

## Trafic Voyageur SNCF

#On charge les packages nécessaires

```
install.packages("forecast")
```

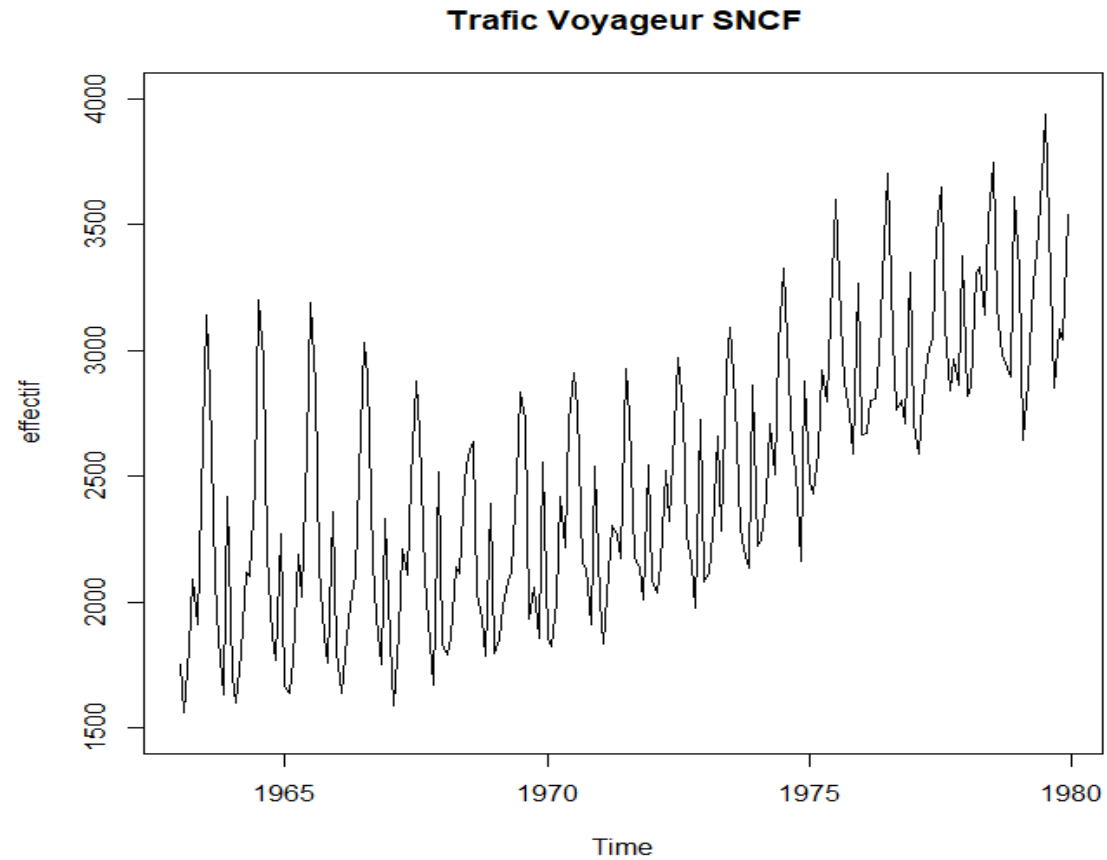
```
library(tseries)
```

```
library(forecast)
```

