HW4

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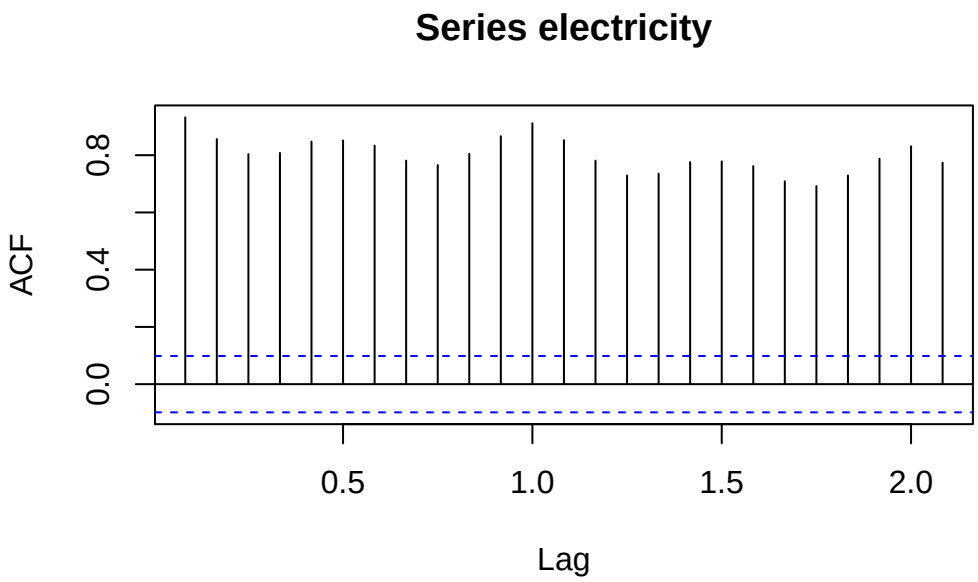
Problem 3a

```
library(TSA)
```

```
Attaching package: 'TSA'

The following objects are masked from 'package:stats':

    acf, arima

The following object is masked from 'package:utils':

    tar
```

```
data(electricity)
acf(electricity)
```

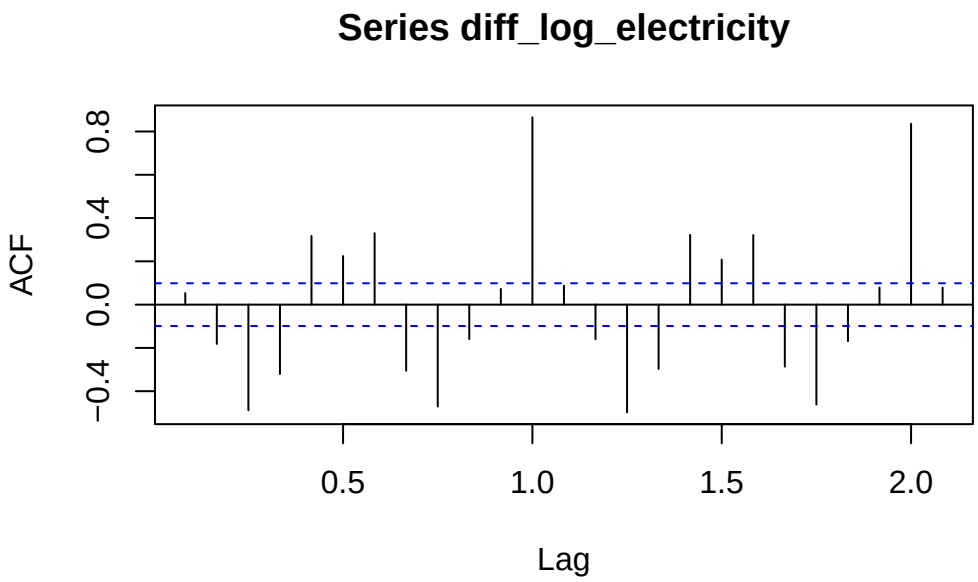


The data does not appear to be stationary based on the ACF plot because:

- Significant ACF at all lags.
- Seasonal pattern with peaks every 12 lags.
- Slow, if any decay in ACF.

