



# VIDEO GAME SALES

Time Series Forecasting

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## FORECAST VIDEO GAME SALES

### Business and Data Understanding

You recently started working for a company as a supply chain analyst that creates and sells video games. Many businesses must be on point when it comes to ordering supplies to meet the demand of its customers. An overestimation of demand leads to bloated inventory and high costs. Underestimating demand means many valued customers won't get the products they want. Your manager has tasked you to forecast monthly sales data to synchronize supply with demand, aid in decision making that will help build a competitive infrastructure and measure company performance. You, the supply chain analyst, are assigned to help your manager run the numbers through a time series forecasting model.

The task at hand is to predict the forecast for the next 4 months of sales.

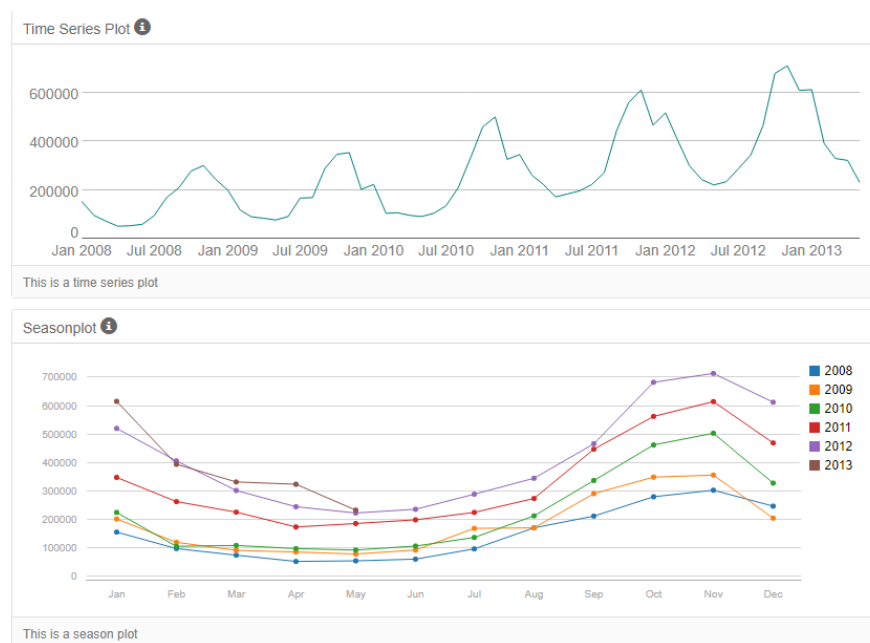
### Planning the Analysis

The Dataset looks promising we have a date of sales overtime, with 4 Characteristics,

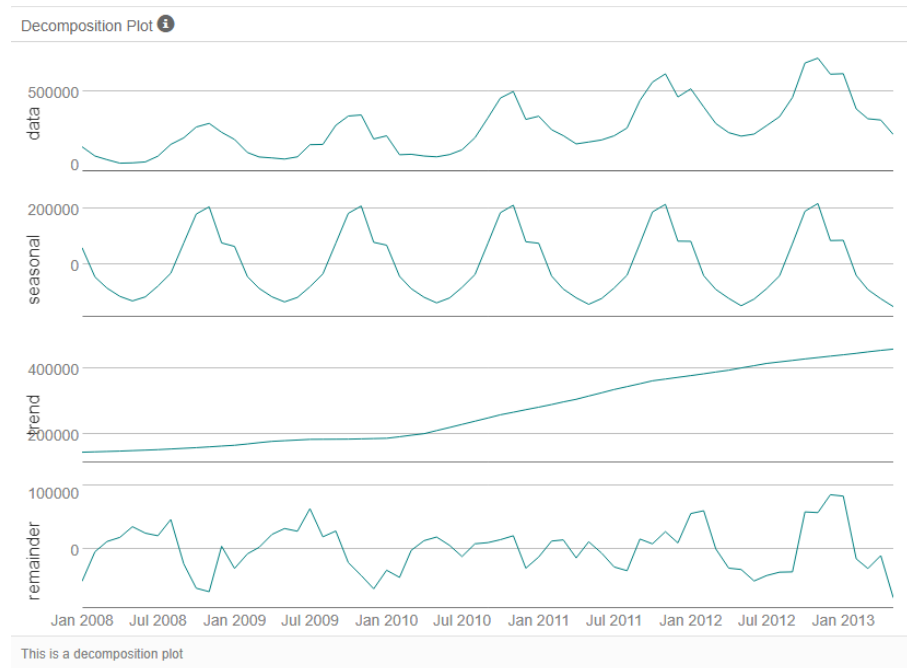
- Continuous time intervals
- Sequential measurements
- Equal spacing between every tow consecutive measurement
- Each time unit has at least data point

As we are to forecast the next 4 months of sales the holdout sample will be from June-13 to Sept-13.

