Vector Auto Regressive (VAR), Johansen Cointegration Test & Granger Causality Test

Disertai Perbandingan dengan EViews

Download STATCAL di <http://statcal.org/> (GRATIS)

Prana Ugiana Gio (CEO STATCAL)

Created by Prana Ugiana Gio & Rezzy Eko Caraka

Rezzy Eko Caraka (CFO STATCAL)

Vector Auto Regressive (VAR), Johansen Cointegration Test & Granger Causality Test

STATCAL

Tutorial Video About Error Correction Model (ECM)

Vector Auto Regressive (VAR), Johansen Cointegration Test & Granger Causality Test

Article

STATCAL is a free statistical application program created by Prana Ugiana Gio (CEO) & Rezzy Eko Caraka (CFO), in January 2017, using R programming language in RStudio, with shiny package as the main package. STATCAL uses various of R packages to perform statistical and graphical data analysis.

STATCAL can be used by online visiting <https://gioprana.shinyapps.io/STATCAL/> or you can run it by offline downloading <http://www.statcal.com/>.

1. Dataset

Tabel 1 Contoh Data

Waktu	SBI	PUAB	INFLASI	PDB
1970	618787	27.75	19.08	5.99
1971	601286	26.25	18.07	6.34
1972	665788	24.75	19.52	6.52
1973	626408	24.5	20.18	2.96
1974	604714	24	22.93	1.5
1975	431941	24.75	30.37	2.82
1976	267738	27	35.89	3.18
1977	443237	28.25	34.51	1.45
1978	629154	24.75	25.69	4.02
1979	611781	21.75	17	4.91
1980	570007	19.75	8.29	5.18
1981	601970	19.5	7.76	2.61
1982	700094	19.5	10.96	5.99
1983	733299	19.5	13.12	6.29
1984	575532	19.5	18.46	5.81
1985	429212	19.5	18.96	6.81
1986	404576	20	20.51	1.7
1987	360338	20.25	17.68	2.76
1988	329654	20.25	14.01	3.37
1989	347920	18.5	12.36	-1.42
1990	301687	17.5	12.42	6.11
1991	282236	17.5	13.48	6.16
1992	236588	17.5	13.45	6.08
1993	228569	17.5	13.23	6.03
1994	274716	17.25	15.78	5.54
1995	279927	17.5	16.94	5.57
1996	233048	20	25.8	5.55
1997	3200059	27	25.07	5.56
1998	113308	17	23.29	5.14
1999	345384	22.5	21.27	5.04
2000	276120	22.5	40.806	5.02
2001	359529	23	18.42	5.02
2002	264454	22.75	19.63	4.73
2003	212848	22.5	21.2	4.7
2004	150587	22.5	21.27	4.71
2005	131654	22.5	14.49	1.44

2006	215915	21	13.01	4.91
2007	337165	20	10.38	5.04
2008	265279	19	9.07	4.8
2009	320921	20	9.91	5.08

2. Data Dalam EViews

EViews - [Group: UNTITLED Workfile: DATA EIEWS::Untitled\]

View	Proc	Object	Print	Name	Freeze	Default	Sort	Transpose	Edit+/-	Smpl+/-	Title	Sample
obs		INFLASI		PDB		PUAB		SBI				
1		19.080		5.99		27.75		618787				
2		18.070		6.34		26.25		601286				
3		19.520		6.52		24.75		665788				
4		20.180		2.96		24.50		626408				
5		22.930		1.50		24.00		604714				
6		30.370		2.82		24.75		431941				
7		35.890		3.18		27.00		267738				
8		34.510		1.45		28.25		443237				
9		25.690		4.02		24.75		629154				
10		17.000		4.91		21.75		611781				
11		8.290		5.18		19.75		570007				
12		7.760		2.61		19.50		601970				
13		10.960		5.99		19.50		700094				
14		13.120		6.29		19.50		733299				
15		18.460		5.81		19.50		575532				
16		18.960		6.81		19.50		429212				
17		20.510		1.70		20.00		404576				
18		17.680		2.76		20.25		360338				
19		14.010		3.37		20.25		329654				
20		12.360		-1.42		18.50		347920				
21		12.420		6.11		17.50		301687				
22		13.480		6.16		17.50		282236				
23		13.450		6.08		17.50		236588				
24		13.230		6.03		17.50		228569				
25		15.780		5.54		17.25		274716				
26		16.940		5.57		17.50		279927				
27		25.800		5.55		20.00		233048				
28		25.070		5.56		27.00		3200059				
29		23.290		5.14		17.00		113308				

3. Uji Stasioneritas Seluruh Data pada Kondisi Level (Perbandingan EViews dan STATCAL)

Dalam EViews, pengujian stasioner dengan menggunakan uji Augmented Dickey-Fuller (ADF).

Null Hypothesis: INFLASI has a unit root

Exogenous: Constant

Lag Length: 1 (Fixed)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.309915	0.1742
Test critical values: 1% level	-3.615588	
5% level	-2.941145	
10% level	-2.609066	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(INFLASI)

Method: Least Squares

Date: 11/21/18 Time: 06:54

Sample (adjusted): 3 40

Included observations: 38 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
----------	-------------	------------	-------------	-------

INFLASI(-1)	-0.330275	0.142981	-2.309915	0.0269
D(INFLASI(-1))	0.022634	0.173339	0.130575	0.8969
C	6.008009	2.875416	2.089440	0.0440
R-squared	0.152786	Mean dependent var	-0.214737	
Adjusted R-squared	0.104374	S.D. dependent var	6.228378	
S.E. of regression	5.894384	Akaike info criterion	6.461534	
Sum squared resid	1216.032	Schwarz criterion	6.590817	
Log likelihood	-119.7691	Hannan-Quinn criter.	6.507532	
F-statistic	3.155934	Durbin-Watson stat	2.001923	
Prob(F-statistic)	0.054939			

Berikut hasil berdasarkan STATCAL.

