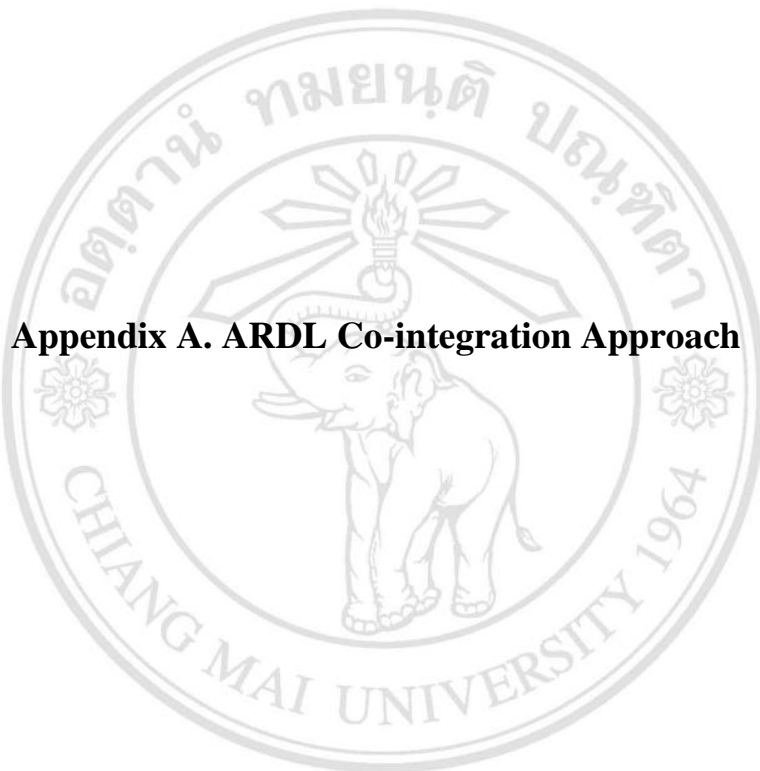


APPENDICES

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
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Appendix A. ARDL Co-integration Approach

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
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ARDL Dynamic Result Estimates

Dependent Variable: RGDP

Method: ARDL

Date: 06/17/16 Time: 18:51

Sample (adjusted): 1987 2015

Included observations: 29 after adjustments

Maximum dependent lags: 3 (Automatic selection)

Model selection method: Akaike info criterion (AIC)

Dynamic regressors (3 lags, automatic): LNNTA LNTR LNUER

Fixed regressors: BREAK08 BREAK89 C

Number of models evaluated: 192

Selected Model: ARDL(1, 2, 2, 2)

Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
RGDP(-1)	-0.269460	0.154139	-1.748158	0.0996
LNNTA	2.409176	1.146822	2.100741	0.0519
LNNTA(-1)	-3.506505	1.128585	-3.106991	0.0068
LNNTA(-2)	2.688328	0.897893	2.994040	0.0086
LNTR	4.550222	0.975035	4.666726	0.0003
LNTR(-1)	-0.934220	1.421671	-0.657128	0.5204
LNTR(-2)	-3.279877	1.273196	-2.576098	0.0203
LNUER	0.270951	2.029076	0.133534	0.8954
LNUER(-1)	-0.578883	2.585098	-0.223931	0.8256
LNUER(-2)	3.190319	1.947757	1.637945	0.1209
BREAK08	-11.37606	1.622203	-7.012724	0.0000
BREAK89	5.855829	2.048664	2.858365	0.0114
C	-32.49022	7.584482	-4.283775	0.0006
R-squared	0.964948	Mean dependent var		7.052345
Adjusted R-squared	0.938659	S.D. dependent var		5.620346
S.E. of regression	1.391999	Akaike info criterion		3.801204
Sum squared resid	31.00259	Schwarz criterion		4.414129
Log likelihood	-42.11745	Hannan-Quinn criter.		3.993164
F-statistic	36.70529	Durbin-Watson stat		2.598485
Prob(F-statistic)	0.000000			

