FEB UNPAD
LEADING AND INSPIRING

ECONOMETRICS
TEACHING TEAM - UNPAD

LAB 8
VAR FORECASTING

bit.ly/LAB8TS23

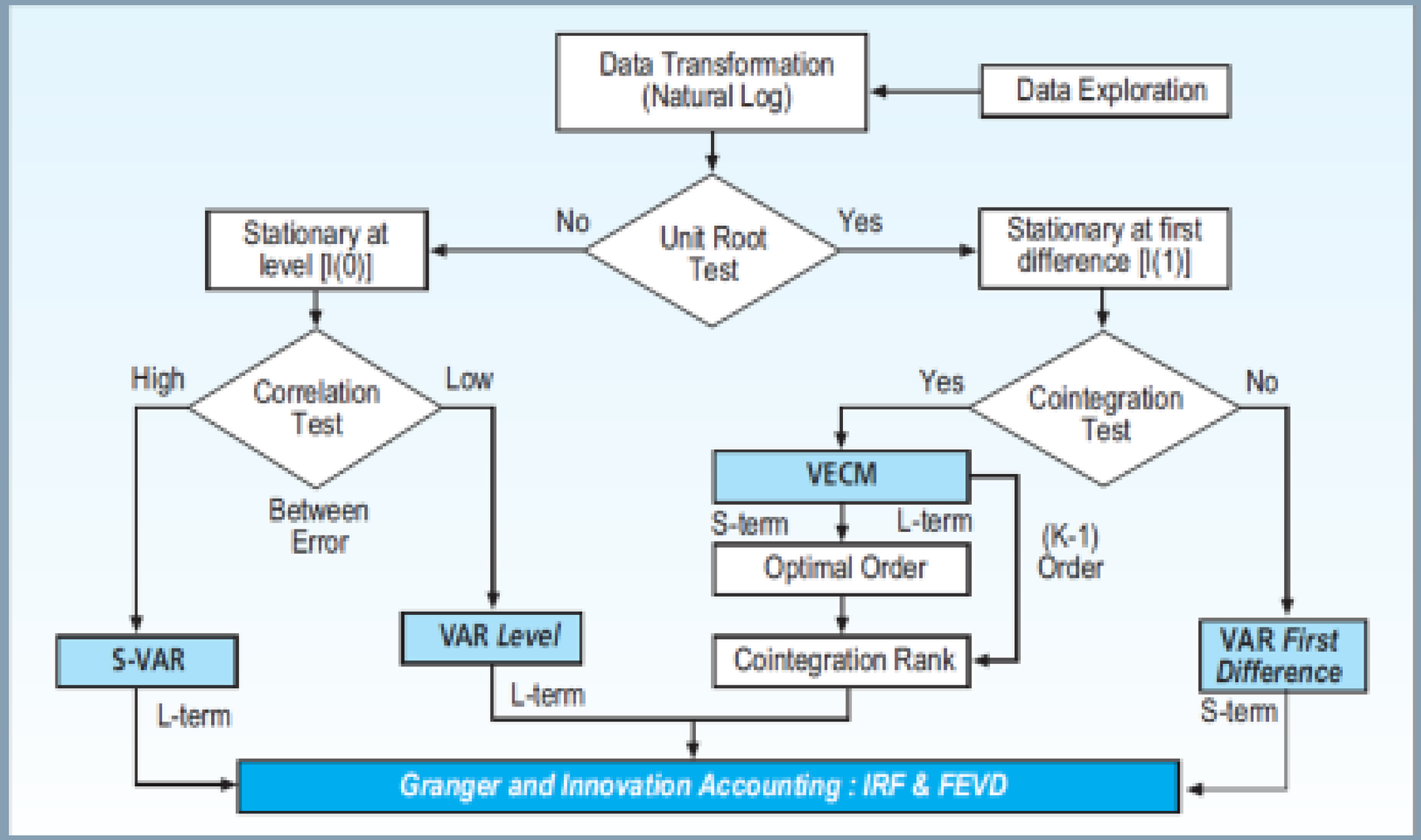
VAR FORECASTING

- VAR (Vector Autoregressive) merupakan model peramalan multivariate yang digunakan untuk menyusun sistem peramalan dari data deret waktu yang saling terkait.

- Penggunaan VAR untuk peramalan ekonomi adalah alternatif dari model persamaan tunggal (univariat) dan model persamaan simultan yang tradisional.

- Keunggulan dari Forecasting VAR adalah memperhitungkan interdependensi antar variabel, sehingga mengurangi masalah akibat mispesifikasi seperti pada model struktural. Berguna ketika teori ekonomi gagal menjelaskan fenomena ekonomi.

