.00	0.00	-67,019.00	-96.32%	0.00%	-1,276,551.28	13.66%
Dec-2007	5,979,562.00	0.00	5,979,562.00	-9022.19%	0.00%	-1,034,680.83	13.32%
Mar-2008	1,800,249.00	0.00	1,800,249.00	-69.89%	0.00%	-943,231.48	12.99%
Jun-2008	-21,387.00	0.00	-21,387.00	-101.19%	0.00%	-914,423.84	12.68%
Sep-2008	-11,599,703.00	0.00	-11,599,703.00	54137.17%	0.00%	-1,238,220.18	12.39%
Dec-2008	-4,276,656.00	0.00	-4,276,656.00	-63.13%	0.00%	-1,327,585.94	12.11%
Mar-2009	-2,718,557.00	0.00	-2,718,557.00	-36.43%	0.00%	-1,367,327.97	11.85%
Jun-2009	-5,154,919.00	0.00	-5,154,919.00	89.62%	0.00%	-1,472,538.83	11.60%
Sep-2009	-1,844,758.00	0.00	-1,844,758.00	-64.21%	0.00%	-1,482,598.81	11.36%
Dec-2009	-628,662.00	0.00	-628,662.00	-65.92%	0.00%	-1,460,126.79	11.13%
Mar-2010	-102,224.00	0.00	-102,224.00	-83.74%	0.00%	-1,425,308.77	10.91%
Jun-2010	49,366.00	0.00	49,366.00	-148.29%	0.00%	-1,388,441.90	10.70%
Sep-2010	-615,726.00	0.00	-615,726.00	-1347.27%	0.00%	-1,369,595.17	10.49%
Dec-2010	1,595,509.00	0.00	1,595,509.00	-359.13%	0.00%	-1,298,997.45	10.30%
Mar-2011	2,369,313.00	0.00	2,369,313.00	48.50%	0.00%	-1,213,687.91	10.12%
Jun-2011	316,898.00	0.00	316,898.00	-86.62%	0.00%	-1,178,901.86	9.94%
Sep-2011	-848,148.00	0.00	-848,148.00	-367.64%	0.00%	-1,171,551.78	9.77%
Dec-2011	1,003,401.00	96,057.91	907,343.09	-218.30%	9605790.64%	-1,126,358.41	9.60%
Mar-2012	1,482,415.00	293,853.43	1,188,561.57	47.74%	205.91%	-1,077,104.79	9.43%
Jun-2012	-245,480.00	516,325.38	-761,805.38	-116.56%	75.71%	-1,070,536.06	9.37%
Sep-2012	-1,691,852.00	655,734.94	-2,347,586.94	589.20%	27.00%	-1,096,598.32	9.23%
Dec-2012	771,313.00	707,262.94	64,050.06	-145.59%	7.86%	-1,073,385.35	9.05%
Mar-2013	1,369,708.00	851,162.04	518,545.96	77.58%	20.35%	-1,042,171.01	8.89%
Jun-2013	-85,437.00	1,018,432.13	-1,103,869.13	-106.24%	19.65%	-1,043,357.51	9.20%
Sep-2013	-45,631.00	1,111,071.42	-1,156,702.42	-46.59%	9.10%	-1,045,496.10	9.93%
Dec-2013	2,146,407.00	1,188,085.60	958,321.40	-4803.84%	6.93%	-1,008,388.37	9.76%
Mar-2014	3,222,741.00	1,356,731.04	1,866,009.96	50.15%	14.19%	-956,126.58	9.60%
Jun-2014	7,387,696.00	1,581,827.91	5,805,868.09	129.24%	16.59%	-835,376.67	9.45%
Sep-2014	571,550.00	2,024,951.40	-1,453,401.40	-92.26%	28.01%	-846,219.21	9.36%
Dec-2014	3,892,258.00	2,175,187.38	1,717,070.62	581.00%	7.42%	-802,024.56	9.22%
Mar-2015	3,522,648.00	2,466,083.46	1,056,564.54	-9.50%	13.37%	-770,523.05	9.07%
Jun-2015	515,510.00	2,744,326.27	-2,228,816.27	-85.37%	11.28%	-794,827.94	9.04%
Sep-2015	3,544,778.00	2,871,518.79	673,259.21	587.63%	4.63%	-770,760.94	8.89%
Dec-2015	5,736,223.00	3,116,886.24	2,619,336.76	61.82%	8.54%	-716,081.94	8.76%
Mar-2016	9,655,117.00	3,467,022.07	6,188,094.93	68.32%	11.23%	-606,491.83	8.64%
Jun-2016	7,453,235.00	4,025,586.60	3,427,648.40	-22.81%	16.11%	-543,458.39	8.52%
Sep-2016	3,500,785.00	4,519,637.07	-1,018,852.07	-53.03%	12.27%	-550,772.14	8.39%

Dec-2016	5,108,989.00	4,832,771.89	276,217.11	45.94%	6.93%	-538,242.00	8.27%
Mar-2017	4,208,499.00	5,198,357.75	-989,858.75	-17.63%	7.56%	-544,982.55	8.15%
Avg	153,806.61	698,789.16	-544,982.55	744.40%	145550.32%	-976,099.03	18.61%
Max	20,862,482.00	5,198,357.75	20,862,482.00	54137.17%	9605790.64%	961,399.00	100.00%
Min	-20,192,434.00	0.00	-20,192,434.00	-9022.19%	0.00%	-2,297,461.71	8.15%
StDev	4,854,380.18	1,330,089.66	4,438,460.77	6869.29%	1182390.09%	574,935.11	16.51%
Var	###############	###############	###############	471871.17%	###############	###############	2.73%
Median	-102,224.00	0.00	-628,662.00	-38.88%	0.00%	-1,096,598.32	12.11%

Audit Trail - Statistics

Accuracy Measures	Value
AIC	2,245.13
BIC	2,249.54
MAPE	151.75%
Sum Squared Error (SSE)	###############
R-Square	15.12%
Adjusted R-Square	13.82%
Root Mean Square Error	4,438,796.13

Forecast Statistics	Value
Mean	153,806.61
Standard Deviation	4,854,380.18

Method Statistics	Value
Method Selected	Double Holt
Level	0.04
Trend	0.31

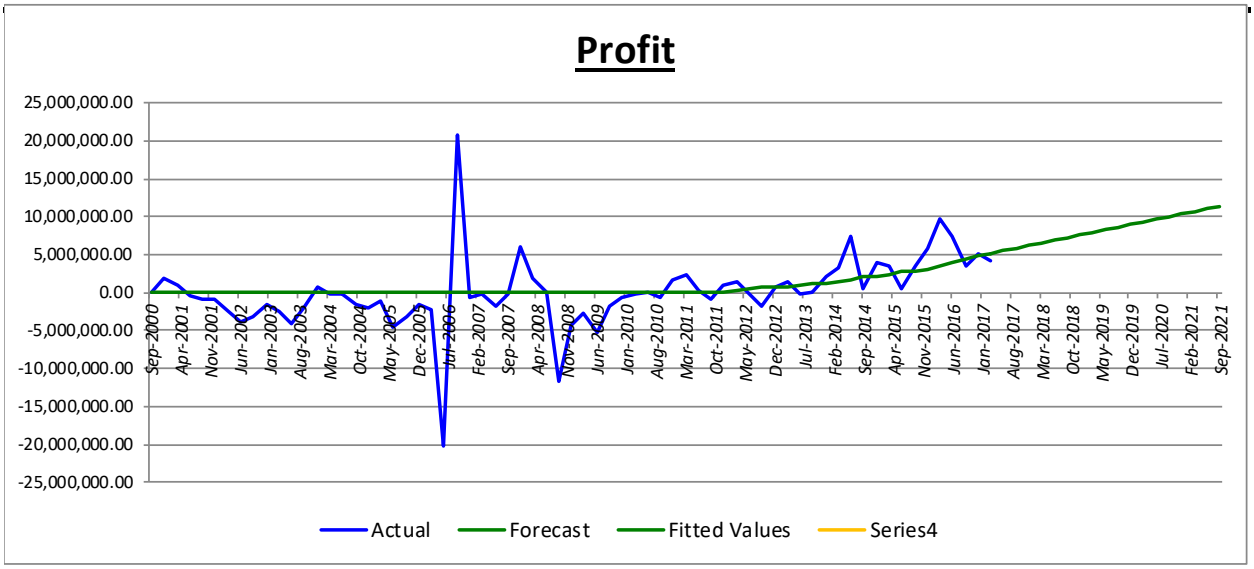
ForecastX Configuration Parameters

Item	Value
Data range selected	[Transportation Data for Forecasting.xlsx]Sheet1'!$A$1:$B$68
Time scale for data	Quarterly
Periods to forecast	17.00
Seasonal Length	
Replace Outliers Activated	No
Replace Outliers Standard Deviations	
Replace Outliers Forecasting Technique	
Replace Missing Values	No
Replace Missing Values (Lower Limit)	
Replace Missing Values (Upper Limit)	
Remove Leading Zeroes	Yes
Remove Trailing Zeroes	No
Use Holdback Evaluation	No
Holdback Evaluation Period	
Apply Tracking Signal	No
Apply Tracking Signal (Under Forecast Percentage)	
Apply Tracking Signal (Over Forecast Percentage)	
Forecast Method Selected	Double Exponential Smoothing Holt

Report Details

Run Date: 3/13/2017 7:10:21 PM
Author: Collin
Note:

Appendix J: Holt's Double Exponential Smoothing Procast



Forecast -- Double Exponential Smoothing-Holt Selected		
		Forecast
Date	Quarterly	Annual
Jun-2017	5,504,192.22	
Sep-2017	5,847,630.99	
Dec-2017	6,191,069.77	17,542,892.98
Mar-2018	6,534,508.54	
Jun-2018	6,877,947.31	
Sep-2018	7,221,386.09	
Dec-2018	7,564,824.86	28,198,666.80
Mar-2019	7,908,263.63	
Jun-2019	8,251,702.40	
Sep-2019	8,595,141.18	
Dec-2019	8,938,579.95	33,693,687.16
Mar-2020	9,282,018.72	
Jun-2020	9,625,457.50	
Sep-2020	9,968,896.27	
Dec-2020	10,312,335.04	39,188,707.53
Mar-2021	10,655,773.81	
Jun-2021	10,999,212.59	
Sep-2021	11,342,651.36	
Total	151,621,592.24	
Avg	8,423,421.79	29,655,988.62
Max	11,342,651.36	39,188,707.53
Min	5,504,192.22	17,542,892.98

Summary Comments	
The forecast has an average error of	151.75%
The data has a standard deviation of	4,854,380.18
The forecast exceeds the accuracy of a simple average by	15.12%

Audit Trail - Summary Analysis

Audit Trail - Historical Versus Fitted Analysis

Series:Profit

Dates	Original Data	Fitted Data	Error	Series % Change	Forecast % Change	Cumulative Error	Cumulative MAPE
Sep-2000	23,702.00	0.00	23,702.00			23,702.00	100.00%
Dec-2000	1,899,096.00	0.00	1,899,096.00	7912.39%	0.00%	961,399.00	75.00%
Mar-2001	937,327.00	0.00	937,327.00	-50.64%	0.00%	953,375.00	61.11%
Jun-2001	-327,425.00	0.00	-327,425.00	-134.93%	0.00%	633,175.00	52.08%
Sep-2001	-909,776.00	0.00	-909,776.00	177.86%	0.00%	324,584.80	45.67%
Dec-2001	-923,115.00	0.00	-923,115.00	1.47%	0.00%	116,634.83	40.83%
Mar-2002	-2,560,103.00	0.00	-2,560,103.00	177.33%	0.00%	-265,756.29	37.04%
Jun-2002	-3,873,515.00	0.00	-3,873,515.00	51.30%	0.00%	-716,726.13	33.97%
Sep-2002	-3,250,361.00	0.00	-3,250,361.00	-16.09%	0.00%	-998,241.11	31.43%
Dec-2002	-1,469,850.00	0.00	-1,469,850.00	-54.78%	0.00%	-1,045,402.00	29.29%
Mar-2003	-2,494,531.00	0.00	-2,494,531.00	69.71%	0.00%	-1,177,141.00	27.45%
Jun-2003	-4,150,742.00	0.00	-4,150,742.00	66.39%	0.00%	-1,424,941.08	25.86%
Sep-2003	-1,920,924.00	0.00	-1,920,924.00	-53.72%	0.00%	-1,463,093.62	24.46%
Dec-2003	647,420.00	0.00	647,420.00	-133.70%	0.00%	-1,312,342.64	23.23%
Mar-2004	-265,900.00	0.00	-265,900.00	-141.07%	0.00%	-1,242,579.80	22.12%
Jun-2004	-176,064.00	0.00	-176,064.00	-33.79%	0.00%	-1,175,922.56	21.13%
Sep-2004	-1,456,177.00	0.00	-1,456,177.00	727.07%	0.00%	-1,192,408.12	20.23%
Dec-2004	-1,915,125.00	0.00	-1,915,125.00	31.52%	0.00%	-1,232,559.06	19.42%
Mar-2005	-1,123,527.00	0.00	-1,123,527.00	-41.33%	0.00%	-1,226,820.53	18.67%
Jun-2005	-4,609,595.00	0.00	-4,609,595.00	310.28%	0.00%	-1,395,959.25	17.99%
Sep-2005	-3,207,135.00	0.00	-3,207,135.00	-30.42%	0.00%	-1,482,205.71	17.36%
Dec-2005	-1,487,161.00	0.00	-1,487,161.00	-53.63%	0.00%	-1,482,430.95	16.78%
Mar-2006	-2,333,166.00	0.00	-2,333,166.00	56.89%	0.00%	-1,519,419.43	16.24%
Jun-2006	-20,192,434.00	0.00	-20,192,434.00	765.45%	0.00%	-2,297,461.71	15.73%
Sep-2006	20,862,482.00	0.00	20,862,482.00	-203.32%	0.00%	-1,371,063.96	15.26%
Dec-2006	-694,110.00	0.00	-694,110.00	-103.33%	0.00%	-1,345,027.27	14.82%
Mar-2007	-161,700.00	0.00	-161,700.00	-76.70%	0.00%	-1,301,200.33	14.41%
Jun-2007	-1,820,559.00	0.00	-1,820,559.00	1025.89%	0.00%	-1,319,748.86	14.03%
Sep-2007	-67,019.00	0.00	-67,019.00	-96.32%	0.00%	-1,276,551.28	13.66%
Dec-2007	5,979,562.00	0.00	5,979,562.00	-9022.19%	0.00%	-1,034,680.83	13.32%
Mar-2008	1,800,249.00	0.00	1,800,249.00	-69.89%	0.00%	-943,231.48	12.99%
Jun-2008	-21,387.00	0.00	-21,387.00	-101.19%	0.00%	-914,423.84	12.68%
Sep-2008	-11,599,703.00	0.00	-11,599,703.00	54137.17%	0.00%	-1,238,220.18	12.39%
Dec-2008	-4,276,656.00	0.00	-4,276,656.00	-63.13%	0.00%	-1,327,585.94	12.11%
Mar-2009	-2,718,557.00	0.00	-2,718,557.00	-36.43%	0.00%	-1,367,327.97	11.85%
Jun-2009	-5,154,919.00	0.00	-5,154,919.00	89.62%	0.00%	-1,472,538.83	11.60%
Sep-2009	-1,844,758.00	0.00	-1,844,758.00	-64.21%	0.00%	-1,482,598.81	11.36%
Dec-2009	-628,662.00	0.00	-628,662.00	-65.92%	0.00%	-1,460,126.79	11.13%
Mar-2010	-102,224.00	0.00	-102,224.00	-83.74%	0.00%	-1,425,308.77	10.91%
Jun-2010	49,366.00	0.00	49,366.00	-148.29%	0.00%	-1,388,441.90	10.70%
Sep-2010	-615,726.00	0.00	-615,726.00	-1347.27%	0.00%	-1,369,595.17	10.49%
Dec-2010	1,595,509.00	0.00	1,595,509.00	-359.13%	0.00%	-1,298,997.45	10.30%
Mar-2011	2,369,313.00	0.00	2,369,313.00	48.50%	0.00%	-1,213,687.91	10.12%
Jun-2011	316,898.00	0.00	316,898.00	-86.62%	0.00%	-1,178,901.86	9.94%
Sep-2011	-848,148.00	0.00	-848,148.00	-367.64%	0.00%	-1,171,551.78	9.77%
Dec-2011	1,003,401.00	96,057.91	907,343.09	-218.30%	9605790.64%	-1,126,358.41	9.60%
Mar-2012	1,482,415.00	293,853.43	1,188,561.57	47.74%	205.91%	-1,077,104.79	9.43%
Jun-2012	-245,480.00	516,325.38	-761,805.38	-116.56%	75.71%	-1,070,536.06	9.37%
Sep-2012	-1,691,852.00	655,734.94	-2,347,586.94	589.20%	27.00%	-1,096,598.32	9.23%
Dec-2012	771,313.00	707,262.94	64,050.06	-145.59%	7.86%	-1,073,385.35	9.05%
Mar-2013	1,369,708.00	851,162.04	518,545.96	77.58%	20.35%	-1,042,171.01	8.89%
Jun-2013	-85,437.00	1,018,432.13	-1,103,869.13	-106.24%	19.65%	-1,043,357.51	9.20%
Sep-2013	-45,631.00	1,111,071.42	-1,156,702.42	-46.59%	9.10%	-1,045,496.10	9.93%
Dec-2013	2,146,407.00	1,188,085.60	958,321.40	-4803.84%	6.93%	-1,008,388.37	9.76%
Mar-2014	3,222,741.00	1,356,731.04	1,866,009.96	50.15%	14.19%	-956,126.58	9.60%
Jun-2014	7,387,696.00	1,581,827.91	5,805,868.09	129.24%	16.59%	-835,376.67	9.45%
Sep-2014	571,550.00	2,024,951.40	-1,453,401.40	-92.26%	28.01%	-846,219.21	9.36%
Dec-2014	3,892,258.00	2,175,187.38	1,717,070.62	581.00%	7.42%	-802,024.56	9.22%
Mar-2015	3,522,648.00	2,466,083.46	1,056,564.54	-9.50%	13.37%	-770,523.05	9.07%
Jun-2015	515,510.00	2,744,326.27	-2,228,816.27	-85.37%	11.28%	-794,827.94	9.04%
Sep-2015	3,544,778.00	2,871,518.79	673,259.21	587.63%	4.63%	-770,760.94	8.89%
Dec-2015	5,736,223.00	3,116,886.24	2,619,336.76	61.82%	8.54%	-716,081.94	8.76%
Mar-2016	9,655,117.00	3,467,022.07	6,188,094.93	68.32%	11.23%	-606,491.83	8.64%
Jun-2016	7,453,235.00	4,025,586.60	3,427,648.40	-22.81%	16.11%	-543,458.39	8.52%
Sep-2016	3,500,785.00	4,519,637.07	-1,018,852.07	-53.03%	12.27%	-550,772.14	8.39%
Dec-2016	5,108,989.00	4,832,771.89	276,217.11	45.94%	6.93%	-538,242.00	8.27%
Mar-2017	4,208,499.00	5,198,357.75	-989,858.75	-17.63%	7.56%	-544,982.55	8.15%
Avg	153,806.61	698,789.16	-544,982.55	744.40%	145550.32%	-976,099.03	18.61%
Max	20,862,482.00	5,198,357.75	20,862,482.00	54137.17%	9605790.64%	961,399.00	100.00%
Min	-20,192,434.00	0.00	-20,192,434.00	-9022.19%	0.00%	-2,297,461.71	8.15%
StDev	4,854,380.18	1,330,089.66	4,438,460.77	6869.29%	1182390.09%	574,935.11	16.51%

Var	###############	###############	###############	471871.17%	###############	###############	2.73%
Median	-102,224.00	0.00	-628,662.00	-38.88%	0.00%	-1,096,598.32	12.11%

Audit Trail - Statistics

Accuracy Measures	Value
AIC	2,245.13
BIC	2,249.54
MAPE	151.75%
Sum Squared Error (SSE)	###############
R-Square	15.12%
Adjusted R-Square	13.82%
Root Mean Square Error	4,438,796.13

Forecast Statistics	Value
Mean	153,806.61
Standard Deviation	4,854,380.18

Method Statistics	Value
Method Selected	Double Holt
Level	0.04
Trend	0.31

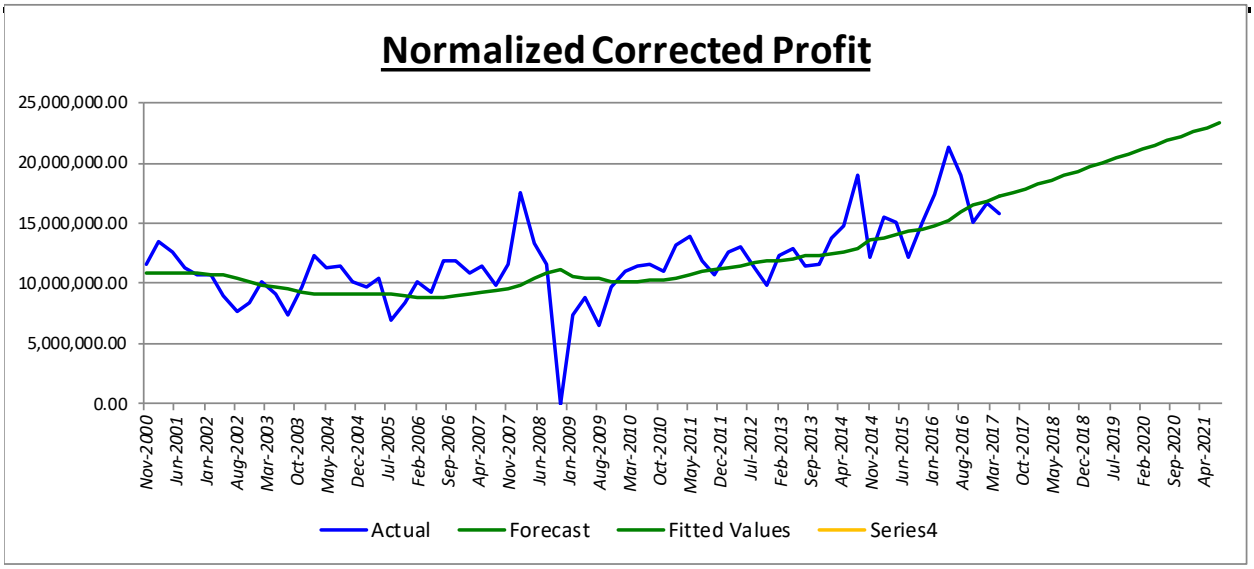
ForecastX Configuration Parameters

Item	Value
Data range selected	[Transportation Data for Forecasting.xlsx]Sheet1'!$A$1:$B$68
Time scale for data	Quarterly
Periods to forecast	18.00
Seasonal Length	4.00
Replace Outliers Activated	No
Replace Outliers Standard Deviations	
Replace Outliers Forecasting Technique	
Replace Missing Values	No
Replace Missing Values (Lower Limit)	
Replace Missing Values (Upper Limit)	
Remove Leading Zeroes	Yes
Remove Trailing Zeroes	No
Use Holdback Evaluation	No
Holdback Evaluation Period	
Apply Tracking Signal	No
Apply Tracking Signal (Under Forecast Percentage)	
Apply Tracking Signal (Over Forecast Percentage)	
Forecast Method Selected	Procast

Report Details

Run Date: 3/20/2017 3:56:01 PM
Author: Collin
Note:

Appendix K: Holt's Double Exponential Smoothing Sensitivity Analysis



Forecast -- Double Exponential Smoothing-Holt Selected		
		Forecast
Date	Quarterly	Annual
Aug-2017	17,489,177.50	
Nov-2017	17,852,282.77	35,341,460.27
Feb-2018	18,215,388.05	
May-2018	18,578,493.32	
Aug-2018	18,941,598.59	
Nov-2018	19,304,703.86	75,040,183.82
Feb-2019	19,667,809.14	
May-2019	20,030,914.41	
Aug-2019	20,394,019.68	
Nov-2019	20,757,124.96	80,849,868.19
Feb-2020	21,120,230.23	
May-2020	21,483,335.50	
Aug-2020	21,846,440.78	
Nov-2020	22,209,546.05	86,659,552.56
Feb-2021	22,572,651.32	
May-2021	22,935,756.60	
Aug-2021	23,298,861.87	
Total	346,698,334.62	
Avg	20,394,019.68	69,472,766.21
Max	23,298,861.87	86,659,552.56
Min	17,489,177.50	35,341,460.27

Summary Comments	
The forecast has an average error of	14.67%
The data has a standard deviation of	3,285,729.92
The forecast exceeds the accuracy of a simple average by	35.63%

Audit Trail - Summary Analysis

Audit Trail - Historical Versus Fitted Analysis

Series:Normalized Corrected Profit

Dates	Original Data	Fitted Data	Error	Series % Change	Forecast % Change	Cumulative Error	Cumulative MAPE
Nov-2000	11,623,405.00	10,912,314.60	711,090.40			711,090.40	6.12%
Feb-2001	13,498,799.00	10,817,238.84	2,681,560.16	16.13%	-0.87%	1,696,325.28	8.03%
May-2001	12,537,030.00	10,872,772.14	1,664,257.86	-7.12%	0.51%	1,685,636.14	6.83%
Aug-2001	11,272,278.00	10,890,145.79	382,132.21	-10.09%	0.16%	1,359,760.16	5.33%
Nov-2001	10,689,927.00	10,837,147.15	-147,220.15	-5.17%	-0.49%	1,058,364.09	4.32%
Feb-2002	10,676,588.00	10,751,132.64	-74,544.64	-0.12%	-0.79%	869,545.97	3.62%
May-2002	9,039,600.00	10,668,420.23	-1,628,820.23	-15.33%	-0.77%	512,636.51	3.47%
Aug-2002	7,726,188.00	10,473,226.46	-2,747,038.46	-14.53%	-1.83%	105,177.14	3.59%
Nov-2002	8,349,342.00	10,176,649.97	-1,827,307.97	8.07%	-2.83%	-109,543.43	3.46%
Feb-2003	10,129,853.00	9,910,382.31	219,470.69	21.33%	-2.62%	-76,642.01	3.14%
May-2003	9,105,172.00	9,767,230.12	-662,058.12	-10.12%	-1.44%	-129,861.66	2.91%
Aug-2003	7,448,961.00	9,563,682.16	-2,114,721.16	-18.19%	-2.08%	-295,266.62	2.87%
Nov-2003	9,678,779.00	9,247,312.57	431,466.43	29.93%	-3.31%	-239,364.08	2.67%
Feb-2004	12,247,123.00	9,086,156.21	3,160,966.79	26.54%	-1.74%	3,516.70	2.61%
May-2004	11,333,803.00	9,126,434.64	2,207,368.36	-7.46%	0.44%	150,440.14	2.53%
Aug-2004	11,423,639.00	9,139,350.41	2,284,288.59	0.79%	0.14%	283,805.67	2.45%
Nov-2004	10,143,526.00	9,186,453.97	957,072.03	-11.21%	0.52%	323,409.57	2.34%
Feb-2005	9,684,578.00	9,168,003.02	516,574.98	-4.52%	-0.20%	334,140.99	2.22%
May-2005	10,476,176.00	9,130,378.49	1,345,797.51	8.17%	-0.41%	387,386.07	2.14%
Aug-2005	6,990,108.00	9,158,956.64	-2,168,848.64	-33.28%	0.31%	259,574.33	2.11%
Nov-2005	8,392,568.00	8,952,851.77	-560,283.77	20.06%	-2.25%	220,533.47	2.03%
Feb-2006	10,112,542.00	8,833,986.36	1,278,555.64	20.49%	-1.33%	268,625.39	1.96%
May-2006	9,266,537.00	8,839,773.57	426,763.43	-8.37%	0.07%	275,500.95	1.88%
Aug-2006	11,934,727.00	8,801,053.76	3,133,673.24	28.79%	-0.44%	394,591.46	1.85%
Nov-2006	11,934,727.00	8,962,086.89	2,972,640.11	0.00%	1.83%	497,713.41	1.82%
Feb-2007	10,905,593.00	9,152,266.33	1,753,326.67	-8.62%	2.12%	546,006.23	1.77%
May-2007	11,438,003.00	9,293,573.13	2,144,429.87	4.88%	1.54%	605,207.10	1.73%
Aug-2007	9,779,144.00	9,485,712.07	293,431.93	-14.50%	2.07%	594,072.28	1.67%
Nov-2007	11,532,684.00	9,572,900.77	1,959,783.23	17.93%	0.92%	641,165.76	1.63%
Feb-2008	17,579,265.00	9,783,454.72	7,795,810.28	52.43%	2.20%	879,653.91	1.63%
May-2008	13,399,952.00	10,438,174.20	2,961,777.80	-23.77%	6.69%	946,819.20	1.60%
Aug-2008	11,578,316.00	10,847,321.91	730,994.09	-13.59%	3.92%	940,074.66	1.56%
Nov-2008	0.00	11,134,886.88	-11,134,886.88	-100.00%	2.65%	574,166.74	1.51%
Feb-2009	7,323,047.00	10,580,615.43	-3,257,568.43	732304700.00%	-4.98%	461,468.64	1.50%
May-2009	8,881,146.00	10,446,892.03	-1,565,746.03	21.28%	-1.26%	403,548.22	1.47%
Aug-2009	6,444,784.00	10,392,241.32	-3,947,457.32	-27.43%	-0.52%	282,686.96	1.48%
Nov-2009	9,754,945.00	10,146,376.42	-391,431.42	51.36%	-2.37%	264,467.54	1.44%
Feb-2010	10,971,041.00	10,104,373.30	866,667.70	12.47%	-0.41%	280,314.91	1.41%
May-2010	11,497,479.00	10,147,550.01	1,349,928.99	4.80%	0.43%	307,740.92	1.38%
Aug-2010	11,649,069.00	10,236,655.00	1,412,414.00	1.32%	0.88%	335,357.74	1.36%
Nov-2010	10,983,977.00	10,347,775.77	636,201.23	-5.71%	1.09%	342,695.39	1.33%
Feb-2011	13,195,212.00	10,421,550.60	2,773,661.40	20.13%	0.71%	400,575.53	1.31%
May-2011	13,969,016.00	10,656,942.74	3,312,073.26	5.86%	2.26%	468,284.78	1.29%
Aug-2011	11,916,601.00	10,966,987.83	949,613.17	-14.69%	2.91%	479,224.06	1.26%
Nov-2011	10,751,555.00	11,150,552.50	-398,997.50	-9.78%	1.67%	459,708.03	1.24%
Feb-2012	12,603,104.00	11,249,693.12	1,353,410.88	17.22%	0.89%	479,136.35	1.22%
May-2012	13,082,118.00	11,469,380.03	1,612,737.97	3.80%	1.95%	503,255.54	1.20%
Aug-2012	11,354,223.00	11,725,250.60	-371,027.60	-13.21%	2.23%	485,041.30	1.17%
Nov-2012	9,907,851.00	11,859,739.83	-1,951,888.83	-12.74%	1.15%	435,308.04	1.16%
Feb-2013	12,371,016.00	11,875,989.59	495,026.41	24.86%	0.14%	436,502.40	1.13%
May-2013	12,969,411.00	12,042,445.01	926,965.99	4.84%	1.40%	446,119.34	1.12%
Aug-2013	11,514,266.00	12,246,319.76	-732,053.76	-11.22%	1.69%	423,462.16	1.10%
Nov-2013	11,554,072.00	12,343,205.67	-789,133.67	0.35%	0.79%	400,582.99	1.08%
Feb-2014	13,746,110.00	12,426,488.48	1,319,621.52	18.97%	0.67%	417,602.23	1.06%
May-2014	14,822,444.00	12,650,817.04	2,171,626.96	7.83%	1.81%	449,493.59	1.05%
Aug-2014	18,987,399.00	12,953,412.76	6,033,986.24	28.10%	2.39%	549,216.67	1.04%
Nov-2014	12,171,253.00	13,561,322.47	-1,390,069.47	-35.90%	4.69%	515,194.10	1.02%
Feb-2015	15,491,961.00	13,714,954.02	1,777,006.98	27.28%	1.13%	536,949.50	1.01%
May-2015	15,122,351.00	14,077,756.84	1,044,594.16	-2.39%	2.65%	545,553.65	0.99%
Aug-2015	12,115,213.00	14,411,091.47	-2,295,878.47	-19.89%	2.37%	498,196.44	0.98%
Nov-2015	15,144,481.00	14,518,327.35	626,153.65	25.00%	0.74%	500,294.10	0.97%
Feb-2016	17,335,926.00	14,805,388.97	2,530,537.03	14.47%	1.98%	533,039.96	0.96%
May-2016	21,254,820.00	15,237,215.05	6,017,604.95	22.61%	2.92%	620,096.54	0.95%
Aug-2016	19,052,938.00	15,952,090.94	3,100,847.06	-10.36%	4.69%	658,858.27	0.94%
Nov-2016	15,100,488.00	16,535,856.87	-1,435,368.87	-20.74%	3.66%	626,639.39	0.92%