### Determine Trend, Seasonal and Error components



## Project 6 Time Series Forecasting



The time series and decomposition plots are generated using TS plot function.

The seasonality and trend show increasing trends; thus multiplication and addition should be applied respectively.

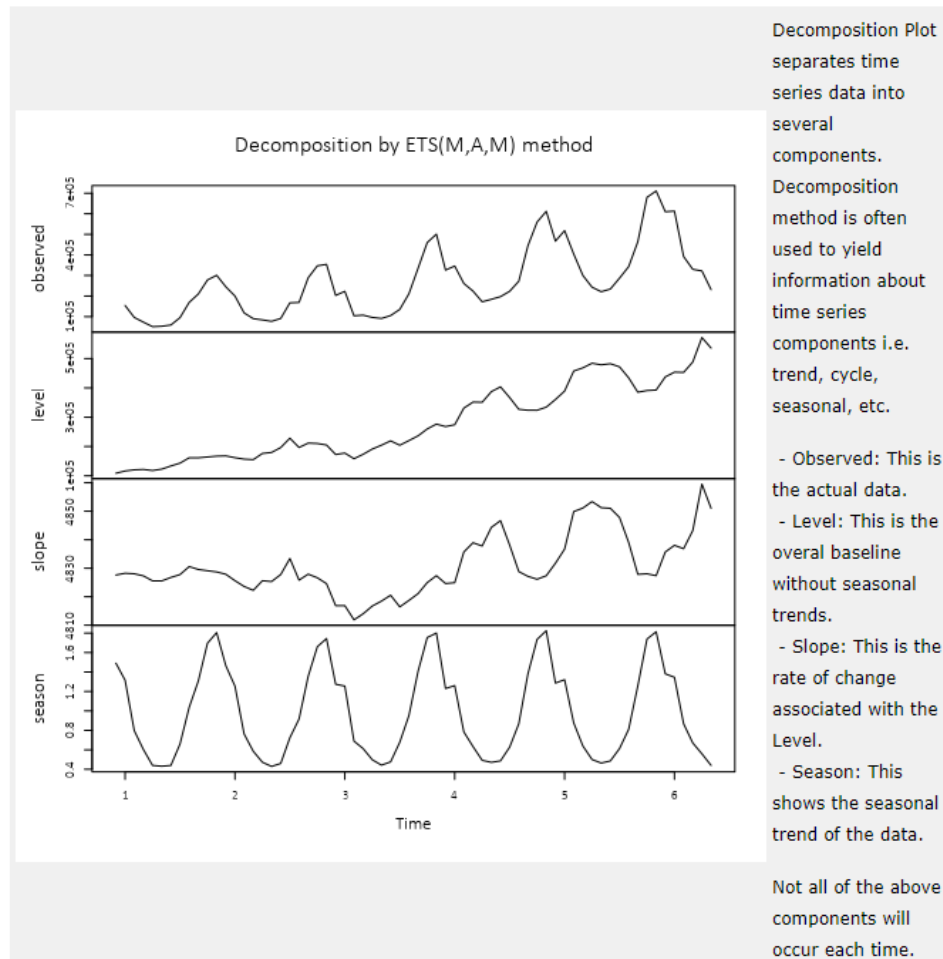
For error plot, there isn't a trend but rather fluctuations and thus should be applied multiplicatively as Well

## Models

ETS(M,A,M) (M.Ad.M)

chosen based on the decomposition plot above. A dampened and non-dampened ETS models are run with a holdout sample of 4 months.