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1963	1750	1560	1820	2090	1910	2410	3140	2850	2090	1850	1630	2420
1964	1710	1600	1800	2120	2100	2460	3200	2960	2190	1870	1770	2270
1965	1670	1640	1770	2190	2020	2610	3190	2860	2140	1870	1760	2360
1966	1810	1640	1860	1990	2110	2500	3030	2900	2160	1940	1750	2330
1967	1850	1590	1880	2210	2110	2480	2880	2670	2100	1920	1670	2520
1968	1834	1792	1860	2138	2115	2485	2581	2639	2038	1936	1784	2391
1969	1798	1850	1981	2085	2120	2491	2834	2725	1932	2058	1856	2553
1970	1854	1823	2005	2418	2219	2722	2912	2771	2153	2136	1910	2537
1971	2008	1835	2120	2304	2264	2175	2928	2738	2178	2137	2009	2546
1972	2084	2034	2152	2522	2318	2684	2971	2759	2267	2152	1978	2723
1973	2081	2112	2279	2661	2281	2929	3089	2803	2296	2210	2135	2862
1974	2223	2248	2421	2710	2505	3020	3327	3044	2607	2525	2160	2876
1975	2481	2428	2596	2923	2795	3287	3598	3118	2875	2754	2588	3266
1976	2667	2668	2804	2806	2976	3430	3705	3053	2764	2802	2707	3307
1977	2706	2586	2796	2978	3053	3463	3649	3095	2839	2966	2863	3375
1978	2820	2857	3306	3333	3141	3512	3744	3179	2984	2950	2896	3611
1979	3313	2644	2872	3267	3391	3682	3937	3284	2849	3085	3043	3541

## représentation graphique de la série temporelle

```
plot.ts( effectif,ylim=c(1500,4000), main="Trafic Voyageur SNCF")
```