Proses Pembentukan Model VAR



Tahapan Estimasi VAR

01

Uji Stasioneritas

02

Penetuan Lag Optimal (Pra/Post Estimation)

03

Regresi VAR dengan lag Optimum

04

Uji Kausalitas

05

Uji Kestabilan Model

06

Granger and Innovation Accountin: **IRF & FEVD**

07

Uji Kointegrasi

08

Forecast VAR

Penentuan LAG Optimum

Terdapat 2 cara untuk mengujian lag optimum:

- Pre-estimation Command ➔ varsoc d.varname1 d.varname2
- Post-estimation Command ➔ var d.varname1 d.varname2 varsoc

```
. varsoc

  Selection-order criteria
  Sample:  1972m4 - 2008m11                       Number of obs      =       440

+---------------------------------------------------------------------------+
| lag |    LL      LR      df    p      FPE       AIC      HQIC      SBIC    |
|-----+---------------------------------------------------------------------|
|  0  | -559.676                      .044039   2.55307   2.5604    2.57165  |
|  1  | -543.575  32.201    4  0.000  .041682   2.49807   2.52005   2.5538*  |
|  2  | -531.612  23.927*   4  0.000   .0402*  2.46187*  2.49851*  2.55475  |
+---------------------------------------------------------------------------+
Endogenous:  D.hours D.income
 Exogenous:  _cons
```

```
. var d.hours d.income, lags(1/2)

Vector autoregression

Sample:  1972m4 - 2008m11                       No. of obs      =       440
Log likelihood = -531.6118                      AIC             =  2.461872
FPE            =  .0402003                      HQIC            =  2.498513
Det(Sigma_ml)  =  .0384139                      SBIC            =  2.554753

Equation           Parms      RMSE     R-sq      chi2     P>chi2
------------------------------------------------------------------
D_hours                5     .400021   0.0343   15.62982   0.0036
D_income               5     .500032   0.0868   41.79808   0.0000
------------------------------------------------------------------

------------------------------------------------------------------------------
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
D_hours      |
      hours  |
         LD. |  -.0532379   .0475768    -1.12   0.263    -.1464868    .0400109
        L2D. |   .1645273   .0479031     3.43   0.001     .0706389    .2584157
             |
      income |
         LD. |   .0037413   .0382137     0.10   0.922    -.0711561    .0786388
        L2D. |   .0331609   .0382789     0.87   0.386    -.0418644    .1081861
             |
       _cons |    .083112   .0213592     3.89   0.000     .0412486    .1249753
-------------+----------------------------------------------------------------
D_income     |
      hours  |
         LD. |   .0434296   .0594717     0.73   0.465    -.0731328     .159992
        L2D. |   .0642823   .0598796     1.07   0.283    -.0530796    .1816441
             |
      income |
         LD. |  -.2989546   .0477677    -6.26   0.000    -.3925775   -.2053317
        L2D. |  -.1485468   .0478491    -3.10   0.002    -.2423294   -.0547642
             |
       _cons |   .1798158   .0266994     6.73   0.000      .127486    .2321456
------------------------------------------------------------------------------
```

Membentuk Persamaan VAR

**contoh : kita sudah menentukan lag optimum dan melakukan regresi VAR.

**command :

var d.hours d.income, lags(1/(lag optimum))

Persamaan Linear & Matriks

LINEAR

$$d.hours_t = 0{,}0831 - 0{,}0532 d.hours_{t-1} + 0{,}16465\ d.hours_{t-2} + 0{,}0037 d.income_{t-1} + 0.0332 d.income_{t-2}$$

$$d.income_t = 0{,}1798 + 0{,}0434\ d.hours_{t-1} + 0{,}0643 d.hours_{t-2} - 0{,}2989\ d.income_{t-1} - 0.1485 d.income_{t-2}$$

MATRIKS

$$\begin{bmatrix} d.hours_t \\ d.income_t \end{bmatrix} = \begin{bmatrix} cons_1 \\ cons_2 \end{bmatrix} + \begin{bmatrix} \beta_{11} & \beta_{12} & \beta_{13} & \beta_{14} \\ \beta_{21} & \beta_{22} & \beta_{23} & \beta_{24} \end{bmatrix} \begin{bmatrix} d.hours_{t-1} \\ d.hours_{t-2} \\ d.income_{t-1} \\ d.income_{t-2} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix}$$

$$\begin{bmatrix} d.hours_t \\ d.income_t \end{bmatrix} = \begin{bmatrix} 0.0831 \\ 0.1798 \end{bmatrix} + \begin{bmatrix} -0.0532 & 0.1645 & 0.0037 & 0.0332 \\ 0.0434 & 0.0643 & -0.2989 & -0.1485 \end{bmatrix} \begin{bmatrix} d.hours_{t-1} \\ d.hours_{t-2} \\ d.income_{t-1} \\ d.income_{t-2} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix}$$