Bound Testing

ARDL Bounds Test

Date: 06/17/16 Time: 18:52

Sample: 1987 2015

Included observations: 29

Null Hypothesis: No long-run relationships exist

Test Statistic	Value	K
F-statistic	24.10744	3

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.72	3.77
5%	3.23	4.35
2.5%	3.69	4.89
1%	4.29	5.61

Test Equation:

Dependent Variable: D(RGDP)

Method: Least Squares

Date: 06/17/16 Time: 18:52

Sample: 1987 2015

Included observations: 29

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNTA)	2.409176	1.146822	2.100741	0.0519
D(LNTA(-1))	-2.688328	0.897893	-2.994040	0.0086
D(LNTR)	4.550222	0.975035	4.666726	0.0003
D(LNTR(-1))	3.279877	1.273196	2.576098	0.0203
D(LNUER)	0.270951	2.029076	0.133534	0.8954
D(LNUER(-1))	-3.190319	1.947757	-1.637945	0.1209
BREAK08	-11.37606	1.622203	-7.012724	0.0000
BREAK89	5.855829	2.048664	2.858365	0.0114
C	-32.49022	7.584482	-4.283775	0.0006
LNTA(-1)	1.590999	0.748799	2.124733	0.0495
LNTR(-1)	0.336125	0.900891	0.373103	0.7140
LNUER(-1)	2.882387	1.129051	2.552928	0.0213
RGDP(-1)	-1.269460	0.154139	-8.235802	0.0000

R-squared	0.943339	Mean dependent var	0.331000
Adjusted R-squared	0.900844	S.D. dependent var	4.420583
S.E. of regression	1.391999	Akaike info criterion	3.801204
Sum squared resid	31.00259	Schwarz criterion	4.414129
Log likelihood	-42.11745	Hannan-Quinn criter.	3.993164
F-statistic	22.19861	Durbin-Watson stat	2.598485
Prob(F-statistic)	0.000000		



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ARDL Short Run and Long Run Coefficient Estimation Using ECM

ARDL Cointegrating And Long Run Form

Dependent Variable: RGDP

Selected Model: ARDL(1, 2, 2, 2)

Date: 06/17/16 Time: 18:52

Sample: 1985 2015

Included observations: 29

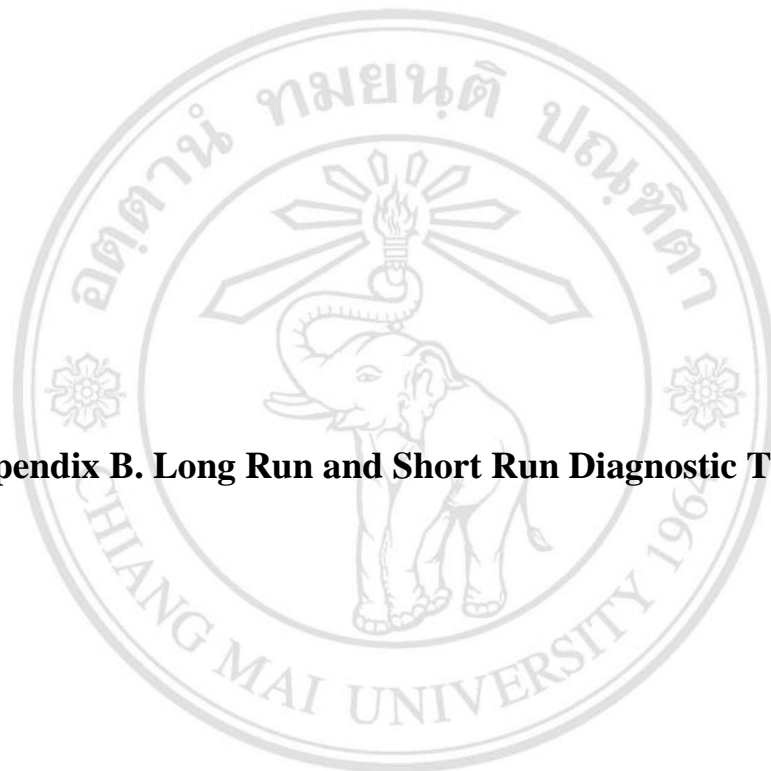
Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNTA)	2.450688	0.690806	3.547578	0.0027
D(LNTA(-1))	-2.718809	0.771333	-3.524816	0.0028
D(LNTR)	4.812239	0.896798	5.366023	0.0001
D(LNTR(-1))	3.611569	1.086544	3.323903	0.0043
D(LNUER)	0.500955	1.406879	0.356076	0.7264
D(LNUER(-1))	-3.215176	1.506143	-2.134708	0.0486
D(BREAK08)	-10.368128	1.385180	-7.485039	0.0000
D(BREAK89)	5.413322	2.252961	2.402758	0.0288
C	-34.996750	3.623604	-9.657996	0.0000
CointEq(-1)	-1.362829	0.140983	-9.666625	0.0000

