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Real exchange rate adjustment in European transition countries

Florin G. Maican^a, Richard J. Sweeney^{b,*}^a University of Gothenburg and Research Institute of Industrial Economics, Department of Economics, School of Economics and Commercial Law, University of Gothenburg, Box 640, SE 405 30 Göteborg, Sweden^b McDonough School of Business, Georgetown University, 37th and "O" Str., NW, Washington, DC 20057, USA

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ABSTRACT

In single-equation tests, real exchange rates show mean reversion for nine of 10 Central and Eastern European transition countries for the period January 1993 to December 2005. Because of the shift from controlled to market economies and accompanying crises, failed policy regimes and changes in exchange rate regimes, unit root tests for transition countries often require allowance for structural changes. Accounting for structural breaks gives substantially faster mean-reversion speeds than those found for major industrialized countries. These fast adjustment speeds are plausible: Transition countries had perhaps 10 years to make unprecedented adjustments required for accession to the European Union. A number of papers have applied non-linear models to the Central and Eastern European countries. This paper investigates four non-linear models and compares them with piece-wise linear break models. The break models appear superior in detecting mean reversion for the Central and Eastern European transition countries.

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1. Introduction

Purchasing power parity (PPP) is one of the oldest, most studied topics in international finance. Many models of exchange-rate determination assume that PPP holds at least in the long run. Many papers present tests of PPP in developed countries, and more recently a growing number of papers present tests of PPP in developing countries. Little work, however, deals systematically with PPP in the transition countries of Central and Eastern Europe (CEE). These countries moved from communist planning to free market economies, some with mostly free markets by the end of this sample period but others with a distance to go. All ten CEE economies discussed are European Union members: The Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia joined in 2004, Bulgaria and Romania in 2007. Many observers argue that stable long-run real exchange rates are important for real convergence of CEE economies to other EU members' and thus for successful integration. This paper investigates whether long run PPP holds for these ten CEE countries by testing, country-by-country, the unit-root null hypothesis for their real exchange rates for

the sample period January 1993 to December 2005. It finds mean reversion for nine of the ten countries (not Poland). The chosen sample period purposely limits the investigation to the effects of the transition process—some of these countries joined the Euro soon after (Slovenia, Slovakia and Estonia joined on January 1 of 2007, 2009 and 2011, respectively). Further, the effects of the 2007–2008 crises and the following sovereign-debt crises of Euro countries are reserved to further work.

Standard linear tests of PPP, such as the Augmented Dickey–Fuller and Phillips–Perron models seldom reject the unit-root null in past work. The history of the CEE countries suggests that these models may be too confining by not allowing parameter shifts, as in piece-wise linear break models where the mean of the time trend may shift (Perron, 1989 and Zivot and Andrews, 1992 and many following). The CEE countries shook off communist control in 1989–1991. All had more or less great disequilibria in their real rates but many did not begin to focus fully on real adjustment for the next several years because of political problems. The countries' moves to market economies often included major lurches, reversals and slow downs. Many of these CEE countries experienced financial or political crises, abandoned economic-policy regimes that appeared failing and adopted other regimes. In particular, these countries often relied heavily on exchange rates as a stabilization tool, using a range of exchange-rate regimes from managed

* Corresponding author. Tel.: +1 202 6873742; fax: +1 202 6864031.

E-mail addresses: florin.maican@handels.gu.se (F.G. Maican), sweeneyr@georgetown.edu (R.J. Sweeney).

floats to currency boards. Table 1 shows that of the ten CEE countries, nine or ten—depending on how the researcher views Romania's varying tightness—changed exchange-rate regimes at least once in response to economic difficulties. As an example, because of hyperinflation Bulgaria switched in July, 1997, from a managed float to a currency board. Such changes in exchange-rate regimes affected real exchange rates, often substantially. Furthermore, several countries experienced periods of strong real appreciation, which their policy makers and others attributed to capital-account liberalization, catch-up price rises as non-tradable goods were gradually decontrolled, fiscal imbalances and productivity gains (Christev and Noorbakhsh, 2000; De Broeck and Sløk, 2006). In Fig. 1 there appear to be structural shifts in real exchange rates for a number of countries, for example, Bulgaria, Estonia, Romania and Slovenia. Previous tests with linear models did not allow for parameter shifts and seldom rejected the null; these simple tests arose as preliminaries to other work, for example, vector autoregressions including Gross Domestic Product or testing cointegration of prices with an exchange rate (see Section 2). Work reported below documents that, if the researcher is to understand their real exchange rate behavior in terms of linear models, these CEE economies require careful test-equation specification that accounts for important shifts in the underlying economic processes. For the ten CEE countries, at least one of the five linear models, including models that allow shifts in mean or time trend, rejects the null for nine countries (not Poland), and for seven countries multiple models reject. Bulgaria, for example, has an estimated speed of adjustment in the augmented Dickey–Fuller (ADF) model of 1.24%/month, significant at the 10% level; an estimated speed of adjustment in the best fitting model that allows for parameter

