APPENDIX A

Unit root test

Augmented Dickey-Fuller test (ADF test)

1. SET

Null Hypothesis: SET has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=17)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-20.82712	0.0000
Test critical values:	1% level	-3.977251	
	5% level	-3.419191	
	10% level	-3.132165	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SET)
Method: Least Squares
Date: 08/03/15 Time: 21:44
Sample (adjusted): 1/04/2013 1/30/2015
Included observations: 481 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SET(-1)	-0.951605	0.045691	-20.82712	0.0000
C	0.007774	0.102334	0.075968	0.9395
@TREND(1/03/2013)	8.74E-05	0.000368	0.237417	0.8124

R-squared	0.475745	Mean dependent var	-0.000817
Adjusted R-squared	0.473551	S.D. dependent var	1.544204
S.E. of regression	1.120425	Akaike info criterion	3.071511
Sum squared resid	600.0587	Schwarz criterion	3.097556
Log likelihood	-735.6985	Hannan-Quinn criter.	3.081748
F-statistic	216.8847	Durbin-Watson stat	1.999698
Prob(F-statistic)	0.000000		

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

2. SCC

Null Hypothesis: SCC has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=17)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-21.78145	0.0000
Test critical values:	1% level	-3.977251	
	5% level	-3.419191	
	10% level	-3.132165	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SCC)
Method: Least Squares
Date: 08/03/15 Time: 21:48
Sample (adjusted): 1/04/2013 1/30/2015
Included observations: 481 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SCC(-1)	-0.998483	0.045841	-21.78145	0.0000
C	-0.038294	0.146730	-0.260981	0.7942
@TREND(1/03/2013)	0.000308	0.000528	0.582797	0.5603

R-squared	0.498132	Mean dependent var	0.006087
Adjusted R-squared	0.496032	S.D. dependent var	2.262882
S.E. of regression	1.606436	Akaike info criterion	3.792131
Sum squared resid	1233.544	Schwarz criterion	3.818176
Log likelihood	-909.0074	Hannan-Quinn criter.	3.802368
F-statistic	237.2206	Durbin-Watson stat	1.992661
Prob(F-statistic)	0.000000		

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

3. SCCC

Null Hypothesis: SCCC has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=17)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-21.10692	0.0000
Test critical values:	1% level	-3.977251	
	5% level	-3.419191	
	10% level	-3.132165	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SCCC)
Method: Least Squares
Date: 08/03/15 Time: 21:49
Sample (adjusted): 1/04/2013 1/30/2015
Included observations: 481 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SCCC(-1)	-0.964866	0.045713	-21.10692	0.0000
C	-0.026446	0.164476	-0.160789	0.8723
@TREND(1/03/2013)	0.000163	0.000591	0.275430	0.7831

R-squared	0.482405	Mean dependent var	0.000976
Adjusted R-squared	0.480239	S.D. dependent var	2.497785
S.E. of regression	1.800764	Akaike info criterion	4.020516
Sum squared resid	1550.034	Schwarz criterion	4.046561
Log likelihood	-963.9342	Hannan-Quinn criter.	4.030753
F-statistic	222.7511	Durbin-Watson stat	2.003805
Prob(F-statistic)	0.000000		

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

4. SGX

Null Hypothesis: SGX has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=17)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-20.57362	0.0000
Test critical values:	1% level	-3.977251	
	5% level	-3.419191	
	10% level	-3.132165	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SGX)
Method: Least Squares
Date: 08/03/15 Time: 21:49
Sample (adjusted): 1/04/2013 1/30/2015
Included observations: 481 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SGX(-1)	-0.939802	0.045680	-20.57362	0.0000
C	-0.014916	0.056926	-0.262031	0.7934
@TREND(1/03/2013)	0.000109	0.000205	0.534648	0.5931

R-squared	0.469640	Mean dependent var	-0.003191
Adjusted R-squared	0.467421	S.D. dependent var	0.853998
S.E. of regression	0.623231	Akaike info criterion	1.898418
Sum squared resid	185.6632	Schwarz criterion	1.924463
Log likelihood	-453.5695	Hannan-Quinn criter.	1.908655
F-statistic	211.6371	Durbin-Watson stat	2.000052
Prob(F-statistic)	0.000000		

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

5. CES

Null Hypothesis: CES has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=17)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-21.18666	0.0000
Test critical values:	1% level	-3.977251	
	5% level	-3.419191	
	10% level	-3.132165	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(CES)
Method: Least Squares
Date: 08/03/15 Time: 21:50
Sample (adjusted): 1/04/2013 1/30/2015
Included observations: 481 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CES(-1)	-0.968538	0.045715	-21.18666	0.0000
C	0.104604	0.144081	0.726007	0.4682
@TREND(1/03/2013)	-8.42E-05	0.000518	-0.162680	0.8708

R-squared	0.484288	Mean dependent var	-0.002786
Adjusted R-squared	0.482131	S.D. dependent var	2.190739
S.E. of regression	1.576525	Akaike info criterion	3.754541
Sum squared resid	1188.036	Schwarz criterion	3.780585
Log likelihood	-899.9670	Hannan-Quinn criter.	3.764777
F-statistic	224.4373	Durbin-Watson stat	2.001416
Prob(F-statistic)	0.000000		

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

6. LKH

Null Hypothesis: LKH has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=17)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-23.18773	0.0000
Test critical values:	1% level	-3.977251	
	5% level	-3.419191	
	10% level	-3.132165	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LKH)
Method: Least Squares
Date: 08/03/15 Time: 21:50
Sample (adjusted): 1/04/2013 1/30/2015
Included observations: 481 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LKH(-1)	-1.058518	0.045650	-23.18773	0.0000
C	0.091027	0.119156	0.763930	0.4453
@TREND(1/03/2013)	-0.000156	0.000428	-0.363756	0.7162

R-squared	0.529375	Mean dependent var	0.003142
Adjusted R-squared	0.527406	S.D. dependent var	1.896809
S.E. of regression	1.303970	Akaike info criterion	3.374922
Sum squared resid	812.7619	Schwarz criterion	3.400967
Log likelihood	-808.6687	Hannan-Quinn criter.	3.385159
F-statistic	268.8355	Durbin-Watson stat	1.997258
Prob(F-statistic)	0.000000		

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

7. MYX

Null Hypothesis: MYX has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=17)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-20.21068	0.0000
Test critical values:	1% level	-3.977251	
	5% level	-3.419191	
	10% level	-3.132165	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MYX)
Method: Least Squares
Date: 08/03/15 Time: 21:51
Sample (adjusted): 1/04/2013 1/30/2015
Included observations: 481 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MYX(-1)	-0.918325	0.045438	-20.21068	0.0000
C	0.044373	0.052573	0.844025	0.3991
@TREND(1/03/2013)	-0.000138	0.000189	-0.731350	0.4649

R-squared	0.460795	Mean dependent var	-0.002333
Adjusted R-squared	0.458539	S.D. dependent var	0.781278
S.E. of regression	0.574896	Akaike info criterion	1.736962
Sum squared resid	157.9816	Schwarz criterion	1.763007
Log likelihood	-414.7394	Hannan-Quinn criter.	1.747199
F-statistic	204.2450	Durbin-Watson stat	1.996615
Prob(F-statistic)	0.000000		

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

8. GAM

Null Hypothesis: GAM has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=17)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-25.02942	0.0000
Test critical values:	1% level	-3.977251	
	5% level	-3.419191	
	10% level	-3.132165	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GAM)
Method: Least Squares
Date: 08/03/15 Time: 21:51
Sample (adjusted): 1/04/2013 1/30/2015
Included observations: 481 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GAM(-1)	-1.133307	0.045279	-25.02942	0.0000
C	0.176636	0.128976	1.369532	0.1715
@TREND(1/03/2013)	-0.000377	0.000463	-0.813770	0.4162

R-squared	0.567218	Mean dependent var	-0.003016
Adjusted R-squared	0.565407	S.D. dependent var	2.138336
S.E. of regression	1.409670	Akaike info criterion	3.530805
Sum squared resid	949.8667	Schwarz criterion	3.556850
Log likelihood	-846.1587	Hannan-Quinn criter.	3.541042
F-statistic	313.2405	Durbin-Watson stat	2.007110
Prob(F-statistic)	0.000000		

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

9. IJM

Null Hypothesis: IJM has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=17)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-23.44550	0.0000
Test critical values:	1% level	-3.977251	
	5% level	-3.419191	
	10% level	-3.132165	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(IJM)
Method: Least Squares
Date: 08/03/15 Time: 21:51
Sample (adjusted): 1/04/2013 1/30/2015
Included observations: 481 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IJM(-1)	-1.069637	0.045622	-23.44550	0.0000
C	0.086281	0.098653	0.874593	0.3822
@TREND(1/03/2013)	-5.32E-05	0.000354	-0.150145	0.8807

R-squared	0.534887	Mean dependent var	-0.000235
Adjusted R-squared	0.532941	S.D. dependent var	1.579075
S.E. of regression	1.079167	Akaike info criterion	2.996473
Sum squared resid	556.6791	Schwarz criterion	3.022518
Log likelihood	-717.6517	Hannan-Quinn criter.	3.006710
F-statistic	274.8537	Durbin-Watson stat	2.014298
Prob(F-statistic)	0.000000		

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Phillips-Perron test (PP test)

1. SET

Null Hypothesis: SET has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-20.82904	0.0000
Test critical values:	1% level	-3.977251	
	5% level	-3.419191	
	10% level	-3.132165	

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

Residual variance (no correction)	1.247523
HAC corrected variance (Bartlett kernel)	1.251895

Phillips-Perron Test Equation
Dependent Variable: D(SET)
Method: Least Squares
Date: 08/03/15 Time: 21:53
Sample (adjusted): 1/04/2013 1/30/2015
Included observations: 481 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SET(-1)	-0.951605	0.045691	-20.82712	0.0000
C	0.007774	0.102334	0.075968	0.9395
@TREND(1/03/2013)	8.74E-05	0.000368	0.237417	0.8124

R-squared	0.475745	Mean dependent var	-0.000817
Adjusted R-squared	0.473551	S.D. dependent var	1.544204
S.E. of regression	1.120425	Akaike info criterion	3.071511
Sum squared resid	600.0587	Schwarz criterion	3.097556
Log likelihood	-735.6985	Hannan-Quinn criter.	3.081748
F-statistic	216.8847	Durbin-Watson stat	1.999698
Prob(F-statistic)	0.000000		

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

2. SCC

Null Hypothesis: SCC has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-21.91610	0.0000
Test critical values:	1% level	-3.977251	
	5% level	-3.419191	
	10% level	-3.132165	

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

Residual variance (no correction)	2.564541
HAC corrected variance (Bartlett kernel)	2.014692

Phillips-Perron Test Equation
Dependent Variable: D(SCC)
Method: Least Squares
Date: 08/03/15 Time: 21:54
Sample (adjusted): 1/04/2013 1/30/2015
Included observations: 481 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SCC(-1)	-0.998483	0.045841	-21.78145	0.0000
C	-0.038294	0.146730	-0.260981	0.7942
@TREND(1/03/2013)	0.000308	0.000528	0.582797	0.5603

R-squared	0.498132	Mean dependent var	0.006087
Adjusted R-squared	0.496032	S.D. dependent var	2.262882
S.E. of regression	1.606436	Akaike info criterion	3.792131
Sum squared resid	1233.544	Schwarz criterion	3.818176
Log likelihood	-909.0074	Hannan-Quinn criter.	3.802368
F-statistic	237.2206	Durbin-Watson stat	1.992661
Prob(F-statistic)	0.000000		

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

3. SCCC

Null Hypothesis: SCCC has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-21.10613	0.0000
Test critical values:	1% level	-3.977251	
	5% level	-3.419191	
	10% level	-3.132165	

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

Residual variance (no correction)	3.222525
HAC corrected variance (Bartlett kernel)	3.216226

Phillips-Perron Test Equation
Dependent Variable: D(SCCC)
Method: Least Squares
Date: 08/03/15 Time: 21:54
Sample (adjusted): 1/04/2013 1/30/2015
Included observations: 481 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SCCC(-1)	-0.964866	0.045713	-21.10692	0.0000
C	-0.026446	0.164476	-0.160789	0.8723
@TREND(1/03/2013)	0.000163	0.000591	0.275430	0.7831