$$\text{Cointeq} = \text{RGDP} - (1.2533*\text{LNTA} + 0.2648*\text{LNTR} + 2.2706*\text{LNUER} - 8.9613 * \text{BREAK08} + 4.6129*\text{BREAK89})$$

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNTA	1.253288	0.583510	2.147842	0.0474
LNTR	0.264778	0.716960	0.369307	0.7167
LNUER	2.270562	0.711128	3.192902	0.0057
BREAK08	-8.961343	0.972539	-9.214383	0.0000
BREAK89	4.612852	1.832872	2.516735	0.0229



Appendix B. Long Run and Short Run Diagnostic Tests

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Breusch-Godfrey Serial Correlation LM Test for Long Run Estimation Model

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.244095	Prob. F(2,14)	0.1428
Obs*R-squared	7.040036	Prob. Chi-Square(2)	0.0296

Test Equation:

Dependent Variable: RESID

Method: ARDL

Date: 06/17/16 Time: 18:54

Sample: 1987 2015

Included observations: 29

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RGDP(-1)	0.000643	0.145004	0.004435	0.9965
LNTA	-0.112653	1.093892	-0.102983	0.9194
LNTA(-1)	-0.186894	1.091269	-0.171263	0.8665
LNTA(-2)	-0.103797	0.844075	-0.122971	0.9039
LNTR	0.507931	0.978953	0.518851	0.6120
LNTR(-1)	0.072066	1.493852	0.048242	0.9622
LNTR(-2)	0.009324	1.233046	0.007561	0.9941
LNUER	0.541312	1.914286	0.282775	0.7815
LNUER(-1)	-0.946334	2.464790	-0.383941	0.7068
LNUER(-2)	0.464115	1.826334	0.254124	0.8031
BREAK08	-1.370684	1.662313	-0.824564	0.4234
BREAK89	-0.579481	1.982948	-0.292232	0.7744
C	3.114190	7.207187	0.432095	0.6723
RESID(-1)	-0.593708	0.300665	-1.974648	0.0684
RESID(-2)	-0.440096	0.303824	-1.448519	0.1695

R-squared	0.242760	Mean dependent var	2.54E-15
Adjusted R-squared	-0.514480	S.D. dependent var	1.052253
S.E. of regression	1.294946	Akaike info criterion	3.661060
Sum squared resid	23.47641	Schwarz criterion	4.368282
Log likelihood	-38.08537	Hannan-Quinn criter.	3.882553
F-statistic	0.320585	Durbin-Watson stat	2.177944
Prob(F-statistic)	0.979275		

Heteroskedasticity Breusch-Godfrey Test for Long Run Estimation Model

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.746934	Prob. F(12,16)	0.6915
Obs*R-squared	10.41264	Prob. Chi-Square(12)	0.5798
Scaled explained SS	4.433931	Prob. Chi-Square(12)	0.9743

