CHAPETR-III
DATABASE AND RESEARCH METHODOLOGY

Research could be broadly divided into two parts, namely, basic and applied research. The nature of the research may be descriptive, applied as well as fundamental research. The present study is analytical in nature. Database and Research Methodology of the study has been presented in this chapter. The nature of the data, the period of the study, sources of data and the statistical tools applied for the analysis of data are covered in this chapter. Furthermore, the hypotheses have been framed for testing on the basis of the findings of the study and limitations of the study are also presented.

3.1 DATABASE OF THE STUDY

The data is the most important component of any research to achieve the objectives of the research. The accuracy of the results of any study depends mainly on the reliability of data. The nature of the present study is analytical and is based on the secondary data.

3.2 PERIOD OF THE STUDY

The study covers a comprehensive period of 17 years from 1994-95 to 2010-11. The period of study has been deliberately selected to analyze the post-WTO scenario during which drastic policy changes have been introduced by the Indian government for the compliance of WTO provisions which got birth on 1st January, 1995. However, the data relating to pre-reforms period has also been taken to compare the pre and post reforms period performance of external sector of India. To bring uniformity, quarterly data was developed on the basis of monthly data, as the GDP data were available on quarterly basis only.

3.3 SOURCES OF THE DATA

The data of present study has been collected from the different sources, namely, Database of Reserve Bank of India, and various Reports published by CMIE. The data has also been collected with the help of online databases such as SSRN (Social Science Research Network).
For the analysis of commodity composition of Indian foreign trade, we have taken the principal items of composition of Indian merchandise exports and imports, which includes, namely, agricultural & allied products; ores and minerals; leather & manufacturing; chemicals & allied products; engineering goods; gems & jewellery; handicrafts; petroleum; and others. The direction of Indian foreign trade include all the imperative destinations of Indian foreign trade, namely, OECD, OPEC, Eastern Europe and Developing countries. The compound growth rate has been used for the analysis of the change in composition of commodity and direction of Indian foreign trade under the post-WTO period. The annual average growth rate has also been calculated for the in-depth analysis of the changes in structure of Indian foreign trade.

3.4 STATISTICAL TOOLS APPLIED FOR THE ANALYSIS OF DATA

Research Methodology is a mode to systematically resolve the research problem. It provides the framework on the basis of which entire research is carried-out. Therefore, it is very significant that research methodology of a study should be clear and scientific.

To achieve the objectives of the present research, descriptive statistical techniques such as percentages and averages have been used. The Compound Growth Rate has been calculated for the scientific analysis of the study. Advanced Time Series Analytical Techniques such as Phillips Perron (PP) Test, Johansen Co-integration Test and Block Exogeneity Wald Test. Eviews, SPSS Package and MS-Excel software have been used for data analysis. The detail of the statistical tools selected for the examination of time series data of the present study are as follows:

- **The Compound Growth Rate**
  
The compound growth rate has been calculated to analyze the growth of Indian foreign trade under the study period. With the help of regression, the correlation coefficient (r) and the value of t-statistics have been calculated for the reference period.

- **The Percentage Change Calculator**
  
  It is used to calculate percentage changes of exports and imports during the study period from 1994-95 to 2010-11. For this purpose, we applied the following formula:

\[
\text{Percentage Growth Rate Change} = \left\{ \frac{X_2 - X_1}{X_1} \right\} \times 100
\]

Here \(X_1\) = First Value

| Percentage Growth Rate Change = \{ (X_2-X_1)/X_1 *100 | Here \(X_1\) = First Value |
• **Balance of Trade Formula**
  The balance of trade has been calculated by taking the difference of exports and imports for all the years covered under the study.

• **Unit Root Test**
  The time series must be required to be stationary for feasibility of inference and forecasting. A number of tests are available to check the stationarity of a time series data. In this study we used the Philips Perron test to examine the stationarity of the variables under study. For the application of Unit Root tests, the variables must fulfill two conditions, i.e. (i) all the variables are stationary at same order; and (ii) differenced series or the residual series are stationary at level for the application of Johansen Co-integration Test. PP test is also used to check the integration order of the variables.