Show entries Search:

	Variable	Augmented Dickey-Fuller Test Statistic	Critical Value 5% Level	Conclusion
1	SBI	-4.2518	-2.93	Stationer at Level
2	PUAB	-2.328	-2.93	Not Stationer at Level
3	INFLASI	-2.3099	-2.93	Not Stationer at Level
4	PDB	-3.5703	-2.93	Stationer at Level

Showing 1 to 4 of 4 entries Previous Next

STATCAL menggunakan:

- ⇒ **package URCA**
- ⇒ **fungsi ur.df()**

Unit root and cointegration tests encountered in applied econometric analysis are implemented.

Version: 1.3-0
 Depends: R ($\geq 2.0.0$), methods
 Imports: [nlme](#), graphics, stats
 Published: 2016-09-06
 Author: Bernhard Pfaff [aut, cre], Eric Zivot [ctb], Matthieu Stigler [ctb]
 Maintainer: Bernhard Pfaff <bernhard at pfaffikus.de>
 License: [GPL-2](#) | [GPL-3](#) [expanded from: GPL (≥ 2)]
 NeedsCompilation: yes
 Citation: [urca citation info](#)
 Materials: [ChangeLog](#)
 In views: [Econometrics](#), [Finance](#), [TimeSeries](#)
 CRAN checks: [urca results](#)

4. Uji Stasioneritas Seluruh Data pada Kondisi First Difference (Perbandingan EViews dan STATCAL)

Dalam EViews, pengujian stasioner dengan menggunakan uji Augmented Dickey-Fuller (ADF).

Null Hypothesis: D(INFLASI) has a unit root

Exogenous: Constant

Lag Length: 1 (Fixed)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.341973	0.0015
Test critical values: 1% level	-3.621023	
5% level	-2.943427	
10% level	-2.610263	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(INFLASI,2)

Method: Least Squares

Date: 11/21/18 Time: 07:08

Sample (adjusted): 4 40

Included observations: 37 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INFLASI(-1))	-1.130022	0.260255	-4.341973	0.0001
D(INFLASI(-1),2)	-0.019858	0.171397	-0.115862	0.9084
C	-0.291518	1.056161	-0.276016	0.7842
R-squared	0.576924	Mean dependent var	-0.016486	

Adjusted R-squared	0.552037	S.D. dependent var	9.581958
S.E. of regression	6.413208	Akaike info criterion	6.632201
Sum squared resid	1398.394	Schwarz criterion	6.762816
Log likelihood	-119.6957	Hannan-Quinn criter.	6.678249
F-statistic	23.18189	Durbin-Watson stat	1.997687
Prob(F-statistic)	0.000000		

Berikut hasil berdasarkan STATCAL.

	Variable	Augmented Dickey-Fuller Test Statistic	Critical Value 5% Level	Conclusion
1	D(SBI)	-7.1694	-2.93	Stationer at First Difference (1st Difference)
2	D(PUAB)	-5.4054	-2.93	Stationer at First Difference (1st Difference)
3	D(INFLASI)	-4.342	-2.93	Stationer at First Difference (1st Difference)
4	D(PDB)	-6.3834	-2.93	Stationer at First Difference (1st Difference)

Showing 1 to 4 of 4 entries

Previous **1** Next

STATCAL menggunakan:

- ⇒ **package URCA**
- ⇒ **fungsi ur.df()**

Unit root and cointegration tests encountered in applied econometric analysis are implemented.

Version: 1.3-0
 Depends: R ($\geq 2.0.0$), methods
 Imports: [nlme](#), graphics, stats
 Published: 2016-09-06
 Author: Bernhard Pfaff [aut, cre], Eric Zivot [ctb], Matthieu Stigler [ctb]
 Maintainer: Bernhard Pfaff <bernhard at pfaffikus.de>
 License: [GPL-2](#) | [GPL-3](#) [expanded from: GPL (≥ 2)]
 NeedsCompilation: yes
 Citation: [urca citation info](#)
 Materials: [ChangeLog](#)
 In views: [Econometrics](#), [Finance](#), [TimeSeries](#)
 CRAN checks: [urca results](#)

5. Vector Auto Regressive (Perbandingan EViews dan STATCAL)

Berikut hasil VAR dalam EViews.

EViews - [Var: UNTITLED Workfile: DATA EIEWS::Untitled\]									
File	Edit	Object	View	Proc	Quick	Options	Add-ins	Window	Help
View	Proc	Object	Print	Name	Freeze	Estimate	Stats	Impulse	Resids
Vector Autoregression Estimates									

Vector Autoregression Estimates
Date: 11/21/18 Time: 07:17
Sample (adjusted): 4 40
Included observations: 37 after adjustments
Standard errors in () & t-statistics in []

	INFLASI	PDB	PUAB	SBI
INFLASI(-1)	0.608028 (0.21608) [2.81389]	0.051095 (0.09872) [0.51755]	0.183831 (0.05879) [3.12707]	33900.27 (28191.4) [1.20250]
INFLASI(-2)	0.055716 (0.15657) [0.35586]	-0.008079 (0.07153) [-0.11294]	-0.046154 (0.04260) [-1.08354]	-11417.16 (20427.0) [-0.55893]
INFLASI(-3)	-0.142551 (0.14961) [-0.95278]	0.013798 (0.06836) [0.20186]	-0.028750 (0.04070) [-0.70631]	7735.930 (19519.8) [0.39631]
PDB(-1)	-0.145388 (0.44088) [-0.32977]	0.074150 (0.20143) [0.36812]	0.021589 (0.11995) [0.17999]	2905.966 (57520.4) [0.05052]
PDB(-2)	-0.298834 (0.42089) [-0.71001]	-0.009739 (0.19230) [-0.05064]	-0.053351 (0.11451) [-0.46592]	-2764.683 (54911.8) [-0.05035]
PDB(-3)	0.479336 (0.40867) [1.17293]	-0.010605 (0.18671) [-0.05680]	0.231527 (0.11118) [2.08242]	29071.69 (53317.5) [0.54526]
PUAB(-1)	2.244369 (0.96801) [2.31853]	-0.610846 (0.44227) [-1.38117]	1.435733 (0.26336) [5.45165]	117315.5 (126294.) [0.92891]
PUAB(-2)	-3.156556 (1.22843) [-2.56958]	0.278578 (0.56125) [0.49635]	-1.465508 (0.33421) [-4.38502]	-314722.8 (160270.) [-1.96370]
PUAB(-3)	1.189460	-0.062922	0.807497	170375.3

