var package

-- read documentation

VARS <- is the function we use!!

Feb 2017

Model the relationship between "Feb" and Jan, Dec (non-seasonal)

Model the relationship between "Feb 2017" and all of the "Febs" in prior years. (seasonal component)

Raw series --> Differenced Series --> VAR model

Var model --> forecasted difference series --> forecasted integrated series.

cmort

SARIMA: p,q,P,Q

VAR: p, with a series of dummies.

Sarima(p,d,q)x(P,D,Q),m

m = 12

\*\*

d, D are the orders of differenceing.

X <- time series variable.

Is this stationary?

Figure out values of d and big D.

If you are using monthly data, and you think that there is a yearly effect.

X.seasonal.diff <- diff(X, lag = 12)

Once you have figured out d and D

Figure out p,q,P,Q

Part 1: non-seasonal component

Part 2: Seasonal component

Part 3: Fine tuning.

Parts 1 and 2:

- AIC/BIC values

- Residual analysis

Part 3: Out of sample test.

Comparing AIC values.

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Z <- linear trend

Arima(Z, order = c(2,1,1))

Arima(Z, order = c(2,0,1))

monthplot(x)

7 years of data

D = 2

- P and Q

Varying P and Q between (0 and 2)

AIC is min at (2,2)

\*\*\*\*\*\*\*\*\*

\* VAR\*

\*\*\*\*\*\*\*\*\*

- Correlation does not mean related.

Spurrious correlation: We observe a corrleation where none exists.

- Errors are potentially correlated

- Mis-specification (pooomitted variable bias)

cmort <-- lag(cmort) + lag(tempr)

tempr <-- lag(cmort) + lag(tempr)

Unit Root

--> Explosive series. Not well behaved

Unit root: Random walk

x(t) = x(t-1) + w(t)

(1 - B)\*x(t) = w(t)

B = 1

(1 - a1B = a2B^2...)

Random walk is \*not\* well behaved

--> Not stationary

--> Long term mean cannot be predicted.

\*\*\*\* Why do unit roots matter? \*\*\*

Non-stationary and prone to spurriousness.

Sometimes they are related to one another:

- Exchange rates (random walk) might be related to changes in unemployment.

x,z are two time series, and contain unit-roots, we dont know if there is a relationship.

Co-integrated.

Linear combination of x and z IS stationary.

Inflation and unemployment rate have a long term relationship with each other, but in the short term are random walks.

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Suppose you have x, z.

(1) Examine if they are stationary. Both in terms of "trend" and unit-root

(2) If they are both stationary, then you can use a VAR.

(3) If one of more contain a unit-root (adf.test) then we have to see if they are co-integrated.

If they are co-integrated, then we can use an Error Correction Model.

If they are NOT co-integrated then we have to take the first difference of the series with the unit root, and then run a VAR on that.

EDA process:

Plot the data

Cross correlation plots

Unit root test

Co-integration test.

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Reminder:

VAR can only "use" stationary data.

Unit root:

---> adt.test

---->pp.test

po.test.

acf(mortality)

acf(mortality, type = "partial")

?VAR

pp.test