CHAPTER II

SHARE PRICE-DIVIDEND CAUSAL NEXUS:
EVIDENCE FROM INDIA

2.1 INTRODUCTION

The long-run relationship between share price and dividend has occupied a prominent place in the finance literature. It has caught the fancy of researchers’ worldwide and there have been a good number of attempts to understand this crucial relation. Prior empirical research has examined the long-run relations between share prices and dividends based on two theoretical frameworks, viz., present value model of stock price and the Lintner (1956) dividend model.

Of these, the present value model of stock price asserts that stock price is a linear function of the present discounted value of expected future dividends. According to Campbell & Shiller (1987), if the present value model is true, then a linear combination of the variables is stationary and the variables are cointegrated i.e. for the present value model of stock price to hold, stock prices and dividends should be cointegrated. Campbell & Shiller (1987) tested this proposition using data relating to US firms and found some evidence of cointegration between stock prices and dividends. They also found that price-dividend spreads Granger-cause dividend changes.

Following Campbell & Shiller (1987), many studies have attempted to empirically examine the long-run relationship between stock prices and dividends. Most of these
studies have tested for cointegration between stock prices and dividends, with a few examining the causal relations between the two series.

The evidence obtained from the empirical investigation of the long-run cointegrating relationship between stock prices and dividends remains inconclusive. A group of studies have found evidence supporting the presence of cointegration between stock prices and dividends. For instance, using US stock market data, Yuhn (1996) found that stock prices and dividends are cointegrated.

Similar evidence has been reported by Crowder & Wohar (1998), Taylor & Peel (1998), Kanas (2003), Chang et al. (2007) and Chang et al. (2008) for US market. In a multicountry study pertaining to the markets Germany, Belgium, Canada, Denmark, France, Ireland, Italy, Japan, Netherlands, UK and US, Kapetanios et al. (2006) tested for cointegration between stock prices and dividends, and found that both are cointegrated.

On the other hand, some studies have documented that there is no long-run cointegrating relationship between share prices and dividends. One such study is Lim & Phoon (1991) that tested for cointegration between stock prices and dividends for US market and found that stock prices and dividends are not cointegrated. Similarly, Han (1996) reported that stock prices and dividends relating to US market bear no long-run relationship.

In a later study, Blancard & Raymond (2004) tested whether a long-run relationship exists between stock prices and dividends of French, German, Japanese, UK and US
stock markets. The results of cointegration test showed that there is no cointegration between stock prices and dividends in these markets.

Besides the test of cointegration between share prices and dividends, the causal relation between the two series has also been the subject of examination for few studies. For instance, Mills (1993) for UK market found that stock price and dividend are cointegrated and that price-dividend spreads Granger-cause dividend changes.

Subsequently, Timmermann (1994) examined whether stock prices Granger cause dividends and whether dividends granger cause stock prices for US market. The study found that stock prices Granger cause dividends; however, dividends do not Granger cause stock prices. Evidence of such unidirectional causality from stock prices to dividends is also reported by Reschreiter (2009) for US market.

By examining the stock price–dividend relation for UK, US, Japan, and Germany, Kanas (2005) found significant evidence of cointegration and Granger causality between stock prices and dividends for all the four countries. Following Kanas (2005), Chen & Shen (2009) also tested for cointegration and causality between stock prices and dividends of US, UK, Japan and Germany. The study found that stock prices and dividends were cointegrated in all the four countries. While bi-directional causality was observed between stock price and dividend for US and Germany, only unidirectional causality from dividend to stock price is found to exist for UK market. Further, in Japan, no causality is found to exist between stock price and dividend. In a recent study, Esteve & Prats (2010) have studied the stock price-
dividend relation for US market and have found evidence of causality from stock price to dividend.

Few studies have attempted to examine the long-run relation between stock prices and dividends using panel data. For instance, Marsh & Power (1999) examined whether a long-run relationship exists between stock prices and dividends of UK firms and found evidence of cointegration between stock prices and dividends. Similarly, the examination of the long-run relation between stock prices and dividends using panel data has been carried out by Su et al. (2007) for Taiwan market and Goddard et al. (2008) for UK market. Both these studies have found evidence supporting the presence of a long-run cointegrating relationship between stock prices and dividends.