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 06/17/16 Time: 18:54

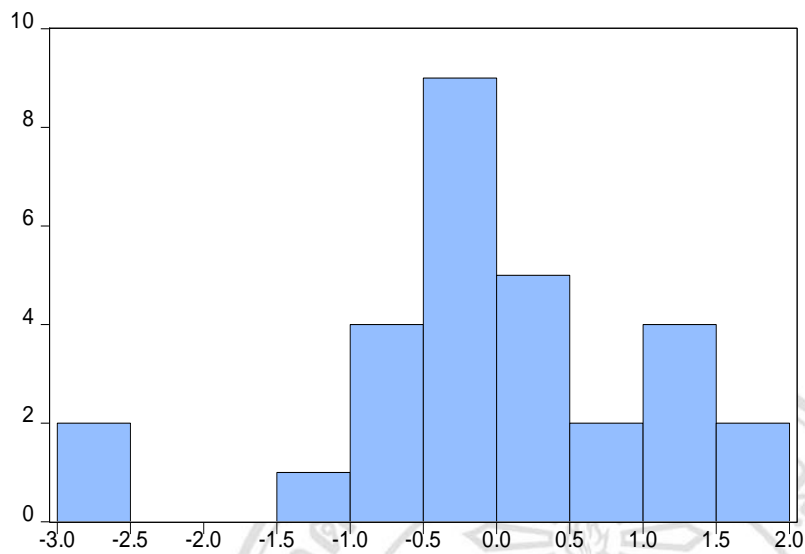
Sample: 1987 2015

Included observations: 29

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-19.92851	10.50129	-1.897720	0.0759
RGDP(-1)	-0.290150	0.213417	-1.359541	0.1928
LNTA	1.218848	1.587863	0.767603	0.4539
LNTA(-1)	0.276154	1.562613	0.176726	0.8619
LNTA(-2)	0.077564	1.243202	0.062391	0.9510
LNTR	-1.017023	1.350010	-0.753344	0.4622
LNTR(-1)	1.721516	1.968412	0.874571	0.3947
LNTR(-2)	-2.283567	1.762837	-1.295394	0.2136
LNUER	-1.081564	2.809411	-0.384979	0.7053
LNUER(-1)	3.779935	3.579266	1.056064	0.3066
LNUER(-2)	-1.052648	2.696819	-0.390329	0.7014
BREAK08	-2.560675	2.246064	-1.140072	0.2710
BREAK89	0.503352	2.836532	0.177453	0.8614

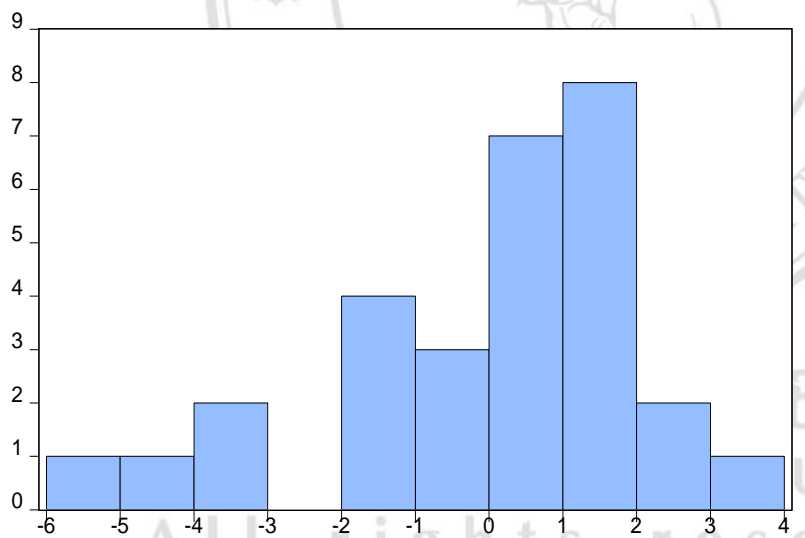
R-squared	0.359057	Mean dependent var	1.069055
Adjusted R-squared	-0.121651	S.D. dependent var	1.819814
S.E. of regression	1.927329	Akaike info criterion	4.451992
Sum squared resid	59.43356	Schwarz criterion	5.064918
Log likelihood	-51.55388	Hannan-Quinn criter.	4.643953
F-statistic	0.746934	Durbin-Watson stat	2.286850
Prob(F-statistic)	0.691517		

