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The Devaluation of the Thai Baht and A Simple Second Generation Currency Crisis Model

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THE DEVALUATION OF THE THAI BAHT AND A SIMPLE SECOND GENERATION CURRENCY CRISIS MODEL

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ABSTRACT

An important element of the Thai crisis was the sterilisation of reserve outflows by the monetary authorities in an attempt to bailout fragile banks. This paper develops a new second generation currency crisis model to explore the effects of such a policy.

Key words: banks, currency crisis, East Asia, lender of last resort, Thailand

JEL Classification: F30, F32

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All dollars ($) refer to US$.

1. Introduction

An important characteristic of the Thai crisis of 1997 was the large-scale sterilisation of reserve outflows by the monetary authorities so as to ensure smooth growth of money supply during the crisis period (World Bank, 1999 and Table 1)[1]. The reasons for this monetary creation was the Bank of Thailand (BOT) acting as a lender of last resort in the face of domestic banking fragilities and the threat of an outright collapse of the banking sector (Table 2). Indeed, the provision of credit to the domestic banks and the concomitant focus on banking sector fragilities provides a reason why activist (i.e. tight) monetary policy to defend the currency may not be a viable/preferred option. This is so, given its adverse repercussions on the banking sector and the real economy through the Keynesian aggregate demand, and the potentially more potent, Fischerian debt deflation channels (Calvo and Reinhart, 1999)[2].

The preceding hints at a strategic choice of policy actions and the discretionary role of the monetary authority and points to the need to appeal to "new second-generation" (NSG) models a la Obstfeld (1996). These models have, as a common element, conscious maximisation by the monetary authority of a welfare function which incorporates the tradeoffs between the costs and benefits of defending a peg under attack. Unlike the early second-generation models (see Obstfeld, 1986 and Dellas and Stockman, 1993), which are based on the Krugman (1979) monetary framework, there is no such canonical framework in the case of the NSG models. However, all of these models exhibit certain basic traits. These include:

(a) there is a reason why the government is tempted to abandon the prevailing peg[3]; (b) there is a reason why the government would like to hang on to the fixed exchange rate Thus,

[1] Calvo (1996), Flood et al. (1996), Sachs et al. (1996) and others have emphasised this to have been a characteristic of the Mexican crisis of 1994-95 too.

[2] The costs of hiking interest rates is a non-negligible point, as governments could in turn defend a currency peg (by reducing the monetary base sufficiently) if they were willing to subordinate all other goals to it (Obstfeld and Rogoff, 1995).

[3] For the purposes of this paper, we make no distinction between fiscal and monetary (central banking) authorities, assuming that the 'policy maker' or 'government' is a monolithic body.

there is a tension between motives (a) and (b). The decision regarding the abandonment of the peg is a policy decision, as an optimizing policy maker balances the various tradeoffs[4]; and (c) there exist two or more equilibra corresponding to various magnitudes of the post-crisis depreciation.

A popular NSG model is that used by Sachs et al (1996) and Velasco (1996), in which the government, burdened with public debt, attempts to offset adverse shocks to government revenue and inflation. Motivated by this framework, this paper aims to develop a NSG model to explore the effects of government bailout of the domestic banking system through monetary infusion. As with Chinn et al. (1999), Dooley (1998) and Flood et al. (1996) and others, it is assumed that the central bank acts as a lender of last resort in the face of an imminent domestic banking collapse.

2. The Model

The government is assumed to minimise the following single period quadratic loss function:

$$L_t = ½(\beta\Pi_t^2 + f_t^2) + cZ, \qquad \beta > 0 \qquad (1)$$

where: Π_t is the inflation rate (which is assumed equal to the rate of devaluation by assuming PPP); f_t is the size of the fiscal deficit (which is a policy determined, flow variable)[5]; β is a parameter; c generically refers to the costs incurred by the government by devaluing (in terms of loss of reputation and credibility, political costs, etc); and Z = 1 if Δe_t

[4] More precisely, this class of models has in common "escape clauses" a la Obstfeld (1991), in which the policy makers use discretion in the event of exceptional circumstances, otherwise they follow a policy rule.

