DATE 29 03 2016

1.

CASUALITY TEST

1) Granger's Casuality test

2) Sims Casuality "

3) Causality test through weak and strong exogenity test

* Correlation does not show which one cause this

* which one reach the equilibrium first

lead- lag relationship

The one with high coefficient is leading the other

a) This will only happen in bi-directional Casuality

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GRANGER CASUALITY

was developed on VAR

we check for 3 possibilities

1. $X \rightarrow Y$ (X causing Y)

2. $Y \rightarrow X$ (Y causing X)

3. $X \leftrightarrow Y$ (Bi-directional casuality)

In 1 and 2 we have uni-directional casuality

CONDITION FOR USING Granger's Causality

1) All variables must be stationary

Granger's specification will be

This is an F-based test

$F_{cal.} > F_{crit.}$ we accept H_1

$$y_t = \alpha_1 + \sum_{p=1}^{i=1} \beta_i X_{t-p} + \sum_{q=1}^{j=1} \lambda_j y_{t-q} + e_t$$

$$X_t = \Delta + \sum_{q=1}^{j=1} \lambda_i y_{t-q} + \sum_{p=1}^{i=1} \beta_i X_{t-p} + e_t$$

The resultant casuality from this equation is called Long-Run Granger Casu-ality test

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Restrictions.

H_0: All β's are 0 → No Causality from X to y

H_1: $\beta_i \neq 0$ X cause Y

This is the first equati

This is the second

H_0: $\lambda_i = 0$ NO Causuality running from y to X

H_1: $\lambda_i \neq 0$ Y cause X

There are 4 cases to be developed. from both the eq.

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If all the variables are Integrated of same order then we have to add Δ in both the equations.

$$\Delta y_t = \alpha_1 + \sum \beta \Delta X_{t-p} + \sum \lambda \Delta y_{t-q}$$

$$\Delta X_t = \Delta + \sum_{q=1}^{j=1} \lambda_i \Delta y_{t-q} + \sum_{p=1}^{i=1} \beta_i \Delta X_{t-p} + e_{t_2}$$

In case the variables are $I(d)$ then it will be a short run and we cannot have long-run.

This is an F based test because β's are restricted

2. SIMS CAUSALITY

assumes the role of expectation that is, the future variables in the relationship

$$y_t = \alpha_1 + \sum_{p=1}^{i=1} \beta_i X_{t-p} + \sum_{q=1}^{j=1} y_{t-q} + \sum_{M=1}^{n=1} \underbrace{\tau_n X_{t+M}}_{\text{Lead values}} + e_t$$

$$X_t = \Delta + \sum_{q=1} \lambda_i y_{t-q} + \sum \lambda_j X_{t-q} + \sum \underbrace{\nabla_k y_{t+k}}_{\text{Lead values}} + e_{t2}$$

$H_0 : \tau_n = 0 \rightarrow$ No causality running from X to y

$H_1 : \tau_n \neq 0 \rightarrow$ Causality running from X to y

$H_0 : \nabla_k = 0 \rightarrow$ No causality ~~&~~ running from y to X

$H_1 : \nabla_k \neq 0 \rightarrow$ Causality runni from y to X

The same concept of integration applies in this ~~cause~~ case also.

If the variables are integrated of order (d) then it becomes

Short-run causality

Practical

1. equation sims.ls exg c exg(-1) exg(-2) inf(-1) inf(-2) inf(1) inf(2)

2. equation sims.ls inf c inf(-1) inf(-2) exg(-1) exg(-2) exg(1) exg(2)

Have to constrain ~~the~~

lead value of both

variable in both variables

View

↓

Coeff. Rest

↓

Wald test

$C(b) = C(?) = 0 \Rightarrow$ NULL H_0

The evidence still remains for H_0

$F = 0.120104$

$\chi^2 = 0.240218$

no causality for inf to exg

3. Causality test through weak and strong exogenity test.

$$y_t = \alpha_1 + \alpha_2 X_t + e_t$$

1st eq.

$$e_t = y_t - \alpha_1 - \alpha_2 X_t$$

2 eq.

$X_t = \beta_1 + \beta_2 y_t + u_1$

$$e_{t-1} = y_{t-1} - \alpha_1 - \alpha_2 X_{t-1}$$

Short-run dynamics

$u_t = X_t - \beta_1 - \beta_2 y_t$

$u_{t-1} = X_{t-1} - \beta - \beta_2 y_{t-1}$

$$\Delta y_t = \beta_1 + \beta_2 \Delta X_t + \underbrace{e_{t-1}}_{ECT} + v_1$$

This is static framework and not dynamic framework

Suppose, if we have dynamic framework

$$\Delta y = \alpha_1 + \sum_{p=1}^{i=1} \beta_i \Delta X_{t-p}$$

$$+ \sum_{q=1}^{j=1} \beta_j \Delta y_{t-q}$$

$$+ \phi e_{t-1}$$

Theta

$$+ v_1$$

P.T.O.

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Gamma

$$\Delta x_t = \Delta + \sum \lambda_i \Delta y_{t-q} + \sum_{p=1}^{j=1} X_{t-p} + \gamma u_{t-1} + v_2$$

We check for short-run causality

short-run causality

a) H_0 ; $\theta = 0$ $= \beta_i = 0$

b) H_1 ; $\theta \neq 0$ $\neq \beta_i \neq 0$

if θ is statistically different from 0 then there is causality

statistically not different from 0.

c) H_0 : $\gamma = 0$ $= \lambda_i = 0$

d) H_1 : $\gamma \neq 0$ $= \lambda_i \neq 0$

Long-run casuality

if we ~~exp~~ except (b) then there is
X is strong exogenous

if we except (d) then Y is strong exogenous

if we except (a) then X is weak exogenous.

if we except (c) then Y is weak exogenous.

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If you have two series that are integrated but you want to use the original series to test the causality

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4 TODA YAMAMOTO (1995)

X_t, Y_t

$X_t \sim I(m)$ $Y_t \sim I(n)$

If (a) $m = n$, (b) $m > n$ (c) $n < m$

$$y_t = A_1 y_{t-1} + \dots + A_p y_{t-p} + B_1 X_{t-1} + \dots + B_1 X_{t-q} + \cancel{e_t} + B_k \cancel{y}_{t-\cancel{k}} + e_{t_1}$$

$A_k y_{t-k}$

X w

K is equal to p+1

w = q+1

$$X_t = B_1 X_{t-1} + \dots + B_q X_{t-q} + A_1 y_{t-1} + \dots + A_p y_{t-p} + B_w X_{t-w} + A_k y_{t-k} + e_t$$

If $m = 0$, $n = 2$

$k_1 = p+1$, $k_2 = k_1 + 1$ = k

$w_1 = q+1$, $w_2 = q+1$, $w_2 = w_1 + 1$

if $m = 1$; $n = 1$

$m = 2$, $n = 1$

$n = 2$, $n = 1$

we create an exogenous that will take into consideration the integration of the series

if $p = 4$, $K = 4 + 1 = 5$

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$H_0: \beta_1 = \beta_q = 0$

$H_1: \beta_1 \neq \beta_q \neq 0$

← FIRST EQUATION

$H_0: A_1 = A_p = 0$

$H_1: A_1 \neq A_p \neq 0$

← SECOND

Acceptance of Both Null ⟶ no casuality b/w X and Y

Acceptance of Both Alternative ⟶ Casuality b/w X and Y