R-squared	0.482405	Mean dependent var	0.000976
Adjusted R-squared	0.480239	S.D. dependent var	2.497785
S.E. of regression	1.800764	Akaike info criterion	4.020516
Sum squared resid	1550.034	Schwarz criterion	4.046561
Log likelihood	-963.9342	Hannan-Quinn criter.	4.030753
F-statistic	222.7511	Durbin-Watson stat	2.003805
Prob(F-statistic)	0.000000		

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

4. SGX

Null Hypothesis: SGX has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-20.61105	0.0000
Test critical values:	1% level	-3.977251	
	5% level	-3.419191	
	10% level	-3.132165	

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

Residual variance (no correction)	0.385994
HAC corrected variance (Bartlett kernel)	0.404788

Phillips-Perron Test Equation
Dependent Variable: D(SGX)
Method: Least Squares
Date: 08/03/15 Time: 21:54
Sample (adjusted): 1/04/2013 1/30/2015
Included observations: 481 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SGX(-1)	-0.939802	0.045680	-20.57362	0.0000
C	-0.014916	0.056926	-0.262031	0.7934
@TREND(1/03/2013)	0.000109	0.000205	0.534648	0.5931

R-squared	0.469640	Mean dependent var	-0.003191
Adjusted R-squared	0.467421	S.D. dependent var	0.853998
S.E. of regression	0.623231	Akaike info criterion	1.898418
Sum squared resid	185.6632	Schwarz criterion	1.924463
Log likelihood	-453.5695	Hannan-Quinn criter.	1.908655
F-statistic	211.6371	Durbin-Watson stat	2.000052
Prob(F-statistic)	0.000000		

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

5. CES

Null Hypothesis: CES has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 10 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-21.54942	0.0000
Test critical values:	1% level	-3.977251	
	5% level	-3.419191	
	10% level	-3.132165	

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

Residual variance (no correction)	2.469929
HAC corrected variance (Bartlett kernel)	3.356901

Phillips-Perron Test Equation
Dependent Variable: D(CES)
Method: Least Squares
Date: 08/03/15 Time: 21:55
Sample (adjusted): 1/04/2013 1/30/2015
Included observations: 481 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CES(-1)	-0.968538	0.045715	-21.18666	0.0000
C	0.104604	0.144081	0.726007	0.4682
@TREND(1/03/2013)	-8.42E-05	0.000518	-0.162680	0.8708

R-squared	0.484288	Mean dependent var	-0.002786
Adjusted R-squared	0.482131	S.D. dependent var	2.190739
S.E. of regression	1.576525	Akaike info criterion	3.754541
Sum squared resid	1188.036	Schwarz criterion	3.780585
Log likelihood	-899.9670	Hannan-Quinn criter.	3.764777
F-statistic	224.4373	Durbin-Watson stat	2.001416

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

6. LKH

Null Hypothesis: LKH has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-23.15904	0.0000
Test critical values:	1% level	-3.977251	
	5% level	-3.419191	
	10% level	-3.132165	

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

Residual variance (no correction)	1.689734
HAC corrected variance (Bartlett kernel)	1.795162

Phillips-Perron Test Equation
Dependent Variable: D(LKH)
Method: Least Squares
Date: 08/03/15 Time: 21:55
Sample (adjusted): 1/04/2013 1/30/2015
Included observations: 481 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LKH(-1)	-1.058518	0.045650	-23.18773	0.0000
C	0.091027	0.119156	0.763930	0.4453
@TREND(1/03/2013)	-0.000156	0.000428	-0.363756	0.7162

R-squared	0.529375	Mean dependent var	0.003142
Adjusted R-squared	0.527406	S.D. dependent var	1.896809
S.E. of regression	1.303970	Akaike info criterion	3.374922
Sum squared resid	812.7619	Schwarz criterion	3.400967
Log likelihood	-808.6687	Hannan-Quinn criter.	3.385159
F-statistic	268.8355	Durbin-Watson stat	1.997258
Prob(F-statistic)	0.000000		

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

7. MYX

Null Hypothesis: MYX has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-20.17845	0.0000
Test critical values:	1% level	-3.977251	
	5% level	-3.419191	
	10% level	-3.132165	

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

Residual variance (no correction)	0.328444
HAC corrected variance (Bartlett kernel)	0.312933

Phillips-Perron Test Equation
Dependent Variable: D(MYX)
Method: Least Squares
Date: 08/03/15 Time: 21:55
Sample (adjusted): 1/04/2013 1/30/2015
Included observations: 481 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MYX(-1)	-0.918325	0.045438	-20.21068	0.0000
C	0.044373	0.052573	0.844025	0.3991
@TREND(1/03/2013)	-0.000138	0.000189	-0.731350	0.4649

R-squared	0.460795	Mean dependent var	-0.002333
Adjusted R-squared	0.458539	S.D. dependent var	0.781278
S.E. of regression	0.574896	Akaike info criterion	1.736962
Sum squared resid	157.9816	Schwarz criterion	1.763007
Log likelihood	-414.7394	Hannan-Quinn criter.	1.747199
F-statistic	204.2450	Durbin-Watson stat	1.996615
Prob(F-statistic)	0.000000		

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

8. GAM

Null Hypothesis: GAM has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-25.05708	0.0000
Test critical values:	1% level	-3.977251	
	5% level	-3.419191	
	10% level	-3.132165	

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

Residual variance (no correction)	1.974775
HAC corrected variance (Bartlett kernel)	1.943091

Phillips-Perron Test Equation
Dependent Variable: D(GAM)
Method: Least Squares
Date: 08/03/15 Time: 21:56
Sample (adjusted): 1/04/2013 1/30/2015
Included observations: 481 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GAM(-1)	-1.133307	0.045279	-25.02942	0.0000
C	0.176636	0.128976	1.369532	0.1715
@TREND(1/03/2013)	-0.000377	0.000463	-0.813770	0.4162

R-squared	0.567218	Mean dependent var	-0.003016
Adjusted R-squared	0.565407	S.D. dependent var	2.138336
S.E. of regression	1.409670	Akaike info criterion	3.530805
Sum squared resid	949.8667	Schwarz criterion	3.556850
Log likelihood	-846.1587	Hannan-Quinn criter.	3.541042
F-statistic	313.2405	Durbin-Watson stat	2.007110
Prob(F-statistic)	0.000000		

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

9. IJM

Null Hypothesis: IJM has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 13 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-24.29335	0.0000
Test critical values:	1% level	-3.977251	
	5% level	-3.419191	
	10% level	-3.132165	

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

Residual variance (no correction)	1.157337
HAC corrected variance (Bartlett kernel)	0.761144

Phillips-Perron Test Equation
Dependent Variable: D(IJM)
Method: Least Squares
Date: 08/03/15 Time: 21:57
Sample (adjusted): 1/04/2013 1/30/2015
Included observations: 481 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IJM(-1)	-1.069637	0.045622	-23.44550	0.0000
C	0.086281	0.098653	0.874593	0.3822
@TREND(1/03/2013)	-5.32E-05	0.000354	-0.150145	0.8807

R-squared	0.534887	Mean dependent var	-0.000235
Adjusted R-squared	0.532941	S.D. dependent var	1.579075
S.E. of regression	1.079167	Akaike info criterion	2.996473
Sum squared resid	556.6791	Schwarz criterion	3.022518
Log likelihood	-717.6517	Hannan-Quinn criter.	3.006710
F-statistic	274.8537	Durbin-Watson stat	2.014298
Prob(F-statistic)	0.000000		

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

APPENDIX B

Bivariate Generalized Extreme Value Distribution (BGEV)

1. SET and SCC

```
> M1 <- fbvevd(ps, model="log")
Call: fbvevd(x = ps, model = "log")
Deviance: 3124.074
AIC: 3138.074
Dependence: 0.5829045
Estimates
   loc1     scale1   shape1    loc2   scale2   shape2      dep
-0.3885   1.2280  -0.2081  -0.5781   1.6898  -0.1722   0.5029
Standard Errors
   loc1     scale1    shape1    loc2      scale2   shape2     dep
0.05921  0.03672  0.01441  0.08196  0.05372  0.01988  0.02414
Optimization Information
Convergence: successful
Function Evaluations: 54
Gradient Evaluations: 14
```

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

> M2 <- fbvevd(ps, model="alog")

Call: fbvevd(x = ps, model = "alog")

Deviance: 3126.329

AIC: 3144.329

Dependence: 0.6066056

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	asy1	asy2	dep
-0.4672	1.2266	-0.2012	-0.6382	1.6844	-0.1754	0.9992	0.9272	0.4532

Standard Errors

loc1	scale1	shape1	loc2	scale2	shape2	asy1
6.040e-02	3.638e-02	1.430e-02	8.364e-02	5.331e-02	2.033e-02	2.002e-06

asy2	dep
4.612e-02	2.534e-02

Optimization Information

Convergence: successful

Function Evaluations: 112

Gradient Evaluations: 10

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

> M3 <- fbvevd(ps, model="hr")

Call: fbvevd(x = ps, model = "hr")

Deviance: 3144.868

AIC: 3158.868

Dependence: 0.5625122

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	dep
-0.3972	1.2399	-0.1881	-0.5781	1.6892	-0.1563	1.7268

Standard Errors

loc1	scale1	shape1	loc2	scale2	shape2	dep
0.06016	0.03675	0.01406	0.08236	0.05325	0.01915	0.10773

Optimization Information

Convergence: successful

Function Evaluations: 52

Gradient Evaluations: 14

> M4 <- fbvevd(ps, model="neglog")

Call: fbvevd(x = ps, model = "neglog")

Deviance: 3129.943

AIC: 3143.943

Dependence: 0.5816157

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	dep
-0.3901	1.2335	-0.2027	-0.5783	1.6912	-0.1680	1.2790

Standard Errors

loc1	scale1	shape1	loc2	scale2	shape2	dep
0.05967	0.03690	0.01468	0.08220	0.05378	0.01951	0.09637

Optimization Information

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Convergence: successful

Function Evaluations: 61

Gradient Evaluations: 14

> M5 <- fbvevd(ps, model="aneglog")

Call: fbvevd(x = ps, model = "aneglog")

Deviance: 3142.395

AIC: 3160.395

Dependence: 0.5191123

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	asy1	asy2	dep
-0.4046	1.1609	-0.2094	-0.5726	1.6498	-0.1543	0.9992	0.9713	1.0821

Standard Errors

loc1	scale1	shape1	loc2	scale2	shape2	asy1
5.766e-02	3.140e-02	1.097e-02	8.100e-02	5.080e-02	2.261e-02	2.002e-06

asy2	dep
7.989e-02	9.743e-02

Optimization Information

Convergence: successful

Function Evaluations: 111

Gradient Evaluations: 9

> M6 <- fbvevd(ps, model="bilog", std.err = FALSE)

Call: fbvevd(x = ps, model = "bilog", std.err = FALSE)

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Deviance: 3124.062

AIC: 3140.062

Dependence: 0.5829957

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	alpha	beta
-0.3894	1.2284	-0.2078	-0.5769	1.6898	-0.1726	0.4995	0.5062

Optimization Information

Convergence: successful

Function Evaluations: 65

Gradient Evaluations: 18

> M7 <- fbvevd(ps, model="negbilog", std.err = FALSE)

Call: fbvevd(x = ps, model = "negbilog", std.err = FALSE)

Deviance: 3129.855

AIC: 3145.855

Dependence: 0.5815582

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	alpha	beta
-0.3924	1.2344	-0.2016	-0.5749	1.6904	-0.1694	0.8140	0.7506

Optimization Information

Convergence: successful

Function Evaluations: 63

Gradient Evaluations: 18

> M8 <- fbvevd(ps, model="ct")

Call: fbvevd(x = ps, model = "ct")

Deviance: 3132.879

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

AIC: 3148.879

Dependence: 0.5667888

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	alpha	beta
-0.3961	1.2296	-0.1986	-0.5743	1.6778	-0.1703	1.3121	1.5655

Standard Errors

loc1	scale1	shape1	loc2	scale2	shape2	alpha	beta
0.05999	0.03711	0.01548	0.08227	0.05289	0.01966	0.28186	0.39457

Optimization Information

Convergence: successful

Function Evaluations: 54

Gradient Evaluations: 15

> M9 <- fbvevd(ps, model="amix", std.err = FALSE)

Call: fbvevd(x = ps, model = "amix", std.err = FALSE)

