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# Toward an econometric target zone model with endogenous devaluation risk for a small open economy<sup>☆</sup>

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## Abstract

A number of econometric target zone models is estimated for the Belgian franc and the Dutch guilder vis-à-vis the deutsche mark, with a particular focus on the modeling of endogenous devaluation risk. Both currencies can be characterized by mean reversion, whereas the theoretical S-effect is observed only for the Belgian franc. Exchange rate volatility can be adequately modeled by means of a GARCH(1,1) process. For the Belgian franc, exchange rate tensions have been induced by movements in the inflation differential vis-à-vis Germany and the level of foreign exchange reserves, whereas for the Dutch guilder the interest rate differential vis-à-vis Germany and the level of foreign exchange reserves have been particularly important. © 2002 Elsevier Science B.V. All rights reserved.

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## 1. Introduction

This article focuses on the movements in exchange rates within a system of target zones such as the Exchange Rate Mechanism (ERM) of the European

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Monetary System (EMS). In particular, it will focus on the modeling of endogenous devaluation risk. The models developed in the paper will be applied to the experience of the Belgian franc and the Dutch guilder within the ERM. While both currencies have been irrevocably fixed with the coming into being of the EMU and the adoption of the euro, the experience from their ERM participation might contain valuable lessons for the countries currently participating in ERM-II (Denmark and Greece), as well as those countries — mainly Central and Eastern European — for which future participation in ERM-II will be a prerequisite for joining the euro area.

Belgium and the Netherlands have been participating in the ERM since its establishment in 1979. Both countries may be characterized as small open economies that attach great value to stable exchange rates. To a large extent, monetary policy in EMS countries has always been aimed at a stable exchange rate against the deutsche mark. Underlying this choice is the importance of Germany as a partner in foreign trade and, above all, the pronounced anti-inflation reputation of the Bundesbank. Before monetary policy was completely subordinated to the exchange rate target, both currencies experienced a number of devaluations (Ungerer et al., 1990; Knot and De Haan, 1995). The Dutch guilder, for instance, was devalued twice in the early years of the ERM (1979–1983) before being anchored definitively in a narrow band around central parity. Before 1987, the Belgian authorities even devalued as many as seven times, as the country's deteriorating fundamentals frequently caused speculative pressure on the franc. From March 1990 on, the National Bank of Belgium has adhered to the so-called franc fort policy, under which the franc is virtually pegged at central parity.

In the theoretical target zone models developed in the late 1980s, the probability of a realignment is often assumed to be exogenous or is sometimes not even modeled at all (Krugman, 1991; Svensson, 1991; Lindberg and Söderlind, 1994). To circumvent these limitations and to investigate the empirical behavior of exchange rates and devaluation risk in a target zone, various authors have constructed econometric target zone models. After an extensive study of different model specifications, Nieuwland et al. (1991) conclude that an AR(1)–GARCH(1,1) jump model best describes exchange rate developments within the ERM. They model the probability of a jump by means of a Poisson distribution, while the observed clustering of extreme values necessitates a GARCH specification. In a MA(1)–GARCH(1,1) jump model presented by Vlaar (1992), the probability of a jump is conditioned on economic fundamentals such as the inflation differential vis-à-vis Germany and the trade surplus. The study shows that the Dutch and French probabilities of a jump are affected by developments in the inflation differential and that the Danish probability of a jump is related to developments in the trade surplus. For Belgium, Ireland, and Italy, no significant relationships are reported.

Ball and Roma (1993) adopt a different approach to model exchange rate dynamics within the ERM. Their decomposition of the exchange rate into the central parity ( $c_t$ ) and the exchange rate within the band ( $x_t$ ) is more in line with the theoretical target zone models. Assuming that  $x_t$  follows an Ornstein–

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