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R Markdown

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When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

```
install.packages('remotes')
```

```
## Installing package into '/home/rstudio-user/R/x86_64-pc-linux-gnu-library/3.6'
## (as 'lib' is unspecified)
```

```
install.packages("astsa")
```

```
## Installing package into '/home/rstudio-user/R/x86_64-pc-linux-gnu-library/3.6'
## (as 'lib' is unspecified)
```

```
library(astsa)

soi
```

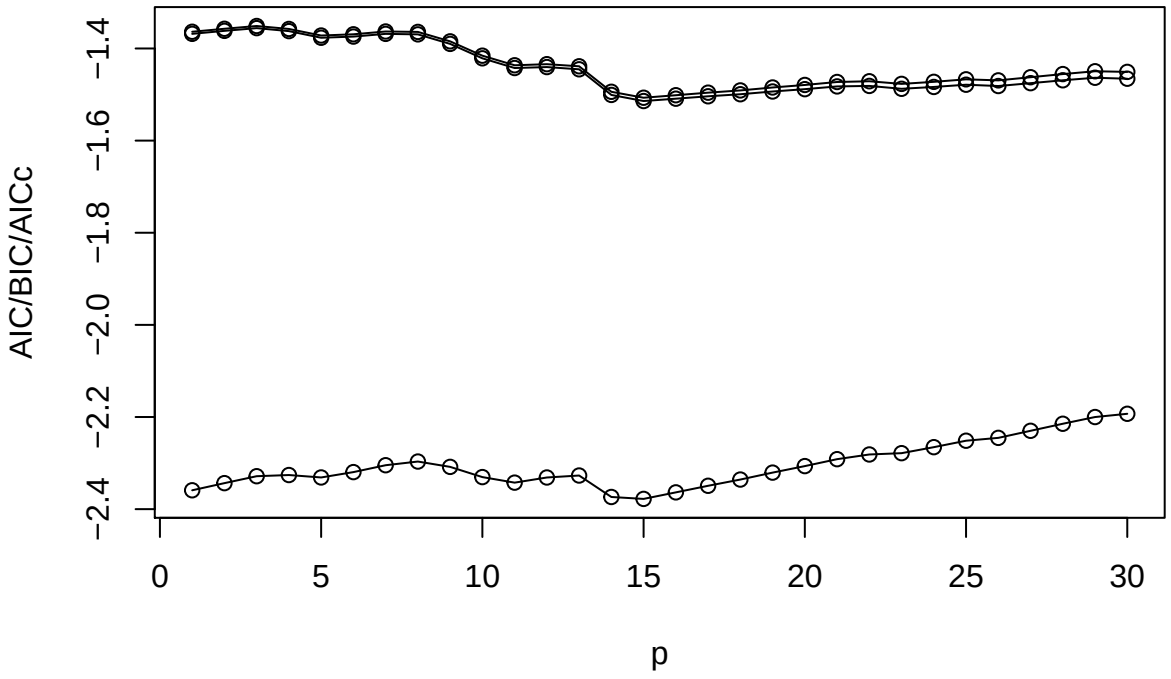
```
##             Jan        Feb        Mar        Apr        May        Jun
## 1950  0.3770000  0.2460000  0.3110000  0.1040000 -0.0160000  0.2350000
## 1951 -0.1580000  0.3660000  0.6070000 -0.3550000 -0.1800000  0.2680000
## 1952  0.7600000  0.8910000  0.6070000  0.5740000  0.0050000  0.4750000
## 1953  0.5300000  0.5300000  0.3770000 -0.2350000 -0.5850000 -0.1800000
## 1954  0.4100000  0.2240000  0.1480000 -0.4320000 -0.0930000 -0.2680000
## 1955  0.3440000 -0.0380000  0.2900000 -0.1260000 -0.3660000 -0.1150000
## 1956  0.6500000  0.6280000  0.1260000  0.1690000  0.1370000 -0.2570000
## 1957  0.1910000  1.0000000  0.4860000  0.4100000  0.1580000  0.1260000
## 1958  0.7050000  0.6390000  0.4540000  0.3110000  0.3550000 -0.1580000
## 1959  0.0820000  0.1480000  0.0600000 -0.1910000 -0.6070000 -0.5850000
## 1960  0.1690000  0.4320000  0.2020000 -0.3660000 -0.6610000  0.0930000
## 1961  0.6070000  0.1800000  0.0710000  0.2460000 -0.4320000  0.0600000
## 1962  0.1690000  0.3330000 -0.0050000 -0.0380000 -0.1260000 -0.4430000
## 1963  0.3110000  0.5960000  0.0050000  0.3880000 -0.5080001 -0.5520000
## 1964  0.3220000  0.1800000  0.1260000  0.0820000  0.1260000 -0.2130000
## 1965  0.7380000  0.4430000  0.5960000 -0.1370000 -0.4860000 -0.3770000
## 1966  0.3110000  0.3880000  0.3880000  0.1800000 -0.3330000  0.0490000
## 1967  0.3330000  0.3770000  0.0710000 -0.1580000 -0.5410000 -0.6830000
## 1968  0.1150000  0.4640000  0.1040000 -0.1800000 -0.6720000  0.1040000
## 1969  0.5300000  0.6610000  0.3550000 -0.3440000 -0.0380000  0.2350000
## 1970  0.7050000  0.3770000  0.5850000 -0.1260000 -0.2130000  0.1480000
## 1971  0.0820000  0.5740000  0.3550000 -0.2570000 -0.3770000 -0.3440000
## 1972  0.3660000  0.3660000  0.0380000 -0.2680000  0.3220000  0.0820000
## 1973  0.6610000  0.7160000  0.6280000  0.1910000  0.5300000  0.1800000
## 1974  0.1040000  0.2240000  0.4320000 -0.2130000 -0.9670000 -1.0000000
## 1975  0.3330000  0.3550000  0.3880000 -0.0600000 -0.2020000  0.0050000
## 1976  0.8030000  0.8360000  0.6500000  0.0050000 -0.3660000  0.0710000
```

```
## 1977  0.2350000 -0.0930000  0.4750000 -0.0820000 -0.6170000 -0.0930000
## 1978  0.5520000  0.6070000  0.4640000 -0.3010000 -0.7700000 -0.6500000
## 1979  0.0820000  0.6070000 -0.1580000 -0.4540000 -0.7810000 -0.3880000
## 1980  0.3990000  0.0270000  0.0160000 -0.3770000 -0.1800000 -0.0380000
## 1981  0.1690000  0.3990000  0.1580000 -0.5410000 -0.6280000  0.0270000
## 1982  0.4540000  0.3010000 -0.0050000 -0.0930000 -0.2240000 -0.2130000
## 1983  0.7700000  0.6070000 -0.1580000 -0.2350000 -0.2020000 -0.3330000
## 1984  0.5190000  0.5410000  0.3010000 -0.5740000 -0.3440000 -0.2790000
## 1985 -0.6070000 -0.5630000 -0.2350000 -0.2460000 -0.3990000 -0.3330000
## 1986  0.0490000  0.4540000  0.1580000 -0.4210000 -0.2680000 -0.3110000
## 1987  0.3990000  0.5190000  0.4320000  0.3550000 -0.1260000 -0.5080001
##             Jul        Aug        Sep        Oct        Nov        Dec
## 1950  0.1370000  0.1910000 -0.0160000  0.2900000  0.0380000 -0.0160000
## 1951  0.0930000  0.0270000  0.2460000  0.2020000  0.4320000  0.6170000
## 1952  0.2020000 -0.0270000 -0.0380000  0.7160000  0.8360000  0.8910000
## 1953 -0.5300000 -0.4640000 -0.4430000  0.0490000  0.4540000  0.2570000
## 1954  0.1580000 -0.0600000 -0.3990000  0.2350000  0.3660000  0.2020000
## 1955 -0.3010000 -0.4860000 -0.1370000  0.7380000  0.3660000  0.3660000
## 1956  0.1690000 -0.0930000  0.4750000  0.6390000  0.5960000  0.7490000
## 1957  0.0600000  0.2460000  0.7380000  0.8030000  0.4210000  0.6170000
## 1958 -0.0380000  0.1150000  