Feb-2017	16,708,692.00	16,834,440.54	-125,748.54	10.65%	1.81%	615,239.57	0.91%
May-2017	15,808,202.00	17,208,341.92	-1,400,139.92	-5.39%	2.22%	585,159.28	0.90%
Avg	11,753,509.61	11,168,350.33	585,159.28	11095527.02%	0.71%	477,929.49	2.01%
Max	21,254,820.00	17,208,341.92	7,795,810.28	732304700.00%	6.69%	1,696,325.28	8.03%
Min	0.00	8,801,053.76	-11,134,886.88	-100.00%	-4.98%	-295,266.62	0.90%
StDev	3,285,729.92	2,110,205.60	2,569,434.05	90140477.22%	2.05%	352,024.09	1.42%
Var	###############	###############	###############	###############	0.04%	###############	0.02%
Median	11,514,266.00	10,656,942.74	711,090.40	0.57%	0.77%	461,468.64	1.50%

Audit Trail - Statistics

Accuracy Measures	**Value**
AIC	2,174.30
BIC	2,178.71
MAPE	14.67%
Sum Squared Error (SSE)	###############
R-Square	35.63%
Adjusted R-Square	34.64%
Root Mean Square Error	2,616,460.49

Forecast Statistics	**Value**
Mean	11,753,509.61
Standard Deviation	3,285,729.92

Method Statistics	**Value**
Method Selected	Double Holt
Level	0.06
Trend	0.22

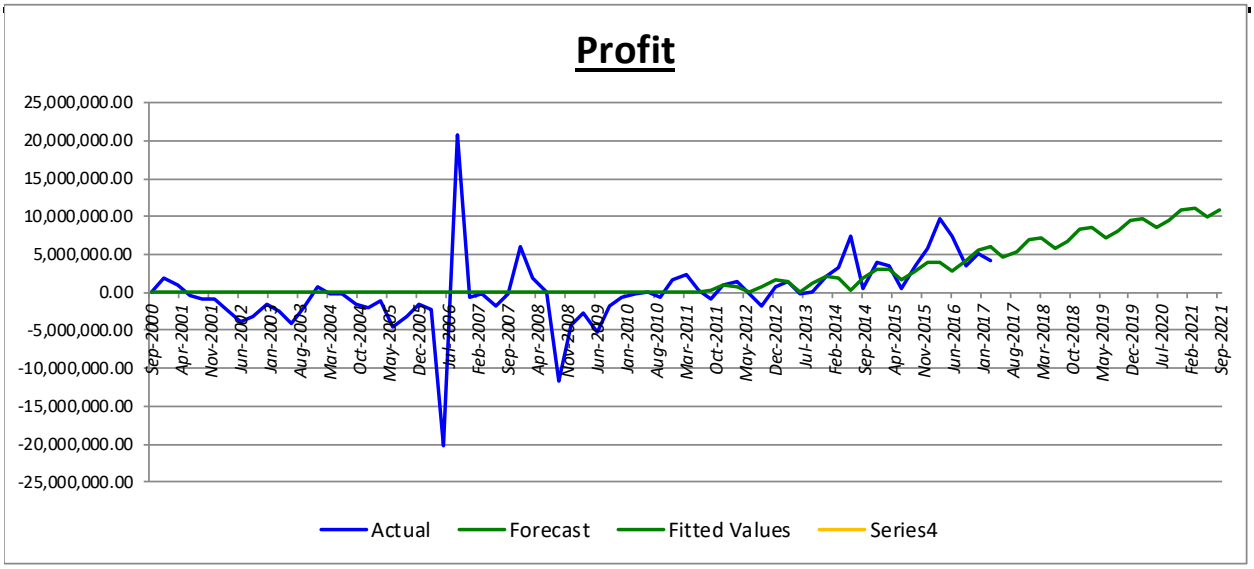
ForecastX Configuration Parameters

Item	**Value**
Data range selected	[Transportation Data for Forecasting.xlsx]Sheet1'!$A$1:$B$68
Time scale for data	Quarterly
Periods to forecast	17.00
Seasonal Length	
Replace Outliers Activated	No
Replace Outliers Standard Deviations	
Replace Outliers Forecasting Technique	
Replace Missing Values	No
Replace Missing Values (Lower Limit)	
Replace Missing Values (Upper Limit)	
Remove Leading Zeroes	Yes
Remove Trailing Zeroes	No
Use Holdback Evaluation	No
Holdback Evaluation Period	
Apply Tracking Signal	No
Apply Tracking Signal (Under Forecast Percentage)	
Apply Tracking Signal (Over Forecast Percentage)	
Forecast Method Selected	Double Exponential Smoothing Holt

Report Details

Run Date: 5/3/2017 10:34:46 PM
Author: Collin
Note:

Appendix L: Holt-Winters Exponetial Smoothing



Forecast -- Holt-Winters Selected		
		Forecast
Date	Quarterly	Annual
Jun-2017	4,552,213.83	
Sep-2017	5,457,293.64	
Dec-2017	6,902,042.22	16,911,549.70
Mar-2018	7,138,229.70	
Jun-2018	5,885,368.66	
Sep-2018	6,790,448.47	
Dec-2018	8,235,197.05	28,049,243.89
Mar-2019	8,471,384.53	
Jun-2019	7,218,523.49	
Sep-2019	8,123,603.30	
Dec-2019	9,568,351.88	33,381,863.21
Mar-2020	9,804,539.36	
Jun-2020	8,551,678.32	
Sep-2020	9,456,758.13	
Dec-2020	10,901,506.71	38,714,482.53
Mar-2021	11,137,694.19	
Jun-2021	9,884,833.15	
Sep-2021	10,789,912.96	
Total	148,869,579.62	
Avg	8,270,532.20	29,264,284.83
Max	11,137,694.19	38,714,482.53
Min	4,552,213.83	16,911,549.70

Summary Comments	
The forecast has an average error of	129.10%
The data has a standard deviation of	4,854,380.18
The forecast exceeds the accuracy of a simple average by	14.59%

Audit Trail - Summary Analysis

Audit Trail - Historical Versus Fitted Analysis

Series:Profit

Dates	Original Data	Fitted Data	Error	Series % Change	Forecast % Change	Cumulative Error	Cumulative MAPE
Sep-2000	23,702.00	0.00	23,702.00			23,702.00	100.00%
Dec-2000	1,899,096.00	42,438.52	1,856,657.48	7912.39%	4243852.45%	940,179.74	74.44%
Mar-2001	937,327.00	0.00	937,327.00	-50.64%	-100.00%	939,228.83	60.74%
Jun-2001	-327,425.00	0.00	-327,425.00	-134.93%	0.00%	622,565.37	51.80%
Sep-2001	-909,776.00	0.00	-909,776.00	177.86%	0.00%	316,097.10	45.44%
Dec-2001	-923,115.00	0.00	-923,115.00	1.47%	0.00%	109,561.75	40.65%
Mar-2002	-2,560,103.00	0.00	-2,560,103.00	177.33%	0.00%	-271,818.93	36.88%
Jun-2002	-3,873,515.00	0.00	-3,873,515.00	51.30%	0.00%	-722,030.94	33.83%
Sep-2002	-3,250,361.00	0.00	-3,250,361.00	-16.09%	0.00%	-1,002,956.50	31.31%
Dec-2002	-1,469,850.00	0.00	-1,469,850.00	-54.78%	0.00%	-1,049,645.85	29.18%
Mar-2003	-2,494,531.00	0.00	-2,494,531.00	69.71%	0.00%	-1,180,999.05	27.35%
Jun-2003	-4,150,742.00	0.00	-4,150,742.00	66.39%	0.00%	-1,428,477.63	25.77%
Sep-2003	-1,920,924.00	0.00	-1,920,924.00	-53.72%	0.00%	-1,466,358.12	24.38%
Dec-2003	647,420.00	0.00	647,420.00	-133.70%	0.00%	-1,315,373.97	23.15%
Mar-2004	-265,900.00	0.00	-265,900.00	-141.07%	0.00%	-1,245,409.03	22.05%
Jun-2004	-176,064.00	0.00	-176,064.00	-33.79%	0.00%	-1,178,574.97	21.06%
Sep-2004	-1,456,177.00	0.00	-1,456,177.00	727.07%	0.00%	-1,194,904.50	20.17%
Dec-2004	-1,915,125.00	0.00	-1,915,125.00	31.52%	0.00%	-1,234,916.75	19.36%
Mar-2005	-1,123,527.00	0.00	-1,123,527.00	-41.33%	0.00%	-1,229,054.13	18.61%
Jun-2005	-4,609,595.00	0.00	-4,609,595.00	310.28%	0.00%	-1,398,081.18	17.93%
Sep-2005	-3,207,135.00	0.00	-3,207,135.00	-30.42%	0.00%	-1,484,226.60	17.31%
Dec-2005	-1,487,161.00	0.00	-1,487,161.00	-53.63%	0.00%	-1,484,359.98	16.73%
Mar-2006	-2,333,166.00	0.00	-2,333,166.00	56.89%	0.00%	-1,521,264.59	16.19%
Jun-2006	-20,192,434.00	0.00	-20,192,434.00	765.45%	0.00%	-2,299,229.98	15.69%
Sep-2006	20,862,482.00	0.00	20,862,482.00	-203.32%	0.00%	-1,372,761.50	15.22%
Dec-2006	-694,110.00	0.00	-694,110.00	-103.33%	0.00%	-1,346,659.52	14.78%
Mar-2007	-161,700.00	0.00	-161,700.00	-76.70%	0.00%	-1,302,772.13	14.37%
Jun-2007	-1,820,559.00	0.00	-1,820,559.00	1025.89%	0.00%	-1,321,264.52	13.99%
Sep-2007	-67,019.00	0.00	-67,019.00	-96.32%	0.00%	-1,278,014.67	13.62%
Dec-2007	5,979,562.00	0.00	5,979,562.00	-9022.19%	0.00%	-1,036,095.45	13.28%
Mar-2008	1,800,249.00	0.00	1,800,249.00	-69.89%	0.00%	-944,600.47	12.96%
Jun-2008	-21,387.00	0.00	-21,387.00	-101.19%	0.00%	-915,750.05	12.65%
Sep-2008	-11,599,703.00	0.00	-11,599,703.00	54137.17%	0.00%	-1,239,506.20	12.36%
Dec-2008	-4,276,656.00	0.00	-4,276,656.00	-63.13%	0.00%	-1,328,834.13	12.08%
Mar-2009	-2,718,557.00	0.00	-2,718,557.00	-36.43%	0.00%	-1,368,540.50	11.82%
Jun-2009	-5,154,919.00	0.00	-5,154,919.00	89.62%	0.00%	-1,473,717.68	11.56%
Sep-2009	-1,844,758.00	0.00	-1,844,758.00	-64.21%	0.00%	-1,483,745.80	11.33%
Dec-2009	-628,662.00	0.00	-628,662.00	-65.92%	0.00%	-1,461,243.59	11.10%
Mar-2010	-102,224.00	0.00	-102,224.00	-83.74%	0.00%	-1,426,396.94	10.88%
Jun-2010	49,366.00	0.00	49,366.00	-148.29%	0.00%	-1,389,502.86	10.67%
Sep-2010	-615,726.00	0.00	-615,726.00	-1347.27%	0.00%	-1,370,630.26	10.47%
Dec-2010	1,595,509.00	138,880.50	1,456,628.50	-359.13%	13888049.96%	-1,303,314.57	10.27%
Mar-2011	2,369,313.00	0.00	2,369,313.00	48.50%	-100.00%	-1,217,904.63	10.09%
Jun-2011	316,898.00	0.00	316,898.00	-86.62%	0.00%	-1,183,022.75	9.91%
Sep-2011	-848,148.00	189,684.50	-1,037,832.50	-367.64%	18968449.74%	-1,179,796.30	9.75%
Dec-2011	1,003,401.00	960,914.10	42,486.90	-218.30%	406.59%	-1,153,224.93	9.54%
Mar-2012	1,482,415.00	685,765.66	796,649.34	47.74%	-28.63%	-1,111,738.24	9.36%
Jun-2012	-245,480.00	0.00	-245,480.00	-116.56%	-100.00%	-1,093,691.19	9.21%
Sep-2012	-1,691,852.00	826,827.08	-2,518,679.08	589.20%	82682708.15%	-1,122,772.58	9.08%
Dec-2012	771,313.00	1,630,151.57	-858,838.57	-145.59%	97.16%	-1,117,493.90	8.95%
Mar-2013	1,369,708.00	1,366,848.79	2,859.21	77.58%	-16.15%	-1,095,526.19	8.77%
Jun-2013	-85,437.00	0.00	-85,437.00	-106.24%	-100.00%	-1,076,101.40	8.64%
Sep-2013	-45,631.00	1,198,688.91	-1,244,319.91	-46.59%	119868890.50%	-1,079,275.33	9.45%
Dec-2013	2,146,407.00	2,117,716.59	28,690.41	-4803.84%	76.67%	-1,058,757.45	9.27%
Mar-2014	3,222,741.00	1,919,465.91	1,303,275.09	50.15%	-9.36%	-1,015,811.40	9.12%
Jun-2014	7,387,696.00	184,131.73	7,203,564.27	129.24%	-90.41%	-869,036.84	8.98%
Sep-2014	571,550.00	1,920,346.01	-1,348,796.01	-92.26%	942.92%	-877,453.66	8.90%
Dec-2014	3,892,258.00	3,003,461.95	888,796.05	581.00%	56.40%	-847,001.08	8.75%
Mar-2015	3,522,648.00	2,998,561.71	524,086.29	-9.50%	-0.16%	-823,762.31	8.61%
Jun-2015	515,510.00	1,721,772.20	-1,206,262.20	-85.37%	-42.58%	-830,137.31	8.53%
Sep-2015	3,544,778.00	2,708,456.36	836,321.64	587.63%	57.31%	-802,818.31	8.40%
Dec-2015	5,736,223.00	3,995,829.66	1,740,393.34	61.82%	47.53%	-761,798.77	8.27%
Mar-2016	9,655,117.00	4,005,373.01	5,649,743.99	68.32%	0.24%	-660,028.25	8.15%
Jun-2016	7,453,235.00	2,796,537.75	4,656,697.25	-22.81%	-30.18%	-576,954.41	8.04%
Sep-2016	3,500,785.00	4,183,036.03	-682,251.03	-53.03%	49.58%	-578,574.36	7.92%

Dec-2016	5,108,989.00	5,629,098.36	-520,109.36	45.94%	34.57%	-577,688.53	7.80%
Mar-2017	4,208,499.00	5,956,173.00	-1,747,674.00	-17.63%	5.81%	-595,151.00	7.70%
Avg	153,806.61	748,957.61	-595,151.00	744.40%	3631107.70%	-991,421.19	18.43%
Max	20,862,482.00	5,956,173.00	20,862,482.00	54137.17%	119868890.50%	940,179.74	100.00%
Min	-20,192,434.00	0.00	-20,192,434.00	-9022.19%	-100.00%	-2,299,229.98	7.70%
StDev	4,854,380.18	1,431,295.13	4,446,081.98	6869.29%	17933837.89%	570,057.00	16.52%
Var	###############	###############	###############	471871.17%	###############	###############	2.73%
Median	-102,224.00	0.00	-615,726.00	-38.88%	0.00%	-1,122,772.58	12.08%

Audit Trail - Statistics

Accuracy Measures	Value
AIC	2,247.55
BIC	2,254.16
MAPE	129.10%
Sum Squared Error (SSE)	###############
R-Square	14.59%
Adjusted R-Square	11.92%
Root Mean Square Error	4,452,730.65

Forecast Statistics	Value
Mean	153,806.61
Standard Deviation	4,854,380.18

Method Statistics	Value
Method Selected	Holt Winters
Level	0.02
Seasonal	0.07
Trend	0.57
Decomposition type	Additive

Seasonal Indexes	Value
Index 1	-310,330.86
Index 2	659,247.27
Index 3	166,688.37
Index 4	-515,604.79

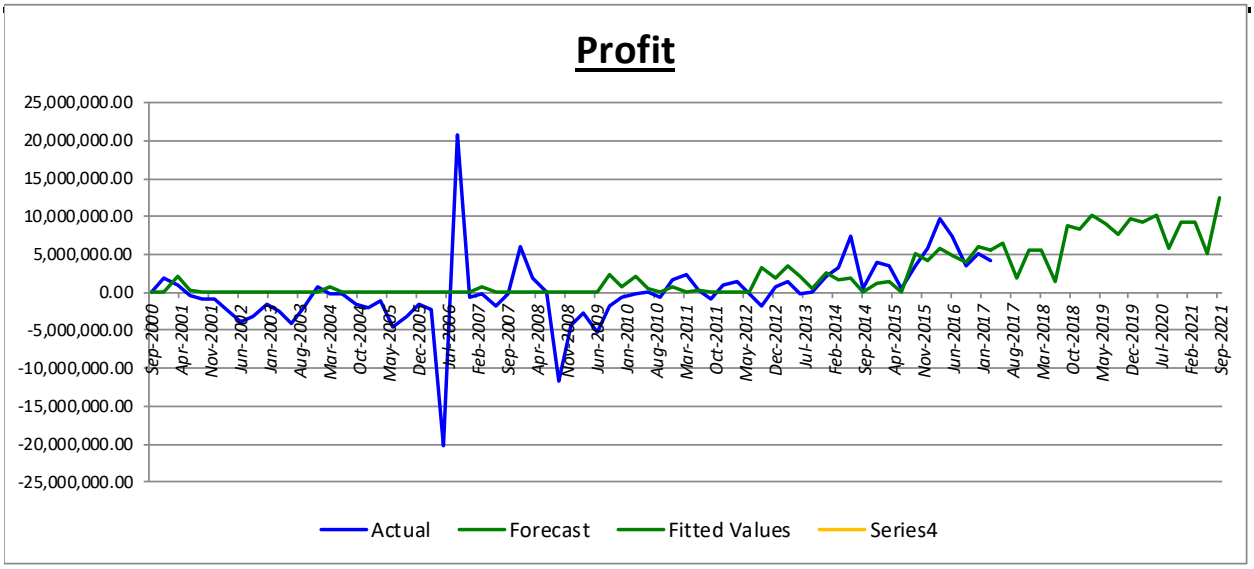
ForecastX Configuration Parameters

Item	Value
Data range selected	[Transportation Data for Forecasting.xlsx]Sheet1'!$A$1:$B$68
Time scale for data	Quarterly
Periods to forecast	18.00
Seasonal Length	
Replace Outliers Activated	No
Replace Outliers Standard Deviations	
Replace Outliers Forecasting Technique	
Replace Missing Values	No
Replace Missing Values (Lower Limit)	
Replace Missing Values (Upper Limit)	
Remove Leading Zeroes	Yes
Remove Trailing Zeroes	No
Use Holdback Evaluation	No
Holdback Evaluation Period	
Apply Tracking Signal	No
Apply Tracking Signal (Under Forecast Percentage)	
Apply Tracking Signal (Over Forecast Percentage)	
Forecast Method Selected	Holt Winters

Report Details

Run Date: 3/19/2017 2:34:12 AM
Author: Collin
Note:

Appendix M: Holt-Winters Exponential Smoothing Procast



Forecast -- Holt-Winters Selected		
		Forecast
Date	Quarterly	Annual
Jun-2017	6,428,099.58	
Sep-2017	1,987,302.63	
Dec-2017	5,488,077.25	13,903,479.45
Mar-2018	5,586,840.05	
Jun-2018	1,338,853.48	
Sep-2018	8,781,167.74	
Dec-2018	8,377,604.29	24,084,465.56
Mar-2019	10,210,460.41	
Jun-2019	9,064,280.09	
Sep-2019	7,622,049.89	
Dec-2019	9,728,203.26	36,624,993.65
Mar-2020	9,247,965.21	
Jun-2020	10,192,118.24	
Sep-2020	5,751,321.29	
Dec-2020	9,252,095.91	34,443,500.66
Mar-2021	9,350,858.72	
Jun-2021	5,102,872.14	
Sep-2021	12,545,186.41	
Total	136,055,356.60	
Avg	7,558,630.92	27,264,109.83
Max	12,545,186.41	36,624,993.65
Min	1,338,853.48	13,903,479.45

Summary Comments	
The forecast has an average error of	216.72%
The data has a standard deviation of	4,854,380.18
The forecast exceeds the accuracy of a simple average by	14.14%

Audit Trail - Summary Analysis

Audit Trail - Historical Versus Fitted Analysis

Series:Profit

Dates	Original Data	Fitted Data	Error	Series % Change	Forecast % Change	Cumulative Error	Cumulative MAPE
Sep-2000	23,702.00	0.00	23,702.00			23,702.00	100.00%
Dec-2000	1,899,096.00	58,092.03	1,841,003.97	7912.39%	5809203.03%	932,352.98	74.24%
Mar-2001	937,327.00	2,184,319.47	-1,246,992.47	-50.64%	3660.10%	205,904.50	64.27%
Jun-2001	-327,425.00	328,536.70	-655,961.70	-134.93%	-84.96%	-9,562.05	60.73%
Sep-2001	-909,776.00	0.00	-909,776.00	177.86%	-100.00%	-189,604.84	52.58%
Dec-2001	-923,115.00	0.00	-923,115.00	1.47%	0.00%	-311,856.53	46.59%
Mar-2002	-2,560,103.00	0.00	-2,560,103.00	177.33%	0.00%	-633,034.60	41.98%
Jun-2002	-3,873,515.00	0.00	-3,873,515.00	51.30%	0.00%	-1,038,094.65	38.29%
Sep-2002	-3,250,361.00	0.00	-3,250,361.00	-16.09%	0.00%	-1,283,902.02	35.27%
Dec-2002	-1,469,850.00	0.00	-1,469,850.00	-54.78%	0.00%	-1,302,496.82	32.75%
Mar-2003	-2,494,531.00	0.00	-2,494,531.00	69.71%	0.00%	-1,410,863.56	30.60%
Jun-2003	-4,150,742.00	0.00	-4,150,742.00	66.39%	0.00%	-1,639,186.77	28.74%
Sep-2003	-1,920,924.00	0.00	-1,920,924.00	-53.72%	0.00%	-1,660,858.86	27.12%
Dec-2003	647,420.00	0.00	647,420.00	-133.70%	0.00%	-1,495,981.80	25.69%
Mar-2004	-265,900.00	774,178.72	-1,040,078.72	-141.07%	77417872.22%	-1,465,588.26	25.72%
Jun-2004	-176,064.00	0.00	-176,064.00	-33.79%	-100.00%	-1,384,993.00	24.50%
Sep-2004	-1,456,177.00	0.00	-1,456,177.00	727.07%	0.00%	-1,389,180.29	23.41%
Dec-2004	-1,915,125.00	0.00	-1,915,125.00	31.52%	0.00%	-1,418,399.44	22.42%
Mar-2005	-1,123,527.00	0.00	-1,123,527.00	-41.33%	0.00%	-1,402,879.84	21.51%
Jun-2005	-4,609,595.00	0.00	-4,609,595.00	310.28%	0.00%	-1,563,215.60	20.69%
Sep-2005	-3,207,135.00	0.00	-3,207,135.00	-30.42%	0.00%	-1,641,497.47	19.93%
Dec-2005	-1,487,161.00	0.00	-1,487,161.00	-53.63%	0.00%	-1,634,482.18	19.23%
Mar-2006	-2,333,166.00	0.00	-2,333,166.00	56.89%	0.00%	-1,664,859.74	18.58%
Jun-2006	-20,192,434.00	0.00	-20,192,434.00	765.45%	0.00%	-2,436,842.00	17.98%
Sep-2006	20,862,482.00	0.00	20,862,482.00	-203.32%	0.00%	-1,504,869.04	17.42%
Dec-2006	-694,110.00	0.00	-694,110.00	-103.33%	0.00%	-1,473,686.00	16.90%
Mar-2007	-161,700.00	846,035.04	-1,007,735.04	-76.70%	84603504.49%	-1,456,428.55	17.13%
Jun-2007	-1,820,559.00	0.00	-1,820,559.00	1025.89%	-100.00%	-1,469,433.21	16.65%
Sep-2007	-67,019.00	0.00	-67,019.00	-96.32%	0.00%	-1,421,074.10	16.19%
Dec-2007	5,979,562.00	0.00	5,979,562.00	-9022.19%	0.00%	-1,174,386.23	15.76%
Mar-2008	1,800,249.00	0.00	1,800,249.00	-69.89%	0.00%	-1,078,430.26	15.36%
Jun-2008	-21,387.00	0.00	-21,387.00	-101.19%	0.00%	-1,045,397.66	14.98%
Sep-2008	-11,599,703.00	0.00	-11,599,703.00	54137.17%	0.00%	-1,365,225.09	14.61%
Dec-2008	-4,276,656.00	0.00	-4,276,656.00	-63.13%	0.00%	-1,450,855.41	14.27%
Mar-2009	-2,718,557.00	0.00	-2,718,557.00	-36.43%	0.00%	-1,487,075.46	13.94%
Jun-2009	-5,154,919.00	0.00	-5,154,919.00	89.62%	0.00%	-1,588,960.00	13.63%
Sep-2009	-1,844,758.00	2,400,134.07	-4,244,892.07	-64.21%	240013406.59%	-1,660,741.95	13.43%
Dec-2009	-628,662.00	637,198.36	-1,265,860.36	-65.92%	-73.45%	-1,650,350.33	13.22%
Mar-2010	-102,224.00	2,138,062.33	-2,240,286.33	-83.74%	235.54%	-1,665,476.89	14.32%
Jun-2010	49,366.00	635,449.60	-586,083.60	-148.29%	-70.28%	-1,638,492.06	14.71%
Sep-2010	-615,726.00	0.00	-615,726.00	-1347.27%	-100.00%	-1,613,546.54	14.41%
Dec-2010	1,595,509.00	761,520.11	833,988.89	-359.13%	76152011.23%	-1,555,271.89	14.09%
Mar-2011	2,369,313.00	0.00	2,369,313.00	48.50%	-100.00%	-1,464,002.48	13.82%
Jun-2011	316,898.00	230,609.17	86,288.83	-86.62%	23060916.73%	-1,428,768.58	13.52%
Sep-2011	-848,148.00	0.00	-848,148.00	-367.64%	-100.00%	-1,415,865.90	13.27%
Dec-2011	1,003,401.00	0.00	1,003,401.00	-218.30%	0.00%	-1,363,273.14	13.03%
Mar-2012	1,482,415.00	0.00	1,482,415.00	47.74%	0.00%	-1,302,726.59	12.79%
Jun-2012	-245,480.00	0.00	-245,480.00	-116.56%	0.00%	-1,280,700.62	12.57%
Sep-2012	-1,691,852.00	3,392,603.51	-5,084,455.51	589.20%	339260351.25%	-1,358,328.27	12.44%
Dec-2012	771,313.00	1,985,312.41	-1,213,999.41	-145.59%	-41.48%	-1,355,441.69	12.25%
Mar-2013	1,369,708.00	3,476,113.80	-2,106,405.80	77.58%	75.09%	-1,370,166.48	12.07%
Jun-2013	-85,437.00	2,230,645.56	-2,316,082.56	-106.24%	-35.83%	-1,388,357.17	12.84%
Sep-2013	-45,631.00	633,317.21	-678,948.21	-46.59%	-71.61%	-1,374,972.10	13.13%
Dec-2013	2,146,407.00	2,530,901.58	-384,494.58	-4803.84%	299.63%	-1,356,629.92	12.89%
Mar-2014	3,222,741.00	1,671,738.60	1,551,002.40	50.15%	-33.95%	-1,303,763.88	12.68%
Jun-2014	7,387,696.00	1,927,400.30	5,460,295.70	129.24%	15.29%	-1,182,977.10	12.47%
Sep-2014	571,550.00	0.00	571,550.00	-92.26%	-100.00%	-1,152,195.92	12.28%
Dec-2014	3,892,258.00	1,283,583.76	2,608,674.24	581.00%	128358376.36%	-1,087,353.33	12.09%
Mar-2015	3,522,648.00	1,430,397.77	2,092,250.23	-9.50%	11.44%	-1,033,461.75	11.90%
Jun-2015	515,510.00	0.00	515,510.00	-85.37%	-100.00%	-1,007,645.55	11.73%
Sep-2015	3,544,778.00	5,069,395.56	-1,524,617.56	587.63%	506939556.22%	-1,016,120.50	11.55%
Dec-2015	5,736,223.00	4,267,177.31	1,469,045.69	61.82%	-15.82%	-976,037.18	11.37%
Mar-2016	9,655,117.00	5,884,799.39	3,770,317.61	68.32%	37.91%	-900,698.21	11.20%
Jun-2016	7,453,235.00	5,000,418.41	2,452,816.59	-22.81%	-15.03%	-848,299.54	11.04%
Sep-2016	3,500,785.00	3,961,284.07	-460,499.07	-53.03%	-20.78%	-842,333.38	10.87%

Dec-2016	5,108,989.00	6,134,343.09	-1,025,354.09	45.94%	54.86%	-845,106.42	10.71%
Mar-2017	4,208,499.00	5,679,917.02	-1,471,418.02	-17.63%	-7.41%	-854,454.36	10.56%
Avg	153,806.61	1,008,260.97	-854,454.36	744.40%	22448762.38%	-1,218,280.62	21.63%
Max	20,862,482.00	6,134,343.09	20,862,482.00	54137.17%	506939556.22%	932,352.98	100.00%
Min	-20,192,434.00	0.00	-20,192,434.00	-9022.19%	-100.00%	-2,436,842.00	10.56%
StDev	4,854,380.18	1,690,020.44	4,414,970.45	6869.29%	81563856.21%	516,411.32	16.57%
Var	###############	###############	###############	471871.17%	###############	###############	2.75%
Median	-102,224.00	0.00	-923,115.00	-38.88%	0.00%	-1,370,166.48	14.61%

Audit Trail - Statistics

Accuracy Measures	Value
AIC	2,247.90
BIC	2,254.51
MAPE	216.72%
Sum Squared Error (SSE)	###############
R-Square	14.14%
Adjusted R-Square	11.46%
Root Mean Square Error	4,464,429.58

Forecast Statistics	Value
Mean	153,806.61
Standard Deviation	4,854,380.18

Method Statistics	Value
Method Selected	Holt Winters
Level	0.03
Seasonal	0.10
Trend	0.31
Decomposition type	Additive

Seasonal Indexes	Value
Index 1	1,133,418.75
Index 2	1,323,279.89
Index 3	3,502,167.14
Index 4	1,814,002.27
Index 5	-600,185.73
Index 6	1,091,437.25
Index 7	239,633.58
Index 8	1,572,255.88
Index 9	-3,751,386.65
Index 10	-538,223.92
Index 11	-825,970.86
Index 12	-4,960,427.62

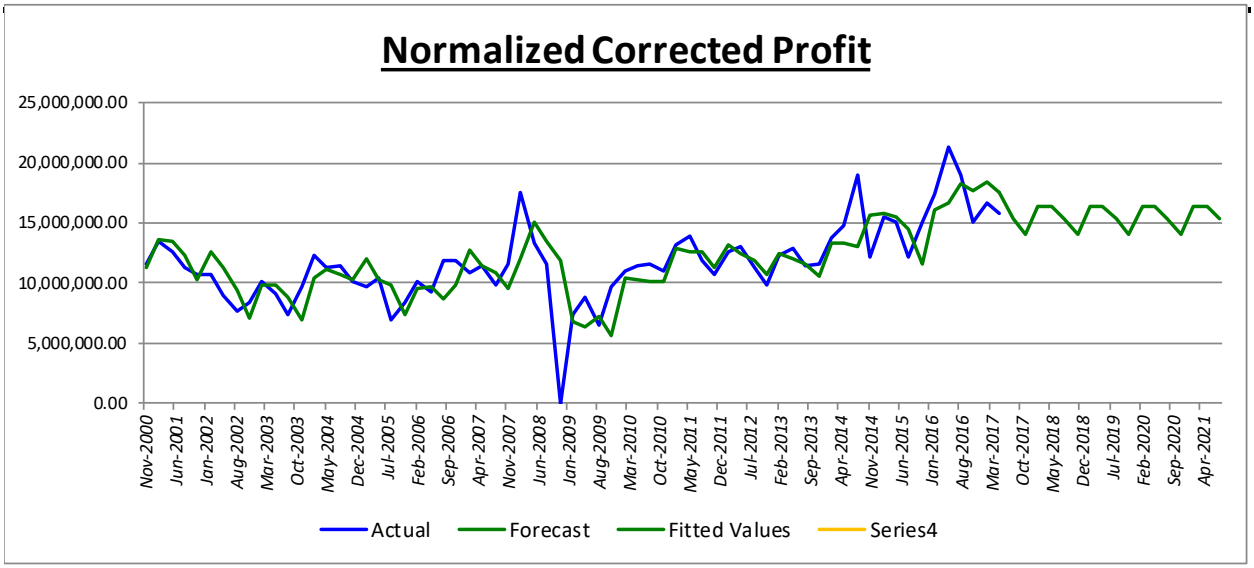
ForecastX Configuration Parameters

Item	Value
Data range selected	[Transportation Data for Forecasting.xlsx]Sheet1'!$A$1:$B$68
Time scale for data	Quarterly
Periods to forecast	18.00
Seasonal Length	
Replace Outliers Activated	No
Replace Outliers Standard Deviations	
Replace Outliers Forecasting Technique	
Replace Missing Values	No
Replace Missing Values (Lower Limit)	
Replace Missing Values (Upper Limit)	
Remove Leading Zeroes	Yes
Remove Trailing Zeroes	No
Use Holdback Evaluation	No
Holdback Evaluation Period	
Apply Tracking Signal	No
Apply Tracking Signal (Under Forecast Percentage)	
Apply Tracking Signal (Over Forecast Percentage)	
Forecast Method Selected	Procast