Command:

Var varname1 varname2, lags (1/lag optimum)

Uji KAUSALITAS

Kausalitas merupakan suatu peristiwa yang menyebabkan peristiwa lain muncul (Sebab-akibat). Ada 2 tipe kausalitas:

- Unidirectional causality (searah) E

  x : Y2 ke Y1
- Bi-directional causality (dua arah)

  Ex : Y2 ke Y1 juga Y1 ke Y2

Command:

vargranger

Hipotesis

Ho : tidak terdapat hubungan kausalitas antar variabel Ha : terdapat hubungan kausalitas (1/2 arah) antar variabel

Kriteria

P-value < alfa -> Ho ditolak

P-value > alfa -> Ho tidak dapat ditolak

UJI KESTABILAN MODEL

Command:

varstable, graph

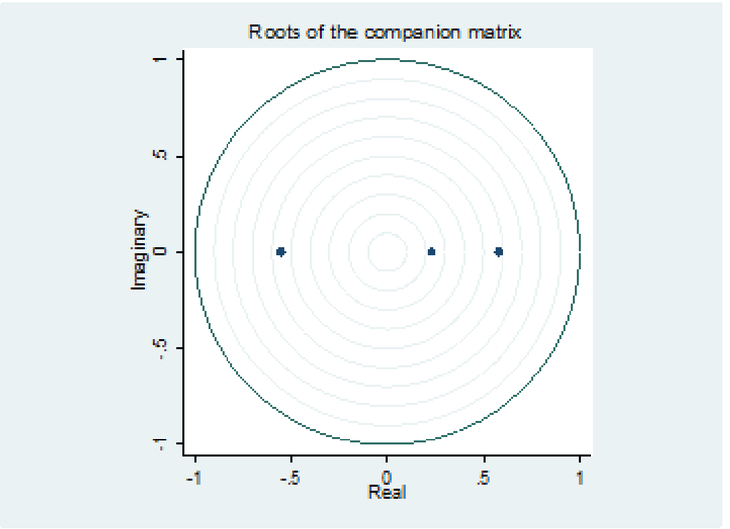
- Model dikatakan stabil apabila eigenvalue berada antara -1<= e <= 1 atau titik eigenvalue dalam grafik berada di dalam lingkaran

```
varstable, graph

Eigenvalue stability condition
```

Eigenvalue	Modulus
.5789777	.578978
-.5539183	.553918
.2327889	.232789

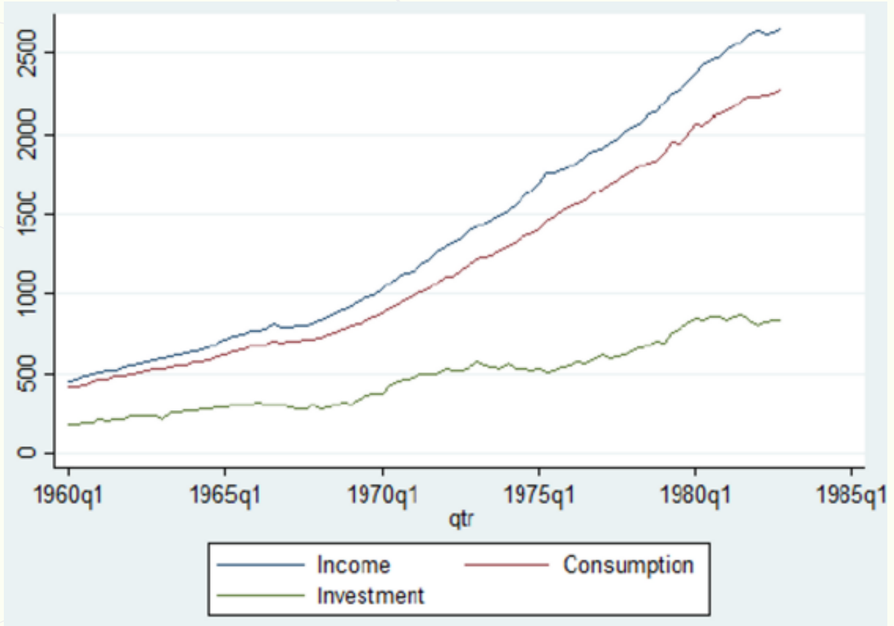
```
All the eigenvalues lie inside the unit circle.
VAR satisfies stability condition.
```



UJI KOINTEGRASI

Command:

tsline varname1 varname2



UJI KOINTEGRASI JOHANSEN

Johansen tests for cointegration

Trend: constant — Number of obs = 90
Sample: 1960q3 - 1982q4 — Lags = 2

maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value
0	12	-1093.0618	.	42.4026	29.68
1	17	-1078.966	0.26893	14.2110*	15.41
2	20	-1073.4007	0.11633	3.0804	3.76
3	21	-1071.8605	0.03365		