shifts is 5.48%/month, significant at the 1% level. Thus, though the speed from the ADF model is significant, better parameterization gives a faster speed of adjustment. Indeed, with shifts included, estimated speeds of adjustment are much faster than those found for industrialized countries, perhaps 19.5%/month versus 1%/month – 2%/month.

This is the first paper to use piece-wise linear models to explore real exchange rate behavior for the CEE countries, as their transition histories suggest. Other authors apply non-linear models without parameter shifts to some or all of these countries. In general, they find moderate support for mean reversion (see Section 2), with rejections for roughly half the countries. These models are not designed to capture parameter shifts, as are the piece-wise linear models, but the fact that they provide some support to mean reversion suggests examining these models and comparing their results with those from break models. Non-linear unit-root tests typically arise in exponential smooth transition autoregressive (ESTAR) models, though some arise in models where a deterministic trend is allowed to vary in possibly complex ways over time (Biernes, 1997a,b). A number of versions of the ESTAR models exist because of the different steps authors take to identify the model (Taylor, Peel and Sarno [TPS], 2001; Kapetanios, Shin and Snell [KSS], 2003; Park and Shintani [PS], 2005). Previous work on ESTAR tests for CEE countries uses only the KSS test. This paper systematically explores the TPS, KSS and PS models across the ten CEE countries. The PS model provides the strongest results, rejecting for seven of ten CEE countries; the TPS and KSS reject for (the same) four countries. These results are consistent with those in the non-linear literature. The results for the three Biernes tests statistics are conflicting and difficult to interpret. Overall, use of piece-wise linear models appears superior.

Table 1
Exchange-rate regimes.

	Regime
Bulgaria	Managed float from February 1991, Currency board with DEM (subsequently EUR) from July 1997
Czech Republic	Fixed peg against basket 65% DEM, 35% USD from January 1991, Managed float against Euro from March 1997
Estonia	Currency board with DEM (subsequently EUR) from June 1992, ERM II from June 2004
Hungary	Peg to basket 50% ECU, 50% USD, Basket changed to 50% DEM, 50% USD from August 1993, Basket changed to 70% ECU, 30% USD from May 1994, Crawling peg/band to basket from March 1995, Basket changed to 70% EUR, 30% USD from January 1999, Basket changed to 100% EUR from January 2000
Latvia	Managed float from July 1992, Fixed peg to SDR basket. Central Bank margin $\pm 1\%$ from February 1994, Fixed peg to EUR. Central Bank margin $\pm 1\%$ from January 2005, ERM II from May 2005
Lithuania	Managed float from July 1992, Currency board with USD from April 1994, Currency board with EUR from February 2002, ERM II from June 2004
Poland	Fixed to USD from January 1990, Fixed to basket (45% USD, 55% DEM + GBP + FF + CHF) from May 1991, Crawling peg to (same) basket, Basket changed to 55% EUR, 45% USD from January 1999, Free float (but Central Bank reserves extraordinary right to intervene) from April 2000
Romania	Managed float, various degrees of tightness from August 1992
Slovakia	Fixed peg against basket 60% DEM, 40% USD, Central Bank intervention band $\pm 1.5\%$ from January 1991, Crawling band, band currency board with DEM (subsequently EUR) from June 1992, Managed float from October 1998, core inflation target, ERM II from November 2005
Slovenia	Managed float with no pre-announced exchange rate path from 1992, annual M3 growth target, ERM II from June 2004

Source: IMF, National Central Banks, Kočenda (2005), Halpern and Wyplosz (2001).

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