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## Fiscal Consequences of Asian Crisis

**Guillermo Tolosa**

**Guillermo Tolosa is a Ph.D. student** in the Department of Economics, University of California, Los Angeles. He can be reached at [gtolosa@ucla.edu](mailto:gtolosa@ucla.edu).

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# Fiscal Consequences of Asian Crisis

Guillermo Tolosa<sup>1</sup>

## Abstract

This paper shows evidence of the consequences of the currency crises in South East Asia on the government's net worth. Results indicate that these episodes derived in severe fiscal deterioration for a significant number of years. This goes against the assumption of a class of models that imply that the devaluation would serve the purpose of equilibrating the intertemporal budget constraint. In addition, it provides insights with respect to the relative importance of the main channels by which this deterioration takes place. Traditional sources of finance for devaluation like seignorage or debt deflation did not play a major role whereas factors related to financial dollarization like bailouts to the banking system generally assumed a fundamental role.

## 1. Introduction

It has been widely argued that fiscal situation deteriorates in the face of real exchange rate devaluations in countries where a considerable fraction of the liabilities are denominated in foreign currency. However, the view that real exchange rate devaluations provide sources of finance that let governments equilibrate the government budget constraint is still strongly held by a strand of the literature.

This debate has a variety of fundamental consequences on both economic policy and theory. On the policy arena, the estimation of the fiscal accounts deterioration in the face of real exchange rate shocks provide a key result for the computation of the sustainable fiscal policy to be adopted in normal times. The theoretical issues involved are diverse. It provides insight with respect to the possible existence of strategic incentives of the fiscal authority to devalue, illuminating the debate about possible causes for devaluations. In addition, it helps to assess the pertinence of arguments that identify fiscal vulnerability as a major drawback of financial liberalization. Also, if the solvency of countries is actually severely affected after this type of episode, the tightening of the borrowing

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<sup>1</sup> I want to thank Arnold Harberger and conference participants at the East West Center for extremely helpful comments

constraint and consequent procyclical fiscal policy usually observed will be better understood.

This paper is an attempt to shed light on this issue. It analyzes quantitatively the evolution of the public finances after episodes of severe increase of the real exchange rate. It decomposes the behavior of all components fiscal accounts to identify the main drivers of this evolution. The focus is on South East Asian countries that underwent a severe financial crisis in 1997, because of their considerable degree of financial dollarization and because they provide a considerable time span after the crises in which relevant variables can be traced. In other countries the result is self evident, in the sense the fiscal situation got unsustainable to a point where a restructuring of the debt in ways more or less friendly to the market had to be implemented, as in Russia, Argentina and Uruguay.

Results show that currency crisis in the 1990's have effectively made the fiscal situation worse. Fiscal accounts have deteriorated sharply because of the increased transfers to the ailing banking system, decrease in tax revenue because of output fall, and because the sources of revenue typically mentioned have not been relevant. As a matter of fact, some of them not only did not help but also made things worse. Some fiscal efforts have been done to revert the situation in most countries, but they have not been enough.

These results imply that following these events governments have the need to put even greater pressure to the private sector to adjust to a situation where overall current account should be then balanced because of the lack of capital inflows. Interest rate hikes might have been functional to this purpose even when the declared objective was to stop exchange rate depreciation. In addition, it could provide a rationale for early action from official creditors to prevent this crisis with catastrophic consequences to arise.

The rest of the paper proceeds as follows. Section II provides a brief survey of the relevant literature, introducing the main direct and indirect effects by which real exchange rate devaluations have an impact on the fiscal accounts. Section III describes the methodology employed for the empirical analysis. Section IV shows the results. Section V concludes.

## 2. Literature review

The class of models which state that devaluations allow governments to stop eroding their net asset position, can roughly be categorized as the “first generation models of currency crisis”. According to this view, fiscal problems as the main cause of the currency crisis and these problems are somehow fixed by the occurrence of the devaluation. However, the identification of the most relevant mechanism at work to equilibrate the government budget constraint has been an elusive quest.

The first models, spurred by the seminal theoretical contributions by Krugman (1979) and Flood and Garber (1984) assumed a sustained fiscal deficit backed by a loss of international reserves before the crisis occur. After the devaluation, the fiscal deficits were supposed to be covered mainly by seignorage revenues. That is, once the government abandons its commitment to a certain level of the exchange rate, it can recur to the systematic increase of the money supply that will allow it to cover the fiscal deficit.