• **Johansen Co-integration Test**
  After checking the stationarity of the variables, we used the Johansen Co-integration test to examine the Co-integration among the variables under study. In this test, the null hypothesis that no co-integration exist is rejected, if there exist, at least, one co-integrating vector, it exhibit a stable long-run relationship between the variables. For this purpose, trace test and maximum eigen value tests have been considered. The hypotheses of Johansen Co-integration test are as follows.
  
  \[ H_0: r=0; \quad H_1: r=1 \]

• **Tests for Granger Causality with VECM**
  We used the Vector Error-Correction Model (VECM) to examine the direction of long-run and short run Causality among real exports, real GDP and trade openness and whether or not the ELG or GLE or both hypotheses are true in case of India.
  
  The performance of Indian exports under the trade liberalization period has been examined with the help of the VECM. The application of this test requires quarterly data. There is a general consensus among the researchers that the number of
observations should be more than thirty for the application of this test. So accordingly, quarterly data have been generated from the monthly data.

The data used for this analysis was taken from 1996-97 Q1 to 2008-09 Q4, which comprises 52 observations. All the data has been taken from the database of RBI. We have taken three variables namely, real exports (X), real imports (M) and real GDP (measured as economic growth) to study the causal association between exports growth and economic growth. The GDP deflator index is used as price deflator for all nominal series to deflate the inflationary effects. The variables under study have been transformed to natural logs denoted as lnX, lnM and lnGDP.

There are large number of empirical studies that validate the strong association among exports growth and economic growth having positive/negative impact. An assessment of the link between exports and economic growth has got more attention during the era of globalization. Several studies like Michaely (1977), Balassa (1978), Tyler (1981), Gupta (1985), Kavoussi (1984), Ram (1985), Sheehey (1990), and Hatemi and Irandoost (2002) found positive impact of exports on economic growth, while the others studies like Boltho (1996) and Medina Smith (2001) found negative or neutral effects and raise some doubts with regard to promoting exports as a comprehensive development strategy.

In the light of this controversy, an attempt has been made to apply the co-integration test and VECM to investigate the ELG hypothesis in India during the post-WTO period.

**Block Exogeneity Wald Test**

The direction between the variables has been identified by Block Exogeneity Wald Test. The Granger causality test in VAR framework is known as Block Exogeneity Wald Test. This test is used in a multivariate context, when we have two variables, we may like to know if some of these variables are generated independently of other variables considered (Badani, 2009).

### 3.5 HYPOTHESES OF THE STUDY

In the course of our investigation the following hypotheses have been framed to test on the basis of the findings of the present study:
H1: The composition of Indian Exports and Imports has changed during the post-WTO period;
H2: The direction of Indian Exports and Imports of goods has changed during the post-WTO period;
H3: The Liberalization of trade policy led to higher volume of exports;
H4: Exports growth is positively related to GDP growth;
H5: The share of merchandised export as ratio of GDP has increased under the study period;
H6: Foreign trade reforms in merchandised exports have succeeded to reduce trade deficit or balance of trade; and
H7: Foreign trade reforms have a positive impact on the Balance of payments.

3.6 LIMITATIONS OF THE STUDY

Just like any other research project, the present study also has certain limitations, some of which are listed below:

- The present study is based on secondary data, therefore, it carries all the limitations of a secondary data based studies;
- The present study could not analyze the impact of export-led economic growth model on the transfer of technology, level of unemployment, level of competition and reduction of poverty in India during the post-WTO period which are the key problems being faced by the Indian economy;
- Moreover, the present study could not differentiate the recession period from the normal period, which might have affected the results of the study;
- Some advanced statistical tools have been applied for the analysis of data Therefore, all the limitations of such techniques might have affect on the results of the present study;
- The study is based on secondary data, therefore, the problems being faced by exporters and importers are missing in India could not be included in the study; and
The present study has focused on the merchandised trade, therefore, the contribution of invisibles trade has not included in the study.