The above discussed studies attempted to understand the stock price-dividend relation based on the present value model of stock price. Besides this model, the Lintner (1956) dividend model has been used by Sung & Urrutia (1995) to examine the share price and dividend relationship. Sung & Urrutia (1995) assert that both the present value model of stock price and the Lintner’s (1956) dividend model are important theoretical frameworks for explaining the relation between stock price and dividend. From both these models, they have derived models of causality from stock prices to dividends and from dividends to stock prices.

Sung & Urrutia (1995) state that, as per the Lintner’s (1956) dividend model, current dividend is determined by current target dividend and past dividends, and that, as per the present value model, current and past stock prices are determined by current
target dividend and past dividends. Based on these relations, they derived model of causality from stock prices to dividends and concluded that current and past stock prices affect current dividends.

They further state that, as per the present value model of stock price, the current stock price is determined by future dividends, and that, as per the Lintner’s (1956) dividend model, future dividends are determined by current and past dividends. Based on these relations, they derived model of causality from dividends to stock prices and concluded that current and past dividends affect current stock prices.

Sung & Urrutia (1995) empirically tested these causal relations using data pertaining to US firms and found evidence in favour of bi-directional causality between stock prices and dividends, supporting their claim that both present value model of stock price and the Lintner’s (1956) dividend model are important theoretical frameworks for explaining the relation between stock prices and dividends.

From the review, it is apparent that prior empirical research on long-run relations between share prices and dividends has largely used time series data. Few studies have used panel data; however, their focus has been limited to the test of cointegration between share prices and dividends. Particularly, in the Indian context, no study has examined the long-run causal relations between share prices and dividends. In this chapter, an attempt has been made to fill these gaps by examining whether share prices and dividends of Indian firms affect each other in the long-run. For this purpose, an error correction model is estimated. Before estimating the error correction model, the unit root properties of the data and cointegration between the
variables are examined. Further, the empirical investigation of the issue is carried out for different sectors.

2.2 METHODOLOGY

To examine whether share prices and dividends affect each other in the long-run, the following econometric methodology is employed. First, the unit root properties of the data are assessed using panel unit root tests, followed by the application of the panel cointegration test that examines whether share prices and dividends bear a long-run equilibrium relation or not. The third step involves the estimation of the cointegrating parameter using Fully Modified Ordinary Least Squares (FMOLS) method. Finally, in order to examine the long-run causal relations between share prices and dividends, an error correction model is estimated.

2.2.1 PANEL UNIT ROOT TEST

The panel unit root tests, viz., Fisher-ADF and Fisher-PP tests proposed by Maddala & Wu (1999) are employed to examine the unit root properties of the data. Both these tests assume that there is individual member specific unit root process i.e. the autoregressive coefficient \( \rho_i \) is allowed to vary across the cross sections. These tests are based on the combination of the \( p \)-values from the individual unit root test of each cross section.

In Fisher-ADF test, the augmented Dickey-Fuller (ADF) test is first applied to each individual cross section \( i \) and then the \( p \)-values from the individual unit root test of each cross section are combined to test for unit root in the panel. In Fisher-PP test,
instead of ADF test, Phillips-Perron (PP) test is first applied to each cross section and then, similar to Fisher-ADF test, the $p$-values from individual unit root test of each cross sectional unit are combined to test for unit root in the panel.

Both Fisher-ADF and Fisher-PP tests combine the $p$-values as shown in equation (2.1):

$$p_\lambda = -2 \sum_{i=1}^{N} \log(p_i)$$  

(2.1)

where $p_i$ is the $p$-value from the individual unit root test of cross-section $i$. The test statistic $p_\lambda$ follows $\chi^2$ distribution with $2N$ degrees of freedom.

In both the tests, the null hypothesis ($H_0$) is that there is unit root for all the cross sections i.e. $H_0: \rho_i = \rho = 0$ for all $i$, and the alternative hypothesis ($H_1$) is that some cross sections do not have unit root i.e. $H_1: \rho_i = 0$ for some $i$ and $\rho_i < 0$ for the other $i$.