Hipotesis

Ho : r = 0 (tidak terdapat kointegrasi antara variabel income, consumption, dan investment) Ha : r ≠ 0 (terdapat kointegrasi antara variabel income, consumption, dan investment)

Kriteria

Trace statistic < critical value -> Ho tidak dapat ditolak
Trace statistic > critical value -> Ho ditolak

Hasil

- rank(0): 42,4026 > 29,68 atau trace stat > critical value maka Ho ditolak
- rank(1): 14,2110 < 15,41 atau trace stat < critical value maka Ho tidak dapat ditolak
- rank (2): 3,0804 < 3,76 atau trace stat < critical value maka Ho tidak dapat ditolak

Kesimpulan

Kesimpulan: Jadi, terdapat hubungan jangka panjang atau kointegrasi antara variabel income, consumption, dan investment sebanyak 1 kejadian.

FORECASTING VAR

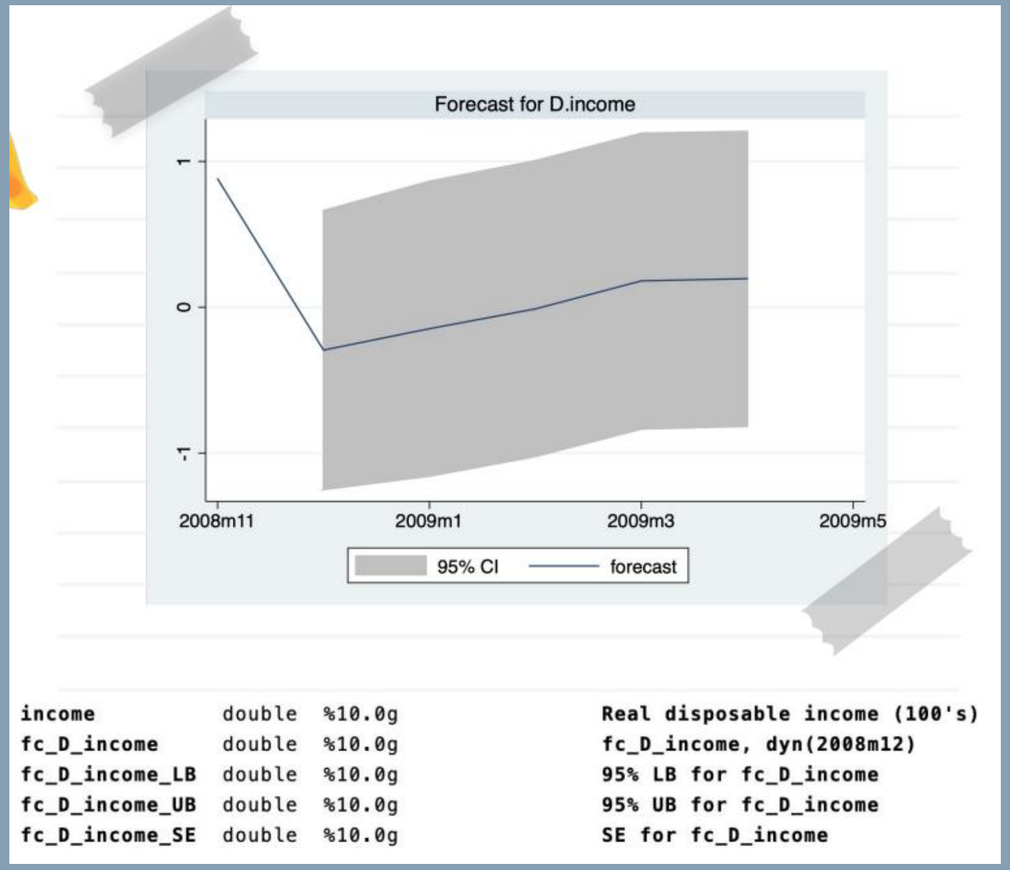
Command :

*

- fcast compute fc_, step(5)
- fcast graph fc_D_income

*step menunjukkan jumlah periodeyang ingin di forecast

*fcast compute membuat variabel baru:



income	double	%10.0g	Real disposable income (100's)
fc_D_income	double	%10.0g	fc_D_income, dyn(2008m12)
fc_D_income_LB	double	%10.0g	95% LB for fc_D_income
fc_D_income_UB	double	%10.0g	95% UB for fc_D_income
fc_D_income_SE	double	%10.0g	SE for fc_D_income

- Variabel baru yang diperkirakan
- Variabel batas bawah “LB”
- Variabel batas atas "UB"
- Variabel standar error “SE”

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Thanks!

Teaching Assistant Time Series Econometrics 2023

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