Report Details

Run Date: 3/19/2017 2:36:12 AM
Author: Collin
Note:

Appendix N: Holt-Winters Exponential Smoothing Sensitivity Analysis



Forecast -- Holt-Winters Selected		
		Forecast
Date	Quarterly	Annual
Aug-2017	15,357,753.06	
Nov-2017	14,035,937.70	29,393,690.75
Feb-2018	16,360,401.92	
May-2018	16,438,264.41	
Aug-2018	15,357,753.06	
Nov-2018	14,035,937.70	62,192,357.09
Feb-2019	16,360,401.92	
May-2019	16,438,264.41	
Aug-2019	15,357,753.06	
Nov-2019	14,035,937.70	62,192,357.09
Feb-2020	16,360,401.92	
May-2020	16,438,264.41	
Aug-2020	15,357,753.06	
Nov-2020	14,035,937.70	62,192,357.09
Feb-2021	16,360,401.92	
May-2021	16,438,264.41	
Aug-2021	15,357,753.06	
Total	264,127,181.40	
Avg	15,536,893.02	53,992,690.50
Max	16,438,264.41	62,192,357.09
Min	14,035,937.70	29,393,690.75

Summary Comments	
The forecast has an average error of	12.21%
The data has a standard deviation of	3,285,729.92
The forecast exceeds the accuracy of a simple average by	45.73%

Audit Trail - Summary Analysis

Audit Trail - Historical Versus Fitted Analysis

Series:Normalized Corrected Profit

Dates	Original Data	Fitted Data	Error	Series % Change	Forecast % Change	Cumulative Error	Cumulative MAPE
Nov-2000	11,623,405.00	11,335,643.13	287,761.87			287,761.87	2.48%
Feb-2001	13,498,799.00	13,669,468.32	-170,669.32	16.13%	20.59%	58,546.27	1.55%
May-2001	12,537,030.00	13,456,845.25	-919,815.25	-7.12%	-1.56%	-267,574.23	1.85%
Aug-2001	11,272,278.00	12,377,238.32	-1,104,960.32	-10.09%	-8.02%	-476,920.76	2.00%
Nov-2001	10,689,927.00	10,273,903.68	416,023.32	-5.17%	-16.99%	-298,331.94	1.76%
Feb-2002	10,676,588.00	12,648,116.26	-1,971,528.26	-0.12%	23.11%	-577,197.99	1.98%
May-2002	9,039,600.00	11,361,143.26	-2,321,543.26	-15.33%	-10.18%	-826,390.18	2.22%
Aug-2002	7,726,188.00	9,473,393.41	-1,747,205.41	-14.53%	-16.62%	-941,492.08	2.29%
Nov-2002	8,349,342.00	7,113,147.83	1,236,194.17	8.07%	-24.91%	-699,526.94	2.22%
Feb-2003	10,129,853.00	9,784,015.75	345,837.25	21.33%	37.55%	-594,990.52	2.03%
May-2003	9,105,172.00	9,786,762.83	-681,590.83	-10.12%	0.03%	-602,863.28	1.91%
Aug-2003	7,448,961.00	8,869,754.50	-1,420,793.50	-18.19%	-9.37%	-671,024.13	1.88%
Nov-2003	9,678,779.00	6,905,270.07	2,773,508.93	29.93%	-22.15%	-406,060.05	1.91%
Feb-2004	12,247,123.00	10,385,260.26	1,861,862.74	26.54%	50.40%	-244,065.56	1.85%
May-2004	11,333,803.00	11,175,377.40	158,425.60	-7.46%	7.61%	-217,232.82	1.73%
Aug-2004	11,423,639.00	10,682,648.61	740,990.39	0.79%	-4.41%	-157,343.87	1.65%
Nov-2004	10,143,526.00	10,240,449.75	-96,923.75	-11.21%	-4.14%	-153,789.74	1.56%
Feb-2005	9,684,578.00	12,027,946.53	-2,343,368.53	-4.52%	17.46%	-275,433.01	1.54%
May-2005	10,476,176.00	10,312,563.24	163,612.76	8.17%	-14.26%	-252,325.34	1.47%
Aug-2005	6,990,108.00	9,863,903.67	-2,873,795.67	-33.28%	-4.35%	-383,398.85	1.50%
Nov-2005	8,392,568.00	7,312,212.90	1,080,355.10	20.06%	-25.87%	-313,696.28	1.45%
Feb-2006	10,112,542.00	9,608,881.43	503,660.57	20.49%	31.41%	-276,543.70	1.40%
May-2006	9,266,537.00	9,685,341.86	-418,804.86	-8.37%	0.80%	-282,728.97	1.35%
Aug-2006	11,934,727.00	8,691,899.64	3,242,827.36	28.79%	-10.26%	-135,830.79	1.34%
Nov-2006	11,934,727.00	9,888,759.79	2,045,967.21	0.00%	13.77%	-48,558.87	1.31%
Feb-2007	10,905,593.00	12,692,419.32	-1,786,826.32	-8.62%	28.35%	-115,415.31	1.29%
May-2007	11,438,003.00	11,404,572.84	33,430.16	4.88%	-10.15%	-109,902.51	1.24%
Aug-2007	9,779,144.00	10,926,140.56	-1,146,996.56	-14.50%	-4.20%	-146,941.59	1.21%
Nov-2007	11,532,684.00	9,548,560.26	1,984,123.74	17.93%	-12.61%	-73,456.57	1.19%
Feb-2008	17,579,265.00	12,046,559.96	5,532,705.04	52.43%	26.16%	113,415.48	1.18%
May-2008	13,399,952.00	15,038,919.08	-1,638,967.08	-23.77%	24.84%	56,887.01	1.16%
Aug-2008	11,578,316.00	13,528,554.56	-1,950,238.56	-13.59%	-10.04%	-5,835.66	1.14%
Nov-2008	0.00	11,916,414.43	-11,916,414.43	-100.00%	-11.92%	-366,762.29	1.10%
Feb-2009	7,323,047.00	6,780,425.14	542,621.86	732304700.00%	-43.10%	-340,015.70	1.08%
May-2009	8,881,146.00	6,436,070.92	2,445,075.08	21.28%	-5.08%	-260,441.68	1.07%
Aug-2009	6,444,784.00	7,220,236.01	-775,452.01	-27.43%	12.18%	-274,747.52	1.05%
Nov-2009	9,754,945.00	5,570,868.25	4,184,076.75	51.36%	-22.84%	-154,238.76	1.05%
Feb-2010	10,971,041.00	10,446,781.68	524,259.32	12.47%	87.53%	-136,383.54	1.03%
May-2010	11,497,479.00	10,226,318.54	1,271,160.46	4.80%	-2.11%	-100,292.67	1.01%
Aug-2010	11,649,069.00	10,117,271.21	1,531,797.79	1.32%	-1.07%	-59,490.41	0.99%
Nov-2010	10,983,977.00	10,126,720.82	857,256.18	-5.71%	0.09%	-37,130.74	0.97%
Feb-2011	13,195,212.00	12,857,262.48	337,949.52	20.13%	26.96%	-28,200.26	0.95%
May-2011	13,969,016.00	12,583,851.38	1,385,164.62	5.86%	-2.13%	4,668.69	0.93%
Aug-2011	11,916,601.00	12,557,868.28	-641,267.28	-14.69%	-0.21%	-10,011.67	0.91%
Nov-2011	10,751,555.00	11,287,116.21	-535,561.21	-9.78%	-10.12%	-21,690.55	0.90%
Feb-2012	12,603,104.00	13,190,978.50	-587,874.50	17.22%	16.87%	-33,998.89	0.88%
May-2012	13,082,118.00	12,466,361.64	615,756.36	3.80%	-5.49%	-20,174.31	0.86%
Aug-2012	11,354,223.00	11,860,904.54	-506,681.54	-13.21%	-4.86%	-30,309.88	0.85%
Nov-2012	9,907,851.00	10,673,953.15	-766,102.15	-12.74%	-10.01%	-45,326.05	0.83%
Feb-2013	12,371,016.00	12,443,357.48	-72,341.48	24.86%	16.58%	-45,866.36	0.82%
May-2013	12,969,411.00	12,096,127.52	873,283.48	4.84%	-2.79%	-27,843.81	0.80%
Aug-2013	11,514,266.00	11,557,501.90	-43,235.90	-11.22%	-4.45%	-28,139.81	0.79%
Nov-2013	11,554,072.00	10,615,106.73	938,965.27	0.35%	-8.15%	-9,892.55	0.78%
Feb-2014	13,746,110.00	13,400,617.20	345,492.80	18.97%	26.24%	-3,311.34	0.76%
May-2014	14,822,444.00	13,357,144.26	1,465,299.74	7.83%	-0.32%	23,390.68	0.75%
Aug-2014	18,987,399.00	13,089,612.39	5,897,786.61	28.10%	-2.00%	128,290.61	0.75%
Nov-2014	12,171,253.00	15,586,356.85	-3,415,103.85	-35.90%	19.07%	66,125.79	0.74%
Feb-2015	15,491,961.00	15,860,304.34	-368,343.34	27.28%	1.76%	58,634.95	0.73%
May-2015	15,122,351.00	15,490,991.74	-368,640.74	-2.39%	-2.33%	51,392.99	0.72%
Aug-2015	12,115,213.00	14,496,150.77	-2,380,937.77	-19.89%	-6.42%	10,854.14	0.71%
Nov-2015	15,144,481.00	11,639,673.52	3,504,807.48	25.00%	-19.71%	68,132.06	0.71%
Feb-2016	17,335,926.00	16,053,745.50	1,282,180.50	14.47%	37.92%	87,713.49	0.70%
May-2016	21,254,820.00	16,620,603.40	4,634,216.60	22.61%	3.53%	159,880.21	0.69%
Aug-2016	19,052,938.00	18,321,365.61	731,572.39	-10.36%	10.23%	168,812.90	0.68%
Nov-2016	15,100,488.00	17,645,844.04	-2,545,356.04	-20.74%	-3.69%	127,056.45	0.68%
Feb-2017	16,708,692.00	18,471,300.98	-1,762,608.98	10.65%	4.68%	98,425.16	0.67%
May-2017	15,808,202.00	17,547,769.68	-1,739,567.68	-5.39%	-5.00%	70,992.43	0.66%
Avg	11,753,509.61	11,682,517.18	70,992.43	11095527.02%	2.45%	-148,479.99	1.23%
Max	21,254,820.00	18,471,300.98	5,897,786.61	732304700.00%	87.53%	287,761.87	2.48%
Min	0.00	5,570,868.25	-11,916,414.43	-100.00%	-43.10%	-941,492.08	0.66%
StDev	3,285,729.92	2,855,437.77	2,419,451.59	90140477.22%	20.24%	249,022.74	0.49%

Var	###############	###############	###############	###############	4.09%	###############	0.00%
Median	11,514,266.00	11,404,572.84	158,425.60	0.57%	-2.23%	-59,490.41	1.08%

Audit Trail - Statistics

Accuracy Measures	Value
AIC	2,164.86
BIC	2,171.48
MAPE	12.21%
Sum Squared Error (SSE)	###############
R-Square	45.73%
Adjusted R-Square	44.04%
Root Mean Square Error	2,402,377.27

Forecast Statistics	Value
Mean	11,753,509.61
Standard Deviation	3,285,729.92

Method Statistics	Value
Method Selected	Holt Winters
Level	0.57
Seasonal	0.16
Trend	0.00
Decomposition type	Additive

Seasonal Indexes	Value
Index 1	-1,430,574.21
Index 2	740,029.94
Index 3	624,211.99
Index 4	66,332.28

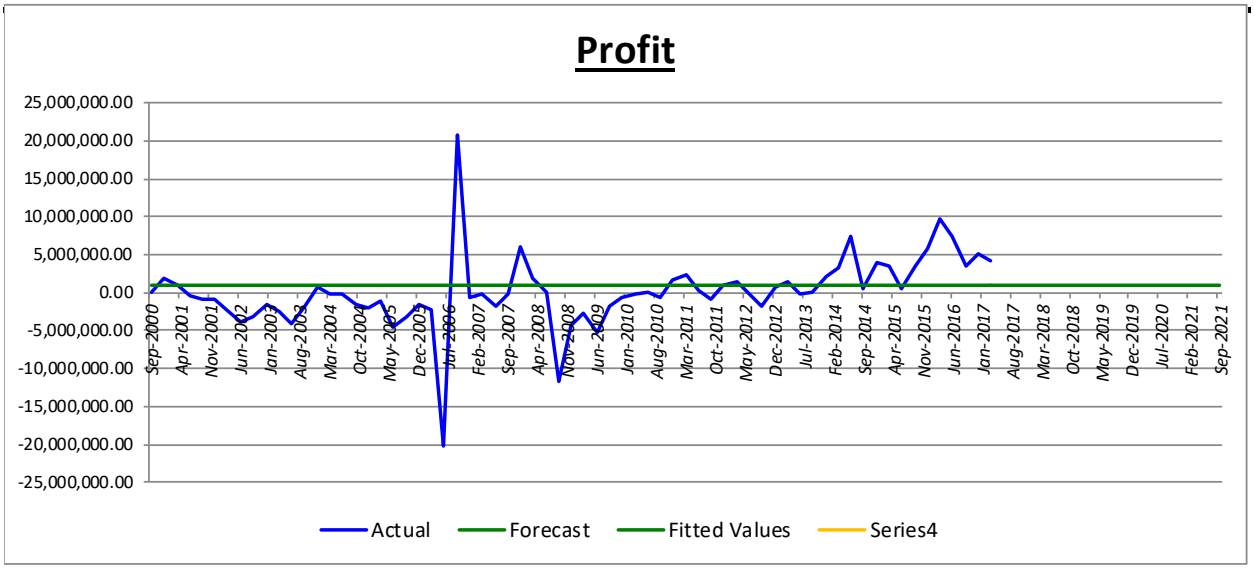
ForecastX Configuration Parameters

Item	Value
Data range selected	[Transportation Data for Forecasting.xlsx]Sheet1'!$A$1:$B$68
Time scale for data	Quarterly
Periods to forecast	17.00
Seasonal Length	
Replace Outliers Activated	No
Replace Outliers Standard Deviations	
Replace Outliers Forecasting Technique	
Replace Missing Values	No
Replace Missing Values (Lower Limit)	
Replace Missing Values (Upper Limit)	
Remove Leading Zeroes	Yes
Remove Trailing Zeroes	No
Use Holdback Evaluation	No
Holdback Evaluation Period	
Apply Tracking Signal	No
Apply Tracking Signal (Under Forecast Percentage)	
Apply Tracking Signal (Over Forecast Percentage)	
Forecast Method Selected	Holt Winters

Report Details

Run Date: 5/3/2017 10:38:57 PM
Author: Collin
Note:

Appendix O: Adaptive Response Exponential Smoothing



Forecast -- Adaptive Exponential Smoothing Selected		
		Forecast
Date	Quarterly	Annual
Jun-2017	953,375.00	
Sep-2017	953,375.00	
Dec-2017	953,375.00	2,860,125.00
Mar-2018	953,375.00	
Jun-2018	953,375.00	
Sep-2018	953,375.00	
Dec-2018	953,375.00	3,813,500.00
Mar-2019	953,375.00	
Jun-2019	953,375.00	
Sep-2019	953,375.00	
Dec-2019	953,375.00	3,813,500.00
Mar-2020	953,375.00	
Jun-2020	953,375.00	
Sep-2020	953,375.00	
Dec-2020	953,375.00	3,813,500.00
Mar-2021	953,375.00	
Jun-2021	953,375.00	
Sep-2021	953,375.00	
Total	17,160,750.00	
Avg	953,375.00	3,575,156.25
Max	953,375.00	3,813,500.00
Min	953,375.00	2,860,125.00

Summary Comments	
The forecast has an average error of	375.76%
The data has a standard deviation of	4,854,380.18
The forecast exceeds the accuracy of a simple average by	0.00%

Audit Trail - Summary Analysis

Audit Trail - Historical Versus Fitted Analysis

Series:Profit

Dates	Original Data	Fitted Data	Error	Series % Change	Forecast % Change	Cumulative Error	Cumulative MAPE
Sep-2000	23,702.00	953,375.00	-929,673.00			-929,673.00	3922.34%
Dec-2000	1,899,096.00	953,375.00	945,721.00	7912.39%	0.00%	8,024.00	1973.62%
Mar-2001	937,327.00	953,375.00	-16,048.00	-50.64%	0.00%	0.00	1315.94%
Jun-2001	-327,425.00	953,375.00	-1,280,800.00	-134.93%	0.00%	-320,200.00	1011.40%
Sep-2001	-909,776.00	953,375.00	-1,863,151.00	177.86%	0.00%	-628,790.20	817.31%
Dec-2001	-923,115.00	953,375.00	-1,876,490.00	1.47%	0.00%	-836,740.17	686.74%
Mar-2002	-2,560,103.00	953,375.00	-3,513,478.00	177.33%	0.00%	-1,219,131.29	591.44%
Jun-2002	-3,873,515.00	953,375.00	-4,826,890.00	51.30%	0.00%	-1,670,101.13	519.45%
Sep-2002	-3,250,361.00	953,375.00	-4,203,736.00	-16.09%	0.00%	-1,951,616.11	463.33%
Dec-2002	-1,469,850.00	953,375.00	-2,423,225.00	-54.78%	0.00%	-1,998,777.00	418.65%
Mar-2003	-2,494,531.00	953,375.00	-3,447,906.00	69.71%	0.00%	-2,130,516.00	381.73%
Jun-2003	-4,150,742.00	953,375.00	-5,104,117.00	66.39%	0.00%	-2,378,316.08	350.77%
Sep-2003	-1,920,924.00	953,375.00	-2,874,299.00	-53.72%	0.00%	-2,416,468.62	324.68%
Dec-2003	647,420.00	953,375.00	-305,955.00	-133.70%	0.00%	-2,265,717.64	301.73%
Mar-2004	-265,900.00	953,375.00	-1,219,275.00	-141.07%	0.00%	-2,195,954.80	283.65%
Jun-2004	-176,064.00	953,375.00	-1,129,439.00	-33.79%	0.00%	-2,129,297.56	268.43%
Sep-2004	-1,456,177.00	953,375.00	-2,409,552.00	727.07%	0.00%	-2,145,783.12	253.21%
Dec-2004	-1,915,125.00	953,375.00	-2,868,500.00	31.52%	0.00%	-2,185,934.06	239.61%
Mar-2005	-1,123,527.00	953,375.00	-2,076,902.00	-41.33%	0.00%	-2,180,195.53	227.51%
Jun-2005	-4,609,595.00	953,375.00	-5,562,970.00	310.28%	0.00%	-2,349,334.25	216.43%
Sep-2005	-3,207,135.00	953,375.00	-4,160,510.00	-30.42%	0.00%	-2,435,580.71	206.42%
Dec-2005	-1,487,161.00	953,375.00	-2,440,536.00	-53.63%	0.00%	-2,435,805.95	197.38%
Mar-2006	-2,333,166.00	953,375.00	-3,286,541.00	56.89%	0.00%	-2,472,794.43	189.06%
Jun-2006	-20,192,434.00	953,375.00	-21,145,809.00	765.45%	0.00%	-3,250,836.71	181.37%
Sep-2006	20,862,482.00	953,375.00	19,909,107.00	-203.32%	0.00%	-2,324,438.96	174.26%
Dec-2006	-694,110.00	953,375.00	-1,647,485.00	-103.33%	0.00%	-2,298,402.27	167.91%
Mar-2007	-161,700.00	953,375.00	-1,115,075.00	-76.70%	0.00%	-2,254,575.33	162.64%
Jun-2007	-1,820,559.00	953,375.00	-2,773,934.00	1025.89%	0.00%	-2,273,123.86	157.03%
Sep-2007	-67,019.00	953,375.00	-1,020,394.00	-96.32%	0.00%	-2,229,926.28	153.42%
Dec-2007	5,979,562.00	953,375.00	5,026,187.00	-9022.19%	0.00%	-1,988,055.83	148.40%
Mar-2008	1,800,249.00	953,375.00	846,874.00	-69.89%	0.00%	-1,896,606.48	143.66%
Jun-2008	-21,387.00	953,375.00	-974,762.00	-101.19%	0.00%	-1,867,798.84	143.62%
Sep-2008	-11,599,703.00	953,375.00	-12,553,078.00	54137.17%	0.00%	-2,191,595.18	139.37%
Dec-2008	-4,276,656.00	953,375.00	-5,230,031.00	-63.13%	0.00%	-2,280,960.94	135.38%
Mar-2009	-2,718,557.00	953,375.00	-3,671,932.00	-36.43%	0.00%	-2,320,702.97	131.62%
Jun-2009	-5,154,919.00	953,375.00	-6,108,294.00	89.62%	0.00%	-2,425,913.83	128.06%
Sep-2009	-1,844,758.00	953,375.00	-2,798,133.00	-64.21%	0.00%	-2,435,973.81	124.71%
Dec-2009	-628,662.00	953,375.00	-1,582,037.00	-65.92%	0.00%	-2,413,501.79	121.60%
Mar-2010	-102,224.00	953,375.00	-1,055,599.00	-83.74%	0.00%	-2,378,683.77	119.16%
Jun-2010	49,366.00	953,375.00	-904,009.00	-148.29%	0.00%	-2,341,816.90	117.32%
Sep-2010	-615,726.00	953,375.00	-1,569,101.00	-1347.27%	0.00%	-2,322,970.17	114.61%
Dec-2010	1,595,509.00	953,375.00	642,134.00	-359.13%	0.00%	-2,252,372.45	111.91%
Mar-2011	2,369,313.00	953,375.00	1,415,938.00	48.50%	0.00%	-2,167,062.91	109.34%
Jun-2011	316,898.00	953,375.00	-636,477.00	-86.62%	0.00%	-2,132,276.86	106.96%
Sep-2011	-848,148.00	953,375.00	-1,801,523.00	-367.64%	0.00%	-2,124,926.78	104.68%
Dec-2011	1,003,401.00	953,375.00	50,026.00	-218.30%	0.00%	-2,077,645.20	102.41%
Mar-2012	1,482,415.00	953,375.00	529,040.00	47.74%	0.00%	-2,022,183.81	100.25%
Jun-2012	-245,480.00	953,375.00	-1,198,855.00	-116.56%	0.00%	-2,005,031.13	98.37%
Sep-2012	-1,691,852.00	953,375.00	-2,645,227.00	589.20%	0.00%	-2,018,096.35	96.43%
Dec-2012	771,313.00	953,375.00	-182,062.00	-145.59%	0.00%	-1,981,375.66	94.51%
Mar-2013	1,369,708.00	953,375.00	416,333.00	77.58%	0.00%	-1,934,361.76	92.67%
Jun-2013	-85,437.00	953,375.00	-1,038,812.00	-106.24%	0.00%	-1,917,139.65	91.34%
Sep-2013	-45,631.00	953,375.00	-999,006.00	-46.59%	0.00%	-1,899,816.38	90.39%
Dec-2013	2,146,407.00	953,375.00	1,193,032.00	-4803.84%	0.00%	-1,842,541.41	88.74%
Mar-2014	3,222,741.00	953,375.00	2,269,366.00	50.15%	0.00%	-1,767,779.45	87.15%
Jun-2014	7,387,696.00	953,375.00	6,434,321.00	129.24%	0.00%	-1,621,313.38	85.62%
Sep-2014	571,550.00	953,375.00	-381,825.00	-92.26%	0.00%	-1,599,567.96	84.14%
Dec-2014	3,892,258.00	953,375.00	2,938,883.00	581.00%	0.00%	-1,521,318.81	82.71%
Mar-2015	3,522,648.00	953,375.00	2,569,273.00	-9.50%	0.00%	-1,451,986.75	81.33%
Jun-2015	515,510.00	953,375.00	-437,865.00	-85.37%	0.00%	-1,435,084.72	80.00%
Sep-2015	3,544,778.00	953,375.00	2,591,403.00	587.63%	0.00%	-1,369,076.72	78.70%
Dec-2015	5,736,223.00	953,375.00	4,782,848.00	61.82%	0.00%	-1,269,852.13	77.46%
Mar-2016	9,655,117.00	953,375.00	8,701,742.00	68.32%	0.00%	-1,111,572.86	76.25%
Jun-2016	7,453,235.00	953,375.00	6,499,860.00	-22.81%	0.00%	-992,644.22	75.08%
Sep-2016	3,500,785.00	953,375.00	2,547,410.00	-53.03%	0.00%	-938,181.85	73.94%
Dec-2016	5,108,989.00	953,375.00	4,155,614.00	45.94%	0.00%	-861,003.12	72.84%
Mar-2017	4,208,499.00	953,375.00	3,255,124.00	-17.63%	0.00%	-799,568.39	71.77%
Avg	153,806.61	953,375.00	-799,568.39	744.40%	0.00%	-1,848,930.87	299.10%
Max	20,862,482.00	953,375.00	19,909,107.00	54137.17%	0.00%	8,024.00	3922.34%
Min	-20,192,434.00	953,375.00	-21,145,809.00	-9022.19%	0.00%	-3,250,836.71	71.77%
StDev	4,854,380.18	0.00	4,854,380.18	6869.29%	0.00%	637,084.06	546.71%

Var	###############	0.00	###############	471871.17%	0.00%	###############	2988.92%
Median	-102,224.00	953,375.00	-1,055,599.00	-38.88%	0.00%	-2,022,183.81	135.38%

Audit Trail - Statistics

Accuracy Measures	Value
AIC	2,255.93
BIC	2,258.14
MAPE	375.76%
Sum Squared Error (SSE)	###############
R-Square	0.00%
Adjusted R-Square	0.00%
Root Mean Square Error	4,883,912.37

Forecast Statistics	Value
Mean	153,806.61
Standard Deviation	4,854,380.18

Method Statistics	Value
Method Selected	Adaptive Exponential Smoothing
Beta	0.00

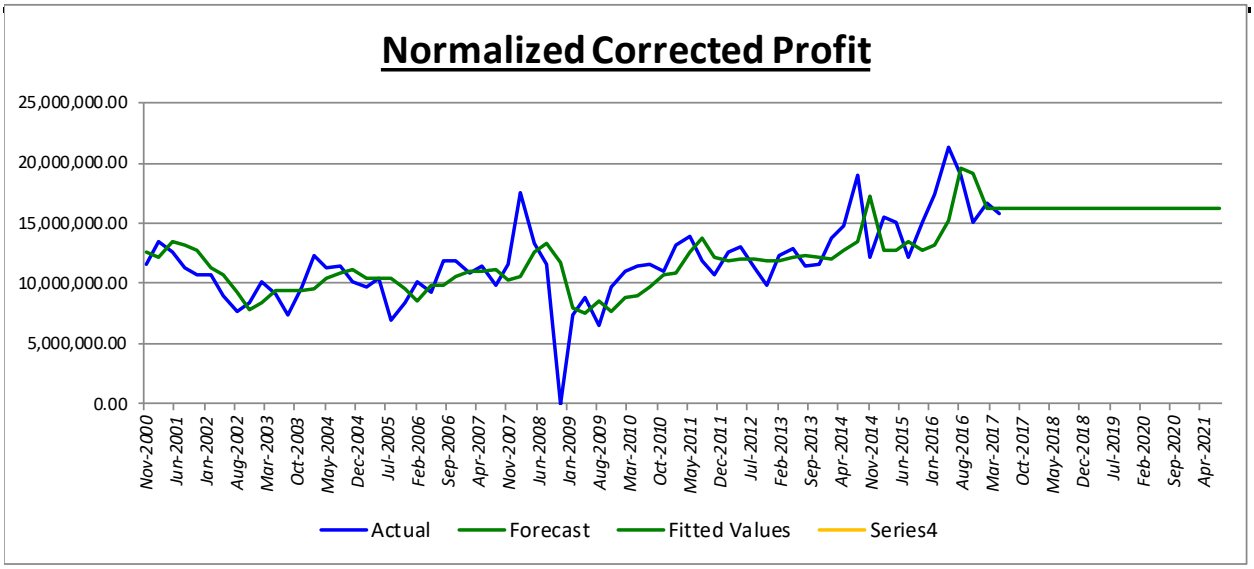
ForecastX Configuration Parameters

Item	Value
Data range selected	[Transportation Data for Forecasting.xlsx]Sheet1'!$A$1:$B$68
Time scale for data	Quarterly
Periods to forecast	18.00
Seasonal Length	
Replace Outliers Activated	No
Replace Outliers Standard Deviations	
Replace Outliers Forecasting Technique	
Replace Missing Values	No
Replace Missing Values (Lower Limit)	
Replace Missing Values (Upper Limit)	
Remove Leading Zeroes	Yes
Remove Trailing Zeroes	No
Use Holdback Evaluation	No
Holdback Evaluation Period	
Apply Tracking Signal	No
Apply Tracking Signal (Under Forecast Percentage)	
Apply Tracking Signal (Over Forecast Percentage)	
Forecast Method Selected	Adaptive Exponential Smoothing

Report Details

Run Date: 3/19/2017 8:19:20 PM
Author: Collin
Note:

Appendix P: Adaptive Response Exponential Smoothing Sensitivity Analysis



Forecast -- Adaptive Exponential Smoothing Selected		
		Forecast
Date	Quarterly	Annual
Aug-2017	16,172,051.91	
Nov-2017	16,172,051.91	32,344,103.83
Feb-2018	16,172,051.91	
May-2018	16,172,051.91	
Aug-2018	16,172,051.91	
Nov-2018	16,172,051.91	64,688,207.66
Feb-2019	16,172,051.91	
May-2019	16,172,051.91	
Aug-2019	16,172,051.91	
Nov-2019	16,172,051.91	64,688,207.66
Feb-2020	16,172,051.91	
May-2020	16,172,051.91	
Aug-2020	16,172,051.91	
Nov-2020	16,172,051.91	64,688,207.66
Feb-2021	16,172,051.91	
May-2021	16,172,051.91	
Aug-2021	16,172,051.91	
Total	274,924,882.54	
Avg	16,172,051.91	56,602,181.70
Max	16,172,051.91	64,688,207.66
Min	16,172,051.91	32,344,103.83

Summary Comments	
The forecast has an average error of	13.95%
The data has a standard deviation of	3,285,729.92
The forecast exceeds the accuracy of a simple average by	36.52%

