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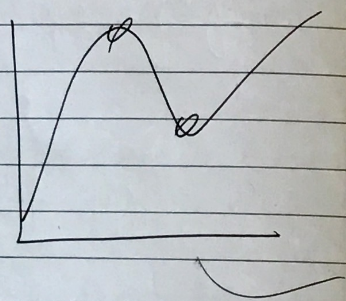
Unit root test

URT without breaks

URT with breaks

1948
Global Fundamentals
Regional Fundamental
Nation "



Three sources of break

1. Structural break

2. Policy Regime shift

3. Exogenous break
3(a) Natural & disaster
3(b) Earthquake
3(c) War

How do we distinguish b/w
~~Bu~~. Drift and Break

a) you can drift in the same regime

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when the equilibrium goes off the Nash equilibrium it is structural break

Peron (1989) challenges the series is stable over long period of time. His allows for one exogenous structural breaks.

Peron (1989) — unit test in the presence of one subjective (exogenous) break date

~~One~~ important break date

~~He~~ developed Model A, Model B, and Model C

Only addition to RWM w Drift

TB

$$Y_t = u + BY_{t-1} + d(\cancel{BT})_t + e_t$$

Crash Model

Model A

$$Y_t = u_2 + B_2(Y_{t-1}) + (u_2 - u_1)\Delta T + e_t$$

changing ~~of~~ growth Model

$$Y_t = \lambda + BY_{t-1} + d(BT)_t + (u_2 - u_1)DT + e_t$$

Model C

Pure RWM with drift and trend

Create a dummy variable

1929 – Global Reces

1973 – Oil Crash

If $(\mu_2 - \mu_1)$ the growth is significant enough, then there is structure break in Model B

If it happen both at intercept and the slope – in model C

H_0: Model (A):

Model (A): $Y_t = \mu_1 + y_{t-1} + d D(TB)_t + e_t$

Model (B) $Y_t = \mu_1 + Y_{t-1} + (\mu_2 - \mu_1) DU_t + e_t$

$$Y_t = u_1 + y_{t-1} + d\,B(TB)_t + (u_2 - u_1)\,\Delta u_t + e_t$$

H_1 : Alternative

$$y_t = u + BT + (u_2 - u_1)\,\Delta u_t + e_t$$

$$y_t = u_1 + B_1 t + (B_2 - B_1)\,\Delta t + e_t.$$

$$y_t = u_1 + B_1 t + (u_2 - u_1)\,\Delta u_t + (B_2 - B_1)\,B\,t + e_t$$

The model contains unit root at level with break.

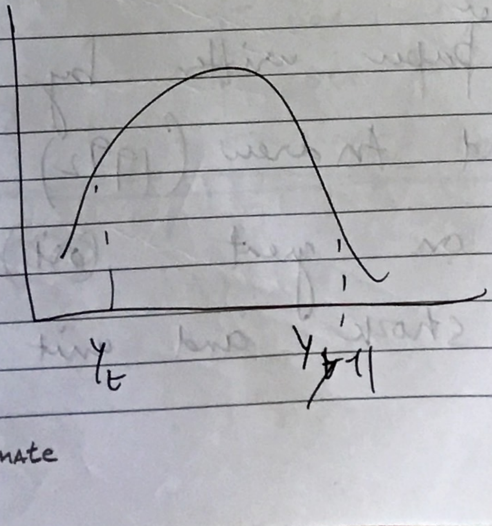
Unit root exists in the presence of break in the slope fn

Unit root in the presence of break both at intercept and slope

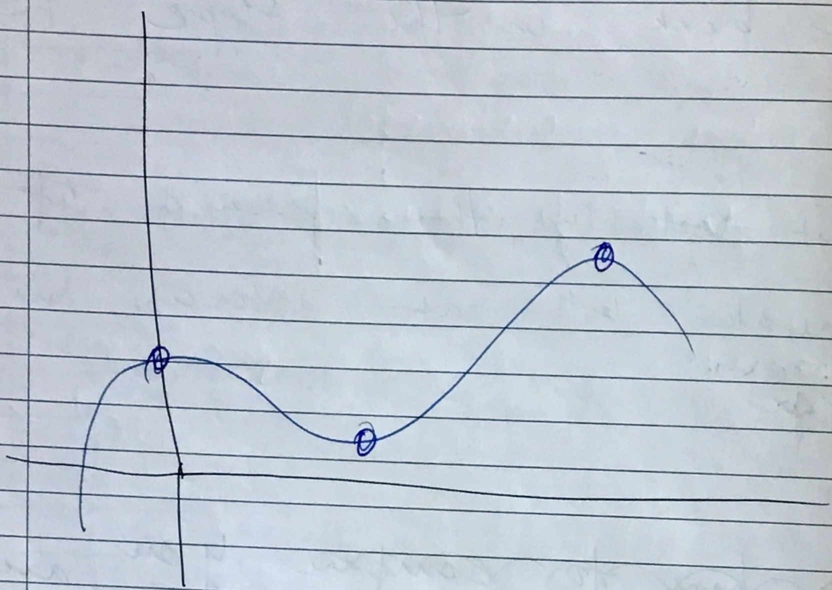
~~we have to compare~~ you are searching for breaks in either model A, B or C.

$E(y_t) =$ constant

$E(y_t) =$



break in intercept.
slope
slope and inte



The exogenous assumption of break is the limitation.

* In another paper written by Zivot and Andrew (1992): further evidence on great (???) crash, oil price shock and unit root.

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They addressed the problem.
They said that there are another events that are as important in the series:

* Person did not consider the OPEC formation.
* The tax cut happen in 1964
* Vietnam.

