Journal of Macroeconomics 31 (2009) 621–632

Contents lists available at ScienceDirect

Journal of Macroeconomics

journal homepage: www.elsevier.com/locate/jmacro

On the determinants of currency crises: The role of model uncertainty

Jesús Crespo Cuaresma [a,b,*], Tomas Slacik [c]

[a] Department of Economics, University of Innsbruck, Universitätstrasse 15, 6020 Innsbruck, Austria
[b] World Population Program, IIASA, Laxenburg, Austria
[c] Oesterreichische Nationalbank, Foreign Research Division, Otto-Wagner-Platz 3, P.O. Box 61, 1011 Vienna, Austria

ARTICLE INFO

Article history:
Received 4 February 2008
Accepted 26 January 2009
Available online 6 February 2009

JEL classification:
F31
F34
E43

Keywords:
Currency crisis
Bayesian model averaging

ABSTRACT

We tackle explicitly the issue of model uncertainty in the framework of binary variable models of currency crises. Using Bayesian model averaging techniques, we assess the robustness of the explanatory variables proposed in the recent literature for both static and dynamic models. Our results indicate that the variables belonging to the set of macroeconomic fundamentals proposed by the literature are very fragile determinants of the occurrence of currency crises. The results improve if the crisis index identifies a crisis period (defined as the period up to a year before a crisis) instead of a crisis occurrence. In this setting, the extent of real exchange rate misalignment and financial market indicators appear as robust determinants of crisis periods.

1. Introduction

Over the course of the last couple of decades several parts of the world have experienced rather harsh financial market crises, sometimes repeatedly, and mostly accompanied by painful real shocks. The very last wave of such turmoils, initially triggered on the US (subprime) mortgage market, has exemplified that financial market turbulences are not confined only to the developing and emerging economies. Moreover, the recent tensions have clearly unveiled challenges financial stability authorities and policy makers have to face in the age of ever deeper and more global markets. Most importantly, diminishing barriers to capital flows and instant information distribution increase the potential sudden evasiveness of capital. As evidenced by the shocking promptness with which the US mortgage malaise extended from one corner of the financial market to another, crises can spread swiftly between different types of markets in geographical and technical terms.

One of the most frequent targets of speculators is the currency market and substantial devaluations of the currency under attack generally imply severe consequences for the respective economy. Against this backdrop it is not surprising that both in the academic literature and in the private sector a variety of empirical attempts has been undertaken to predict currency crises. Following the pioneering indicator approach by Kaminsky et al. (1998) a whole plethora of early warning systems for currency crises has been developed. Some of the rather recent approaches employ innovative methodologies such as Markov switching models (see e.g. Abiad, 2003 or Chen, 2005) or financial market tools (see e.g. Malz, 2000 or Crespo Cuaresma and Slacik, 2007) to predict currency attacks.

The vast majority of the empirical literature assesses the effect of various potential determinants on the probability of a currency crisis using limited dependent variable – logit or probit – models. The discrete crisis variable is regressed on a set of

* Corresponding author. Address: Department of Economics, University of Innsbruck, Universitätstrasse 15, 6020 Innsbruck, Austria.
E-mail addresses: jesus.crespo-cuaresma@uibk.ac.at (J. Crespo Cuaresma), tomas.slacik@oenb.co.at (T. Slacik).

0164-0704/$ - see front matter © 2009 Elsevier Inc. All rights reserved.
doi:10.1016/j.jmacro.2009.01.004

fundamental indicators, such as, inter alia, current account and government balances, exchange rate overvaluation or liquidity ratios. The choice of regressors is typically inspired by the three generations of theoretical models on balance-of-payment crises. In one of the most recent empirical contributions on this topic Bussière (2007) overhauls the usually static specification, in which, moreover, all regressors tend to enter at the same lag. He thus extends the usual set of explanatory variables by including several lags of the regressors as well as of the dependent binary crisis variable. He finds that there are several variables significantly affecting the probability of a crisis in a dynamic logit model. However, the impact of the indicators ranges between short run (4–6 months) e.g. for the liquidity measures to very long-run (2 years) in case of over-appreciation of the exchange rate. In addition, his results indicate that past crisis episodes increase the probability of a new attack, particularly in the short run.

