

CHAPTER- XI

GRANGER CAUSALITY BETWEEN TRADE DEFICIT AND BUDGET DEFICIT: RESTRICTED VAR MODEL

11.1 Introduction:

The study of '*Granger Causality*' between trade deficit and budget deficit in Chapter VIII is based on the estimation of an '**Unrestricted VAR (UVAR) Model**'. In such models all the equations for endogenous variables contain same *Autoregressive and Distributed Lag Structures*. If any of the equations is of AR (p) structure, then each equation in the system will consist of AR (p) structure for the endogenous variable concerned along with the same distributed lag structure for each of the endogenous variables of the system. Zero restriction for any of the coefficients in any equation is untenable in the '*Unrestricted VAR (UVAR) Model*'.

The '*Unrestricted VAR Model*' therefore, results in '*over parameterization*' leading to unnecessary loss of degree of freedom. Moreover, such models become '*atheoretic*' in view of the fact that very often the '*Autoregressive Structure*' in any constituent equation in the system may not be in conformity with the '*Univariate*' i.e. ARIMA (p,d,q) stochastic structure for the endogenous variable concerned. Moreover, any extended '*Distributed Lag Structure*' may be captured by AR (1) structure through '*Koyck Transformation*'. This usually results in the attainment of '*parsimony*' of estimable coefficients and improvement in degrees of freedom.

An alternative method of studying '*Granger Causality*' among variables involves the use of '*Restricted VAR Model*' (RVAR), where '*Autoregressive*' and '*Distributed Lag Structures*' vary across different constituent equations of the model. Different equations of the model entail different '*Autoregressive*' and '*Distributed Lag Structures*'. Consequently '*zero restrictions*' for coefficients are permissible in such a '*Restricted VAR Model*'.

It, therefore, becomes pertinent for us to study nature and direction of *Causal relation* between trade deficit and budget deficit through the estimation of a '*Restricted VAR Model*.' Such study is expected to supplement and supplant the findings in Chapter 8. Our study in this chapter is an attempt in this direction.

11.2 The Estimable Model:

The estimable 'Restricted VAR Model' consists of the following equations.

$$\Delta TD_t = \alpha_1 + \beta_1 \Delta TD_{t-1} + \gamma_1 \Delta BD_{t-1} + \gamma_2 \Delta BD_{t-2} + \gamma_3 \Delta BD_{t-3} + u_{1t} \quad (11.1)$$

$$\Delta BD_t = \alpha_2 + \beta_2 \Delta BD_{t-1} + \theta_1 \Delta TD_{t-1} + \theta_2 \Delta TD_{t-2} + \theta_3 \Delta TD_{t-3} + u_{2t} \quad (11.2)$$

where $u_{1t} \sim iidN(0, \sigma^2 u_1)$

$u_{2t} \sim iidN(0, \sigma^2 u_2)$

11.3 Results of the Estimation of the Model [Equations (11.1) and (11.2)]

Results of the estimation of the model are being presented through the Tables (11.1)-(11.2)

Table -11.1
Results of Estimation of the Equation (11.1)

Dependent Variable: DTD(Real)		Sample (adjusted) : 1983-2003		
Included observations :21				
Variable	Coefficient	Std.Error	t-Statistic	Prob.
C	-162.0572	58.82904	-2.754715	0.1113
DTD _{t-1}	-0.440829	0.261529	-1.685581	0.1113
DBD _{t-1}	0.149788	0.493975	0.303229	0.7656
DBD _{t-2}	0.238342	0.474757	0.502029	0.6225
DBD _{t-3}	-0.445573	0.477871	-0.932412	0.3650
R-squared	0.233721	Mean dependent variable		-120.6776
Adjusted R-squared	0.042151	S.D dependent var		251.2776
S.E of regression	245.9247	Akaike info criterion		14.05218
Sum squared resid	967663.5	Schwarz criterion		14.30088
Log likelihood	-142.5479	F-statistic		1.220030
Durbin-Watson stat	1.774166	Prob(F-statistic)		0.341148

Table -11.2
Results of Estimation of the Equation (11.2)

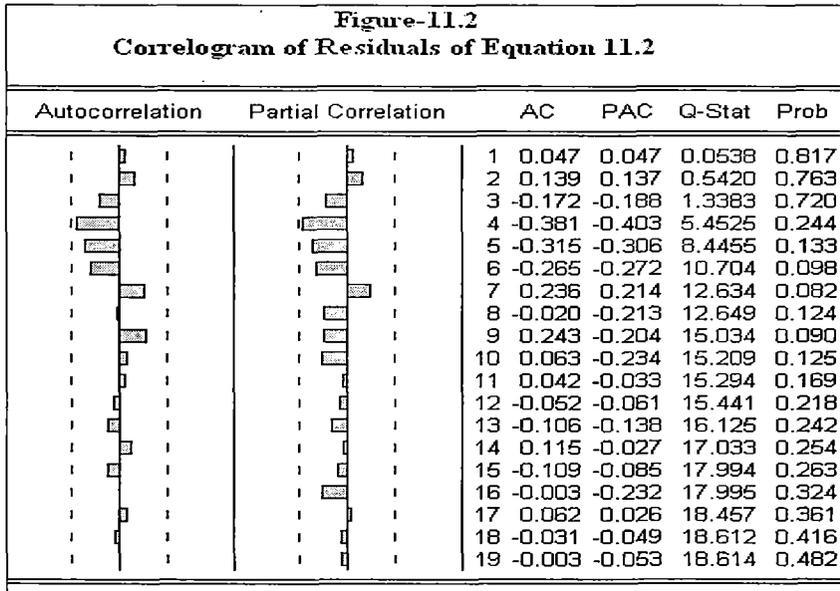
Dependent Variable: DTD(Real)		Sample (adjusted) :1983-2003		
Included observations :21				
Variable	Coefficient	Std.Error	t-Statistic	Prob.
C	-12.55988	37.04310	-0.339061	0.7390
DBD _{t-1}	-0.095494	0.247881	-0.385241	0.7051
DTD _{t-1}	-0.116490	0.131277	-0.887362	0.3880
DTD _{t-2}	0.065507	0.141802	0.461957	0.6503
DTD _{t-3}	0.113752	0.136588	0.832809	0.4172
R-squared	0.118630	Mean dependent variable		-17.68185
Adjusted R-squared	-0.101712	S.D dependent var		116.0564
S.E of regression	121.8156	Akaike info criterion		12.64715
Sum squared resid	237424.8	Schwarz criterion		12.89585
Log likelihood	-127.7951	F-statistic		0.538391
Durbin-Watson stat	1.854704	Prob (F-statistic)		0.709718