More recently, some authors of this paradigm started to focus on the relevance of the deflation of debt as the fundamental equilibrating mechanism of the government budget constraint. This view, generally associated with the fiscal theory of the price level<sup>2</sup>, claims that movements in the exchange rate have dramatic consequences on the dollar value of the non-indexed debt and thus huge fiscal gains can be made instantaneously when the crisis take place. The higher the level of non-indexed debt, the smaller the adjustment needed of the exchange rate. Typically, debt in this literature is defined in a broad way and can also include social security liabilities. Given that currency crisis are actually associated with big movements in the real exchange rate, even if some of this debt is actually indexed to the price level, a devaluation implies a huge reduction in their dollar value.

Another shift of emphasis has been started by Burnside, Eichenbaun and Rebelo (2003), who show that there might be a role for what they call “implicit fiscal reform”. This mechanism relies on the fact that government revenues are in many countries might be more linked to the tradable sector and thus the exchange rate than government expenditures, which are typically heavy on nontradables like health and education. Thus,

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<sup>2</sup> See Daniel 2001, Corsetti and Makowicz (2002))

right after the devaluation, an automatic adjustment would let governments to have a much more favorable fiscal surplus.

Finally, other authors, using political economy arguments, have stated that also explicit reforms (increase in tax rates, exceptional decrease in government spending) could potentially become another source of improvement of the fiscal accounts, as they tend to be more politically viable in times of economic crises.

On the other hand, other authors share the view that fiscal sustainability is under severe threat after a devaluation of the real exchange rate<sup>3</sup>. This school of thought gives more emphasis mainly to the fact that governments after these episodes are generally involved in gigantic bailouts to the banking sector, which is in problems because of the currency mismatch of their main debtors, nontradable firms. Another very relevant channel is the fact that these currency crises are typically associated with very important decreases in output that affect the tax revenues.<sup>4</sup>

While theoretical debate is intense, the empirical work done in the area is extremely scarce. There is not generic assessment of the relative empirical importance of each of the channels highlighted above and the overall effect of those on the fiscal situation in specific countries. With the methodology provided in the next section, each specific channel will be computed and the overall consequence of the crisis will be determined.

### 3. Methodology<sup>5</sup>

#### 3.a. Decomposition of the intertemporal budget constraint

I start by considering a standard government budget identity that results from the consolidation of the central bank and the general government:

$$h_{T+1} - h_T = r_t h_T + (\tau_T - g_T) - v_T + (M_T - M_{T-1})/S_T - (\delta_T)B_T/S_T \quad (1)$$

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<sup>3</sup> See, among many others, Calvo, Izquierdo and Talvi (2002)

<sup>4</sup> Another effect usually mentioned is the dramatic increase of debt/GDP ratio, but this is not necessary a negative element per se if one of the main assets, namely surpluses/GDP also go up because of, say, the deflation of pension and wage spending.

<sup>5</sup> I build on Burnside et al. (2003)

where  $h_t$  represents the government net assets in dollars,  $r_t$  is the average interest rate the country pays or receives for those net assets,  $\tau_t - g_t$  is primary surplus of the government in dollar terms,  $v_t$  are total transfers from the government to the banking system,  $M_t$  is the base money,  $S_t$  is the nominal exchange,  $B_t$  is nominal debt in domestic currency and  $\delta$  the period devaluation rate. The last term intends to capture the gains due to the variation in the dollar value of domestic currency denominated liabilities.

I will assume that this country that suffers a currency crisis at a certain time T. Solving forward, we get the variation from T to N (time period of last data available) of the government net asset position:

$$H_N - h_T = \sum_{t=T}^N (1 + r_t)^{-(t-T)} \left( (\tau_t - g_t) - v_t + (M_t - M_{t-1}) / S_t + \delta_t (B_t / S_t) \right) \quad (2)^6$$

Let's now assume that the government decides not to devalue the currency. The variation of the net asset position from N to T would be:

$$H_N^e - h_T = \sum_{t=T}^N (1 + r)^{-(t-T)} \left( (t_t^e - g_t^e) - v_t^e + (M_t^e - M_{t-1}^e) / S_t^e + \delta_t^e (B_t^e / S_t^e) \right) \quad (3)$$

where  $X^e$  is the expected value of variable X in the scenario of no devaluation of the currency.

The objective is to compare the fiscal situation at time N under each scenario.