The economy can have other events that shape the

FOR EXAMPLE

1960's

These are expected to be break points.

- Tax cut (1964)
- oil price (1973)
- OPEC (1971)

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Let the data choose which is the significant break and choose from others

data dependent unit roots in the presence of break

<u>Similarity</u>

* Both assume the presence of <u>one</u> break. data

The null hypothesis is that there is a drift

In the alternative we have a break

H_0: Presence of unit root with drift

H_1: Trend stationary that allow the presence of one unknown or endogenous break date in the trend function.

They adjusted the ADF model

They were able to counter the concl. of Perron (1989)'

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MODELS USED FOR THE TESTS

$$Y_t = \hat{u}^A + \underbrace{\hat{\theta}^A \mu(\alpha)}_{\text{the only differen}} + \hat{\beta}^A t + \hat{a}^A Y_{t-1}$$

This is modeA Crash model.

$$+ \sum_{j=1}^{k} \hat{c}_j^A \Delta Y_{t-j} + e_t$$

this is the difference

$$Y_t = \hat{u}^B + \hat{\beta}^B t + \boxed{\hat{\alpha}^B \Delta T(\hat{\alpha})}$$

$$+ \hat{\alpha}^B y_{t-1} + \sum_{j=1}^{k} \hat{C}_j^B Y_{t-j} + e_t$$

$$Y_t = \hat{u}^C + \hat{\theta}^C \Delta u_t(\hat{\alpha}) + \hat{\beta}^C t$$

$$+ \alpha^C \Delta T_t(\alpha) + \hat{a}^C Y_{t-1}$$

This is lambda.

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$$+ \sum_{j=1}^{k} c_j \cdot Y_{t-j} + e_t$$

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Even if conclusion remained the same, the break date changed with the use of Zivot and Andrew

Linnden and

Lumsdaine and pappeqⁿ (1997)

Ho : unit root ~~break~~ drift

H_1: Trend stationary with two unknown break dates that can happen at level and slope of trend function.

- utilized only model (C) of 1989 test

Adjusted model C of perron (1989)

THE MODEL

$$Y_t = u_1 + \underbrace{\alpha_1 \Delta U_1 + \alpha_2 TB_1}_{\text{First break date}} + \overbrace{\beta_1 \Delta U_2 + \beta_2 TB_2}^{\text{second break date}}$$

$$+ \cancel{\beta} \lambda Y_{t1} + \sum_{j=1}^{k=1} c_j \Delta y_{t-k} +$$

NELSON AND PLOSSER (1982)

D.F developed 1976

A.D.F developed in 1979.

K.P.S.S. (1992)

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They tested 13 time series for ~~US~~ 1909-1970.

11 out of 13 series have evidence in favour of null

(2) Perron (1989)
11 out of 13 series were rejected

(3) Ziroth and Andrew in 1992
they only rejected the H_0 for 3 out of 13 series

(4) Lumsdaine and Puppel (1997)
They were able to reject for 5 series (additional 2)

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The 2 other test drift in null.

The critical values will be different for all the tests. ~~The~~ The appropiate level of significance, and other will have to be.

LEE AND STRAZTICH (2003)

1) Spurious rejection of H_0 because of the test exhibit size distortion.

2) The breakpoint is incorrectly estimated because the tests tend to identify the break

point one period prior to the

break point.

utilized model A and C of

perron (1989) tests

MODEL A:

more in complement with Perron.

H_0 : unit root with 2 unknown break dates at level as against

H_1: level stationary with two unknown break dates

MODEL C

H_0: unit root with 2 endogen-ous break dates at level and slope of the trend function

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H_1: trend stationary in the presence of two unknown break at both level and trend function

MODEL A

$$y_t = \delta' Z_t + e_t$$

$$e_t = \beta u_{t-1} + v_1$$

Z_t is a vector of exogenous variable

$Z_t = [1, t, D_{jt}, D_{2t}]$ under model A when $D_{jt} = 1$

for $t \geq TB_j + 1$ and $j = 1, 2$

and 0 otherwise.

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MODEL C

$$Z = [\,1,\ t,\ \overbrace{D_{1t},\ D_{2t}}^{\text{Dummy for level.}},\ \underbrace{D_1T_{1t}\quad D_2T_{2t}}_{\text{Dummy for slope.}}\,]$$

$DT_{j,t} = t - TB_j$ for $t \geq TB_j + 1$

$j = 1, 2,$ and 0 otherwise.

$\cancel{H_0: y_t = y_0 + d_1 + B_{1t} + d_2 B_{2t} + y_{t-1} + e_t}$

$\cancel{H_1: y_t = \mu_1 + y_{t-1} + d_1 D_{1t} + d_2 D_{2t} + e_{2t}}$

$H_0: \delta' = 1$ unit root

$H_1: \delta' < 1$ trend stationary

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This is LM test →

LEE & STRAZICH (2004)

H_0: unit root in the presence of one unknown break date

H_1: trend stationary in the presence of one unknown break dates

In this test they only utilized model C

Dummy for level

$$Z_t = [1, t, D_{1t}, DT_{1t}]$$

Dummy for trend.

In continuation from previous secti

Lee and Straztich (2003)
reject the H_0 for 6 Series

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UR

UR without breaks

1. DF
2. ADF
3. PP
4. ADF : GLS

t

H_0: unit root

H_1: stationary

5. KPSS — LM

H_0: Station

H_1: unit root

UR with breaks.

1. Perron (1989) — t, exogenous
2. Lee and Strazich (2003, 04)
3. Zivot and Andr.. t
4. Lumsdaine and ... (1997) t

endogenous

LM test

— 2 break

H_0: drift and null and

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