11.4 Correlograms of Residuals $\hat{\mu}_{1t}$ and $\hat{\mu}_{2t}$:

The *Correlograms* of residuals $\hat{\mu}_{1t}$ and $\hat{\mu}_{2t}$ are given by the Figures 11.1 and 11.2 respectively.

Figure-11.1
Correlogram Of Residuals of Equation 11.1

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob	
		1	0.032	0.032	0.0245	0.876
		2	-0.308	-0.309	2.4383	0.295
		3	-0.330	-0.340	5.3609	0.147
		4	0.132	0.039	5.8571	0.210
		5	0.123	-0.087	6.3113	0.277
		6	0.135	0.096	6.9000	0.330
		7	-0.146	-0.084	7.6317	0.366
		8	-0.043	0.034	7.7000	0.463
		9	-0.153	-0.183	8.6388	0.471
		10	0.074	-0.023	8.8770	0.544
		11	0.058	-0.033	9.0394	0.618
		12	0.023	-0.091	9.0672	0.697
		13	-0.093	-0.029	9.5930	0.727
		14	-0.155	-0.238	11.260	0.665
		15	-0.040	-0.092	11.388	0.725
		16	0.215	0.033	15.839	0.464
		17	0.136	0.026	18.078	0.384
		18	-0.052	0.006	18.518	0.422
		19	-0.121	0.025	22.073	0.281



11.5 Serial Independence of Residuals $\hat{\mu}_{1t}$ and $\hat{\mu}_{2t}$:

It is observed from these figures that

- (i) the corresponding ACFs are free from the dying out pattern of spikes, and
- (ii) the corresponding PACFs are marked by the absence of any singularly significant spike at lag 1.

All these observations testify for the 'Serial Independence' of the residuals $\hat{\mu}_{1t}$ and $\hat{\mu}_{2t}$.

11.6 Findings From the Table 11.1 [Equation 11.1]

The Table 11.1 shows that

- (i) $|\hat{\beta}_1| < 1$. So the 'Autoregressive Structure' is 'stable'
- (ii) $\hat{\beta}_1$ is not significant even at 10% level.
- (iii) $\hat{\gamma}_i$ ($i = 1,2,3$) are insignificant even at 10% level.

11.7 Economic Interpretations of the Findings in Section 11.6

The economic significance of the findings is as follows.

- (i) $\hat{\beta}_1$, being insignificant (even at 10% level), indicates that trade deficit does not follow the AR (1) structure.
- (ii) $\hat{\gamma}_i$ ($i = 1,2,3$) being insignificant even at 10% level in the presence of ΔTD_{t-1} in the vector of regressors in equation (11.1), indicate that budget deficit fails to 'Granger Cause' trade deficit.

11.8 Findings From the Table 11.2 [Equation 11.2]

It is observed from the Table 11.2 that

- (i) $|\hat{\beta}_2| < 1$ indicates the 'Stability' of the 'Auto-regressive' structure for ΔBD_t
- (ii) $\hat{\beta}_2$ is not significant even at 10% level
- (iii) $\hat{\theta}_i$ ($i = 1,2,3$) are not significant even at 10% level.

11.9 Economic Interpretations of the Findings in Section 11.7

These findings have the following economic significance.

- (i) $\hat{\beta}_2$, being insignificant (even at 10% level), indicates that budget deficit does not follow the AR (1) structure.
- (ii) $\hat{\theta}_i$ ($i = 1, 2, 3$) being insignificant (even at 10% level) in the presence of ΔBD_{t-1} in the vector of regressors in equation (11.2), indicate that trade deficit fails to 'Granger Cause' budget deficit.
- (iii) the budget deficit becomes an 'exogenous' variable in the system.

11.10 Overview of Findings in Chapter XI.

It is observed from the findings in sections 11.5-11.8 that in the economy of Maldives

- (i) *'budget deficit' fails to 'Granger Cause' trade deficit over the period concerned.*
- (ii) *trade deficit fails to 'Granger Cause' budget deficit in the economy of Maldives.*
- (iii) *budget deficit and trade deficit are independent of each other in Maldives over the period of study.*
- (iv) *budget deficit appears to be an 'exogenous' variable in the system.*

All these findings are in conformity of findings in our study with an 'Unrestricted VAR Model' in Chapter VIII.

All these findings further confirm that in the economy of Maldives

- (i) **there exists no 'causal relation' of any kind between budget deficit and trade deficit. Consequently, 'Twin Deficit Hypothesis' remains invalidated by these findings.**
- (ii) **the 'Ricardian Equivalence Hypothesis' is a valid phenomenon.**