Vector Autoregression Estimates
Date: 11/21/18 Time: 07:17
Sample (adjusted): 4 40
Included observations: 37 after adjustments
Standard errors in () & t-statistics in []

	INFLASI	PDB	PUAB	SBI
INFLASI(-1)	0.608028 (0.21608) [2.81389]	0.051095 (0.09872) [0.51755]	0.183831 (0.05879) [3.12707]	33900.27 (28191.4) [1.20250]
INFLASI(-2)	0.055716 (0.15657) [0.35586]	-0.008079 (0.07153) [-0.11294]	-0.046154 (0.04260) [-1.08354]	-11417.16 (20427.0) [-0.55893]
INFLASI(-3)	-0.142551 (0.14961) [-0.95278]	0.013798 (0.06836) [0.20186]	-0.028750 (0.04070) [-0.70631]	7735.930 (19519.8) [0.39631]
PDB(-1)	-0.145388 (0.44088) [-0.32977]	0.074150 (0.20143) [0.36812]	0.021589 (0.11995) [0.17999]	2905.966 (57520.4) [0.05052]
PDB(-2)	-0.298834	-0.009739	-0.053351	-2764.683

	(0.42089)	(0.19230)	(0.11451)	(54911.8)
	[-0.71001]	[-0.05064]	[-0.46592]	[-0.05035]
PDB(-3)	0.479336	-0.010605	0.231527	29071.69
	(0.40867)	(0.18671)	(0.11118)	(53317.5)
	[1.17293]	[-0.05680]	[2.08242]	[0.54526]
PUAB(-1)	2.244369	-0.610846	1.435733	117315.5
	(0.96801)	(0.44227)	(0.26336)	(126294.)
	[2.31853]	[-1.38117]	[5.45165]	[0.92891]
PUAB(-2)	-3.156556	0.278578	-1.465508	-314722.8
	(1.22843)	(0.56125)	(0.33421)	(160270.)
	[-2.56958]	[0.49635]	[-4.38502]	[-1.96370]
PUAB(-3)	1.189460	-0.062922	0.807497	170375.3
	(0.81789)	(0.37368)	(0.22252)	(106708.)
	[1.45430]	[-0.16838]	[3.62894]	[1.59665]
SBI(-1)	-3.72E-06	1.45E-06	-4.14E-06	-0.232477
	(2.4E-06)	(1.1E-06)	(6.4E-07)	(0.30872)
	[-1.57056]	[1.34210]	[-6.42625]	[-0.75304]
SBI(-2)	1.02E-05	-1.35E-06	5.25E-06	0.760935
	(3.6E-06)	(1.7E-06)	(9.9E-07)	(0.47447)
	[2.80182]	[-0.81216]	[5.30393]	[1.60376]
SBI(-3)	3.09E-07	6.13E-07	-3.70E-06	-0.893443
	(3.7E-06)	(1.7E-06)	(1.0E-06)	(0.47971)
	[0.08398]	[0.36494]	[-3.69522]	[-1.86248]
C	-0.310655	11.07785	2.816071	490686.0
	(8.58120)	(3.92061)	(2.33460)	(1119564)
	[-0.03620]	[2.82555]	[1.20623]	[0.43828]
R-squared	0.810750	0.250075	0.901988	0.196089
Adj. R-squared	0.716125	-0.124887	0.852983	-0.205867
Sum sq. resids	413.5025	86.31545	30.60610	7.04E+12
S.E. equation	4.150816	1.896438	1.129271	541544.6
F-statistic	8.568033	0.666933	18.40575	0.487836
Log likelihood	-97.15502	-68.17190	-48.99093	-532.9734
Akaike AIC	5.954325	4.387670	3.350861	29.51208
Schwarz SC	6.520324	4.953669	3.916859	30.07808
Mean dependent	18.58368	4.382973	21.03378	451285.6
S.D. dependent	7.790582	1.788068	2.945195	493156.2
Determinant resid covariance (dof adj.)		8.52E+12		
Determinant resid covariance		1.51E+12		
Log likelihood		-728.7876		
Akaike information criterion		42.20474		
Schwarz criterion		44.46873		

Berikut hasil VAR berdasarkan STATCAL.

Vector Autoregressive (VAR)

Data In:

☒ Level ☐ First Difference (1st) ☐ Second Difference (2nd)

Maximum Lag

13

VAR Estimation Results:

=====

Estimated coefficients for equation SBI:

=====

Call:

SBI = SBI.11 + PUAB.11 + INFLASI.11 + PDB.11 + SBI.12 + PUAB.12 + INFLASI.12 + PDB.12 + SBI.13 + PUAB.13 + INFLASI.13 + PDB.13 + const

SBI.11	PUAB.11	INFLASI.11	PDB.11	SBI.12
-2.324936e-01	1.173234e+05	3.389630e+04	2.904968e+03	7.609678e-01
PUAB.12	INFLASI.12	PDB.12	SBI.13	PUAB.13
-3.147301e+05	-1.141303e+04	-2.766236e+03	-8.934580e-01	1.703794e+05
INFLASI.13	PDB.13	const		
7.732362e+03	2.907171e+04	4.906575e+05		

Estimated coefficients for equation PUAB:

=====

VAR Estimation Results:

=====

Estimated coefficients for equation SBI:

=====

Call:

SBI = SBI.11 + PUAB.11 + INFLASI.11 + PDB.11 + SBI.12 + PUAB.12 + INFLASI.12 + PDB.12 + SBI.13 + PUAB.13 + INFLASI.13 + PDB.13 + const

