



# Central bank intervention and exchange rate dynamics: A rationale for the regime-switching process of exchange rates

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**Lee, Hsiu-Yun, and Chang, Wen-Ya**—Central bank intervention and exchange rate dynamics: A rationale for the regime-switching process of exchange rates

By proposing a stochastic intervention model of exchange rate determination, this paper provides an alternative rationale for the success of the Markov-switching model in explaining exchange rate dynamics. One extreme case is a pure floating rate model while the other extreme one is a driftless random walk model. The relation between the exchange rate and the future fundamentals under a non-intervention state is looser than the one under a pure floating exchange regime. This article also provides a method for detecting a central bank's interventions when intervention data are not available. Applying the stochastic intervention model to the monthly NT\$/US\$ exchange rates in 1989M1–2004M6, we find that it outperforms both the pure floating rate model and the random walk model in terms of the likelihood value and the diagnostic test of heteroscedasticity. In addition, with the constructed intervention state index in this article, the estimation of the stochastic intervention model is found to be consistent with the hypothesis that the regime switches of exchange rates are due to a central bank's (non-)interventions. *J. Japanese Int. Economies* **21** (1) (2007) 64–77. Department of Economics, National Chung Cheng University, 168 University Road, Ming-Hsiung, Chia-Yi, Taiwan; Department of Economics, Fu-Jen Catholic University, Taiwan.  
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## 1. Introduction

The most popular exchange rate arrangement nowadays is a regime between undisputed floats and undisputed pegs. In order to capture reality, this paper first proposes a simple model of short-run exchange rate determination with stochastic interventions from a central bank. Under stochastic intervention, the exchange rate sometimes is endogenously determined by market fundamentals, while it sometimes is manipulated by the central bank. The implied state-dependent exchange rate adjustment of a theoretical model can then be shown to conform to the actual exchange rate process for emerging market countries such as Taiwan.

Due most likely to “fear of floating” and “fear of pegging,” many emerging market countries that claim they are floating actually manage their exchange rates (Calvo and Reinhart, 2002, and Levy-Yeyati and Sturzenegger, 2005). The stylized facts are the following. Unlike monetary authorities in the European Monetary System or those in several major industrialized countries, the central banks in emerging market countries do not coordinate with other countries to undertake joint currency interventions. Moreover, the central banks in these emerging market countries neither publicly announce the target of their exchange rate policy nor promise under what situation that they will undertake intervention operations. Even if they announce it *ex ante*, they can undo it *ex post*. In addition, intervention data are seldom revealed by the central banks of emerging market countries.<sup>1</sup>

In constructing the analytical framework, we consider that the central bank undertakes intervention operations on a case-by-case basis, but the exact timing and the exact magnitude of the intervention are not known by market participants *ex ante*. These characters make our model distinct from those in Hsieh (1992), Natividad-Carlos (1994), Lewis (1995), and other target-zone models. In these previous papers the central bank follows an explicit target rate or intervention rule, through which the central bank affects the exchange rate by changing monetary aggregates or reserves. The stochastic intervention model in this paper implies a state-dependent adjustment of the exchange rate. In the case of non-intervention, market fundamentals and the probability of the central bank’s continual non-intervention shall determine the exchange rate. On the other hand, in the case of intervention the exchange rate is assumed to follow a driftless random walk process as the monetary authority usually pursues a stable value of its home currency in practice.

Because the process of exchange rates displays non-linearity, many empirical studies employ regime-switching models to fit exchange rate data or to forecast future exchange rates (e.g., Engel and Hamilton, 1990; Engel, 1994; Engel and Kim, 1999; Bollen et al., 2000; Dewachter, 2001; and Clarida et al., 2003). The research works in Sill and Wrase (1999) and Sarno et al. (2004) appear to be the first approach that provides a rationale for using Markov-switching models in explaining exchange rate dynamics; that is, market fundamentals themselves are regime switching.<sup>2</sup> This article provides an alternative theoretical base for using regime-switching models. In a stochastic intervention model, the exchange rate is sometimes pegged by the central bank and at other times determined by market fundamentals. Therefore, the exchange rate follows a regime-switching process even though the market fundamentals do not. Furthermore, the relation between the exchange rate and the fundamentals under a non-intervention period is different from the one under a pure floating exchange regime. Specifically, the relation between the exchange rate and the future fundamentals under a non-intervention state is looser

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<sup>1</sup> Sarno and Taylor (2001, pp. 851–852) provide a detailed discussion for data availability on intervention.

<sup>2</sup> Vigfusson (1997), on the other hand, claims that the process of exchange rates in an economy mixed with chartists and fundamentalists can be approximated with a Markov regime-switching model.

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