Summary. Previous early warning systems (EWS) for currency crises have relied on models that require a priori dating of crises. This paper proposes an alternative EWS, based on a Markov-switching model, which identifies and characterizes crisis periods endogenously; this also allows the model to utilize information contained in exchange rate dynamics. The model is estimated on data from 1972–1999 for the Asian crisis countries, taking a country-by-country approach. The model outperforms standard EWSs, both in signaling crises and reducing false alarms. Two lessons emerge. First, accounting for the dynamics of exchange rates is important. Second, different indicators matter for different countries, suggesting that the assumption of parameter constancy underlying panel estimates of EWSs may contribute to poor performance.

Key words: Currency crisis, early warning system, regime switching, Markov switching

10.1 Introduction

A succession of currency crisis episodes in the 1990s led to a proliferation of theoretical and empirical papers on the factors that brought about these crises. Several papers have also focused on the issue of anticipation—devising early warning systems that give policymakers and market participants warning that a crisis is likely to occur. Two approaches to constructing early warning systems have become standard: limited dependent variable probit/logit models and the indicators approach of Kaminsky, Lizondo and Reinhart [31], henceforth KLR. Berg et al. [4] assess the performance of these models, and find that they have outperformed alternative measures of vulnerability such as bond spreads and credit ratings. However, while these models are able to anticipate some crises, they also generate many false alarms.
There are several well-known methodological issues associated with the existing early warning models. Perhaps the most significant is that they require an a priori dating of crisis episodes before they can be estimated. The most common procedure for doing so is by taking changes in exchange rates, reserves and/or interest rates, choosing weights for each and combining them into an index of speculative pressure, specifying a sample-dependent threshold, and identifying crises based on whether or not the index exceeds the threshold. But as is evident from the survey of 26 recent empirical studies of currency crises in Section 10.2 below, this simple procedure has been applied in a multitude of ways, resulting in different periods being identified as crises.

The threshold procedure provides a set of crisis dates, but raises even more problems. First, the choice of the crisis-identification threshold is arbitrary. A selected sampling of thresholds used in the literature include the threshold of $1.5 \times \sigma$ (where $\sigma$ is the sample standard deviation) used in Aziz et al. [2], $1.645 \times \sigma$ in Caramazza et al. [5], $1.75 \times \sigma$ in Kamin et al. [29], $2.5 \times \sigma$ in Edison [11], and $3 \times \sigma$ in KLR. Different choices of threshold will obviously result in different crisis dates and different estimated coefficients. Moreover, the threshold is sometimes treated as a free parameter and chosen so that the fit of the model is maximized (Kamin et al. [29]), or so that a set percentage, say 5 percent, of all observations are crises (Caramazza et. al. [5]).

Second, the sample-dependent nature of the threshold definition implies that future data can affect the identification of past crises. Thus one can observe cases of disappearing crises, as documented by Edison [11]. Since the threshold is defined in terms of the sample standard deviation, the occurrence of a new, relatively large crisis such as the Asian crisis results in previously identified crises no longer being identified as such. Edison notes that the threshold methodology identifies five crises in Malaysia using pre-1997 data, but these all disappear and only one crisis is identified (the 1997 crisis itself), when data up to 1999 are included in the sample.

Third, many of these studies make ad hoc adjustments to the binary crisis variable that may introduce artificial serial correlation. One common procedure is the use of “exclusion windows”, which omits any crises identified by the threshold method if they follow a previous crisis within a certain window of time. As is the case with the threshold level, the width of the exclusion window is arbitrary, and has been chosen to be anywhere from one quarter (Eichengreen, Rose and Wyplosz [12]) to as long as 18 months (Aziz et al. [2]) and even 3 years (Frankel and Rose [16], using annual data). The motivation for using exclusion windows is to eliminate identifying speculative pressure episodes as new crises if they are just a continuation of a previous one. But in doing so, one eliminates any information the sample contains regarding

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1 For example, Kamin et al. [29] compare their identified crisis dates with those identified by KLR and find that only 61 percent of crisis dates were commonly identified.