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Purchasing power parity and structural instability in the US/UK exchange rate

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ABSTRACT

The aim of this study is to determine if nonlinearities have affected purchasing power parity (PPP) since 1885. Also using recent advances in the econometrics of structural change we segment the sample space according to the identified breaks and look at whether the PPP condition holds in each sub-sample and whether this involves linear or non-linear adjustment. Our results suggest that during some sub-periods, PPP holds, although whether it holds or not and whether the adjustment is linear or non-linear, depends primarily on the type of exchange rate regime in operation at any point in time.

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1. Introduction

The popular purchasing power parity (PPP) condition has been one of the most frequented areas of research over recent years and for a good reason; not only is it a key assumption especially in general equilibrium models of exchange rate determination, but also it entails substantial implications for international trade and capital movements. The evidence on PPP however has been surprisingly mixed.¹ Interestingly, Taylor (2006) suggests that the evidence on whether this condition holds or not has systematically varied over the last thirty years. In the 1970s the evidence was largely positive. During the 1980s many studies failed to support the existence of PPP, but more recent studies have been more supportive, particularly over the long run. Therefore, it seems that the evidence depends

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¹ For a comprehensive review of the PPP literature see either Taylor and Taylor (2004) or Taylor (2006). In addition for a discussion of many of the problems and puzzles associated with PPP and the real exchange rate, see (Taylor and Taylor, 2004).

not only on the econometric techniques that are used but also on the data spans that are examined. This study aims to identify the structural breaks in the data, then test for long-run PPP using cointegration which assumes adjustment is asymmetric, based on the [Enders and Siklos \(2001\)](#) approach. This contributes to the literature by using a new approach to identify structural breaks, based on the variance as well as the mean and also using the non-linear cointegration approach to determine whether different types of exchange rate regime adjust in different ways.

The time-dependence of the evidence on PPP is not actually surprising. Specific to the US/UK exchange rate which is the focus of this paper, over the last hundred years there have been numerous changes to the exchange rate regime used by the UK and USA, beginning with the Gold standard at the turn of the last century, then involving the Bretton-Woods fixed exchange rate regime, which collapsed in 1973. This required that the UK Sterling was pegged within narrow limits to the price of Gold and therefore other currencies including the US dollar. When this system failed, both the UK and USA moved to a managed floating regime. The UK also became a member of the European Exchange Rate Mechanism (ERM) in 1990, but subsequently was forced out in September 1992. It is only natural that such changes manifest themselves as structural changes (i.e. breaks) in the stochastic process of exchange rates. Failure to take them into account leads inevitably to biased results and consequently to inappropriate inferences.

A growing strand of the literature particularly over the last two decades has tried to address this issue and robustify its results by employing several approaches for the identification of such structural changes. Probably the most popular approach to determine the number and timing of breaks, primarily due to its simplicity, is to use exogenous information. [Enders \(1988\)](#) for example, one of the first who tried to address this issue, tests for differences between fixed and floating eras. He used the Bretton-Woods agreement to define the fixed era, the period lasting until April 1971 and as the floating era the period after January 1973. More recently, [Zumaquero and Urrea \(2002\)](#) go a step further to propose three main sources of breaks for European currencies namely the oil crisis, the beginning of the European Monetary System (EMS) in the late 1970s and the volatility in the EMS during the early 1990s. A number of studies have concentrated on determining the breaks endogenously, these include [Hegwood and Papell \(1998\)](#), who find evidence of “Quasi-PPP” and [Papell and Prodan \(2006\)](#) who use unit root tests which incorporate structural change while maintaining the long-run mean, again finding some evidence of trend-PPP. Other studies such as [Prodan \(2008\)](#) use the Bai test to determine multiple structural breaks in the mean. However, the well-known issue of breaks in the variance of such processes, which stems from the nature of exchange rate regimes, as fixed regimes are inherently characterised by a low variance of the exchange rate, is typically neglected.

Probably the most important contribution to this strand of the literature is the recognition that breaks present in the stochastic process of the exchange rates might also be linked to important, and often country-specific, economic events that are not, at least directly, relevant to the exchange rate regimes. For example, throughout the time period examined in this study there have been a number of events in the European Union, which will have impacted on the UK to a greater extent than the US. Such events to be considered, include the two World Wars, the failure of the Gold standard or the formation of the European single currency in 1999, where the UK had a policy of prepare for joining, but waiting for an opportune time to do so.

However, this contribution also constitutes the main methodological discrepancy of this approach; other completely irrelevant and most likely country specific events that are not taken into account might also induce breaks in the exchange rates. Furthermore, the timing of each break is unlikely to correspond directly to the timing of the event that induces this break – lead or lag effects are very typical in financial markets. It appears that data-driven methods are not only interesting but also paramount in ensuring that inference is not severely ‘contaminated’ by the presence of unidentified breaks.

A second approach to identifying the breaks is to work with panel data (see for example [Papell, 2002](#)). In this way, there is enough information available to determine the timing of each break by data-driven methods and therefore evidence on whether PPP holds are more robust. However, this approach is based on the assumption that each break occurs at the same point in time across all countries in the panel. Naturally, this is a fairly strong assumption since it is quite unlikely that all panel members respond in exactly the same way and are affected only by the same common events.

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