Deviance: 3145.593

AIC: 3161.593

Dependence: 0.4997292

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	alpha
-0.410560	1.203898	-0.202130	-0.602352	1.671586	-0.146613	0.998305

beta

0.000769

Optimization Information

Convergence: successful

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Function Evaluations: 162

Gradient Evaluations: 14

> **AIC(M1,M2,M3,M4,M5,M6,M7,M8,M9)**

	df	AIC
M1	**7**	**3138.074**
M2	9	3144.329
M3	7	3158.868
M4	7	3143.943
M5	9	3160.395
M6	8	3140.062
M7	8	3145.855
M8	8	3148.879
M9	8	3161.593

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

2. SET and SCCC

```
> M1 <- fbvevd(ps, model="log")
Call: fbvevd(x = ps, model = "log")
Deviance: 3328.007
AIC: 3342.007
Dependence: 0.5304006
Estimates
   loc1       scale1   shape1    loc2     scale2   shape2      dep
-0.3588   1.2566  -0.2224  -0.6644   1.9836  -0.1967   0.5554
Standard Errors
   loc1       scale1   shape1    loc2       scale2   shape2      dep
0.05975  0.03915  0.01412  0.09482  0.05926  0.01252  0.02768
Optimization Information
Convergence: successful
Function Evaluations: 62
Gradient Evaluations: 12

> M2 <- fbvevd(ps, model="alog")
Call: fbvevd(x = ps, model = "alog")
Deviance: 3308.788
AIC: 3326.788
Dependence: 0.5534496
Estimates
   loc1      scale1     shape1     loc2      scale2  shape2     asy1     asy2      dep
-0.3793   1.2786  -0.2143  -0.6147   1.9847  -0.2167   0.9280   0.7787   0.4271
```

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Standard Errors

loc1	scale1	shape1	loc2	scale2	shape2	asy1	asy2	dep
0.06188	0.04010	0.01479	0.09531	0.05995	0.01257	0.08822	0.06066	0.04823

Optimization Information

Convergence: successful

Function Evaluations: 72

Gradient Evaluations: 15

> M3 <- fbvevd(ps, model="hr")

Call: fbvevd(x = ps, model = "hr")

Deviance: 3360.408

AIC: 3374.408

Dependence: 0.4796908

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	dep
-0.3614	1.2462	-0.2151	-0.6451	2.0029	-0.1807	1.4148

Standard Errors

loc1	scale1	shape1	loc2	scale2	shape2	dep
0.05963	0.03822	0.01296	0.09593	0.05875	0.01225	0.09886

Optimization Information

Convergence: successful

Function Evaluations: 52

Gradient Evaluations: 13

> M4 <- fbvevd(ps, model="neglog")

Call: fbvevd(x = ps, model = "neglog")

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Deviance: 3338.367

AIC: 3352.367

Dependence: 0.5260349

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	dep
-0.3585	1.2585	-0.2197	-0.6568	1.9926	-0.1929	1.0790

Standard Errors

loc1	scale1	shape1	loc2	scale2	shape2	dep
0.06005	0.03923	0.01388	0.09545	0.05941	0.01262	0.09198

Optimization Information

Convergence: successful

Function Evaluations: 53

Gradient Evaluations: 14

> M5 <- fbvevd(ps, model="aneglog")

Call: fbvevd(x = ps, model = "aneglog")

Deviance: 3326.281

AIC: 3344.281

Dependence: 0.473551

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	asy1	asy2	dep
-0.4030	1.2314	-0.2178	-0.6439	1.9755	-0.1930	1.0000	0.8270	1.0702

Standard Errors

loc1	scale1	shape1	loc2	scale2	shape2	asy1

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

6.000e-02 3.717e-02 1.282e-02 9.419e-02 5.894e-02 1.401e-02 2.002e-06

asy2 dep

6.620e-02 1.056e-01

Optimization Information

Convergence: successful

Function Evaluations: 109

Gradient Evaluations: 9

> M6 <- fbvevd(ps, model="bilog", std.err = FALSE)

Call: fbvevd(x = ps, model = "bilog", std.err = FALSE)

Deviance: 3322.448

AIC: 3338.448

Dependence: 0.5324365

Estimates

loc1 scale1 shape1 loc2 scale2 shape2 alpha beta

-0.3811 1.2609 -0.2138 -0.6253 1.9808 -0.2039 0.4662 0.6204

Optimization Information

Convergence: successful

Function Evaluations: 130

Gradient Evaluations: 21

> M7 <- fbvevd(ps, model="negbilog", std.err = FALSE)

Call: fbvevd(x = ps, model = "negbilog", std.err = FALSE)

Deviance: 3330.851

AIC: 3346.851

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Dependence: 0.5266619

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	alpha	beta
-0.3809	1.2631	-0.2105	-0.6238	1.9852	-0.2017	1.3094	0.6130

Optimization Information

Convergence: successful

Function Evaluations: 63

Gradient Evaluations: 18

> M8 <- fbvevd(ps, model="ct")

Call: fbvevd(x = ps, model = "ct")

Deviance: 3331.38

AIC: 3347.38

Dependence: 0.5065632

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	alpha	beta
-0.3823	1.2527	-0.2107	-0.6258	1.9685	-0.2020	0.6827	1.9781

Standard Errors

loc1	scale1	shape1	loc2	scale2	shape2	alpha	beta
0.06048	0.03835	0.01378	0.09455	0.05805	0.01207	0.13280	0.63904

Optimization Information

Convergence: successful

Function Evaluations: 55

Gradient Evaluations: 16

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

> M9 <- fbvevd(ps, model="amix", std.err = FALSE)

Call: fbvevd(x = ps, model = "amix", std.err = FALSE)

Deviance: 3331.27

AIC: 3347.27

Dependence: 0.4565313

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	alpha	beta
-0.3268	1.1925	-0.2152	-0.6791	2.0080	-0.2131	1.1722	-0.1728

Optimization Information

Convergence: successful

Function Evaluations: 107

Gradient Evaluations: 8

> **AIC(M1,M2,M3,M4,M5,M6,M7,M8,M9)**

	df	AIC
M1	7	3342.007
M2	**9**	**3326.788**
M3	7	3374.408
M4	7	3352.367
M5	9	3344.281
M6	8	3338.448
M7	8	3346.851
M8	8	3347.380
M9	8	3347.270

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

3. SGX and CES

```
> M1 <- fbvevd(ps, model="log")
Call: fbvevd(x = ps, model = "log")
Deviance: 2733.576
AIC: 2747.576
Dependence: 0.3447182
Estimates
   loc1     scale1   shape1     loc2      scale2   shape2      dep
-0.1915   0.6780  -0.2672  -0.5240   1.6702  -0.1490   0.7271
Standard Errors
   loc1     scale1     shape1     loc2      scale2   shape2      dep
0.03249  0.02222  0.01943  0.07998  0.04931  0.01110  0.03588
Optimization Information
Convergence: successful
Function Evaluations: 62
Gradient Evaluations: 12

> M2 <- fbvevd(ps, model="alog")
Call: fbvevd(x = ps, model = "alog")
Deviance: 2724.01
AIC: 2742.01
Dependence: 0.3863348

Estimates
   loc1     scale1   shape1     loc2      scale2   shape2      asy1      asy2      dep
```

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

-0.1931 0.6918 -0.2638 -0.5081 1.6651 -0.1577 0.7738 0.7215 0.5681

Standard Errors

loc1 scale1 shape1 loc2 scale2 shape2 asy1 asy2 dep

0.03400 0.02367 0.02204 0.08004 0.04918 0.01032 0.14350 0.10442 0.07003

Optimization Information

Convergence: successful

Function Evaluations: 58

Gradient Evaluations: 15

> M3 <- fbvevd(ps, model="hr")

Call: fbvevd(x = ps, model = "hr")

Deviance: 2753.42

AIC: 2767.42

Dependence: 0.2629445

Estimates

loc1 scale1 shape1 loc2 scale2 shape2 dep

-0.1950 0.6658 -0.2656 -0.5313 1.6871 -0.1350 0.8933

Standard Errors

loc1 scale1 shape1 loc2 scale2 shape2 dep

0.03219 0.02121 0.01753 0.08129 0.04965 0.01171 0.08627

Optimization Information

Convergence: successful

Function Evaluations: 52

Gradient Evaluations: 13

> M4 <- fbvevd(ps, model="neglog")

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Call: fbvevd(x = ps, model = "neglog")

Deviance: 2741.762

AIC: 2755.762

Dependence: 0.3274395

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	dep
-0.1915	0.6747	-0.2645	-0.5255	1.6772	-0.1444	0.6208

Standard Errors

loc1	scale1	shape1	loc2	scale2	shape2	dep
0.03247	0.02198	0.01876	0.08061	0.04947	0.01148	0.07448

Optimization Information

Convergence: successful

Function Evaluations: 60

Gradient Evaluations: 12

> M5 <- fbvevd(ps, model="aneglog")

Call: fbvevd(x = ps, model = "aneglog")

Deviance: 2724.327

AIC: 2742.327

Dependence: 0.3862538

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	asy1	asy2	dep
-0.1930	0.6923	-0.2614	-0.5089	1.6646	-0.1575	0.7502	0.6975	1.1061

Standard Errors

loc1	scale1	shape1	loc2	scale2	shape2	asy1	asy2	dep
0.03394	0.02372	0.02156	0.08003	0.04911	0.01034	0.12435	0.10047	0.21962

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Optimization Information

Convergence: successful

Function Evaluations: 57

Gradient Evaluations: 15

> M6 <- fbvevd(ps, model="bilog", std.err = FALSE)

Call: fbvevd(x = ps, model = "bilog", std.err = FALSE)

Deviance: 2732.704

AIC: 2748.704

Dependence: 0.3453365

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	alpha	beta
-0.1986	0.6799	-0.2625	-0.5184	1.6605	-0.1509	0.6823	0.7622

Optimization Information

Convergence: successful

Function Evaluations: 77

Gradient Evaluations: 14

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

> M7 <- fbvevd(ps, model="negbilog", std.err = FALSE)

Call: fbvevd(x = ps, model = "negbilog", std.err = FALSE)

Deviance: 2739.246

AIC: 2755.246

Dependence: 0.3230713

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	alpha	beta
-0.1987	0.6770	-0.2577	-0.5143	1.6689	-0.1491	2.2439	1.1525

Optimization Information

Convergence: successful

Function Evaluations: 112

Gradient Evaluations: 25

> M8 <- fbvevd(ps, model="ct")

Call: fbvevd(x = ps, model = "ct")

Deviance: 2734.697

AIC: 2750.697

Dependence: 0.3251348

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	alpha	beta
-0.1983	0.6768	-0.2612	-0.5149	1.6629	-0.1512	0.3135	0.5709

Standard Errors

loc1	scale1	shape1	loc2	scale2	shape2	alpha	beta
0.03301	0.02195	0.01988	0.08006	0.04885	0.01085	0.09611	0.20119

Optimization Information

Convergence: successful

Function Evaluations: 68

Gradient Evaluations: 14

> M9 <- fbvevd(ps, model="amix", std.err = FALSE)

Call: fbvevd(x = ps, model = "amix", std.err = FALSE)

Deviance: 2724.547

AIC: 2740.547

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Dependence: 0.3773107

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	alpha	beta
-0.19416	0.68900	-0.26110	-0.50939	1.66190	-0.15738	0.87736	-0.08182

Optimization Information

Convergence: successful

Function Evaluations: 54

Gradient Evaluations: 13

> AIC(M1,M2,M3,M4,M5,M6,M7,M8,M9)

	df	AIC
M1	7	2747.576
M2	9	2742.010
M3	7	2767.420
M4	7	2755.762
M5	9	2742.327
M6	8	2748.704
M7	8	2755.246
M8	8	2750.697
M9	**8**	**2740.547**

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

4. SGX and LKH

```
> M1 <- fbvevd(ps, model="log")
Call: fbvevd(x = ps, model = "log")
Deviance: 2623.78
AIC: 2637.78
Dependence: 0.2101419
Estimates
   loc1     scale1   shape1    loc2     scale2   shape2     dep
-0.1926   0.6677  -0.2757  -0.4505   1.4949  -0.1977   0.8398
Standard Errors
    loc1       scale1       shape1       loc2       scale2      shape2       dep
0.032169  0.021653  0.017640  0.071629  0.041875  0.008278  0.039869
Optimization Information
Convergence: successful
Function Evaluations: 67
Gradient Evaluations: 12
```