[5] The fiscal burden of bank bailouts was most clearly articulated by Diaz-Alejandro (1985) when he described the 1982 Chilean banking crisis. Writing about East Asia, Burnside et al. (1998) and Corsetti et al. (1998) have argued that forward-looking agents may have become aware of the high fiscal costs involved in financial sector restructuring. Thus, even though actual fiscal balances were in surplus, these contingent liabilities implied high "prospective" fiscal deficits.

(devaluation) > 0, otherwise Z = 0.

Two assumptions have been made. First, that the government only faces a cost if it devalues, but not if it revalues (the latter generally being perceived as a sign of strength by private agents). Second, that the costs of devaluation are fixed, being independent of the size of the devaluation itself.

The resource constraint faced by the government may be written as follows:

$$bo_t + g(\Delta i^e_t) - \psi(\Pi_t - \Pi^e_t) = f_t, \qquad \psi > 0 \qquad (2)$$

where: (Δi^e_t) refers to an unexpected rise in real interest rates; Π^e_t is the rate of devaluation/inflation expected by private agents; bo_t is the size of bank bailout by government; and ψ is a parameter. Thus, the overall fiscal cost of the bank bailout in this case is equal to the sum of the existing bailout plus the increase due to an unanticipated hike in interest rates (to try and stave off the currency attack). Eq. (2) assumes that the exogenous shock takes the form of an unanticipated rise in interest rates rather than an exogenous negative shock to net tax revenue as in Sachs et al. (1996) and Velasco (1996).

The public is assumed to make the first move, setting expectations on the basis of the existing magnitude of the bank bailout. The shock is then realised and observed by the authorities, who set policy based on eq. (1). Thus, as typical in these models, the government is assumed to possess informational advantage over the public.

The aim is to maximise eq. (1) subject to eq. (2). The first order conditions are:

$$f_t^* = (\beta/\psi)\Pi^*_t, \qquad (3)$$

$$\Pi^*_t = (1 - \lambda)[bo_t - g(\Delta i^e_t) + \psi\Pi^e_t], \qquad (4)$$

where: $\lambda = \beta/(\psi^2 + \beta)$.

The analysis and solution proceeds along similar lines to any escape clause-based model. Agents are assumed to form expectations of devaluation/inflation on the basis of outstanding bailout obligations of the government (which is known with certainty) and the expected net revenue shock. The shock is realised and observed by the government, which then makes its decision.

If the government maintains the prevailing peg, $\Pi_t = 0$. Thus, from eqs. (1) and (2), the government loss function from a fixed exchange rate (L^F_t) is:

$$L^F_t = ½[bo_t - g(\Delta i^e_t) + \psi\Pi^e_t]^2. \qquad (5)$$

To derive the government loss function if it devalues (L^D_t), substitute eqs. (4) and (5) into eq. (1). This yields:

$$L^D_t = ½\lambda[bo_t - g(\Delta i^e_t) + \psi\Pi^e_t]^2 + c. \qquad (6)$$

The government will forsake the policy rule (of fixed parity) and invoke the escape clause (i.e. devalue) if $L^F_t > L^D_t$ i.e. if:

$$bo_t - g(\Delta i^e_t) + \psi\Pi^e_t > k. \qquad (7)$$

where: $k = [2c/(1 - \lambda)\psi]^{1/2}$.

