Time Series Properties Of Stocks Returns

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Section 1: Preparing the data

**require**(tseries)

## Loading required package: tseries

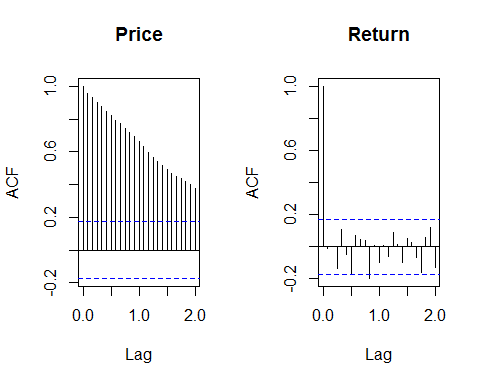
**require**(zoo)

## Loading required package: zoo  
##   
## Attaching package: 'zoo'  
##   
## The following objects are masked from 'package:base':  
##   
## as.Date, as.Date.numeric

mytick <- 'CRM'  
  
price <- **get.hist.quote**(mytick, quote="AdjClose", start="1990-01-01", compress="m", quiet=TRUE, retclass="zoo")  
  
price <- **zooreg**(price, start=**as.yearmon**(**start**(price)), frequency=12)  
ret <- 100 \* **diff**(**log**(price))

Section 2: Auto-Correlation Function (ACF)

**par**(mfrow=**c**(1,2))  
**acf**(price, 24, plot=TRUE, main="Price", cex.main=0.8)  
**acf**(ret, 24, plot=TRUE, main="Return", cex.main=0.8)



CRM's price today is an excellent predictor of it's price tomorrow, with significant influence up to 2 periods out.

But CRM's logarithmic returns today are poor predictor's of tomorrow's returns, it is irregularly significant.

Section 3: Estimating AR(p) model

fit <- **ar**(ret, aic=TRUE, order.max=24, method="ols", demean=FALSE)  
fit

##   
## Call:  
## ar(x = ret, aic = TRUE, order.max = 24, method = "ols", demean = FALSE)  
##   
## Coefficients:  
## 1 2 3 4 5 6 7 8   
## 0.0765 0.0929 -0.0860 0.1601 -0.0360 -0.1448 0.1126 0.0339   
## 9 10 11   
## 0.0312 -0.0858 0.0154   
##   
## Order selected 11 sigma^2 estimated as 127.9

The high order selected (11) is in line with the earlier findings that few of the returns were significantly predictive. We need more counts of P then to gather enough significant data.

**library**(dyn)  
fit <- dyn$**lm**(ret ~ **lag**(ret, -1:-6))  
**summary**(fit)

##   
## Call:  
## lm(formula = dyn(ret ~ lag(ret, -1:-6)))  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -44.023 -7.955 1.262 8.583 32.256   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 2.818332 1.198441 2.352 0.0204 \*  
## lag(ret, -1:-6)1 -0.003251 0.092155 -0.035 0.9719   
## lag(ret, -1:-6)2 0.060538 0.091470 0.662 0.5094   
## lag(ret, -1:-6)3 -0.135760 0.089916 -1.510 0.1338   
## lag(ret, -1:-6)4 0.086653 0.089169 0.972 0.3332   
## lag(ret, -1:-6)5 -0.047267 0.089572 -0.528 0.5987   
## lag(ret, -1:-6)6 -0.194740 0.088794 -2.193 0.0303 \*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 12.03 on 115 degrees of freedom  
## (12 observations deleted due to missingness)  
## Multiple R-squared: 0.06502, Adjusted R-squared: 0.01624   
## F-statistic: 1.333 on 6 and 115 DF, p-value: 0.2482

The results of the AR(6) model are very weak, many of the coefficients are negative and the standard errors are large despite marginally significant results.

month = **cycle**(ret)  
dummy <- **zooreg**(**matrix**(NA, **length**(ret), 12), start=**as.yearmon**(**start**(ret)), frequency=12)  
for (i in 1:12) dummy[,i] <- **as.numeric**(month == i)  
**colnames**(dummy) <- **c**("JAN","FEB","MAR","APR","MAY","JUN","JUL","AUG","SEP","OCT","NOV","DEC")  
  
fit <- dyn$**lm**(ret ~ **lag**(ret, -1:-12), dummy[,1:11])  
**summary**(fit)

##   
## Call:  
## lm(formula = dyn(ret ~ lag(ret, -1:-12)), data = dummy[, 1:11])  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -41.058 -7.839 1.396 7.960 21.597   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 3.152312 1.342939 2.347 0.0208 \*  
## lag(ret, -1:-12)1 0.047990 0.098580 0.487 0.6274   
## lag(ret, -1:-12)2 0.034635 0.096603 0.359 0.7207   
## lag(ret, -1:-12)3 -0.117938 0.095374 -1.237 0.2191   
## lag(ret, -1:-12)4 0.132658 0.096048 1.381 0.1702   
## lag(ret, -1:-12)5 -0.070522 0.095916 -0.735 0.4639   
## lag(ret, -1:-12)6 -0.201223 0.092981 -2.164 0.0328 \*  
## lag(ret, -1:-12)7 0.070086 0.092973 0.754 0.4527   
## lag(ret, -1:-12)8 0.013412 0.093390 0.144 0.8861   
## lag(ret, -1:-12)9 -0.009502 0.092834 -0.102 0.9187   
## lag(ret, -1:-12)10 -0.115390 0.091078 -1.267 0.2080   
## lag(ret, -1:-12)11 -0.027271 0.091978 -0.296 0.7675   
## lag(ret, -1:-12)12 -0.127476 0.090985 -1.401 0.1642   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 11.68 on 103 degrees of freedom  
## (24 observations deleted due to missingness)  
## Multiple R-squared: 0.1184, Adjusted R-squared: 0.01568   
## F-statistic: 1.153 on 12 and 103 DF, p-value: 0.3273

The dummy variable returns are mostly statistically insignificant, with rather large standard errors on all the results. CRM's past returns are clearly not a good predictor of future results.