International Review of Economics and Finance 20 (2011) 679–689

Contents lists available at ScienceDirect

International Review of Economics and Finance

journal homepage: www.elsevier.com/locate/iref

The term structure of interest rates, the expectations hypothesis and international financial integration: Evidence from Asian economies

Mark J. Holmes [a,*], Jesús Otero [b], Theodore Panagiotidis [c]

[a] Department of Economics, University of Waikato, New Zealand
[b] Facultad de Economía, Universidad del Rosario, Colombia
[c] Department of Economics, University of Macedonia, Greece

ARTICLE INFO

Article history:
Received 23 March 2010
Received in revised form 22 November 2010
Accepted 22 November 2010
Available online 29 November 2010

Jel classification:
C33
F31
F33
G15

Keywords:
Heterogeneous dynamic panels
Term structure
Mean reversion
Panel stationarity test

ABSTRACT

The validity of the expectations hypothesis of the term structure is examined for a sample of Asian countries. A panel stationarity testing procedure is employed that addresses both structural breaks and cross-sectional dependence. Asian term structures are found to be stationary and supportive of the expectations hypothesis. Further analysis suggests that international financial integration is associated with interdependencies between domestic and foreign term structures insofar as cross-term structures based on differentials between domestic (foreign) short- and foreign (domestic) long-rates are also stationary.

1. Introduction

The expectations hypothesis of the term structure of interest rates (EHTS) postulates a formal relationship between long- and short-term interest rates such that the long rate is an average of current and expected future short rates. This can be contrasted with the segmentation theory which argues that uncertainty can provide a rationale for the absence of perfect arbitrage, so that bonds of different maturities are no longer perfect substitutes for each other, since different maturities involve different risks of capital gain or loss. Which viewpoint prevails has strong implications for both econometric model building and the conduct of monetary policy, particularly since many macroeconomic models typically employ a single interest rate in representations of the economy despite the presence of a spectrum of differing maturities upon which decision-making is based. If the expectations theory prevails, then central banks can influence long-rates by operating at the short-end of the market. In addition to this, the EHTS is related to the concept of market efficiency insofar as two implications of the EHTS are that the forward rate is an unbiased predictor of future spot rates, and that this predictor cannot be improved by using any currently available information.

A large volume of research into the term structure of interest rates has tested the EHTS where in the majority of cases, it has been rejected (see, for example, Mankiw, 1986; Mankiw & Summers, 1984; Shiller, Campbell, & Schoenholtz, 1983; Taylor, 1992). Conversely, studies such as MacDonald and Speight (1988) have found evidence in favor of the EHTS. The majority of this literature has largely been concerned with the case of a closed economy, thereby ignoring international influences on the domestic term

* Corresponding author. Tel.: +64 7 838 4454; fax: +64 7 838 4331.
E-mail addresses: holmesmj@waikato.ac.nz (M.J. Holmes), jesus.otero@urosario.edu.co (J. Otero), tpanag@uom.gr (T. Panagiotidis).

1059-0560/$ – see front matter © 2010 Elsevier Inc. All rights reserved.
doi:10.1016/j.iref.2010.11.021

structure. However, the liberalization of international financial markets makes the case for modeling the domestic term structure at an international context stronger, where foreign monetary policy and term structures ultimately influence the domestic term structure of interest rates. Additionally, Bekaert, Wei, and Xing (2007) point out that both theorists and policy makers have often ignored the deviations from uncovered interest rate parity (UIP) and the EHTS demonstrated by empirical research.

This study seeks to further our understanding of term structure behavior by testing the applicability of the EHTS for a sample of seven Asian countries. As argued below, existing evidence concerning Asian countries offers only mixed support. Further research on this important unresolved issue is therefore warranted. It is conceivable that low test power is a contributory factor driving the conclusions so far drawn. We therefore adopt a panel data approach. However, in sharp contrast to the existing literature, our methodology is based on testing for the joint stationarity, rather than joint non-stationarity, of national term structures. For this purpose, we utilize a panel data approach advocated by Hadri and Rao (2008). Whereas existing panel unit root tests provide no guidance on which sample members are responsible for rejecting the null of joint non-stationarity, the Hadri and Rao procedure addresses this issue. In panel unit root tests, it is well known that size distortion can result from cross sectional dependency among the series and structural breaks in the data. We attend to this issue through the implementation of a bootstrap procedure and we incorporate endogenously-determined structural breaks into our analysis.