2.2.2 PANEL COINTEGRATION TEST

The panel cointegration test proposed by Pedroni (1999, 2004) is employed to test for cointegration between share price and dividend. This test is an extension of the Engle & Granger (1987) two step residual based method for testing the null of no cointegration in the case of heterogeneous panels. It is a residual based test that allows for considerable heterogeneity among individual members of the panel. It allows for individual member specific fixed effects, deterministic trends and slope coefficients.
To test whether share price \((P)\) and dividend \((D)\) are cointegrated or not, the following relation is estimated:

\[
P_{i,t} = \alpha_i + \beta_i D_{i,t} + e_{i,t} \tag{2.2}
\]

where \(\alpha_i\) is the member specific intercept; \(\beta_i\) is slope coefficient of the \(i^{th}\) member; \(e_{i,t}\) is the error term; \(i = 1, \ldots, N\); \(N\) is the number of cross-sectional units; \(t = 1, \ldots, T\); \(T\) is the number of observations over time.

The variables share price and dividend in equation (2.2) are integrated of the same order and said to be cointegrated, if \(e_{i,t}\) is a stationary process; hence, testing for cointegration between share price and dividend involves testing for stationarity of \(e_{i,t}\). The stationarity of the residuals \(e_{i,t}\) is tested by estimating the following auxiliary regression:

\[
e_{i,t} = \rho_i e_{i,t-1} + u_{i,t} \tag{2.3}
\]

In order to test for cointegration between a set of variables, Pedroni (1999) has proposed two sets of statistics, viz., pooled panel cointegration statistics or within dimension statistics and group mean panel cointegration statistics or between dimension statistics. The pooled panel cointegration statistics comprise of four statistics, viz., Panel Variance, Panel Rho, Panel PP and Panel ADF statistic, while the group mean panel cointegration statistics comprise of three statistics, viz., Group Rho, Group PP and Group ADF statistic.
The null hypothesis in both the sets of statistics is the same. The null is that there is no cointegration i.e. $H_0: \rho_i = 1$ for all $i$. The alternative hypothesis is different for the two sets of statistics. In case of pooled panel cointegration statistics, the alternative hypothesis is $H_1: \rho_i = \rho < 1$ for all $i$. Here, a common value is assumed for all $\rho_i$'s such that $\rho_i = \rho$. In group mean panel cointegration statistics, the alternative hypothesis is $H_1: \rho_i < 1$ for all $i$. Here, unlike pooled panel cointegration statistics, a common value for $\rho_i$ is not assumed. The group mean panel cointegration statistics, therefore, allows to model an additional source of potential heterogeneity across individual members of the panel.

2.2.3 FULLY MODIFIED ORDINARY LEAST SQUARES METHOD

The panel cointegration test indicates whether or not a long-run equilibrium relationship exists between the variables under consideration. It however doesn’t provide the estimate of the cointegrating vector. If Ordinary Least Squares (OLS) method is used to obtain the cointegrating vector from a panel, the estimate would be biased because of serial correlation and endogeneity problem.

To overcome these problems, Pedroni (2000) developed the fully modified ordinary least squares method for heterogeneous cointegrated panels that allows for considerable heterogeneity across individual members of the panel. This method corrects for serially correlated errors by using a serial correlation correction term and resolves the endogeneity problem by using transformed endogenous variable in the conventional OLS estimator, thus producing unbiased estimates.
FMOLS produces two types of estimators, viz., pooled panel or within dimension estimator and group mean panel or between dimension estimator. The null hypothesis being tested under both the estimators is the same. The null is that the cointegrating parameter of each cross section \( i \) (\( \beta_i \)) is equal to the hypothesized common value (\( \beta_0 \)) i.e. \( H_0: \beta_i = \beta_0 \) for all \( i \). The alternative hypothesis varies for both the estimators. The alternative hypothesis in case of pooled panel estimator is \( H_1: \beta_i = \beta_a \neq \beta_0 \) for all \( i \), where \( \beta_0 \) is the hypothesized common value for \( \beta \) under the null and \( \beta_a \) is some alternative value for \( \beta \) which is also common to all members of the panel.