SBI.11	PUAB.11	INFLASI.11	PDB.11	SBI.12
-2.324936e-01	1.173234e+05	3.389630e+04	2.904968e+03	7.609678e-01
PUAB.12	INFLASI.12	PDB.12	SBI.13	PUAB.13
-3.147301e+05	-1.141303e+04	-2.766236e+03	-8.934580e-01	1.703794e+05
INFLASI.13	PDB.13	const		
7.732362e+03	2.907171e+04	4.906575e+05		

Estimated coefficients for equation PUAB:

=====

Call:

PUAB = SBI.11 + PUAB.11 + INFLASI.11 + PDB.11 + SBI.12 + PUAB.12 + INFLASI.12 + PDB.12 + SBI.13 + PUAB.13 + INFLASI.13 + PDB.13 + const

SBI.11	PUAB.11	INFLASI.11	PDB.11	SBI.12
-4.137116e-06	1.435795e+00	1.838117e-01	2.158722e-02	5.247988e-06
PUAB.12	INFLASI.12	PDB.12	SBI.13	PUAB.13
-1.465595e+00	-4.613822e-02	-5.335759e-02	-3.696602e-06	8.075285e-01
INFLASI.13	PDB.13	const		
-2.875071e-02	2.315321e-01	2.816024e+00		

Estimated coefficients for equation INFLASI:

=====

Call:

INFLASI = SBI.11 + PUAB.11 + INFLASI.11 + PDB.11 + SBI.12 + PUAB.12 +
INFLASI.12 + PDB.12 + SBI.13 + PUAB.13 + INFLASI.13 + PDB.13 + const

SBI.11	PUAB.11	INFLASI.11	PDB.11	SBI.12
-3.717130e-06	2.244782e+00	6.078996e-01	-1.453295e-01	1.019031e-05
PUAB.12	INFLASI.12	PDB.12	SBI.13	PUAB.13
-3.156761e+00	5.572648e-02	-2.988689e-01	3.099902e-07	1.189318e+00
INFLASI.13	PDB.13	const		
-1.424835e-01	4.793292e-01	-3.117230e-01		

Estimated coefficients for equation PDB:

=====

Call:

PDB = SBI.11 + PUAB.11 + INFLASI.11 + PDB.11 + SBI.12 + PUAB.12 + INFLASI.12
+ PDB.12 + SBI.13 + PUAB.13 + INFLASI.13 + PDB.13 + const

SBI.11	PUAB.11	INFLASI.11	PDB.11	SBI.12
1.450934e-06	-6.108354e-01	5.108879e-02	7.414792e-02	-1.349370e-06
PUAB.12	INFLASI.12	PDB.12	SBI.13	PUAB.13
2.785485e-01	-8.069653e-03	-9.741147e-03	6.129918e-07	-6.291036e-02
INFLASI.13	PDB.13	const		
1.379779e-02	-1.060370e-02	1.107796e+01		

VAR Estimation Results:

=====

Endogenous variables: SBI, PUAB, INFLASI, PDB

Deterministic variables: const

Sample size: 37

Log Likelihood: -728.789

Roots of the characteristic polynomial:

0.7736 0.7736 0.7401 0.7401 0.7369 0.6744 0.6744 0.6676 0.6676 0.3526 0.3526
0.2206

Call:

VAR(y = get_data, type = "const", lag.max = max_lag)

Estimation results for equation SBI:

=====

SBI = SBI.11 + PUAB.11 + INFLASI.11 + PDB.11 + SBI.12 + PUAB.12 + INFLASI.12
+ PDB.12 + SBI.13 + PUAB.13 + INFLASI.13 + PDB.13 + const

	Estimate	Std. Error	t value	Pr(> t)
SBI.11	-2.325e-01	3.087e-01	-0.753	0.4587
PUAB.11	1.173e+05	1.263e+05	0.929	0.3621
INFLASI.11	3.390e+04	2.819e+04	1.202	0.2409
PDB.11	2.905e+03	5.752e+04	0.051	0.9601
SBI.12	7.610e-01	4.745e-01	1.604	0.1218
PUAB.12	-3.147e+05	1.603e+05	-1.964	0.0612 .

```
INFLASI.12 -1.141e+04 2.042e+04 -0.559 0.5815
PDB.12 -2.766e+03 5.491e+04 -0.050 0.9602
SBI.13 -8.935e-01 4.797e-01 -1.862 0.0748 .
PUAB.13 1.704e+05 1.067e+05 1.597 0.1234
INFLASI.13 7.732e+03 1.952e+04 0.396 0.6955
PDB.13 2.907e+04 5.332e+04 0.545 0.5906
const 4.907e+05 1.120e+06 0.438 0.6651
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Residual standard error: 541500 on 24 degrees of freedom
Multiple R-Squared: 0.1961, Adjusted R-squared: -0.2059
F-statistic: 0.4878 on 12 and 24 DF, p-value: 0.9021

Estimation results for equation PUAB:

```
=====
PUAB = SBI.11 + PUAB.11 + INFLASI.11 + PDB.11 + SBI.12 + PUAB.12 + INFLASI.12
+ PDB.12 + SBI.13 + PUAB.13 + INFLASI.13 + PDB.13 + const
```

	Estimate	Std. Error	t value	Pr(> t)	
SBI.11	-4.137e-06	6.438e-07	-6.426	1.21e-06	***
PUAB.11	1.436e+00	2.633e-01	5.452	1.33e-05	***
INFLASI.11	1.838e-01	5.878e-02	3.127	0.004581	**
PDB.11	2.159e-02	1.199e-01	0.180	0.858685	
SBI.12	5.248e-06	9.894e-07	5.304	1.93e-05	***
PUAB.12	-1.466e+00	3.342e-01	-4.385	0.000198	***
INFLASI.12	-4.614e-02	4.259e-02	-1.083	0.289439	
PDB.12	-5.336e-02	1.145e-01	-0.466	0.645434	
SBI.13	-3.697e-06	1.000e-06	-3.695	0.001134	**
PUAB.13	8.075e-01	2.225e-01	3.629	0.001338	**
INFLASI.13	-2.875e-02	4.070e-02	-0.706	0.486734	
PDB.13	2.315e-01	1.112e-01	2.082	0.048132	*
const	2.816e+00	2.335e+00	1.206	0.239495	

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.129 on 24 degrees of freedom
Multiple R-Squared: 0.902, Adjusted R-squared: 0.853
F-statistic: 18.41 on 12 and 24 DF, p-value: 3.029e-09

Estimation results for equation INFLASI:

