Time Series Analysis

Basics of Time Series Analysis: Data Example

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Stationarity of ED Volume Time Series

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About This Lesson

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Residual Process

```
## Residual Process: Trend Removal
resid.1 = Volume.tr-vol.fit.gam
## Residual Process: Seasonality Removal
resid.2 = Volume.tr-vol.fit.lm.seastr.2
## Residual Process: Trend and Seasonality Removal
resid.3 = Volume.tr-vol.fit.gam.seastr.2
y.min = min(c(resid.1,resid.2,resid.3))
y.max = max(c(resid.1,resid.2,resid.3))

ggplot(edvoldata, aes(dates, resid.1),ymin=y.min,ymax=y.max) + geom_line() +
xlab("Time") + ylab("Residual Process")
lines(dates,resid.2,col="blue")
lines(dates,resid.3,col="brown")
```

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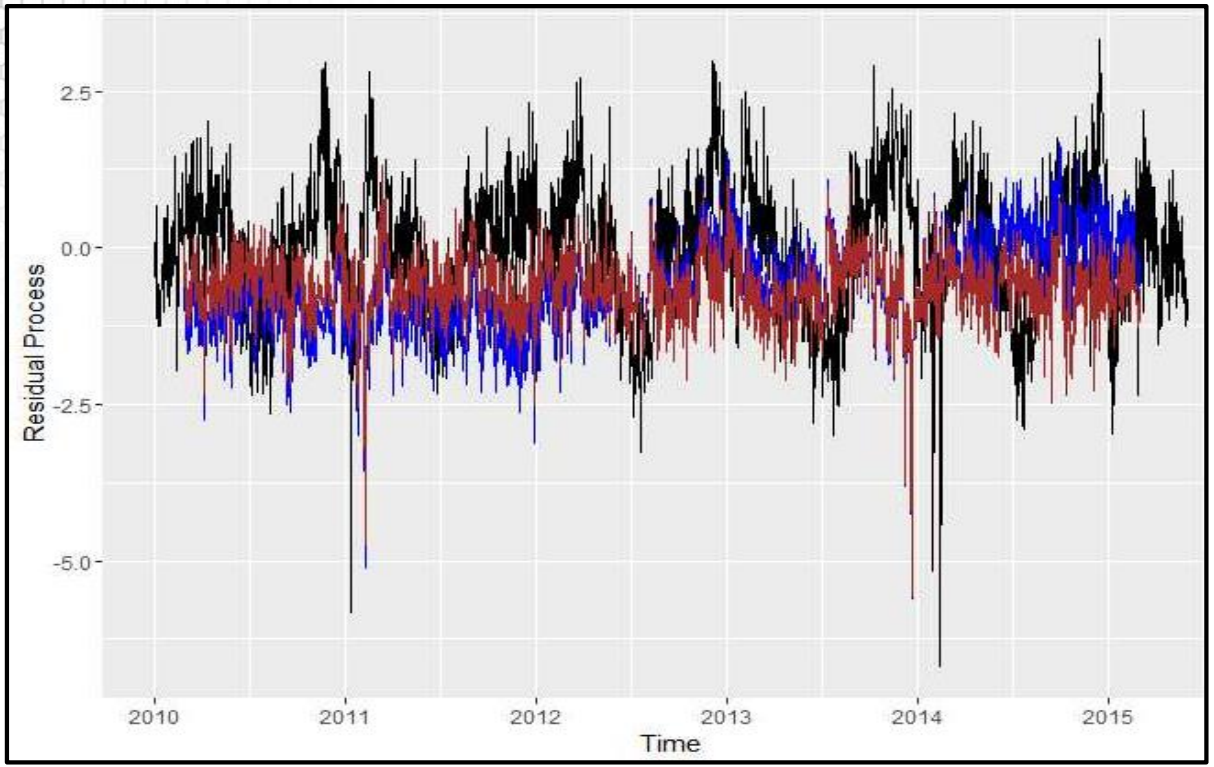
Residual Process