Under the group mean estimator, the alternative hypothesis is \( H_1: \beta_i \neq \beta_0 \) for all \( i \), where the values for \( \beta \) are not necessarily constrained to be homogeneous across different members of the panel. The group mean estimator thus provides greater flexibility by allowing heterogeneity of the cointegrating parameters.

### 2.2.4 PANEL VECTOR ERROR CORRECTION MODEL

If a set of variables are individually I(1) and a linear combination of them is I(0), then the variables can be represented by way of an error correction model. The panel error correction model proposed by Canning & Pedroni (2008) identifies the direction of long-run causality using a two-step procedure. In the first step, the cointegrating relationship is estimated using FMOLS method. Next, the disequilibrium error term \( \hat{e}_{i,t} \) is obtained from this estimated cointegrating relationship and the error correction model is then estimated.
The bi-variate error correction model for the variables share price \((P)\) and dividend \((D)\) is of the form given in equation (2.4).

\[
\Delta P_{i,t} = c_{1i} + \lambda_{1i} \hat{e}_{i,t-1} + \sum_{j=1}^{k} \varphi_{11i j} \Delta P_{i,t-j} + \sum_{j=1}^{k} \varphi_{12i j} \Delta D_{i,t-j} + \epsilon_{1i,t}
\]

\[
\Delta D_{i,t} = c_{2i} + \lambda_{2i} \hat{e}_{i,t-1} + \sum_{j=1}^{k} \varphi_{21i j} \Delta P_{i,t-j} + \sum_{j=1}^{k} \varphi_{22i j} \Delta D_{i,t-j} + \epsilon_{2i,t}
\]

where \(\Delta\) is the first difference operator; \(c_{1i}\) and \(c_{2i}\) are the intercept terms; \(\lambda_{1i}\) and \(\lambda_{2i}\) are the speed of adjustment coefficients; \(\hat{e}_{i,t-1}\) is the disequilibrium error, which is the residual from the cointegrating relationship; \(\varphi\)'s are the slope coefficients; \(\epsilon_{1i,t}\) and \(\epsilon_{2i,t}\) are white noise error terms.

The parameter \(\lambda_{1i}\) indicates the presence or absence of long-run causality from dividend to share price and \(\lambda_{2i}\) indicates the presence or absence of long-run causality from share price to dividend. To test for the existence of long-run causal relationship between the variables, Canning & Pedroni (2008) construct two tests, viz., group mean based test and lambda-Pearson test.

The group mean based test averages the individual \(\lambda_{1i}\) and examines whether the long-run causal effect is zero on average for the panel. The group mean panel estimate for \(\lambda_{1i}\) is computed as given in equation (2.5).

\[
\bar{\lambda}_1 = N^{-1} \sum_{i=1}^{N} \hat{\lambda}_{1i}
\]
The group mean panel test statistic is computed as

$$\bar{t}_{\lambda_1} = N^{-1} \sum_{i=1}^{N} t_{\lambda_{1i}}$$  \hspace{1cm} (2.6)$$

where $t_{\lambda_{1i}}$ is the individual t-statistic for the null hypothesis that $\lambda_{1i} = 0$. Similarly, the group mean panel test is computed for $\lambda_{2i}$. The test statistics $\bar{t}_{\lambda_1}$ and $\bar{t}_{\lambda_2}$ follow a standard normal distribution.

The lambda-Pearson test examines whether the long-run causal effect is pervasively zero for the panel. It uses the probability values associated with t-statistic of each individual cross section and computes the test statistic for the panel as given in equation (2.7).

$$P_{\lambda_1} = -2 \sum_{i=1}^{N} \ln p_{\lambda_{1i}}$$  \hspace{1cm} (2.7)$$

where $\ln p_{\lambda_{1i}}$ is the log of the $p$ value associated with t-test of each individual cross section, for the null hypothesis that $\lambda_{1i} = 0$. Similarly, the lambda-Pearson test is computed for $\lambda_{2i}$. The test statistics $P_{\lambda_1}$ and $P_{\lambda_2}$ follow $\chi^2$ distribution with $2N$ degrees of freedom.

