

Data and Methodology

This study aims to determine long-term relationship between R&D expenditure and sales growth data for 26 Turkish manufacturing firms which range from 2007-Q1 to 2014-Q3. For this purpose, the relationship between R&D expenditure data⁴ which are reported in accordance with International Financial Reporting Standards (IFRS) and are classified as research activities in accordance with International Accounting Standard (IAS) 38 with sales revenue data are tested by panel data analysis unlike the methods of Table 1.

In this study, the long-term relationship between the panels has been tested by Durbin-Hausman panel cointegration test. In order to obtain results of Durbin-Hausman cointegration test, firstly, candidate cointegration must be estimated and thus residuals be obtained. Then, in order to consider cross-correlation, these residuals are decomposed by using principal components method. After observing common factor, if obtained error terms are stationary, it is determined that there is cointegration among equity variables. In this context, one of the two tests recommended by Westerlund (2008) is Durbin-Hausman panel test. This test performs analysis by assuming that the autoregressive parameters don't change between industries. According to this test, a rejection of null hypothesis means that there is a cointegration relationship in all panels. On the other hand, the second test is Durbin-Hausman group test which also allows parameter differentiation between industries. Alternative hypothesis of this test does not indicate that there is a cointegration relationship in all panels. It indicates that there is at least one cointegration relationship in panel (Bayar and Tokpinar, 2014). In order for the implementation of this test, there is not also condition that series are stationary at the same level; however, independent variable must be stationary I(1) level, and may be stationary I(0) or I(1).

After this step, CCE estimator, which forecast long-run regression coefficient of the explanatory variable under cross section dependency, recently advanced by Pesaran (2006), must be estimated in order to interpret the analysis results.

Empirical Findings

Slope Homogeneity and Cross Section Dependency Test have an important place in determining panel cointegration test used here. Accordingly, both panels have heterogeneous structure according to Slope Homogeneity test in Table 2. With respect to cross sectional dependency, instead of using Breusch and Pagan (1980) CDLM test whose results are not dependable when individual means are different than zero, Pesaran's (2008) CDLM_{adj} Test is used that gives test statistics by taking into accounting variation and means.

Table 2. Pesaran and Yamagata (2008) Slope Homogeneity Test Results

	Test Statistics	P-Values
Δ	18.03	0.00
Δ_{adj}	19.28	0.00

Table 3. Cross Section Dependency Test Results

	R&D Expenditure	Sales Growth
CDLM (1980)	528.31 (0.00)*	581.86 (0.00)*
Bias-adjusted CDLM (2008)	1.58 (0.06)**	1.52 (0.06)**

Note: Values in parentheses indicate p-values. *, ** indicate significant at 1% and 10% level.

⁴According to IAS 38, R&D expenditures which its benefits are consumed in the same period are classified as expense, while R&D expenditures which its benefits will be consumed in following periods are classified as intangible assets.