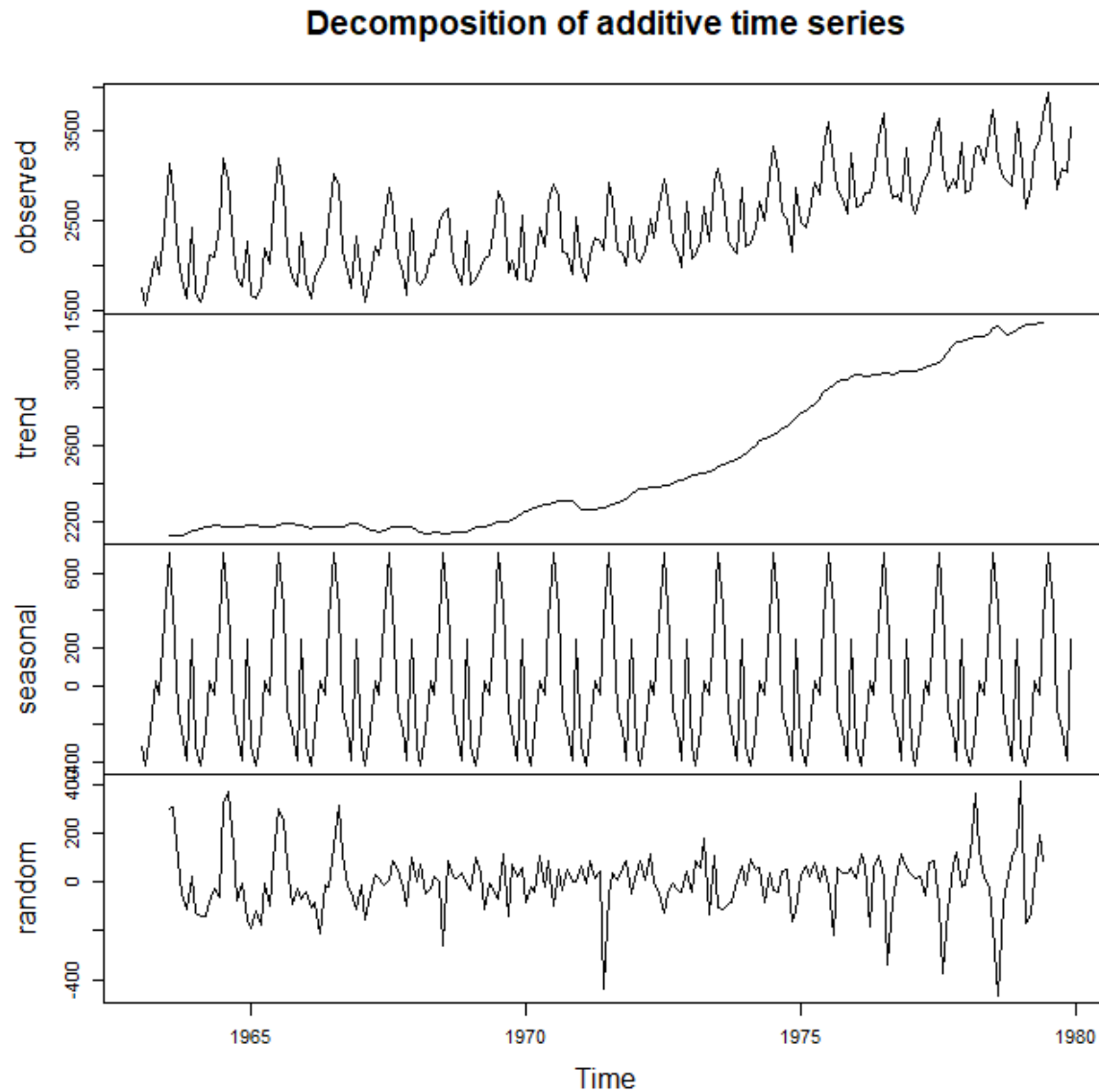


# décomposition de la série en tendance, saisonnalité et « bruit blanc »

```
tsdisplay(effectif)
```

```
m <- decompose(effectif)
```

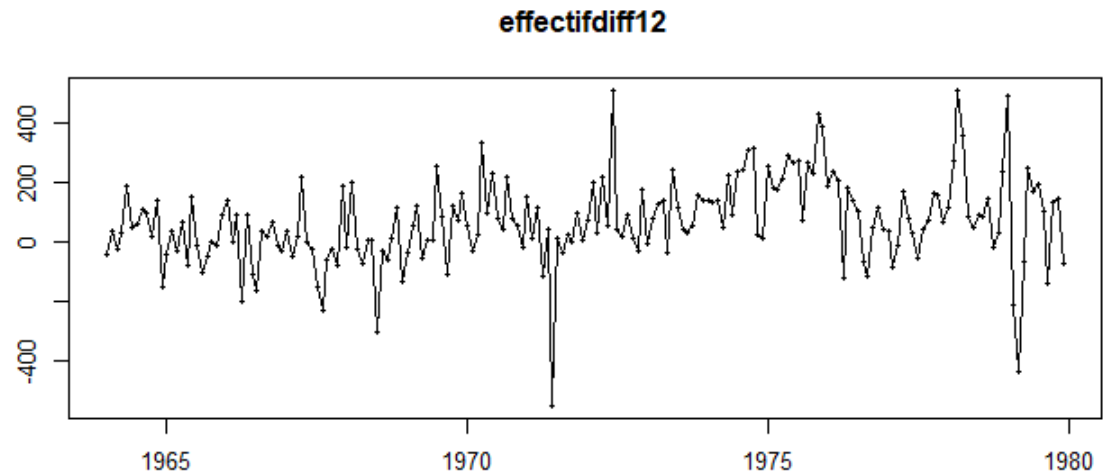