Notwithstanding substantial variations in the literature on early warning systems with respect to methodology, data as well as results, there is one general caveat which applies to all existing binary choice models. Given that there is no unique theoretical framework linking the potential set of determinants with the realizations of currency crises, the issue of model uncertainty surrounding both the choice of variables and the estimates obtained deserves to be treated seriously. Model uncertainty can be explicitly taken into account using Bayesian statistical techniques, in particular with the use of the Bayesian model averaging (BMA) methodology which proposes averaging of the parameter values over all (relevant) alternative models using posterior model probablities as respective weights to evaluate the relative importance of different variables (see Raftery, 1995 for a general discussion and Sala-i-Martin et al., 2004; Fernández et al., 2001 or Crespo Cuaresma and Doppelhofer, 2007 for applications to economic growth regressions).

The different theoretical settings used to explain different crises episodes give rise to alternative sets of potential explanatory variables (with intersections which are not necessarily empty) for the probability of a crisis ocurring. The so called *first generation* models (Krugman, 1979; Flood and Garber, 1984) concentrate on bad economic policy leading to unsustainable developments of some fundamental macroeconomic variables. The abandonment of the fixed exchange rate regime is then precipitated by the eventual exhaustion of the central bank's foreign reserves. The *second generation* of currency crises models (see for instance Obstfeld, 1994), explains crises as the consequence of self-fulfilling expectations in theoretical settings with multiple equilibria. In contrast, the *third generation* of models (Krugman, 1998) explains the outbreak of a currency run as a symptom of accumulated problems in the banking and financial sector. In the theoretical setting, government guarantees aimed at attracting foreign investment lead to a bubble on the asset market that eventually bursts and creates the crisis. Obviously, given the different theoretical nature of the ultimate cause of the currency crises in the different generations of models, the potential empirical determinants to be included in econometric studies vary strongly depending on the theory used to select covariates.

The objective of the present paper is to revisit binary variable models for currency crises based on macroeconomic fundamental data by explicitly taking into account model uncertainty. In particular, we want to work out to what extent model uncertainty puts the robustness of the explanatory variables of the logit models championed in the literature (e.g. Bussière and Fratzscher, 2006 or Bussière, 2007) under strain. On the one hand, our results indicate that the usual macroeconomic variables used in empirical studies of currency crisis are very fragile determinants of the occurrence of such episodes. On the other hand, if we redefine the crisis indicator as to give a signal for observations up to one year prior to the crisis, several variables appear as robust determinants of these crisis periods. Financial market indicators and the deviations of the real exchange rate from a linear trend present very high posterior model inclusion probabilities and thus can be considered robust determinants of crisis periods.

The remainder of the paper is structured as follows: Section 2 sketches the Bayesian model averaging procedure. In section 3 the data are described and variables defined. Section 4 presents the results on the extent to which model uncertainty matters, while section 5 concludes.

2. Dealing with model uncertainty: Bayesian model averaging

The binary variable we are interested in modelling takes value one if a currency crisis occurs in period t ($y_i = 1$) and zero if no currency crisis is observed ($y_i = 0$). A stereotypical regression aimed at assessing the effect of a set of variables $\{\mathbf{x}_j\}_{j=1}^{K}$ on the probability of a currency crisis occurring is given by

$$P\left(y_i = 1 | \{\mathbf{x}_j\}_{j=1}^{K}\right) = F(\mathbf{X}_K \beta), \tag{1}$$

where $F(z)$ will typically be a logistic function ($F(z) = (1 + e^z)^{-1}$) or the distribution function of a normal random variable ($F(z) = \Phi(z)$), $\mathbf{X}_K = (x_1 \dots x_K)$, which is a subset of $\mathbf{X}_{\overline{K}} = (x_1, \dots, x_{\overline{K}})$, containing all possible regressors ($\overline{K} > K$ of them), and $\beta = (\beta_1 \dots \beta_K)'$. In principle, many candidate variables can be proposed as potential covariates in (1).

So far, the literature tends to concentrate on an arguably tiny subset of this model space. Model averaging techniques propose averaging over all these alternative models using Bayes factors so as to evaluate the relative importance of different variables as determinants of the occurrence of a currency crisis. In the situation where there are M competing models, $\{M_1, \dots, M_M\}$, which are defined by the choice of independent variables, so that $M = 2^{\overline{K}}$, Bayesian inference about the parameter of interest, β_i is based on its posterior distribution (that is, the distribution given the data, $\mathbf{Y} = \{y\mathbf{X}_K\}$)