Designing an early warning system for debt crises

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Abstract

This paper develops an early warning system for debt crises broadly defined as episodes of outright default or failure of a country to be current on external obligations. A multinomial model is applied, that allows to differentiate between three regimes: a 'tranquil' period, a 'crisis' state and an adjustment or 'post-crisis' phase. The model, estimated using a large set of macroeconomic variables, is able to predict 76% of entries into crisis while sending 36% of false alarms and has rather good out-of-sample performance. Finally the paper tries to integrate the analysis based on macroeconomic variables with the approach based on risky market instruments.
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1. Introduction

Emerging market economies have experienced crises, driven by their poorly developed financial systems, volatility of macroeconomic policies, weak banking sector, high dependence on external capital flows and uncertain growth prospects; such crises had disruptive effects on these economies.

For this reason, both the academic and the official sectors have felt the importance of developing models that cannot only identify weaknesses and vulnerabilities in emerging market economies, but also send timely and correct signals about the onset of a financial crisis, the so-called early warning systems (EWS).

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Most of the EWS models developed so far have tried to signal the onset of currency and banking crises, both individually or jointly determined (so-called twin-crises). The seminal papers in the field are those written by Kaminsky et al. (1998) and by Frankel and Rose (1996), whereas a thorough review of such category of models can be found in Berg et al. (2004).

Until now, however, little work has been done on 'debt' crises, which can be broadly defined as episodes of default or failure to be current on external obligations. The time span from 1994 onwards has been characterized by large sovereign and corporate defaults, or debt servicing difficulties on foreign currency-denominated bonds.

Currency and debt crises might be generated by common factors, such as unfavorable macroeconomic developments, a deterioration in external financing conditions (e.g. a sudden reduction in capital flows or a sharp upsurge in their cost) or an increase in the extent of international investors' risk aversion.

Notwithstanding the previous considerations, currency and debt crises do remain quite distinct events, in fact:

1) the two types of crises are not perfectly correlated, as shown in Sy (2003), in the sense that it is possible to have a currency crisis which is not associated with a debt crisis, as it is conceivable that a country may fall into arrears or default on its external debt without any major disruption in the exchange rate, as happened in Pakistan in 1999;
2) it is not clear what the causal relationship should be: in fact, one could expect a sharp depreciation of the exchange rate as a response to an excessively high growth of the external debt or a rapidly worsening scenario for the country's financing needs; under such a scenario, investors might not trust the government's ability to face its external obligations and therefore start selling off assets denominated in that particular currency.

The literature on the empirical determinants of a debt crisis is quite small compared with the large body of theoretical and empirical work on currency and banking crises. A broad classification is between models which are based on the evolution of a particular set of macroeconomic variables leading to the build-up of a crisis, and models that extract information from financial data and market prices for widely traded financial instruments such as sovereign bonds or, more recently, credit default swaps (CDSs). As recognized by the IMF (2002) itself, any macro-based model should be complemented with information on market expectations extracted from bond spreads as well as from CDSs. A detailed description of the aforementioned categories of EWS for debt crises can be found in Ciarlone and Trebeschi (2004).

The rest of this paper is organized as follows: Section 2 reports the definition of debt crisis, the data set and the event study analysis; Section 3 presents the two econometric specifications, the binomial and the multinomial logit, both based on macro variables; Section 4 is devoted to the analysis of CDSs spreads with the aim to extract early warning signals. Section 5 concludes.

2. Debt crisis, macroeconomic variables and event study analysis

The main concern of a researcher is to define what a debt crisis really is: the actual problem is that such event may take on different forms, ranging from an outright default declared by an insolvent country on part or all of the stock of external or public debt, to debt-servicing difficulties determined more by illiquidity than by insolvency. These increasing debt servicing difficulties might well be signaled by the accumulation of interest or principal arrears (e.g. Detragiache and Spilimbergo, 2001) or by a worsening of the market evaluation of a country's