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

```
> M2 <- fbvevd(ps, model="alog")
Call: fbvevd(x = ps, model = "alog")
Deviance: 2619.821
AIC: 2637.821
Dependence: 0.2369607
Estimates
   loc1     scale1   shape1    loc2      scale2   shape2     asy1     asy2     dep
-0.1896   0.6724  -0.2836  -0.4445   1.5005  -0.2009   0.4668   0.4762  0.5825
```

Standard Errors

loc1	scale1	shape1	loc2	scale2	shape2	asy1	asy2
0.033171	0.022339	0.018663	0.072216	0.042572	0.008186	0.202753	0.203265

dep
0.162406

Optimization Information

Convergence: successful

Function Evaluations: 64

Gradient Evaluations: 19

> M3 <- fbvevd(ps, model="hr")

Call: fbvevd(x = ps, model = "hr")

Deviance: 2634.986

AIC: 2648.986

Dependence: 0.1262884

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	dep
-0.1998	0.6608	-0.2728	-0.4596	1.4983	-0.1909	0.6541

Standard Errors

loc1	scale1	shape1	loc2	scale2	shape2	dep
0.032242	0.021044	0.016684	0.072263	0.041754	0.008813	0.094950

Optimization Information

Convergence: successful

Function Evaluations: 54

Gradient Evaluations: 14

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

```
> M4 <- fbvevd(ps, model="neglog")
Call: fbvevd(x = ps, model = "neglog")
Deviance: 2628.759
AIC: 2642.759
Dependence: 0.1896959
Estimates
   loc1     scale1   shape1     loc2      scale2   shape2      dep
-0.1943   0.6657  -0.2716  -0.4529   1.4952  -0.1951   0.4170
Standard Errors
    loc1       scale1       shape1       loc2       scale2    shape2       dep
0.032274  0.021443  0.017426  0.071894  0.041776  0.008498  0.069347
Optimization Information
Convergence: successful
Function Evaluations: 74
Gradient Evaluations: 13
> M5 <- fbvevd(ps, model="aneglog")
Call: fbvevd(x = ps, model = "aneglog")
Deviance: 2619.86
AIC: 2637.86
Dependence: 0.2358575
Estimates
   loc1     scale1    shape1     loc2      scale2   shape2     asy1      asy2      dep
-0.1894   0.6724  -0.2840  -0.4441   1.5001  -0.2008   0.4507   0.4559  1.0610
Standard Errors
   loc1     scale1     shape1     loc2      scale2     shape2     asy1       asy2       dep
0.03322  0.02234  0.01830  0.07220  0.04245  0.00818  0.16396  0.17701  0.42381
```

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Optimization Information

Convergence: successful

Function Evaluations: 72

Gradient Evaluations: 17

> M6 <- fbvevd(ps, model="bilog", std.err = FALSE)

Call: fbvevd(x = ps, model = "bilog", std.err = FALSE)

Deviance: 2623.538

AIC: 2639.538

Dependence: 0.1994152

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	alpha	beta
-0.1956	0.6663	-0.2736	-0.4389	1.4851	-0.1977	0.8221	0.8695

Optimization Information

Convergence: successful

Function Evaluations: 85

Gradient Evaluations: 18

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

> M7 <- fbvevd(ps, model="negbilog", std.err = FALSE)

Call: fbvevd(x = ps, model = "negbilog", std.err = FALSE)

Deviance: 2627.546

AIC: 2643.546

Dependence: 0.1904561

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	alpha	beta
-0.1991	0.6679	-0.2659	-0.4482	1.4913	-0.1963	3.4230	1.6453

Optimization Information

Convergence: successful

Function Evaluations: 103

Gradient Evaluations: 22

> M8 <- fbvevd(ps, model="ct")

Call: fbvevd(x = ps, model = "ct")

Deviance: 2623.94

AIC: 2639.94

Dependence: 0.2021206

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	alpha	beta
-0.1964	0.6674	-0.2725	-0.4476	1.4921	-0.1979	0.1615	0.2546

Standard Errors

loc1	scale1	shape1	loc2	scale2	shape2	alpha	beta
0.032680	0.021576	0.018528	0.071729	0.041721	0.008204	0.078446	0.129751

Optimization Information

Convergence: successful

Function Evaluations: 74

Gradient Evaluations: 17

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

> M9 <- fbvevd(ps, model="amix", std.err = FALSE)

Call: fbvevd(x = ps, model = "amix", std.err = FALSE)

Deviance: 2619.882

AIC: 2635.882

Dependence: 0.2354081

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	alpha
-0.189205	0.672042	-0.283603	-0.444247	1.499537	-0.200744	0.460327

beta
0.006993

Optimization Information

Convergence: successful

Function Evaluations: 79

Gradient Evaluations: 15

> AIC(M1,M2,M3,M4,M5,M6,M7,M8,M9)

	df	AIC
M1	7	2637.780
M2	9	2637.821
M3	7	2648.986
M4	7	2642.759
M5	9	2637.860
M6	8	2639.538
M7	8	2643.546
M8	8	2639.940
M9	**8**	**2635.882**

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

5. MYX and GAM

```
> M1 <- fbvevd(ps, model="log")
Call: fbvevd(x = ps, model = "log")
Deviance: 2462.389
AIC: 2476.389
Dependence: 0.5677262
Estimates
   loc1      scale1      shape1     loc2      scale2    shape2      dep
-0.21859   0.65927  -0.12234  -0.48926   1.51110  -0.07449   0.51831

Standard Errors
   loc1      scale1      shape1     loc2       scale2    shape2      dep
0.031188  0.017462  0.004061  0.071682  0.045638  0.005399  0.024081
Optimization Information
Convergence: successful
Function Evaluations: 115
Gradient Evaluations: 13

> M2 <- fbvevd(ps, model="alog")
Call: fbvevd(x = ps, model = "alog")
Deviance: 2460.315
AIC: 2478.315
Dependence: 0.5586237
Estimates
  loc1     scale1  shape1     loc2      scale2  shape2     asy1      asy2      dep
```

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

-0.2192 0.6596 -0.1226 -0.4945 1.5064 -0.0744 0.8914 0.8978 0.4600

Standard Errors

loc1 scale1 shape1 loc2 scale2 shape2 asy1 asy2

0.031324 0.015531 0.003414 0.072109 0.045653 0.005238 0.085651 0.072974

dep

0.045929

Optimization Information

Convergence: successful

Function Evaluations: 218

Gradient Evaluations: 21

> M3 <- fbvevd(ps, model="hr")

Call: fbvevd(x = ps, model = "hr")

Deviance: 2472.145

AIC: 2486.145

Dependence: 0.5470147

Estimates

loc1 scale1 shape1 loc2 scale2 shape2 dep

-0.21262 0.65465 -0.12180 -0.47873 1.51426 -0.07544 1.66047

Standard Errors

loc1 scale1 shape1 loc2 scale2 shape2 dep

0.031166 0.019772 0.004573 0.072300 0.045082 0.005355 0.097312

Optimization Information

Convergence: successful

Function Evaluations: 91

Gradient Evaluations: 18

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

```
> M4 <- fbvevd(ps, model="neglog")
Call: fbvevd(x = ps, model = "neglog")
Deviance: 2465.43
AIC: 2479.43
Dependence: 0.5624633
Estimates
   loc1     scale1   shape1     loc2     scale2   shape2     dep
-0.2166   0.6593  -0.1227  -0.4868   1.5106  -0.0751   1.2046
Standard Errors
    loc1        scale1    shape1        loc2        scale2       shape2       dep
0.031480  0.020207  0.004641  0.072290  0.045432  0.005254  0.089999
Optimization Information
Convergence: successful
Function Evaluations: 194
Gradient Evaluations: 22
> M5 <- fbvevd(ps, model="aneglog")
Call: fbvevd(x = ps, model = "aneglog")
Deviance: 2460.702
AIC: 2478.702
Dependence: 0.5567373
Estimates
    loc1       scale1      shape1      loc2        scale2      shape2      asy1      asy2
-0.22021   0.65769  -0.12156  -0.49873   1.50341  -0.07319   0.86569   0.87428
     dep
 1.55293
```

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Standard Errors

loc1	scale1	shape1	loc2	scale2	shape2	asy1	asy2
0.031557	0.018980	0.004416	0.072345	0.044925	0.005479	0.076104	0.064334

dep

0.205501

Optimization Information

Convergence: successful

Function Evaluations: 139

Gradient Evaluations: 19

> M6 <- fbvevd(ps, model="bilog", std.err = FALSE)

Call: fbvevd(x = ps, model = "bilog", std.err = FALSE)

Deviance: 2462.285

AIC: 2478.285

Dependence: 0.5658582

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	alpha	beta
-0.21567	0.65933	-0.12235	-0.48689	1.51147	-0.07506	0.52776	0.51242

Optimization Information

Convergence: successful

Function Evaluations: 100

Gradient Evaluations: 16

> M7 <- fbvevd(ps, model="negbilog", std.err = FALSE)

Call: fbvevd(x = ps, model = "negbilog", std.err = FALSE)

Deviance: 2465.382

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

AIC: 2481.382

Dependence: 0.5638588

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	alpha	beta
-0.21451	0.65888	-0.12231	-0.48394	1.51377	-0.07534	0.81351	0.83979

Optimization Information

Convergence: successful

Function Evaluations: 72

Gradient Evaluations: 16

> M8 <- fbvevd(ps, model="ct")

Call: fbvevd(x = ps, model = "ct")

Deviance: 2466.723

AIC: 2482.723

Dependence: 0.5541651

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	alpha	beta
-0.21568	0.65422	-0.12123	-0.48628	1.50877	-0.07433	1.32036	1.34506

Standard Errors

loc1	scale1	shape1	loc2	scale2	shape2	alpha	beta
0.031362	0.020026	0.004812	0.072357	0.045029	0.005498	0.330167	0.331527

Optimization Information

Convergence: successful

Function Evaluations: 123

Gradient Evaluations: 15

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

> M9 <- fbvevd(ps, model="amix", std.err = FALSE)

Call: fbvevd(x = ps, model = "amix", std.err = FALSE)

Deviance: 2473.364

AIC: 2489.364

Dependence: 0.4938947

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	alpha	beta
-0.22481	0.65869	-0.12257	-0.49924	1.50486	-0.07439	1.02190	-0.02274

Optimization Information

Convergence: successful

Function Evaluations: 140

Gradient Evaluations: 17

> **AIC(M1,M2,M3,M4,M5,M6,M7,M8,M9**)

	df	AIC
M1	**7**	**2476.389**
M2	9	2478.315
M3	7	2486.145
M4	7	2479.430
M5	9	2478.702
M6	8	2478.285
M7	8	2481.382
M8	8	2482.723
M9	8	2489.364

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

6. MYX and IJM

> M1 <- fbvevd(ps, model="log")

Call: fbvevd(x = ps, model = "log")

Deviance: 2298.806

AIC: 2312.806

Dependence: 0.484664

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	dep
-0.2190	0.6559	-0.1081	-0.3287	1.2038	-0.1749	0.5996

Standard Errors

loc1	scale1	shape1	loc2	scale2	shape2	dep
0.031122	0.019659	0.007555	0.057030	0.036624	0.007696	0.029709

Optimization Information

Convergence: successful

Function Evaluations: 89

Gradient Evaluations: 15

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

> M2 <- fbvevd(ps, model="alog")

Call: fbvevd(x = ps, model = "alog")

Deviance: 2278.072

AIC: 2296.072

Dependence: 0.5040883

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	asy1	asy2	dep
-0.2245	0.6610	-0.1125	-0.3306	1.2040	-0.1783	0.8127	0.7560	0.4396

Standard Errors

loc1	scale1	shape1	loc2	scale2	shape2	asy1	asy2
0.031989	0.020635	0.006907	0.058438	0.037823	0.006615	0.087979	0.076962

dep
0.049025

Optimization Information

Convergence: successful

Function Evaluations: 160

Gradient Evaluations: 18

> M3 <- fbvevd(ps, model="hr")

Call: fbvevd(x = ps, model = "hr")

Deviance: 2338.764

AIC: 2352.764

Dependence: 0.4175461

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	dep
-0.21916	0.65203	-0.09877	-0.32054	1.21494	-0.15403	1.23352

Standard Errors

loc1	scale1	shape1	loc2	scale2	shape2	dep
0.03111	0.01924	0.00756	0.05784	0.03604	0.01030	0.09558

Optimization Information

Convergence: successful

Function Evaluations: 59

Gradient Evaluations: 13

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

> M4 <- fbvevd(ps, model="neglog")