0.1370000  0.2570000  0.1150000  0.0380000
## 1959 -0.2680000 -0.0930000 -0.0930000  0.2570000 -0.0050000  0.2240000
## 1960 -0.7160000  0.1480000 -0.0930000  0.2790000  0.4320000 -0.1040000
## 1961 -0.3880000  0.2020000 -0.1040000  0.1910000  0.4750000  0.5520000
## 1962 -0.0160000  0.0270000  0.3330000  0.3550000  0.3440000  0.1150000
## 1963 -0.8580000 -0.5960000  0.0600000  0.0710000  0.2240000  0.2790000
## 1964 -0.2350000  0.1690000  0.3880000  0.5190000  0.1260000  0.4100000
## 1965  0.2680000 -0.1690000 -0.2130000 -0.1910000  0.3770000  0.1260000
## 1966 -0.0820000  0.1910000  0.3990000  0.0930000  0.0050000  0.3660000
## 1967 -0.6830000 -0.3440000 -0.3010000  0.2020000 -0.1260000  0.0820000
## 1968 -0.4860000  0.0930000  0.2790000  0.1040000  0.1800000  0.4750000
## 1969  0.4860000  0.1690000  0.3330000  0.1370000  0.1690000  0.3330000
## 1970 -0.1260000 -0.3440000 -0.5080001  0.2790000  0.0820000  0.3550000
## 1971 -0.6500000 -0.0930000 -0.1370000  0.1150000  0.7050000  0.3990000
## 1972  0.0820000  0.0600000  0.2680000  0.4210000  0.7700000  0.8030000
## 1973 -0.4640000  0.2790000  0.3550000  0.2020000  0.5520000  0.6170000
## 1974 -0.4320000 -0.6830000 -0.5080001 -0.1370000  0.0820000 -0.0600000
## 1975 -0.1150000  0.1370000  0.4540000  0.3880000  0.7380000  0.7700000
## 1976 -0.0050000 -0.4540000  0.1910000  0.4320000  0.6830000  0.3880000
## 1977 -0.0710000  0.4320000  0.4210000  0.4970000  0.4540000  0.5960000
## 1978 -0.6940000 -0.1370000 -0.4640000 -0.2460000  0.1690000 -0.2020000
## 1979  0.1800000  0.0600000 -0.5080001 -0.2680000  0.2240000  0.1150000
## 1980 -0.2020000  0.1370000  0.0930000 -0.2790000 -0.0380000  0.2350000
## 1981 -0.7380000 -0.9130000 -0.0270000  0.0710000 -0.1260000  0.0490000
## 1982 -0.3110000 -0.2350000 -0.3220000  0.3220000  0.0930000  0.1150000
## 1983 -0.1580000 -0.2240000 -0.3550000  0.0050000  0.4540000  0.4100000
## 1984 -0.7160000 -0.8690000 -0.5960000 -0.2900000 -0.4540000 -0.2460000
## 1985 -0.5300000 -0.0490000  0.1580000  0.1150000  0.3220000  0.1150000
## 1986 -0.1150000 -0.3220000 -0.3220000  0.1260000  0.3330000  0.5190000
## 1987 -0.3880000  0.3880000  0.0710000
```