2.3 EMPIRICAL RESULTS

For the empirical investigation of the issue of share price-dividend causal nexus, panel data comprising of annual time series data over the period 1999-2008 and cross section data pertaining to four sectors, viz., capital goods, healthcare, metal and PSU is used. As initial sample, the various sector wise stock indices listed in Bombay Stock Exchange (BSE) were considered. Out of this initial sample, only
those sectors that had a minimum of eight firms with continuous data on share prices and dividends over the sample period were considered. This screening yielded a final sample\(^1\) of four sectors, the details of which are given in table 2.1.

Table 2.1: Details of Final Sample

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Sector</th>
<th>No. of firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Capital Goods</td>
<td>9</td>
</tr>
<tr>
<td>2</td>
<td>Healthcare</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>Metal</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>PSU</td>
<td>23</td>
</tr>
</tbody>
</table>

Note: PSU – Public Sector Undertaking

As a measure of dividend, dividend per share computed as annual dividend amount paid to equity shareholders upon number of equity shares outstanding is used. Real dividend per share and real share price series are obtained by deflating the nominal series by wholesale price index. The face value of the shares is not the same; it differs from one firm to the other. Hence, the face value of each share is taken as ₹10 and the values of share prices and dividend per share are adjusted accordingly. Data on share prices, dividends and outstanding shares are collected from Prowess database provided by the Centre for Monitoring Indian Economy (CMIE).

\(^1\) List of sample firms under each sector is provided in Appendix II-B.
2.3.1 PANEL UNIT ROOT TEST RESULTS

The results of panel unit root tests\(^2\), for the variable share price, pertaining to each of the four sectors, is presented in table 2.2. For all the sectors under consideration, both Fisher-ADF and Fisher-PP tests fail to reject the null hypothesis that share price in level is nonstationary. This necessitates testing for stationarity of share price in first difference. For each of the chosen sectors, both the tests reject the null hypothesis that share price in first difference in nonstationary. Thus, the finding that share price is nonstationary in level and stationary in first difference together indicate that share price data pertaining to each of the chosen sectors follows an I(1) process.

Table 2.3 presents the results of Fisher-ADF and Fisher-PP tests for the variable dividend pertaining to all the sectors under consideration. The results of both the tests, for each of the chosen sectors, fail to reject the null hypothesis that dividend in level is nonstationary. Hence, dividend is tested for stationarity in first difference. From the test results, it is found that the null hypothesis that dividend in first difference is nonstationary is rejected for all the sectors under consideration. These findings from table 2.3 that dividend is nonstationary in level and becomes stationary upon first differencing indicates that dividend data pertaining to each of the chosen sectors follows an I(1) process.

\(^2\) The panel unit root tests have been carried out in Eviews.
Table 2.2: Panel Unit Root Test Results for Share Price

Null hypothesis ($H_0$): Share price series has unit root

<table>
<thead>
<tr>
<th>Sector</th>
<th>Share Price in Level</th>
<th>Share Price in First Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fisher-ADF test</td>
<td>Fisher-PP test</td>
</tr>
<tr>
<td>Capital Goods</td>
<td>16.62 (0.55)</td>
<td>11.26 (0.88)</td>
</tr>
<tr>
<td>Healthcare</td>
<td>21.37 (0.16)</td>
<td>22.05 (0.14)</td>
</tr>
<tr>
<td>Metal</td>
<td>1.06 (1.00)</td>
<td>4.66 (1.00)</td>
</tr>
<tr>
<td>PSU</td>
<td>25.07 (0.99)</td>
<td>18.21 (1.00)</td>
</tr>
</tbody>
</table>

Note: Numbers in (#) are $p$-values; PSU – Public Sector Undertaking
Table 2.3: Panel Unit Root Test Results for Dividend