Call: fbvevd(x = ps, model = "neglog")

Deviance: 2309.088

AIC: 2323.088

Dependence: 0.4792406

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	dep
-0.2178	0.6561	-0.1065	-0.3225	1.2090	-0.1731	0.9423

Standard Errors

loc1	scale1	shape1	loc2	scale2	shape2	dep
0.031204	0.019676	0.007646	0.057394	0.036367	0.008717	0.084789

Optimization Information

Convergence: successful

Function Evaluations: 68

Gradient Evaluations: 12

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

> M5 <- fbvevd(ps, model="aneglog")

Call: fbvevd(x = ps, model = "aneglog")

Deviance: 2278.534

AIC: 2296.534

Dependence: 0.5038163

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	asy1	asy2	dep
-0.2247	0.6618	-0.1121	-0.3284	1.2053	-0.1781	0.7994	0.7359	1.6547

Standard Errors

loc1	scale1	shape1	loc2	scale2	shape2	asy1	asy2
0.031928	0.020402	0.007045	0.058180	0.038440	0.006836	0.082077	0.072780

dep
0.249946

Optimization Information

Convergence: successful

Function Evaluations: 99

Gradient Evaluations: 17

> M6 <- fbvevd(ps, model="bilog", std.err = FALSE)

Call: fbvevd(x = ps, model = "bilog", std.err = FALSE)

Deviance: 2292.877

AIC: 2308.877

Dependence: 0.4964737

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	alpha	beta
-0.2234	0.6539	-0.1134	-0.3155	1.2103	-0.1786	0.5271	0.6382

Optimization Information

Convergence: successful

Function Evaluations: 86

Gradient Evaluations: 15

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

> M7 <- fbvevd(ps, model="negbilog", std.err = FALSE)

Call: fbvevd(x = ps, model = "negbilog", std.err = FALSE)

Deviance: 2305.995

AIC: 2321.995

Dependence: 0.4600833

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	alpha	beta
-0.2322	0.6365	-0.1068	-0.3396	1.1599	-0.1685	1.4943	0.8105

Optimization Information

Convergence: successful

Function Evaluations: 124

Gradient Evaluations: 19

> M8 <- fbvevd(ps, model="ct")

Call: fbvevd(x = ps, model = "ct")

Deviance: 2301.93

AIC: 2317.93

Dependence: 0.4640201

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	alpha	beta
-0.2259	0.6501	-0.1084	-0.3105	1.2026	-0.1760	0.5771	1.4038

Standard Errors

loc1	scale1	shape1	loc2	scale2	shape2	alpha	beta
0.031166	0.019199	0.007161	0.057207	0.036041	0.007679	0.121047	0.440449

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Optimization Information

Convergence: successful

Function Evaluations: 86

Gradient Evaluations: 16

> M9 <- fbvevd(ps, model="amix", std.err = FALSE)

Call: fbvevd(x = ps, model = "amix", std.err = FALSE)

Deviance: 2288.729

AIC: 2304.729

Dependence: 0.4594296

Estimates

loc1	scale1	shape1	loc2	scale2	shape2	alpha	beta
-0.2250	0.6467	-0.1122	-0.3204	1.1899	-0.1775	1.1211	-0.1348

Optimization Information

Convergence: successful

Function Evaluations: 130

Gradient Evaluations: 16

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

> **AIC(M1,M2,M3,M4,M5,M6,M7,M8,M9)**

	df	AIC
M1	7	2312.806
M2	**9**	**2296.072**
M3	7	2352.764
M4	7	2323.088
M5	9	2296.534
M6	8	2308.877

M7 8 2321.995

M8 8 2317.930

M9 8 2304.729

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Bivariate Generalized Pareto Distribution (BGPD)

1. SET and SCC

```
> u <- apply(ps, 2, quantile, prob=0.80)
> u
   dat...1.      dat...2.
0.7373644 1.3032185
> M1 <- fbvpot(ps, u, model = "log")
Call: fbvpot(x = ps, threshold = u, model = "log")
Likelihood: censored
Deviance: 1197.941
AIC: 1207.941
Dependence: 0.3852608
Threshold: 0.7374 1.3032
Marginal Number Above: 97 97
Marginal Proportion Above: 0.2012 0.2012
Number Above: 48
Proportion Above: 0.0996
Estimates
 scale1     shape1     scale2   shape2      dep
0.69583  0.07808  0.82435  0.12437  0.69130
Standard Errors
 scale1     shape1    scale2     shape2      dep
0.10260  0.10872  0.12720  0.11563  0.04167
```

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Optimization Information

Convergence: successful

Function Evaluations: 32

Gradient Evaluations: 9

> M2 <- fbvbot(ps, u, model = "alog")

Call: fbvpot(x = ps, threshold = u, model = "alog")

Likelihood: censored

Deviance: 1198.639

AIC: 1212.639

Dependence: 0.3840694

Threshold: 0.7374 1.3032

Marginal Number Above: 97 97

Marginal Proportion Above: 0.2012 0.2012

Number Above: 48

Proportion Above: 0.0996

Estimates

scale1	shape1	scale2	shape2	asy1	asy2	dep
0.65158	0.08318	0.85903	0.14433	0.99907	0.81664	0.65327

Standard Errors

scale1	shape1	scale2	shape2	asy1	asy2	dep
9.030e-02	9.599e-02	1.452e-01	1.378e-01	2.001e-06	2.491e-01	6.970e-02

Optimization Information

Convergence: successful

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Function Evaluations: 95

Gradient Evaluations: 7

> M3 <- fbvpot(ps, u, model = "hr")

Call: fbvpot(x = ps, threshold = u, model = "hr")

Likelihood: censored

Deviance: 1197.201

AIC: 1207.201

Dependence: 0.3799806

Threshold: 0.7374 1.3032

Marginal Number Above: 97 97

Marginal Proportion Above: 0.2012 0.2012

Number Above: 48

Proportion Above: 0.0996

Estimates

scale1 shape1 scale2 shape2 dep

0.70290 0.05977 0.82180 0.13833 1.13904

Standard Errors

scale1 shape1 scale2 shape2 dep

0.1028 0.1028 0.1295 0.1194 0.1104

Optimization Information

Convergence: successful

Function Evaluations: 32

Gradient Evaluations: 9

> M4 <- fbvpot(ps, u, model = "neglog")

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Call: fbvpot(x = ps, threshold = u, model = "neglog")

Likelihood: censored

Deviance: 1197.407

AIC: 1207.407

Dependence: 0.3822585

Threshold: 0.7374 1.3032

Marginal Number Above: 97 97

Marginal Proportion Above: 0.2012 0.2012

Number Above: 48

Proportion Above: 0.0996

Estimates

scale1	shape1	scale2	shape2	dep
0.69968	0.06935	0.82239	0.12826	0.72078

Standard Errors

scale1	shape1	scale2	shape2	dep
0.10270	0.10517	0.12804	0.11727	0.09135

Optimization Information

Convergence: successful

Function Evaluations: 32

Gradient Evaluations: 10

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

> M5 <- fbvpot(ps, u, model = "aneglog")

Call: fbvpot(x = ps, threshold = u, model = "aneglog")

Likelihood: censored

Deviance: 1198.09

AIC: 1212.09

Dependence: 0.379784

Threshold: 0.7374 1.3032

Marginal Number Above: 97 97

Marginal Proportion Above: 0.2012 0.2012

Number Above: 48

Proportion Above: 0.0996

Estimates

scale1 shape1 scale2 shape2 asy1 asy2 dep

0.72150 0.10451 0.83111 0.09319 0.99980 0.79233 0.81920

Standard Errors

scale1 shape1 scale2 shape2 asy1 asy2 dep

1.194e-01 1.331e-01 1.206e-01 1.013e-01 2.001e-06 2.010e-01 1.565e-01

Optimization Information

Convergence: successful

Function Evaluations: 100

Gradient Evaluations: 9

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

> M6 <- fbvpot(ps, u, model = "bilog")

Call: fbvpot(x = ps, threshold = u, model = "bilog")

Likelihood: censored

Deviance: 1197.039

AIC: 1209.039

Dependence: 0.3847242

Threshold: 0.7374 1.3032

Marginal Number Above: 97 97

Marginal Proportion Above: 0.2012 0.2012

Number Above: 48

Proportion Above: 0.0996

Estimates

scale1	shape1	scale2	shape2	alpha	beta
0.68340	0.09614	0.83925	0.11406	0.59988	0.75529

Standard Errors

scale1	shape1	scale2	shape2	alpha	beta
0.10150	0.10908	0.13114	0.11969	0.12290	0.07163

Optimization Information

Convergence: successful

Function Evaluations: 39

Gradient Evaluations: 12

> M7 <- fbvpot(ps, u, model = "negbilog")

Call: fbvpot(x = ps, threshold = u, model = "negbilog")

Likelihood: censored

Deviance: 1195.977

AIC: 1207.977

Dependence: 0.3811717

Threshold: 0.7374 1.3032

Marginal Number Above: 97 97

Marginal Proportion Above: 0.2012 0.2012

Number Above: 48

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Proportion Above: 0.0996

Estimates

scale1 shape1 scale2 shape2 alpha beta

0.69022 0.08351 0.83957 0.10994 2.18666 0.82420

Standard Errors

scale1 shape1 scale2 shape2 alpha beta

0.1010 0.1025 0.1313 0.1191 0.8991 0.4061

Optimization Information

Convergence: successful

Function Evaluations: 39

Gradient Evaluations: 13

> M8 <- fbvpot(ps, u, model = "ct")

Call: fbvpot(x = ps, threshold = u, model = "ct")

Likelihood: censored

Deviance: 1196.216

AIC: 1208.216

Dependence: 0.3859128

Threshold: 0.7374 1.3032

Marginal Number Above: 97 97

Marginal Proportion Above: 0.2012 0.2012

Number Above: 48

Proportion Above: 0.0996

Estimates

scale1 shape1 scale2 shape2 alpha beta

0.68967 0.08801 0.84332 0.11086 0.35220 1.15997

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Standard Errors

scale1 shape1 scale2 shape2 alpha beta

0.1015 0.1034 0.1319 0.1195 0.1517 0.9992

Optimization Information

Convergence: successful

Function Evaluations: 33

Gradient Evaluations: 14

> M9 <- fbvpot(ps, u, model = "amix")

Call: fbvpot(x = ps, threshold = u, model = "amix")

Likelihood: censored

Deviance: 1198.582

AIC: 1210.582

Dependence: 0.4059728

Threshold: 0.7374 1.3032

Marginal Number Above: 97 97

Marginal Proportion Above: 0.2012 0.2012

Number Above: 48

Proportion Above: 0.0996

Estimates

scale1 shape1 scale2 shape2 alpha beta

0.6924 0.1071 0.8509 0.1326 1.1826 -0.2471

Standard Errors

scale1 shape1 scale2 shape2 alpha beta

0.1043 0.1072 0.1336 0.1204 0.3438 0.2167

Optimization Information

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Convergence: successful

Function Evaluations: 34

Gradient Evaluations: 10

> **AIC(M1,M2,M3,M4,M5,M6,M7,M8,M9)**

	df	AIC
M1	5	1207.941
M2	7	1212.639
M3	**5**	**1207.201**
M4	5	1207.407
M5	7	1212.090
M6	6	1209.039
M7	6	1207.977
M8	6	1208.216
M9	6	1210.582

2. SET and SCCC

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

> u <- apply(ps, 2, quantile, prob=0.80)

> u

dat...1.	dat...2.
0.7373644	1.1461318

> M1 <- fbvpot(ps, u, model = "log")

Call: fbvpot(x = ps, threshold = u, model = "log")

Likelihood: censored

Deviance: 1275.42

AIC: 1285.42

Dependence: 0.3389737

Threshold: 0.7374 1.1461

Marginal Number Above: 97 96

Marginal Proportion Above: 0.2012 0.1992

Number Above: 44

Proportion Above: 0.0913

Estimates

scale1 shape1 scale2 shape2 dep

0.73311 0.01303 1.27056 0.01919 0.73207

Standard Errors

scale1 shape1 scale2 shape2 dep

0.10370 0.09378 0.17986 0.09447 0.04208

Optimization Information

Convergence: successful

Function Evaluations: 32

Gradient Evaluations: 8

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

> M2 <- fbvbot(ps, u, model = "alog")

Call: fbvpot(x = ps, threshold = u, model = "alog")