```
plot(m)
```



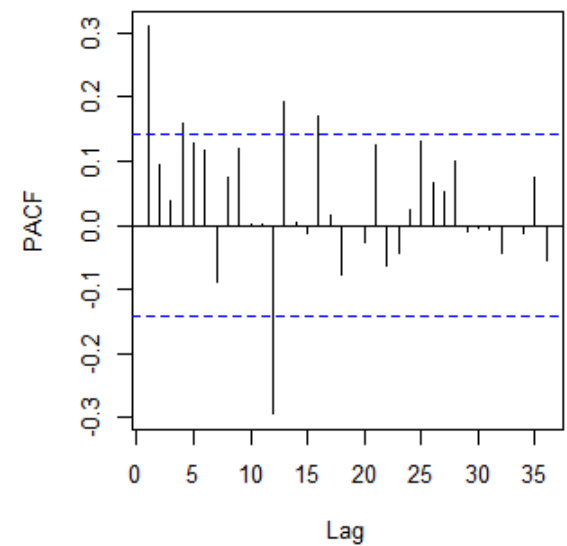
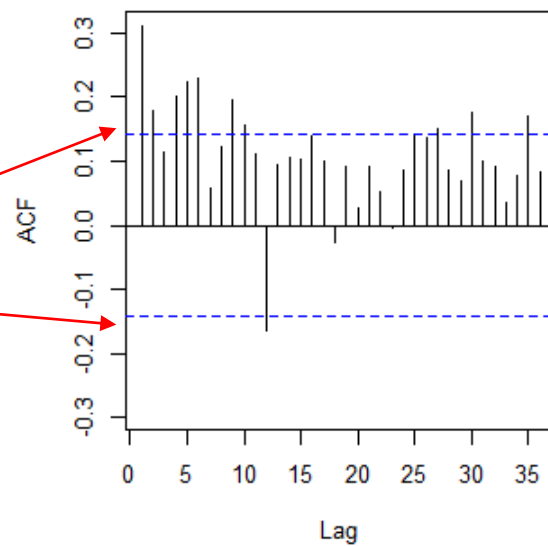
## ATTENTION

```
effectifdiff12 <- diff(effectif,12)
```

```
tsdisplay(effectifdiff12)
```



