Business Forecasting Project

Introduction

A supply chain organization is trying to plan labor for the upcoming year at one manufacturing location. We will look at 5 years of previous sales figures to help the team anticipate where there may be labor constraints in 2022. Note data is not real sales, figures are simulated for this proof of concept.

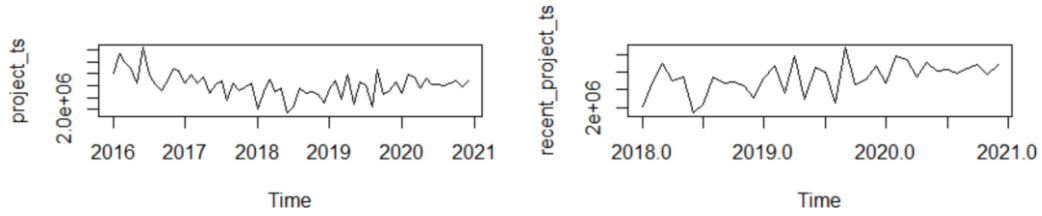
Import Data

Pdata is imported into R. Pdata is monthly sales data from 2016-2021

	MonthYr	Qty
1	2016-01-01	8159778
2	2017-01-01	11336447
3	2018-01-01	9866122
4	2019-01-01	8796665
5	2020-01-01	6404143
6	2016-02-01	12350282

Plot and Infer

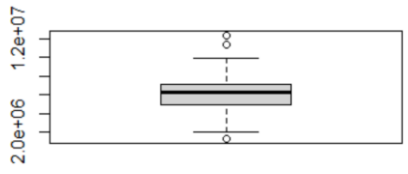
Looking at the time series as a whole, from 2016 thru 2021 the appears to be a significant shift in 2018.



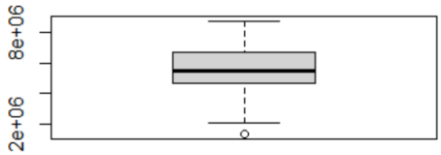
Central Tendency

```
> summary(recent_project_ts)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
1311440 4671583 5498730 5401580 6684775 8768251
```

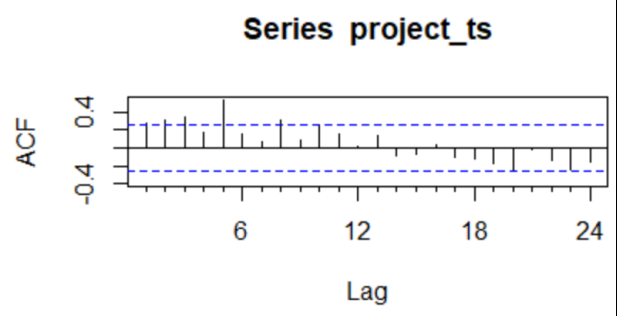
```
> boxplot(project_ts)
```



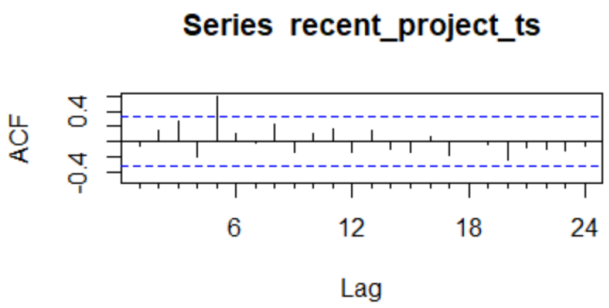

```
> boxplot(recent_project_ts)
```



```
> Acf(project_ts)
```



