The macrodynamics of financial fragility within a hard peg arrangement

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ABSTRACT

The paper presents an open-economy macrodynamical growth model with the aim of giving an endogenous characterisation to the process that leads a small country with a currency-board arrangement to accumulate dangerously high levels of external debt and become vulnerable to macroeconomic instability. The macrodynamics of the model results from the combination of the commitment to maintain the peg – that makes liquidity closely dependent on the dynamics of foreign reserves – and the non-linear real and financial interactions that drives the pro-cyclical behaviour of the economy. Within this context, the external financing ease during an economic upswing leads to debt-supported growth and financial fragility; the consequent deterioration of profitability expectations brings about a capital reversal that, in the absence of monetary stabilisation tools, makes the currency arrangement unsustainable. A financial crisis may thus turn into a currency crisis.

We run a continuous-time estimation of a non-linear differential equations system for Argentina during the years of the currency-board arrangement. We find that two steady-state solutions exist. The local stability and sensitivity analysis show that both equilibria are unstable and that the qualitative nature of the equilibria depends in particular on lenders' responsiveness to the degree of leverage. We also show that relaxing the assumption on the currency arrangement and allowing for an autonomous monetary policy makes both equilibria stable.

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1. Introduction

Financial integration into world capital markets represents a crucial factor in the growth process of emerging market economies, where the accumulation process would otherwise be constrained by the limited resources channelled by the domestic financial markets. The increased access to international capital markets relaxes financial bottlenecks and bursts growth, but may lead to overborrowing and determine macroeconomic instability. This is particularly true in the presence of weak institutions when capital inflows are largely debt-creating (Calvo et al., 2008, Ranciere et al., 2005).

In fact, the recent literature on currency crises[3] emphasises the role played by the large imbalances of the private sector in the financial distress of the Asian tigers and the Latin-American countries during the nineties. Most contributions extend to open economies the Bernanke et al. (1999) "financial acceleration hypothesis": in the presence of highly leveraged balance sheets a currency devaluation impacts negatively on firms' net worth determining capital flights, thus accelerating a financial and currency crisis. The issue is particularly relevant for open emerging economies, which typically face difficulties in attempting to borrow in their own currency.[4]

Yet, tight nominal pegs do not appear a valid protection from a crisis. In the aftermath of the more recent financial crisis, some of the European economies that gravitate around the EMU, appear to have been severely affected by huge capital outflows. In a number of these countries, monetary stability had been achieved thanks to the choice of a hard peg regime. Yet, the massive capital inflows fuelled by the integration into world capital markets led to the building up of large imbalances in the public and private sectors. The absence of policy instruments for stabilisation purposes has then determined a financial collapse. In fact, hard pegs require macroeconomic imbalances to be limited in size and persistence; at the same time wage and price flexibility should be allowed to fully operate in order to ensure the exchange regime sustainability.[5]

Not too different was the experience of Argentina during the currency board years, that is, 1991–2001. As known, after a period of outperforming growth driven by massive capital inflows, Argentina plunged into a severe recession that led to a financial crisis and the abandonment of the currency-board arrangement.

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[3] The so-called "third generation" models of currency crises. Among the others, see Krugman (1999), Céspedes et al. (2000), Aghion et al. (2001), and Hausmann and Velasco (2002).

[4] See Eichengreen et al. (2003).

[5] Roubini (1998) and Mulino (2002), among others, has shed light on some of the critical features of currency boards.

The above macro-dynamical behaviour can be explained along two different theoretical perspectives: the first regards a currency crisis as the result of a "sudden stop" due to the surge of interest rate spreads or other exogenous factors, in the presence of imperfect financial markets. The second views a currency crisis as the outcome of an endogenous overborrowing process. In the explanation of Argentina's experience Calvo et al. (2008) emphasise the sudden-stop hypothesis, whereas Perry and Serven (2003) interpret that crisis as the outcome of an endogenous capital reversal.

In this paper we follow the second interpretation and address both theoretically and empirically the issue of "financial instability" and currency crisis for a country that adopts a super-fixed exchange rate, such as a currency board or a dollarization. We argue that, as far as Argentina was concerned, an endogenous overborrowing process first fostered growth and eventually made the country financially fragile; the consequent massive capital reversal propelled the currency crisis. In fact, the macroeconomic imbalances accumulated during the boom would have required an unsustainable output adjustment, given the wage and price rigidities. Our analysis is very close to the macrodynamical literature that builds on Minsky's "financial fragility hypothesis" in the explanation of business fluctuations.[6] In particular, in Franke and Semmler (1989) a nonlinear real-financial interaction is at the basis of an endogenous overborrowing process that determines financial instability. The endogenous nature of the model derives from the combination of a certain degree of "inertia" in agent behaviour, together with the "financial acceleration hypothesis". The idea is that firms' investment decisions as well as lenders' financing decisions require an assessment of future profitability conditions of the economy. Within the context of limited information, such an evaluation is made on the basis of the *current* economic return on investment, and on the perceived "state of confidence". The latter moves pro-cyclically, but is negatively affected by the accumulation of high leverage ratios that increase the possibility of default. Deteriorated balance sheets also negatively affect lenders' willingness to provide finance, for given profitability expectations. The economy thus behaves pro-cyclically, and its macro-dynamical behaviour turns out to depend strongly on the attitude of firms and lenders to incur in an overborrowing process.

