

CHAPTER 5

CAUSAL RELATIONSHIP BETWEEN GROWTH OF MANUFACTURING SECTOR AND ECONOMIC GROWTH IN HARYANA

5.1 Introduction

This chapter is dedicated to the results and analysis of third objective of this study. As the variables taken in this study for the purpose of causality analysis are time series variables it is essential to examine whether they are stationary. Various researchers have utilized the Augmented Dickey Fuller (ADF) test for examination of stationarity in their studies. This study has also applied Augmented Dickey Fuller (ADF) test to check unit root. One of the purposes of this study is to find out the causality between the indicators. To check the causality and its direction the Granger Causality test has been applied in this study.

5.2 Unit root

It deals with the stationarity of time series variables taken in a study. To make the study free from spurious relationship, it is essential to testify whether taken variables are stationary or not. Stationarity condition is prime assumption for the analysis of time series, which is necessary to be fulfilled a time series analysis. If the data taken in the study is unit root at level zero it is necessary to be stationary at level one. It means that data should be stationary after first difference. In this study I have applied Augmented Dickey Fuller (ADF) Test which has three models such as Intercept, Trend and Intercept and no trend and no intercept. Null hypothesis is there is unit root or non stationary and alternative hypothesis is there is no unit root or stationary. The rejection of null hypothesis is based on the criteria of test statistics and probability value. If test statistics is more than critical value at 5 percent level of significant the null hypothesis will be rejected. On the other hand probability value (p-value) plays a crucial role to check

significance of the model. The p-value is less than 0.05 leads to rejection of the null hypothesis at level of significance. In the following table 5.1 reveals the results of unit root test at level zero.

Table 5.1: ADF Test at level				
Variables	ADF model	t-statistics	Critical value at 5%	p-value
GSDP	Intercept	-0.85	-3.07	0.01
	Trend & Intercept	-3.77	-3.79	0.05
	None	-0.63	-1.97	0.43
MNF	Intercept	-6.29	-3.07	0.00
	Trend & Intercept	-6.99	-3.73	0.00
	None	2.07	-1.97	0.99
Source: Calculated in e-views				

The above table 5.1 depicts the results for unit root test. Here Gross State Domestic Product (GSDP) of Haryana and Manufacturing (MNF) are the two variables which are being checked unit root. The above table states that in the model of intercept for GSDP the t-statistics is -0.85 and critical value at 5 percent level of significance is -3.07. It states that t-statistics is lesser than the critical value at 5 percent. Meanwhile the p-value is 0.01 which is significant. In this model null hypothesis cannot be rejected. It means GSDP is unit root or not stationarity intercept at level zero.

In the model of trend and intercept for GSDP the t-statistics is -3.79 which is less than 5 percent critical value -3.79. On the other hand p-value is 0.00, which indicates that the model is significant. This result shows that the null hypothesis cannot be rejected which means in this model GSDP has unit root.

Further, the model which have no trend and no intercept, the t-statistics -0.63 which is less than 5 percent critical value -1.97. On the other hand p-value is 0.43 which is greater than 0.05. It shows that the null hypothesis cannot be rejected. It means GSDP has unit root in this model also.

Apart from GSDP the other variable is manufacturing (MNF) which is also required to be examined the presence of unit root. For this indicator three models have been adopted which are intercept, trend and intercept and no trend and no intercept. For intercept the t-test of manufacturing is -6.29 and critical value at 5 percent level of significance is -3.07. Here the t-statistic is greater than critical value at 5 percent level of significance. In the model of trend and intercept the t-statistics is -6.99 and the critical value is -3.73 which less than the t-statistics. The p- value is 0.00. In this situation null hypothesis can be rejected. The other model is no trend and no intercept the t-statistics is 2.07 and critical value is -1.97. Here the value of t-statistics is more than critical value at 5 percent level of significance. More over the p- value is 0.99 which is more than 5 percent. The result indicates that the null hypothesis cannot be rejected. It means manufacturing is unit root or not stationary at level zero.

In nut shell it is found that the indicators taken in this study are unit root at level zero which is not full filling the assumption of time series analysis.

Since the variable are unit root at level zero which is not meeting the assumption of time series analysis this study needs to go for the examination of unit root at level one i.e. after first difference.