Normality Test for Long Run Estimation Model



Series: Residuals	
Sample 1987 2015	
Observations 29	
Mean	2.54e-15
Median	-0.069892
Maximum	1.831638
Minimum	-2.700814
Std. Dev.	1.052253
Skewness	-0.667137
Kurtosis	3.797783
Jarque-Bera	2.920236
Probability	0.232209

Normality Test for Short Run Estimation Model



Series: Residuals	
Sample 1987 2015	
Observations 29	
Mean	-5.97e-16
Median	0.282843
Maximum	3.937987
Minimum	-5.557636
Std. Dev.	2.092841
Skewness	-0.855785
Kurtosis	3.632234
Jarque-Bera	4.022770
Probability	0.133803

Breusch-Godfrey Serial Correlation LM Test for Short Run Estimation Model

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.650162	Prob. F(2,18)	0.5338
Obs*R-squared	1.953821	Prob. Chi-Square(2)	0.3765

Test Equation:

Dependent Variable: RESID

Method: ARDL

Date: 06/17/16 Time: 18:59

Sample: 1987 2015

Included observations: 29

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RGDP(-1)	0.083014	0.135715	0.611677	0.5484
D(LNTA)	-0.085956	1.421034	-0.060488	0.9524
D(LNTA(-1))	-0.418699	1.302196	-0.321533	0.7515
D(LNTR)	0.362025	1.812783	0.199707	0.8439
D(LNUER)	0.735823	3.076378	0.239185	0.8137
RESID01	0.065133	0.414353	0.157192	0.8768
BREAK08	0.201256	1.232435	0.163300	0.8721
BREAK89	-1.347405	3.175385	-0.424328	0.6764
C	0.521171	2.368473	0.220045	0.8283
RESID(-1)	-0.334290	0.314499	-1.062929	0.3019
RESID(-2)	-0.028652	0.281240	-0.101878	0.9200
R-squared	0.067373	Mean dependent var	-5.97E-16	
Adjusted R-squared	-0.450753	S.D. dependent var	2.092841	
S.E. of regression	2.520769	Akaike info criterion	4.968701	
Sum squared resid	114.3769	Schwarz criterion	5.487331	
Log likelihood	-61.04617	Hannan-Quinn criter.	5.131130	
F-statistic	0.130032	Durbin-Watson stat	1.947116	
Prob(F-statistic)	0.998871			

Heteroskedasticity Breusch-Godfrey Test for Short Run Estimation Model

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.323139	Prob. F(8,20)	0.9475
Obs*R-squared	3.319362	Prob. Chi-Square(8)	0.9127
Scaled explained SS	2.077845	Prob. Chi-Square(8)	0.9785

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 06/17/16 Time: 18:59

Sample: 1987 2015

Included observations: 29

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.477401	7.155484	1.044989	0.3085
RGDP(-1)	0.025055	0.324120	0.077300	0.9392
D(LNTA)	3.816488	4.210351	0.906453	0.3755
D(LNTA(-1))	0.739190	3.724751	0.198454	0.8447
D(LNTR)	-0.600087	5.478141	-0.109542	0.9139
D(LNUER)	-2.963973	9.217068	-0.321574	0.7511
RESID01	1.489828	1.250792	1.191107	0.2476
BREAK08	0.804304	3.754570	0.214220	0.8325
BREAK89	-4.163172	9.065262	-0.459245	0.6510

R-squared	0.114461	Mean dependent var	4.228950
Adjusted R-squared	-0.239755	S.D. dependent var	6.982562
S.E. of regression	7.774683	Akaike info criterion	7.188749
Sum squared resid	1208.914	Schwarz criterion	7.613082
Log likelihood	-95.23685	Hannan-Quinn criter.	7.321644
F-statistic	0.323139	Durbin-Watson stat	1.423257
Prob(F-statistic)	0.947459		

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