Null hypothesis ($H_0$): Dividend series has unit root

<table>
<thead>
<tr>
<th>Sector</th>
<th>Dividend in Level</th>
<th>Dividend in First Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fisher-ADF test</td>
<td>Fisher-PP test</td>
</tr>
<tr>
<td>Capital Goods</td>
<td>6.90 (0.99)</td>
<td>6.02 (1.00)</td>
</tr>
<tr>
<td>Healthcare</td>
<td>8.97 (0.91)</td>
<td>9.89 (0.87)</td>
</tr>
<tr>
<td>Metal</td>
<td>4.48 (1.00)</td>
<td>3.98 (1.00)</td>
</tr>
<tr>
<td>PSU</td>
<td>37.45 (0.81)</td>
<td>40.11 (0.72)</td>
</tr>
</tbody>
</table>

Note: Numbers in (#) are $p$-values; PSU – Public Sector Undertaking
Having identified from the panel unit root tests, that both share price and dividend data pertaining to each of the chosen sectors is integrated of order one i.e. I(1), the panel cointegration test is next carried out to find out whether share price and dividend are cointegrated.

### 2.3.2 PANEL COINTEGRATION TEST RESULTS

Table 2.4 reports the results of panel cointegration test\(^3\). For each of the chosen sectors, the results lead to the rejection of the null hypothesis that there is no cointegration between share prices and dividends. This implies that share price and dividend are cointegrated i.e. a long-run equilibrium relation exists between share price and dividend.

**Table 2.4: Panel Cointegration Test Results**

Null hypothesis (\(H_0\)): No cointegration between share price and dividend

<table>
<thead>
<tr>
<th>Sector</th>
<th>Group-ADF test statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Goods</td>
<td>-7.06 (0.00)</td>
</tr>
<tr>
<td>Healthcare</td>
<td>-4.85 (0.00)</td>
</tr>
<tr>
<td>Metal</td>
<td>-10.07 (0.00)</td>
</tr>
<tr>
<td>PSU</td>
<td>-7.57 (0.00)</td>
</tr>
</tbody>
</table>

Note: Numbers in (#) are \(p\)-values; PSU – Public Sector Undertaking

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\(^3\) Panel-ADF and Group-ADF statistics have better small sample properties as compared to other statistics (Lee & Chang, 2008). Of these two statistics, the group-ADF statistic allows potential heterogeneity across individual members of the panel. Hence, the Group-ADF test statistic is considered for the test of cointegration.

\(^4\) The panel cointegration test is performed in Eviews.
2.3.3 GROUP MEAN PANEL FMOLS RESULTS

Since share price and dividend are cointegrated, the group mean panel FMOLS method is employed to estimate the cointegrating parameter. The estimates of the cointegrating parameter and the corresponding \( t \)-statistic for each of the chosen sectors are presented in table 2.5\(^5\).

**Table 2.5: Group Mean Panel FMOLS Results**

<table>
<thead>
<tr>
<th>Sector</th>
<th>( \beta ) Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Goods</td>
<td>87.71 [9.33]***</td>
</tr>
<tr>
<td>Healthcare</td>
<td>26.63 [4.07]***</td>
</tr>
<tr>
<td>Metal</td>
<td>93.75 [15.80]***</td>
</tr>
<tr>
<td>PSU</td>
<td>42.51 [16.81]***</td>
</tr>
</tbody>
</table>

Note: Numbers in [#] are \( t \)-values; PSU – Public Sector Undertaking; \( \beta \) is the cointegrating parameter; *** denotes significance at 1% level

From the results of table 2.5, it is found that the cointegrating parameter \( \beta \) is positive and statistically significant for all the sectors under consideration. This finding implies that dividend has a significant positive influence on share prices.

2.3.4 PANEL LONG-RUN CAUSALITY TEST RESULTS

In order to infer the direction of causality between share price and dividend, the error correction model\(^6\) of the form given in equation (2.4) is estimated and the results of the same are reported in table 2.6.