```
n = length(soi)
AIC = rep(0, 30)
AICc= rep(0,30)
```

```
BIC=  rep(0,30)
for (k in 1:30)
  {
variance = ar(soi, order=k, aic=FALSE)$var.pred
AIC[k] = log(variance) + ((n+2*k)/n)
BIC[k] = log(variance) + (k*log(n)/n)
AICc[k] = log(variance) + ((n+k)/(n-k-2))

}
IC = cbind(AIC,BIC,AICc)
ts.plot(IC, type="o", xlab="p", ylab="AIC/BIC/AICc")
```




```
AIC
```

```
##  [1] -1.368168 -1.361728 -1.355802 -1.362306 -1.376683 -1.374135 -1.368249
##  [8] -1.369355 -1.390025 -1.421318 -1.442422 -1.440328 -1.445162 -1.500801
## [15] -1.514060 -1.508964 -1.503789 -1.499315 -1.493362 -1.488295 -1.482333
## [22] -1.481242 -1.487477 -1.483523 -1.478617 -1.481498 -1.475273 -1.469052
## [29] -1.463542 -1.465602
```

```
AICc
```

```
##  [1] -1.363694 -1.357195 -1.351190 -1.357594 -1.371852 -1.369164 -1.363118
##  [8] -1.364043 -1.384511 -1.415581 -1.436441 -1.434083 -1.438630 -1.493961
## [15] -1.506891 -1.501443 -1.495895 -1.491026 -1.484654 -1.479147 -1.472722
## [22] -1.471146 -1.476873 -1.472388 -1.466926 -1.469229 -1.462402 -1.455556
## [29] -1.449397 -1.450784
```

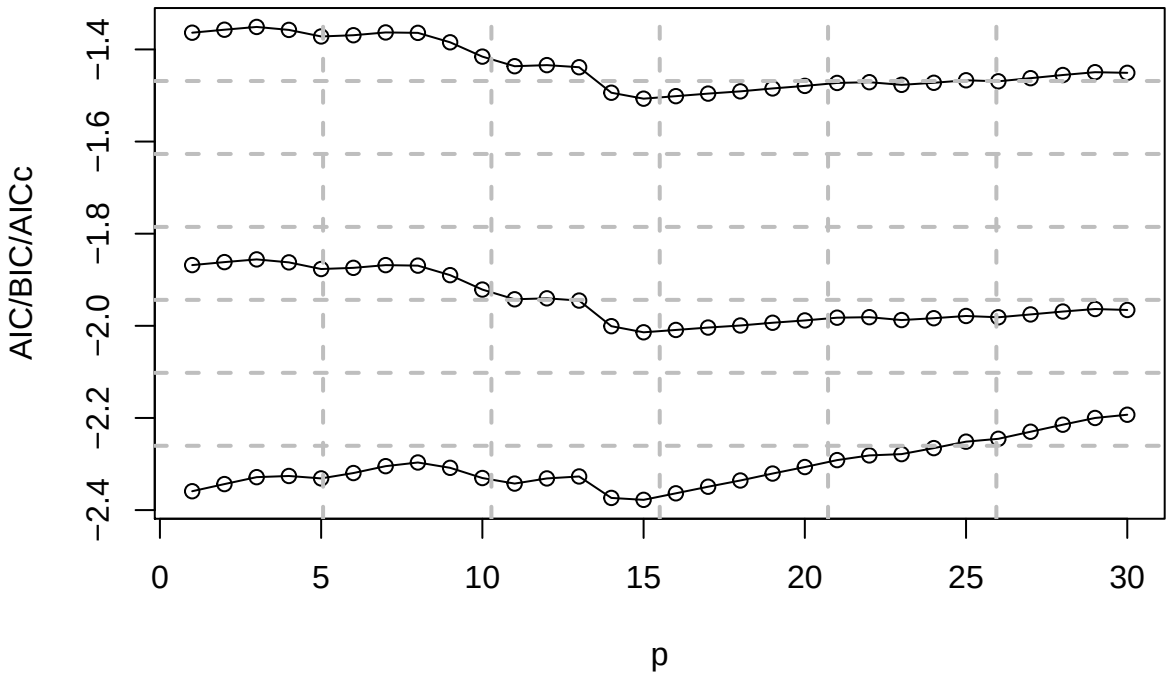
```
BIC
```

```
##  [1] -2.359082 -2.343556 -2.328544 -2.325962 -2.331254 -2.319620 -2.304648
##  [8] -2.296668 -2.308252 -2.330459 -2.342477 -2.331298 -2.327046 -2.373599
## [15] -2.377772 -2.363590 -2.349330 -2.335770 -2.320731 -2.306578 -2.291530
## [22] -2.281353 -2.278502 -2.265463 -2.251470 -2.245266 -2.229955 -2.214648
## [29] -2.200052 -2.193026
```

```r
#From the row we see that AIC and AICc almost have the same value.
#Since AIC and AICc are quite identical to each other, we might want to shift them.(I.e,shift AIC to ob

IC_shifted=cbind(AIC-0.5, BIC,AICc)

ts.plot(IC_shifted, type="o", xlab="p", ylab="AIC/BIC/AICc")
grid(nx=6,ny=7,col="grey",lty=2,lwd=2)
```




```r
#As we can see, the all 3 curves tend to obtain minimum at p=15
```

Note that the `echo = FALSE` parameter was added to the code chunk to prevent printing of the R code that generated the plot.