A. Countries and Crisis Dates

1. Mexico, December 1994
2. Argentina January 2002
3. Thailand July 1997
4. Indonesia July 1997
5. S. Korea July 1997
6. Taiwan July 1997

B. Data

For all countries

CPI, GDP deflator, interest rates on government debt: one for short term (30 days), one for longer term (1yr), real GDP per capita, nominal exchange with the U.S.

For Mexico

Consumption, investment, labor input, net exports, (capital stock?), government spending

1. Collateral Constraints

Small open economy, world interest rate R is given. Collateral constraint is

(1) $$-b_{t+1} \leq V(k_{t+1})$$

where b_{t+1} is saving in period t. The government in each country solves the problem of maximizing the utility of the representative consumer:

$$\max \sum \beta^t U(c_t, l_t)$$

subject to the country's budget constraint

$$(2) \qquad c_t + g_t + b_{t+1} + k_{t+1} \leq F(k_t, l_t) + (1-\delta)k_t + Rb_t$$

and the collateral constraint (1). The first order conditions are

$$c_t : \beta^t U_{ct} = \lambda_t$$

$$l_t : -\beta^t U_{lt} = \lambda_t F_{lt}$$

$$k_{t+1} : \lambda_t - \mu_t V'(k_{t+1}) = \lambda_{t+1} \left[F_{kt+1} + 1 - \delta \right]$$

$$b_{t+1} : \lambda_t - \mu_t = \lambda_{t+1} R$$

The conditions can be simplified to obtain

$$-\frac{U_{lt}}{U_{ct}} = F_{lt}$$

$$U_{ct} = \beta U_{ct+1} \left[F_{kt+1} + 1 - \delta \right] + \mu_t V'(k_{t+1})$$

and the complementary slackness condition where $\mu_t \geq 0$ and

$$\mu_t \left[V(k_{t+1}) + b_{t+1} \right] = 0$$

Associated Prototype Economy

$$\max \sum \beta^t U(c_t, l_t)$$

subject to the budget constraint

$$(3) \qquad c_t + k_{t+1} \leq \left[(r_t - \delta)(1 - \tau_{kt}) + 1 \right] k_t + w_t l_t + T_t$$

The resource constraint is

$$c_t + G_t + k_{t+1} = F(k_t, l_t) + (1-\delta)k_t$$

$$\sum \left(\frac{1}{R}\right)^t G_t + b_0 = \sum \left(\frac{1}{R}\right)^t g_t$$

Proposition 1. Consider an equilibrium allocation $\{c_t, l_t, g_t, k_{t+1}, b_{t+1}\}_{t=0}^{\infty}$ in the original economy, then $\{c_t, l_t, k_{t+1}, G_t\}_{t=0}^{\infty}$ is an equilibrium allocation in the prototype economy with capial taxes

$$\tau_{kt+1} = -\frac{\mu_t V'(k_{t+1})}{\beta^t U_{ct+1}\left(F_{kt+1} - \delta\right)}$$

where μ_t and government spending in the prototype economy

$$G_t = g_t + b_{t+1} - Rb_t.$$

Remarks: 1. For an equilibrium in the prototype economy to be an equilibrium in the original economy clearly we also need that $U_{ct} - R\beta U_{ct+1}$ is nonnegative for all t some appropriate choice of $R > 1$. This R will serve as the world interest rate in the original economy.

2. A special case of this economy is one in which the collateral constraint is replaced by a simple borrowing constraint with $V(k_{t+1}) = \bar{V}_t$ so that

$$-b_{t+1} \leq \bar{V}_t.$$

In this case $V'(k_{t+1}) = 0$ and in the protoype economy $\tau_{kt+1} = 0$.

2. Adding Intermediate Goods

Consider adding foreign intermediate goods to the above economy. We suppose that imports of intermediate goods z_t as well as borrowing are to a collateral constraint of the form

$$(4) \qquad z_t - b_{t+1} \leq V(k_{t+1}).$$

The government in each country solves the problem of maximizing the utility of the representative consumer:

$$\max \sum \beta^t U(c_t, l_t)$$

subject to the country's budget constraint

$$(5) \qquad c_t + g_t + b_{t+1} + k_{t+1} \leq G(k_t, l_t, z_t) + (1-\delta)k_t + Rb_t - Rz_{t-1}$$

and the collateral constraint (1). Here $G(k_t, l_t, z_t)$ is gross output and $G(k_t, l_t, z_t) - p_t z_t$ is value added where p_t is the domestic price of the foreign intermediate good in units of the final good. The first order conditions are

$$c_t : \beta^t U_{ct} = \lambda_t$$

$$l_t : -\beta^t U_{lt} = \lambda_t G_{lt}$$

$$k_{t+1} : \lambda_t - \mu_t V'(k_{t+1}) = \lambda_{t+1} \left[G_{kt+1} + 1 - \delta \right]$$

$$b_{t+1} : \lambda_t - \mu_t = \lambda_{t+1} R$$

$$z_t : \mu_t + \lambda_{t+1} R = \lambda_t G_{zt}$$

The conditions can be simplified to obtain

$$-\frac{U_{lt}}{U_{ct}} = F_{lt}$$

$$U_{ct} = \beta U_{ct+1} \left[F_{kt+1} + 1 - \delta \right] + \mu_t V'(k_{t+1})$$

and the complementary slackness condition where $\mu_t \geq 0$ and

$$\mu_t \left[V(k_{t+1}) + b_{t+1} \right] = 0$$

Associated Prototype Economy

$$\max \sum \beta^t U(c_t, l_t)$$

subject to the budget constraint

$$c_t + k_{t+1} \leq \left[(r_t - \delta)(1 - \tau_{kt}) + 1 \right] k_t + w_t l_t + T_t \tag{6}$$

The resource constraint is

$$c_t + G_t + k_{t+1} = F(k_t, l_t) + (1 - \delta) k_t$$

$$\sum \left(\frac{1}{R} \right)^t G_t + b_0 = \sum \left(\frac{1}{R} \right)^t g_t$$

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