Non-Dampened ETS Model:



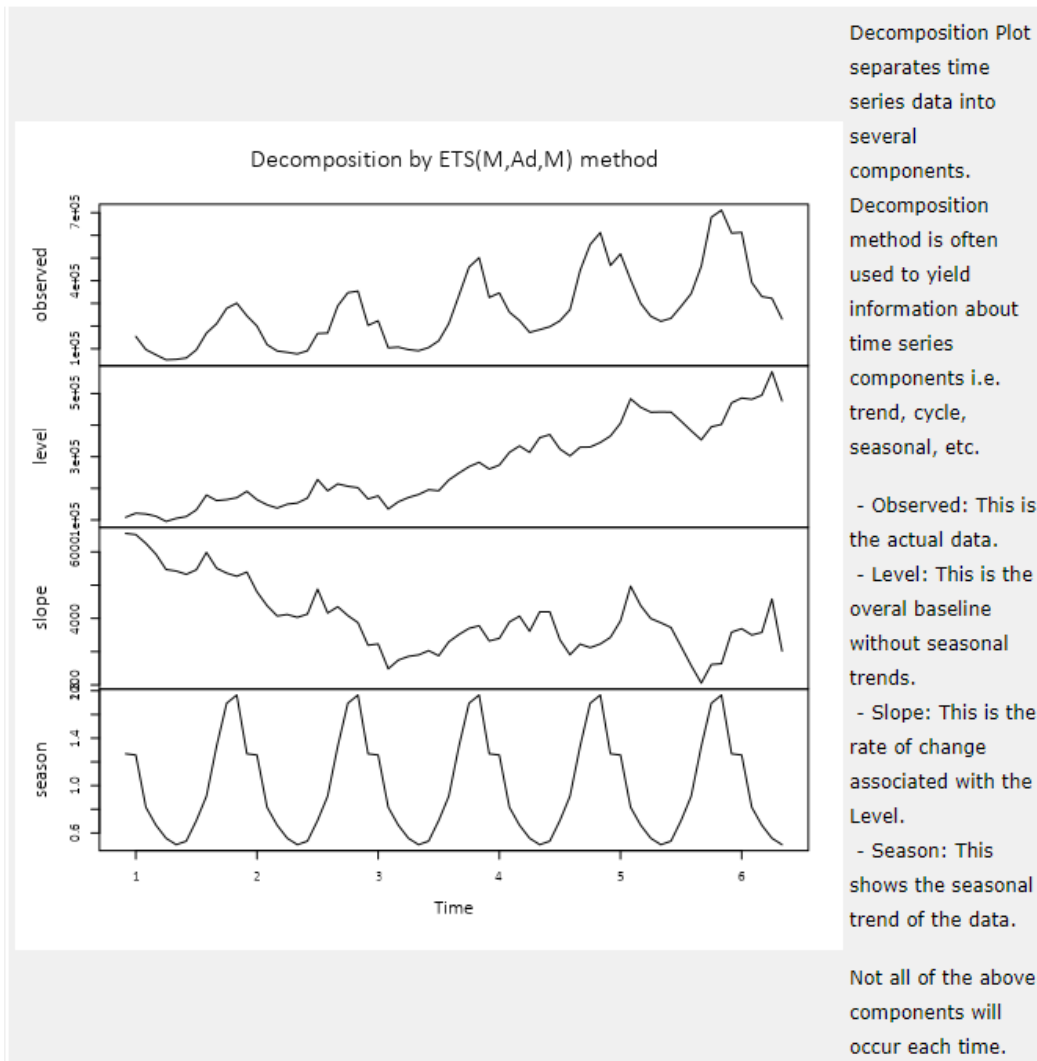
In-sample error measures:

ME	RMSE	MAE	MPE	MAPE	MASE	ACF1
281.3033372	40906.5798105	28212.6317577	-0.9199379	11.2444007	0.4115798	0.2971592

Information criteria:

AIC	AICc	BIC
1649.9458	1662.9671	1686.9104

AIC Values is 1649.74, RMSE (Root Mean Square Error) is 40906.57 and MASE (Mean Absolute Error) is 0.411.