```
=====
INFLASI = SBI.11 + PUAB.11 + INFLASI.11 + PDB.11 + SBI.12 + PUAB.12 +
INFLASI.12 + PDB.12 + SBI.13 + PUAB.13 + INFLASI.13 + PDB.13 + const
```

	Estimate	Std. Error	t value	Pr(> t)	
SBI.11	-3.717e-06	2.366e-06	-1.571	0.12931	
PUAB.11	2.245e+00	9.680e-01	2.319	0.02923	*
INFLASI.11	6.079e-01	2.161e-01	2.813	0.00962	**
PDB.11	-1.453e-01	4.409e-01	-0.330	0.74455	
SBI.12	1.019e-05	3.637e-06	2.802	0.00988	**
PUAB.12	-3.157e+00	1.229e+00	-2.570	0.01682	*

```
INFLASI.12  5.573e-02  1.566e-01  0.356  0.72498
PDB.12      -2.989e-01  4.209e-01  -0.710  0.48451
SBI.13      3.100e-07  3.677e-06  0.084  0.93351
PUAB.13     1.189e+00  8.180e-01  1.454  0.15890
INFLASI.13 -1.425e-01  1.496e-01  -0.952  0.35039
PDB.13      4.793e-01  4.087e-01  1.173  0.25236
const      -3.117e-01  8.582e+00  -0.036  0.97132
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Residual standard error: 4.151 on 24 degrees of freedom
Multiple R-Squared: 0.8107, Adjusted R-squared: 0.7161
F-statistic: 8.568 on 12 and 24 DF, p-value: 5.016e-06

Estimation results for equation PDB:

```
=====
PDB = SBI.11 + PUAB.11 + INFLASI.11 + PDB.11 + SBI.12 + PUAB.12 + INFLASI.12
+ PDB.12 + SBI.13 + PUAB.13 + INFLASI.13 + PDB.13 + const
```

	Estimate	Std. Error	t value	Pr(> t)
SBI.11	1.451e-06	1.081e-06	1.342	0.19212
PUAB.11	-6.108e-01	4.422e-01	-1.381	0.17994
INFLASI.11	5.109e-02	9.872e-02	0.518	0.60952
PDB.11	7.415e-02	2.014e-01	0.368	0.71602
SBI.12	-1.349e-06	1.662e-06	-0.812	0.42470
PUAB.12	2.785e-01	5.613e-01	0.496	0.62420
INFLASI.12	-8.070e-03	7.152e-02	-0.113	0.91111
PDB.12	-9.741e-03	1.923e-01	-0.051	0.96002
SBI.13	6.130e-07	1.680e-06	0.365	0.71839
PUAB.13	-6.291e-02	3.737e-01	-0.168	0.86772
INFLASI.13	1.380e-02	6.835e-02	0.202	0.84172
PDB.13	-1.060e-02	1.867e-01	-0.057	0.95518
const	1.108e+01	3.921e+00	2.826	0.00936 **

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.896 on 24 degrees of freedom
Multiple R-Squared: 0.2501, Adjusted R-squared: -0.1249
F-statistic: 0.6669 on 12 and 24 DF, p-value: 0.7651

Covariance matrix of residuals:

	SBI	PUAB	INFLASI	PDB
SBI	2.933e+11	4.082e+05	-3.641e+05	1.411e+05
PUAB	4.082e+05	1.275e+00	1.317e+00	2.259e-01
INFLASI	-3.641e+05	1.317e+00	1.723e+01	1.116e+00
PDB	1.411e+05	2.259e-01	1.116e+00	3.596e+00

Correlation matrix of residuals:

	SBI	PUAB	INFLASI	PDB
SBI	1.0000	0.6675	-0.1620	0.1374
PUAB	0.6675	1.0000	0.2810	0.1055

INFLASI	-0.1620	0.2810	1.0000	0.1418
PDB	0.1374	0.1055	0.1418	1.0000

Mari kita bandingkan sedikit hasil VAR antara EViews dan STATCAL.

Vector Autoregression
Estimates
Date: 11/21/18 Time:
07:17
Sample (adjusted): 4 40
Included observations: 37
after adjustments
Standard errors in () & t-
statistics in []

	INFLASI
INFLASI(-1)	0.608028 (0.21608) [2.81389]
INFLASI(-2)	0.055716 (0.15657) [0.35586]
INFLASI(-3)	-0.142551 (0.14961) [-0.95278]
PDB(-1)	-0.145388 (0.44088) [-0.32977]
PDB(-2)	-0.298834 (0.42089) [-0.71001]
PDB(-3)	0.479336 (0.40867) [1.17293]
PUAB(-1)	2.244369 (0.96801) [2.31853]
PUAB(-2)	-3.156556 (1.22843) [-2.56958]
PUAB(-3)	1.189460 (0.81789) [1.45430]

SBI(-1)	-3.72E-06 (2.4E-06) [-1.57056]
SBI(-2)	1.02E-05 (3.6E-06) [2.80182]
SBI(-3)	3.09E-07 (3.7E-06) [0.08398]
C	-0.310655 (8.58120) [-0.03620]

SAMA.....

