Tests of Homogeneity in Panel Data with EViews

Khouiled, Brahim

University of Ouargla

14 June 2018

Tests of Homogeneity in Panel Data with EViews

Brahim Khouiled

University of Ouargla, Algeria

Abstract

This paper presents **Hsiaotest**, an EViews Add-in that facilitates the performance of homogeneity tests in Panel data. Detection strategy is based on three standard Fischer tests. The add-in implements these tests and the output shows of the main null and alternative hypotheses for each test.

Keywords: Panel data, Specification, Homogeneous, Heterogeneous, Fisher test, EViews.

1. Introduction

Considering a panel data sample, the first thing that should be checked is the homogeneous or heterogeneous specification generator process data. It is necessary to adopt a procedure of nested homogeneity tests, the general test procedure presented in Hsiao (1986).

2. General Testing Procedure

Let's assume one explanatory variable, we have the following equation $\forall\ i \in [1, N],\ \forall\ t \in [1, T]$:

$$y_{it} = \alpha_i + \beta_i\, x_{it} + \varepsilon_{it} \tag{1}$$

Where a sample of T observations of N individual processes, $\alpha_i\ \beta_i \in \mathbb{R}$, and the innovations ε_{it} are assumed to be *i.i.d.* with zero mean and variance equal to σ_ε^2.

It is necessary to assume that the parameters α_i and β_i of the model (1) may differ in individual dimension, but the they are assumed constant over time.

There are (07) Steps - at most - to run the tests of homogeneity according to Hsiao strategy:

1. Estimate the model (1) and test the following composite hypothesis:

$$H_o^1: \alpha_i = \alpha \quad \beta_i = \beta \quad \forall\ i \in [1, N]$$

$$H_1^1: \exists\ (i,j) \in [1, N] \,/\, \alpha_i \neq \alpha_j \text{ or } \beta_i \neq \beta_j$$

2. If we accept the null hypothesis, *there is homogeneity between the individuals, so the model is a pooled* as the following form:

$$y_{it} = \alpha + \beta\, x_{it} + \varepsilon_{it} \tag{2}$$

3. If we reject the null hypothesis, we reestimate the model (1) and test the following hypothesis:

$$H_o^2 : \beta_i = \beta \quad \forall\ i \in [1, N]$$

$$H_1^2 : \exists\ (i,j) \in [1, N] / \beta_i \neq \beta_j$$

4. If we reject the null hypothesis, we reject the panel structure, in other words, *there is a total heterogeneity between the individuals*, *and the model is composed of N Equation* as the following form:

$$y_{it} = \alpha + \beta_i\, x_{it} + \varepsilon_{it} \tag{3}$$

5. If we accept the null hypothesis, we estimate the model (4):

$$y_{it} = \alpha_i + \beta\, x_{it} + \varepsilon_{it} \tag{4}$$

And test the following hypothesis:

$$H_o^3 : \alpha_i = \alpha \quad \forall\ i \in [1, N]$$

$$H_1^3 : \exists\ (i,j) \in [1, N] / \alpha_i \neq \alpha_j$$

6. If we accept the null hypothesis, *there is a total homogeneity between the individuals, and the model is a pooled* like the (2).

7. If we reject the null hypothesis, *so the panel is partially homogeneous* e.i *heterogeneous intercepts homogeneous slope, and the model has individual effects* as the form (4).

3. Construction of tests statistics

We will present the construction of various Fischer tests which that are used in this procedure.

Test of total homogeneity by testing the hypothesis H_o^1, the Fischer statistics associated with this test F_1 is written in the following form with *(N-1)(K+1)* and *NT-N(K+1)* degrees of freedom and *K* explanatory variables:

$$\text{F1} = \frac{(RSSr - RSSu)/\,[(N-1)(K+1)]}{RSSu/\,[NT - N(K+1)]}$$

Where *RSSu* is the sum of squared residuals of the model (1), and *RSSr* is the sum of squared residuals of the model restricted (2).

Test of homogeneity of slopes β_i by testing the hypothesis H_o^2, the Fischer statistics associated with this test F_2 is written in the following form with *K(N-1)* and *NT-N(K+1)* degrees of freedom:

$$\text{F2} = \frac{(RSSr' - RSSu)/\,[K(N-1)]}{RSSu/\,[NT - N(K+1)]}$$

Where *RSSu* is the sum of squared residuals of the model (1), and *RSSr′* is the sum of squared residuals of the model restricted (4).

Test of homogeneity of intercepts α_i by testing the hypothesis H_o^3, the Fischer statistics associated with this test F_3 is written in the following form with *(N-1)* and *N(T-1)-K* degrees of freedom:

$$F3 = \frac{(RSSr - RSSr')/\,(N-1)}{RSSr'/\,[N(T-1)-K]}$$

Where *RSSr* is the sum of squared residuals of the pooled model (2), and *RSSr'* is the sum of squared residuals of the model an individual effects (4).