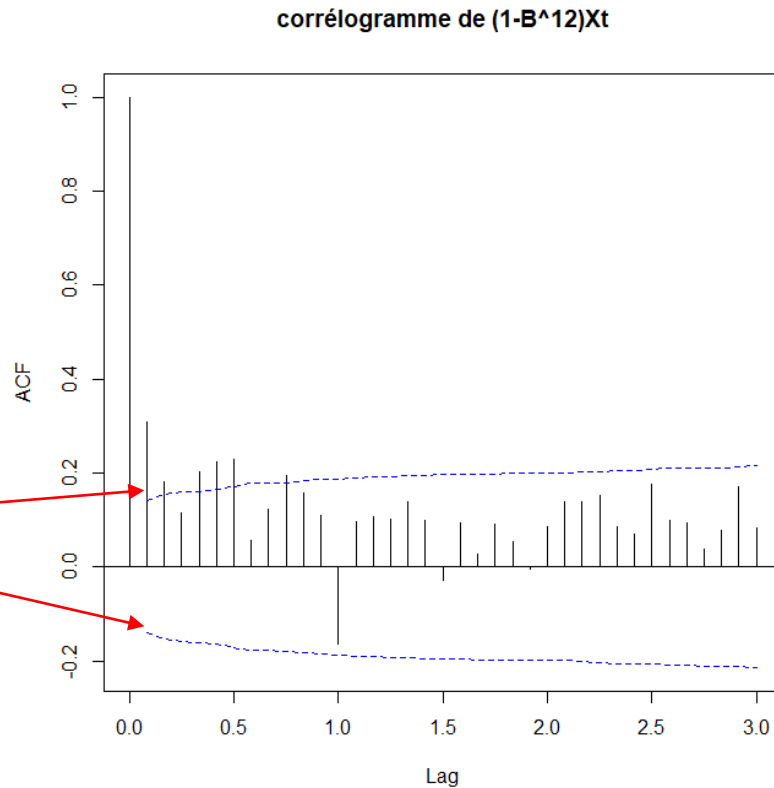
Problème



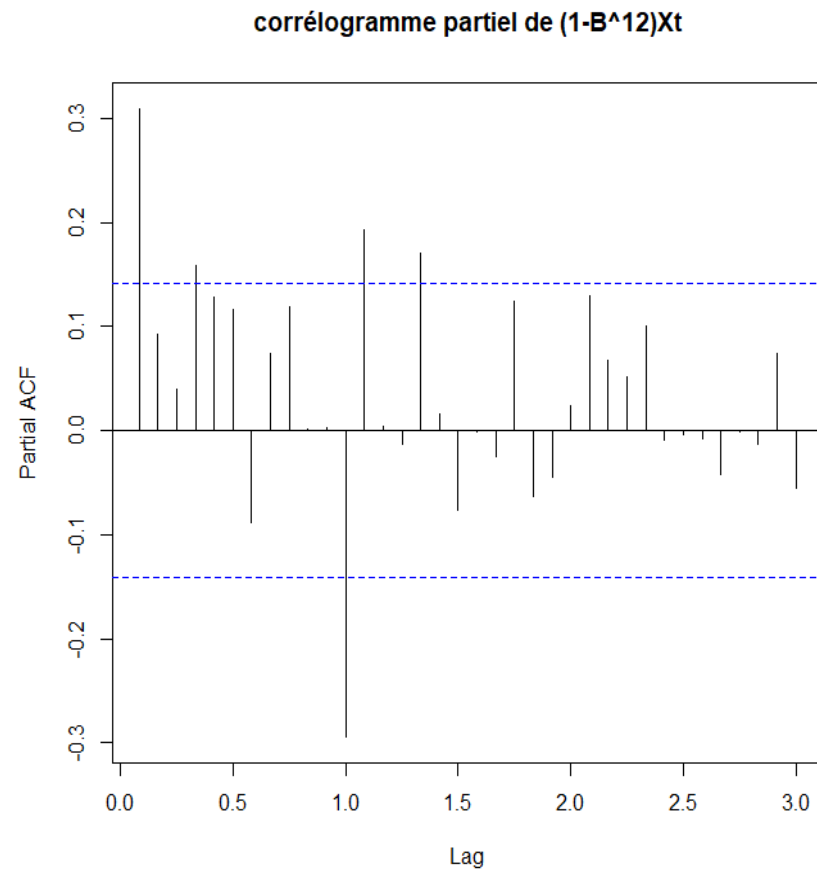
**Ce qu'il faut écrire:**

```
acf(effectifdiff12,lag.max=24,main="corrélogramme de (1-B^12)Xt",ci.type="ma")
```

**Intervalle de Bartlett**



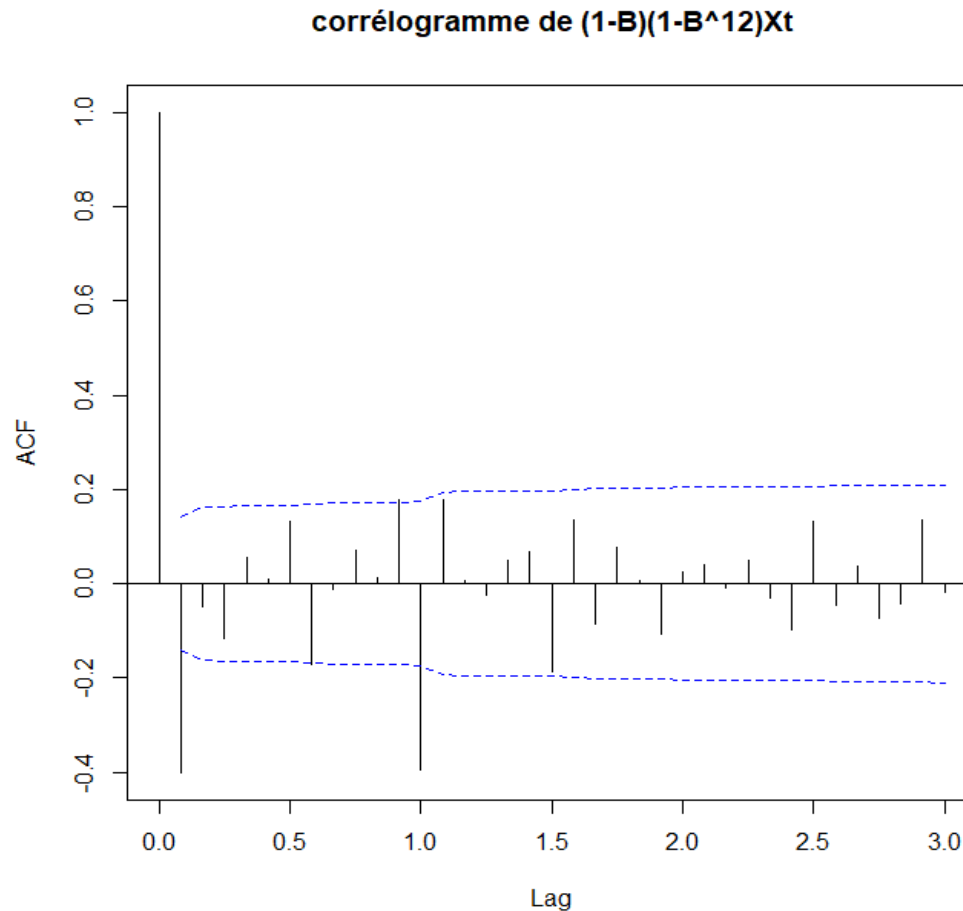
```
pacf(effectifdiff12,lag.max=36,main="corrélogramme partiel de (1-B^12)Xt")
```