Audit Trail - Summary Analysis

Audit Trail - Historical Versus Fitted Analysis

Series:Normalized Corrected Profit

Dates	Original Data	Fitted Data	Error	Series % Change	Forecast % Change	Cumulative Error	Cumulative MAPE
Nov-2000	11,623,405.00	12,553,078.00	-929,673.00			-929,673.00	8.00%
Feb-2001	13,498,799.00	12,215,244.15	1,283,554.85	16.13%	-2.69%	176,940.93	6.38%
May-2001	12,537,030.00	13,498,799.00	-961,769.00	-7.12%	10.51%	-202,629.05	5.10%
Aug-2001	11,272,278.00	13,144,062.49	-1,871,784.49	-10.09%	-2.63%	-619,917.91	4.87%
Nov-2001	10,689,927.00	12,691,311.84	-2,001,384.84	-5.17%	-3.44%	-896,211.29	4.64%
Feb-2002	10,676,588.00	11,331,768.12	-655,180.12	-0.12%	-10.71%	-856,039.43	4.04%
May-2002	9,039,600.00	10,783,294.96	-1,743,694.96	-15.33%	-4.84%	-982,847.36	3.85%
Aug-2002	7,726,188.00	9,266,233.68	-1,540,045.68	-14.53%	-14.07%	-1,052,497.15	3.68%
Nov-2002	8,349,342.00	7,834,717.72	514,624.28	8.07%	-15.45%	-878,372.55	3.35%
Feb-2003	10,129,853.00	8,327,162.45	1,802,690.55	21.33%	6.29%	-610,266.24	3.19%
May-2003	9,105,172.00	9,454,715.00	-349,543.00	-10.12%	13.54%	-586,564.13	2.94%
Aug-2003	7,448,961.00	9,399,275.72	-1,950,314.72	-18.19%	-0.59%	-700,210.01	2.87%
Nov-2003	9,678,779.00	9,379,409.89	299,369.11	29.93%	-0.21%	-623,319.31	2.67%
Feb-2004	12,247,123.00	9,536,313.90	2,710,809.10	26.54%	1.67%	-385,167.28	2.59%
May-2004	11,333,803.00	10,489,783.98	844,019.02	-7.46%	10.00%	-303,221.53	2.45%
Aug-2004	11,423,639.00	10,896,482.53	527,156.47	0.79%	3.88%	-251,322.90	2.32%
Nov-2004	10,143,526.00	11,213,789.90	-1,070,263.90	-11.21%	2.91%	-299,495.90	2.22%
Feb-2005	9,684,578.00	10,490,657.15	-806,079.15	-4.52%	-6.45%	-327,639.42	2.12%
May-2005	10,476,176.00	10,447,620.74	28,555.26	8.17%	-0.41%	-308,892.33	2.01%
Aug-2005	6,990,108.00	10,455,277.73	-3,465,169.73	-33.28%	0.07%	-466,706.20	2.03%
Nov-2005	8,392,568.00	9,599,497.90	-1,206,929.90	20.06%	-8.19%	-501,954.95	1.97%
Feb-2006	10,112,542.00	8,609,808.43	1,502,733.57	20.49%	-10.31%	-410,832.74	1.91%
May-2006	9,266,537.00	9,921,569.29	-655,032.29	-8.37%	15.24%	-421,450.11	1.84%
Aug-2006	11,934,727.00	9,797,630.79	2,137,096.21	28.79%	-1.25%	-314,844.02	1.79%
Nov-2006	11,934,727.00	10,548,485.69	1,386,241.31	0.00%	7.66%	-246,800.60	1.74%
Feb-2007	10,905,593.00	11,009,569.81	-103,976.81	-8.62%	4.37%	-241,307.38	1.68%
May-2007	11,438,003.00	10,951,375.26	486,627.74	4.88%	-0.53%	-214,346.82	1.62%
Aug-2007	9,779,144.00	11,194,481.36	-1,415,337.36	-14.50%	2.22%	-257,239.34	1.58%
Nov-2007	11,532,684.00	10,331,035.91	1,201,648.09	17.93%	-7.71%	-206,932.88	1.54%
Feb-2008	17,579,265.00	10,569,521.42	7,009,743.58	52.43%	2.31%	33,623.01	1.53%
May-2008	13,399,952.00	12,547,935.81	852,016.19	-23.77%	18.72%	60,022.79	1.49%
Aug-2008	11,578,316.00	13,269,150.99	-1,690,834.99	-13.59%	5.75%	5,308.48	1.46%
Nov-2008	0.00	11,804,016.16	-11,804,016.16	-100.00%	-11.04%	-352,549.84	1.41%
Feb-2009	7,323,047.00	7,946,938.47	-623,891.47	732304700.00%	-32.68%	-360,530.48	1.38%
May-2009	8,881,146.00	7,521,493.07	1,359,652.93	21.28%	-5.35%	-311,382.38	1.35%
Aug-2009	6,444,784.00	8,474,347.66	-2,029,563.66	-27.43%	12.67%	-359,109.64	1.34%
Nov-2009	9,754,945.00	7,635,101.00	2,119,844.00	51.36%	-9.90%	-292,110.89	1.32%
Feb-2010	10,971,041.00	8,864,400.81	2,106,640.19	12.47%	16.10%	-228,985.86	1.30%
May-2010	11,497,479.00	9,028,891.24	2,468,587.76	4.80%	1.86%	-159,817.31	1.28%
Aug-2010	11,649,069.00	9,718,303.10	1,930,765.90	1.32%	7.64%	-107,552.73	1.26%
Nov-2010	10,983,977.00	10,784,828.30	199,148.70	-5.71%	10.97%	-100,072.21	1.23%
Feb-2011	13,195,212.00	10,923,152.46	2,272,059.54	20.13%	1.28%	-43,592.88	1.21%
May-2011	13,969,016.00	12,535,241.44	1,433,774.56	5.86%	14.76%	-9,235.50	1.18%
Aug-2011	11,916,601.00	13,747,162.81	-1,830,561.81	-14.69%	9.67%	-50,629.28	1.16%
Nov-2011	10,751,555.00	12,110,180.70	-1,358,625.70	-9.78%	-11.91%	-79,695.86	1.15%
Feb-2012	12,603,104.00	11,894,658.77	708,445.23	17.22%	-1.78%	-62,562.36	1.12%
May-2012	13,082,118.00	12,038,087.15	1,044,030.85	3.80%	1.21%	-39,017.82	1.10%
Aug-2012	11,354,223.00	12,082,014.21	-727,791.21	-13.21%	0.36%	-53,367.27	1.08%
Nov-2012	9,907,851.00	11,828,244.25	-1,920,393.25	-12.74%	-2.10%	-91,469.84	1.07%
Feb-2013	12,371,016.00	11,825,677.90	545,338.10	24.86%	-0.02%	-78,733.68	1.05%
May-2013	12,969,411.00	12,108,643.08	860,767.92	4.84%	2.39%	-60,312.08	1.03%
Aug-2013	11,514,266.00	12,309,795.25	-795,529.25	-11.22%	1.66%	-74,450.87	1.01%
Nov-2013	11,554,072.00	12,183,940.18	-629,868.18	0.35%	-1.02%	-84,930.45	1.00%
Feb-2014	13,746,110.00	12,053,341.16	1,692,768.84	18.97%	-1.07%	-52,010.09	0.98%
May-2014	14,822,444.00	12,782,554.45	2,039,889.55	7.83%	6.05%	-13,975.55	0.97%
Aug-2014	18,987,399.00	13,489,732.57	5,497,666.43	28.10%	5.53%	84,446.63	0.96%
Nov-2014	12,171,253.00	17,216,818.43	-5,045,565.43	-35.90%	27.63%	-5,553.58	0.96%
Feb-2015	15,491,961.00	12,687,681.64	2,804,279.36	27.28%	-26.31%	42,891.81	0.95%
May-2015	15,122,351.00	12,809,033.37	2,313,317.63	-2.39%	0.96%	81,373.61	0.93%
Aug-2015	12,115,213.00	13,438,043.84	-1,322,830.84	-19.89%	4.91%	57,970.20	0.92%
Nov-2015	15,144,481.00	12,807,386.52	2,337,094.48	25.00%	-4.69%	95,332.89	0.91%
Feb-2016	17,335,926.00	13,225,357.14	4,110,568.86	14.47%	3.26%	160,094.76	0.90%
May-2016	21,254,820.00	15,171,982.97	6,082,837.03	22.61%	14.72%	254,106.54	0.89%
Aug-2016	19,052,938.00	19,646,969.33	-594,031.33	-10.36%	29.50%	240,854.39	0.88%
Nov-2016	15,100,488.00	19,125,720.47	-4,025,232.47	-20.74%	-2.65%	175,222.28	0.87%

Feb-2017	16,708,692.00	16,168,310.11	540,381.89	10.65%	-15.46%	180,755.01	0.86%
May-2017	15,808,202.00	16,190,600.37	-382,398.37	-5.39%	0.14%	172,349.73	0.85%
Avg	11,753,509.61	11,581,159.88	172,349.73	11095527.02%	0.95%	-229,060.56	1.93%
Max	21,254,820.00	19,646,969.33	7,009,743.58	732304700.00%	29.50%	254,106.54	8.00%
Min	0.00	7,521,493.07	-11,804,016.16	-100.00%	-32.68%	-1,052,497.15	0.85%
StDev	3,285,729.92	2,449,409.33	2,612,101.16	90140477.22%	10.59%	315,260.37	1.39%
Var	###############	###############	###############	###############	1.12%	###############	0.02%
Median	11,514,266.00	11,331,768.12	299,369.11	0.57%	0.66%	-202,629.05	1.38%

Audit Trail - Statistics

Accuracy Measures	**Value**
AIC	2,171.36
BIC	2,173.57
MAPE	13.95%
Sum Squared Error (SSE)	###############
R-Square	36.52%
Adjusted R-Square	36.52%
Root Mean Square Error	2,598,257.10

Forecast Statistics	**Value**
Mean	11,753,509.61
Standard Deviation	3,285,729.92

Method Statistics	**Value**
Method Selected	Adaptive Exponential Smoothing
Beta	0.36

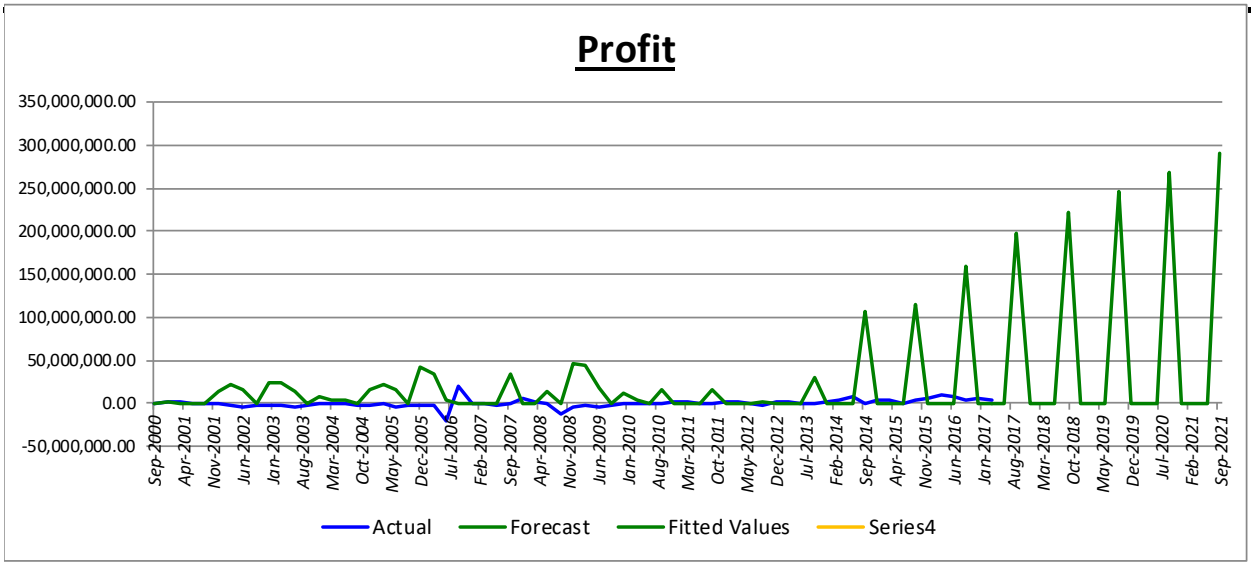
ForecastX Configuration Parameters

Item	**Value**
Data range selected	[Transportation Data for Forecasting.xlsx]Sheet1'!$A$1:$B$68
Time scale for data	Quarterly
Periods to forecast	17.00
Seasonal Length	
Replace Outliers Activated	No
Replace Outliers Standard Deviations	
Replace Outliers Forecasting Technique	
Replace Missing Values	No
Replace Missing Values (Lower Limit)	
Replace Missing Values (Upper Limit)	
Remove Leading Zeroes	Yes
Remove Trailing Zeroes	No
Use Holdback Evaluation	No
Holdback Evaluation Period	
Apply Tracking Signal	No
Apply Tracking Signal (Under Forecast Percentage)	
Apply Tracking Signal (Over Forecast Percentage)	
Forecast Method Selected	Adaptive Exponential Smoothing

Report Details

Run Date: 5/3/2017 10:48:18 PM
Author: Collin
Note:

Appendix Q: Linear Decomposition Model



Forecast -- Decomposition Selected		
		Forecast
Date	Quarterly	Annual
Jun-2017	0.00	
Sep-2017	197,083,124.21	
Dec-2017	0.00	197,083,124.21
Mar-2018	0.00	
Jun-2018	0.00	
Sep-2018	222,494,962.33	
Dec-2018	0.00	222,494,962.33
Mar-2019	0.00	
Jun-2019	0.00	
Sep-2019	245,757,634.73	
Dec-2019	0.00	245,757,634.73
Mar-2020	0.00	
Jun-2020	0.00	
Sep-2020	268,689,121.29	
Dec-2020	0.00	268,689,121.29
Mar-2021	0.00	
Jun-2021	0.00	
Sep-2021	291,582,234.61	
Total	1,225,607,077.17	
Avg	68,089,282.06	233,506,210.64
Max	291,582,234.61	268,689,121.29
Min	0.00	197,083,124.21

Summary Comments	
The forecast has an average error of	3613.29%
The data has a standard deviation of	4,854,380.18
The forecast exceeds the accuracy of a simple average by	0.00%

Audit Trail - Summary Analysis

Audit Trail - Historical Versus Fitted Analysis

Series:Profit

Dates	Original Data	Fitted Data	Error	Series % Change	Forecast % Change	Cumulative Error	Cumulative MAPE
Sep-2000	23,702.00	23,702.00	0.00			0.00	0.00%
Dec-2000	1,899,096.00	1,899,096.00	0.00	7912.39%	7912.39%	0.00	0.00%
Mar-2001	937,327.00	0.00	937,327.00	-50.64%	-100.00%	312,442.33	11.11%
Jun-2001	-327,425.00	0.00	-327,425.00	-134.93%	0.00%	152,475.50	14.58%
Sep-2001	-909,776.00	0.00	-909,776.00	177.86%	0.00%	-59,974.80	15.67%
Dec-2001	-923,115.00	14,332,741.94	-15,255,856.94	1.47%	###############	-2,592,621.82	58.96%
Mar-2002	-2,560,103.00	21,633,465.20	-24,193,568.20	177.33%	50.94%	-5,678,471.31	69.83%
Jun-2002	-3,873,515.00	15,900,390.08	-19,773,905.08	51.30%	-26.50%	-7,440,400.53	69.07%
Sep-2002	-3,250,361.00	0.00	-3,250,361.00	-16.09%	-100.00%	-6,974,840.58	62.63%
Dec-2002	-1,469,850.00	24,780,585.17	-26,250,435.17	-54.78%	###############	-8,902,400.04	74.23%
Mar-2003	-2,494,531.00	24,531,048.79	-27,025,579.79	69.71%	-1.01%	-10,549,961.83	76.43%
Jun-2003	-4,150,742.00	13,119,328.87	-17,270,070.87	66.39%	-46.52%	-11,109,970.92	72.95%
Sep-2003	-1,920,924.00	0.00	-1,920,924.00	-53.72%	-100.00%	-10,403,121.16	67.93%
Dec-2003	647,420.00	8,173,045.57	-7,525,625.57	-133.70%	817304557.14%	-10,197,585.76	69.01%
Mar-2004	-265,900.00	3,399,930.92	-3,665,830.92	-141.07%	-58.40%	-9,762,135.44	70.54%
Jun-2004	-176,064.00	3,700,181.68	-3,876,245.68	-33.79%	8.83%	-9,394,267.33	74.73%
Sep-2004	-1,456,177.00	0.00	-1,456,177.00	727.07%	-100.00%	-8,927,320.84	70.68%
Dec-2004	-1,915,125.00	15,202,830.39	-17,117,955.39	31.52%	###############	-9,382,356.09	69.51%
Mar-2005	-1,123,527.00	22,878,502.24	-24,002,029.24	-41.33%	50.49%	-10,151,812.57	71.77%
Jun-2005	-4,609,595.00	15,551,032.55	-20,160,627.55	310.28%	-32.03%	-10,652,253.32	69.28%
Sep-2005	-3,207,135.00	0.00	-3,207,135.00	-30.42%	-100.00%	-10,297,723.88	66.20%
Dec-2005	-1,487,161.00	42,883,634.99	-44,370,795.99	-53.63%	###############	-11,846,499.88	69.36%
Mar-2006	-2,333,166.00	34,811,165.83	-37,144,331.83	56.89%	-18.82%	-12,946,405.62	69.35%
Jun-2006	-20,192,434.00	4,024,255.30	-24,216,689.30	765.45%	-88.44%	-13,416,000.77	66.67%
Sep-2006	20,862,482.00	0.00	20,862,482.00	-203.32%	-100.00%	-12,044,861.46	64.17%
Dec-2006	-694,110.00	0.00	-694,110.00	-103.33%	0.00%	-11,608,294.10	61.85%
Mar-2007	-161,700.00	0.00	-161,700.00	-76.70%	0.00%	-11,184,346.17	59.69%
Jun-2007	-1,820,559.00	0.00	-1,820,559.00	1025.89%	0.00%	-10,849,925.20	57.69%
Sep-2007	-67,019.00	34,187,687.89	-34,254,706.89	-96.32%	###############	-11,656,986.63	116.47%
Dec-2007	5,979,562.00	0.00	5,979,562.00	-9022.19%	-100.00%	-11,069,101.68	112.70%
Mar-2008	1,800,249.00	0.00	1,800,249.00	-69.89%	0.00%	-10,653,961.34	109.17%
Jun-2008	-21,387.00	13,107,602.83	-13,128,989.83	-101.19%	###############	-10,731,305.98	165.71%
Sep-2008	-11,599,703.00	0.00	-11,599,703.00	54137.17%	-100.00%	-10,757,621.04	160.78%
Dec-2008	-4,276,656.00	46,756,471.04	-51,033,127.04	-63.13%	###############	-11,942,194.74	157.08%
Mar-2009	-2,718,557.00	43,264,086.60	-45,982,643.60	-36.43%	-7.47%	-12,914,779.00	153.97%
Jun-2009	-5,154,919.00	17,786,189.15	-22,941,108.15	89.62%	-58.89%	-13,193,288.14	150.04%
Sep-2009	-1,844,758.00	0.00	-1,844,758.00	-64.21%	-100.00%	-12,886,571.11	146.06%
Dec-2009	-628,662.00	11,319,740.53	-11,948,402.53	-65.92%	###############	-12,861,882.46	143.53%
Mar-2010	-102,224.00	4,382,632.90	-4,484,856.90	-83.74%	-61.28%	-12,647,086.93	142.74%
Jun-2010	49,366.00	270,588.17	-221,222.17	-148.29%	-93.83%	-12,336,440.32	139.45%
Sep-2010	-615,726.00	15,054,693.29	-15,670,419.29	-1347.27%	5463.69%	-12,417,756.88	137.56%
Dec-2010	1,595,509.00	0.00	1,595,509.00	-359.13%	-100.00%	-12,084,107.69	134.34%
Mar-2011	2,369,313.00	0.00	2,369,313.00	48.50%	0.00%	-11,747,981.63	131.27%
Jun-2011	316,898.00	0.00	316,898.00	-86.62%	0.00%	-11,473,779.82	128.34%
Sep-2011	-848,148.00	16,692,786.25	-17,540,934.25	-367.64%	###############	-11,608,605.47	126.51%
Dec-2011	1,003,401.00	0.00	1,003,401.00	-218.30%	-100.00%	-11,334,431.42	123.81%
Mar-2012	1,482,415.00	0.00	1,482,415.00	47.74%	0.00%	-11,061,732.56	121.22%
Jun-2012	-245,480.00	0.00	-245,480.00	-116.56%	0.00%	-10,836,393.96	118.74%
Sep-2012	-1,691,852.00	1,810,177.95	-3,502,029.95	589.20%	181017794.68%	-10,686,713.06	116.40%
Dec-2012	771,313.00	0.00	771,313.00	-145.59%	-100.00%	-10,457,552.54	114.11%
Mar-2013	1,369,708.00	0.00	1,369,708.00	77.58%	0.00%	-10,225,645.47	111.91%
Jun-2013	-85,437.00	0.00	-85,437.00	-106.24%	0.00%	-10,030,641.46	109.80%
Sep-2013	-45,631.00	30,013,160.02	-30,058,791.02	-46.59%	###############	-10,408,531.08	131.18%
Dec-2013	2,146,407.00	0.00	2,146,407.00	-4803.84%	-100.00%	-10,176,032.22	128.78%
Mar-2014	3,222,741.00	0.00	3,222,741.00	50.15%	0.00%	-9,932,418.17	126.47%
Jun-2014	7,387,696.00	0.00	7,387,696.00	129.24%	0.00%	-9,623,130.41	124.25%
Sep-2014	571,550.00	105,976,939.85	-105,405,389.85	-92.26%	###############	-11,303,520.93	127.74%
Dec-2014	3,892,258.00	0.00	3,892,258.00	581.00%	-100.00%	-11,041,524.74	125.57%
Mar-2015	3,522,648.00	0.00	3,522,648.00	-9.50%	0.00%	-10,794,674.36	123.47%
Jun-2015	515,510.00	0.00	515,510.00	-85.37%	0.00%	-10,606,171.28	121.44%
Sep-2015	3,544,778.00	114,060,116.95	-110,515,338.95	587.63%	###############	-12,244,026.49	120.29%
Dec-2015	5,736,223.00	0.00	5,736,223.00	61.82%	-100.00%	-11,954,022.47	118.37%
Mar-2016	9,655,117.00	0.00	9,655,117.00	68.32%	0.00%	-11,611,020.25	116.52%
Jun-2016	7,453,235.00	0.00	7,453,235.00	-22.81%	0.00%	-11,313,141.26	114.72%
Sep-2016	3,500,785.00	160,068,875.75	-156,568,090.75	-53.03%	###############	-13,547,832.80	114.02%
Dec-2016	5,108,989.00	0.00	5,108,989.00	45.94%	-100.00%	-13,265,153.68	112.31%

Dec-2016	5,108,989.00	0.00	5,108,989.00	45.94%	-100.00%	-13,265,153.68	112.31%
Mar-2017	4,208,499.00	0.00	4,208,499.00	-17.63%	0.00%	-13,004,352.89	110.66%
Avg	153,806.61	13,158,159.50	-13,004,352.89	744.40%	968737137.96%	-10,064,936.54	98.38%
Max	20,862,482.00	160,068,875.75	20,862,482.00	54137.17%	##############	312,442.33	165.71%
Min	-20,192,434.00	0.00	-156,568,090.75	-9022.19%	-100.00%	-13,547,832.80	0.00%
StDev	4,854,380.18	28,071,241.33	28,586,256.96	6869.29%	##############	3,402,481.56	39.95%
Var	##############	##############	##############	471871.17%	##############	##############	15.96%
Median	-102,224.00	0.00	-1,844,758.00	-38.88%	0.00%	-10,836,393.96	112.70%

Audit Trail - Statistics

Accuracy Measures	Value
AIC	2,506.48
BIC	2,510.89
MAPE	3613.29%
Sum Squared Error (SSE)	##############
R-Square	0.00%
Adjusted R-Square	0.00%
Root Mean Square Error	31,210,425.39

Forecast Statistics	Value
Mean	153,806.61
Standard Deviation	4,854,380.18

Method Statistics	Value
Method Selected	Decomposition
Basic Method	Trend (Linear) Regression
Decomposition type	Multiplicative

Components of Decomposition

Date	Original Data	Forecasted Data	Centered Moving Average	CMA Trend	Seasonal Indices	Cycle Factors
Sep-2000	23,702.00				27.84	
Dec-2000	1,899,096.00				-8.83	
Mar-2001	937,327.00	-4,736,127.53	516,490.25	-3,158,059.26	-9.17	-0.16
Jun-2001	-327,425.00	-274,907.98	47,029.13	-3,056,356.99	-5.85	-0.02
Sep-2001	-909,776.00	-20,686,284.15	-742,926.00	-2,954,654.72	27.84	0.25
Dec-2001	-923,115.00	14,332,741.94	-1,623,366.00	-2,852,952.45	-8.83	0.57
Mar-2002	-2,560,103.00	21,633,465.20	-2,359,200.38	-2,751,250.19	-9.17	0.86
Jun-2002	-3,873,515.00	15,900,390.08	-2,720,115.38	-2,649,547.92	-5.85	1.03
Sep-2002	-3,250,361.00	-77,414,525.64	-2,780,260.75	-2,547,845.65	27.84	1.09
Dec-2002	-1,469,850.00	24,780,585.17	-2,806,717.63	-2,446,143.38	-8.83	1.15
Mar-2003	-2,494,531.00	24,531,048.79	-2,675,191.38	-2,344,441.12	-9.17	1.14
Jun-2003	-4,150,742.00	13,119,328.87	-2,244,353.00	-2,242,738.85	-5.85	1.00
Sep-2003	-1,920,924.00	-47,366,434.90	-1,701,115.38	-2,141,036.58	27.84	0.79
Dec-2003	647,420.00	8,173,045.57	-925,701.75	-2,039,334.31	-8.83	0.45
Mar-2004	-265,900.00	3,399,930.92	-370,773.63	-1,937,632.04	-9.17	0.19
Jun-2004	-176,064.00	3,700,181.68	-632,998.38	-1,835,929.78	-5.85	0.34
Sep-2004	-1,456,177.00	-29,529,475.99	-1,060,519.88	-1,734,227.51	27.84	0.61
Dec-2004	-1,915,125.00	15,202,830.39	-1,721,914.63	-1,632,525.24	-8.83	1.05
Mar-2005	-1,123,527.00	22,878,502.24	-2,494,975.75	-1,530,822.97	-9.17	1.63
Jun-2005	-4,609,595.00	15,551,032.55	-2,660,350.00	-1,429,120.71	-5.85	1.86
Sep-2005	-3,207,135.00	-76,796,343.00	-2,758,059.38	-1,327,418.44	27.84	2.08
Dec-2005	-1,487,161.00	42,883,634.99	-4,857,119.13	-1,225,716.17	-8.83	3.96
Mar-2006	-2,333,166.00	34,811,165.83	-3,796,271.88	-1,124,013.90	-9.17	3.38
Jun-2006	-20,192,434.00	4,024,255.30	-688,438.38	-1,022,311.63	-5.85	0.67
Sep-2006	20,862,482.00	-8,850,984.78	-317,873.75	-920,609.37	27.84	0.35
Dec-2006	-694,110.00	-19,865,697.70	2,250,043.88	-818,907.10	-8.83	-2.75
Mar-2007	-161,700.00	-17,700,894.41	1,930,340.63	-717,204.83	-9.17	-2.69
Jun-2007	-1,820,559.00	-867,247.65	148,362.00	-615,502.56	-5.85	-0.24
Sep-2007	-67,019.00	34,187,687.89	1,227,814.63	-513,800.30	27.84	-2.39
Dec-2007	5,979,562.00	-14,991,288.01	1,697,954.75	-412,098.03	-8.83	-4.12
Mar-2008	1,800,249.00	-4,413,124.87	481,265.75	-310,395.76	-9.17	-1.55
Jun-2008	-21,387.00	13,107,602.83	-2,242,347.00	-208,693.49	-5.85	10.74
Sep-2008	-11,599,703.00	-113,861,771.28	-4,089,225.00	-106,991.22	27.84	38.22
Dec-2008	-4,276,656.00	46,756,471.04	-5,295,767.25	-5,288.96	-8.83	1,001.29
Mar-2009	-2,718,557.00	43,264,086.60	-4,718,090.63	96,413.31	-9.17	-48.94
Jun-2009	-5,154,919.00	17,786,189.15	-3,042,723.25	198,115.58	-5.85	-15.36
Sep-2009	-1,844,758.00	-62,919,364.36	-2,259,682.38	299,817.85	27.84	-7.54
Dec-2009	-628,662.00	11,319,740.53	-1,282,105.13	401,520.11	-8.83	-3.19
Mar-2010	-102,224.00	4,382,632.90	-477,940.50	503,222.38	-9.17	-0.95
Jun-2010	49,366.00	270,588.17	-46,290.13	604,924.65	-5.85	-0.08
Sep-2010	-615,726.00	15,054,693.29	540,673.38	706,626.92	27.84	0.77
Dec-2010	1,595,509.00	-7,796,533.93	883,057.00	808,329.19	-8.83	1.09
Mar-2011	2,369,313.00	-8,137,726.22	887,445.75	910,031.45	-9.17	0.98
Jun-2011	316,898.00	-4,585,077.58	784,379.50	1,011,733.72	-5.85	0.78
Sep-2011	-848,148.00	16,692,786.25	599,503.75	1,113,435.99	27.84	0.54
Dec-2011	1,003,401.00	-3,693,572.60	418,344.25	1,215,138.26	-8.83	0.34
Mar-2012	1,482,415.00	-2,224,453.92	242,584.00	1,316,840.52	-9.17	0.18
Jun-2012	-245,480.00	-631,955.24	108,110.00	1,418,542.79	-5.85	0.08
Sep-2012	-1,691,852.00	1,810,177.95	65,010.63	1,520,245.06	27.84	0.04
Dec-2012	771,313.00	626,221.90	70,927.63	1,621,947.33	-8.83	0.04

Dec-2012	771,313.00	-626,221.90	70,927.63	1,621,947.33	-8.83	0.04
Mar-2013	1,369,708.00	-2,720,785.84	296,710.63	1,723,649.60	-9.17	0.17
Jun-2013	-85,437.00	-3,942,048.07	674,375.00	1,825,351.86	-5.85	0.37
Sep-2013	-45,631.00	30,013,160.02	1,077,890.88	1,927,054.13	27.84	0.56
Dec-2013	2,146,407.00	-19,809,348.65	2,243,661.63	2,028,756.40	-8.83	1.11
Mar-2014	3,222,741.00	-29,847,344.56	3,254,950.88	2,130,458.67	-9.17	1.53
Jun-2014	7,387,696.00	-20,753,395.40	3,550,329.88	2,232,160.94	-5.85	1.59
Sep-2014	571,550.00	105,976,939.85	3,806,049.63	2,333,863.20	27.84	1.63
Dec-2014	3,892,258.00	-26,350,360.75	2,984,514.75	2,435,565.47	-8.83	1.23
Mar-2015	3,522,648.00	-22,898,393.89	2,497,145.00	2,537,267.74	-9.17	0.98
Jun-2015	515,510.00	-18,116,873.28	3,099,294.13	2,638,970.01	-5.85	1.17
Sep-2015	3,544,778.00	114,060,116.95	4,096,348.38	2,740,672.27	27.84	1.49
Dec-2015	5,736,223.00	-50,591,406.30	5,730,122.63	2,842,374.54	-8.83	2.02
Mar-2016	9,655,117.00	-60,446,040.88	6,591,839.13	2,944,076.81	-9.17	2.24
Jun-2016	7,453,235.00	-38,042,032.32	6,507,935.75	3,045,779.08	-5.85	2.14
Sep-2016	3,500,785.00	160,068,875.75	5,748,704.25	3,147,481.35	27.84	1.83
Dec-2016	5,108,989.00	-58,938,660.24		3,249,183.61	-8.83	2.05
Mar-2017	4,208,499.00	-63,426,035.17		3,350,885.88	-9.17	2.06
Jun-2017		-40,777,127.31		3,452,588.15	-5.85	2.02
Sep-2017		197,083,124.21		3,554,290.42	27.84	1.99
Dec-2017		-65,611,452.42		3,655,992.68	-8.83	2.03
Mar-2018		-69,851,145.94		3,757,694.95	-9.17	2.03
Jun-2018		-45,524,407.47		3,859,397.22	-5.85	2.02
Sep-2018		222,494,962.33		3,961,099.49	27.84	2.02
Dec-2018		-72,593,327.66		4,062,801.76	-8.83	2.02
Mar-2019		-77,197,931.41		4,164,504.02	-9.17	2.02
Jun-2019		-50,377,949.35		4,266,206.29	-5.85	2.02
Sep-2019		245,757,634.73		4,367,908.56	27.84	2.02
Dec-2019		-79,773,963.38		4,469,610.83	-8.83	2.02
Mar-2020		-84,715,107.32		4,571,313.09	-9.17	2.02
Jun-2020		-55,200,838.41		4,673,015.36	-5.85	2.02
Sep-2020		268,689,121.29		4,774,717.63	27.84	2.02
Dec-2020		-87,015,499.52		4,876,419.90	-8.83	2.02
Mar-2021		-92,254,064.82		4,978,122.17	-9.17	2.02
Jun-2021		-60,010,586.56		5,079,824.43	-5.85	2.02
Sep-2021		291,582,234.61		5,181,526.70	27.84	2.02

