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Model specification in panel data unit root tests with an unknown break

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Abstract

Although the impact of structural breaks on testing for unit root has been studied extensively for univariate time-series, such impact on panel data unit root tests is still relatively unknown. A major issue is the choice of model in accommodating different types of break prior to testing for unit root. Model misspecification has been known to affect unit root tests performance in the univariate case but the effect of misspecification on panel tests is still unknown. This paper has two objectives: (i) it proposes a new test for unit root in the presence of structural break for panel data. The test allows the intercepts, the trend coefficients or both to change at different date for different individuals. Moreover, the test allows for the possibility that only some, but not all, of the individuals experienced structural breaks. Under some mild assumptions, the test statistics is shown to be asymptotically normal which greatly facilitates valid inferences. (ii) This paper provides a systematic study on the impact of structural instability on testing for unit root using Monte Carlo Simulation. The results show that correct specification is crucial for unit root testing in the presence of structural instability. In addition, the proportion of individuals experienced structural instability can also affect the performance of the test substantially.

Keywords: Structural change; Unit roots tests; Model specification; Heterogeneous; Panels; Monte Carlo

1. Introduction

In the time-series literature, the presence of intercept and/or slope structural change has altered the perception of unit root testing as structural breaks lead very often to the under-rejection of the null hypothesis. See for example the seminal work by Perron [20–23]. Perron's test was subsequently modified for the case of unknown (determined endogenously) breakpoint in [28] which proposed a minimum t-statistic testing the null of a unit root with no breaks against the alternative of one unknown break [17] extended [28] for two breakpoints. [16] have recently provided a unit root test of the null hypothesis of a unit root with two unknown breaks against the alternative of trend stationary data with two unknown breaks.

The unit root tests proposed in [28] and [17], the null hypothesis of a unit root is tested for each variable of concern against the alternative of unknown structural break(s). The rejection of the null of these tests does not

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