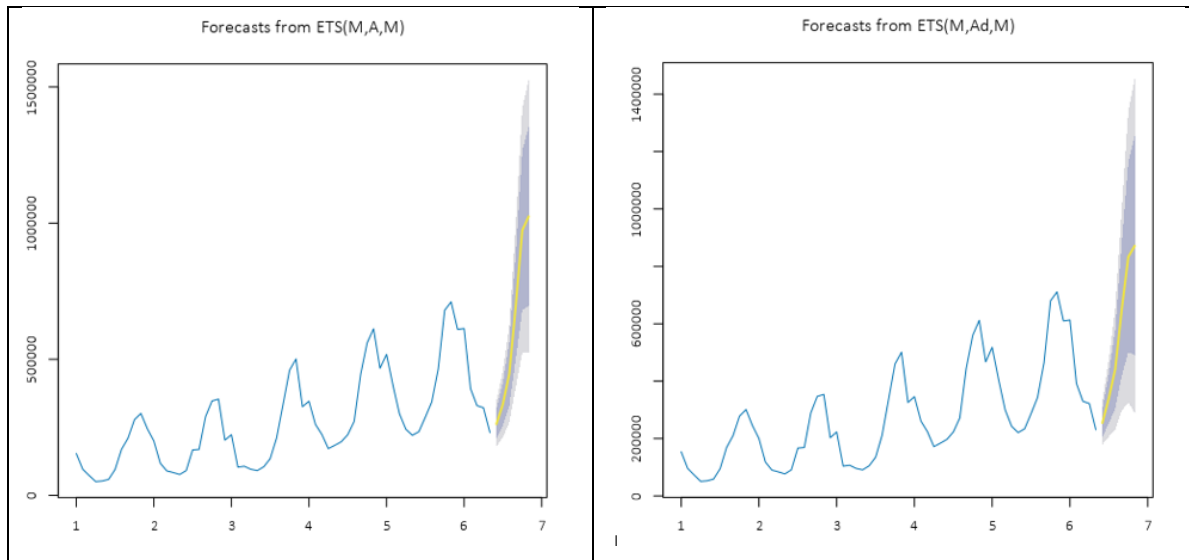
In-sample error measures:

ME	RMSE	MAE	MPE	MAPE	MASE	ACF1
3243.4703524	31474.3668886	24188.2167878	-0.572395	10.3052041	0.3528697	0.0087402

Information criteria:

AIC	AICc	BIC
1640.1232	1654.9928	1679.2622

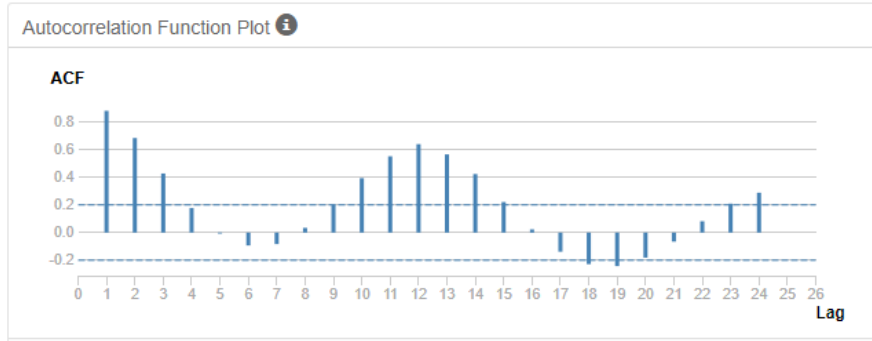
AIC Values is 1640.12, RMSE (Root Mean Square Error) is 31474.36 and MASE (Mean Absolute Error) is 0.352



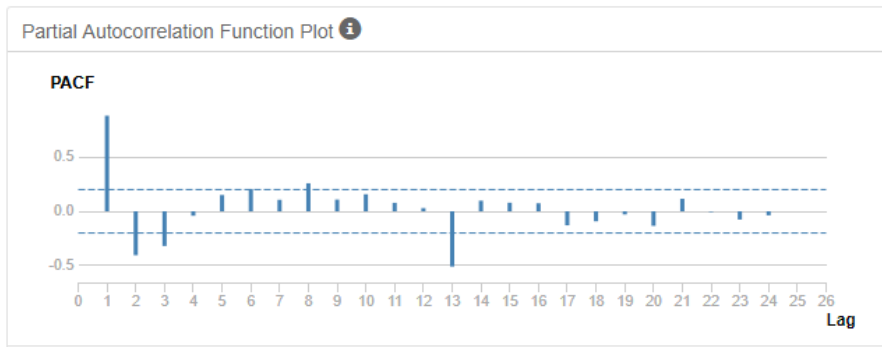
The Forecast Plot shows the historic data in black and the expected value in blue. The orange in the plot shows the 90% confidence interval, and the yellow shows the 95% confidence interval.

