
The inadequacy of linear autoregressive model for real exchange rates: empirical evidence from Asian economies

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Utilizing the formal linearity test of Luukkonen, Saikkonen and Teräsvirta (*Biometrika*, 75, 491–99, 1998) as diagnostic tool, the empirical finding suggests that the linear autoregressive (AR) model is inadequate in describing the real exchange rates behaviour of 11 Asian economies. It is noted that the conventional battery of diagnostic tests is capable of identifying the inadequacy of the linear model in only three of these series. Moreover, the linearity nature of this behaviour has been formally rejected in favour of the non-linear smooth transition autoregressive (STAR) model. The finding of non-linearity in the data generating process of these real exchange rates warrants that the use of linear framework in empirical modelling and statistical testing procedures in the field of exchange rates may lead to an inappropriate policy conclusions.

I. INTRODUCTION

Time series analysis plays an important role in empirical economics research, particularly in the study of exchange rate behaviour. The usefulness of time series models in understanding the historical behaviour of the exchange rates and foretelling the future exchange rate movement has been demonstrated in much related literature (Keller, 1989; Montgomery *et al.*, 1990; Brooks, 1997). It is noted that exchange rate time series models estimated earlier are mostly based on linear framework, which has been shown inappropriate nowadays. In this regard, there has been increasing empirical evidence suggesting that exchange

rates exhibit non-linearities (Sarantis, 1999; Ma and Kanas, 2000; Sarno, 2000; Baum *et al.*, 2001; Poel *et al.*, 2001). Taylor and Peel (2000) argue that it is difficult to model exchange rates using linear framework if they are governed by non-linear process, thereby leading to unsatisfactory out-sample exchange rate forecasts using linear models.¹ As such, in order to avoid misspecification of models and unsatisfactory outcomes, it is important to determine the adequacy of linear exchange rate models before any modelling process is attempted. In this study, the scope of study is narrowed down by testing the adequacy of linear autoregressive (AR) time series model only.² The study is based on the real exchange rates of

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¹Thus, the finding that exchange rate models in the 1990s did not bring about much success as reported by Cheung *et al.* (2002) is not surprising as they included only models based on linear framework.

²Nonetheless, the results will be indicative to other linear exchange rates models such as vector autoregressive model and vector error correction model that are extended from autoregressive model.