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Four harmonic cycles explain and predict commodity currencies' wide long term fluctuations

Elias Sanidas [1]

Department of Economics, College of Social Sciences, SNU, 599, Kwanak Ro, Seoul 151-746, South Korea

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ABSTRACT

In theory and practice, it is difficult to accept a particular model of explanation and forecasting of exchange currencies as the literature review reveals. However, the currencies that are called commodity currencies, such as the Australian dollar are heavily influenced by commodity prices cycles, and hence they might be easier to analyze and predict. We investigate the possibility that the Australian dollar is primarily determined by a handful of harmonic cycles which in turn are based not only on commodity prices cycles but also on commodity production cycles and in general on economic cycles. In this way we can get a very good fit of the relevant data and good out-of-sample forecasts. We cross check these results by referring to the main issues involved, such as fundamentals, short and long cycles, and so on. In addition, our analysis, forecasting ability, and conclusions still hold for three more commodity currencies examined here: New Zealand's dollar, Canada's dollar, and Norway's krone.

1. Introduction

Although the literature on exchange rates is already substantial, the record of having been able to properly understand and in particular to forecast these rates has been poor. Many 'puzzles' have been mentioned in numerous papers, as the literature review shows further below. The aim of the present paper is to attempt to clarify these puzzles by following a non-conventional approach: we want to put more emphasis on the merits of forecasting even if it is not very clear how the fundamentals justify these forecasts. We will claim that a minimum number of four harmonical cycles can explain a substantial (about 85%) of the Australian dollar (A$), a so-called commodity currency; and that these harmonics can improve forecasts considerably. Similar conclusions are reached for the other three commodity currencies examined here: New Zealand's dollar, Canada's dollar, and Norway's krone.

However, we will not ignore a discussion and cross checking of the underlying fundamentals. There are some important reasons we chose the A$ for a full analysis in this study.[2] First, it is rather the only genuine commodity currency in the sense that it is the only one that freely floats (hence it is not pegged, or floating in a managed way, etc.; see [1]). Second, the A$ being strongly associated with trade of metals, is also associated with technological issues that are relevant to the supply of these goods [2–4]. And third, the ratio of commodity exports out of total Australian exports is very high (about 75%).

E-mail address: ellass@snu.ac.kr.
[1] Tel.: +82 2 880 6374, +82 10 8484 1262 (mobile).

[2] From this point till the subsection 3.4 we will only examine the A$ exclusively. Then in 3.4 we will briefly examine the other three currencies.

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It becomes then necessary to briefly remind the reader about the floating history of the A$. Up to November 1971 it was fixed to sterling, then to the US dollar up to September 1974, and then to the trade weighted index (TWI). From November 1976 to December 1983 it was set in terms of the TWI under a crawling peg system [5]. The Australian dollar started freely floating in December 12, 1983. Fig. 1 shows the nominal A$ in terms of US$ since December 1983. It is worth noting the wide and persistent fluctuations of this currency. The same Figure also shows the commodity prices series.

It will also be useful to briefly describe the Australian economy. Its population, about 21 million, live in a very large country/continent with several big cities and a small rural population. Australia is rich in natural resources. The manufacturing sector never became the dominant sector in the economy. Exports consist of about 60 to 80% natural resources or nearly defined natural resources. Australia can be considered as a "small" country for the purpose of this analysis: it cannot influence world prices, and is a price taker overall. Thus, Australia's dollar is one of these commodity currencies [7] that are heavily influenced by commodity prices. Usually these currencies are those of small economically defined countries hence not being able to influence the world economy and to a considerable extent commodity prices.

Consequently "the A$ appreciates (depreciates) in both nominal and real terms when the prices of certain commodities exported by Australia, e.g. coal, metals, and other primary industrial materials, rise (fall) in international markets" ([8] p. 82). On the other hand, Hatzinikolaou and Polasek ([8] p. 83) observed that "our estimate of the long run elasticity of the exchange rate with respect to commodity prices is 0.939 and statistically not different from unity, which strongly supports the commodity–currency hypothesis". The main commodities having the largest percentage in the construction of the commodity price index in Australia are: gold, coking coal, beef and veal, steaming coal, iron ore, wool, and aluminum [6].

Source: the source of data is RBA [6].

Fig. 1. The floating nominal A$ and commodity prices series [6]. Source: the source of data is RBA.

This brief introduction leads us to believe that we ought to further examine commodity currencies such as the A$. This will be carried out not only in relation to commodity prices cycles, but also in relation to their harmonics (hence indirectly involving economic cycles as well). Section 2 briefly examines commodity currencies in the context of several types of relevant cycles. Section 3 introduces the proposed model and provides econometric evidence, which allows us to make some forecasts in the medium and long term. Section 4 concludes.

2. Commodity currencies and cycles

2.1. Links to fundamentals

De Grauwe and Grimaldi [9] have summarized some of the main issues and explained why the fundamentals of exchange rates do not seem to work properly. For example there is the puzzle of excess volatility according to which the volatility of the exchange rate by far exceeds the volatility of the underlying economic variables (this is also confirmed in our paper). It became clear that monetary instability alone could not possibly explain the persistent exchange rate volatility that remains even to this date. "But the long half-lives of shocks observed in the data are incompatible with the concept of long-run monetary neutrality…a potential solution to this PPP puzzle may lie in identifying a shock that is both sufficiently volatile and persistent…" [7]. Thus, although the purchasing power parity (PPP) hypothesis was strongly suggested as explaining the behavior of exchange rates, recent research dismisses this hypothesis ([10]; for the Australian dollar see [11]).

Chen and Rogoff [7] in particular treated commodity prices as the missing link in the PPP puzzle. Nonetheless, the puzzle remained, even after having included these prices into regression estimations by using autoregressive (AR) models. These authors also included the Balassa–Samuelson relative productivity differences in their models. Their overall conclusion is very revealing: "Hence, we find the PPP puzzle to be like the Russian dolls, in that after controlling for two promising real shocks-peeling away layers of the original PPP puzzle—we are still faced with the identical, despite smaller, PPP puzzle" ([7] p. 25).

The speed of convergence to PPP in the long run is extremely slow; persistent deviations from PPP exist in the long run. For the so called commodity currencies, even after taking into account the effect of commodity price shocks, there is still a purchasing power puzzle in the residuals, implying that there is high degree of persistence remaining [7]. If PPP holds then the real exchange rate is stationary and fluctuates around a fixed value (its mean) in the short run. PPP can be tested by testing for unit roots in a univariate framework or by applying cointegration methods in a multivariate framework.

The massive empirical testing of PPP has generally cast doubt on long run PPP, either by rejecting PPP that follows a stationary process, or by suggesting that the real exchange rate adjusts too slowly back to an equilibrium long run rate. Consequently, as Spiro [12] reminds us forecasts beyond a three-year horizon, based on PPP tend to outperform other techniques. However, Mansur et al [13] have showed that the

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