3 The estimates are obtained using the RATS code provided by Peter Pedroni.

6 This is estimated in Win RATS using the RATS code provided by Peter Pedroni.
Table 2.6: Panel Long-run Causality Test Results

<table>
<thead>
<tr>
<th>Sector</th>
<th>$\lambda_1: D_{i,t} \rightarrow P_{i,t}$</th>
<th>$\lambda_2: P_{i,t} \rightarrow D_{i,t}$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimate</td>
<td>Test</td>
</tr>
<tr>
<td>CAPITAL GOODS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group Mean</td>
<td>-0.68</td>
<td>-10.47</td>
</tr>
<tr>
<td>Lambda-Pearson</td>
<td>-</td>
<td>155.35</td>
</tr>
<tr>
<td>HEALTHCARE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group Mean</td>
<td>-0.89</td>
<td>-2.49</td>
</tr>
<tr>
<td>Lambda-Pearson</td>
<td>-</td>
<td>329.55</td>
</tr>
<tr>
<td>METAL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group Mean</td>
<td>-0.16</td>
<td>-2.60</td>
</tr>
<tr>
<td>Lambda-Pearson</td>
<td>-</td>
<td>416.77</td>
</tr>
<tr>
<td>PSU</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group Mean</td>
<td>-0.78</td>
<td>-3.03</td>
</tr>
<tr>
<td>Lambda-Pearson</td>
<td>-</td>
<td>793.87</td>
</tr>
</tbody>
</table>

Note: $D$ – Dividend; $P$ - Share Price; PSU – Public Sector Undertaking

In table 2.6, the parameter $\lambda_1$ indicates the long-run causal effect of dividend on share price. For all the sectors under consideration, the results of group mean based test reject the null hypothesis that dividend has a zero average long-run effect on share price. Similarly, for all the chosen sectors, the lambda-Pearson test rejects the null hypothesis that the long-run effect of dividends on share price is pervasively.
zero. These results indicate that, in each of the sectors under consideration, dividend has long-run causal effect on share price.

The parameter $\lambda_2$ indicates the long-run causal effect of share price on dividend. The results of group mean based test, for each of the chosen sectors, fail to reject the null hypothesis that share price has a zero average long-run effect on dividend. However, for all the sectors under consideration, the results of lambda-Pearson test reject the null that the long-run effect of share price on dividend is pervasively zero.

Such variation in the results of group mean based test and lambda-Pearson test can occur when the values of individual $\lambda$’s are significantly positive for some fraction of the panel and significantly negative for the remaining portion of the panel. In such situations, it can be inferred that a long-run causal effect is present, even though it is positive for some members of the panel and negative for others (Canning & Pedroni, 2008). The results of $\lambda_2$ thus indicate that, in each of the chosen sectors, share price has long-run causal effect on dividend.

In sum, the results of the empirical investigation point out that, in each of the sectors under consideration, bi-directional long-run causality exists between share prices and dividends. This finding implies that, in the Indian market, share prices and dividends affect each other in the long-run.
2.4 CONCLUSION

The long-run relations between share prices and dividends has been investigated by the extant studies based on two important theoretical frameworks, viz., present value model of stock price and the Lintner’s (1956) dividend model. As per Campbell & Shiller (1987), for the present value model of stock price to hold, stock prices and dividends should be cointegrated. This proposition has been tested by a number of studies. Also, considerable amount of research work has been carried out on the causal relations between share prices and dividends. However, the extant studies have been carried out for foreign markets and no study has, so far, examined this issue for the Indian market.

In this chapter, an attempt has thus been made to examine whether share prices and dividends of Indian firms affect each other in the long-run. For this purpose, panel data comprising of annual time series data over the period 1999-2008 and cross section data pertaining to four sectors, viz., capital goods, healthcare, metal and PSU is used. The empirical investigation is carried out in four steps. First, the unit root properties of the data are examined using panel unit root tests, viz., Fisher-ADF and Fisher-PP test. The test of cointegration between share prices and dividends is then carried out by employing the panel cointegration test of Pedroni (1999), which is followed by the application of fully modified ordinary least squares method of Pedroni (2000) to estimate the cointegrating parameter. Finally, panel correction model of Canning & Pedroni (2008) is employed to infer the direction of long run causality between share prices and dividends.
The results of panel unit root tests reveal that both share prices and dividends are integrated of order one. From the panel cointegration test, it is found that both the series are cointegrated and bear a long-run equilibrium relationship. The results of error correction model indicate that, for each of the sectors under consideration, there exists bi-directional long-run causality between share prices and dividends. This finding implies that, in the Indian market, both share prices and dividends affect each other in the long-run.