Trends

Rob Hayward*

March 24, 2014

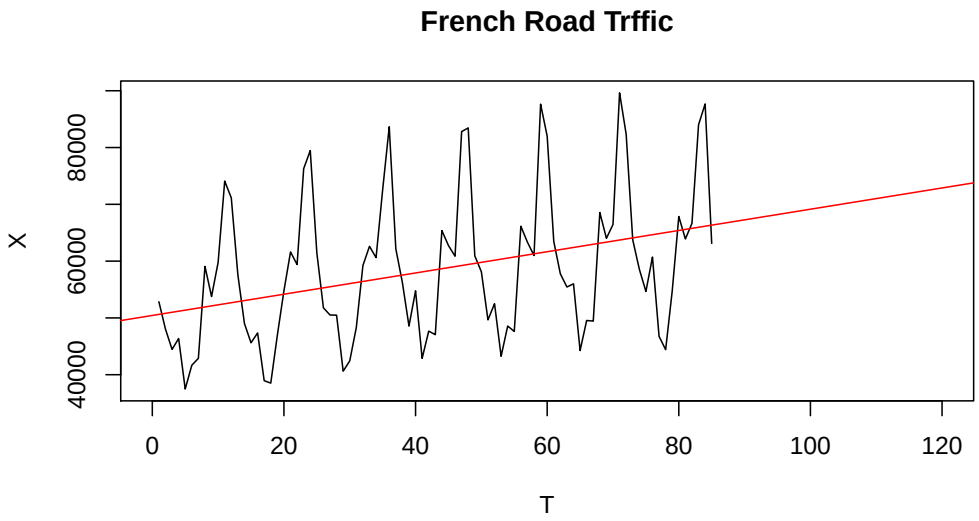
Introduction

One aspects of paris tht may be investigted would be the relatonship between the two series. In the *Pairs* slides in the *Pair* folder, two ways of looking at the relationship were considered: the difference between share price and the ratio of share prices. The evolution of these may be considered.

The following is taken from http://freakonometrics.hypotheses.org/13287.

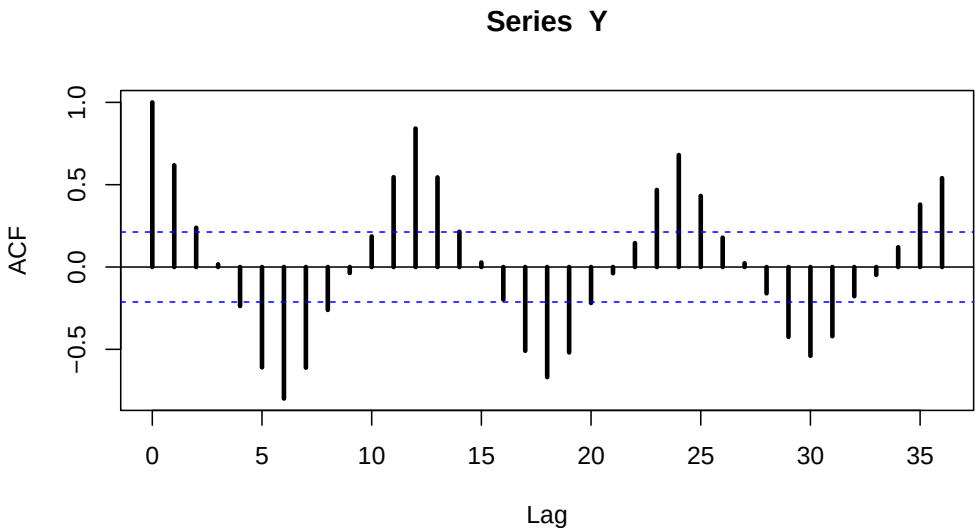
```
autoroute = read.table("http://freakonometrics.blog.free.fr/public/data/autorout
    header = TRUE, sep = ";")
X = autoroute$a100
T = 1:length(X)
plot(T, X, type = "l", xlim = c(0, 120), main = "French Road Trffic")
reg = lm(X ~ T)
abline(reg, col = "red")
```

*University of Brighton Business School, Lewes Road, Brighton, BN2 4AT; Telephone 01273 642586. rh49@brighton.ac.uk