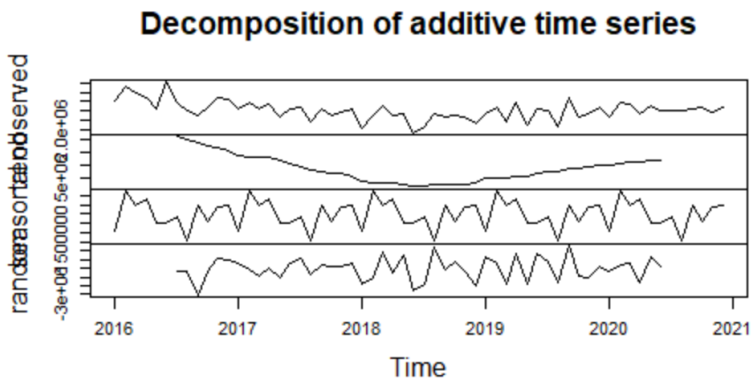

```
> Acf(recent_project_ts)
```



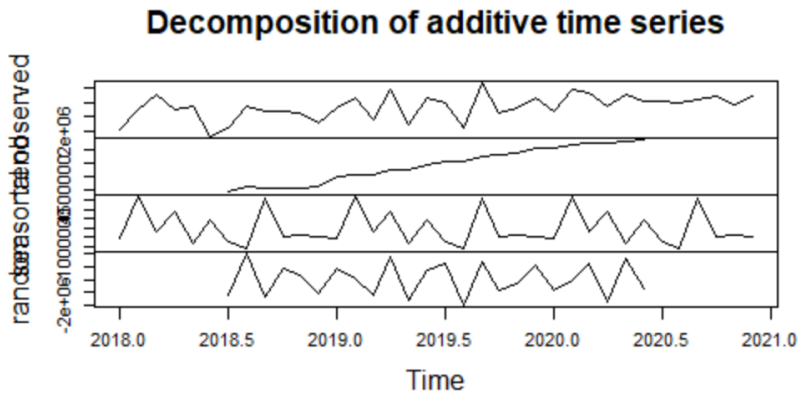
Decomposition

Decomposition Plot

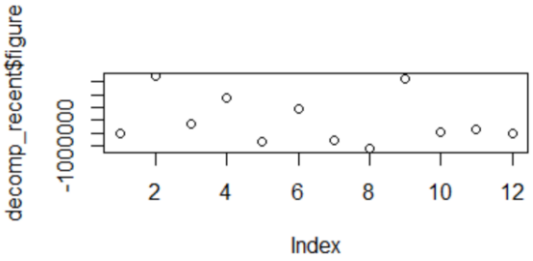
Decomposition plot of entire time series



Decomposition plot of recent time series



February and September have the highest seasonal indexes.

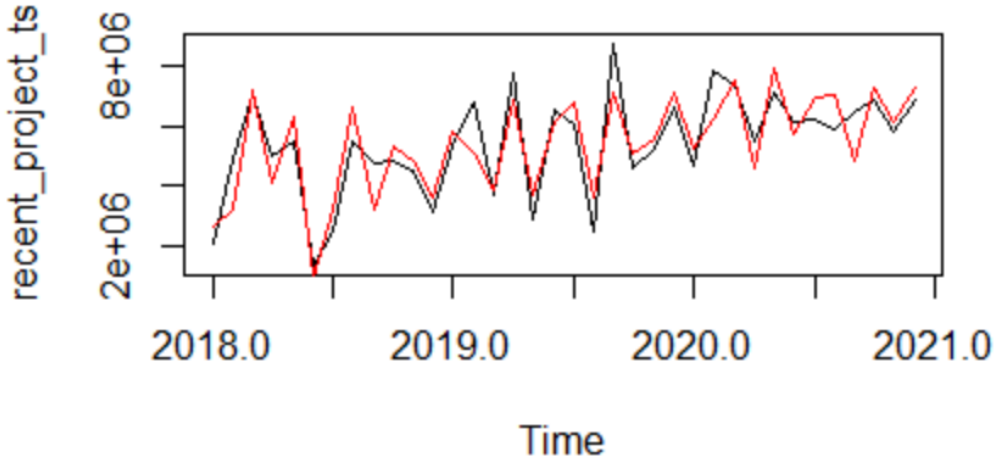



```
$figure
 [1]  -526224.8  1700490.0  -144098.3   888660.2
 [5]  -799539.3   426711.7  -748391.8 -1110811.8
 [9]  1615914.7  -460286.3  -363775.2  -478649.0
```

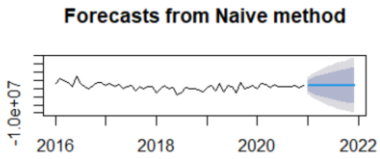
Historically January and February are higher months and June and July are lower.

Seasonally adjusted does not have many big fluctuations.

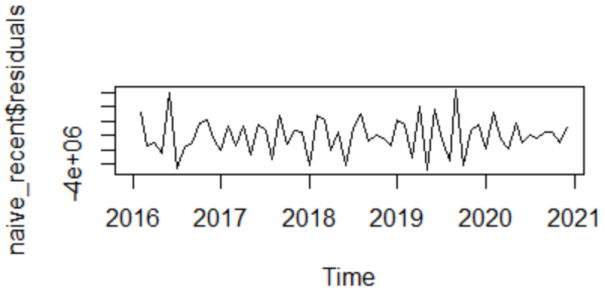
```
> plot(recent_project_ts)
> lines(seasadj_recent, col="Red")
```