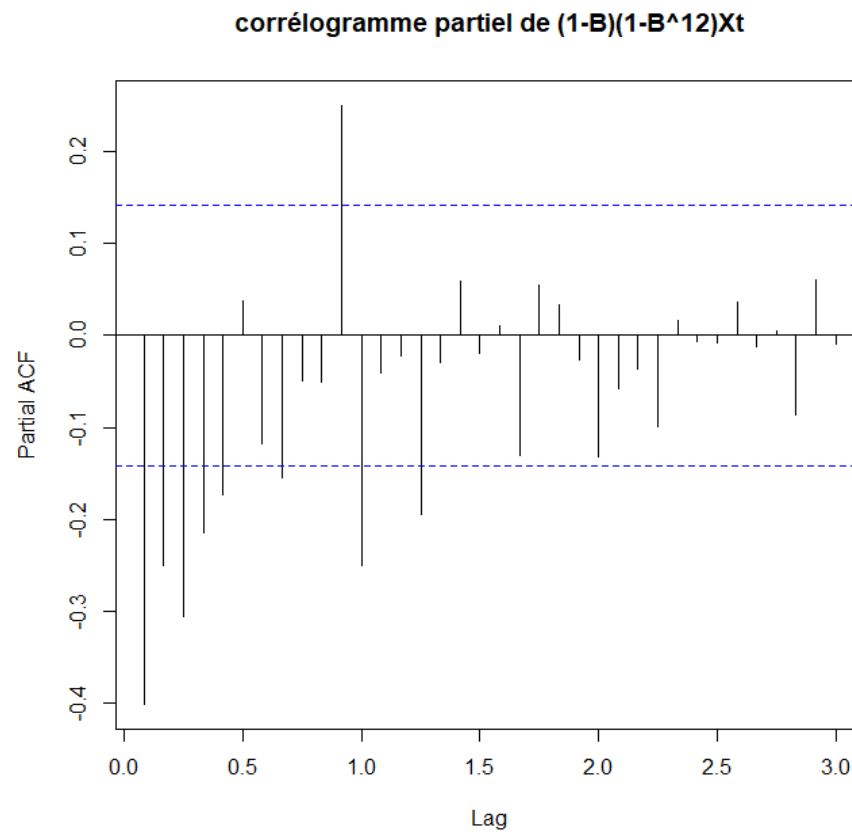
```
effectifdiffdiff12 <- diff(effectifdiff12,lag=1,difference=1)
```

```
effectifdiffdiff12
```

```
acf(effectifdiffdiff12,lag.max=36,main="corrélogramme de (1-B)(1-B^12)Xt",ci.type="ma")
```



```
pacf(effectifdiffdiff12,lag.max=36,main="corrélogramme partiel de (1-B)(1-B^12)Xt")
```





```
model1 <- arima(effectif,order=c(0,1,1), seasonal = list(order=c(0,1,1),period=12))
```

```
model1
```

```
Call:
arima(x = effectif, order = c(0, 1, 1), seasonal = list(order = c(0, 1, 1),
  period = 12))

Coefficients:
          mal          smal
      -0.8336   -0.4793
s.e.    0.0496    0.0647

sigma^2 estimated as 15026:  log likelihood = -1191.71,  aic = 2389.42
```

```
t_stat(model1)
```