Thus, the overall effect of the devaluation on the net worth of the government is given by:

$$H_N - H_N^e = \sum_{t=T}^N (1 + r)^{-(t-T)} \left( \begin{array}{l} \left( (\tau_t - g_t) - (t_t^e - g_t^e) + ((M_t - M_{t-1}) / S_t - (M_t^e - M_{t-1}^e) / S_t^e) \right) \\ \left( (v_t - v_t^e) + (\delta_t)(B_t / S_t) - \delta_t^e (B_t^e / S_t^e) \right) \end{array} \right) \quad (4)$$

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<sup>6</sup> Note that  $H_N = \sum_{t=T}^N (1 + r)^{-(N-T)} (h_N)$



The total effect comprises four major components (all measured in dollar terms): the variation in the fiscal surplus or “implicit fiscal reform” ( $\Delta FS$ ), in seignorage revenues ( $\Delta SE$ ), in government transfers ( $\Delta TR$ ), and in the debt value or “debt deflation” ( $\Delta DV$ ).

We will make a further disaggregation of the effects to be able to distinguish some effects of interest. The variation of the fiscal surplus will be divided in three effects: a price effect, an output effect, and a residual effect. The price effect ( $\Delta FS(p)$ ) will capture exclusively the effect of the real exchange rate variation in the fiscal surplus, (the effect that was previously labeled “implicit fiscal reforms”) The output effect  $\Delta FS(Y)$  will reflect the impact of the decline in output and the residual term that will capture, among others, the effect of explicit reforms in the tax rates and government spending,  $\Delta FS(e)$ . The total effect computed at time  $T_p$  (present) will be given by:

$$\text{TOTAL EFFECT}(T_p) = \Delta SE + \Delta DV + \Delta FS(p) + \Delta FS(e) + \Delta FS(Y) - \Delta TR$$

Note that the effects were ordered according to the discussion of the previous section. The first four components represent the potential sources of financing for the government according to the literature, while the following are the two the main threats for the fiscal situation.

The precise description of the practical computation of each component is described as follows:

### (i) Seignorage

The increase in seignorage, as shown in (4), will be measured with the change in dollar value of the monetary base. The peculiarity of this component is that all variables are collected monthly<sup>7</sup>, so can construct the sum over all months between  $T$  and  $N$  (to be called  $T_m$  and  $N_m$ ) :

$$\Delta SE = \sum_{t=T_m+1}^{N_m} (1 + r_m)^{-(t-t_m)} \left( \frac{M_t - M_{t-1}}{S_t} - \frac{M_t^e - M_{t-1}^e}{S_t^e} \right)$$

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<sup>7</sup> All other components are calculated annually

In this case, there is available monthly data, which explains the subscript of the time period  $t_m$ .

### **(ii) Debt deflation**

The study of the dynamics of debt denominated in domestic currency faces severe limitations because of lack of data availability. Information about currency denomination of debt is scarce, let alone the exact maturity of the bonds. Also, projections of stocks of domestic debt in the counterfactual scenario seem too arbitrary since any combination between domestic and international debt seem equally likely a priori.

As a consequence, we will use a proxy of this component taking into account only domestic debt in the moment of the devaluation and assume it has been and will be paid back at an exchange rate equal to the average of the period since the devaluation. In the counterfactual scenario debt deflation is 0, as no capital gains can be expected in times of normal evolution of the exchange rate.

$$\Delta DD \cong \hat{\delta} B_T / S_T$$

where  $\hat{\delta} = (S_{av} - S_T) / S_T$  and  $S_{av}$  is an average exchange rate between time period T and N.

### **(iii) Fiscal surplus**

The effect of the devaluation in the fiscal surplus will be subdivided in three different effects: output effect, price effect and explicit reforms.

For that purpose, I will assume that dollar tax revenues can be approximated by the following equation:  $T_t = (\tau + \dots) p_t^\alpha Y_t^\beta$ .  $T_t$  are the dollar revenues of the government.  $Y_t$  is defined as real GDP and  $pt=P/S$  (a proxy of the inverse of real exchange rate).

Thus, represents  $\alpha$  is the inverse real exchange rate elasticity of taxes and  $\beta$  the income elasticity of taxes<sup>8</sup>.

Elasticities will be estimated through the following regression:

$$\Delta \log T_t = \alpha \Delta \log p_t + \beta \Delta \log Y_t + \varepsilon_t$$

In the absence of a crisis we define:  $T_t^e = \tau p_t^{e\alpha} Y_t^{e\beta}$ .

For government expenditures, we assume that  $G_t = g p_t^\gamma$ , where  $g$  is government share and  $\gamma$  the elasticity with respect to the inverse of the real exchange rate. With no crisis, we assume  $G_t^e = g p_t^{e\gamma}$ .

