Chapter 3

Research Methodology and Data Source

3.1 Data Description

The study aims to find out the financial development - manufacturing trade relationship in India. Yearly data for a period of 23 years (1992-2014) has been used to conduct the study. A financial index of India has been constructed to measure the depth of financial system of India. Data is collected from RBI, World Bank and Indiastat.

3.2 Variables Used in the Study

3.2.1 Manufacturing Exports: Manufacturing exports (% GDP) is taken to represent the performance of manufacturing exports over the period of 1992 to 2014.

3.2.2 Trade Balance: Trade balance (%GDP) is taken to represent the performance of trade balance of India over the time period of 1992 to 2014.

3.2.3 Financial Development Index: To measure the financial development of India an index has been constructed with the help of proxies such as **Broad money as percent of GDP (M3), Credit by banks and other financial institutions as percentage of GDP (BC), Market Capitalization as percent of GDP (MC) and Financial Innovation (FIN) ratio.**

3.3 Tools Used in the Study

This involves the methods employed in carrying out the research which is mostly based on theoretical background. The methodology commonly applied includes principal component analysis (PCA) for construction of FDI and further unit root test, co- integration test, Granger causality test, vector error correction model (VECM) is used to examine the relationship between variables.

PCA has been applied to calculated weights of variables of Financial Development Index and other models have been applied to identify the type of relationship that exists between financial development and manufacturing trade, the direction of causality between financial development and manufacturing trade and to find out the long run relationship between both these. However, this study used the Johansen multivariate co- integration approach and Vector Error Correction Model (VECM) to establish the relationship long run and short run relationships between financial development and manufacturing trade. Also, the study examines the direction of causality between the financial development and manufacturing trade within the multivariate Granger causality framework rather than conventional bivariate framework. Multivariate Granger causality is an improvement over the bivariate framework and also helps to access relationship among the variables not just in one direction only. Also, distortion of causality inferences is avoided which could be due to omission of relevant variables (Chang and Hsu, 2009).

3.4 Model Specification

Following the theoretical literature and methodology of previous empirical studies, a model can be specified for this study that manufacturing exports and trade balance depends on financial development.

3.5 Techniques for Estimation

The econometric analysis of the relationship between the financial development and manufacturing trade usually involves the following methods.

3.5.1 Unit Root Test

One of the assumptions of standard regression analysis is the condition that variables being tested are stationary. However, many macroeconomic time series are often not

found stationary, they trend up and down over time. Therefore, before regression analysis test for stationary must be done to avoid getting bias and estimates or spurious result. A stationary time series has mean, variance and autocorrelation constant over a period of time. This study has used Augmented Dickey Fuller (ADF) test to examine each variable for the presence of unit root (or Non- stationary).

To test the stationary of variables, we use the Augmented Dickey Fuller (ADF) test which is mostly used to test for unit root. Following equation checks the stationarity of time series data used in the study:

$$\Delta y = \beta_1 + \beta_1 t + \delta y_{t-1} + \sum \alpha \Delta y_{t-1} + \varepsilon_t \qquad \text{…….. (2)}$$

Where εt is white noise error term in the model of unit root test, with a null hypothesis that variable has unit root.

The null and alternative hypothesis for the existence of unit root in variable yt is Ho: $\delta = 0$ versus H1: $\delta < 0$. Rejection of the null hypothesis denotes stationarity in the series.

Once the number of unit roots in the series is decided, the next step before applying Johansen's (1988) co-integration test is to determine an appropriate number of lags to be used in estimation.

3.5.2 Co- integration Test

If the variables are non- stationary, in that case to avoid spurious regression the variables should be differenced before using them in regression model. If co-integration is their between variables or there is a long run relationship between the over time, then they could be used in regression model in the level forms without leading to spurious results. There are many co-integration tests which are used in literature for co integration analysis such as Durbin-Watson, Johansen co- integration

test and Engle- Granger Co- integration test. In this study we will use Johansen test to test for co-integration between the variables because it has an advantage over other co-integration tests as it takes into consideration the possibility of multiple co-integration vectors.

3.5.3 Granger Causality Test

The co-integrating relationship indicates the existence of causal relationship but does not indicates the direction of casual relationship among the variables used in the study. So here, the Granger Causality test will help use to determine the direction of causality between the Manufacturing Exports and Financial development and then between Trade Balance and Financial Development. This study used multivariate Granger- causality as the results of multivariate framework are more informative and reliable than the results of bivariate framework. Formally, a time series x Granger causes another time series y if series y can be predicted with better accuracy by using past values of x rather than by not doing so, other information being identical.

The null hypothesis (H0) that we test in this case is that the X variable does not Granger cause variable Y and variable Y does not Granger cause variable X. In summary, one variable (Xt) is said to granger cause another variable (Yt) if the lagged values of Xt can predict Yt and vice-versa.

In the context of this analysis, the Granger method involves the estimation of the following equations:

If causality (or causation) runs from FD to ME,

$$ln\ ME_t = \Sigma\ \alpha_i\ lnME\ t_{-i} + \beta_j\ lnFD\ _{t-j\ +}\ \lambda_1 t + u_{1t} \quad \text{..... (3)}$$

If causality (or causation) runs from ME to FD, it takes the form:

$$ln\ FD_t = \Sigma\ \gamma_i\ lnFD\ t_{-i} + \delta_j\ lnME\ _{t-j\ +}\ \lambda_2 t + u_{2t} \quad \text{.....(3.1)}$$

Where ME is manufacturing exports and FD is Financial Development.

3.5.4 Vector Error Correction Model (VECM)

If the variables in the model are co-integrated then it will be useful to use Vector Error Correction Model (VECM) to understand the relationship between variables both in short run and also in long run, which will be very useful to have comprehensive information concerning the dynamic relationship between the variables and how the adjustment toward the equilibrium position occur after initial divergence.