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The role of demography in the long-run Yen/USD real exchange rate appreciation ☆

Marcel Aloy, Karine Gente *

DEFI, University of Aix-Marseilles, 14 Avenue Jules Ferry, 13621 Aix-en-Provence, France

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ABSTRACT

This paper aims to measure the contribution of an aging population to explain the real appreciation experienced by the Yen–US Dollar since 1980s. We develop a two-good overlapping-generation model of a semi-small open economy to highlight the link between the birth rate and the real exchange rate. In a creditor (debtor) country, an aging population causes a real exchange rate appreciation (depreciation) due to a positive (negative) wealth effect. Structural parameters are estimated by GMM using quarterly data between 1960 and 2001. Then, numerical simulations show that the long-run relationship between population growth and real exchange rate is negative between 1960 and 1971 and positive between 1971 and 2000. The decrease in population growth may account for a large part of the real appreciation experienced by the Yen/USD between 1971 and 2000.

1. Introduction

Traditional exchange rate theory is often used to explain the real appreciation experienced by the Yen/USD as a result of a high Japanese output growth rate. "It is well known in the literature that the postwar Japanese record has been a prime example of the Balassa (1964) and Samuelson (1964) hypothesis (Ito et al., 1999)". The coexistence of high growth rates and real exchange rate (RER) appreciation makes the Balassa–Samuelson analysis relevant to explain the Japanese situation between 1976 and 1990.

According to the BS hypothesis, the Yen/USD real exchange rate (RER) should have experienced a high appreciation over the period 1960–1976 because the average growth rate of the Japanese GDP per capita exceeds the US one (see Table 1). Conversely, Fig. 1 depicts that the RER appreciation for the Yen/USD starts only at the end of the 1970's. The same phenomenon occurs later: after 1990, the BS hypothesis would predict a real depreciation because the US average growth rate exceeds the Japanese one. Once again, Fig. 1 depicts an appreciation instead of the expected real depreciation suggested by the conventional theory. Thus, the BS hypothesis alone seems much less relevant to explain why the Yen has appreciated so sharply over the last thirty years. The second key-characteristics of Japan during the last three decades, is an aging population as depicted by Fig. 1.[1] The question addressed in this paper is whether these two features are linked.

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* Corresponding author. Tel.: +33 4 42 91 48 26; fax: +33 4 42 91 48 29.
E-mail address: karine.gente@univmed.fr (K. Gente).
[1] Fig. 1 uses the following data: Yen/USD real exchange rate (CPI based), suitably normalized. Pop. Growth = Japanese Population Quarterly Growth Rate.

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Table 1
Average growth rate of GDP per capita (in %).

Periods	United States	Japan
Whole sample 1960–2001	1.78	3.55
Sub-periods		
1960–1976	2.53	6.31
1976–1990	1.48	3.15
1990–2001	1.12	0.29

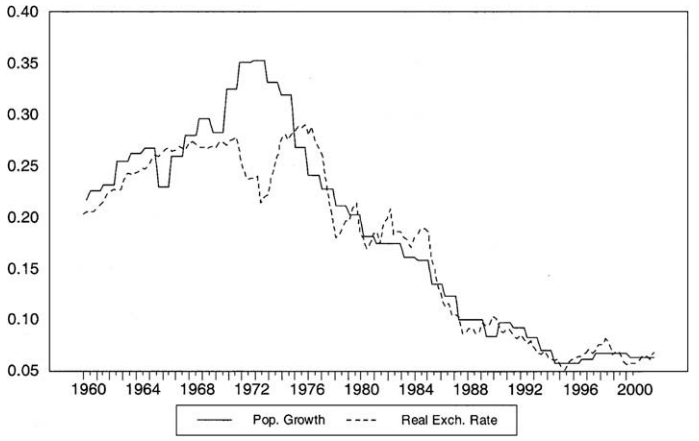

Fig. 1. RER and population growth.

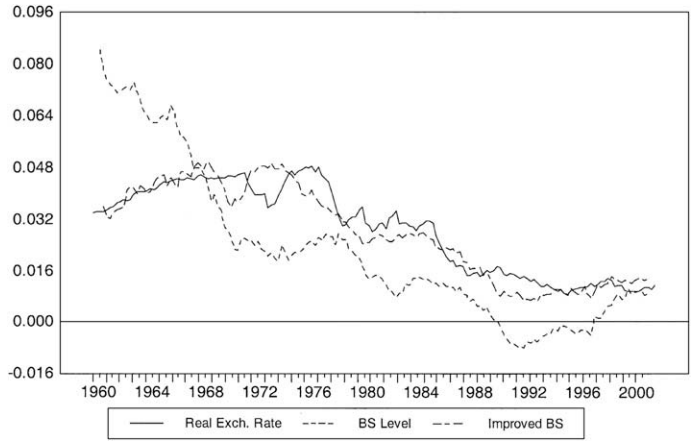

Fig. 2. Observed and estimated RER.

Such a long-run appreciation (which starts during the 1970's) is not frequently observed. The RER does not exhibit a mean reverting process such as the one predicted by PPP. Similarly, the RER still appreciates despite the economic slowdown after 1990, contrasting with what the BS hypothesis predicts. The aim of this paper is to investigate whether the fall in the rate of population growth could explain the departure of the RER from its BS level. The evidence suggests that population can explain at least partly the behavior of the RER. Fig. 2 compares the observed RER, the theoretical BS level and the "improved BS" level[2] of the RER.

[2] The BS level of the RER is the one predicted by the ratio of Japanese and US per capita GDP (in logs). As shown in Table 2, there is no cointegrating relationship between the two series. The "improved BS level" of the RER is the one predicted by relative per capita GDP (in logs) plus differential in rates of population growth between Japan and US. Coefficients of the long-run relationship are those estimated using the Johansen ML method.