Estimation results for equation INFLASI:

=====

INFLASI = SBI.11 + PUAB.11 + INFLASI.11 + PDB.11 + SBI.12 + PUAB.12 + INFLASI.12 + PDB.12 + SBI.13 + PUAB.13 + INFLASI.13 + PDB.13 + const

	Estimate	Std. Error	t value	Pr(> t)	
SBI.11	-3.717e-06	2.366e-06	-1.571	0.12931	
PUAB.11	2.245e+00	9.680e-01	2.319	0.02923	*
INFLASI.11	6.079e-01	2.161e-01	2.813	0.00962	**
PDB.11	-1.453e-01	4.409e-01	-0.330	0.74455	
SBI.12	1.019e-05	3.637e-06	2.802	0.00988	**
PUAB.12	-3.157e+00	1.229e+00	-2.570	0.01682	*
INFLASI.12	5.573e-02	1.566e-01	0.356	0.72498	
PDB.12	-2.989e-01	4.209e-01	-0.710	0.48451	
SBI.13	3.100e-07	3.677e-06	0.084	0.93351	
PUAB.13	1.189e+00	8.180e-01	1.454	0.15890	
INFLASI.13	-1.425e-01	1.496e-01	-0.952	0.35039	
PDB.13	4.793e-01	4.087e-01	1.173	0.25236	
const	-3.117e-01	8.582e+00	-0.036	0.97132	

STATCAL menggunakan:

⇒ **package vars**

⇒ fungsi VAR()

`vars: VAR Modelling`

Estimation, lag selection, diagnostic testing, forecasting, causality analysis, forecast error variance decomposition and impulse response functions of VAR models and estimation of SVAR and SVEC models.

Version: 1.5-3
Depends: R ($\geq 2.0.0$), [MASS](#), [strucchange](#), [urca](#) ($\geq 1.1-6$), [lmtest](#) ($\geq 0.9-26$), [sandwich](#) ($\geq 2.2-4$)
Published: 2018-08-06
Author: Bernhard Pfaff [aut, cre], Matthieu Stigler [ctb]
Maintainer: Bernhard Pfaff <bernhard at pfaffikus.de>
License: [GPL-2](#) | [GPL-3](#) [expanded from: GPL (≥ 2)]
URL: <http://www.pfaffikus.de>
NeedsCompilation: no
Citation: [vars citation info](#)
Materials: [ChangeLog](#)
In views: [Econometrics](#), [Finance](#), [TimeSeries](#)
CRAN checks: [vars results](#)

Downloads:

Reference manual: [vars.pdf](#)
Vignettes: [VAR, SVAR and SVEC models](#)
Package source: [vars_1.5-3.tar.gz](#)

6. Penentuan Lag Optimal (Perbandingan EViews dan STATCAL)

Penentuan lag optimal dalam EViews.

EViews - [Var: UNTITLED Workfile: DATA EViews::Untitled\]

File Edit Object View Proc Quick Options Add-ins Window Help

View Proc Object Print Representations Residuals Estimation Output Endogenous Table Endogenous Graph Lag Structure Residual Tests Cointegration Test... Impulse Response... Variance Decomposition... Label

Vector Autoregression
Date: 11/21/18 Time:
Sample (adjusted): 3 4
Included observations:
Standard errors in () &

INFLASI(-1)

INFLASI(-2)

PDB(-1)

0.137966
(0.43514)
[0.31706]

0.154771
(0.18063)
[0.85686]

0.110222
(0.13234)
[0.83290]

23785.40
(52247.3)
[0.45525]

AR Roots Table
AR Roots Graph
Granger Causality/Block Exogeneity Tests
Lag Exclusion Tests
Lag Length Criteria...

0.04550) (17964.6)
1.55616] [-0.74396]

Lag Specification

Lags to include: 3

OK Cancel

EViews - [Var: UNTITLED Workfile: DATA EViews::Untitled\]

File Edit Object View Proc Quick Options Add-ins Window Help

View Proc Object Print Name Freeze Estimate Stats Impulse Resids

VAR Lag Order Selection Criteria
Endogenous variables: INFLASI PDB PUAB SBI
Exogenous variables: C
Date: 11/21/18 Time: 07:50
Sample: 1 40
Included observations: 37

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-810.5565	NA	1.56e+14	44.03008	44.20423	44.09148
1	-773.4412	64.19942	5.00e+13	42.88871	43.75948*	43.19570
2	-746.8647	40.22395*	2.92e+13	42.31701	43.88439	42.86958*
3	-728.7876	23.45128	2.84e+13*	42.20474*	44.46873	43.00290

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

VAR Lag Order Selection Criteria
 Endogenous variables: INFLASI PDB PUAB SBI
 Exogenous variables: C
 Date: 11/21/18 Time: 07:50
 Sample: 1 40
 Included observations: 37

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-810.5565	NA	1.56e+14	44.03008	44.20423	44.09148
1	-773.4412	64.19942	5.00e+13	42.88871	43.75948*	43.19570
2	-746.8647	40.22395*	2.92e+13	42.31701	43.88439	42.86958*
3	-728.7876	23.45128	2.84e+13*	42.20474*	44.46873	43.00290

* indicates lag order selected by the criterion
 LR: sequential modified LR test statistic (each test at 5% level)
 FPE: Final prediction error
 AIC: Akaike information criterion
 SC: Schwarz information criterion
 HQ: Hannan-Quinn information criterion

Lag optimalnya bisa 2 (LR dan HQ) atau 3 (FPE dan AIC). Jadi dipilih 3 bisa

Berikut penentuan Lag optimal dalam STATCAL.

Determine Lag for VAR

Data In:
☒ Level ☐ First Difference (1st) ☐ Second Difference (2nd)

Decimals:
 0 2 30

Maximum Lag
 1 3

	AIC (n)	HQ (n)	SC (n)	FPE (n)
	3	2	1	3
	1	2	3	
AIC (n)	3.153745e+01	3.096570e+01	3.085332e+01	
HQ (n)	3.184444e+01	3.151827e+01	3.165149e+01	
SC (n)	3.240822e+01	3.253308e+01	3.311732e+01	
FPE (n)	5.005323e+13	2.920907e+13	2.842781e+13	

Berdasarkan hasil STATCAL, lag optimalnya adalah 3 (AIC dan FPE).

STATCAL menggunakan:

⇒ **fungsi VARselect()**

7. Granger Causality (Perbandingan EViews dan STATCAL)

Granger causality dalam EViews.