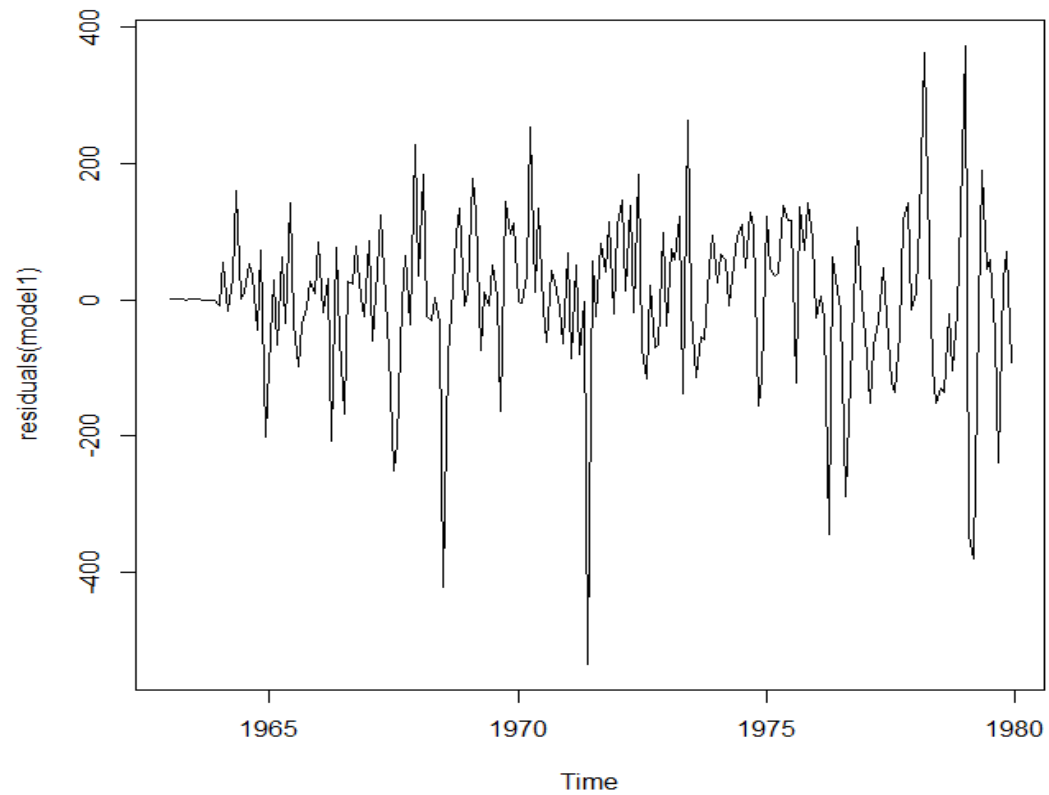
```
          mal          smal
t.stat -16.81645  -7.409417
p.val    0.00000    0.000000
```

```
Box.test(residuals(model1), type="Ljung-Box")
```

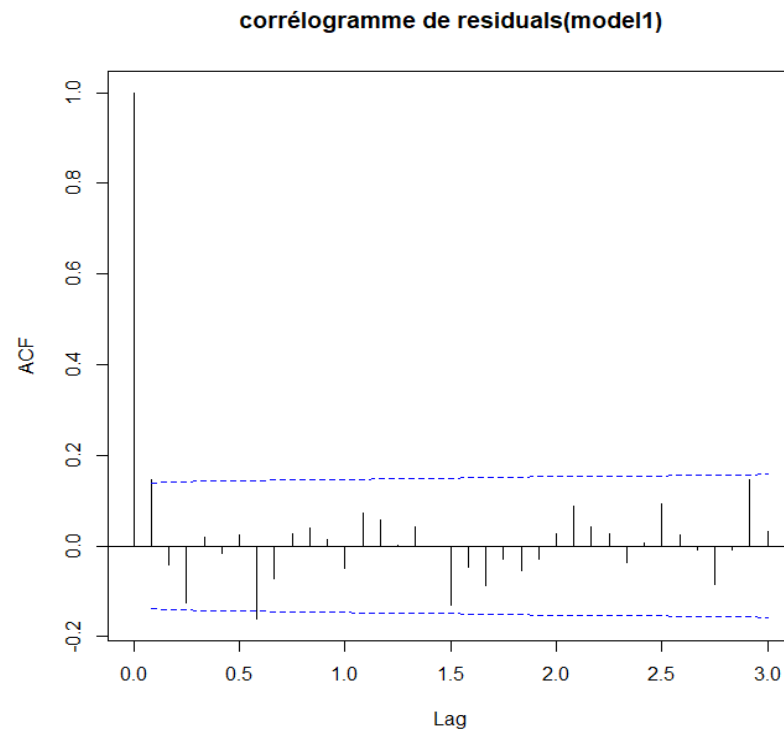
```
Box-Ljung test

data:  residuals(model1)
X-squared = 4.3664, df = 1, p-value = 0.03665
```