Problem 3b

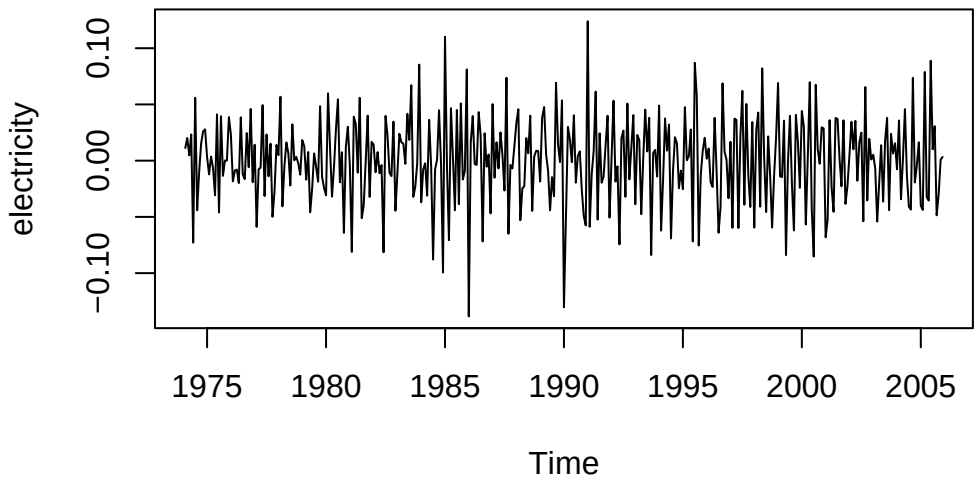
```
log_electricity <- log(electricity)
diff_log_electricity <- diff(log_electricity)
acf(diff_log_electricity)
```



Yes, seasonality is visible. Since the electricity data is monthly and there are significant ACF's at every 12 lags, the seasonal component is 12 months.

Problem 3c

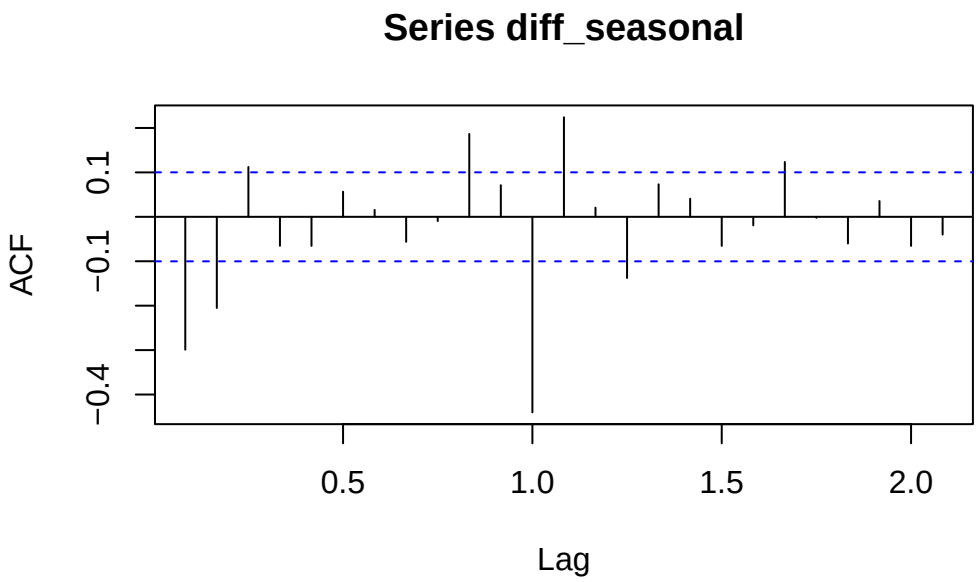
```
diff_seasonal <- diff(diff_log_electricity, lag = 12)
plot(diff_seasonal)
```



Yes, the plot looks stationary now.

Problem 3d

```
acf(diff_seasonal)
```



- $p = 0$ because no gradual decay appears in ACF..
- $d = 1$ because we needed first differencing to remove trend/non-stationarity.
- $q = 1$ because of a sharp drop in ACF after lag 1.
- $P = 0$ because no gradual decay or spike pattern.
- $D = 1$ because seasonal differencing of order 1 is needed.
- $Q = 1$ because the large spike at lag 12.
- Seasonal period of 12

Therefore a model to consider would be:

$ARIMA(0, 1, 1)X(0, 1, 1)_{12}$