

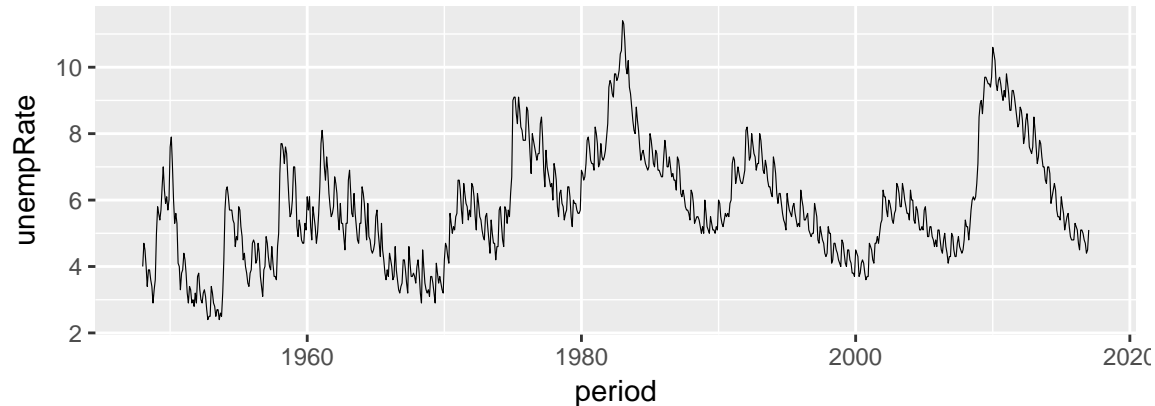
Project - 2

Dwipam

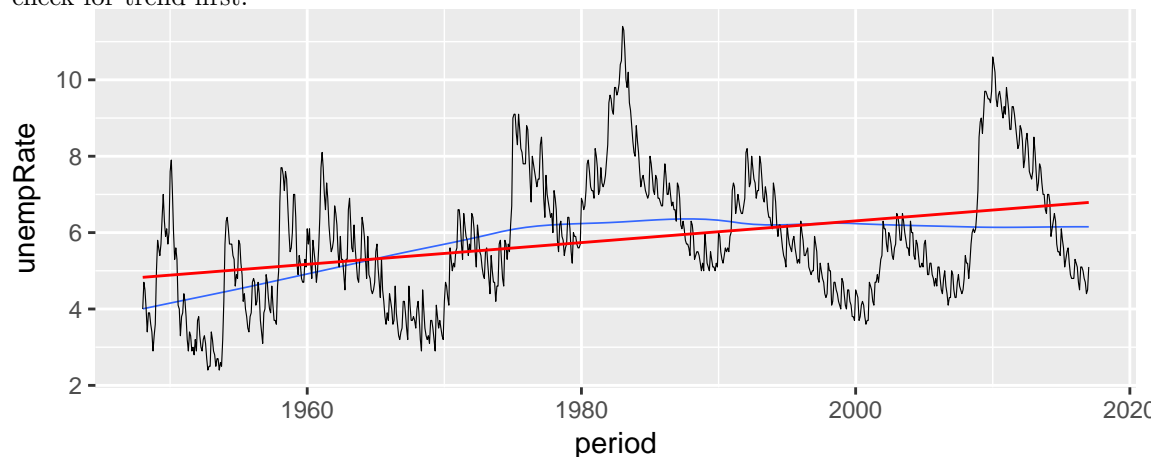
2/19/2017

Question 1:

Unemployment rate by month from 1948 to 2017

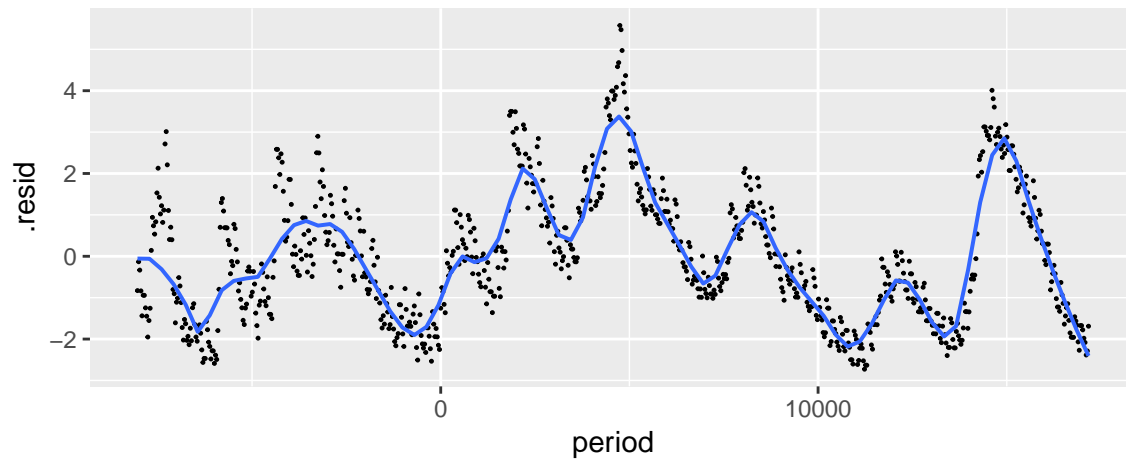


Clearly there seems to be some trend but no seasonal component. Let's fit the Loess line and Linear fit and check for trend first.