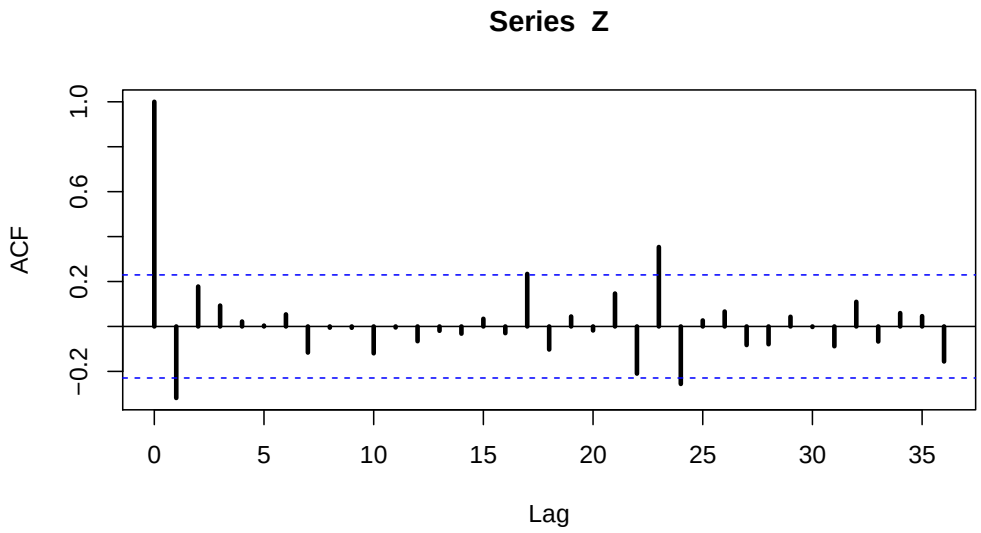
It is possible to work on the residuals from the regression. $Y = X_t - (a + bt)$.

```
Y = residuals(reg)
acf(Y, lag = 36, lwd = 3)
```



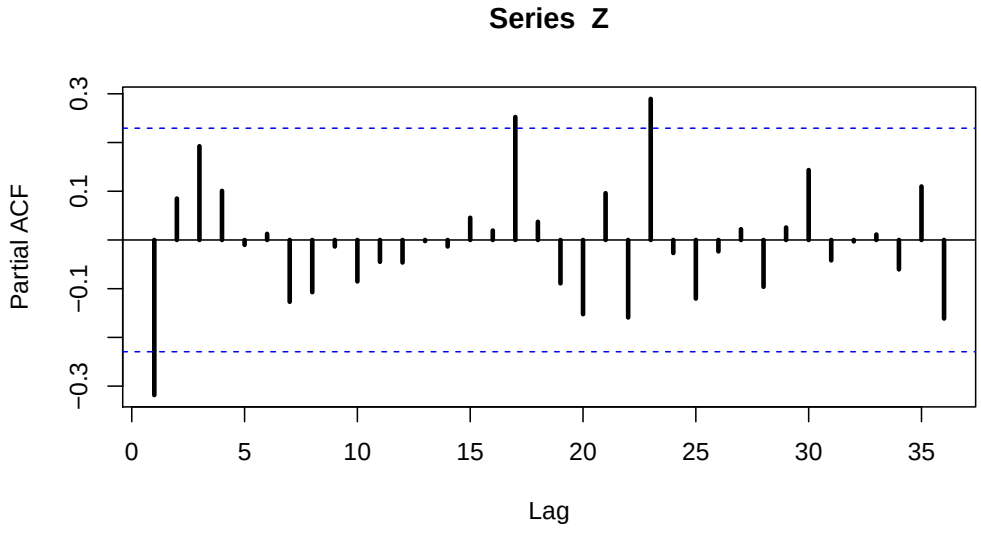
There appers to be a seasonal pattern. Therefore, create $Z_t = (1 - L^{12})Y_t$. The ACF.

```
Z = diff(Y, 12)
acf(Z, lag = 36, lwd = 3)
```



Arthur suggests that this suggests a MA(1) pattern.
The PCF

```
pacf(Z, lag = 36, lwd = 3)
```



Arthur suggests an AR(1)
Create a MA(1) model

```
model1 <- arima(Z, order = c(0, 0, 1))
model1

##
## Call:
## arima(x = Z, order = c(0, 0, 1))
##
## Coefficients:
##          ma1  intercept
##       -0.237     -583.8
## s.e.   0.092      254.9
##
## sigma^2 estimated as 8071255:  log likelihood = -684.1,  aic = 1374
```

Create an AR(1) model

```
model2 <- arima(Z, order = c(1, 0, 0))
model2

##
## Call:
## arima(x = Z, order = c(1, 0, 0))
##
## Coefficients:
##          ar1  intercept
##       -0.321     -583.1
## s.e.   0.111      248.9
##
## sigma^2 estimated as 7842043:  log likelihood = -683.1,  aic = 1372
```

Arthur goes on to discuss the relative merits of AR(1) and seasonal root models. The none-stationary model will revel an expanding variance.