Likelihood: censored

Deviance: 1272.688

AIC: 1286.688

Dependence: 0.3676677

Threshold: 0.7374 1.1461

Marginal Number Above: 97 96

Marginal Proportion Above: 0.2012 0.1992

Number Above: 44

Proportion Above: 0.0913

Estimates

scale1	shape1	scale2	shape2	asy1	asy2	dep
0.69874	0.03336	1.30317	0.03633	0.99932	0.62589	0.60546

Standard Errors

scale1	shape1	scale2	shape2	asy1	asy2	dep
9.417e-02	8.620e-02	1.913e-01	1.077e-01	2.001e-06	2.166e-01	9.322e-02

Optimization Information

Convergence: successful

Function Evaluations: 118

Gradient Evaluations: 12

> M3 <- fbvpot(ps, u, model = "hr")

Call: fbvpot(x = ps, threshold = u, model = "hr")

Likelihood: censored

Deviance: 1276.742

AIC: 1286.742

Dependence: 0.331669

Threshold: 0.7374 1.1461

Marginal Number Above: 97 96

Marginal Proportion Above: 0.2012 0.1992

Number Above: 44

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Proportion Above: 0.0913

Estimates

scale1 shape1 scale2 shape2 dep

0.7341972 0.0002291 1.2658341 0.0498020 1.0301233

Standard Errors

scale1 shape1 scale2 shape2 dep

0.10472 0.09392 0.18219 0.09837 0.10201

Optimization Information

Convergence: successful

Function Evaluations: 30

Gradient Evaluations: 9

> M4 <- fbvpot(ps, u, model = "neglog")

Call: fbvpot(x = ps, threshold = u, model = "neglog")

Likelihood: censored

Deviance: 1275.98

AIC: 1285.98

Dependence: 0.3369413

Threshold: 0.7374 1.1461

Marginal Number Above: 97 96

Marginal Proportion Above: 0.2012 0.1992

Number Above: 44

Proportion Above: 0.0913

Estimates

scale1 shape1 scale2 shape2 dep

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

0.735006 0.004565 1.273819 0.029899 0.637174

Standard Errors

 scale1   shape1   scale2   shape2   dep

0.10446 0.09374 0.18198 0.09657 0.08408

Optimization Information

Convergence: successful

Function Evaluations: 39

Gradient Evaluations: 9

> M5 <- fbvpot(ps, u, model = "aneglog")

Call: fbvpot(x = ps, threshold = u, model = "aneglog")

Likelihood: censored

Deviance: 1272.331

AIC: 1286.331

Dependence: 0.3445953

Threshold: 0.7374 1.1461

Marginal Number Above: 97 96

Marginal Proportion Above: 0.2012 0.1992

Number Above: 44

Proportion Above: 0.0913

Estimates

   scale1   shape1   scale2   shape2   asy1   asy2   dep

 0.711747   0.010698   1.351697 -0.007906   0.999381   0.522859   1.006042

Standard Errors

   scale1   shape1   scale2   shape2   asy1   asy2   dep

9.667e-02 8.283e-02 1.926e-01 9.149e-02 2.001e-06 1.399e-01 2.335e-01

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Optimization Information

Convergence: successful

Function Evaluations: 114

Gradient Evaluations: 12

> M6 <- fbvpot(ps, u, model = "bilog")

Call: fbvpot(x = ps, threshold = u, model = "bilog")

Likelihood: censored

Deviance: 1272.294

AIC: 1284.294

Dependence: 0.3377809

Threshold: 0.7374 1.1461

Marginal Number Above: 97 96

Marginal Proportion Above: 0.2012 0.1992

Number Above: 44

Proportion Above: 0.0913

Estimates

scale1	shape1	scale2	shape2	alpha	beta
0.72104	0.01274	1.30898	0.01141	0.57453	0.81746

Standard Errors

scale1	shape1	scale2	shape2	alpha	beta
0.10131	0.08683	0.18901	0.09917	0.11442	0.05125

Optimization Information

Convergence: successful

Function Evaluations: 45

Gradient Evaluations: 11

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

> M7 <- fbvpot(ps, u, model = "negbilog")

Call: fbvpot(x = ps, threshold = u, model = "negbilog")

Likelihood: censored

Deviance: 1272.633

AIC: 1284.633

Dependence: 0.3339905

Threshold: 0.7374 1.1461

Marginal Number Above: 97 96

Marginal Proportion Above: 0.2012 0.1992

Number Above: 44

Proportion Above: 0.0913

Estimates

scale1	shape1	scale2	shape2	alpha	beta
0.729109	0.005315	1.301587	0.020274	2.964330	0.745530

Standard Errors

scale1	shape1	scale2	shape2	alpha	beta
0.10310	0.08938	0.18925	0.10061	1.11108	0.32452

Optimization Information

Convergence: successful

Function Evaluations: 44

Gradient Evaluations: 13

> M8 <- fbvpot(ps, u, model = "ct")

Call: fbvpot(x = ps, threshold = u, model = "ct")

Likelihood: censored

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Deviance: 1272.287

AIC: 1284.287

Dependence: 0.3351793

Threshold: 0.7374 1.1461

Marginal Number Above: 97 96

Marginal Proportion Above: 0.2012 0.1992

Number Above: 44

Proportion Above: 0.0913

Estimates

scale1	shape1	scale2	shape2	alpha	beta
0.725659	0.007718	1.304650	0.016240	0.240009	1.234463

Standard Errors

scale1	shape1	scale2	shape2	alpha	beta
0.10256	0.08839	0.18883	0.10017	0.09184	0.99601

Optimization Information

Convergence: successful

Function Evaluations: 36

Gradient Evaluations: 14

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

> M9 <- fbvpot(ps, u, model = "amix")

Call: fbvpot(x = ps, threshold = u, model = "amix")

Likelihood: censored

Deviance: 1273.003

AIC: 1285.003

Dependence: 0.353352

Threshold: 0.7374 1.1461

Marginal Number Above: 97 96

Marginal Proportion Above: 0.2012 0.1992

Number Above: 44

Proportion Above: 0.0913

Estimates

scale1	shape1	scale2	shape2	alpha	beta
0.72162	0.03086	1.31343	0.03537	1.32588	-0.41278

Standard Errors

scale1	shape1	scale2	shape2	alpha	beta
0.10289	0.08996	0.18984	0.10135	0.36302	0.22416

Optimization Information

Convergence: successful

Function Evaluations: 44

Gradient Evaluations: 10

> **AIC(M1,M2,M3,M4,M5,M6,M7,M8,M9)**

	df	AIC
M1	5	1285.420
M2	7	1286.688
M3	5	1286.742
M4	5	1285.980
M5	7	1286.331
M6	6	1284.294
M7	6	1284.633
M8	**6**	**1284.287**

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

M9 6 1285.003

3. MYX and GAM

```
> u <- apply(ps, 2, quantile, prob=0.80)
> u
 dat...1.       dat...2.
0.3718665 0.8244029

> M1 <- fbvpot(ps, u, model = "log")
Call: fbvpot(x = ps, threshold = u, model = "log")
Likelihood: censored
Deviance: 1105.073
AIC: 1115.073
Dependence: 0.2803905
Threshold: 0.3719 0.8244
Marginal Number Above: 97 97
Marginal Proportion Above: 0.2012 0.2012
Number Above: 40
Proportion Above: 0.083
Estimates
 scale1      shape1     scale2   shape2      dep
0.34840  0.06059  0.85178  0.12527  0.78208
```

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Standard Errors

scale1 shape1 scale2 shape2 dep

0.04397 0.06576 0.11549 0.07930 0.04132

Optimization Information

Convergence: successful

Function Evaluations: 37

Gradient Evaluations: 10

> M2 <- fbvpot(ps, u, model = "alog")

Call: fbvpot(x = ps, threshold = u, model = "alog")

Likelihood: censored

Deviance: 1105.188

AIC: 1119.188

Dependence: 0.2679959

Threshold: 0.3719 0.8244

Marginal Number Above: 97 97

Marginal Proportion Above: 0.2012 0.2012

Number Above: 40

Proportion Above: 0.083

Estimates

scale1 shape1 scale2 shape2 asy1 asy2 dep

0.35390 0.05108 0.85633 0.11625 0.99949 0.95204 0.78677

Standard Errors

scale1 shape1 scale2 shape2 asy1 asy2 dep

4.497e-02 6.287e-02 1.148e-01 7.552e-02 2.001e-06 4.516e-01 6.456e-02

Optimization Information

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Convergence: successful

Function Evaluations: 97

Gradient Evaluations: 10

> M3 <- fbvpot(ps, u, model = "hr")

Call: fbvpot(x = ps, threshold = u, model = "hr")

Likelihood: censored

Deviance: 1103.964

AIC: 1113.964

Dependence: 0.2866924

Threshold: 0.3719 0.8244

Marginal Number Above: 97 97

Marginal Proportion Above: 0.2012 0.2012

Number Above: 40

Proportion Above: 0.083

Estimates

scale1	shape1	scale2	shape2	dep
0.35045	0.05705	0.84746	0.12484	0.93861

Standard Errors

scale1	shape1	scale2	shape2	dep
0.04419	0.06727	0.11515	0.08179	0.09393

Optimization Information

Convergence: successful

Function Evaluations: 36

Gradient Evaluations: 10

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

> M4 <- fbvpot(ps, u, model = "neglog")

Call: fbvpot(x = ps, threshold = u, model = "neglog")

Likelihood: censored

Deviance: 1104.238

AIC: 1114.238

Dependence: 0.2836298

Threshold: 0.3719 0.8244

Marginal Number Above: 97 97

Marginal Proportion Above: 0.2012 0.2012

Number Above: 40

Proportion Above: 0.083

Estimates

scale1	shape1	scale2	shape2	dep
0.34992	0.05796	0.84706	0.12476	0.55008

Standard Errors

scale1	shape1	scale2	shape2	dep
0.04410	0.06659	0.11486	0.08047	0.07443

Optimization Information

Convergence: successful

Function Evaluations: 43

Gradient Evaluations: 10

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

> M5 <- fbvpot(ps, u, model = "aneglog")

Call: fbvpot(x = ps, threshold = u, model = "aneglog")

Likelihood: censored

Deviance: 1104.292

AIC: 1118.292

Dependence: 0.2723778

Threshold: 0.3719 0.8244

Marginal Number Above: 97 97

Marginal Proportion Above: 0.2012 0.2012

Number Above: 40

Proportion Above: 0.083

Estimates

scale1	shape1	scale2	shape2	asy1	asy2	dep
0.34607	0.05556	0.84140	0.11774	0.99926	0.77381	0.59389

Standard Errors

scale1	shape1	scale2	shape2	asy1	asy2	dep
4.376e-02	6.683e-02	1.109e-01	7.376e-02	2.001e-06	3.439e-01	1.299e-01

Optimization Information

Convergence: successful

Function Evaluations: 108

Gradient Evaluations: 13

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

> M6 <- fbvpot(ps, u, model = "bilog")

Call: fbvpot(x = ps, threshold = u, model = "bilog")

Likelihood: censored

Deviance: 1105.059

AIC: 1117.059

Dependence: 0.2804207

Threshold: 0.3719 0.8244

Marginal Number Above: 97 97

Marginal Proportion Above: 0.2012 0.2012

Number Above: 40

Proportion Above: 0.083

Estimates

scale1	shape1	scale2	shape2	alpha	beta
0.34852	0.05991	0.85086	0.12792	0.76677	0.79590

Standard Errors

scale1	shape1	scale2	shape2	alpha	beta
0.04405	0.06574	0.11614	0.08339	0.14018	0.11821

Optimization Information

Convergence: successful

Function Evaluations: 45

Gradient Evaluations: 11

> M7 <- fbvpot(ps, u, model = "negbilog")

Call: fbvpot(x = ps, threshold = u, model = "negbilog")

Likelihood: censored

Deviance: 1104.113

AIC: 1116.113

Dependence: 0.2827853

Threshold: 0.3719 0.8244

Marginal Number Above: 97 97

Marginal Proportion Above: 0.2012 0.2012

Number Above: 40

Proportion Above: 0.083

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Estimates

scale1 shape1 scale2 shape2 alpha beta

0.35047 0.05532 0.84467 0.13058 2.30656 1.42240

Standard Errors

scale1 shape1 scale2 shape2 alpha beta

0.04415 0.06598 0.11549 0.08421 1.58734 1.02907

Optimization Information

Convergence: successful

Function Evaluations: 44

Gradient Evaluations: 12

> M8 <- fbvpot(ps, u, model = "ct")