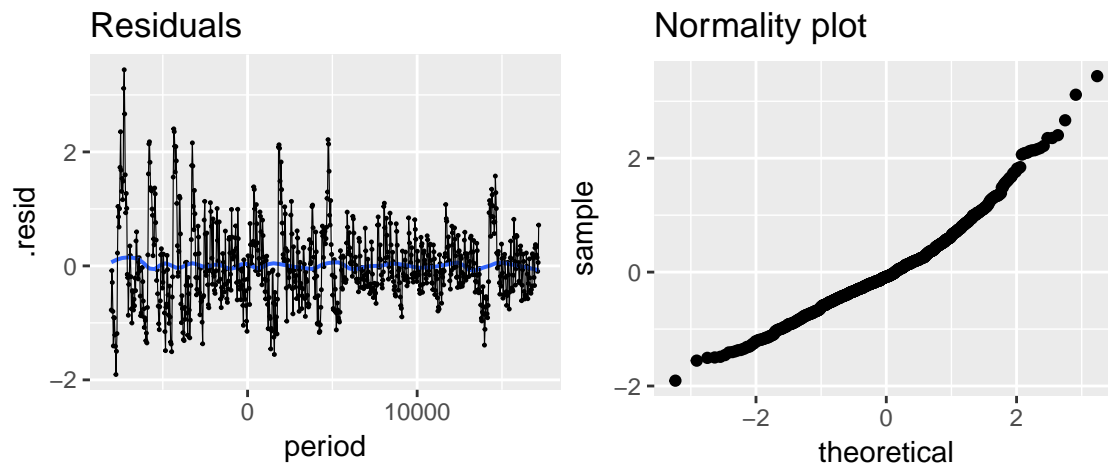
Red line is the Linear fit, and blue line is the loess fit with degree = 1. It seems that there is an increasing trend over period of time for Linear fit. For Loess fit there was a small spike of unemployment during year 1975 - 1995. That's why there is a hump in the curve for Loess fit, but still comparing right and left tail, there is an increase in unemployment rate over all. This hump seems to be an irregularity over the period of time, we will stick with Linear model as it generalizes better. There seems to be a season of 1 month, where unemployment rate starts with low gradually increases and falls down for the next month. However we don't know if there is seasonality. Let's fit trend and assess the residual.

```
## `geom_smooth()` using method = 'loess'
```

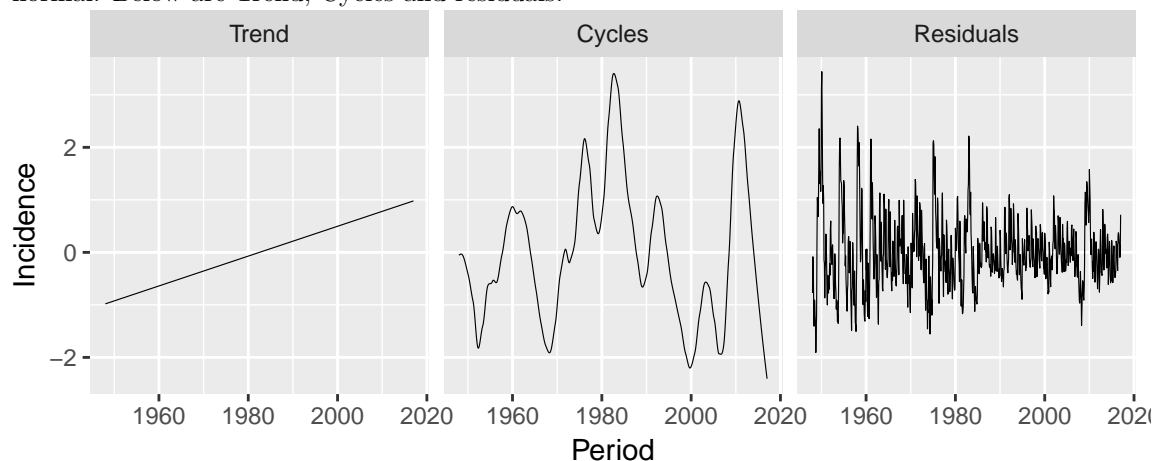


After playing with span parameter and fitting loess method, it seems that there are 6 cycles in the residuals. Now let's try fitting this model and assess second order residuals.

```
## `geom_smooth()` using method = 'loess'
```



Now it seems that there is random behavior in the third order residuals, hence it won't be a good idea to further fit our model. Also, it seems that the normality plot is slightly right-skewed but it seems to look fairly normal. Below are Trend, Cycles, and residuals.



```
##
```

```
## Variance captured Trend: 0.3213793
```

```
##
```

```
## Variance captured Cycles: 1.829738
```

```
##
```

```
## Variance in residuals: 0.5005653
```

There is still too much variance left in the residuals, however there might be some other parameter required to explain this variance.