Given the above, it is straightforward to derive the following results:

Case 1. Certain devaluation, i.e. $g(\Delta i^e_t) = \Pi^e_t = 0$:

$$bo_t > k \qquad (8)$$

Case 2. Uncertain/self-fulfilling devaluation, i.e. $g(\Delta i^e_t) = 0$, $\Pi^e_t > 0$:

$$bo_t > \lambda k \text{ and } bo_t < k \tag{9}$$

Case 3a. *Partially* credible peg:

$$bo_t \leq \lambda k \tag{10}$$

Case 3b. *Fully* credible peg:

$$bo_t + g(\Delta i^e_t) \leq \lambda k \tag{10^I}$$

We have the case of a devaluation with certainty if the size of the bailout is "large" (eq. 8). This occurs as the government undertakes a surprise devaluation, voluntarily pursuing an expansionary monetary policy to bailout out the troubled banks, i.e. $g(\Delta i^e_t) = 0$[6]. Eq. (9) implies multiple equilibra, as an interest rate hike is infeasible (despite $\Pi^e_t > 0$). Cases 3a and 3b are of particular interest. Case 3a (eq. 10) refers to a *partially* credible peg, where an interest rate hike is feasible, but if the defense of the currency is "too costly" (i.e. speculation is "too intense"), the authorities will devalue the currency. In other words, the model suggests that the peg will not enjoy *full* credibility as long as the central bank functions as a lender of the last resort and the banking sector is not "rock solid". In order for an interest rate hike to be effective and be seen as credible in staving off speculative attacks, it should not have "too significant" an adverse impact on the domestic banking sector. This is shown by eq. (10^I), which reveals that *full* credibility of a peg is determined by

[6] It could additionally be assumed that the authority sets a ceiling fiscal allocation ($f \leq f_{max}$) to the bailout of troubled banks. If this is the case, eq. (8) must be modified as: $bo_t > \min \{k, f_{max}\}$.

both the costs/magnitude of the existing bank bail out as well as the costs of a hike in interest rates.

3. Concluding Remarks

Monetary disequilibrium and banking fragilities seem to be common threads that connect the Mexican and Thai crises. Both crises have been characterised by the governments attempting to minimise their respective adverse impacts of capital reversals on their domestic banking systems. This backstopping function of the central bank is modeled within an escape clause-based currency crisis framework which emphasises the non-mechanical behavior of governments that tradeoff various economic policy objectives.

As in all NSG models, the model developed in this paper stresses that while speculative attacks are not inevitable (based on underlying bad fundamentals), neither are they random or arbitrary (i.e. unanchored by fundamentals). Rather, there must exist some weaknesses in the economic fundamentals of the country for an attack to occur, as the credibility of the fixed exchange rate regime is less than perfect. Thus, in the case of the model developed in this paper, a currency crisis may never (always) occur if the existing stock of the government's *contingent liabilities* is "very low" ("very high") and the domestic economy is "sufficiently immune" from an interest rate hike. However, only when these fiscal costs of bank bailouts are within a certain range (as formalised above), is the currency vulnerable to such a crisis. There are a multiplicity of equilibra within this "crisis zone", such that an economy remains on what seems to be a sustainable path ('superior equilibrium') until some trigger or evidently minor event coalesces market expectations to an "inferior" one which is realised.

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Table 1
Monetary Base (millions of baht and $), Dec. 1995 - December 1997[a]

Period	Amount (baht)	Amount ($)
Q1: 96	411057.5	16292.4
Q2: 96	396161.3	15621.5
Q3: 96	403762.7	15883.7
Q4: 96	452924.2	17685.4
Mar-97	462165.8	17796.1
Jun-97	514285.9	19941.3
Sep-97	433848.5	11879.8

Notes: a) end of period
Source: Bank of Thailand and IMF

Table 2
Claims by Monetary Authorities on Domestic Financial Institutions, Q1: 1996 - Q3:1997[a]

	Q1-96	Q2-96	Q3-96	Q4-96	Q1-97	Q2-97	Q3-97	Q4-97
Indonesia[b]	15295	15930	16531	15182	16084	19154	21245	67313
Malaysia[c]	6585	6867	5679	5249	5325	5284	5411	5032
Philippines[d]	13.1	13.2	13.6	14.2	14.3	16.1	20.0	34.5
Thailand[e]	38.4	66.0	72.0	90.1	194.0	353.9	597.9	723.4

Notes: a) end of period; b) billions of rupiah; c) millions of ringgit; d) billions of peso; e) billions of baht
Source: Computed from IMF data

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