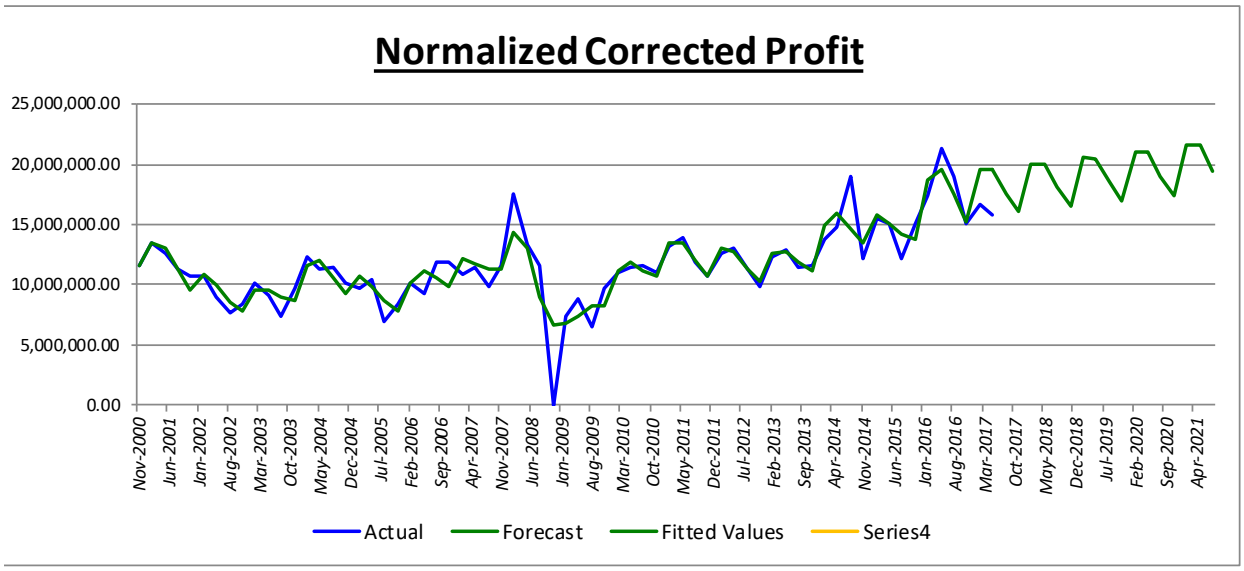
ForecastX Configuration Parameters

Item	Value
Data range selected	[Transportation Data for Forecasting.xlsx]Sheet1'!$A$1:$B$68
Time scale for data	Quarterly
Periods to forecast	18.00
Seasonal Length	
Replace Outliers Activated	No
Replace Outliers Standard Deviations	
Replace Outliers Forecasting Technique	
Replace Missing Values	No
Replace Missing Values (Lower Limit)	
Replace Missing Values (Upper Limit)	
Remove Leading Zeroes	Yes
Remove Trailing Zeroes	No
Use Holdback Evaluation	No
Holdback Evaluation Period	
Apply Tracking Signal	No
Apply Tracking Signal (Under Forecast Percentage)	
Apply Tracking Signal (Over Forecast Percentage)	
Forecast Method Selected	Decomposition

Report Details

Run Date: 3/20/2017 4:39:33 PM
Author: Collin
Note:

Appendix R: Linear Decomposition Sensitivity Analysis



Forecast -- Decomposition Selected

		Forecast
Date	**Quarterly**	**Annual**
Aug-2017	17,608,739.15	
Nov-2017	16,046,244.63	33,654,983.79
Feb-2018	20,032,513.38	
May-2018	19,999,615.61	
Aug-2018	18,066,268.46	
Nov-2018	16,539,682.45	74,638,079.89
Feb-2019	20,539,408.59	
May-2019	20,506,391.29	
Aug-2019	18,543,282.28	
Nov-2019	16,978,222.46	76,567,304.61
Feb-2020	21,062,465.05	
May-2020	21,029,553.94	
Aug-2020	19,017,264.05	
Nov-2020	17,408,713.13	78,517,996.18
Feb-2021	21,590,523.53	
May-2021	21,554,816.91	
Aug-2021	19,489,816.80	
Total	326,013,521.72	
Avg	19,177,265.98	65,844,591.12
Max	21,590,523.53	78,517,996.18
Min	16,046,244.63	33,654,983.79

Summary Comments	
The forecast has an average error of	8.20%
The data has a standard deviation of	3,285,729.92
The forecast exceeds the accuracy of a simple average by	77.76%

Audit Trail - Summary Analysis

Audit Trail - Historical Versus Fitted Analysis

Series:Normalized Corrected Profit

Dates	Original Data	Fitted Data	Error	Series % Change	Forecast % Change	Cumulative Error	Cumulative MAPE
Nov-2000	11,623,405.00	11,623,405.00	0.00			0.00	0.00%
Feb-2001	13,498,799.00	13,498,799.00	0.00	16.13%	16.13%	0.00	0.00%
May-2001	12,537,030.00	13,013,774.70	-476,744.70	-7.12%	-3.59%	-158,914.90	0.42%
Aug-2001	11,272,278.00	11,242,602.07	29,675.93	-10.09%	-13.61%	-111,767.19	0.33%
Nov-2001	10,689,927.00	9,534,200.93	1,155,726.07	-5.17%	-15.20%	141,731.46	0.70%
Feb-2002	10,676,588.00	10,798,768.14	-122,180.14	-0.12%	13.26%	97,746.19	0.61%
May-2002	9,039,600.00	9,925,049.63	-885,449.63	-15.33%	-8.09%	-42,710.35	0.73%
Aug-2002	7,726,188.00	8,571,474.74	-845,286.74	-14.53%	-13.64%	-143,032.40	0.81%
Nov-2002	8,349,342.00	7,745,054.95	604,287.05	8.07%	-9.64%	-59,996.91	0.81%
Feb-2003	10,129,853.00	9,517,863.15	611,989.85	21.33%	22.89%	7,201.77	0.79%
May-2003	9,105,172.00	9,585,649.65	-480,477.65	-10.12%	0.71%	-37,132.72	0.76%
Aug-2003	7,448,961.00	9,030,728.63	-1,581,767.63	-18.19%	-5.79%	-165,852.30	0.84%
Nov-2003	9,678,779.00	8,692,738.49	986,040.51	29.93%	-3.74%	-77,245.16	0.84%
Feb-2004	12,247,123.00	11,553,946.56	693,176.44	26.54%	32.91%	-22,215.05	0.81%
May-2004	11,333,803.00	12,060,781.31	-726,978.31	-7.46%	4.39%	-69,199.26	0.78%
Aug-2004	11,423,639.00	10,586,170.85	837,468.15	0.79%	-12.23%	-12,532.55	0.76%
Nov-2004	10,143,526.00	9,255,296.44	888,229.56	-11.21%	-12.57%	40,453.46	0.75%
Feb-2005	9,684,578.00	10,692,095.34	-1,007,517.34	-4.52%	15.52%	-17,767.14	0.74%
May-2005	10,476,176.00	9,779,215.86	696,960.14	8.17%	-8.54%	19,850.08	0.72%
Aug-2005	6,990,108.00	8,629,166.31	-1,639,058.31	-33.28%	-11.76%	-63,095.34	0.74%
Nov-2005	8,392,568.00	7,764,551.75	628,016.25	20.06%	-10.02%	-30,185.26	0.72%
Feb-2006	10,112,542.00	10,075,893.32	36,648.68	20.49%	29.77%	-27,147.36	0.69%
May-2006	9,266,537.00	11,137,537.67	-1,871,000.67	-8.37%	10.54%	-107,314.89	0.70%
Aug-2006	11,934,727.00	10,532,654.56	1,402,072.44	28.79%	-5.43%	-44,423.75	0.69%
Nov-2006	11,934,727.00	9,907,473.18	2,027,253.82	0.00%	-5.94%	38,443.35	0.69%
Feb-2007	10,905,593.00	12,214,031.85	-1,308,438.85	-8.62%	23.28%	-13,359.81	0.68%
May-2007	11,438,003.00	11,776,345.29	-338,342.29	4.88%	-3.58%	-25,396.20	0.66%
Aug-2007	9,779,144.00	11,340,418.79	-1,561,274.79	-14.50%	-3.70%	-80,249.01	0.66%
Nov-2007	11,532,684.00	11,264,865.29	267,818.71	17.93%	-0.67%	-68,246.67	0.64%
Feb-2008	17,579,265.00	14,393,892.55	3,185,372.45	52.43%	27.78%	40,207.30	0.63%
May-2008	13,399,952.00	12,975,940.73	424,011.27	-23.77%	-9.85%	52,588.07	0.62%
Aug-2008	11,578,316.00	9,032,665.02	2,545,650.98	-13.59%	-30.39%	130,496.29	0.62%
Nov-2008	0.00	6,595,549.15	-6,595,549.15	-100.00%	-26.98%	-73,323.27	0.60%
Feb-2009	7,323,047.00	6,823,620.79	499,426.21	732304700.00%	3.46%	-56,477.70	0.59%
May-2009	8,881,146.00	7,391,410.09	1,489,735.91	21.28%	8.32%	-12,300.16	0.59%
Aug-2009	6,444,784.00	8,260,061.04	-1,815,277.04	-27.43%	11.75%	-62,382.86	0.59%
Nov-2009	9,754,945.00	8,202,216.30	1,552,728.70	51.36%	-0.70%	-18,731.19	0.59%
Feb-2010	10,971,041.00	11,168,161.94	-197,120.94	12.47%	36.16%	-23,425.66	0.57%
May-2010	11,497,479.00	11,945,675.39	-448,196.39	4.80%	6.96%	-34,317.22	0.56%
Aug-2010	11,649,069.00	11,152,520.90	496,548.10	1.32%	-6.64%	-21,045.58	0.55%
Nov-2010	10,983,977.00	10,661,431.81	322,545.19	-5.71%	-4.40%	-12,665.32	0.54%
Feb-2011	13,195,212.00	13,511,816.11	-316,604.11	20.13%	26.74%	-19,901.96	0.53%
May-2011	13,969,016.00	13,412,211.01	556,804.99	5.86%	-0.74%	-6,490.17	0.52%
Aug-2011	11,916,601.00	11,954,367.11	-37,766.11	-14.69%	-10.87%	-7,200.99	0.50%
Nov-2011	10,751,555.00	10,713,095.45	38,459.55	-9.78%	-10.38%	-6,186.31	0.49%
Feb-2012	12,603,104.00	13,008,793.28	-405,689.28	17.22%	21.43%	-14,871.15	0.48%
May-2012	13,082,118.00	12,719,577.16	362,540.84	3.80%	-2.22%	-6,841.11	0.48%
Aug-2012	11,354,223.00	11,301,563.50	52,659.50	-13.21%	-11.15%	-5,601.52	0.47%
Nov-2012	9,907,851.00	10,243,714.45	-335,863.45	-12.74%	-9.36%	-12,341.56	0.46%
Feb-2013	12,371,016.00	12,632,736.26	-261,720.26	24.86%	23.32%	-17,329.13	0.45%
May-2013	12,969,411.00	12,777,713.55	191,697.45	4.84%	1.15%	-13,230.57	0.44%
Aug-2013	11,514,266.00	11,848,179.66	-333,913.66	-11.22%	-7.27%	-19,397.55	0.43%
Nov-2013	11,554,072.00	11,133,205.30	420,866.70	0.35%	-6.03%	-11,090.68	0.43%
Feb-2014	13,746,110.00	14,984,586.51	-1,238,476.51	18.97%	34.59%	-33,820.05	0.42%
May-2014	14,822,444.00	15,955,103.62	-1,132,659.62	7.83%	6.48%	-53,798.95	0.42%
Aug-2014	18,987,399.00	14,624,341.75	4,363,057.25	28.10%	-8.34%	25,073.48	0.42%
Nov-2014	12,171,253.00	13,529,018.88	-1,357,765.88	-35.90%	-7.49%	813.14	0.41%
Feb-2015	15,491,961.00	15,786,514.22	-294,553.22	27.28%	16.69%	-4,279.38	0.41%
May-2015	15,122,351.00	15,141,158.62	-18,807.62	-2.39%	-4.09%	-4,525.62	0.40%
Aug-2015	12,115,213.00	14,188,956.50	-2,073,743.50	-19.89%	-6.29%	-39,012.58	0.40%
Nov-2015	15,144,481.00	13,783,953.34	1,360,527.66	25.00%	-2.85%	-16,069.30	0.39%
Feb-2016	17,335,926.00	18,758,465.03	-1,422,539.03	14.47%	36.09%	-38,754.30	0.39%
May-2016	21,254,820.00	19,539,192.37	1,715,627.63	22.61%	4.16%	-10,906.97	0.39%
Aug-2016	19,052,938.00	17,479,321.64	1,573,616.36	-10.36%	-10.54%	13,851.21	0.38%
Nov-2016	15,100,488.00	15,235,018.69	-134,530.69	-20.74%	-12.84%	11,568.41	0.38%

Feb-2017	16,708,692.00	19,540,369.91	-2,831,677.91	10.65%	28.26%	-31,511.08	0.37%
May-2017	15,808,202.00	19,585,646.12	-3,777,444.12	-5.39%	0.23%	-87,420.53	0.37%
Avg	11,753,509.61	11,840,930.14	-87,420.53	11095527.02%	1.91%	-22,880.75	0.56%
Max	21,254,820.00	19,585,646.12	4,363,057.25	732304700.00%	36.16%	141,731.46	0.84%
Min	0.00	6,595,549.15	-6,595,549.15	-100.00%	-30.39%	-165,852.30	0.00%
StDev	3,285,729.92	2,999,959.70	1,547,139.90	90140477.22%	15.52%	53,530.68	0.18%
Var	###############	###############	###############	###############	2.41%	2,865,533,960.89	0.00%
Median	11,514,266.00	11,301,563.50	0.00	0.57%	-3.59%	-17,767.14	0.57%

Audit Trail - Statistics

Accuracy Measures	Value
AIC	2,103.10
BIC	2,107.51
MAPE	8.20%
Sum Squared Error (SSE)	###############
R-Square	77.76%
Adjusted R-Square	77.41%
Root Mean Square Error	1,538,037.13

Forecast Statistics	Value
Mean	11,753,509.61
Standard Deviation	3,285,729.92

Method Statistics	Value
Method Selected	Decomposition
Basic Method	Trend (Linear) Regression
Decomposition type	Multiplicative

Components of Decomposition

Date	Original Data	Forecasted Data	Centered Moving Average	CMA Trend	Seasonal Indices	Cycle Factors
Nov-2000	11,623,405.00				0.88	
Feb-2001	13,498,799.00				1.08	
May-2001	12,537,030.00	13,013,774.70	12,116,193.25	8,472,190.55	1.07	1.43
Aug-2001	11,272,278.00	11,242,602.07	11,646,732.13	8,572,907.44	0.97	1.36
Nov-2001	10,689,927.00	9,534,200.93	10,856,777.00	8,673,624.33	0.88	1.25
Feb-2002	10,676,588.00	10,798,768.14	9,976,337.00	8,774,341.21	1.08	1.14
May-2002	9,039,600.00	9,925,049.63	9,240,502.63	8,875,058.10	1.07	1.04
Aug-2002	7,726,188.00	8,571,474.74	8,879,587.63	8,975,774.99	0.97	0.99
Nov-2002	8,349,342.00	7,745,054.95	8,819,442.25	9,076,491.88	0.88	0.97
Feb-2003	10,129,853.00	9,517,863.15	8,792,985.38	9,177,208.76	1.08	0.96
May-2003	9,105,172.00	9,585,649.65	8,924,511.63	9,277,925.65	1.07	0.96
Aug-2003	7,448,961.00	9,030,728.63	9,355,350.00	9,378,642.54	0.97	1.00
Nov-2003	9,678,779.00	8,692,738.49	9,898,587.63	9,479,359.42	0.88	1.04
Feb-2004	12,247,123.00	11,553,946.56	10,674,001.25	9,580,076.31	1.08	1.11
May-2004	11,333,803.00	12,060,781.31	11,228,929.38	9,680,793.20	1.07	1.16
Aug-2004	11,423,639.00	10,586,170.85	10,966,704.63	9,781,510.08	0.97	1.12
Nov-2004	10,143,526.00	9,255,296.44	10,539,183.13	9,882,226.97	0.88	1.07
Feb-2005	9,684,578.00	10,692,095.34	9,877,788.38	9,982,943.86	1.08	0.99
May-2005	10,476,176.00	9,779,215.86	9,104,727.25	10,083,660.74	1.07	0.90
Aug-2005	6,990,108.00	8,629,166.31	8,939,353.00	10,184,377.63	0.97	0.88
Nov-2005	8,392,568.00	7,764,551.75	8,841,643.63	10,285,094.52	0.88	0.86
Feb-2006	10,112,542.00	10,075,893.32	9,308,516.13	10,385,811.40	1.08	0.90
May-2006	9,266,537.00	11,137,537.67	10,369,363.38	10,486,528.29	1.07	0.99
Aug-2006	11,934,727.00	10,532,654.56	10,911,264.63	10,587,245.18	0.97	1.03
Nov-2006	11,934,727.00	9,907,473.18	11,281,829.25	10,687,962.06	0.88	1.06
Feb-2007	10,905,593.00	12,214,031.85	11,283,814.63	10,788,678.95	1.08	1.05
May-2007	11,438,003.00	11,776,345.29	10,964,111.38	10,889,395.84	1.07	1.01
Aug-2007	9,779,144.00	11,340,418.79	11,748,065.00	10,990,112.72	0.97	1.07
Nov-2007	11,532,684.00	11,264,865.29	12,827,517.63	11,090,829.61	0.88	1.16
Feb-2008	17,579,265.00	14,393,892.55	13,297,657.75	11,191,546.50	1.08	1.19
May-2008	13,399,952.00	12,975,940.73	12,080,968.75	11,292,263.38	1.07	1.07
Aug-2008	11,578,316.00	9,032,665.02	9,357,356.00	11,392,980.27	0.97	0.82
Nov-2008	0.00	6,595,549.15	7,510,478.00	11,493,697.16	0.88	0.65
Feb-2009	7,323,047.00	6,823,620.79	6,303,935.75	11,594,414.04	1.08	0.54
May-2009	8,881,146.00	7,391,410.09	6,881,612.38	11,695,130.93	1.07	0.59
Aug-2009	6,444,784.00	8,260,061.04	8,556,979.75	11,795,847.82	0.97	0.73
Nov-2009	9,754,945.00	8,202,216.30	9,340,020.63	11,896,564.70	0.88	0.79
Feb-2010	10,971,041.00	11,168,161.94	10,317,597.88	11,997,281.59	1.08	0.86
May-2010	11,497,479.00	11,945,675.39	11,121,762.50	12,097,998.48	1.07	0.92
Aug-2010	11,649,069.00	11,152,520.90	11,553,412.88	12,198,715.36	0.97	0.95
Nov-2010	10,983,977.00	10,661,431.81	12,140,376.38	12,299,432.25	0.88	0.99
Feb-2011	13,195,212.00	13,511,816.11	12,482,760.00	12,400,149.14	1.08	1.01
May-2011	13,969,016.00	13,412,211.01	12,487,148.75	12,500,866.02	1.07	1.00
Aug-2011	11,916,601.00	11,954,367.11	12,384,082.50	12,601,582.91	0.97	0.98
Nov-2011	10,751,555.00	10,713,095.45	12,199,206.75	12,702,299.80	0.88	0.96
Feb-2012	12,603,104.00	13,008,793.28	12,018,047.25	12,803,016.68	1.08	0.94
May-2012	13,082,118.00	12,719,577.16	11,842,287.00	12,903,733.57	1.07	0.92
Aug-2012	11,354,223.00	11,301,563.50	11,707,813.00	13,004,450.46	0.97	0.90
Nov-2012	9,907,851.00	10,243,714.45	11,664,713.63	13,105,167.34	0.88	0.89

Feb-2013	12,371,016.00	12,632,736.26	11,670,630.63	13,205,884.23	1.08	0.88
May-2013	12,969,411.00	12,777,713.55	11,896,413.63	13,306,601.12	1.07	0.89
Aug-2013	11,514,266.00	11,848,179.66	12,274,078.00	13,407,318.01	0.97	0.92
Nov-2013	11,554,072.00	11,133,205.30	12,677,593.88	13,508,034.89	0.88	0.94
Feb-2014	13,746,110.00	14,984,586.51	13,843,364.63	13,608,751.78	1.08	1.02
May-2014	14,822,444.00	15,955,103.62	14,854,653.88	13,709,468.67	1.07	1.08
Aug-2014	18,987,399.00	14,624,341.75	15,150,032.88	13,810,185.55	0.97	1.10
Nov-2014	12,171,253.00	13,529,018.88	15,405,752.63	13,910,902.44	0.88	1.11
Feb-2015	15,491,961.00	15,786,514.22	14,584,217.75	14,011,619.33	1.08	1.04
May-2015	15,122,351.00	15,141,158.62	14,096,848.00	14,112,336.21	1.07	1.00
Aug-2015	12,115,213.00	14,188,956.50	14,698,997.13	14,213,053.10	0.97	1.03
Nov-2015	15,144,481.00	13,783,953.34	15,696,051.38	14,313,769.99	0.88	1.10
Feb-2016	17,335,926.00	18,758,465.03	17,329,825.63	14,414,486.87	1.08	1.20
May-2016	21,254,820.00	19,539,192.37	18,191,542.13	14,515,203.76	1.07	1.25
Aug-2016	19,052,938.00	17,479,321.64	18,107,638.75	14,615,920.65	0.97	1.24
Nov-2016	15,100,488.00	15,235,018.69	17,348,407.25	14,716,637.53	0.88	1.18
Feb-2017	16,708,692.00	19,540,369.91		14,817,354.42	1.08	1.22
May-2017	15,808,202.00	19,585,646.12		14,918,071.31	1.07	1.22
Aug-2017		17,608,739.15		15,018,788.19	0.97	1.21
Nov-2017		16,046,244.63		15,119,505.08	0.88	1.21
Feb-2018		20,032,513.38		15,220,221.97	1.08	1.22
May-2018		19,999,615.61		15,320,938.85	1.07	1.22
Aug-2018		18,066,268.46		15,421,655.74	0.97	1.21
Nov-2018		16,539,682.45		15,522,372.63	0.88	1.21
Feb-2019		20,539,408.59		15,623,089.51	1.08	1.21
May-2019		20,506,391.29		15,723,806.40	1.07	1.21
Aug-2019		18,543,282.28		15,824,523.29	0.97	1.21
Nov-2019		16,978,222.46		15,925,240.17	0.88	1.21
Feb-2020		21,062,465.05		16,025,957.06	1.08	1.21
May-2020		21,029,553.94		16,126,673.95	1.07	1.21
Aug-2020		19,017,264.05		16,227,390.83	0.97	1.21
Nov-2020		17,408,713.13		16,328,107.72	0.88	1.21
Feb-2021		21,590,523.53		16,428,824.61	1.08	1.21
May-2021		21,554,816.91		16,529,541.49	1.07	1.21
Aug-2021		19,489,816.80		16,630,258.38	0.97	1.21

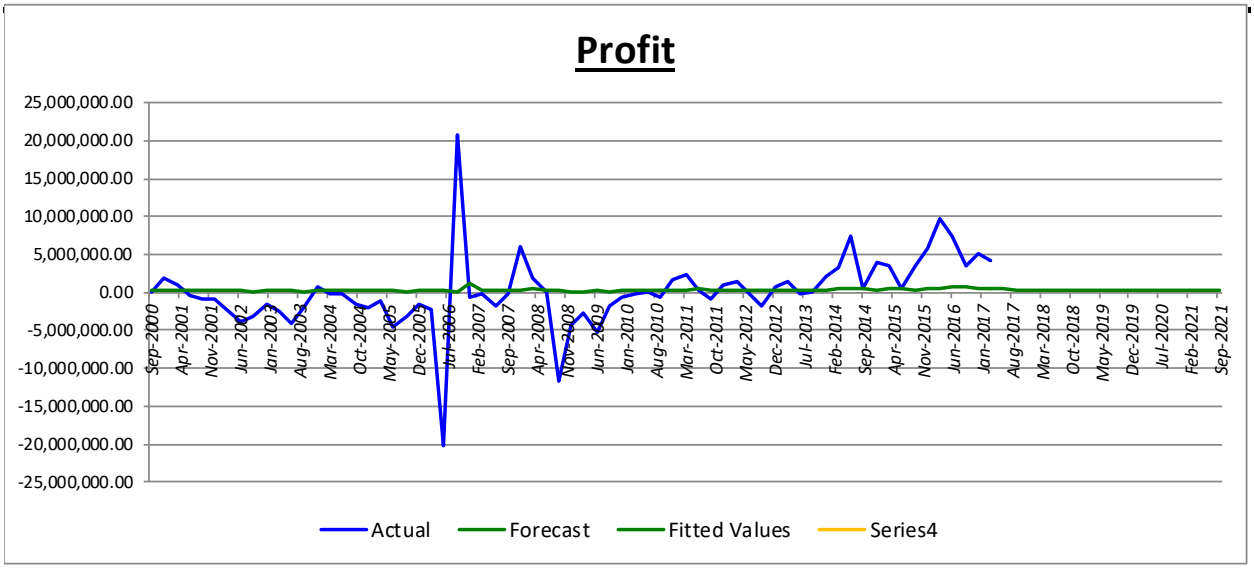
ForecastX Configuration Parameters

Item	Value
Data range selected	[Transportation Data for Forecasting.xlsx]Sheet1'!$A$1:$B$68
Time scale for data	Quarterly
Periods to forecast	17.00
Seasonal Length	
Replace Outliers Activated	No
Replace Outliers Standard Deviations	
Replace Outliers Forecasting Technique	
Replace Missing Values	No
Replace Missing Values (Lower Limit)	
Replace Missing Values (Upper Limit)	
Remove Leading Zeroes	Yes
Remove Trailing Zeroes	No
Use Holdback Evaluation	No
Holdback Evaluation Period	
Apply Tracking Signal	No
Apply Tracking Signal (Under Forecast Percentage)	
Apply Tracking Signal (Over Forecast Percentage)	
Forecast Method Selected	Decomposition

Report Details

Run Date: 5/3/2017 10:59:53 PM
Author: Collin
Note:

Appendix S: Box Jenkins Model (AR(1))



Forecast -- Box Jenkins Selected		
		Forecast
Date	Quarterly	Annual
Jun-2017	499,927.41	
Sep-2017	342,044.35	
Dec-2017	335,322.87	1,177,294.63
Mar-2018	335,036.72	
Jun-2018	335,024.54	
Sep-2018	335,024.02	
Dec-2018	335,024.00	1,340,109.29
Mar-2019	335,024.00	
Jun-2019	335,024.00	
Sep-2019	335,024.00	
Dec-2019	335,024.00	1,340,096.00
Mar-2020	335,024.00	
Jun-2020	335,024.00	
Sep-2020	335,024.00	
Dec-2020	335,024.00	1,340,096.00
Mar-2021	335,024.00	
Jun-2021	335,024.00	
Sep-2021	335,024.00	
Total	6,202,667.92	
Avg	344,592.66	1,299,398.98
Max	499,927.41	1,340,109.29
Min	335,024.00	1,177,294.63

Summary Comments	
The forecast has an average error of	189.02%
The data has a standard deviation of	4,854,380.18
The forecast exceeds the accuracy of a simple average by	1.42%

Audit Trail - Summary Analysis

Audit Trail - Historical Versus Fitted Analysis

Series:Profit

Dates	Original Data	Fitted Data	Error	Series % Change	Forecast % Change	Cumulative Error	Cumulative MAPE
Sep-2000	23,702.00	334,459.76	-310,757.76			-310,757.76	1311.10%
Dec-2000	1,899,096.00	321,770.25	1,577,325.75	7912.39%	-3.79%	633,284.00	676.32%
Mar-2001	937,327.00	401,610.41	535,716.59	-50.64%	24.81%	600,761.53	457.23%
Jun-2001	-327,425.00	360,665.53	-688,090.53	-134.93%	-10.20%	278,548.51	356.06%
Sep-2001	-909,776.00	306,821.91	-1,216,597.91	177.86%	-14.93%	-20,480.77	290.19%
Dec-2001	-923,115.00	282,029.79	-1,205,144.79	1.47%	-8.08%	-217,924.77	245.45%
Mar-2002	-2,560,103.00	281,461.91	-2,841,564.91	177.33%	-0.20%	-592,730.51	212.65%
Jun-2002	-3,873,515.00	211,771.29	-4,085,286.29	51.30%	-24.76%	-1,029,299.98	187.72%
Sep-2002	-3,250,361.00	155,856.09	-3,406,217.09	-16.09%	-26.40%	-1,293,401.88	168.16%
Dec-2002	-1,469,850.00	182,385.30	-1,652,235.30	-54.78%	17.02%	-1,329,285.22	152.46%
Mar-2003	-2,494,531.00	258,186.05	-2,752,717.05	69.71%	41.56%	-1,458,688.12	139.52%
Jun-2003	-4,150,742.00	214,562.85	-4,365,304.85	66.39%	-16.90%	-1,700,906.18	128.62%
Sep-2003	-1,920,924.00	144,053.85	-2,064,977.85	-53.72%	-32.86%	-1,728,911.69	119.36%
Dec-2003	647,420.00	238,982.72	408,437.28	-133.70%	65.90%	-1,576,243.91	111.16%
Mar-2004	-265,900.00	348,323.47	-614,223.47	-141.07%	45.75%	-1,512,109.21	104.77%
Jun-2004	-176,064.00	309,441.18	-485,505.18	-33.79%	-11.16%	-1,447,946.46	99.30%
Sep-2004	-1,456,177.00	313,265.72	-1,769,442.72	727.07%	1.24%	-1,466,858.00	93.88%
Dec-2004	-1,915,125.00	258,768.15	-2,173,893.15	31.52%	-17.40%	-1,506,137.73	89.02%
Mar-2005	-1,123,527.00	239,229.59	-1,362,756.59	-41.33%	-7.55%	-1,498,591.36	84.67%
Jun-2005	-4,609,595.00	272,929.88	-4,882,524.88	310.28%	14.09%	-1,667,788.03	80.70%
Sep-2005	-3,207,135.00	124,519.35	-3,331,654.35	-30.42%	-54.38%	-1,747,019.76	77.09%
Dec-2005	-1,487,161.00	184,225.53	-1,671,386.53	-53.63%	47.95%	-1,743,581.89	73.82%
Mar-2006	-2,333,166.00	257,449.08	-2,590,615.08	56.89%	39.75%	-1,780,409.42	70.82%
Jun-2006	-20,192,434.00	221,432.56	-20,413,866.56	765.45%	-13.99%	-2,556,803.47	68.05%
Sep-2006	20,862,482.00	0.00	20,862,482.00	-203.32%	-100.00%	-1,620,032.05	65.48%
Dec-2006	-694,110.00	1,208,928.63	-1,903,038.63	-103.33%	120892863.30%	-1,630,916.92	63.37%
Mar-2007	-161,700.00	291,211.22	-452,911.22	-76.70%	-75.91%	-1,587,287.08	61.41%
Jun-2007	-1,820,559.00	313,877.23	-2,134,436.23	1025.89%	7.78%	-1,606,828.12	59.36%
Sep-2007	-67,019.00	243,255.50	-310,274.50	-96.32%	-22.50%	-1,562,119.37	57.87%
Dec-2007	5,979,562.00	317,908.04	5,661,653.96	-9022.19%	30.69%	-1,321,326.93	56.04%
Mar-2008	1,800,249.00	575,325.94	1,224,923.06	-69.89%	80.97%	-1,239,189.83	54.31%
Jun-2008	-21,387.00	397,402.25	-418,789.25	-101.19%	-30.93%	-1,213,552.31	54.52%
Sep-2008	-11,599,703.00	319,850.70	-11,919,553.70	54137.17%	-19.51%	-1,537,976.60	52.96%
Dec-2008	-4,276,656.00	0.00	-4,276,656.00	-63.13%	-100.00%	-1,618,525.99	51.49%
Mar-2009	-2,718,557.00	138,693.38	-2,857,250.38	-36.43%	13869338.19%	-1,653,918.12	50.11%
Jun-2009	-5,154,919.00	205,025.51	-5,359,944.51	89.62%	47.83%	-1,756,863.29	48.80%
Sep-2009	-1,844,758.00	101,303.55	-1,946,061.55	-64.21%	-50.59%	-1,761,976.76	47.55%
Dec-2009	-628,662.00	242,225.29	-870,887.29	-65.92%	139.11%	-1,738,527.04	46.40%
Mar-2010	-102,224.00	293,997.50	-396,221.50	-83.74%	21.37%	-1,704,108.95	45.46%
Jun-2010	49,366.00	316,409.27	-267,043.27	-148.29%	7.62%	-1,668,182.31	44.67%
Sep-2010	-615,726.00	322,862.83	-938,588.83	-1347.27%	2.04%	-1,650,387.34	43.67%
Dec-2010	1,595,509.00	294,548.22	1,300,960.78	-359.13%	-8.77%	-1,580,117.15	42.67%
Mar-2011	2,369,313.00	388,685.96	1,980,627.04	48.50%	31.96%	-1,497,309.15	41.73%
Jun-2011	316,898.00	421,628.71	-104,730.71	-86.62%	8.48%	-1,465,659.64	40.79%
Sep-2011	-848,148.00	334,252.33	-1,182,400.33	-367.64%	-20.72%	-1,459,364.98	39.96%
Dec-2011	1,003,401.00	284,653.44	718,747.56	-218.30%	-14.84%	-1,412,014.71	39.12%
Mar-2012	1,482,415.00	363,478.46	1,118,936.54	47.74%	27.69%	-1,358,164.68	38.32%
Jun-2012	-245,480.00	383,871.27	-629,351.27	-116.56%	5.61%	-1,342,981.07	37.64%
Sep-2012	-1,691,852.00	310,310.51	-2,002,162.51	589.20%	-19.16%	-1,356,433.75	36.92%
Dec-2012	771,313.00	248,734.88	522,578.12	-145.59%	-19.84%	-1,318,853.52	36.21%
Mar-2013	1,369,708.00	353,597.90	1,016,110.10	77.58%	42.16%	-1,273,069.92	35.53%
Jun-2013	-85,437.00	379,073.06	-464,510.06	-106.24%	7.20%	-1,257,520.69	35.04%
Sep-2013	-45,631.00	317,123.94	-362,754.94	-46.59%	-16.34%	-1,240,638.32	34.66%
Dec-2013	2,146,407.00	318,818.58	1,827,588.42	-4803.84%	0.53%	-1,183,819.30	34.05%
Mar-2014	3,222,741.00	412,139.05	2,810,601.95	50.15%	29.27%	-1,111,193.46	33.46%
Jun-2014	7,387,696.00	457,961.25	6,929,734.75	129.24%	11.12%	-967,605.46	32.89%
Sep-2014	571,550.00	635,273.68	-63,723.68	-92.26%	38.72%	-951,747.88	32.32%
Dec-2014	3,892,258.00	345,093.50	3,547,164.50	581.00%	-45.68%	-874,180.43	31.79%
Mar-2015	3,522,648.00	486,464.25	3,036,183.75	-9.50%	40.97%	-807,903.07	31.28%
Jun-2015	515,510.00	470,729.03	44,780.97	-85.37%	-3.23%	-793,691.67	30.76%
Sep-2015	3,544,778.00	342,707.74	3,202,070.26	587.63%	-27.20%	-728,187.37	30.28%
Dec-2015	5,736,223.00	471,671.16	5,264,551.84	61.82%	37.63%	-631,530.29	29.81%
Mar-2016	9,655,117.00	564,966.39	9,090,150.61	68.32%	19.78%	-477,217.89	29.36%
Jun-2016	7,453,235.00	731,803.40	6,721,431.60	-22.81%	29.53%	-364,739.00	28.93%
Sep-2016	3,500,785.00	638,063.84	2,862,721.16	-53.03%	-12.81%	-315,085.76	28.50%