EViews - [Group: UNTITLED Workfile: DATA EIEWS::Untitled\]

View	Proc	Object	Print	Name	Freeze	Default	Sort	Transpose	Edit+/-
obs		INFLASI		PDB		PUAB		SBI	
1		19.080		5.99		27.75		618787	
2		18.070		6.34		26.25		601286	
3		19.520		6.52		24.75		665788	
4		20.180		2.96		24.50		626408	
5		22.930		1.50		24.00		604714	
6		30.370		2.82		24.75		431941	
7		35.890		3.18		27.00		267738	
8		34.510		1.45		28.25		443237	
9		25.690		4.02		24.75		629154	
10		17.000		4.91		21.75		611781	
11		8.290		5.18		19.75		570007	
12		7.760		2.61		19.50		601970	
13		10.960		5.99		19.50		700094	
14		13.120		6.29		19.50		733299	
15		18.460		5.81		19.50		575532	
16		18.960		6.81		19.50		429212	
17		20.510		1.70		20.00		404576	
18		17.680		2.76		20.25		360338	
19		14.010		3.37		20.25		329654	
20		12.360		-1.42		18.50		347920	
21		12.420		6.11		17.50		301687	
22		13.480		6.16		17.50		282236	
23		13.450		6.08		17.50		236588	
24		13.230		6.03		17.50		228569	
25		15.780		5.54		17.25		274716	
26		16.940		5.57		17.50		279927	
27		25.800		5.55		20.00		233048	
28		25.070		5.56		27.00		3200059	
29		23.290		5.14		17.00		113308	
30		21.270		5.04		22.50		345384	
31		40.806		5.02		22.50		276120	
32		18.420		5.02		23.00		359529	
33		19.630		4.73		22.75		264454	
34		21.200		4.70		22.50		212848	

EViews - [Group: UNTITLED Workfile: DATA EIEWS::Untitled\]

View	Proc	Object	Print	Group Members	Transpose
obs		INFLASI		Spreadsheet	SBI
1		19.080		Dated Data Table	618787
2		18.070		Graph...	601286
3		19.520			665788
4		20.180			626408
5		22.930		Descriptive Stats	604714
6		30.370		Covariance Analysis...	431941
7		35.890		N-Way Tabulation...	267738
8		34.510		Tests of Equality...	443237
9		25.690		Principal Components...	629154
10		17.000			611781
11		8.290			570007
12		7.760		Correlogram (1) ...	601970
13		10.960		Cross Correlation (2) ...	700094
14		13.120		Long-run Covariance...	733299
15		18.460		Unit Root Test...	575532
16		18.960		Cointegration Test	429212
17		20.510		Granger Causality...	404576
18		17.680			360338
19		14.010			329654
20		12.360			347920
21		12.420			301687
22		13.480	6.16	17.50	282236
23		13.450	6.08	17.50	236588
24		13.230	6.03	17.50	228569
25		15.780	5.54	17.25	274716

Lag Specification

Lags to include:

OK Cancel

EViews - [Group: UNTITLED Workfile: DATA EIEWS::Untitled\]

File Edit Object View Proc Quick Options Add-ins Window Help

View Proc Object Print Name Freeze Sample Sheet Stats Spec

Pairwise Granger Causality Tests
Date: 11/21/18 Time: 07:59
Sample: 1 40
Lags: 3

Null Hypothesis:	Obs	F-Statistic	Prob.
PDB does not Granger Cause INFLASI	37	0.42465	0.7367
INFLASI does not Granger Cause PDB		0.72786	0.5434
PUAB does not Granger Cause INFLASI	37	5.54489	0.0038
INFLASI does not Granger Cause PUAB		7.22219	0.0009
SBI does not Granger Cause INFLASI	37	10.4148	7.E-05
INFLASI does not Granger Cause SBI		0.53826	0.6597
PUAB does not Granger Cause PDB	37	1.55107	0.2218
PDB does not Granger Cause PUAB		0.35890	0.7831
SBI does not Granger Cause PDB	37	0.06950	0.9758
PDB does not Granger Cause SBI		0.14031	0.9351
SBI does not Granger Cause PUAB	37	24.4623	3.E-08
PUAB does not Granger Cause SBI		1.38057	0.2677

Pairwise Granger Causality Tests

Date: 11/21/18 Time: 07:59

Sample: 1 40

Lags: 3

Null Hypothesis:	Obs	F-Statistic	Prob.
PDB does not Granger Cause INFLASI	37	0.42465	0.7367
INFLASI does not Granger Cause PDB		0.72786	0.5434
PUAB does not Granger Cause INFLASI	37	5.54489	0.0038
INFLASI does not Granger Cause PUAB		7.22219	0.0009
SBI does not Granger Cause INFLASI	37	10.4148	7.E-05
INFLASI does not Granger Cause SBI		0.53826	0.6597
PUAB does not Granger Cause PDB	37	1.55107	0.2218
PDB does not Granger Cause PUAB		0.35890	0.7831
SBI does not Granger Cause PDB	37	0.06950	0.9758
PDB does not Granger Cause SBI		0.14031	0.9351
SBI does not Granger Cause PUAB	37	24.4623	3.E-08
PUAB does not Granger Cause SBI		1.38057	0.2677

Vector Auto Regressive (VAR), Johansen Cointegration Test & Granger Causality Test dengan STATCAL

Prana Ugiana Gio (CEO STATCAL)

Created by Prana Ugiana Gio & Rezzy Eko Caraka

Rezzy Eko Caraka (CFO STATCAL)

STATCAL is a free statistical application program created by Prana Ugiana Gio (CEO) & Rezzy Eko Caraka (CFO), in January 2017, using R programming language in RStudio, with shiny package as the main package. STATCAL uses various of R packages to perform statistical and graphical data analysis.

STATCAL can be used by online visiting <https://gioprana.shinyapps.io/STATCAL/> or you can run it by offline downloading <http://www.statcal.com/>.