Call: fbvpot(x = ps, threshold = u, model = "ct")

Likelihood: censored

Deviance: 1104.68

AIC: 1116.68

Dependence: 0.2835916

Threshold: 0.3719 0.8244

Marginal Number Above: 97 97

Marginal Proportion Above: 0.2012 0.2012

Number Above: 40

Proportion Above: 0.083

Estimates

scale1 shape1 scale2 shape2 alpha beta

0.34992 0.05817 0.84955 0.13009 0.27271 0.40324

Standard Errors

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

scale1 shape1 scale2 shape2 alpha beta

0.04425 0.06577 0.11600 0.08385 0.20459 0.37200

Optimization Information

Convergence: successful

Function Evaluations: 39

Gradient Evaluations: 13

> M9 <- fbvpot(ps, u, model = "amix")

Call: fbvpot(x = ps, threshold = u, model = "amix")

Likelihood: censored

Deviance: 1107.393

AIC: 1119.393

Dependence: 0.281045

Threshold: 0.3719 0.8244

Marginal Number Above: 97 97

Marginal Proportion Above: 0.2012 0.2012

Number Above: 40

Proportion Above: 0.083

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Estimates

scale1 shape1 scale2 shape2 alpha beta

0.35204 0.06781 0.86526 0.13392 0.58864 -0.01770

Standard Errors

scale1 shape1 scale2 shape2 alpha beta

0.04511 0.06876 0.11822 0.08407 0.34624 0.21115

Optimization Information

Convergence: successful

Function Evaluations: 36

Gradient Evaluations: 11

> **AIC(M1,M2,M3,M4,M5,M6,M7,M8,M9)**

	df	AIC
M1	5	1115.073
M2	7	1119.188
M3	**5**	**1113.964**
M4	5	1114.238
M5	7	1118.292
M6	6	1117.059
M7	6	1116.113
M8	6	1116.680
M9	6	1119.393

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

4. MYX and IJM

> u <- apply(ps, 2, quantile, prob=0.80)

> u

dat...1.	dat...2.
0.3718665	0.7015086

> M1 <- fbvpot(ps, u, model = "log")

Call: fbvpot(x = ps, threshold = u, model = "log")

Likelihood: censored

Deviance: 1061.06

AIC: 1071.06

Dependence: 0.3462662

Threshold: 0.3719 0.7015

Marginal Number Above: 97 97

Marginal Proportion Above: 0.2012 0.2012

Number Above: 48

Proportion Above: 0.0996

Estimates

scale1 shape1 scale2 shape2 dep

0.3271 0.2049 0.7175 0.1642 0.7257

Standard Errors

scale1 shape1 scale2 shape2 dep

0.04627 0.10229 0.11785 0.13523 0.04201

Optimization Information

Convergence: successful

Function Evaluations: 40

Gradient Evaluations: 9

> M2 <- fbvpot(ps, u, model = "alog")

Call: fbvpot(x = ps, threshold = u, model = "alog")

Likelihood: censored

Deviance: 1060.793

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

AIC: 1074.793

Dependence: 0.343503

Threshold: 0.3719 0.7015

Marginal Number Above: 97 97

Marginal Proportion Above: 0.2012 0.2012

Number Above: 48

Proportion Above: 0.0996

Estimates

scale1 shape1 scale2 shape2 asy1 asy2 dep

0.3302 0.2163 0.7459 0.1560 0.9998 0.8350 0.6984

Standard Errors

scale1 shape1 scale2 shape2 asy1 asy2 dep

4.795e-02 1.061e-01 1.307e-01 1.506e-01 2.001e-06 2.205e-01 6.076e-02

Optimization Information

Convergence: successful

Function Evaluations: 105

Gradient Evaluations: 11

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

> M3 <- fbvpot(ps, u, model = "hr")

Call: fbvpot(x = ps, threshold = u, model = "hr")

Likelihood: censored

Deviance: 1060.736

AIC: 1070.736

Dependence: 0.3436709

Threshold: 0.3719 0.7015

Marginal Number Above: 97 97

Marginal Proportion Above: 0.2012 0.2012

Number Above: 48

Proportion Above: 0.0996

Estimates

scale1 shape1 scale2 shape2 dep

0.3294 0.1872 0.6836 0.2312 1.0560

Standard Errors

scale1 shape1 scale2 shape2 dep

0.04549 0.09432 0.11130 0.13122 0.10405

Optimization Information

Convergence: successful

Function Evaluations: 33

Gradient Evaluations: 9

> M4 <- fbvpot(ps, u, model = "neglog")

Call: fbvpot(x = ps, threshold = u, model = "neglog")

Likelihood: censored

Deviance: 1060.489

AIC: 1070.489

Dependence: 0.3451597

Threshold: 0.3719 0.7015

Marginal Number Above: 97 97

Marginal Proportion Above: 0.2012 0.2012

Number Above: 48

Proportion Above: 0.0996

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Estimates

scale1 shape1 scale2 shape2 dep

0.3290 0.1930 0.7004 0.1935 0.6516

Standard Errors

scale1 shape1 scale2 shape2 dep

0.04582 0.09739 0.11466 0.13289 0.08485

Optimization Information

Convergence: successful

Function Evaluations: 33

Gradient Evaluations: 9

> M5 <- fbvpot(ps, u, model = "aneglog")

Call: fbvpot(x = ps, threshold = u, model = "aneglog")

Likelihood: censored

Deviance: 1059.618

AIC: 1073.618

Dependence: 0.3589926

Threshold: 0.3719 0.7015

Marginal Number Above: 97 97

Marginal Proportion Above: 0.2012 0.2012

Number Above: 48

Proportion Above: 0.0996

Estimates

scale1 shape1 scale2 shape2 asy1 asy2 dep

0.3371 0.1978 0.7286 0.1300 0.9996 0.8090 0.7583

Standard Errors

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

scale1 shape1 scale2 shape2 asy1 asy2 dep

4.838e-02 1.017e-01 1.167e-01 1.227e-01 2.001e-06 1.802e-01 1.353e-01

Optimization Information

Convergence: successful

Function Evaluations: 109

Gradient Evaluations: 11

> M6 <- fbvpot(ps, u, model = "bilog")

Call: fbvpot(x = ps, threshold = u, model = "bilog")

Likelihood: censored

Deviance: 1060.454

AIC: 1072.454

Dependence: 0.3464068

Threshold: 0.3719 0.7015

Marginal Number Above: 97 97

Marginal Proportion Above: 0.2012 0.2012

Number Above: 48

Proportion Above: 0.0996

Estimates

scale1 shape1 scale2 shape2 alpha beta

0.3274 0.2070 0.7355 0.1406 0.6426 0.7828

Standard Errors

scale1 shape1 scale2 shape2 alpha beta

0.04643 0.09701 0.11983 0.12819 0.13207 0.07467

Optimization Information

Convergence: successful

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Function Evaluations: 36

Gradient Evaluations: 10

> M7 <- fbvpot(ps, u, model = "negbilog")

Call: fbvpot(x = ps, threshold = u, model = "negbilog")

Likelihood: censored

Deviance: 1059.456

AIC: 1071.456

Dependence: 0.3443315

Threshold: 0.3719 0.7015

Marginal Number Above: 97 97

Marginal Proportion Above: 0.2012 0.2012

Number Above: 48

Proportion Above: 0.0996

Estimates

scale1 shape1 scale2 shape2 alpha beta

0.3298 0.1936 0.7243 0.1567 2.4148 0.9210

Standard Errors

scale1 shape1 scale2 shape2 alpha beta

0.04596 0.09289 0.11801 0.12794 1.13984 0.51065

Optimization Information

Convergence: successful

Function Evaluations: 35

Gradient Evaluations: 12

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

> M8 <- fbvpot(ps, u, model = "ct")

Call: fbvpot(x = ps, threshold = u, model = "ct")

Likelihood: censored

Deviance: 1059.799

AIC: 1071.799

Dependence: 0.3487113

Threshold: 0.3719 0.7015

Marginal Number Above: 97 97

Marginal Proportion Above: 0.2012 0.2012

Number Above: 48

Proportion Above: 0.0996

Estimates

scale1 shape1 scale2 shape2 alpha beta

0.3296 0.1994 0.7331 0.1474 0.3034 0.8599

Standard Errors

scale1 shape1 scale2 shape2 alpha beta

0.04649 0.09506 0.11926 0.12839 0.14694 0.75067

Optimization Information

Convergence: successful

Function Evaluations: 51

Gradient Evaluations: 16

> M9 <- fbvpot(ps, u, model = "amix")

Call: fbvpot(x = ps, threshold = u, model = "amix")

Likelihood: censored

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Deviance: 1062.077

AIC: 1074.077

Dependence: 0.3686297

Threshold: 0.3719 0.7015

Marginal Number Above: 97 97

Marginal Proportion Above: 0.2012 0.2012

Number Above: 48

Proportion Above: 0.0996

Estimates

scale1 shape1 scale2 shape2 alpha beta

0.3326 0.2270 0.7645 0.1317 0.8927 -0.1036

Standard Errors

scale1 shape1 scale2 shape2 alpha beta

0.0481 0.1019 0.1272 0.1352 0.3307 0.2002

Optimization Information

Convergence: successful

Function Evaluations: 45

Gradient Evaluations: 11

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

> **AIC(M1,M2,M3,M4,M5,M6,M7,M8,M9)**

	df	AIC
M1	5	1071.060
M2	7	1074.793
M3	5	1070.736
M4	**5**	**1070.489**
M5	7	1073.618

M6 6 1072.454

M7 6 1071.456

M8 6 1071.799

M9 6 1074.077

5. SGX and CES

> u <- apply(ps, 2, quantile, prob=0.80)

> u

 dat...1. dat...2.

0.4531370 0.8424908

> M1 <- fbvpot(ps, u, model = "log")

Call: fbvpot(x = ps, threshold = u, model = "log")

Likelihood: censored

Deviance: 1218.49

AIC: 1228.49

Dependence: 0.09720549

Threshold: 0.4531 0.8425

Marginal Number Above: 97 97

Marginal Proportion Above: 0.2012 0.2012

Number Above: 25

Proportion Above: 0.0519

Estimates

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

scale1 shape1 scale2 shape2 dep

0.4357 -0.1410 1.3185 0.0231 0.9281

Standard Errors

scale1 shape1 scale2 shape2 dep

0.06267 0.10228 0.18144 0.09182 0.03369

Optimization Information

Convergence: successful

Function Evaluations: 44

Gradient Evaluations: 13

> M2 <- fbvbot(ps, u, model = "alog")

Call: fbvpot(x = ps, threshold = u, model = "alog")

Likelihood: censored

Deviance: 1214.242

AIC: 1228.242

Dependence: 0.08407373

Threshold: 0.4531 0.8425

Marginal Number Above: 97 97

Marginal Proportion Above: 0.2012 0.2012

Number Above: 25

Proportion Above: 0.0519

Estimates

scale1 shape1 scale2 shape2 asy1 asy2 dep

0.38200 -0.03419 1.37025 0.07457 0.99956 0.14659 0.76820

Standard Errors

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

scale1 shape1 scale2 shape2 asy1 asy2 dep

5.749e-02 1.288e-01 2.072e-01 1.263e-01 2.001e-06 1.103e-01 1.500e-01

Optimization Information

Convergence: successful

Function Evaluations: 111

Gradient Evaluations: 11

> M3 <- fbvpot(ps, u, model = "hr")

Call: fbvpot(x = ps, threshold = u, model = "hr")

Likelihood: censored

Deviance: 1217.163

AIC: 1227.163

Dependence: 0.09809516

Threshold: 0.4531 0.8425

Marginal Number Above: 97 97

Marginal Proportion Above: 0.2012 0.2012

Number Above: 25

Proportion Above: 0.0519

Estimates

scale1 shape1 scale2 shape2 dep

0.43889 -0.17173 1.31713 0.04229 0.60454

Standard Errors

scale1 shape1 scale2 shape2 dep

0.06165 0.09446 0.18178 0.09329 0.07658

Optimization Information

Convergence: successful

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Function Evaluations: 33

Gradient Evaluations: 12

> M4 <- fbvpot(ps, u, model = "neglog")

Call: fbvpot(x = ps, threshold = u, model = "neglog")