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Residual Process: ACF

```
## Compare Auto-correlation plots
acf(resid.1,lag.max=12*4,main="")
acf(resid.2,lag.max=12*4,main="",col="blue")
acf(resid.3,lag.max=12*4,main="",col="brown")
```

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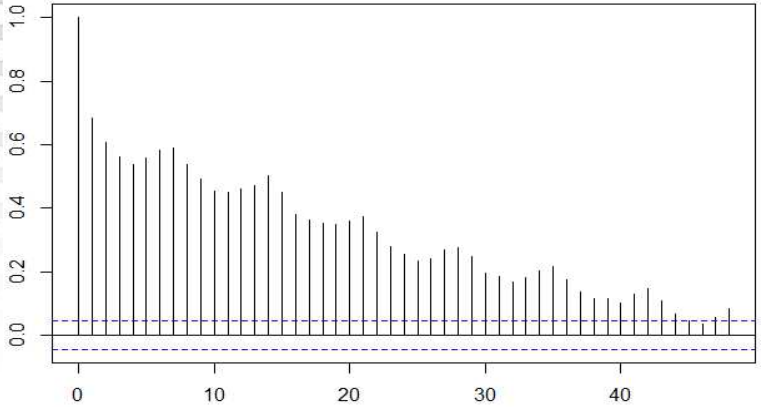
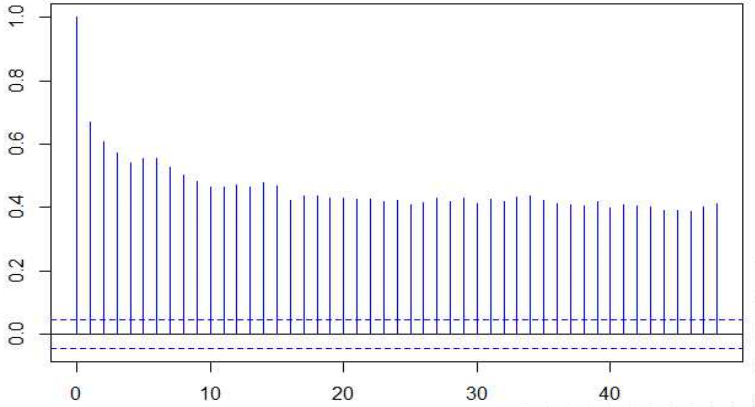
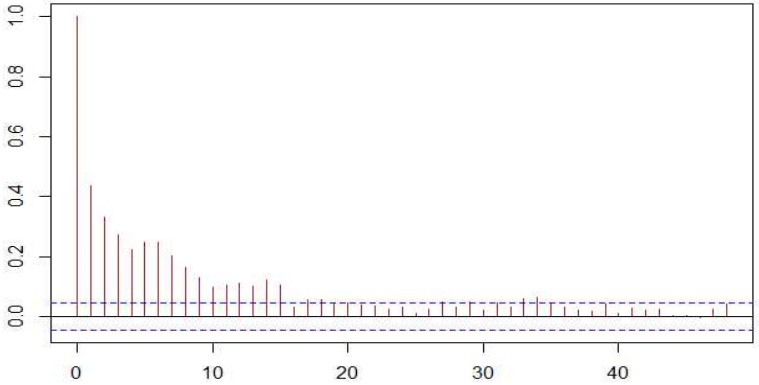
Residual Process: ACF







ACF is outside of the band for the first 15 lags, an indication of stationarity

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Findings

- There is a significant increasing trend in the Emergency Department (ED) patient volume over the past five years
- Seasonality is more complex; both monthly and day-of-the-week are statistically significant seasonality
- There are cyclical patterns that may not be fully captured by seasonality; other cyclical factors such as flu season or school season may explain the cyclical pattern

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Summary

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