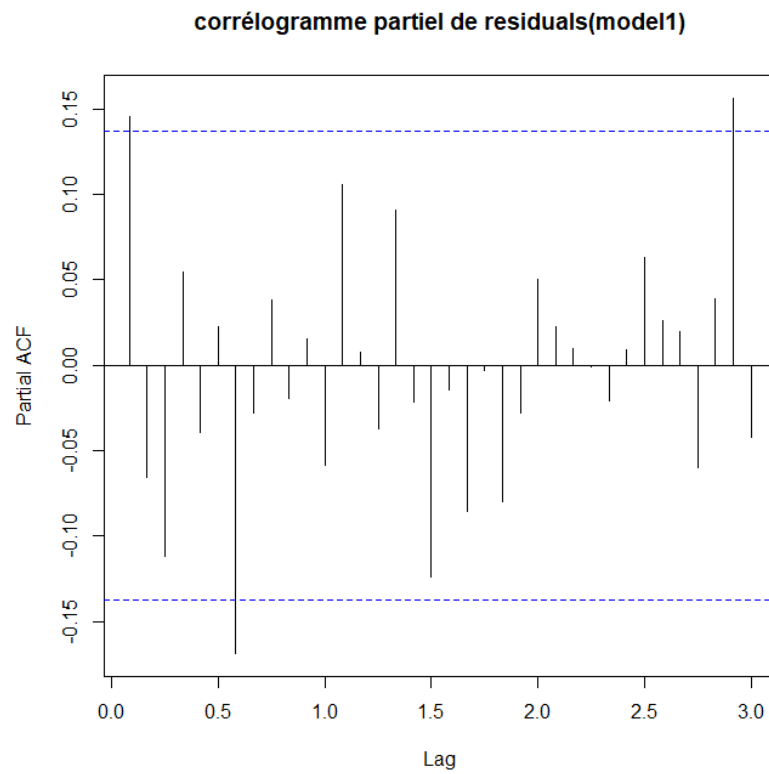
```
plot(residuals(model1))
```



```
acf(residuals(model1),lag.max=36,main="corrélogramme de  
residuals(model1)",ci.type="ma")
```



```
pacf(residuals(model1),lag.max=36,main="corrélogramme partiel de residuals(model1)")
```



```
model2 <- arima(effectif,order=c(1,1,1), seasonal = list(order=c(0,1,1),period=12))
```

model2

Call:

```
arima(x = effectif, order = c(1, 1, 1), seasonal = list(order = c(0, 1, 1),  
  period = 12))
```

Coefficients:

	arl	mal	smal
	0.2051	-0.8911	-0.4991
s.e.	0.0827	0.0374	0.0668

```
sigma^2 estimated as 14527:  log likelihood = -1188.73,  aic = 2385.46
```

```
> t_stat(model2)
```

	arl	mal	smal
t.stat	2.480139	-23.84603	-7.466357
p.val	0.013133	0.00000	0.000000

```
Box.test(residuals(model2), type="Ljung-Box")
```

Box-Ljung test

```
data: residuals(model2)
```

```
X-squared = 0.00020183, df = 1, p-value = 0.9887
```

```
pred=predict(model2,12)
```

```
pred
```

```
$pred
      Jan      Feb      Mar      Apr      May      Jun      Jul      Aug      Sep
1980 3176.531 2847.928 3122.391 3370.375 3393.388 3741.748 3986.534 3385.540 3046.447
      Oct      Nov      Dec
1980 3168.113 3102.083 3674.513

$se
      Jan      Feb      Mar      Apr      May      Jun      Jul      Aug      Sep
1980 120.5295 126.3297 128.0440 129.2216 130.2953 131.3417 132.3761 133.4017 134.4193
      Oct      Nov      Dec
1980 135.4293 136.4318 137.4269
```