Dec-2016	5,108,989.00	469,798.27	4,639,190.73	45.94%	-26.37%	-240,020.97	28.09%
Mar-2017	4,208,499.00	538,263.49	3,670,235.51	-17.63%	14.57%	-181,658.93	27.69%
Avg	153,806.61	335,465.54	-181,658.93	744.40%	2041853.41%	-1,190,085.23	107.30%
Max	20,862,482.00	1,208,928.63	20,862,482.00	54137.17%	120892863.30%	633,284.00	1311.10%
Min	-20,192,434.00	0.00	-20,413,866.56	-9022.19%	-100.00%	-2,556,803.47	27.69%
StDev	4,854,380.18	174,000.65	4,816,279.88	6869.29%	14952374.66%	615,155.64	183.88%
Var	###############	###############	###############	471871.17%	###############	###############	338.13%
Median	-102,224.00	316,409.27	-452,911.22	-38.88%	0.89%	-1,358,164.68	51.49%

Audit Trail - Statistics

Accuracy Measures	**Value**
AIC	2,255.15
BIC	2,259.56
MAPE	189.02%
Sum Squared Error (SSE)	###############
R-Square	1.42%
Adjusted R-Square	0.00%
Root Mean Square Error	4,783,652.85

Forecast Statistics	**Value**
Mean	153,806.61
Standard Deviation	4,854,380.18
Ljung-Box	13.94

Method Statistics	**Value**
Method Selected	Box Jenkins
Model Selected	ARIMA(1,0,0) * (0,0,0)
T-Test For Non Seasonal AR	0.34
T-Test For Constant	0.56

ForecastX Configuration Parameters

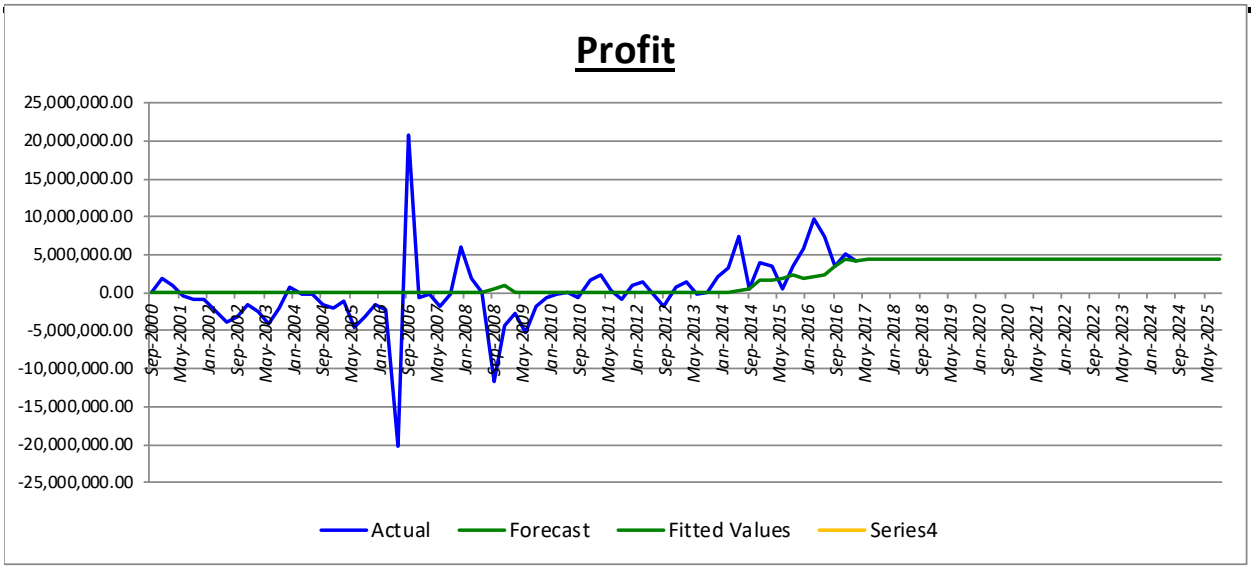
Item	**Value**
Data range selected	[Transportation Data for Forecasting.xlsx]Sheet1'!$A$1:$B$68
Time scale for data	Quarterly
Periods to forecast	18.00
Seasonal Length	
Replace Outliers Activated	No
Replace Outliers Standard Deviations	
Replace Outliers Forecasting Technique	
Replace Missing Values	No
Replace Missing Values (Lower Limit)	
Replace Missing Values (Upper Limit)	
Remove Leading Zeroes	Yes
Remove Trailing Zeroes	No
Use Holdback Evaluation	No
Holdback Evaluation Period	
Apply Tracking Signal	No
Apply Tracking Signal (Under Forecast Percentage)	
Apply Tracking Signal (Over Forecast Percentage)	
Forecast Method Selected	Box Jenkins

Report Details

Run Date: 3/20/2017 5:15:08 PM
Author: Collin
Note:

White Noise Test: Degrees of Freedom: m-p-q-P-Q=12-1-0-0-0=11
Calculated Q=13.94
Critical Value of Q, α=0.05 is 19.675
Fail to Reject that there is White Noise

Appendix T: Box Jenkins Model (3,1,2)



Forecast -- Box Jenkins Selected		
		Forecast
Date	Quarterly	Annual
Jun-2017	4,426,276.46	
Sep-2017	4,379,300.21	
Dec-2017	4,400,727.13	13,206,303.80
Mar-2018	4,389,655.04	
Jun-2018	4,394,445.95	
Sep-2018	4,392,518.23	
Dec-2018	4,393,307.61	17,569,926.84
Mar-2019	4,392,976.56	
Jun-2019	4,393,115.67	
Sep-2019	4,393,057.53	
Dec-2019	4,393,081.78	17,572,231.54
Mar-2020	4,393,071.66	
Jun-2020	4,393,075.89	
Sep-2020	4,393,074.12	
Dec-2020	4,393,074.86	17,572,296.52
Mar-2021	4,393,074.55	
Jun-2021	4,393,074.68	
Sep-2021	4,393,074.62	
Dec-2021	4,393,074.65	17,572,298.50
Mar-2022	4,393,074.64	
Jun-2022	4,393,074.64	
Sep-2022	4,393,074.64	
Dec-2022	4,393,074.64	17,572,298.56
Mar-2023	4,393,074.64	
Jun-2023	4,393,074.64	
Sep-2023	4,393,074.64	
Dec-2023	4,393,074.64	17,572,298.56
Mar-2024	4,393,074.64	
Jun-2024	4,393,074.64	
Sep-2024	4,393,074.64	
Dec-2024	4,393,074.64	17,572,298.56
Mar-2025	4,393,074.64	
Jun-2025	4,393,074.64	
Sep-2025	4,393,074.64	
Total	149,389,176.81	
Avg	4,393,799.32	17,026,244.11
Max	4,426,276.46	17,572,298.56
Min	4,379,300.21	13,206,303.80

Summary Comments	
The forecast has an average error of	101.43%
The data has a standard deviation of	4,854,380.18
The forecast exceeds the accuracy of a simple average by	9.58%

Audit Trail - Summary Analysis

Audit Trail - Historical Versus Fitted Analysis

Series:Profit

Dates	Original Data	Fitted Data	Error	Series % Change	Forecast % Change	Cumulative Error	Cumulative MAPE
Sep-2000	23,702.00	23,702.00	0.00			0.00	0.00%
Dec-2000	1,899,096.00	0.00	1,899,096.00	7912.39%	-100.00%	949,548.00	25.00%
Mar-2001	937,327.00	0.00	937,327.00	-50.64%	0.00%	945,474.33	27.78%
Jun-2001	-327,425.00	0.00	-327,425.00	-134.93%	0.00%	627,249.50	27.08%
Sep-2001	-909,776.00	171,857.46	-1,081,633.46	177.86%	17185746.09%	285,472.91	26.42%
Dec-2001	-923,115.00	161,287.86	-1,084,402.86	1.47%	-6.15%	57,160.28	25.28%
Mar-2002	-2,560,103.00	15,830.52	-2,575,933.52	177.33%	-90.18%	-318,995.98	23.72%
Jun-2002	-3,873,515.00	0.00	-3,873,515.00	51.30%	-100.00%	-763,310.86	22.32%
Sep-2002	-3,250,361.00	0.00	-3,250,361.00	-16.09%	0.00%	-1,039,649.76	21.08%
Dec-2002	-1,469,850.00	0.00	-1,469,850.00	-54.78%	0.00%	-1,082,669.78	19.97%
Mar-2003	-2,494,531.00	0.00	-2,494,531.00	69.71%	0.00%	-1,211,020.80	18.98%
Jun-2003	-4,150,742.00	0.00	-4,150,742.00	66.39%	0.00%	-1,455,997.57	18.09%
Sep-2003	-1,920,924.00	0.00	-1,920,924.00	-53.72%	0.00%	-1,491,761.14	17.29%
Dec-2003	647,420.00	0.00	647,420.00	-133.70%	0.00%	-1,338,962.49	16.57%
Mar-2004	-265,900.00	0.00	-265,900.00	-141.07%	0.00%	-1,267,424.99	15.91%
Jun-2004	-176,064.00	0.00	-176,064.00	-33.79%	0.00%	-1,199,214.93	15.30%
Sep-2004	-1,456,177.00	0.00	-1,456,177.00	727.07%	0.00%	-1,214,330.34	14.75%
Dec-2004	-1,915,125.00	0.00	-1,915,125.00	31.52%	0.00%	-1,253,263.38	14.24%
Mar-2005	-1,123,527.00	0.00	-1,123,527.00	-41.33%	0.00%	-1,246,435.15	13.77%
Jun-2005	-4,609,595.00	0.00	-4,609,595.00	310.28%	0.00%	-1,414,593.14	13.33%
Sep-2005	-3,207,135.00	0.00	-3,207,135.00	-30.42%	0.00%	-1,499,952.28	12.92%
Dec-2005	-1,487,161.00	0.00	-1,487,161.00	-53.63%	0.00%	-1,499,370.86	12.54%
Mar-2006	-2,333,166.00	0.00	-2,333,166.00	56.89%	0.00%	-1,535,622.82	12.18%
Jun-2006	-20,192,434.00	0.00	-20,192,434.00	765.45%	0.00%	-2,312,989.95	11.85%
Sep-2006	20,862,482.00	0.00	20,862,482.00	-203.32%	0.00%	-1,385,971.07	11.53%
Dec-2006	-694,110.00	0.00	-694,110.00	-103.33%	0.00%	-1,359,361.03	11.24%
Mar-2007	-161,700.00	0.00	-161,700.00	-76.70%	0.00%	-1,315,003.22	10.96%
Jun-2007	-1,820,559.00	0.00	-1,820,559.00	1025.89%	0.00%	-1,333,058.78	10.70%
Sep-2007	-67,019.00	0.00	-67,019.00	-96.32%	0.00%	-1,289,402.24	10.45%
Dec-2007	5,979,562.00	0.00	5,979,562.00	-9022.19%	0.00%	-1,047,103.43	10.21%
Mar-2008	1,800,249.00	0.00	1,800,249.00	-69.89%	0.00%	-955,253.35	9.98%
Jun-2008	-21,387.00	68,160.64	-89,547.64	-101.19%	6816063.73%	-928,200.05	10.08%
Sep-2008	-11,599,703.00	478,402.45	-12,078,105.45	54137.17%	601.87%	-1,266,075.97	9.87%
Dec-2008	-4,276,656.00	1,012,896.04	-5,289,552.04	-63.13%	111.72%	-1,384,413.50	9.69%
Mar-2009	-2,718,557.00	0.00	-2,718,557.00	-36.43%	-100.00%	-1,422,531.88	9.49%
Jun-2009	-5,154,919.00	0.00	-5,154,919.00	89.62%	0.00%	-1,526,209.30	9.31%
Sep-2009	-1,844,758.00	0.00	-1,844,758.00	-64.21%	0.00%	-1,534,818.73	9.13%
Dec-2009	-628,662.00	0.00	-628,662.00	-65.92%	0.00%	-1,510,972.50	8.96%
Mar-2010	-102,224.00	0.00	-102,224.00	-83.74%	0.00%	-1,474,850.74	8.79%
Jun-2010	49,366.00	0.00	49,366.00	-148.29%	0.00%	-1,436,745.32	8.64%
Sep-2010	-615,726.00	0.00	-615,726.00	-1347.27%	0.00%	-1,416,720.46	8.48%
Dec-2010	1,595,509.00	0.00	1,595,509.00	-359.13%	0.00%	-1,345,000.71	8.34%
Mar-2011	2,369,313.00	0.00	2,369,313.00	48.50%	0.00%	-1,258,621.32	8.20%
Jun-2011	316,898.00	0.00	316,898.00	-86.62%	0.00%	-1,222,814.07	8.06%
Sep-2011	-848,148.00	0.00	-848,148.00	-367.64%	0.00%	-1,214,488.15	7.93%
Dec-2011	1,003,401.00	0.00	1,003,401.00	-218.30%	0.00%	-1,166,273.17	7.81%
Mar-2012	1,482,415.00	0.00	1,482,415.00	47.74%	0.00%	-1,109,918.11	7.69%
Jun-2012	-245,480.00	0.00	-245,480.00	-116.56%	0.00%	-1,091,908.98	7.57%
Sep-2012	-1,691,852.00	68,488.84	-1,760,340.84	589.20%	6848883.94%	-1,105,550.45	7.46%
Dec-2012	771,313.00	127,470.96	643,842.04	-145.59%	86.12%	-1,070,562.60	7.34%
Mar-2013	1,369,708.00	0.00	1,369,708.00	77.58%	-100.00%	-1,022,714.15	7.24%
Jun-2013	-85,437.00	0.00	-85,437.00	-106.24%	0.00%	-1,004,689.59	7.14%
Sep-2013	-45,631.00	121,530.50	-167,161.50	-46.59%	12153050.08%	-988,887.17	7.13%
Dec-2013	2,146,407.00	126,359.15	2,020,047.85	-4803.84%	3.97%	-933,166.16	7.03%
Mar-2014	3,222,741.00	14,910.78	3,207,830.22	50.15%	-88.20%	-857,875.31	6.94%
Jun-2014	7,387,696.00	245,170.39	7,142,525.61	129.24%	1544.25%	-715,011.01	6.84%
Sep-2014	571,550.00	485,360.62	86,189.38	-92.26%	97.97%	-700,954.86	6.73%
Dec-2014	3,892,258.00	1,770,063.39	2,122,194.61	581.00%	264.69%	-652,279.87	6.63%
Mar-2015	3,522,648.00	1,563,401.09	1,959,246.91	-9.50%	-11.68%	-608,016.71	6.53%
Jun-2015	515,510.00	1,946,543.54	-1,431,033.54	-85.37%	24.51%	-621,733.65	6.50%
Sep-2015	3,544,778.00	2,277,765.78	1,267,012.22	587.63%	17.02%	-590,770.61	6.40%
Dec-2015	5,736,223.00	1,963,704.51	3,772,518.49	61.82%	-13.79%	-520,394.98	6.32%
Mar-2016	9,655,117.00	2,063,895.71	7,591,221.29	68.32%	5.10%	-391,639.16	6.24%
Jun-2016	7,453,235.00	2,379,823.42	5,073,411.58	-22.81%	15.31%	-306,247.74	6.16%
Sep-2016	3,500,785.00	3,520,687.93	-19,902.93	-53.03%	47.94%	-301,842.44	6.06%

Dec-2016	5,108,989.00	4,335,843.94	773,145.06	45.94%	23.15%	-285,554.75	5.97%
Mar-2017	4,208,499.00	4,264,901.56	-56,402.56	-17.63%	-1.64%	-282,134.57	5.89%
Avg	153,806.61	435,941.18	-282,134.57	744.40%	651605.69%	-958,752.28	11.58%
Max	20,862,482.00	4,335,843.94	20,862,482.00	54137.17%	17185746.09%	949,548.00	27.78%
Min	-20,192,434.00	0.00	-20,192,434.00	-9022.19%	-100.00%	-2,312,989.95	0.00%
StDev	4,854,380.18	1,004,901.23	4,607,226.88	6869.29%	2796672.46%	604,340.16	6.14%
Var	###############	###############	###############	471871.17%	###############	###############	0.38%
Median	-102,224.00	0.00	-167,161.50	-38.88%	0.00%	-1,109,918.11	9.49%

Audit Trail - Statistics

Accuracy Measures	**Value**
AIC	2,255.37
BIC	2,266.39
MAPE	101.43%
Sum Squared Error (SSE)	###############
R-Square	9.58%
Adjusted R-Square	3.75%
Root Mean Square Error	4,581,410.86

Forecast Statistics	**Value**
Mean	153,806.61
Standard Deviation	4,854,380.18
Ljung-Box	7.04

Method Statistics	**Value**
Method Selected	Box Jenkins
Model Selected	ARIMA(3,1,2) * (0,0,0)
T-Test For Non Seasonal AR	-0.06
T-Test For Non Seasonal AR	-0.05
T-Test For Non Seasonal AR	-0.10
T-Test For Non Seasonal MA	0.05
T-Test For Non Seasonal MA	0.03

ForecastX Configuration Parameters

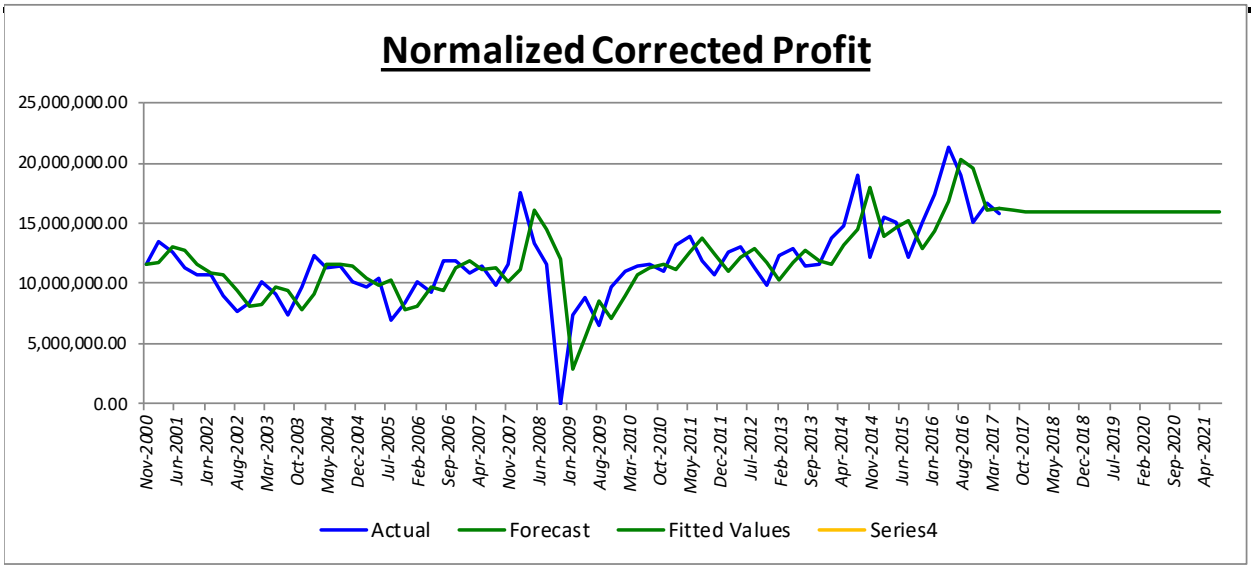
Item	**Value**
Data range selected	[Transportation Data for Forecasting.xlsx]Sheet1'!$A$1:$B$68
Time scale for data	Quarterly
Periods to forecast	34.00
Seasonal Length	
Replace Outliers Activated	No
Replace Outliers Standard Deviations	
Replace Outliers Forecasting Technique	
Replace Missing Values	No
Replace Missing Values (Lower Limit)	
Replace Missing Values (Upper Limit)	
Remove Leading Zeroes	Yes
Remove Trailing Zeroes	No
Use Holdback Evaluation	No
Holdback Evaluation Period	
Apply Tracking Signal	No
Apply Tracking Signal (Under Forecast Percentage)	
Apply Tracking Signal (Over Forecast Percentage)	
Forecast Method Selected	Box Jenkins

Report Details

Run Date: 3/27/2017 5:13:26 PM
Author: Collin
Note:

White Noise Test: Degrees of Freedom: m-p-q-P-Q=12-3-2-0-0=7
Calculated Q=7.04
Critical Value of Q, α=0.05 is 14.067
Fail to reject that there is white noise

Appendix U: Box Jenkins (1,1,0) Sensitivity Analysis



Forecast -- Box Jenkins Selected		
		Forecast
Date	Quarterly	Annual
Aug-2017	16,035,421.93	
Nov-2017	15,978,087.71	32,013,509.64
Feb-2018	15,992,554.81	
May-2018	15,988,904.34	
Aug-2018	15,989,825.46	
Nov-2018	15,989,593.03	63,960,877.63
Feb-2019	15,989,651.68	
May-2019	15,989,636.88	
Aug-2019	15,989,640.61	
Nov-2019	15,989,639.67	63,958,568.84
Feb-2020	15,989,639.91	
May-2020	15,989,639.85	
Aug-2020	15,989,639.86	
Nov-2020	15,989,639.86	63,958,559.48
Feb-2021	15,989,639.86	
May-2021	15,989,639.86	
Aug-2021	15,989,639.86	
Total	271,860,435.18	
Avg	15,991,790.30	55,972,878.90
Max	16,035,421.93	63,960,877.63
Min	15,978,087.71	32,013,509.64

Summary Comments	
The forecast has an average error of	15.29%
The data has a standard deviation of	3,285,729.92
The forecast exceeds the accuracy of a simple average by	33.81%

Audit Trail - Summary Analysis

Audit Trail - Historical Versus Fitted Analysis

Series:Normalized Corrected Profit

Dates	Original Data	Fitted Data	Error	Series % Change	Forecast % Change	Cumulative Error	Cumulative MAPE
Nov-2000	11,623,405.00	11,623,405.00	0.00			0.00	0.00%
Feb-2001	13,498,799.00	11,742,811.40	1,755,987.60	16.13%	1.03%	877,993.80	3.25%
May-2001	12,537,030.00	13,025,582.31	-488,552.31	-7.12%	10.92%	422,478.43	2.60%
Aug-2001	11,272,278.00	12,779,712.42	-1,507,434.42	-10.09%	-1.89%	-59,999.78	2.79%
Nov-2001	10,689,927.00	11,591,411.88	-901,484.88	-5.17%	-9.30%	-228,296.80	2.57%
Feb-2002	10,676,588.00	10,836,871.17	-160,283.17	-0.12%	-6.51%	-216,961.19	2.18%
May-2002	9,039,600.00	10,679,953.82	-1,640,353.82	-15.33%	-1.45%	-420,303.00	2.24%
Aug-2002	7,726,188.00	9,452,659.90	-1,726,471.90	-14.53%	-11.49%	-583,574.11	2.31%
Nov-2002	8,349,342.00	8,057,600.22	291,741.78	8.07%	-14.76%	-486,316.79	2.10%
Feb-2003	10,129,853.00	8,192,102.04	1,937,750.96	21.33%	1.67%	-243,910.01	2.08%
May-2003	9,105,172.00	9,680,578.06	-575,406.06	-10.12%	18.17%	-274,046.02	1.94%
Aug-2003	7,448,961.00	9,363,728.95	-1,914,767.95	-18.19%	-3.27%	-410,772.85	1.96%
Nov-2003	9,678,779.00	7,866,871.42	1,811,907.58	29.93%	-15.99%	-239,797.43	1.92%
Feb-2004	12,247,123.00	9,116,130.78	3,130,992.22	26.54%	15.88%	973.26	1.91%
May-2004	11,333,803.00	11,599,054.78	-265,251.78	-7.46%	27.24%	-16,775.07	1.79%
Aug-2004	11,423,639.00	11,564,260.32	-140,621.32	0.79%	-0.30%	-24,515.47	1.69%
Nov-2004	10,143,526.00	11,400,970.75	-1,257,444.75	-11.21%	-1.41%	-97,040.72	1.63%
Feb-2005	9,684,578.00	10,466,535.91	-781,957.91	-4.52%	-8.20%	-135,091.67	1.56%
May-2005	10,476,176.00	9,800,383.99	675,792.01	8.17%	-6.36%	-92,413.58	1.50%
Aug-2005	6,990,108.00	10,276,432.70	-3,286,324.70	-33.28%	4.86%	-252,109.14	1.54%
Nov-2005	8,392,568.00	7,869,744.80	522,823.20	20.06%	-23.42%	-215,207.60	1.48%
Feb-2006	10,112,542.00	8,038,686.37	2,073,855.63	20.49%	2.15%	-111,159.27	1.46%
May-2006	9,266,537.00	9,678,542.31	-412,005.31	-8.37%	20.40%	-124,239.53	1.40%
Aug-2006	11,934,727.00	9,480,008.78	2,454,718.22	28.79%	-2.05%	-16,782.96	1.38%
Nov-2006	11,934,727.00	11,261,464.71	673,262.29	0.00%	18.79%	10,818.85	1.33%
Feb-2007	10,905,593.00	11,934,727.00	-1,029,134.00	-8.62%	5.98%	-29,179.34	1.30%
May-2007	11,438,003.00	11,165,273.57	272,729.43	4.88%	-6.45%	-17,997.53	1.25%
Aug-2007	9,779,144.00	11,303,660.40	-1,524,516.40	-14.50%	1.24%	-71,801.78	1.23%
Nov-2007	11,532,684.00	10,197,722.59	1,334,961.41	17.93%	-9.78%	-23,292.70	1.20%
Feb-2008	17,579,265.00	11,090,214.63	6,489,050.37	52.43%	8.75%	193,785.40	1.20%
May-2008	13,399,952.00	16,053,535.97	-2,653,583.97	-23.77%	44.75%	101,934.78	1.18%
Aug-2008	11,578,316.00	14,454,514.77	-2,876,198.77	-13.59%	-9.96%	8,868.10	1.17%
Nov-2008	0.00	12,037,967.98	-12,037,967.98	-100.00%	-16.72%	-356,187.54	1.13%
Feb-2009	7,323,047.00	2,921,547.38	4,401,499.62	732304700.00%	-75.73%	-216,255.56	1.15%
May-2009	8,881,146.00	5,475,228.30	3,405,917.70	21.28%	87.41%	-112,764.90	1.15%
Aug-2009	6,444,784.00	8,487,992.10	-2,043,208.10	-27.43%	55.03%	-166,388.32	1.14%
Nov-2009	9,754,945.00	7,059,549.31	2,695,395.69	51.36%	-16.83%	-89,042.80	1.13%
Feb-2010	10,971,041.00	8,919,694.67	2,051,346.33	12.47%	26.35%	-32,716.77	1.12%
May-2010	11,497,479.00	10,664,184.45	833,294.55	4.80%	19.56%	-10,511.36	1.09%
Aug-2010	11,649,069.00	11,364,643.31	284,425.69	1.32%	6.57%	-3,137.93	1.07%
Nov-2010	10,983,977.00	11,610,818.41	-626,841.41	-5.71%	2.17%	-18,350.21	1.04%
Feb-2011	13,195,212.00	11,151,799.14	2,043,412.86	20.13%	-3.95%	30,739.39	1.03%
May-2011	13,969,016.00	12,637,252.81	1,331,763.19	5.86%	13.32%	60,995.75	1.01%
Aug-2011	11,916,601.00	13,773,762.64	-1,857,161.64	-14.69%	8.99%	17,401.27	0.99%
Nov-2011	10,751,555.00	12,434,485.26	-1,682,930.26	-9.78%	-9.72%	-20,383.88	0.98%
Feb-2012	12,603,104.00	11,045,530.14	1,557,573.86	17.22%	-11.17%	13,919.55	0.96%
May-2012	13,082,118.00	12,135,904.10	946,213.90	3.80%	9.87%	33,755.60	0.95%
Aug-2012	11,354,223.00	12,961,248.77	-1,607,025.77	-13.21%	6.80%	-427.34	0.93%
Nov-2012	9,907,851.00	11,790,221.39	-1,882,370.39	-12.74%	-9.03%	-38,834.34	0.92%
Feb-2013	12,371,016.00	10,272,812.91	2,098,203.09	24.86%	-12.87%	3,906.40	0.91%
May-2013	12,969,411.00	11,749,487.51	1,219,923.49	4.84%	14.37%	27,749.88	0.90%
Aug-2013	11,514,266.00	12,818,418.46	-1,304,152.46	-11.22%	9.10%	2,136.37	0.88%
Nov-2013	11,554,072.00	11,881,441.59	-327,369.59	0.35%	-7.31%	-4,080.72	0.87%
Feb-2014	13,746,110.00	11,544,027.78	2,202,082.22	18.97%	-2.84%	36,774.15	0.86%
May-2014	14,822,444.00	13,192,994.77	1,629,449.23	7.83%	14.28%	65,731.87	0.84%
Aug-2014	18,987,399.00	14,550,853.49	4,436,545.51	28.10%	10.29%	143,782.12	0.84%
Nov-2014	12,171,253.00	17,936,459.18	-5,765,206.18	-35.90%	23.27%	40,115.66	0.84%
Feb-2015	15,491,961.00	13,891,165.77	1,600,795.23	27.28%	-22.55%	67,023.93	0.83%
May-2015	15,122,351.00	14,654,049.36	468,301.64	-2.39%	5.49%	73,825.24	0.81%
Aug-2015	12,115,213.00	15,215,614.40	-3,100,401.40	-19.89%	3.83%	20,921.46	0.81%
Nov-2015	15,144,481.00	12,874,001.77	2,270,479.23	25.00%	-15.39%	57,799.46	0.80%
Feb-2016	17,335,926.00	14,380,108.19	2,955,817.81	14.47%	11.70%	104,541.69	0.79%
May-2016	21,254,820.00	16,782,960.40	4,471,859.60	22.61%	16.71%	173,864.20	0.78%
Aug-2016	19,052,938.00	20,265,968.56	-1,213,030.56	-10.36%	20.75%	152,193.97	0.77%
Nov-2016	15,100,488.00	19,608,537.16	-4,508,049.16	-20.74%	-3.24%	80,497.92	0.77%

Feb-2017	16,708,692.00	16,097,806.60	610,885.40	10.65%	-17.90%	88,534.09	0.76%
May-2017	15,808,202.00	16,302,895.15	-494,693.15	-5.39%	1.27%	79,829.21	0.74%
Avg	11,753,509.61	11,673,680.40	79,829.21	11095527.02%	2.90%	-36,832.45	1.31%
Max	21,254,820.00	20,265,968.56	6,489,050.37	732304700.00%	87.41%	877,993.80	3.25%
Min	0.00	2,921,547.38	-12,037,967.98	-100.00%	-75.73%	-583,574.11	0.00%
StDev	3,285,729.92	3,001,764.22	2,672,031.86	90140477.22%	20.61%	200,947.34	0.59%
Var	###############	###############	###############	###############	4.25%	###############	0.00%
Median	11,514,266.00	11,564,260.32	272,729.43	0.57%	1.26%	-10,511.36	1.14%

