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Short paper

Real interest parity: A note on Asian countries using panel stationarity tests[☆]

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ABSTRACT

Existing panel data studies of real interest parity are either unable to identify which panel members are characterised by stationary real interest differentials, or are subject to size distortion resulting from the presence of structural breaks and cross-sectional dependencies. Using a panel stationarity testing procedure recently advocated by Hadri and Rao (2008) that allows for structural breaks and cross-sectional dependency, we are unable to reject the stationarity of Asian real interest rate differentials.

1. Introduction

The extent to which real interest rates are equalised across countries has occupied researchers for a number of reasons. While real interest parity (RIP) provides an indication of whether countries are financially integrated or autonomous, its dependence on purchasing power parity (PPP) means that it can be viewed as a more general indicator of macroeconomic integration or convergence; see, for example, Dutta (2000) for a discussion on the prospects of monetary and economics integration in the Asia-Pacific region. RIP is also important as a key working assumption in various models of exchange rate determination. The purpose of this paper is to test the validity of long-run RIP among Asian economies using a testing procedure for panel stationarity that allows for serial correlation, cross-sectional dependency and structural breaks.

Since early studies such as Meese and Rogoff (1988), unit root testing of real interest rate differentials (RIRDs) has become a commonly used methodological approach providing mixed evidence on RIP. Within a time series approach, Nieh and Yau (2004) employ unit root and cointegration tests to investigate financial integration among Taiwan, Hong-Kong and China after the Asian financial crisis. While these authors find evidence of a long-run relationship between the interest rates of these countries, it is well known that univariate unit root tests can suffer from low power. In an attempt to overcome this, the more recent literature has applied various panel unit root techniques such as Im, Pesaran, and Shin (IPS) (2003) and Pesaran

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(2007). For example, Baharumshah, Haw, and Fountas (2005) examine ten Asian RIRDs using Japan as the base country. These authors find that whereas conventional augmented Dickey and Fuller (ADF) (1979) testing fails to support RIP in half the cases, evidence based on panel unit root tests points to mean reverting behaviour. Further support of RIP based on panel data unit root tests includes Wu and Chen (1998) and Banerjee and Singh (2006), who consider Asian countries as part of wider samples. The tests employed in the above-mentioned studies are of the joint null of a unit root against the alternative of at least one stationary series in the panel. However, the joint null could be rejected if only a fraction of the series in the panel is stationary. There are further grounds for caution because the presence of cross-sectional dependencies among panel members can undermine the asymptotic normality of the tests leading to over-rejections of the null.

To address these issues, we examine Asian RIRDs using a test advocated by Hadri and Rao (2008). The null hypothesis that all individual series are stationary is tested against the alternative of at least one single unit root in the panel. One may therefore conclude that all RIRDs in the panel are stationary if the joint null is not rejected. There are further key advantages. On the issue of size distortion, this procedure takes into account both serial correlation and cross-sectional dependency through the implementation of an autoregressive (AR)-based bootstrap. Also, this test allows for the presence of structural breaks that might arise with, say, changes in capital mobility. Indeed, Baharumshah et al. (2005) impose a structural break at 1985 which they argue corresponds to the pre- and post-liberalisation eras. In contrast, in this paper we allow for potentially different endogenously determined breaking dates across the individuals in the panel.

The outline of the paper is as follows. Section 2 briefly reviews the theoretical foundations of the real interest parity condition. Section 3 presents the Hadri-based approaches for testing stationarity in heterogeneous panels of data, allowing for the likely presence of endogenously determined structural breaks and cross section dependence. Section 4 describes the data and presents the results of the empirical analysis and Section 5 concludes.

2. Real interest parity: theoretical overview

In the two-country modelling of the relationship between domestic and foreign interest rates (denoted as i_t and $i_i^{\bullet}$, respectively), perfectly substitutable bonds denominated in the home and foreign currencies are related according to the uncovered interest parity (UIP) relationship:

$$\Delta s^e_{t+1} = i_t - i^{\bullet}_t, \tag{1}$$

where Δs^e_{t+1} is the one-period ahead expected change in the nominal exchange rate measured as the domestic price of foreign currency. Assuming that the relationship between the two open economies is also characterised by the PPP linkage, the expected change in the exchange rate, conditional on current information, will depend on the relative rates of expected price inflation. The *ex ante* relative PPP suggests that the exchange rate responds to offset spreads in expected inflation between countries

$$\Delta p^e_{t+1} - \Delta p^{\bullet e}_{t+1} = \Delta s^e_{t+1}, \tag{2}$$

where Δp^e refers to the expected rate of inflation, with p expressed as the natural logarithm of the price level. Eqs. (1) and (2) can be used to imply $i_t - i^{\bullet}_t = \Delta p^e_{t+1} - \Delta p^{\bullet e}_{t+1}$, and so

$$i_t - \Delta p^e_{t+1} = i^{\bullet}_t - \Delta p^{\bullet e}_{t+1}. \tag{3}$$

Further, assuming that nominal interest rates satisfy the Fisher parity relationship, $r_t = i_t - \Delta p^e_{t+1}$ and $r^{\bullet}_t = i^{\bullet}_t - \Delta p^{\bullet e}_{t+1}$ lead to the relationship described by Eq. (3) as RIP,

$$r_t = r^{\bullet}_t. \tag{4}$$

Using Eq. (4), we obtain the RIRD as $y_t = r_t - r^{\bullet}_t$. Thus, the validity of the RIP hypothesis would be based on an examination of the time-series properties of this differential, or put another way whether or not domestic and foreign real interest rates are cointegrated with a $[1,-1]'$ cointegrating vector, which is equivalent to testing whether the RIRD is stationary.

3. Econometric methodology

It is well known that unit root and stationarity tests applied to univariate RIRD series suffer from low power. To overcome this, we employ a panel data approach which enhances the power of the tests as it combines both time-series and cross section dimensions. The most widely used unit root tests applied to panels include Maddala and Wu (1999), Im et al. (2003) and more recently Pesaran (2007), all of which test the joint null hypothesis of a unit root against the alternative of at least one stationary series in the panel. These tests are based on ADF statistics across the cross-sectional units of the panel. However, Im et al. (2003, p. 73) warn that due to the heterogeneous nature of the alternative hypothesis in their test, caution has to be exercised when interpreting such results because the null hypothesis of a unit root in each cross section may be rejected when only a fraction of the series in the panel is stationary. An additional concern here is that the presence of cross-sectional dependencies can undermine the asymptotic normality of the IPS test and lead to over-rejection of the null hypothesis of joint non-stationarity.