The Dampened model is out better one as it has the lowest AIC / RMSE out of the two ETS Models.

### The time series ACF / PACF

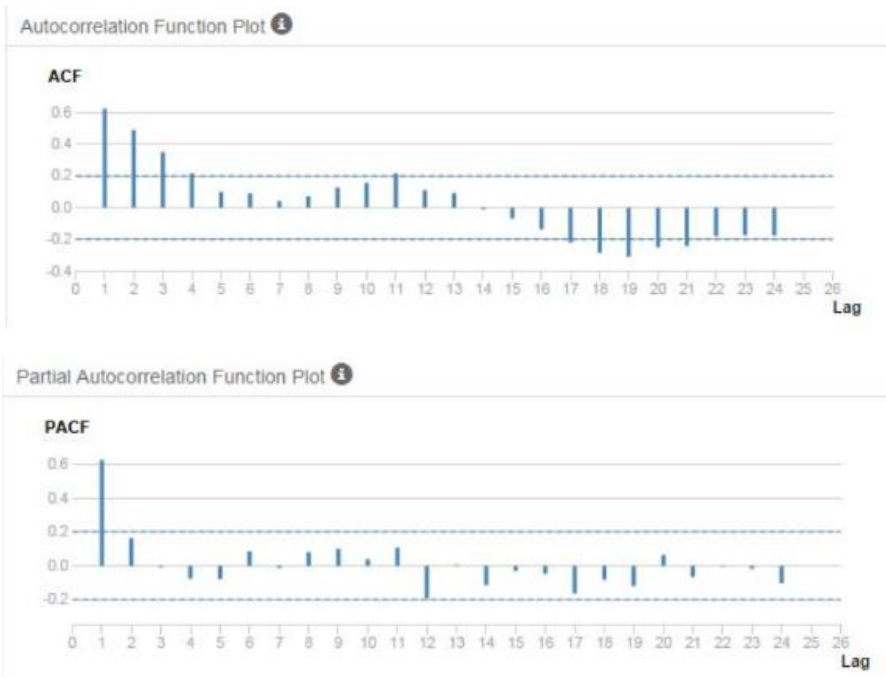


ACF show high correlation



PAF shows a lag at period 13

### Seasonal difference ACF / PACF



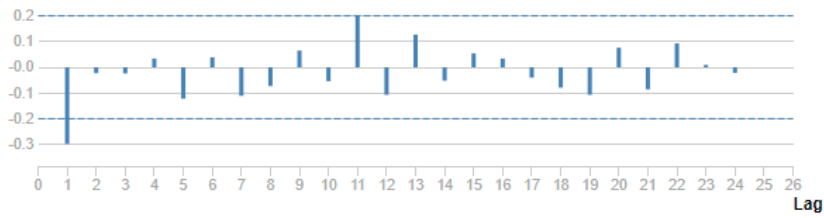
AFC, is slightly less correlated.



## Seasonal difference

Autocorrelation Function Plot 

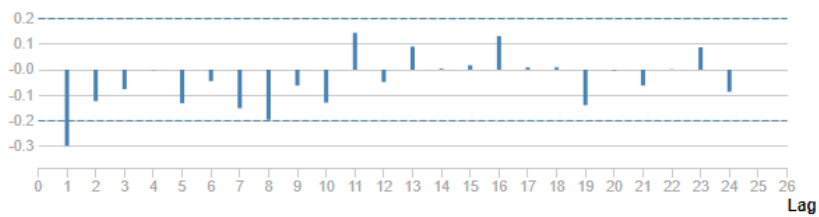
ACF



ACF correlation is still present

Partial Autocorrelation Function Plot 

PACF



## Information Criteria:

AIC	AICc	BIC
1349.6334	1350.0949	1355.7095

## In-sample error measures:

ME	RMSE	MAE	MPE	MAPE	MASE	ACF1
-356.2665104	36761.5281724	24993.041976	-1.8021372	9.824411	0.3646109	0.0164145

AIC 1349.63, RMSE (Root Mean Square Error) is 36761.36 and MASE (Mean Absolute Error) is 0.3646.

The last model run shows no significant correlation, no more models are required.

Between the ETS and ARIMA; ARIMA is the better model as it has the lower AIC value

## Forecast

The forecast for the next 4 periods (Oct-13 till Jan-14) are **754,854**, **785,854**, **684,654** and **687,854**.