Audit Trail - Statistics

Accuracy Measures	**Value**
AIC	2,174.17
BIC	2,176.37
MAPE	15.29%
Sum Squared Error (SSE)	###############
R-Square	33.81%
Adjusted R-Square	33.81%
Root Mean Square Error	2,653,217.56

Forecast Statistics	**Value**
Mean	11,753,509.61
Standard Deviation	3,285,729.92
Ljung-Box	22.06

Method Statistics	**Value**
Method Selected	Box Jenkins
Model Selected	ARIMA(1,1,0) * (0,0,0)
T-Test For Non Seasonal AR	-2.10

ForecastX Configuration Parameters

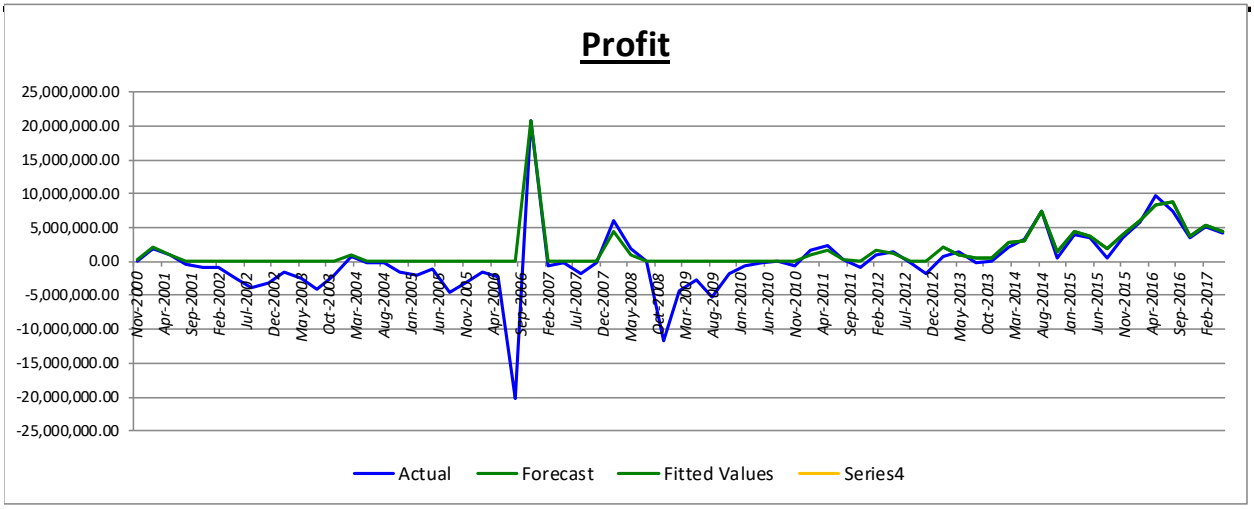
Item	**Value**
Data range selected	[Transportation Data for Forecasting.xlsx]Sheet1'!$A$1:$B$68
Time scale for data	Quarterly
Periods to forecast	17.00
Seasonal Length	
Replace Outliers Activated	No
Replace Outliers Standard Deviations	
Replace Outliers Forecasting Technique	
Replace Missing Values	No
Replace Missing Values (Lower Limit)	
Replace Missing Values (Upper Limit)	
Remove Leading Zeroes	Yes
Remove Trailing Zeroes	No
Use Holdback Evaluation	No
Holdback Evaluation Period	
Apply Tracking Signal	No
Apply Tracking Signal (Under Forecast Percentage)	
Apply Tracking Signal (Over Forecast Percentage)	
Forecast Method Selected	Box Jenkins

Report Details

Run Date: 5/4/2017 1:38:14 PM
Author: Collin
Note:

White Noise Test: Degrees of Freedom: m-p-q-P-Q=12-1-0-0-0=11
Calculated Q=22.06
Critical Value of Q, α=0.05 is 19.675
Reject that there is White Noise

Appendix V: Regression Model



Multiple Regression -- Result Formula

Profit = 188,381.43 + ((Domestic) * 1.24) + ((Dummy 1) * -4,173,152.25) + ((Dummy 2) * 5,707,265.39)

Forecast -- Multiple Regression Selected

		Forecast
Date	**Quarterly**	**Annual**
May-2013	888,996.33	
Aug-2013	620,667.91	
Nov-2013	470,487.61	1,980,151.85
Feb-2014	2,855,501.78	
May-2014	3,150,121.23	
Aug-2014	7,346,961.54	
Nov-2014	1,363,961.32	14,716,545.87
Feb-2015	4,541,575.44	
May-2015	3,701,272.55	
Aug-2015	1,955,823.61	
Nov-2015	3,984,217.18	14,182,888.78
Feb-2016	6,003,259.95	
May-2016	8,255,078.78	
Aug-2016	8,862,615.56	
Nov-2016	3,742,989.65	26,863,943.94
Feb-2017	5,456,377.85	
May-2017	4,436,343.03	
Total	67,636,251.33	
Avg	3,978,603.02	14,435,882.61
Max	8,862,615.56	26,863,943.94
Min	470,487.61	1,980,151.85

Summary Comments	
The forecast has an average error of	113.64%
The data has a standard deviation of	4,853,187.35
The forecast exceeds the accuracy of a simple average by	37.41%

Audit Trail - Summary Analysis

Audit Trail - Historical Versus Fitted Analysis

Series:Profit

Dates	Original Data	Fitted Data	Error	Series % Change	Forecast % Change	Cumulative Error	Cumulative MAPE
Nov-2000	23,702.00	361,239.38	-337,537.38			-337,537.38	1424.09%
Feb-2001	1,899,096.00	2,139,154.00	-240,058.00	7912.39%	492.17%	-288,797.69	715.20%
May-2001	937,327.00	870,192.90	67,134.10	-50.64%	-59.32%	-170,153.76	477.60%
Aug-2001	-327,425.00	0.00	-327,425.00	-134.93%	-100.00%	-209,471.57	364.45%
Nov-2001	-909,776.00	0.00	-909,776.00	177.86%	0.00%	-349,532.45	295.56%
Feb-2002	-923,115.00	0.00	-923,115.00	1.47%	0.00%	-445,129.55	249.08%
May-2002	-2,560,103.00	0.00	-2,560,103.00	177.33%	0.00%	-747,268.61	215.54%
Aug-2002	-3,873,515.00	0.00	-3,873,515.00	51.30%	0.00%	-1,138,049.41	190.16%
Nov-2002	-3,250,361.00	0.00	-3,250,361.00	-16.09%	0.00%	-1,372,750.70	170.26%
Feb-2003	-1,469,850.00	0.00	-1,469,850.00	-54.78%	0.00%	-1,382,460.63	154.24%
May-2003	-2,494,531.00	0.00	-2,494,531.00	69.71%	0.00%	-1,483,557.93	141.04%
Aug-2003	-4,150,742.00	0.00	-4,150,742.00	66.39%	0.00%	-1,705,823.27	129.98%
Nov-2003	-1,920,924.00	0.00	-1,920,924.00	-53.72%	0.00%	-1,722,369.48	120.58%
Feb-2004	647,420.00	941,687.69	-294,267.69	-133.70%	94168768.86%	-1,620,362.21	112.19%
May-2004	-265,900.00	0.00	-265,900.00	-141.07%	-100.00%	-1,530,064.73	105.16%
Aug-2004	-176,064.00	0.00	-176,064.00	-33.79%	0.00%	-1,445,439.69	98.98%
Nov-2004	-1,456,177.00	0.00	-1,456,177.00	727.07%	0.00%	-1,446,071.29	93.50%
Feb-2005	-1,915,125.00	0.00	-1,915,125.00	31.52%	0.00%	-1,472,129.83	88.62%
May-2005	-1,123,527.00	0.00	-1,123,527.00	-41.33%	0.00%	-1,453,782.31	84.23%
Aug-2005	-4,609,595.00	0.00	-4,609,595.00	310.28%	0.00%	-1,611,572.95	80.27%
Nov-2005	-3,207,135.00	0.00	-3,207,135.00	-30.42%	0.00%	-1,687,552.09	76.67%
Feb-2006	-1,487,161.00	0.00	-1,487,161.00	-53.63%	0.00%	-1,678,443.41	73.39%
May-2006	-2,333,166.00	0.00	-2,333,166.00	56.89%	0.00%	-1,706,909.61	70.39%
Aug-2006	-20,192,434.00	0.00	-20,192,434.00	765.45%	0.00%	-2,477,139.79	67.63%
Nov-2006	20,862,482.00	20,862,482.00	0.00	-203.32%	##############	-2,378,054.20	64.93%
Feb-2007	-694,110.00	0.00	-694,110.00	-103.33%	-100.00%	-2,313,287.11	62.58%
May-2007	-161,700.00	0.00	-161,700.00	-76.70%	0.00%	-2,233,598.70	60.40%
Aug-2007	-1,820,559.00	0.00	-1,820,559.00	1025.89%	0.00%	-2,218,847.28	58.37%
Nov-2007	-67,019.00	0.00	-67,019.00	-96.32%	0.00%	-2,144,646.31	56.47%
Feb-2008	5,979,562.00	4,415,706.21	1,563,855.79	-9022.19%	441570620.66%	-2,021,029.57	54.62%
May-2008	1,800,249.00	966,811.11	833,437.89	-69.89%	-78.11%	-1,928,949.98	52.91%
Aug-2008	-21,387.00	0.00	-21,387.00	-101.19%	-100.00%	-1,869,338.63	51.35%
Nov-2008	-11,599,703.00	0.00	-11,599,703.00	54137.17%	0.00%	-2,164,198.16	49.89%
Feb-2009	-4,276,656.00	0.00	-4,276,656.00	-63.13%	0.00%	-2,226,329.27	48.51%
May-2009	-2,718,557.00	0.00	-2,718,557.00	-36.43%	0.00%	-2,240,392.92	47.20%
Aug-2009	-5,154,919.00	0.00	-5,154,919.00	89.62%	0.00%	-2,321,351.98	45.97%
Nov-2009	-1,844,758.00	0.00	-1,844,758.00	-64.21%	0.00%	-2,308,471.06	44.80%
Feb-2010	-628,662.00	0.00	-628,662.00	-65.92%	0.00%	-2,264,265.56	43.69%
May-2010	-102,224.00	9,228.34	-111,452.34	-83.74%	922833.74%	-2,209,065.22	42.64%
Aug-2010	49,366.00	0.00	49,366.00	-148.29%	-100.00%	-2,152,604.44	41.64%
Nov-2010	-615,726.00	0.00	-615,726.00	-1347.27%	0.00%	-2,115,119.60	40.68%
Feb-2011	1,595,509.00	1,004,810.49	590,698.51	-359.13%	100481049.05%	-2,050,695.36	39.73%
May-2011	2,369,313.00	1,652,042.17	717,270.83	48.50%	64.41%	-1,986,324.05	38.83%
Aug-2011	316,898.00	243,821.63	73,076.37	-86.62%	-85.24%	-1,939,519.50	37.95%
Nov-2011	-848,148.00	0.00	-848,148.00	-367.64%	-100.00%	-1,915,266.80	37.16%
Feb-2012	1,003,401.00	1,619,403.84	-616,002.84	-218.30%	161940384.18%	-1,887,021.93	36.38%
May-2012	1,482,415.00	1,134,500.53	347,914.47	47.74%	-29.94%	-1,839,470.09	35.62%
Aug-2012	-245,480.00	166,302.48	-411,782.48	-116.56%	-85.34%	-1,809,726.60	34.95%
Nov-2012	-1,691,852.00	0.00	-1,691,852.00	589.20%	-100.00%	-1,807,321.00	34.28%
Feb-2013	771,313.00	2,068,492.68	-1,297,179.68	-145.59%	206849267.93%	-1,797,118.17	33.66%
May-2013	1,369,708.00	888,996.33	480,711.67	77.58%	-57.02%	-1,752,454.84	33.01%
Aug-2013	-85,437.00	620,667.91	-706,104.91	-106.24%	-30.18%	-1,732,332.72	32.68%
Nov-2013	-45,631.00	470,487.61	-516,118.61	-46.59%	-24.20%	-1,709,385.29	32.47%
Feb-2014	2,146,407.00	2,855,501.78	-709,094.78	-4803.84%	506.92%	-1,690,861.39	31.88%
May-2014	3,222,741.00	3,150,121.23	72,619.77	50.15%	10.32%	-1,658,798.10	31.30%
Aug-2014	7,387,696.00	7,346,961.54	40,734.46	129.24%	133.23%	-1,628,449.30	30.74%
Nov-2014	571,550.00	1,363,961.32	-792,411.32	-92.26%	-81.44%	-1,613,781.97	30.25%
Feb-2015	3,892,258.00	4,541,575.44	-649,317.44	581.00%	232.97%	-1,597,153.27	29.73%
May-2015	3,522,648.00	3,701,272.55	-178,624.55	-9.50%	-18.50%	-1,573,110.41	29.23%
Aug-2015	515,510.00	1,955,823.61	-1,440,313.61	-85.37%	-47.16%	-1,570,897.13	28.82%
Nov-2015	3,544,778.00	3,984,217.18	-439,439.18	587.63%	103.71%	-1,552,348.64	28.35%
Feb-2016	5,736,223.00	6,003,259.95	-267,036.95	61.82%	50.68%	-1,531,617.80	27.89%
May-2016	9,655,117.00	8,255,078.78	1,400,038.22	68.32%	37.51%	-1,485,083.58	27.45%
Aug-2016	7,453,235.00	8,862,615.56	-1,409,380.56	-22.81%	7.36%	-1,483,900.72	27.03%
Nov-2016	3,500,785.00	3,742,989.65	-242,204.65	-53.03%	-57.77%	-1,464,797.71	26.61%
Feb-2017	5,108,989.00	5,456,377.85	-347,388.85	45.94%	45.78%	-1,447,867.27	26.21%
May-2017	4,208,499.00	4,436,343.03	-227,844.03	-17.63%	-18.69%	-1,429,657.97	25.82%
Avg	153,806.61	1,583,464.58	-1,429,657.97	744.40%	46851233.89%	-1,649,953.46	108.86%
Max	20,862,482.00	20,862,482.00	1,563,855.79	54137.17%	##############	-170,153.76	1424.09%
Min	-20,192,434.00	0.00	-20,192,434.00	-9022.19%	-100.00%	-2,477,139.79	25.82%
StDev	4,854,380.18	3,213,558.94	3,001,215.27	6869.29%	262840109.54%	537,513.01	198.44%
Var	23,565,006,905,094.80	##############	9,007,293,124,022.96	471871.17%	##############	##############	393.77%
Median	-102,224.00	0.00	-628,662.00	-38.88%	0.00%	-1,690,861.39	48.51%

Audit Trail -- ANOVA Table (Multiple Regression Selected)

Source of variation	SS	df	MS	SEE
Regression	823,866,342,143,918.00	3	274,622,114,047,973.00	
Error	731,424,113,592,336.00	63	11,609,906,564,957.70	3,407,331.30
Total	1,555,290,455,736,250.00	66		

Audit Trail -- Coefficient Table (Multiple Regression Selected)

Series Description	Included in model	Coefficient	Standard error	T-test	P-value	Elasticity	Overall F-test
Profit	Dependent	188,381.43	99,837.07	1.89	0.07		1,004.39
Domestic	Yes	1.24	0.04	27.73	0.00	1.21	
Dummy 1	Yes	-4,173,152.25	821,669.38	-5.08	0.00	0.08	
Dummy 2	Yes	5,707,265.39	853,264.90	6.69	0.00	-0.11	

Audit Trail -- Correlation Coefficient Table

Series Description	Included in model	Profit	Domestic	Dummy 1	Dummy 2
Profit	Dependent	1.00	0.98	-0.52	0.53
Domestic	Yes	0.98	1.00	-0.47	0.43
Dummy 1	Yes	-0.52	-0.47	1.00	-0.02
Dummy 2	Yes	0.53	0.43	-0.02	1.00

Audit Trail - Statistics

Accuracy Measures	Value
AIC	1,658.97
BIC	1,660.88
MAPE	113.64%
Sum Squared Error (SSE)	722,320,249,000,135.00
R-Square	37.41%
Adjusted R-Square	33.33%
Cochrane-Orcutt	0.31
Root Mean Square Error	3,800,842.67

Method Statistics	Value
Method Selected	Multiple Regression

Forecast Statistics	Value
Durbin Watson (1)	1.37
Mean	-1,028,000.66
Standard Deviation	4,853,187.35

ForecastX Configuration Parameters

Item	Value
Data range selected	[Transportation Data for Forecasting.xlsx]Sheet1'!$A$1:$E$68
Time scale for data	Quarterly
Periods to forecast	17.00
Seasonal Length	
Replace Outliers Activated	No
Replace Outliers Standard Deviations	
Replace Outliers Forecasting Technique	
Replace Missing Values	No
Replace Missing Values (Lower Limit)	
Replace Missing Values (Upper Limit)	
Remove Leading Zeroes	No
Remove Trailing Zeroes	No
Use Holdback Evaluation	No
Holdback Evaluation Period	
Apply Tracking Signal	No
Apply Tracking Signal (Under Forecast Percentage)	
Apply Tracking Signal (Over Forecast Percentage)	
Forecast Method Selected	Multiple Regression

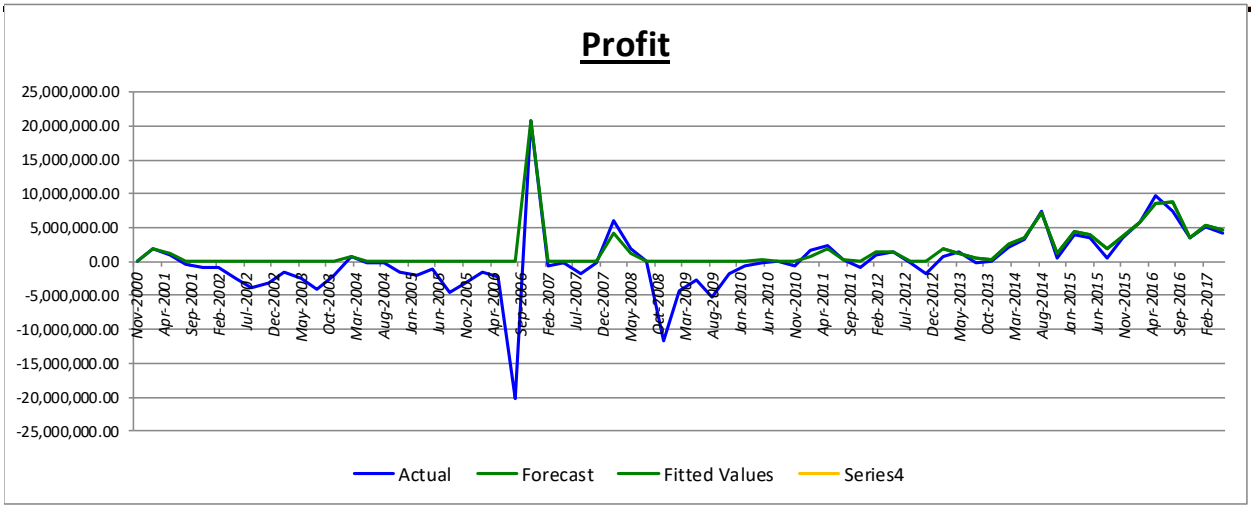
Report Details

Run Date: 5/5/2017 3:29:11 AM
Author: Collin
Note:

Ho:B1=D1=D2=0
Ha: At least one of the variables is different fro
Fcrit=1,004.39
Fcalc=F3,63
2.68<Fcalc<2.76
Fcalc<Fcrit
Reject Ho at α=0.05

Serial Correlation Test
K=3, N=67
1.5≤dl≤1.52, 2.48≤4-du≤2.5 du=1.7, 4-du=2.3
Since DW<dl, reject Ho that pho=0

Appendix W: Regression Model with Seasonal Dummy Variables



Multiple Regression -- Result Formula

Profit = -1,740.82 + ((Domestic) * 1.24) + ((Dummy 1) * -4,221,475.37) + ((Dummy 2) * 5,959,767.28) + ((Seasonal Dummy 1) * 37,993.46) + ((Seasonal Dummy 2) * 541,450.80) + ((Seasonal Dummy 3) * 170,894.13)

Forecast -- Multiple Regression Selected

		Forecast
Date	**Quarterly**	**Annual**
May-2013	1,237,404.83	
Aug-2013	599,638.08	
Nov-2013	279,189.59	2,116,232.49
Feb-2014	2,692,256.82	
May-2014	3,489,105.68	
Aug-2014	7,297,897.48	
Nov-2014	1,168,939.43	14,648,199.40
Feb-2015	4,371,303.17	
May-2015	4,037,959.88	
Aug-2015	1,929,229.04	
Nov-2015	3,778,274.42	14,116,766.51
Feb-2016	5,826,895.58	
May-2016	8,572,786.48	
Aug-2016	8,807,234.47	
Nov-2016	3,538,052.30	26,744,968.83
Feb-2017	5,282,292.81	
May-2017	4,769,966.69	
Total	67,678,426.72	
Avg	3,981,083.92	14,406,541.81
Max	8,807,234.47	26,744,968.83
Min	279,189.59	2,116,232.49

Summary Comments	
The forecast has an average error of	102.57%
The data has a standard deviation of	4,853,187.35
The forecast exceeds the accuracy of a simple average by	37.47%

Audit Trail - Summary Analysis

Audit Trail - Historical Versus Fitted Analysis

Series:Profit

Dates	Original Data	Fitted Data	Error	Series % Change	Forecast % Change	Cumulative Error	Cumulative MAPE
Nov-2000	23,702.00	170,396.68	-146,694.68			-146,694.68	618.91%
Feb-2001	1,899,096.00	1,978,894.67	-79,798.67	7912.39%	1061.35%	-113,246.68	310.51%
May-2001	937,327.00	1,218,679.76	-281,352.76	-50.64%	-38.42%	-169,282.04	210.34%
Aug-2001	-327,425.00	0.00	-327,425.00	-134.93%	-100.00%	-208,817.78	164.00%
Nov-2001	-909,776.00	0.00	-909,776.00	177.86%	0.00%	-349,009.42	135.20%
Feb-2002	-923,115.00	0.00	-923,115.00	1.47%	0.00%	-444,693.69	115.45%
May-2002	-2,560,103.00	0.00	-2,560,103.00	177.33%	0.00%	-746,895.02	101.00%
Aug-2002	-3,873,515.00	0.00	-3,873,515.00	51.30%	0.00%	-1,137,722.51	89.93%
Nov-2002	-3,250,361.00	0.00	-3,250,361.00	-16.09%	0.00%	-1,372,460.12	81.18%
Feb-2003	-1,469,850.00	0.00	-1,469,850.00	-54.78%	0.00%	-1,382,199.11	74.06%
May-2003	-2,494,531.00	0.00	-2,494,531.00	69.71%	0.00%	-1,483,320.19	68.15%
Aug-2003	-4,150,742.00	0.00	-4,150,742.00	66.39%	0.00%	-1,705,605.34	63.17%
Nov-2003	-1,920,924.00	0.00	-1,920,924.00	-53.72%	0.00%	-1,722,168.32	58.90%
Feb-2004	647,420.00	786,419.23	-138,999.23	-133.70%	78641923.20%	-1,609,084.81	54.80%
May-2004	-265,900.00	0.00	-265,900.00	-141.07%	-100.00%	-1,519,539.16	51.59%
Aug-2004	-176,064.00	0.00	-176,064.00	-33.79%	0.00%	-1,435,571.96	48.76%
Nov-2004	-1,456,177.00	0.00	-1,456,177.00	727.07%	0.00%	-1,436,784.02	46.24%
Feb-2005	-1,915,125.00	0.00	-1,915,125.00	31.52%	0.00%	-1,463,358.52	43.98%
May-2005	-1,123,527.00	0.00	-1,123,527.00	-41.33%	0.00%	-1,445,472.65	41.94%
Aug-2005	-4,609,595.00	0.00	-4,609,595.00	310.28%	0.00%	-1,603,678.77	40.09%
Nov-2005	-3,207,135.00	0.00	-3,207,135.00	-30.42%	0.00%	-1,680,033.83	38.41%
Feb-2006	-1,487,161.00	0.00	-1,487,161.00	-53.63%	0.00%	-1,671,266.88	36.87%
May-2006	-2,333,166.00	0.00	-2,333,166.00	56.89%	0.00%	-1,700,045.10	35.46%
Aug-2006	-20,192,434.00	0.00	-20,192,434.00	765.45%	0.00%	-2,470,561.31	34.15%
Nov-2006	20,862,482.00	20,862,482.00	0.00	-203.32%	##############	-2,371,738.85	32.79%
Feb-2007	-694,110.00	0.00	-694,110.00	-103.33%	-100.00%	-2,307,214.67	31.67%
May-2007	-161,700.00	0.00	-161,700.00	-76.70%	0.00%	-2,227,751.16	30.64%
Aug-2007	-1,820,559.00	0.00	-1,820,559.00	1025.89%	0.00%	-2,213,208.58	29.67%
Nov-2007	-67,019.00	0.00	-67,019.00	-96.32%	0.00%	-2,139,202.05	28.77%
Feb-2008	5,979,562.00	4,245,958.53	1,733,603.47	-9022.19%	424595853.40%	-2,010,108.53	27.84%
May-2008	1,800,249.00	1,314,895.28	485,353.72	-69.89%	-69.03%	-1,929,609.75	26.97%
Aug-2008	-21,387.00	0.00	-21,387.00	-101.19%	-100.00%	-1,869,977.79	26.23%
Nov-2008	-11,599,703.00	0.00	-11,599,703.00	54137.17%	0.00%	-2,164,817.94	25.52%
Feb-2009	-4,276,656.00	0.00	-4,276,656.00	-63.13%	0.00%	-2,226,930.83	24.86%
May-2009	-2,718,557.00	0.00	-2,718,557.00	-36.43%	0.00%	-2,240,977.29	24.23%
Aug-2009	-5,154,919.00	0.00	-5,154,919.00	89.62%	0.00%	-2,321,920.12	23.63%
Nov-2009	-1,844,758.00	0.00	-1,844,758.00	-64.21%	0.00%	-2,309,023.84	23.07%
Feb-2010	-628,662.00	0.00	-628,662.00	-65.92%	0.00%	-2,264,803.79	22.53%
May-2010	-102,224.00	361,303.58	-463,527.58	-83.74%	36130357.79%	-2,218,617.22	22.25%
Aug-2010	49,366.00	0.00	49,366.00	-148.29%	-100.00%	-2,161,917.64	21.76%
Nov-2010	-615,726.00	0.00	-615,726.00	-1347.27%	0.00%	-2,124,205.65	21.29%
Feb-2011	1,595,509.00	849,278.95	746,230.05	-359.13%	84927894.71%	-2,055,861.94	20.81%
May-2011	2,369,313.00	1,997,270.40	372,042.60	48.50%	135.17%	-1,999,399.05	20.33%
Aug-2011	316,898.00	224,362.44	92,535.56	-86.62%	-88.77%	-1,951,855.08	19.88%
Nov-2011	-848,148.00	0.00	-848,148.00	-367.64%	-100.00%	-1,927,328.26	19.49%
Feb-2012	1,003,401.00	1,461,310.76	-457,909.76	-218.30%	146131076.05%	-1,895,384.38	19.09%
May-2012	1,482,415.00	1,481,885.80	529.20	47.74%	1.41%	-1,855,045.79	18.68%
Aug-2012	-245,480.00	147,166.39	-392,646.39	-116.56%	-90.07%	-1,824,579.13	18.36%
Nov-2012	-1,691,852.00	0.00	-1,691,852.00	589.20%	-100.00%	-1,821,870.42	18.03%
Feb-2013	771,313.00	1,908,527.86	-1,137,214.86	-145.59%	190852785.95%	-1,808,177.31	17.73%
May-2013	1,369,708.00	1,237,404.83	132,303.17	77.58%	-35.16%	-1,770,128.67	17.38%
Aug-2013	-85,437.00	599,638.08	-685,075.08	-106.24%	-51.54%	-1,749,262.25	17.35%
Nov-2013	-45,631.00	279,189.59	-324,820.59	-46.59%	-53.44%	-1,722,386.00	17.27%
Feb-2014	2,146,407.00	2,692,256.82	-545,849.82	-4803.84%	864.31%	-1,700,598.29	16.96%
May-2014	3,222,741.00	3,489,105.68	-266,364.68	50.15%	29.60%	-1,674,521.31	16.66%
Aug-2014	7,387,696.00	7,297,897.48	89,798.52	129.24%	109.16%	-1,643,015.60	16.36%
Nov-2014	571,550.00	1,168,939.43	-597,389.43	-92.26%	-83.98%	-1,624,671.28	16.10%
Feb-2015	3,892,258.00	4,371,303.17	-479,045.17	581.00%	273.95%	-1,604,919.11	15.83%
May-2015	3,522,648.00	4,037,959.88	-515,311.88	-9.50%	-7.63%	-1,586,451.19	15.57%
Aug-2015	515,510.00	1,929,229.04	-1,413,719.04	-85.37%	-52.22%	-1,583,572.32	15.38%
Nov-2015	3,544,778.00	3,778,274.42	-233,496.42	587.63%	95.84%	-1,561,439.93	15.13%
Feb-2016	5,736,223.00	5,826,895.58	-90,672.58	61.82%	54.22%	-1,537,717.88	14.89%
May-2016	9,655,117.00	8,572,786.48	1,082,330.52	68.32%	47.12%	-1,496,129.81	14.65%
Aug-2016	7,453,235.00	8,807,234.47	-1,353,999.47	-22.81%	2.73%	-1,493,909.02	14.43%
Nov-2016	3,500,785.00	3,538,052.30	-37,267.30	-53.03%	-59.83%	-1,471,499.15	14.21%
Feb-2017	5,108,989.00	5,282,292.81	-173,303.81	45.94%	49.30%	-1,451,829.52	13.99%
May-2017	4,208,499.00	4,769,966.69	-561,467.69	-17.63%	-9.70%	-1,438,540.54	13.79%
Avg	153,806.61	1,592,347.15	-1,438,540.54	744.40%	46174689.02%	-1,647,307.92	51.42%
Max	20,862,482.00	20,862,482.00	1,733,603.47	54137.17%	##############	-113,246.68	618.91%
Min	-20,192,434.00	0.00	-20,192,434.00	-9022.19%	-100.00%	-2,470,561.31	13.79%
StDev	4,854,380.18	3,213,762.04	2,990,415.99	6869.29%	262076801.55%	552,621.93	85.95%
Var	23,565,006,905,094.80	##############	8,942,587,772,825.66	471871.17%	##############	##############	73.87%
Median	-102,224.00	0.00	-561,467.69	-38.88%	0.00%	-1,700,045.10	24.86%

Audit Trail -- ANOVA Table (Multiple Regression Selected)

Source of variation	SS	df	MS	SEE
Regression	826,429,937,797,469.00	6	137,738,322,966,245.00	
Error	728,860,517,938,784.00	60	12,147,675,298,979.70	3,485,351.53
Total	1,555,290,455,736,250.00	66		

Audit Trail -- Coefficient Table (Multiple Regression Selected)

Series Description	Included in model	Coefficient	Standard error	T-test	P-value	Elasticity	Overall F-test
Profit	Dependent	-1,740.82	191,668.50	-0.01	0.99		539.12
Domestic	Yes	1.24	0.05	26.52	0.00	1.21	
Dummy 1	Yes	-4,221,475.37	817,824.30	-5.16	0.00	0.08	
Dummy 2	Yes	5,959,767.28	895,160.87	6.66	0.00	-0.12	
Seasonal Dumm	Yes	37,993.46	252,660.61	0.15	0.88	-0.01	
Seasonal Dumm	Yes	541,450.80	247,234.45	2.19	0.03	-0.13	
Seasonal Dumm	Yes	170,894.13	247,939.20	0.69	0.49	-0.04	

Audit Trail -- Correlation Coefficient Table

Series Description	Included in model	Profit	Domestic	Dummy 1	Dummy 2	Seasonal Dummy 1	Seasonal Dummy 2	Seasonal Dummy 3
Profit	Dependent	1.00	0.98	-0.52	0.53	0.11	0.10	-0.20
Domestic	Yes	0.98	1.00	-0.47	0.43	0.14	0.06	-0.17
Dummy 1	Yes	-0.52	-0.47	1.00	-0.02	-0.07	-0.07	0.22
Dummy 2	Yes	0.53	0.43	-0.02	1.00	-0.07	-0.07	-0.07
Seasonal Dumm	Yes	0.11	0.14	-0.07	-0.07	1.00	-0.34	-0.33
Seasonal Dumm	Yes	0.10	0.06	-0.07	-0.07	-0.34	1.00	-0.33
Seasonal Dumm	Yes	-0.20	-0.17	0.22	-0.07	-0.33	-0.33	1.00

Audit Trail - Statistics

Accuracy Measures	Value
AIC	1,658.92
BIC	1,660.83
MAPE	102.57%
Sum Squared Error (SSE)	721,626,540,310,835.00
R-Square	37.47%
Adjusted R-Square	28.75%
Cochrane-Orcutt	0.31
Root Mean Square Error	3,799,017.08

