

Command	Explanation	Notes
<code>iv_robust()</code>	2SLS regression	requires "estimatr"
<code>ts()</code>	creates time series object	
<code>window(ts)</code>	change window of ts	
<code>VARselect(ts)</code>	selects lag for AR( $p$ ) for ts	requires "vars"
<code>adf.test(ts)</code>	ADF stationarity test of ts	requires "aTSA"
<code>diff(ts)</code>	takes difference of of ts	
<code>final(seas(ts))</code>	seasonal adjustment of ts	requires "seasonal"
<code>auto.arima(ts)</code>	automatically specify and estimate SARIMAX	requires "forecast"
<code>forecast()</code>	forecasts SARIMAX model	requires "forecast"

## Two-Stage Least Squares

```

1  ### Test IV strength and endogeneity of educ
2  ### High p-value means instrument is weak
3  ### High p-value means educ is exogenous
4  ivReg = iv_robust(log(wage) ~ log(educ) + log(exper) + log(feduc)
5                + log(meduc) + urban |
6                log(distance) + log(exper) + log(feduc)
7                + log(meduc) + urban,
8                data=wages,diagnostics = TRUE)
9  summary(ivReg)
10
11 ### Test overidentification of both distance and sibs as IV for educ
12 ### High p-value means model is just identified
13 ivRegOID = iv_robust(log(wage) ~ log(educ) + log(exper) + log(feduc)
14                + log(meduc) + urban |
15                log(distance) + log(sibs+.001) + log(exper) +
16                log(feduc) + log(meduc) + urban,
17                data=wages,diagnostics = TRUE)
18 summary(ivRegOID)

```

## SARIMAX Model

```

1  ### quarterly time series object from 2000Q1 to 2020Q4
2  myTS = ts(data, start=c(2000,1), end=c(2020,4), frequency=4)
3
4  ### test for stationarity
5  dfTestLagMax = floor(12*(length(myTS)/100)^(1/4))
6  dfTestLag = VARselect(myTS, lag.max = dfTestLagMax)
7  adf.test(myTS, nlag = dfTestLag$selection[3])
8
9  ### estimate and forecast series
10 fit = auto.arima(myTS, stepwise=FALSE, approximation=FALSE)
11 fc = forecast(fit)
12 plot(fc$fitted,col="red")      ## plot fitted values with real series
13 lines(fc$x,col="blue")        ## overlay real series
14 plot(fc)                       ## forecast beyond real series

```