4. Using the add-in

An example will be showed using data of the financial leverage ratios *(FLR)* and of the developing capital *(DCA)* of hydrocarbons enterprises in Ouargla (Algeria), with eight (8) cross-section represented the enterprises and seven (7) periods from 2010 to 2016. The data are plotted in figure1.

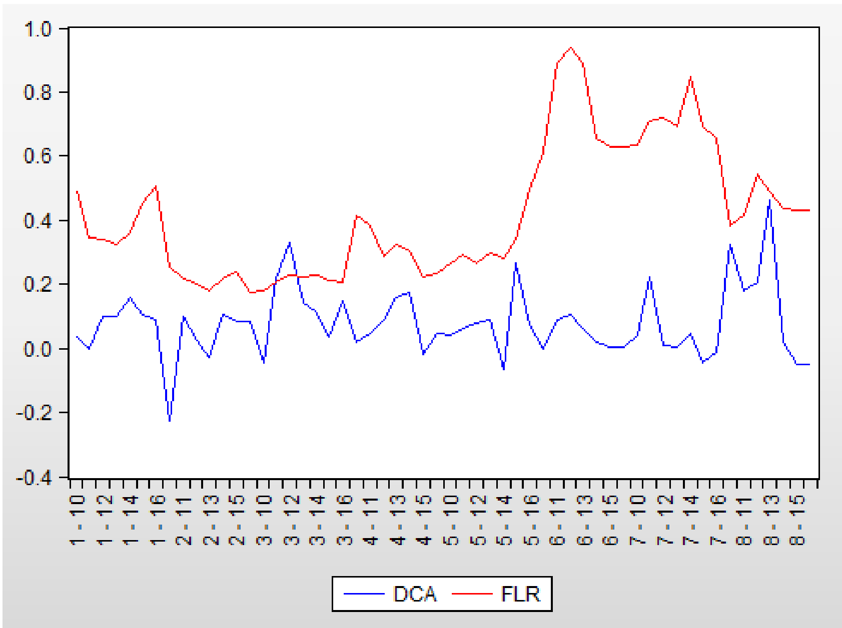

Figure 1: *FLR* and *DCA*

After installing the add-in, the user has to click in *Add-ins->Hsiao Test* to perform the test, then the window showed in figure 2 will appear, the add-in contains three options:

Enter the dependent variable: in our example, we should write *DCA*.

Enter the list of regressors: for write the explanatory variables (in our example *FLR*).

Enter the number of crossid: which is equal to 8 the number of individuals in our example.

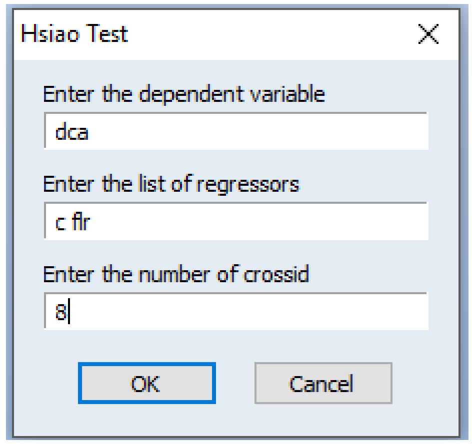

Figure 2: Add-in window

After pressing the "OK" button, will get the results table as in figure 3.

Specification Tests of Hsiao (1986)

H1 = Null Hypothesis : panel is homogeneous versus Alternative Hypothesis : H2
H2 = Null Hypothesis : H3 versus Alternative Hypothesis : panel is heterogeneous
H3 = Null Hypothesis : panel is homogeneous versus Alternative hypothesis : panel is partially homogeneous

Hypotheses	F-Stat	P-Value
H1	4.582653	7.39E-05
H2	0.801706	0.590702
H3	1.534953	0.178893

This program has developed By Brahim KHOUILED
University of Ouargla, Algeria

Figure 3: Results of specification tests

It can be seen that the panel is totally homogeneous i.e *the appropriate form is a pooled model*.

References

HSIAO C. (2003), "Analysis of Panel Data", 2^{nd} ed, Cambridge University press, UK.

HURLIN C. (n.d.), "L'Econométrie des Données de Panel", Ecole Doctorale Edocif (*Séminaire Méthodologique)*, Université d'Orléans.

Related Information:

Package name: hsiao
Default proc name: hsiaotest
Default Menu Text: Hsiao Test
Add-in URL: http://www.eviews.com/Addins/hsiao.aipz

Author: Brahim Khouiled
Affiliation: LAQSEF - University of Ouargla - Algeria
My personal website: https://sites.google.com/site/khouiledibrahim