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Are Southeast Asian real exchange rates mean reverting?

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ABSTRACT

Since the late nineties, both theoretical and empirical analysis devoted to the real exchange rate suggest that their dynamics might be well described by nonlinear models. This paper examines this possibility for post-1970 monthly ASEAN-5 data, extending the existing research in two directions. First, we use recently developed unit root tests which allow for more flexible nonlinear stationary models under the alternative than the commonly used Self-Exciting Threshold or Exponential Smooth Transition AutoRegressions. Second, while different nonlinear models survive the mis-specification tests, a Monte Carlo experiment from generalized impulse response functions is used to compare their relative relevance. Our results (i) support the nonlinear mean-reverting hypothesis, and hence the Purchasing Power Parity, in most of the ASEAN-5 countries and (ii) point to the Multiple Regime-Logistic Smooth Transition and the Exponential Smooth Transition AutoRegression models as the most likely data generating processes of these real exchange rates.

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1. Introduction

Over the last decade, the empirical unit root and/or cointegration tests of the long run Purchasing Power Parity relationship have shifted from a linear towards a nonlinear setup.¹ Basically, the general equilibrium models developed by, e.g. Dumas (1992), Sercu et al. (1995), or Berka (2004) imply a nonlinear dynamics for the real exchange rate in presence of trading costs. The underlying idea is

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¹ See Rogoff (1996) for a comprehensive survey of the literature in the linear framework, and Balke and Fomby (1997) for an introduction to the rationale of the nonlinear modelling of the real exchange rates.

that international trade in goods occurs only when the gain expected from the home and foreign price differential is large enough to offset trading costs. Once trade takes place across countries, it induces changes in home and foreign prices which bring the real exchange rate back into the area where international arbitrage is not profitable anymore. The latter area is a non-arbitrage zone where the real exchange rate behaves like a non-stationary process. However, since any price differential larger than the trading costs will trigger corrective international trade, the real exchange rate process is globally stationary or stable. Due to the random-walk like dynamics of the real exchange in the inner regime, most of the observations belong to the latter: this in turn explains the failure of linear unit root tests to detect the global stationarity of the process. Hence, specific unit root tests have been recently developed in order to consider a nonlinear stationary under the alternative hypothesis (see, e.g. Enders and Granger, 1998; Lo and Zivot, 2001; Kapetanios et al., 2003; Bec et al., 2004; Park and Shintani, 2005; Bec et al., 2008, 2010).

The empirical relevance of these theoretical implications has been explored by a large number of studies for the main OECD countries, using either discontinuous or smooth threshold autoregressive models. The empirical analysis by Michael et al. (1997), Obstfeld and Taylor (1997), Kilian and Taylor (2003), Taylor et al. (2001), Bec et al. (2004, 2008) or Bec et al. (2010) among others provide some support to the PPP relation from multiple regime models for real exchange rate data. Only a few papers have explored this issue for Asian exchange rates data so far. Yet, as stressed by Kim et al. (2009), the PPP assumption has a special meaning to Southeast Asian countries. Actually, the countries belonging to the Association of Southeast Asian Nations (ASEAN hereafter) aim to create an ASEAN Economic Community by 2015, which could be a first step towards a monetary union.² Hence, the PPP relation could prove very useful to choose the optimal common currency for the potential currency union among Southeast Asian countries.

Most of the earlier papers investigating the possible nonlinear PPP relationship for Southeast Asian data have done so by introducing the possibility of structural breaks under the stationary alternative, either using time series techniques (see, e.g. Aggarwal et al. (2000) or Zurbrugg and Allsopp (2004)) or panel data econometrics (as in Wu et al. (2004)). They generally find that the unit root null rejection rate is larger in the structural break analysis than in the standard linear setup. More recently, Kim et al. (2009) also find support to the PPP relationship in the Southeast Asian real exchange rates from time-varying cointegration coefficients approach. More precisely, their results are compatible with the PPP for Indonesia, Korea, Philippines and Singapore when the base currency is the U.S. Dollar.

Concurrently, but to a somewhat lesser extent, unit root tests against a threshold-type nonlinear alternative have been explored for these real exchange rate data. First, Liew et al. (2004) apply the unit root test developed by Kapetanios et al. (2003) for a nonlinear Exponential Smooth Transition Auto-Regression (ESTAR) stationary alternative to 11 Asian real exchange rates and reject the null for eight U.S. Dollar based rates data. More recently, Choi et al. (2011) use the *inf-t* unit root test proposed in Park and Shintani (2005) against various nonlinear stationary alternatives including Threshold Autoregression (TAR) and Logistic Smooth Transition Autoregression (LSTAR) models. When the U.S. dollar is the numeraire currency, they find that 63% of the real exchange rates of Southeast Asian currencies are consistent with nonlinear stationary processes. Our contribution to this strand of empirical research is twofold.

First, we enlarge the set of unit root tests used in previous works to cover a wider class of relevant nonlinear stationary models under the alternative for the Southeast Asian real exchange rates. Actually, we implement the unit root tests developed by Bec et al. (2010) and Bec et al. (2008). The former is built against a Multiple Regime Logistic Smooth Transition Autoregression (MR-LSTAR) model under the alternative hypothesis. As shown by the authors, the MR-LSTAR model has the desirable property that it allows for both ESTAR-type and SETAR-type dynamics. Yet, even though the ESTAR model is often considered as the smooth transition analogue of the SETAR model, the former does not yield the latter as a special case. Unfortunately, neither the discontinuous nor the continuous adjustment cases can be ruled out a priori on theoretical grounds. Yet, the unit root test developed by Bec et al. (2008) is

² Of course, the recent turmoil in the Euro area is closely scrutinized by the ASEAN members and the common currency project is accordingly considered as premature.

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