Global Finance Journal 21 (2010) 138–151

Contents lists available at ScienceDirect

Global Finance Journal

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

Structural breaks in the real exchange rate and real interest rate relationship ☆

Joseph P. Byrne [a], Jun Nagayasu [b,*]

[a] Department of Economics, University of Glasgow, Glasgow, G12 8RT, UK
[b] Graduate School of Systems and Information Engineering, University of Tsukuba, 1-1-1 Tennodai, Tsukuba, Ibaraki 305-8573 Japan

ARTICLE INFO

Article history:
Received 13 March 2008
Accepted 3 May 2010
Available online 6 July 2010

JEL classification:
F31

Keywords:
Real exchange rate
Real interest rate differential
Nonstationarity
Structural breaks
Trace tests

ABSTRACT

In this paper we empirically examine the relationship between the real exchange rate and the real interest rate differential using recent econometric methods robust to potential structural breaks. Generally, our study provides evidence of this relationship in the long-run context. More specifically, we first focus on the UK–US relationship, and interestingly find limited evidence of this long-run relationship using traditional methods. But when an approach robust to structural breaks is employed, we find evidence that the real interest rate differential is an important determinant of the real exchange rate. Secondly, in order to investigate the relevance of structural shifts in a more global context, we replicate our analysis for a number of other exchange rates. While providing evidence of this long-run relationship, European data suggest that the presence of structural breaks is not very common across countries and is indeed country-specific.

1. Introduction

A long-run relationship between the real exchange rate and the real interest rate differential can be obtained using the conventional equilibrium conditions often used in the international finance literature. In particular, the uncovered interest parity (UIP) condition and the Fisher parity hypothesis can be considered as the starting point of a theoretical link between the real exchange rate and interest rates.[1] A number of studies have attempted to uncover evidence of an equilibrium relation based on such an approach and provided mixed results (e.g., Campbell & Clarida, 1987, Meese & Rogoff, 1988 and Edison & Pauls, 1993).

☆ We would like to thank Manuchehr Shahrokhi (editor) and two anonymous referees for useful comments. However, all errors are ours. The second author received financial support from the Murata Science Foundation.

* Corresponding author.
E-mail addresses: j.byrne@lbss.gla.ac.uk (J.P. Byrne), nagayasu@sk.tsukuba.ac.jp (J. Nagayasu).

[1] Optimising models of exchange rate determination are also suggestive of a link. See Obstfeld and Rogoff (1996).

1044-0283/$ – see front matter © 2010 Elsevier Inc. All rights reserved.
doi:10.1016/j.gfj.2010.06.002

A major concern among researchers is the low power of statistical tests to detect equilibrium relationships in international finance. Since at least Perron (1989), it has been recognized that incorrectly modelling economic variables as linear, when they are subject to substantial, unusual and infrequent shocks, can affect the usefulness of statistical results. In particular, conventional unit root and cointegration tests are biased towards the null when there is a structural break in a time series. Thus some recent evidence has highlighted the importance of testing for breaks or non-linearities when considering the real exchange rate–interest rate relationship.[2] For example, Nakagawa (2002) emphasizes non-linearities in the relationship between the real exchange rate and real interest rates. Additionally accounting for changing economic regimes and using a long history of data (1921–2002), Kanas (2005) uncovers a relationship between the US/UK real exchange rate and the real interest rate differential.

In this paper we empirically examine whether a long-run equilibrium relationship exists between the real exchange rate and the real interest rate differential. Therefore, in contrast to Nakagawa (2002) and Kanas (2005), we emphasize the potential nonstationary characteristic of the data, since there is widespread evidence of a nonstationary real exchange rate, which is the failure of PPP, and a nonstationary difference between the real interest rates across countries (Meese & Rogoff, 1988, and Edison & Pauls, 1993). For example, Kanas uses the Markov-switching vector autoregressive model although the methodology is primarily for stationary data and additionally presents evidence of a nonstationary real exchange rate. In a similar view to our paper, Edison and Melick (1999) also consider the equilibrium relationship between the real exchange rate and the real interest rate differential. They emphasize potential nonstationarity and also adjust for potential structural breaks by including shift dummies. Such an approach leads to evidence in favour of the exchange rate–interest rate differential relationship, but their result may be not be reliable since the Johansen (1988) Trace test requires adjusted critical values in the presence of structural shifts (see Lütkepohl, 2004).

This paper is laid out as follows. Section 2 considers the theory related to the real exchange rate–interest rate relationship. Section 3 explains our empirical methodology. Section 4 considers the data used in this study, and presents and interprets our empirical results. Section 5 extends the analysis to other industrial countries using single country and panel data methods in order to see if structural breaks are common phenomena across countries. This paper ends with Section 6 that summarizes our findings.

In short, using multiple-equation estimation methods robust to potential nonstationarity, we uncover results consistent with the previous literature in that there is no evidence of cointegration in the UK data when traditional linear methods are employed. However, adopting an approach set out by Saikkonen and Lütkepohl (2000, 2002) and Lanne, Lütkepohl, and Saikkonen (2002, 2003) and utilizing more powerful cointegration tests which are additionally robust to the possibility of structural breaks, we find evidence of a long-run relation. However, we caution the significance of structural breaks in a global market. Our multiple country analysis suggests that while providing evidence of this long-run relationship, the presence of structural breaks is not very common across industrial countries and thus is indeed country-specific.

2. Theoretical model

In deriving an operational equation for the relationship between the real exchange rate and real interest rates, we essentially follow Edison and Pauls (1993).[3] The two main components of this model are the UIP and the Fisher parity condition. We set out each of these in turn before defining an estimable equation. Firstly, we define the real exchange rate (q_t) as follows:

$$q_t = s_t - p_t + p_t^* \tag{1}$$

[2] Baxter (1994) also fails to find evidence of a statistical link between real exchange rate and real interest rates at the high frequency level, although a more positive vein of research finds more evidence at the low frequency or business cycle level.

[3] An alternative approach would be to adopt Dornbusch (1976) sticky price model, as used for example by Nakagawa (2002). However, this approach assumes a stationary real exchange rate, which is inconsistent with the approach we adopt in the empirical section of this paper, since we find evidence that the real exchange rate is nonstationary, even once we account for possible structural breaks. In setting out our model we illustrate that the Dornbusch's sticky price model is not a necessary component of the parity condition under consideration.