TESTING FOR SUNSPOTS IN THE FOREIGN EXCHANGE MARKET

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It has been shown that the nonfundamental uncertainty called sunspots matters in many areas of the economy. Noting the fact that nationwide capital movement and the speculative demand for foreign currencies are rapidly increasing, this paper conducts empirical tests on the sunspot exchange rate model. The empirical result shows that the sunspot equilibrium exchange rate deviating from Purchasing Power Parity (PPP) and Interest Rate Parity (IRP) is consistent with the real data. More importantly, the Generalized Method of Moments (GMM) over-identification test is shown to support the evidence that more general Euler equations are in favor of our sunspot equilibrium exchange rate model. [C52, E44]

1. INTRODUCTION

Since the work of Cass and Shell (1983), nonfundamental uncertainty or sunspots have caught the attention of many economic researchers. It is now generally accepted that nonfundamental uncertainty matters in many areas of the economy. The foreign exchange market is no exception even though international market parities such as Purchasing Power Parity (PPP) and Interest Rate Parity (IRP) have long been regarded as playing a key role in determination of exchange rate.

Foreign exchange markets are different from other asset markets. Because transactions in today's foreign exchange markets are made with fiat currencies that are intrinsically useless, unbacked and costless to produce, it is rather absurd to suppose that only fundamental factors can usually guide the market to find an equilibrium exchange rate.

King, Wallace and Weber (1992) and Manuelli and Peck (1990) showed the possibility that some sunspot equilibrium exchange rates are consistent with rational expectation models. But their sunspot equilibrium exchange rates are still determined by PPP. In their models, prices are nonfundamental and the sunspot equilibrium exchange rate is implied just by sunspot equilibrium prices. Engel (1996) showed an equilibrium exchange rate with some sunspots which are independent from prices even.

*The author would like to thank two anonymous referees for their helpful comments and suggestions.
As for the empirical tests, little work has been done on the issue of how nonfundamental uncertainty, or sunspots, persistently affects the movement of equilibrium prices. One of the main reasons is that it is difficult to get some empirically tractable model without strong restrictions on the unobservables and the relationships among them. Hamiltonian and Whiteman (1985) criticized empirical tests of sunspots on these grounds. Whereas Imrohoroglu\(^1\) (1993) tested for sunspot equilibria for the German hyperinflation in the context of a linear rational expectation model. The question depends on how strong the assumptions and restrictions are needed to derive an empirically testable model.

The purpose of this paper is to test for the existence of sunspots in the equilibrium exchange rate. Section 2 develops the relationship between the exchange rate and the other variables, and gets an empirically testable model for the exchange rate movement with some sunspots. In Sections 3 and 4, the sunspot exchange rate model is estimated and evaluated in the sense that the sunspot equilibrium exchange rate is consistent with the real data and with the more general Euler equations. Section 5 closes the paper, noting the implications and limitations of this work.

2. MODEL

A. Theoretical Motivation

Consider an economy with two countries, domestic and foreign, each inhabited by homogeneous agents.

A domestic agent solves the maximization problem as follows.

\[
\max_{(c_t, m_t, b_t)_{t=0}^{\infty}} E \sum_{t=0}^{\infty} \beta^t u(c_t)
\]  

s.t. \( p_t c_t + b_t + e_t m_t = w_t, \quad (w_0 > 0 \text{ given}) \)

\[
w_{t,t} = R_{t,t} b_t + e_{t-t} R_{t,t} m_t + I_t, \quad \text{for all } t \geq 0
\]

where \( c_t \) is consumption, \( p_t \) is the nominal price of consumption good, \( e_t \) is the

\(^1\)His model consists of a Cagan's portfolio balance equation and a government budget constraint under rational expectations. He assumes that prediction errors are affected by both the sunspot variable and fundamental shock. He uses the Kalman filter to solve the model by way of obtaining the best estimate of the state vector.