Input: Time, Value, Name of Variable

Input Time

Input Value

Name

Choose Variable

Result

Watch Tutorial Video

Time

1	1970
2	1971
3	1972
4	1973
5	1974
6	1975
7	1976
8	1977
9	1978
10	1979
11	1980
12	1981
13	1982
14	1983
15	1984
16	1985
17	1986
18	1987
19	1988
20	1989
21	1990
22	1991
23	1992
24	1993
25	1994

Input: Time, Value, Name of Variable

Input Time

Input Value

Name

Choose Variable

Result

Watch Tutorial Video

Time

1	618787	27.75	19.88	5.99
2	601286	26.25	18.07	6.34
3	665788	24.75	19.52	6.52
4	626408	24.5	20.18	2.96
5	604714	24	22.93	1.5
6	431941	24.75	30.37	2.82
7	267738	27	35.89	3.18
8	443237	28.25	34.51	1.45
9	629154	24.75	25.69	4.02
10	611781	21.75	17	4.91
11	578807	19.75	8.29	5.18
12	601970	19.5	7.76	2.61
13	700094	19.5	10.96	5.99
14	733299	19.5	13.12	6.29
15	575532	19.5	18.46	5.81
16	429212	19.5	18.96	6.81
17	404576	20	20.51	1.7
18	360338	20.25	17.68	2.76
19	329654	20.25	14.01	3.37
20	347920	18.5	12.36	-1.42
21	301687	17.5	12.42	6.11
22	202236	17.5	13.48	6.16
23	236588	17.5	13.45	6.08
24	228569	17.5	13.23	6.03
25	274716	17.25	15.78	5.54

Prana Ugiana Gio (CEO STATCAL)

Created by Prana Ugiana Gio & Rezzy Eko Caraka

Rezzy Eko Caraka (CFO STATCAL)

Input: Time, Value, Name of Variable

Input TimeInput ValueNameChoose VariableResultWatch Tutorial Video

Label

Time

SBI

PUAB

INFLASI

PDB

Input: Time, Value, Name of Variable

Input TimeInput ValueNameChoose VariableResultWatch Tutorial Video

Choose Numeric Variable (Multiple Choices)

SBI

PUAB

INFLASI

PDB

Choose Time (Single Choice)

Time

Input: Time, Value, Name of Variable

Input TimeInput ValueNameChoose VariableResultWatch Tutorial Video

Vector Auto Regressive (VAR), Johansen Cointegration Test & Granger Causality Test

Descriptive Statistics

Decimals:

0

2

30

Show 10 entries

Search:

	Minimum	Maximum	Mean	Standard Deviation
SBI	113308	3200059	464585.75	476224.55
PUAB	17	28.25	21.43	3.17
INFLASI	7.76	40.81	18.61	7.49
PDB	-1.42	6.81	4.53	1.79

Showing 1 to 4 of 4 entries

Previous1Next

Scatter Plot & Pearson Correlation

Your Data in Level, First Difference or Second Difference

Data In: ☒ Level ☐ First Difference (1st) ☐ Second Difference (2nd)

Decimals: 2

Show 10 entries

Search:

	Time	SBI	PUAB	INFLASI	PDB
1	1970	618787	27.75	19.08	5.99
2	1971	601286	26.25	18.07	6.34
3	1972	665788	24.75	19.52	6.52
4	1973	626408	24.5	20.18	2.96
5	1974	604714	24	22.93	1.5
6	1975	431941	24.75	30.37	2.82
7	1976	267738	27	35.89	3.18
8	1977	443237	28.25	34.51	1.45
9	1978	629154	24.75	25.69	4.02

Stationerity Test based on Graph

Stationerity Test (Augmented Dickey-Fuller Test Unit Root Test)

Determine Lag for VAR

Vector Autoregressive (VAR)

Data In:

☒ Level ☐ First Difference (1st) ☐ Second Difference (2nd)

Maximum Lag

13

VAR Estimation Results:

=====

Estimated coefficients for equation SBI:

=====

Call:

SBI = SBI.l1 + PUAB.l1 + INFLASI.l1 + PDB.l1 + SBI.l2 + PUAB.l2 + INFLASI.l2 + PDB.l2 + SBI.l3 + PUAB.l3 + INFLASI.l3 + PDB.l3 + const

SBI.l1	PUAB.l1	INFLASI.l1	PDB.l1	SBI.l2
-2.324936e-01	1.173234e+05	3.389630e+04	2.904968e+03	7.609678e-01
PUAB.l2	INFLASI.l2	PDB.l2	SBI.l3	PUAB.l3
-3.147301e+05	-1.141303e+04	-2.766236e+03	-8.934580e-01	1.703794e+05
INFLASI.l3	PDB.l3	const		
7.732362e+03	2.907171e+04	4.906575e+05		

Johansen Cointegration Test

The Lag Order of the Series (Levels) in the VAR

13

Data In:

☒ Level ☐ First Difference (1st) ☐ Second Difference (2nd)

```
#####
# Johansen-Procedure #
#####

Test type: trace statistic , with linear trend

Eigenvalues (lambda):
[1] 0.5424279 0.3557297 0.1783055 0.1237594

Values of teststatistic and critical values of test:

      test 10pct 5pct 1pct
r <= 3 | 4.89 6.50 8.18 11.65
r <= 2 | 12.15 15.66 17.95 23.52
r <= 1 | 28.42 28.71 31.52 37.22
r = 0 | 57.35 45.23 48.28 55.43

Eigenvectors, normalised to first column:
(These are the cointegration relations)

      SBI.l3  PUAB.l3  INFLASI.l3  PDB.l3
SBI.l3      1.00      1.00      1.00      1.00
PUAB.l3  80043.10 -484826.4 -394366.16 -195230.87
```

Impulse Response Analysis

Granger Causality Test

Data In:

- ☒ Level ☐ First Difference (1st) ☐ Second Difference (2nd)

Lags

1

2

```
#####
PUAB >< SBI
#####

Granger causality test

Model 1: data_X ~ Lags(data_X, 1:2) + Lags(data_Y, 1:2)
Model 2: data_X ~ Lags(data_X, 1:2)
Res.Df Df      F Pr(>F)
1      33
2      35 -2 0.6923 0.5076

Conclusion: PUAB does not Granger Cause SBI (P-Value = 0.5076 > 0.05)

#####
SBI >< PUAB
#####

Granger causality test
```