### Output effect

The first channel to consider stems from the fact that devaluations typically have important effect on output evolution, as documented by a series of papers<sup>9</sup>. It seems reasonable then to isolate this effect on the total decline of tax revenues.

The output effect in government revenues can be computed as:

$$\Delta(T, Y) = \sum_{t=T}^N (1+r)^{-(t-T)} \tau p_t^{e\alpha} (Y_t - Y_t^e)^\beta$$

$$\Delta(FS, Y) = \Delta(T, Y)$$

### Price effect

The second relevant effect is the decline in the dollar measure of tax revenues and government expenditures because of the decline in the prices measured in dollars in the economy. As mentioned earlier, some authors identify a possible role for this channel in improving fiscal accounts by an “implicit fiscal reform”.

<sup>8</sup> Note that I exclude a potential Tanzi effect not including unanticipated inflation as a determinant of tax receipts because inflation never assumes important magnitudes in the countries considered.

<sup>9</sup> See Aziz et al (2000), Barro et al (2001), Bordo et al (2001), Milesi-Ferreti et al (2001)

For the case of government expenditures, I will consider the deflator implied by the national income accounts. This price will be much more representative of the relevant price effect of the change in the exchange rate.

These effects can be measured with the following equations<sup>10</sup>:

$$\Delta(T, p) = \sum_{t=T}^N (1+r)^{-(t-T)} \tau (p_t - p_t^e)^\alpha Y_t^{e\beta}$$

$$\Delta(G, p) = \sum_{t=T}^N (1+r_a)^{-(t-t_a)} g (p_t^G - p_t^e)^\gamma$$

$$\Delta(FS, p) = \Delta(T, p) - \Delta(G, p)$$

### Explicit reforms

The last effect that has an effect on the fiscal constraint intends to capture the fiscal reforms that governments undertake because of the devaluation. The rationale would be that after the considerable modification of their net assets brought by the devaluation (of any sign), governments will have an incentive to change tax rates and impose or abandon some taxes in the economy.

This component is computed as a residual from the difference of the total variation of revenues (and expenditures) and the variation because of the output and price effects. In turn, this component will end up capturing changes in the share of taxes as a fraction of output that might be derived from an output shift towards a sector of the economy that is more (or less) heavily taxed.

The total variation in tax revenues and government expenditures because of the devaluation is given by:

$$\Delta(T) = \sum_{t=T}^N (1+r_a)^{-(t-t_a)} (T_t - T_t^e)$$

$$\Delta(G) = \sum_{t=T}^N (1+r_a)^{-(t-t_a)} (G_t - G_t^e)$$

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<sup>10</sup> The feasible way used to compute the effect is taking the log-linearized versions of the formulas.

If we subtract from this the two effects already considered we get the residual component that will account for explicit tax reforms.

$$\Delta(T, e) = \Delta(T) - \Delta(T, Y) - \Delta(T, p)$$

$$\Delta(G, e) = \Delta(G) - \Delta(G, p)$$

$$\Delta(FS, e) = \Delta(T, e) - \Delta(G, e)$$

#### **(iv) Transfers to banks (bailouts)**

An additional consequence of the devaluation is the activation of contingent liabilities, more specifically those related to the bailouts to the banking system. Given that in a considerable amount of middle income countries the nontradable sector gets indebted in dollars, devaluations bring along across-the-board bankruptcies that are typically bailed out by the government (see Tornell and Westerman (2002) for an excellent description of this phenomenon).

The cost of the bailout associated with the devaluation can be computed by:

$$\Delta(TR) = BCC - BCC^e$$

where BCC is the banking crisis cost as computed by Caprio et al (1996) and, and BCC<sup>e</sup> is the cost of a banking crisis in the case no currency crisis occur.

## **4. The evidence**

### **4.a Series construction**

For the case of occurrence of currency crisis, we can actually recur to the data and obtain the evolution of these variables for at least a considerable number of years after time T. Notice I will only compute the total effect until the moment when data is available. No projections are going to be made to shed light on the time span needed to go back to the initial situation. As a consequence the computation of all the effects are up to present time and do not offer comparison of paths onto infinity.