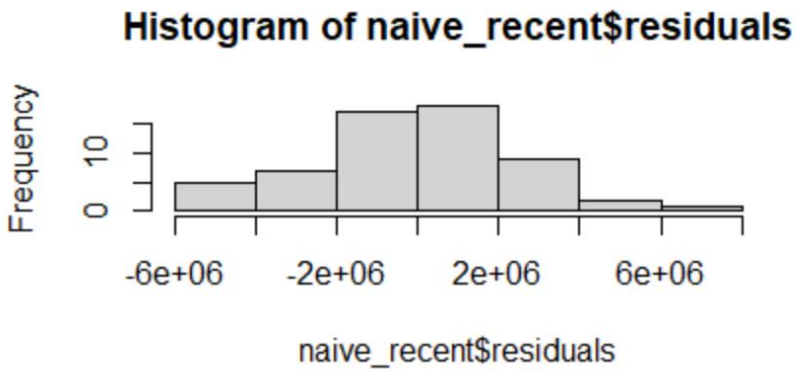


Naïve Method

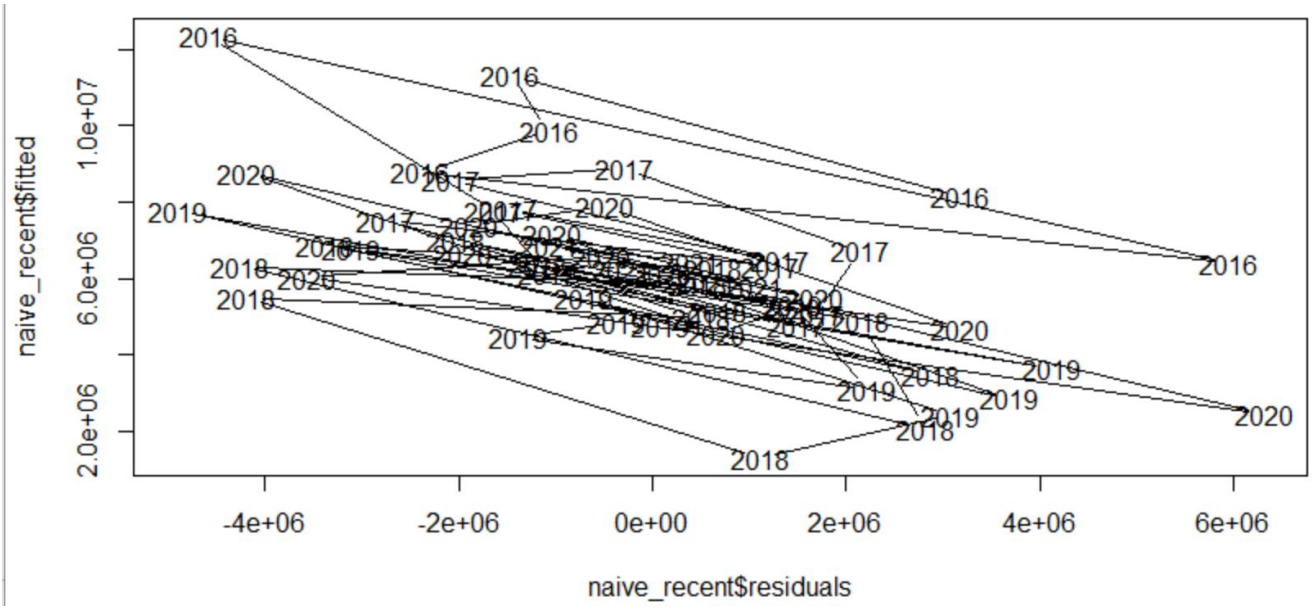


Naïve Residuals plot





***need to figure out how to remove data lables from Plot fitted vs Residuals

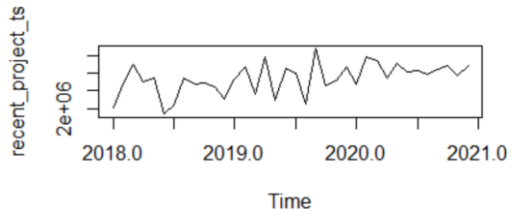


Naïve forecast accuracy

```
> accuracy(naive_recent)
                     ME    RMSE     MAE       MPE
Training set -22286.89 2480182 1992502 -14.20041
                  MAPE     MASE       ACF1
Training set 42.29453 0.835522 -0.5532159
```

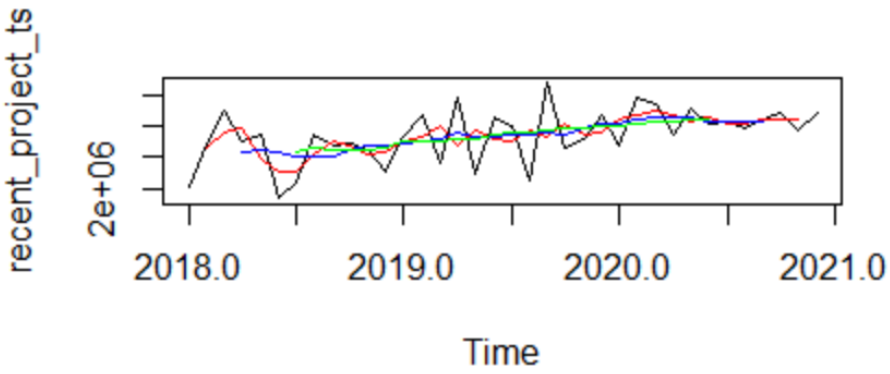
MA Forecast

Time series plot




```
> ma3_fcst=ma(recent_project_ts,order=3)
> ma6_fcst=ma(recent_project_ts,order=6)
> ma12_fcst=ma(recent_project_ts,order=12)
```

```
> plot(recent_project_ts)
> lines(ma3_fcst, col="Red")
> lines(ma6_fcst, col="Blue")
> lines(ma12_fcst, col="Green")
```


recent_project_ts
2e+06
2018.0
2019.0
2020.0
2021.0
Time