We contribute to that literature by extending the analysis to an open-economy framework where an external endogenous overborrowing process leads to financial fragility and the abandonment of the currency arrangement. The focus is on a country that adopts a hard peg. In this case, the strong commitment to maintain the peg makes the money supply closely dependent on the stock of foreign reserves, thus completely endogenous, with no room for stabilisation purposes. In our framework, the currency arrangement has the effect to amplify the fluctuations of the economy in the upturn and in the downturn. The surge in credibility induced by hard pegs is at the origin of the large capital inflows that, initially, finance the accumulation process of an emerging economy that integrates itself into international financial markets. Such a process starts a pro-cyclical expansion that improves the "state of confidence" and bursts the amount of capital flows to the economy. Yet, when most of capital accruing is debt-creating, firms' balance sheets deteriorate, and the resulting financial fragility undermines the "state of confidence" and starts a capital reversal. During the downturn the currency arrangement becomes a binding constraint on the monetary authorities, given that the amount of liquidity which would be necessary to avoid firms' bankruptcy and a financial distress cannot be provided. The perception that the hard peg has become unsustainable accelerates the capital outflows and systemic instability. In this case the only way out is to abandon the peg.

The analysis emphasises that in a currency-board arrangement the accumulation process and growth totally rest on the inflows of foreign currency generated by balance of payments surpluses. It follows that either a country is able to run persistent trade surpluses, and to attract long-term, non debt-creating capital, or its economic growth is inevitably fragile.

With the purpose of assessing the empirical relevance of our theoretical model, we perform an estimation in continuous time in order to preserve the original analytical structure of the theoretical model. We estimate the model as a system of non-linear differential equations from which we derive two unstable equilibria. We then control for the instability by adopting a simple countercyclical monetary rule, thus emphasising that the currency arrangement, with its lack of monetary intervention policies, is the crucial determinant of the crisis.

The paper is organised as follows. In Section 2 we develop the theoretical model by first presenting the dynamical framework for a currency board and then analysing the long-run implications of a debt-supported growth. In Section 3 we develop the empirical analysis by first presenting the data and the methodology and then performing the estimation. In Section 4 we analyse the dynamical properties of our empirical model. In Section 5 we reformulate the model in order to allow for a counter-cyclical monetary rule, and analyse the effects on stability. Section 6 concludes.

2. The theoretical model

2.1. The dynamical framework for a currency board

In this section we present a monetary growth model aiming at describing the macroeconomic behaviour of an economy under a currency board arrangement. Our aim is to explain a financial crisis as the outcome of an endogenous process where foreign finance and profitability expectations interact procyclically: foreign-debt supported expansions lead to the deterioration of firms' net worth, a consequent fall in the state of confidence that makes foreign lenders unwilling to provide additional finance. As a result, shrinking liquidity and dropping output may follow. The analytical framework is similar to the one proposed in Franke and Semmler (1989), but the monetary side of the model differs due to the open-economy setting. To this aim we consider an economy where liquidity is completely created through a country's balance of payment surpluses: in fact, under a currency-board arrangement the growth of liquidity totally rests on the inflows deriving from net current account surpluses and capital inflows, given the monetary authorities' commitment to maintain a fixed proportion between domestic liquidity and the stock of foreign reserves. The consequence is that when accumulation is largely financed with debt-creating capital flows, deteriorated balance sheets may accelerate a capital reversal, and a financial crisis may turn into a currency crisis because of no room for stabilisation policies.

We thus consider a small open economy where prices and the exchange rate are fixed and the PPP holds. The model may be represented by the following equations for the six variables: output, the stock of money, the stock of debt, the stock of foreign reserves (all in units of capital), the interest rate and the economy's "state of confidence", which we denote respectively as: y, m, l, fr, i, ρ:

$$s - \gamma \lfloor \pi^e - i \rfloor - nx + il = 0 \qquad \gamma' > 0 \qquad (2.1)$$

$$m - \lambda(y, i) = 0 \qquad \lambda_1 > 0, \quad \lambda_2 < 0 \qquad (2.2)$$

$$\dot{l} = [\varphi(\pi^e - i; l) - \gamma(\pi^e - i)] l \qquad \varphi_1 > 0, \quad \varphi_2 < 0 \qquad (2.3)$$

$$\dot{\rho} = \omega(\pi - i; l) \qquad \omega_1 > 0, \quad \omega_2 < 0 \qquad (2.4)$$

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[6] Minsky (1982). In such a direction are the works of Foley (1986), Taylor and O'Connel (1985), Franke and Semmler (1989) and Cavallaro (1999), among others. A general framework for disequilibrium macroeconomic dynamics is proposed in Flaschel et al. (1997).