Forecast Statistics	Value
Durbin Watson (1)	1.38
Mean	-1,028,000.66
Standard Deviation	4,853,187.35

Method Statistics	Value
Method Selected	Multiple Regression

ForecastX Configuration Parameters

Item	Value
Data range selected	[Transportation Data for Forecasting.xlsx]Sheet1'!$A$1:$H$68
Time scale for data	Quarterly
Periods to forecast	17.00
Seasonal Length	
Replace Outliers Activated	No
Replace Outliers Standard Deviations	
Replace Outliers Forecasting Technique	
Replace Missing Values	No
Replace Missing Values (Lower Limit)	
Replace Missing Values (Upper Limit)	
Remove Leading Zeroes	No
Remove Trailing Zeroes	No
Use Holdback Evaluation	No
Holdback Evaluation Period	
Apply Tracking Signal	No
Apply Tracking Signal (Under Forecast Percentage)	
Apply Tracking Signal (Over Forecast Percentage)	
Forecast Method Selected	Multiple Regression

Report Details

Run Date: 5/5/2017 7:58:50 AM
Author: Collin
Note:

Ho:all of the seasonal variables are insignificant
Ha:not all of these variables are jointly insignificant

$$\frac{\frac{(.3747-.3741)=0.0006}{3}}{\frac{1-0.3747=0.6253}{67-7=60}} \qquad \text{Fcrit}=F_{3,60} \qquad \text{Fcrit}=1.76$$

$$\frac{0.0002}{0.01042167}$$

Fcalc=0.01919078

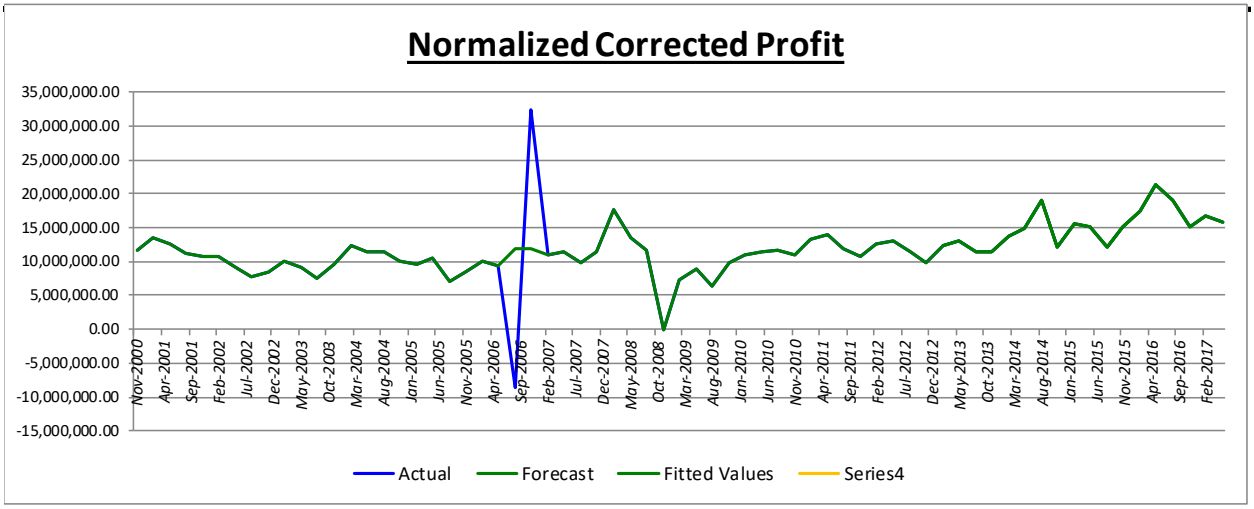
Fcalc<Fcrit
Reject Ho at α=0.05

Serial Correlation Test
K=6, N=67

dl≥1.44	du≥1.77
4-dl≤2.56	4-du≤2.23

DW<dl, so reject Ho: pho=0

Appendix X: Regression Model Sensitivity Analysis



Multiple Regression -- Result Formula

Normalized Corrected Profit = -11,599,703.00 + ((Normalized Domestic) * 1.00)

Forecast -- Multiple Regression Selected

		Forecast
Date	**Quarterly**	**Annual**
May-2013	12,969,411.00	
Aug-2013	11,514,266.00	
Nov-2013	11,554,072.00	36,037,749.00
Feb-2014	13,746,110.00	
May-2014	14,822,444.00	
Aug-2014	18,987,399.00	
Nov-2014	12,171,253.00	59,727,206.00
Feb-2015	15,491,961.00	
May-2015	15,122,351.00	
Aug-2015	12,115,213.00	
Nov-2015	15,144,481.00	57,874,006.00
Feb-2016	17,335,926.00	
May-2016	21,254,820.00	
Aug-2016	19,052,938.00	
Nov-2016	15,100,488.00	72,744,172.00
Feb-2017	16,708,692.00	
May-2017	15,808,202.00	
Total	258,900,027.00	
Avg	15,229,413.35	56,595,783.25
Max	21,254,820.00	72,744,172.00
Min	11,514,266.00	36,037,749.00

Summary Comments	
The forecast has an average error of	6.17%
The data has a standard deviation of	4,853,187.35
The forecast exceeds the accuracy of a simple average by	26.98%

Audit Trail - Summary Analysis

Audit Trail - Historical Versus Fitted Analysis

Series:Normalized Corrected Profit

Dates	Original Data	Fitted Data	Error	Series % Change	Forecast % Change	Cumulative Error	Cumulative MAPE
Nov-2000	11,623,405.00	11,623,405.00	0.00			0.00	0.00%
Feb-2001	13,498,799.00	13,498,799.00	0.00	16.13%	16.13%	0.00	0.00%
May-2001	12,537,030.00	12,537,030.00	0.00	-7.12%	-7.12%	0.00	0.00%
Aug-2001	11,272,278.00	11,272,278.00	0.00	-10.09%	-10.09%	0.00	0.00%
Nov-2001	10,689,927.00	10,689,927.00	0.00	-5.17%	-5.17%	0.00	0.00%
Feb-2002	10,676,588.00	10,676,588.00	0.00	-0.12%	-0.12%	0.00	0.00%
May-2002	9,039,600.00	9,039,600.00	0.00	-15.33%	-15.33%	0.00	0.00%
Aug-2002	7,726,188.00	7,726,188.00	0.00	-14.53%	-14.53%	0.00	0.00%
Nov-2002	8,349,342.00	8,349,342.00	0.00	8.07%	8.07%	0.00	0.00%
Feb-2003	10,129,853.00	10,129,853.00	0.00	21.33%	21.33%	0.00	0.00%
May-2003	9,105,172.00	9,105,172.00	0.00	-10.12%	-10.12%	0.00	0.00%
Aug-2003	7,448,961.00	7,448,961.00	0.00	-18.19%	-18.19%	0.00	0.00%
Nov-2003	9,678,779.00	9,678,779.00	0.00	29.93%	29.93%	0.00	0.00%
Feb-2004	12,247,123.00	12,247,123.00	0.00	26.54%	26.54%	0.00	0.00%
May-2004	11,333,803.00	11,333,803.00	0.00	-7.46%	-7.46%	0.00	0.00%
Aug-2004	11,423,639.00	11,423,639.00	0.00	0.79%	0.79%	0.00	0.00%
Nov-2004	10,143,526.00	10,143,526.00	0.00	-11.21%	-11.21%	0.00	0.00%
Feb-2005	9,684,578.00	9,684,578.00	0.00	-4.52%	-4.52%	0.00	0.00%
May-2005	10,476,176.00	10,476,176.00	0.00	8.17%	8.17%	0.00	0.00%
Aug-2005	6,990,108.00	6,990,108.00	0.00	-33.28%	-33.28%	0.00	0.00%
Nov-2005	8,392,568.00	8,392,568.00	0.00	20.06%	20.06%	0.00	0.00%
Feb-2006	10,112,542.00	10,112,542.00	0.00	20.49%	20.49%	0.00	0.00%
May-2006	9,266,537.00	9,266,537.00	0.00	-8.37%	-8.37%	0.00	0.00%
Aug-2006	-8,592,731.00	11,934,727.00	-20,527,458.00	-192.73%	28.79%	-855,310.75	0.41%
Nov-2006	32,462,185.00	11,934,727.00	20,527,458.00	-477.79%	0.00%	0.00	0.50%
Feb-2007	10,905,593.00	10,905,593.00	0.00	-66.41%	-8.62%	0.00	0.48%
May-2007	11,438,003.00	11,438,003.00	0.00	4.88%	4.88%	0.00	0.46%
Aug-2007	9,779,144.00	9,779,144.00	0.00	-14.50%	-14.50%	0.00	0.45%
Nov-2007	11,532,684.00	11,532,684.00	0.00	17.93%	17.93%	0.00	0.43%
Feb-2008	17,579,265.00	17,579,265.00	0.00	52.43%	52.43%	0.00	0.42%
May-2008	13,399,952.00	13,399,952.00	0.00	-23.77%	-23.77%	0.00	0.40%
Aug-2008	11,578,316.00	11,578,316.00	0.00	-13.59%	-13.59%	0.00	0.39%
Nov-2008	0.00	0.00	0.00	-100.00%	-100.00%	0.00	0.38%
Feb-2009	7,323,047.00	7,323,047.00	0.00	732304700.00%	732304700.00%	0.00	0.37%
May-2009	8,881,146.00	8,881,146.00	0.00	21.28%	21.28%	0.00	0.36%
Aug-2009	6,444,784.00	6,444,784.00	0.00	-27.43%	-27.43%	0.00	0.35%
Nov-2009	9,754,945.00	9,754,945.00	0.00	51.36%	51.36%	0.00	0.34%
Feb-2010	10,971,041.00	10,971,041.00	0.00	12.47%	12.47%	0.00	0.33%
May-2010	11,497,479.00	11,497,479.00	0.00	4.80%	4.80%	0.00	0.32%
Aug-2010	11,649,069.00	11,649,069.00	0.00	1.32%	1.32%	0.00	0.31%
Nov-2010	10,983,977.00	10,983,977.00	0.00	-5.71%	-5.71%	0.00	0.30%
Feb-2011	13,195,212.00	13,195,212.00	0.00	20.13%	20.13%	0.00	0.30%
May-2011	13,969,016.00	13,969,016.00	0.00	5.86%	5.86%	0.00	0.29%
Aug-2011	11,916,601.00	11,916,601.00	0.00	-14.69%	-14.69%	0.00	0.28%
Nov-2011	10,751,555.00	10,751,555.00	0.00	-9.78%	-9.78%	0.00	0.28%
Feb-2012	12,603,104.00	12,603,104.00	0.00	17.22%	17.22%	0.00	0.27%
May-2012	13,082,118.00	13,082,118.00	0.00	3.80%	3.80%	0.00	0.27%
Aug-2012	11,354,223.00	11,354,223.00	0.00	-13.21%	-13.21%	0.00	0.26%
Nov-2012	9,907,851.00	9,907,851.00	0.00	-12.74%	-12.74%	0.00	0.25%
Feb-2013	12,371,016.00	12,371,016.00	0.00	24.86%	24.86%	0.00	0.25%
May-2013	12,969,411.00	12,969,411.00	0.00	4.84%	4.84%	0.00	0.24%
Aug-2013	11,514,266.00	11,514,266.00	0.00	-11.22%	-11.22%	0.00	0.24%
Nov-2013	11,554,072.00	11,554,072.00	0.00	0.35%	0.35%	0.00	0.24%
Feb-2014	13,746,110.00	13,746,110.00	0.00	18.97%	18.97%	0.00	0.23%
May-2014	14,822,444.00	14,822,444.00	0.00	7.83%	7.83%	0.00	0.23%
Aug-2014	18,987,399.00	18,987,399.00	0.00	28.10%	28.10%	0.00	0.22%
Nov-2014	12,171,253.00	12,171,253.00	0.00	-35.90%	-35.90%	0.00	0.22%
Feb-2015	15,491,961.00	15,491,961.00	0.00	27.28%	27.28%	0.00	0.22%
May-2015	15,122,351.00	15,122,351.00	0.00	-2.39%	-2.39%	0.00	0.21%
Aug-2015	12,115,213.00	12,115,213.00	0.00	-19.89%	-19.89%	0.00	0.21%
Nov-2015	15,144,481.00	15,144,481.00	0.00	25.00%	25.00%	0.00	0.20%
Feb-2016	17,335,926.00	17,335,926.00	0.00	14.47%	14.47%	0.00	0.20%
May-2016	21,254,820.00	21,254,820.00	0.00	22.61%	22.61%	0.00	0.20%
Aug-2016	19,052,938.00	19,052,938.00	0.00	-10.36%	-10.36%	0.00	0.20%
Nov-2016	15,100,488.00	15,100,488.00	0.00	-20.74%	-20.74%	0.00	0.19%
Feb-2017	16,708,692.00	16,708,692.00	0.00	10.65%	10.65%	0.00	0.19%
May-2017	15,808,202.00	15,808,202.00	0.00	-5.39%	-5.39%	0.00	0.19%
Avg	11,753,509.61	11,753,509.61	0.00	11095515.55%	11095527.02%	-12,765.83	0.20%
Max	32,462,185.00	21,254,820.00	20,527,458.00	732304700.00%	732304700.00%	0.00	0.50%
Min	-8,592,731.00	0.00	-20,527,458.00	-477.79%	-100.00%	-855,310.75	0.00%
StDev	4,854,380.18	3,285,729.92	3,573,371.77	90140478.65%	90140477.22%	104,492.84	0.16%
Var	23,565,006,905,094.80	##########	12,768,985,816,417.10	##########	##########	##########	0.00%
Median	11,497,479.00	11,514,266.00	0.00	0.11%	0.57%	0.00	0.22%

Audit Trail -- ANOVA Table (Multiple Regression Selected)

Source of variation	SS	df	MS	SEE
Regression	712,537,391,852,725.00	1	712,537,391,852,725.00	
Error	842,753,063,883,528.00	65	12,965,431,752,054.30	3,600,754.33
Total	1,555,290,455,736,250.00	66		

Audit Trail -- Coefficient Table (Multiple Regression Selected)

Series Description	Included in model	Coefficient	Standard error	T-test	P-value	Elasticity	Overall F-test
Normalized Corr	Dependent	-11,599,703.00	5,298,116.89	-2.19	0.03		17.73
Normalized Dom	Yes	1.00	0.24	4.21	0.00	2.10	

Audit Trail -- Correlation Coefficient Table

Series Description	Included in model	Normalized Corrected Profit	Normalized Domestic
Normalized Corr	Dependent	1.00	0.68
Normalized Dom	Yes	0.68	1.00

Audit Trail - Statistics

Accuracy Measures	Value
AIC	1,666.68
BIC	1,668.59
MAPE	6.17%
Sum Squared Error (SSE)	842,753,063,883,528.00
R-Square	26.98%
Adjusted R-Square	25.46%
Cochrane-Orcutt	-0.50
Root Mean Square Error	4,105,491.60

Forecast Statistics	Value
Durbin Watson (1)	3.00
Mean	10,571,702.34
Standard Deviation	4,853,187.35

Method Statistics	Value
Method Selected	Multiple Regression

ForecastX Configuration Parameters

Item	Value
Data range selected	[Transportation Data for Forecasting.xlsx]Sheet1'!$Q$1:$S$68
Time scale for data	Quarterly
Periods to forecast	17.00
Seasonal Length	
Replace Outliers Activated	No
Replace Outliers Standard Deviations	
Replace Outliers Forecasting Technique	
Replace Missing Values	No
Replace Missing Values (Lower Limit)	
Replace Missing Values (Upper Limit)	
Remove Leading Zeroes	No
Remove Trailing Zeroes	No
Use Holdback Evaluation	No
Holdback Evaluation Period	
Apply Tracking Signal	No
Apply Tracking Signal (Under Forecast Percentage)	
Apply Tracking Signal (Over Forecast Percentage)	
Forecast Method Selected	Multiple Regression

Report Details

Run Date: 5/5/2017 4:03:19 AM
Author: Collin
Note:

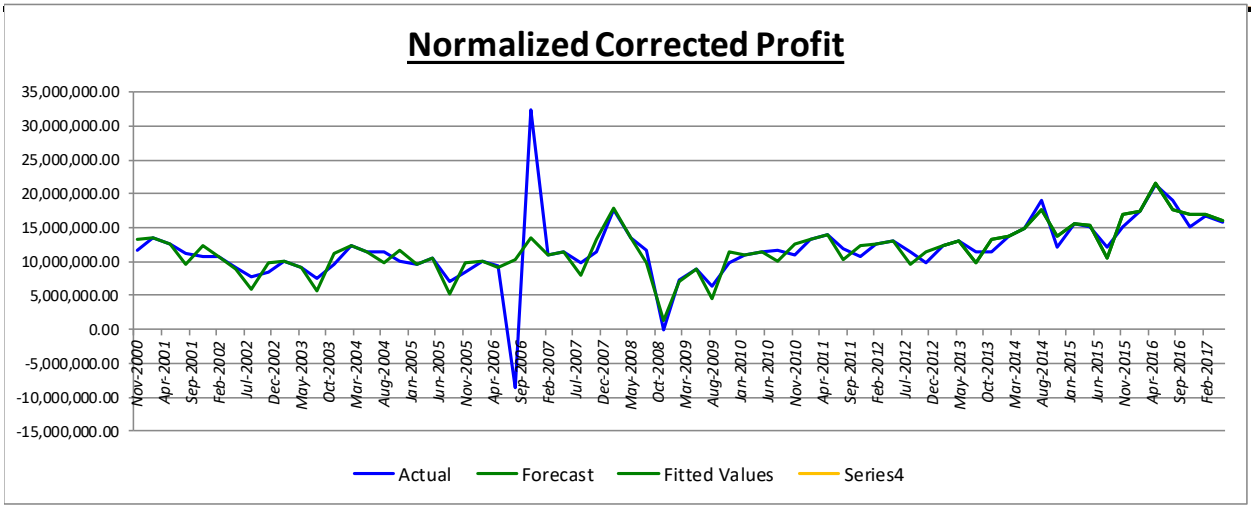
Ho:B1=D2=D3=D4
Ha: At least one of these variables is different from 0.
Fcrit=17.73
Fcalc=F1,66
3.92<Fcrit<4

Since Fcalc<Fcrit, Reject Ho at α=0.05

Serial Correlation Test
K=1, N=67
1.65≤du≤1.66 1.6≤dl≤1.61
2.35≤4-du≤2.4 2.39≤4-dl≤2.4

DW>4-dl, therefore reject H. that pho=0

Appendix Y: Regression Model Sensitivity Analysis with Seasonal Dummy Variables



Multiple Regression -- Result Formula

Normalized Corrected Profit = -10,720,142.73 + ((Normalized Domestic) * 1.03) + ((Seasonal Dummy 1) * -1,649,238.86) + ((Seasonal Dummy 2) * -1,633,689.84) + ((Seasonal Dummy 3) * -3,304,267.39)

Forecast -- Multiple Regression Selected

		Forecast
Date	**Quarterly**	**Annual**
May-2013	13,029,048.86	
Aug-2013	9,855,129.63	
Nov-2013	13,200,521.46	36,084,699.94
Feb-2014	13,815,924.31	
May-2014	14,943,457.20	
Aug-2014	17,575,784.47	
Nov-2014	13,838,144.45	60,173,310.44
Feb-2015	15,619,600.62	
May-2015	15,253,297.59	
Aug-2015	10,475,980.94	
Nov-2015	16,909,850.41	58,258,729.56
Feb-2016	17,524,640.62	
May-2016	21,588,883.54	
Aug-2016	17,643,494.22	
Nov-2016	16,864,400.29	73,621,418.68
Feb-2017	16,876,631.66	
May-2017	15,961,865.05	
Total	260,976,655.32	
Avg	15,351,567.96	57,034,539.65
Max	21,588,883.54	73,621,418.68
Min	9,855,129.63	36,084,699.94

Summary Comments	
The forecast has an average error of	13.68%
The data has a standard deviation of	4,853,187.35
The forecast exceeds the accuracy of a simple average by	32.86%

Audit Trail - Summary Analysis

Audit Trail - Historical Versus Fitted Analysis

Series:Normalized Corrected Profit

Dates	Original Data	Fitted Data	Error	Series % Change	Forecast % Change	Cumulative Error	Cumulative MAPE
Nov-2000	11,623,405.00	13,272,150.87	-1,648,745.87			-1,648,745.87	14.18%
Feb-2001	13,498,799.00	13,560,421.99	-61,622.99	16.13%	2.17%	-855,184.43	7.21%
May-2001	12,537,030.00	12,582,346.72	-45,316.72	-7.12%	-7.21%	-585,228.53	4.84%
Aug-2001	11,272,278.00	9,605,126.61	1,667,151.39	-10.09%	-23.66%	-22,133.55	4.56%
Nov-2001	10,689,927.00	12,307,754.62	-1,617,827.62	-5.17%	28.14%	-341,272.36	4.25%
Feb-2002	10,676,588.00	10,644,734.95	31,853.05	-0.12%	-13.51%	-279,084.79	3.55%
May-2002	9,039,600.00	8,969,076.38	70,523.62	-15.33%	-15.74%	-229,140.74	3.06%
Aug-2002	7,726,188.00	5,941,584.57	1,784,603.43	-14.53%	-33.75%	22,577.28	3.04%
Nov-2002	8,349,342.00	9,889,645.79	-1,540,303.79	8.07%	66.45%	-151,076.17	2.93%
Feb-2003	10,129,853.00	10,079,891.23	49,961.77	21.33%	1.92%	-130,972.37	2.64%
May-2003	9,105,172.00	9,036,820.23	68,351.77	-10.12%	-10.35%	-112,852.00	2.41%
Aug-2003	7,448,961.00	5,655,175.38	1,793,785.62	-18.19%	-37.42%	46,034.47	2.37%
Nov-2003	9,678,779.00	11,263,115.82	-1,584,336.82	29.93%	99.16%	-79,378.71	2.29%
Feb-2004	12,247,123.00	12,267,288.52	-20,165.52	26.54%	8.92%	-75,149.19	2.13%
May-2004	11,333,803.00	11,339,266.96	-5,463.96	-7.46%	-7.57%	-70,503.51	1.98%
Aug-2004	11,423,639.00	9,761,500.92	1,662,138.08	0.79%	-13.91%	37,786.59	1.92%
Nov-2004	10,143,526.00	11,743,255.97	-1,599,729.97	-11.21%	20.30%	-58,537.92	1.86%
Feb-2005	9,684,578.00	9,619,868.03	64,709.97	-4.52%	-18.08%	-51,690.81	1.76%
May-2005	10,476,176.00	10,453,234.02	22,941.98	8.17%	8.66%	-47,762.77	1.67%
Aug-2005	6,990,108.00	5,181,124.45	1,808,983.55	-33.28%	-50.44%	45,074.55	1.65%
Nov-2005	8,392,568.00	9,934,303.51	-1,541,735.51	20.06%	91.74%	-30,487.84	1.61%
Feb-2006	10,112,542.00	10,062,006.87	50,535.13	20.49%	1.29%	-26,804.97	1.54%
May-2006	9,266,537.00	9,203,529.89	63,007.11	-8.37%	-8.53%	-22,900.10	1.47%
Aug-2006	-8,592,731.00	10,289,516.96	-18,882,247.96	-192.73%	11.80%	-808,706.26	1.79%
Nov-2006	32,462,185.00	13,593,784.34	18,868,400.66	-477.79%	32.11%	-21,621.99	1.81%
Feb-2007	10,905,593.00	10,881,324.95	24,268.05	-66.41%	-19.95%	-19,856.98	1.74%
May-2007	11,438,003.00	11,446,918.23	-8,915.23	4.88%	5.20%	-19,451.73	1.68%
Aug-2007	9,779,144.00	8,062,537.68	1,716,606.32	-14.50%	-29.57%	42,550.34	1.64%
Nov-2007	11,532,684.00	13,178,425.05	-1,645,741.05	17.93%	63.45%	-15,666.61	1.60%
Feb-2008	17,579,265.00	17,776,039.39	-196,774.39	52.43%	34.89%	-21,703.53	1.55%
May-2008	13,399,952.00	13,473,850.05	-73,898.05	-23.77%	-24.20%	-23,387.23	1.50%
Aug-2008	11,578,316.00	9,921,301.07	1,657,014.93	-13.59%	-26.37%	29,125.34	1.47%
Nov-2008	0.00	1,263,760.55	-1,263,760.55	-100.00%	-87.26%	-10,053.02	1.42%
Feb-2009	7,323,047.00	7,180,119.44	142,927.56	732304700.00%	468.16%	-5,553.59	1.38%
May-2009	8,881,146.00	8,805,374.13	75,771.87	21.28%	22.64%	-3,230.00	1.34%
Aug-2009	6,444,784.00	4,617,738.47	1,827,045.53	-27.43%	-47.56%	47,610.98	1.33%
Nov-2009	9,754,945.00	11,341,804.56	-1,586,859.56	51.36%	145.61%	3,436.10	1.30%
Feb-2010	10,971,041.00	10,948,940.69	22,100.31	12.47%	-3.46%	3,927.27	1.27%
May-2010	11,497,479.00	11,508,364.17	-10,885.17	4.80%	5.11%	3,547.46	1.24%
Aug-2010	11,649,069.00	9,994,397.52	1,654,671.48	1.32%	-13.16%	44,825.56	1.22%
Nov-2010	10,983,977.00	12,611,544.02	-1,627,567.02	-5.71%	26.19%	4,035.50	1.20%
Feb-2011	13,195,212.00	13,246,779.71	-51,567.71	20.13%	5.04%	2,711.61	1.17%
May-2011	13,969,016.00	14,061,762.33	-92,746.33	5.86%	6.15%	491.66	1.14%
Aug-2011	11,916,601.00	10,270,790.60	1,645,810.40	-14.69%	-26.96%	37,885.27	1.12%
Nov-2011	10,751,555.00	12,371,423.84	-1,619,868.84	-9.78%	20.45%	1,046.29	1.10%
Feb-2012	12,603,104.00	12,635,060.17	-31,956.17	17.22%	2.13%	328.84	1.08%
May-2012	13,082,118.00	13,145,488.89	-63,370.89	3.80%	4.04%	-1,026.47	1.06%
Aug-2012	11,354,223.00	9,689,785.76	1,664,437.24	-13.21%	-26.29%	33,670.69	1.04%
Nov-2012	9,907,851.00	11,499,775.05	-1,591,924.05	-12.74%	18.68%	495.29	1.03%
Feb-2013	12,371,016.00	12,395,285.05	-24,269.05	24.86%	7.79%	0.00	1.01%
May-2013	12,969,411.00	13,029,048.86	-59,637.86	4.84%	5.11%	-1,169.37	0.99%
Aug-2013	11,514,266.00	9,855,129.63	1,659,136.37	-11.22%	-24.36%	30,759.59	0.97%
Nov-2013	11,554,072.00	13,200,521.46	-1,646,449.46	0.35%	33.95%	-885.87	0.96%
Feb-2014	13,746,110.00	13,815,924.31	-69,814.31	18.97%	4.66%	-2,162.32	0.94%
May-2014	14,822,444.00	14,943,457.20	-121,013.20	7.83%	8.16%	-4,323.24	0.93%
Aug-2014	18,987,399.00	17,575,784.47	1,411,614.53	28.10%	17.62%	20,961.36	0.91%
Nov-2014	12,171,253.00	13,838,144.45	-1,666,891.45	-35.90%	-21.27%	-8,650.09	0.90%
Feb-2015	15,491,961.00	15,619,600.62	-127,639.62	27.28%	12.87%	-10,701.64	0.88%
May-2015	15,122,351.00	15,253,297.59	-130,946.59	-2.39%	-2.35%	-12,739.69	0.87%
Aug-2015	12,115,213.00	10,475,980.94	1,639,232.06	-19.89%	-31.32%	14,793.17	0.86%
Nov-2015	15,144,481.00	16,909,850.41	-1,765,369.41	25.00%	61.42%	-14,389.82	0.85%
Feb-2016	17,335,926.00	17,524,640.62	-188,714.62	14.47%	3.64%	-17,201.51	0.83%
May-2016	21,254,820.00	21,588,883.54	-334,063.54	22.61%	23.19%	-22,231.07	0.82%
Aug-2016	19,052,938.00	17,643,494.22	1,409,443.78	-10.36%	-18.28%	138.85	0.81%
Nov-2016	15,100,488.00	16,864,400.29	-1,763,912.29	-20.74%	-4.42%	-27,000.39	0.80%
Feb-2017	16,708,692.00	16,876,631.66	-167,939.66	10.65%	0.07%	-29,135.84	0.79%
May-2017	15,808,202.00	15,961,865.05	-153,663.05	-5.39%	-5.42%	-30,994.45	0.78%
Avg	11,753,509.61	11,784,504.06	-30,994.45	11095515.55%	11.01%	-81,745.30	1.88%
Max	32,462,185.00	21,588,883.54	18,868,400.66	732304700.00%	468.16%	47,610.98	14.18%
Min	-8,592,731.00	1,263,760.55	-18,882,247.96	-477.79%	-87.26%	-1,648,745.87	0.78%
StDev	4,854,380.18	3,479,781.74	3,473,388.60	90140478.65%	67.30%	256,723.09	1.89%
Var	23,565,006,905,094.80	##############	12,064,428,374,100.70	##############	45.29%	##############	0.04%
Median	11,497,479.00	11,499,775.05	-31,956.17	0.11%	2.15%	-10,701.64	1.38%

Audit Trail -- ANOVA Table (Multiple Regression Selected)

Source of variation	SS	df	MS	SEE
Regression	758,973,819,087,725.00	4	189,743,454,771,931.00	
Error	796,316,636,648,529.00	62	12,843,816,720,137.60	3,583,827.11
Total	1,555,290,455,736,250.00	66		

Audit Trail -- Coefficient Table (Multiple Regression Selected)

Series Description	Included in model	Coefficient	Standard error	T-test	P-value	Elasticity	Overall F-test
Normalized Cor	Dependent	-10,720,142.73	5,423,735.67	-1.98	0.05		5.50
Normalized Dom	Yes	1.03	0.25	4.12	0.00	2.17	
Seasonal Dumm	Yes	-1,649,238.86	1,712,395.81	-0.96	0.34	-0.04	
Seasonal Dumm	Yes	-1,633,689.84	1,712,079.55	-0.95	0.35	-0.04	
Seasonal Dumm	Yes	-3,304,267.39	1,664,920.67	-1.98	0.05	-0.08	

Audit Trail -- Correlation Coefficient Table

Series Description	Included in model	Normalized Corrected Profit	Normalized Domestic	Seasonal Dummy 1	Seasonal Dummy 2	Seasonal Dummy 3
Normalized Cor	Dependent	1.00	0.68	0.11	0.10	-0.20
Normalized Dom	Yes	0.68	1.00	0.16	0.15	-0.07
Seasonal Dumm	Yes	0.11	0.16	1.00	-0.34	-0.33
Seasonal Dumm	Yes	0.10	0.15	-0.34	1.00	-0.33
Seasonal Dumm	Yes	-0.20	-0.07	-0.33	-0.33	1.00

Audit Trail - Statistics

Accuracy Measures	Value
AIC	1,662.48
BIC	1,664.39
MAPE	13.68%
Sum Squared Error (SSE)	774,924,853,883,762.00
R-Square	32.86%
Adjusted R-Square	26.89%
Cochrane-Orcutt	-0.50
Root Mean Square Error	3,936,813.06

Forecast Statistics	Value
Durbin Watson (1)	2.99
Mean	10,571,702.34
Standard Deviation	4,853,187.35

Method Statistics	Value
Method Selected	Multiple Regression

ForecastX Configuration Parameters

Item	Value
Data range selected	[Transportation Data for Forecasting.xlsx]Sheet1'!$Q$1:$V$68
Time scale for data	Quarterly
Periods to forecast	17.00
Seasonal Length	
Replace Outliers Activated	No
Replace Outliers Standard Deviations	
Replace Outliers Forecasting Technique	
Replace Missing Values	No
Replace Missing Values (Lower Limit)	
Replace Missing Values (Upper Limit)	
Remove Leading Zeroes	No
Remove Trailing Zeroes	No
Use Holdback Evaluation	No
Holdback Evaluation Period	
Apply Tracking Signal	No
Apply Tracking Signal (Under Forecast Percentage)	
Apply Tracking Signal (Over Forecast Percentage)	
Forecast Method Selected	Multiple Regression

Report Details

Run Date: 5/5/2017 4:24:30 AM
Author: Collin
Note:

Serial Correlation Test
K=4, N=67
1.49≤dl≤1.51 du=1.74
2.49≤4-dl≤2.51 4-du=2.26

DW>4-dl, so reject Ho that pho=0

.3286-0.2698=0.0588
3
0.6714
62

0.0196
0.01082903

Fcrit=F3,62
2.68≤Fcrit≤2.76

Fcalc=1.80994974
Since Fcalc<Fcrit, reject the null hypothesis that all of these variables are insignificant