The case of no crisis is obviously more problematic since it is unobservable and counterfactual simulations are required.<sup>11</sup> The most natural assumption is that even the run against the currencies would have been avoided with some credibility shock or equivalent, the banking crisis would have been inevitable. So the counterfactuals would include the upcoming banking crisis. The objective of the paper is to isolate the effect of the devaluation on the fiscal accounts, so considering both effects would have lead to misleading results<sup>12</sup>. For each variable a univariant time series model was then estimated so as to make projections of the likely outcomes if the situation would have evolved as in the past<sup>13</sup>. These results were then adjusted by the output costs of the banking crisis as computed by Barro (2001). For the counterfactual of the bailout to the banking system (BCCe), we assumed that the banking crisis would have been much milder. A good approximation of this component is the amount of nonperforming loans previous to the crisis adjusted by the proportion of nonperforming loans that receive a bailout (obtained from the effective bailout value and nonperforming loans after the crisis). Admittedly, this is a rough estimate of the effect of the devaluation since a considerable fraction of the worsening of banks assets the year of the devaluation can be because of the recession and not the devaluation itself.

#### **4. b Results**

The results show, as summarized in figure 1, that currency crises have been very costly for all the countries involved. In other words, even considering all sources of revenue and policy reaction to these events, the fiscal situation experienced a severe deterioration.

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<sup>11</sup> From all possible assumptions, in every case the ones chosen where those in which the decline of the fiscal situation was much smaller, to be able to get to the most robust conclusion if the crisis indeed worsened the fiscal situation.

<sup>12</sup> Note that it is not the total effect of the currency crisis because the fall in reserves preceding the devaluations are not taken into account

<sup>13</sup> See appendix for model specification

**Figure 1**

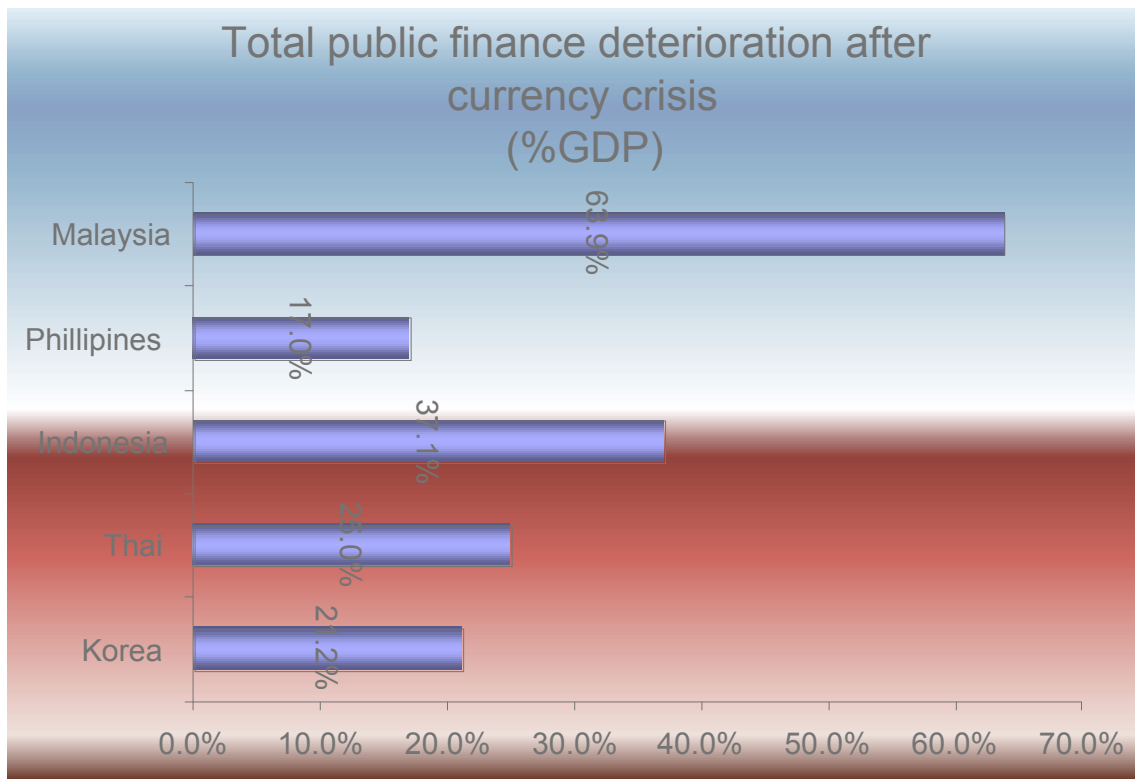


Table 1 summarizes the quantitative importance of all the effects considered for different countries.