The table 5.2 indicates the results of unit root for the indicators GSDP and Manufacturing (MNF) at level one. In this test there are three models taken which are intercept, trend and intercept and no trend and no intercept. This table states that in the model of intercept for GSDP the t-statistics is -3.41 and critical value at 5% level of significance is -3.12. It states that the critical value at 5 percent is lesser than the t-statistics. The p- value is 0.03 which is significant. In this model null hypothesis will be rejected, because the critical value is less than t-statistics and p- value is less than 0.05%. It means GSDP is stationary intercept at level one. So null hypothesis can be rejected. In this model of trend and intercept for GSDP the t-statistics is -2.92 which is less than 5

percent critical value -3.83. The p- value is 0.19, which indicates that the model is not significant. Thus the null hypothesis cannot be rejected.

Variables	ADF model	t-statistics	Critical value at 5%	p-value
GSDP	Intercept	-3.41	-3.12	0.03
	Trend & Intercept	-2.92	-3.83	0.19
	None	-3.52	-1.97	0.00
MNF	Intercept	-3.35	-3.08	0.03
	Trend & Intercept	-1.90	-3.76	0.61
	None	-2.75	-1.97	0.01

In the ADF model of no trend and no intercept, the t-statistics is -3.52 which is greater than 5 percent critical value -1.97. On the other hand p- value is 0.00. The result shows that the null hypothesis can be rejected. It means the model is significant.

Apart from GSDP, for intercept the t-statistics of manufacturing is -3.52 and critical value at 5 percent level of significance -3.08. Here the t-statistics is greater than critical value at 5 percent level of significance. So the null hypothesis can be rejected. In the ADF model which have trend and intercept the t-statistics of manufacturing is -1.90 and critical value at 5 percent level of significance is -3.76. The p- value is 0.61, which means that null hypothesis cannot be rejected.

Further, the model which has no trend and no intercepts t-statistics is -2.75 which is greater than 5 percent critical value -1.97.

In the other model of no trend and no intercept the t-statistics is -2.75 and critical value is -1.97, which is less than the t-statistics. The p- value is 0.01. So the null hypothesis can be rejected. With the above results we can say that the model is stationary and we can proceed. Because only after the stationarity of model, we can check any relationship

between variables. To see the long-run relationship between GSDP and manufacturing sector growth, co-integration test is used.

5.3 Co-integration Test

Through Co-integration Test we will check long-run relationship between variables. This test has adopted trace statistics and max statistics for the examination of relationship between variables. Results of the co-integration test has been depicted in the table 5.3.

Table 5.3 Co-integration Test								
Trace Statistics					Max statistics			
No. of CE	Eigen Value	trace stat	5% critical value	P-value	Eigen Value	Max-Eigen stat	5% critical value	P-value
None	0.73	20.06	15.49	0.01	0.73	17.21	14.26	0.02
At most 1	0.20	2.85	3.84	0.09	0.20	2.85	3.84	0.09

Source: Calculated by Researcher by E-views 9.5

The above table 5.3 reveals co-integration between economic growth (GSDP) and growth of manufacturing (MNF) sector in Haryana. Here trace statistics and max eigen value have been utilized for determination of relationship. In this test, trace statistics (20.06) for none is greater than 5 percent critical value (15.49) and max eigen statistics (17.21) is more than 5 percent critical value (14.26). In both statistics probability value is significant at 5 percent level of significance. These values lead to reject the null hypothesis which is there is no co-integration between the variables. It means that the variables are co-integrated in the long run.

5.4 Granger Causality Test

It is statistical hypothesis test to determine the causality between the variables. It shows the causality between the indicators. It does not only examine the causality between the variables but also show the direction of causality between the variables. This test is based on f-statistics. To test the hypothesis the probability value (p-value) plays a significant role. If the p-value is less than 0.05 the null hypothesis will be rejected. Results of the Granger causality test have been depicted in the above table 5.4.

Granger causality Test		
Null Hypothesis	F-Statistics	P-value
Ln MNF Does not granger cause LnGSDP	1.56	0.28
LnGSDP Does not granger cause LnMNF	10.31	0.01

The above table 5.4 reveals that the p-value is 0.28 for null hypothesis MNF does not granger cause GSDP which is more than 0.05, so the null hypothesis cannot be rejected at this level of significance. On the other for the null hypothesis GSDP does not granger cause MNF, the p-value is 0.01 which is less than 0.05. This value prompts to rejects the null hypothesis. It means economic growth causes the growth of manufacturing sector in Haryana. The above results indicate that there is unidirectional relationship between GSDP and manufacturing sector in Haryana.