The outline of the paper is as follows. Section 2 discusses issues with modeling the term structure and associated literature. Section 3 reviews the Hadri-based approaches for testing the term structure of interest rates in a sample of selected Asian economies, 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. We offer support for the EHTS noting evidence consistent with domestic (foreign) short rates cointegrated with foreign (domestic) long rates against a background of interdependent national financial markets. Section 5 concludes.

2. The expectations hypothesis of the term structure

The EHTS of interest rates states that the yield to maturity of an n-period bond $R_{n,t}$ will equal an average of the current and future rates on a set of m-period short-yields $R_{m,t}$ with $m<n$, plus the term premium reflecting risk and/or liquidity considerations. The relationship can be expressed in the following form

$$\left(1 + R_{n,t}\right)^n = \varphi^*_{n,t} \prod_{i=0}^{n-1} \left(1 + E_t R_{m,t+i}\right), \tag{1}$$

where $\varphi^*_{n,t}$ denotes a possible non-zero n-period term premium and E_t is the expectations operator conditional on information up to and including time t. The equality in Eq. (1) is established by the condition of no arbitrage opportunities to investors willing to hold both short-term and long-term bonds. Log-linearising Eq. (1), we get

$$R_{n,t} = \varphi_{n,t} + \left(\frac{1}{n}\right) \sum_{i=0}^{n-1} E_t R_{m,t+i}, \tag{2}$$

where $\varphi_{n,t} = \log(\varphi^*_{n,t})$. Eq. (2) indicates that the yield of the n-period bond and the m-period short yields are functionally related. It is convenient to re-express Eq. (2) as

$$\left(R_{n,t} - R_{m,t}\right) = \varphi_{n,t} + \left(\frac{1}{n}\right) \sum_{i=1}^{n} \left(E_t R_{m,t+i-1} - R_{m,t}\right). \tag{3}$$

The left hand side of Eq. (3) represents the spread between the n-period (long-term) yield and the m-period (short-term) yield as determined by the term premium and investors' expectations of changes in future yields. Eq. (3) can be regarded as an "attractor" towards which $(R_{n,t} - R_{m,t})$ might move in the long-run. As argued by Siklos and Wohar (1996) and Chiang and Kim (2000) among others, while short-run deviations will occur, the key issue is whether or not in the long-run (a period of time over which investors have had sufficient time to react to this disequilibrium) portfolio adjustment will ensure that yields will adjust and eliminate departures from the long-run equilibrium. In this respect, the stationarity of $(R_{n,t} - R_{m,t})$ can provide long-run support for the EHTS.

Whether or not $(R_{n,t} - R_{m,t})$ is I(0) will depend on the time series properties of the right hand side variables, $\varphi_{n,t}$ and $\left(\frac{1}{n}\right) \sum_{i=1}^{n} \left(E_t r_{m,t+i-1} - r_{m,t}\right)$, and any relationship between them. $(R_{n,t} - R_{m,t})$ will be I(0) if $\varphi_{n,t}$ and $\left(\frac{1}{n}\right) \sum_{i=1}^{n} \left(E_t r_{m,t+i-1} - r_{m,t}\right)$ are themselves I(0). However, $(R_{n,t} - R_{m,t})$ might also be I(0) if $\varphi_{n,t}$ and $\left(\frac{1}{n}\right) \sum_{i=1}^{n} \left(E_t r_{m,t+i-1} - r_{m,t}\right)$ are I(1) and cointegrated with a unity vector. On the other hand, $(R_{n,t} - R_{m,t})$ will be I(1) if one of $\varphi_{n,t}$ or $\left(\frac{1}{n}\right) \sum_{i=1}^{n} \left(E_t r_{m,t+i-1} - r_{m,t}\right)$ is I(1), or if both are I(1) but not cointegrated. Under these scenarios, the EHTS does not hold in the long-run.

The basic concept underlying the international determination of the term structure is that of financial integration across markets of similar maturity and risk (see, for instance, Holmes & Pentecost, 1997). In a two-country world therefore, the expected depreciation of the home currency $x_{m,t}$ will be closely linked to the differential between the domestic short term rate $R_{m,t}$ and foreign rate $R^f_{m,t}$ by the uncovered interest rate parity condition, which we can write as

$$x_{m,t} = \left(R_{m,t} - R^f_{m,t}\right) + \psi_{m,t} + z_t, \tag{4}$$