**Table 1**  
**Fiscal consequences of currency crisis**  
**(1997 billions of dollars)**

	$\Delta SE$	$\Delta DV$	$\Delta FS(p)$	$\Delta FS(e)$	$\Delta FS(Y)$	$\Delta TR$	<i>Total</i>	<i>Total</i> (%GDP)
<b>Korea</b>	0.2	15.9	-24	39	-72	-60	-100.9	<b>21%</b>
<b>Thailand</b>	-8	1.8	9	-11	-10	-19	-37.6	<b>25%</b>
<b>Indonesia</b>	-8	0.2	5	13	-35	-55	-80	<b>37%</b>
<b>Phillipines</b>	-3	0.3	15	-24	0	-2	-14	<b>17%</b>
<b>Malaysia</b>	-5	9.5	9	-46	-23	-8.5	-64	<b>64%</b>

The first element that stands out is that the increased transfers to banks account for more than half of the total cost of the crisis in Korea, Thailand and Indonesia, illustrating the key role of the dollar debts in the outcome. Those same countries suffered big declines in their tax revenues associated with the fall in output associated with the currency collapse. But it is also very informative that even in Malaysia and Phillipines experienced a considerable weakening of their fiscal situation, even when those countries did not have to offer these huge bailouts to the financial system and where the output did not fall as much. The main culprit of this situation was the comparatively more expansive fiscal policies, in the case of Malaysia probably related to the fact that their decision not to follow the IMF guidelines.

The other very surprising result is the lack of relevance of seignorage. As a matter of fact, in most cases seignorage has the opposite sign to expected. Seignorage has then decreased in almost all countries with respect to the counterfactual scenario. This can be explained by the combined effect of the monetary policy prudence and the decrease of the money demand growth because of the traumatic shock of the currency crisis. Debt deflation is not a very important component either, both because the low debt levels of these countries before the crisis and the fact that an important amount of the debt was denominated in dollars.

“Implicit fiscal reforms” ( $F_s(p)$ ) was indeed a positive contributor to the change in the fiscal situation except for the case of Korea. Negative contributions of this factor should be associated in theory with countries with big interest payments to dollar debt and a small tradable sector in the economy, for which this result for Korea is very challenging.

Explicit fiscal reforms ( $F_s(e)$ ) is a residual component and thus its interpretation should be carried out with extreme caution. It intends to capture the discretionary fiscal stance of governments after the devaluation, but other elements also interfere like a possible change in the relevant parameters of the model after the episode. As already mentioned, however, expansive fiscal policies seem to be playing a role in the importance of this element in the case of Malaysia at least.

In all cases the gap in public finances has been covered by increase in debt. In a more speculative arena, it can be stated that the financing mix of South East Asian after this



traumatic experience does seem very appropriate in the long run. The sources of growth are intact, in the sense that property rights, at least of bond holders of public debt have not been violated, price stability has been safeguarded, and distortionary taxes have not gone out of control. The experiences of Latin American countries with respect to the first two and of England after world war II show the perils of these methods of finance to which South East Asian countries have not recurred in a relevant way.

### **5. Concluding remarks**

This paper has shown that fiscal accounts suffered a big shock after the currency crisis that took place in South East Asia in 1997. The activation of contingent liabilities and steep decreases in output has now taken the center stage of public finances compared to episodes in the past where seignorage and debt deflation were the main features. Governments have let their net asset position deteriorate without recurring to sufficient offsetting change in taxes (including the inflation tax) or reduction in spending.

These stylized facts give important inputs for modeling strategies of these events. In particular, models where agents run against the currency anticipating a government which devalues acting strategically does not seem to have empirical ground in the last episodes of currency crisis. Given the huge fiscal costs involved in the devaluation, it will always be optimal for a government that cares about its fiscal accounts because of financing problems or compromised objectives to defend the nominal exchange rate until it is able to do it. This line of argument could constitute a rationale for the fact that those countries that receive negative shocks and exhibit downward sticky prices tend not to let the nominal exchange rate move (i.e. exhibit “fear of floating”).

The empirical exercise also gives new insights of the reason why perception of risk increases so dramatically after currency crisis and countries have a very hard time to have access to private credit, having no choice but acting procyclically and embarking in some fiscal reforms that would hurt the economy even more.

Unfortunately, downward movements of the real exchange rate do not have the opposite result on the fiscal accounts, since obviously banks do not feel compelled to transfer the

windfall given by the improved situation in the credit market to the government. The asymmetrical nature of the result calls for much greater fiscal responsibility in normal times for governments finances to be on a sustainable path.

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