

Statistical distributions and the identification of currency crises

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Abstract

We use extreme value theory to identify periods of currency crisis for a broad cross-section of Asian, European, and Latin American countries. We argue that our methodology improves upon the more conventional methodology for defining currency crises because fewer parametric assumptions need to be satisfied. We compare the incidence of currency crises using the conventional method with the incidence obtained using our method. We conclude that identifying currency crises using extreme value theory is a good alternative to the conventional method.

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1. Introduction

A voluminous literature on currency crises has developed in response to the severe dislocations that economies experience when their currencies come under attack. This literature has focused on many issues, seeking answers to a variety of questions including: What are the determinants of currency crises? Are currency crises contagious? Can crises be predicted? Are certain exchange rate systems more prone to currency crisis? This paper addresses none of these interesting issues. Instead, our

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objective is more basic and fundamental—to evaluate the existing methodology used for identifying currency crises and to present an alternative methodology that makes fewer parametric assumptions. We apply this alternative methodology to the economies of a broad sample of European, Latin American, and Asian countries.

In what follows we first discuss how currency crises have more commonly been defined. In general, researchers declare a currency crisis to take place when large values for a currency index are observed, with ‘large’ defined as observations that are 1, 2 or 3 standard deviations above the mean value for the index. We question the appropriateness of these methods to define extreme values given the non-conformity of speculative price series to the parametric assumptions needed to employ such methods. We suggest instead using extreme value theory for identifying large values of the currency index. In place of making an a priori assumption about the shape of the distribution and using that assumption to define extreme values, we estimate the shape of the distribution of the currency index and use this information directly to infer the frequency of extreme observations. Our contribution, therefore, lies in avoiding parametric assumptions in identifying the extreme or tail values of the distribution of the currency index. We demonstrate the application to data spanning 1965 to 1997. In conclusion, we compare the performance of the methodology based on extreme value theory to that of the conventional methodology using data from 16 nations located in Asia, Europe and Latin America.

2. What is a currency crisis?

The most straightforward approach to defining currency crises is to simply label very large movements in nominal exchange rates as crisis events. In [Frankel and Rose \(1996\)](#), exchange rate depreciations of 25% or more over the year are used to identify currency crashes.¹ But this is not necessarily the optimal approach because, as Frankel and Rose point out, though this methodology identifies currency crashes, it does not necessarily pick up currency crises. A currency crisis is a slightly broader concept that results from speculative pressures that are placed on a currency. Sometimes the speculative attack is successful, in which case we are likely to see large exchange rate depreciations. But, at other times, the government is able to ward off the speculators. In this case, the exchange rate may remain fixed and we are likely to observe losses in international reserves, increases in domestic interest rates, and/or the imposition of capital controls. Thus, for the purpose of better understanding and identifying the origins of crises, it is more useful to devise a broader definition to

¹ Actually, they use a slightly more complicated methodology to correct for high inflation countries. They also require that the depreciation be at least 10% more than the previous year’s. Hence for high inflation countries where large depreciations consistently take place, a 25% depreciation is not necessarily considered unusually large. An alternative method that has been employed to correct for high inflation is to define large jumps in the real exchange rate as crises. [Goldfajn and Valdés \(1998\)](#) define increases in the real effective exchange rate greater than 1.96 standard deviations as a crisis.

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