Likelihood: censored

Deviance: 1217.354

AIC: 1227.354

Dependence: 0.09752029

Threshold: 0.4531 0.8425

Marginal Number Above: 97 97

Marginal Proportion Above: 0.2012 0.2012

Number Above: 25

Proportion Above: 0.0519

Estimates

scale1	shape1	scale2	shape2	dep
0.43785	-0.16416	1.31794	0.03544	0.29778

Standard Errors

scale1	shape1	scale2	shape2	dep
0.06181	0.09607	0.18158	0.09295	0.05632

Optimization Information

Convergence: successful

Function Evaluations: 34

Gradient Evaluations: 12

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

> M5 <- fbvpot(ps, u, model = "aneglog")

Call: fbvpot(x = ps, threshold = u, model = "aneglog")

Likelihood: censored

Deviance: 1210.883

AIC: 1224.883

Dependence: 0.08201267

Threshold: 0.4531 0.8425

Marginal Number Above: 97 97

Marginal Proportion Above: 0.2012 0.2012

Number Above: 25

Proportion Above: 0.0519

Estimates

scale1	shape1	scale2	shape2	asy1	asy2	dep
0.44028	-0.16749	1.31633	0.01856	0.99920	0.10930	0.68764

Standard Errors

scale1	shape1	scale2	shape2	asy1	asy2	dep
6.176e-02	8.997e-02	1.806e-01	9.225e-02	2.001e-06	8.433e-02	3.316e-01

Optimization Information

Convergence: successful

Function Evaluations: 143

Gradient Evaluations: 19

> M6 <- fbvpot(ps, u, model = "bilog")

Call: fbvpot(x = ps, threshold = u, model = "bilog")

Likelihood: censored

Deviance: 1209.404

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

AIC: 1221.404

Dependence: 0.09253411

Threshold: 0.4531 0.8425

Marginal Number Above: 97 97

Marginal Proportion Above: 0.2012 0.2012

Number Above: 25

Proportion Above: 0.0519

Estimates

scale1	shape1	scale2	shape2	alpha	beta
0.42742	-0.14110	1.34222	0.01911	0.27921	0.97901

Standard Errors

scale1	shape1	scale2	shape2	alpha	beta
0.06378	0.12012	0.18608	0.09463	0.55584	0.01515

Optimization Information

Convergence: successful

Function Evaluations: 68

Gradient Evaluations: 21

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

> M7 <- fbvpot(ps, u, model = "negbilog")

Call: fbvpot(x = ps, threshold = u, model = "negbilog")

Likelihood: censored

Deviance: 1209.742

AIC: 1221.742

Dependence: 0.1088363

Threshold: 0.4531 0.8425

Marginal Number Above: 97 97

Marginal Proportion Above: 0.2012 0.2012

Number Above: 25

Proportion Above: 0.0519

Estimates

scale1	shape1	scale2	shape2	alpha	beta
0.43054	-0.15080	1.32665	0.01995	19.99912	0.35649

Standard Errors

scale1	shape1	scale2	shape2	alpha	beta
5.778e-02	8.674e-02	1.819e-01	9.232e-02	2.001e-06	2.056e-01

Optimization Information

Convergence: successful

Function Evaluations: 154

Gradient Evaluations: 36

> M8 <- fbvpot(ps, u, model = "ct")

Call: fbvpot(x = ps, threshold = u, model = "ct")

Likelihood: censored

Deviance: 1209.309

AIC: 1221.309

Dependence: 0.09547104

Threshold: 0.4531 0.8425

Marginal Number Above: 97 97

Marginal Proportion Above: 0.2012 0.2012

Number Above: 25

Proportion Above: 0.0519

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Estimates

scale1	shape1	scale2	shape2	alpha	beta
0.43228	-0.15825	1.33590	0.01810	0.02424	22.33887

Standard Errors

scale1	shape1	scale2	shape2	alpha	beta
0.05900	0.08186	0.18390	0.09331	0.01403	104.49547

Optimization Information

Convergence: successful

Function Evaluations: 122

Gradient Evaluations: 42

> M9 <- fbvpot(ps, u, model = "amix")

Call: fbvpot(x = ps, threshold = u, model = "amix")

Likelihood: censored

Deviance: 1226.466

AIC: 1238.466

Dependence: 0.1507804

Threshold: 0.4531 0.8425

Marginal Number Above: 97 97

Marginal Proportion Above: 0.2012 0.2012

Number Above: 25

Proportion Above: 0.0519

Estimates

scale1	shape1	scale2	shape2	alpha	beta
0.55500	-0.08907	1.34695	0.01374	0.60221	-0.20044

Standard Errors

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

scale1 shape1 scale2 shape2 alpha beta

1.200e-01 2.356e-01 1.835e-01 9.361e-02 2.001e-06 2.001e-06

Optimization Information

Convergence: successful

Function Evaluations: 92

Gradient Evaluations: 6

> AIC(M1,M2,M3,M4,M5,M6,M7,M8,M9)

df AIC

M1 5 1228.490

M2 7 1228.242

M3 5 1227.163

M4 5 1227.354

M5 7 1224.883

M6 6 1221.404

M7 6 1221.742

M8 6 1221.309

M9 6 1238.466

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

6. SGX and LKH

> u <- apply(ps, 2, quantile, prob=0.80)

> u

dat...1. dat...2.

0.4531370 0.7462687

> M1 <- fbvpot(ps, u, model = "log")

Call: fbvpot(x = ps, threshold = u, model = "log")

Likelihood: censored

Deviance: 1147.065

AIC: 1157.065

Dependence: 0.05825879

Threshold: 0.4531 0.7463

Marginal Number Above: 97 95

Marginal Proportion Above: 0.2012 0.1971

Number Above: 23

Proportion Above: 0.0477

Estimates

scale1	shape1	scale2	shape2	dep
0.4295	-0.1354	0.8420	0.1415	0.9574

Standard Errors

scale1	shape1	scale2	shape2	dep
0.06176	0.10369	0.15248	0.14994	0.03219

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Optimization Information

Convergence: successful

Function Evaluations: 35

Gradient Evaluations: 12

> M2 <- fbvpot(ps, u, model = "alog")

Error in bvpost.optim(x = x, opt = opt, nm = nm, fixed.param = fixed.param, :

observed information matrix for alog is singular; use std.err = FALSE

> M3 <- fbvpot(ps, u, model = "hr")

Call: fbvpot(x = ps, threshold = u, model = "hr")

Likelihood: censored

Deviance: 1146.222

AIC: 1156.222

Dependence: 0.06358461

Threshold: 0.4531 0.7463

Marginal Number Above: 97 95

Marginal Proportion Above: 0.2012 0.1971

Number Above: 23

Proportion Above: 0.0477

Estimates

scale1	shape1	scale2	shape2	dep
0.4328	-0.1512	0.8340	0.1576	0.5391

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Standard Errors

scale1	shape1	scale2	shape2	dep
0.06175	0.09982	0.15144	0.15083	0.08387

Optimization Information

Convergence: successful

Function Evaluations: 63

Gradient Evaluations: 20

> M4 <- fbvpot(ps, u, model = "neglog")

Call: fbvpot(x = ps, threshold = u, model = "neglog")

Likelihood: censored

Deviance: 1146.376

AIC: 1156.376

Dependence: 0.06193378

Threshold: 0.4531 0.7463

Marginal Number Above: 97 95

Marginal Proportion Above: 0.2012 0.1971

Number Above: 23

Proportion Above: 0.0477

Estimates

scale1	shape1	scale2	shape2	dep
0.4319	-0.1469	0.8357	0.1533	0.2492

Standard Errors

scale1	shape1	scale2	shape2	dep
0.06171	0.10046	0.15170	0.15075	0.05978

Optimization Information

Convergence: successful

Function Evaluations: 36

Gradient Evaluations: 11

> M5 <- fbvpot(ps, u, model = "aneglog")

Call: fbvpot(x = ps, threshold = u, model = "aneglog")

Likelihood: censored

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Deviance: 1144.128

AIC: 1158.128

Dependence: 0.05470173

Threshold: 0.4531 0.7463

Marginal Number Above: 97 95

Marginal Proportion Above: 0.2012 0.1971

Number Above: 23

Proportion Above: 0.0477

Estimates

scale1	shape1	scale2	shape2	asy1	asy2	dep
0.44153	-0.14822	0.85575	0.14468	0.99938	0.09175	0.50568

Standard Errors

scale1	shape1	scale2	shape2	asy1	asy2	dep
6.463e-02	1.030e-01	1.600e-01	1.595e-01	2.001e-06	1.190e-01	2.982e-01

Optimization Information

Convergence: successful

Function Evaluations: 106

Gradient Evaluations: 15

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

> M6 <- fbvpot(ps, u, model = "bilog")

Call: fbvpot(x = ps, threshold = u, model = "bilog")

Likelihood: censored

Deviance: 1141.715

AIC: 1153.715

Dependence: 0.04687531

Threshold: 0.4531 0.7463

Marginal Number Above: 97 95

Marginal Proportion Above: 0.2012 0.1971

Number Above: 23

Proportion Above: 0.0477

Estimates

scale1	shape1	scale2	shape2	alpha	beta
0.4413	-0.1719	0.8757	0.1185	0.1009	0.9916

Standard Errors

scale1	shape1	scale2	shape2	alpha	beta
6.285e-02	9.467e-02	1.569e-01	1.481e-01	2.001e-06	6.546e-03

Optimization Information

Convergence: successful

Function Evaluations: 132

Gradient Evaluations: 22

> M7 fbvpot(ps, u, model = "negbilog")

Call: fbvpot(x = ps, threshold = u, model = "negbilog")

Likelihood: censored

Deviance: 1143.127

AIC: 1155.127

Dependence: 0.07542458

Threshold: 0.4531 0.7463

Marginal Number Above: 97 95

Marginal Proportion Above: 0.2012 0.1971

Number Above: 23

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Proportion Above: 0.0477

Estimates

scale1	shape1	scale2	shape2	alpha	beta
0.4360	-0.1477	0.8433	0.1430	19.9991	0.6321

Standard Errors

scale1	shape1	scale2	shape2	alpha	beta
6.168e-02	9.434e-02	1.533e-01	1.516e-01	2.001e-06	3.600e-01

Optimization Information

Convergence: successful

Function Evaluations: 185

Gradient Evaluations: 44

> M8 <- fbvpot(ps, u, model = "ct")

Call: fbvpot(x = ps, threshold = u, model = "ct")

Likelihood: censored

Deviance: 1142.333

AIC: 1154.333

Dependence: 0.05525808

Threshold: 0.4531 0.7463

Marginal Number Above: 97 95

Marginal Proportion Above: 0.2012 0.1971

Number Above: 23

Proportion Above: 0.0477

Estimates

scale1	shape1	scale2	shape2	alpha	beta
0.43182	-0.15001	0.84654	0.13417	0.01172	18.23607

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Standard Errors

scale1	shape1	scale2	shape2	alpha	beta
0.060950	0.093291	0.152405	0.149113	0.009466	89.287306

Optimization Information

Convergence: successful

Function Evaluations: 132

Gradient Evaluations: 44

> M9 <- fbvpot(ps, u, model = "amix")

Call: fbvpot(x = ps, threshold = u, model = "amix")

Likelihood: censored

Deviance: 1147.966

AIC: 1159.966

Dependence: 0.04248493

Threshold: 0.4531 0.7463

Marginal Number Above: 97 95

Marginal Proportion Above: 0.2012 0.1971

Number Above: 23

Proportion Above: 0.0477

Estimates

scale1	shape1	scale2	shape2	alpha	beta
0.42660	-0.12638	0.84781	0.13661	0.16870	-0.05582

Standard Errors

scale1	shape1	scale2	shape2	alpha	beta
6.170e-02	1.079e-01	1.536e-01	1.502e-01	2.001e-06	2.001e-06

Optimization Information

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

Convergence: successful

Function Evaluations: 152

Gradient Evaluations: 29

> **AIC(M1,M3,M4,M5,M6,M7,M8,M9)**

	df	AIC
M1	5	1157.065
M3	5	1156.222
M4	5	1156.376
M5	7	1158.128
M6	**6**	**1153.715**
M7	6	1155.127
M8	6	1154.333
M9	6	1159.966

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

CURRICULUM VITAE

Author's Name	Mr. Yuttana Panchusri
Date/Year of Birth	11th January 1989
Place of Birth	Nakornsawan Province, Thailand
Education	2012 Graduated Bachelor Degree from Industrial Engineering, Chiang Mai University, Chiang Mai, Thailand
Experience	Present Manager of Sukina Japanese Restaurant.

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved