A Model of the Twin Ds: Optimal Default and Devaluation

by Na, Schmitt-Grohe, Uribe and Yue

Discussion by Anastasios Karantounias,
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December 12, 2014
What this paper is doing.

- Study the joint determination of optimal sovereign default and devaluation.
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- Going after the Twin D’s of Reinhart (2002): default episodes are typically accompanied with nominal devaluations.

Basic ingredients of the model:
1. Limited enforcement of external debt contracts a la Eaton-Gersovitz ⇒ default in equilibrium.
2. Downward nominal wage rigidity (non-Walrasian element) ⇒ give a motive for devaluation in order to achieve full employment.

Connection of the two phenomena:
1. Adverse shocks: Government devalues in order to reduce real wages and increase employment.
2. Adverse shocks: More incentives of the government to default.

Main result: Eaton-Gersovitz allocation (public external debt) equivalent to: allocation with decentralized borrowing (private external debt), with optimal capital controls and devaluation.

Quantitative study of the joint default and devaluation/capital controls properties. Analyze also pegging.
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Discussion plan

- Overview of the model.
- Some thoughts about the setup.
- Some questions.
The setup

- Small open economy with tradeables and non-tradeables.
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- Production of non-tradeables with labor from a competitive firm.

- Labor markets do not clear due an ad hoc downward wage rigidity.

- **Government**: Taxes holdings of external debt, chooses exchange rate policy, provides transfers and decides each period to honor or not the private agent’s liability.
Agent

- Utility of agent: $E_0 \sum_{t=0}^{\infty} \beta^t U(c_t), c_t = A(c_t^T, c_t^N)$
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- Budget constraint:

$$P_t^T c_t^T + P_t^N c_t^N + \mathcal{E}_t d_t = P_t^T y_t + W_t h_t + (1 - \tau^d_t) q_t^d \mathcal{E}_t d_{t+1} + \mathcal{E}_t f + \Phi_t$$
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- Demand for non-tradables:

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\frac{A_2(c^T_t, c^N_t)}{A_1(c^T_t, c^N_t)} = p_t, \quad p_t \equiv \frac{P^N_t}{P^T_t}
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- Law of one price: \( P_T^T = \mathcal{E}_t P_T^{T*} = \mathcal{E}_t \).
- Devaluation of \( \mathcal{E}_t \equiv \) inflation rate in tradables.
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\]

- Law of one price: \( P_t^T = \varepsilon_t P_t^{T*} = \varepsilon_t \).

- Devaluation of \( \varepsilon_t \equiv \) inflation rate in tradables.

- Debt holdings:

\[
(1 - \tau_d^d) q_t^d = \beta E_t \frac{U'(c_{t+1}) A_{1,t+1}}{U'(c_t) A_{1t}}
\]
Firms and downward wage rigidity

- Demand for labor for production of non-tradeables

\[ F'(h_t) = \frac{w_t}{p_t} \]
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- Labor market equilibrium

\[ (h_t - \bar{h})(w_t - \gamma \frac{w_{t-1}}{\epsilon_t}) = 0 \]

- If unemployment \( h_t < \bar{h} \Rightarrow \) wages do not adjust enough downwards, \( W_t = \gamma W_{t-1}. \) If \( W_t > \gamma W_{t-1} \Rightarrow h_t = \bar{h}. \)
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- Due to the nominal rigidity, real wage can be above the full-employment real wage, \( F'(\bar{h}) \).
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- Government though decides to default \( I_t = 0 \) or not on the agent’s debt. If default, setup like Arellano: output losses in terms of tradeables and stochastic exclusion from markets.

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- **How?** *Confiscates* the payments to the foreign lender and rebates them lump-sum to the agent.

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- Foreign lender: prices the default risk.

\[
q_t = \frac{\text{Prob}_t(\text{repayment at } t + 1)}{1 + r^*}
\]
Competitive equilibrium

- Given policy \( \{\tau^d_t, \epsilon_t, I_t\}_{t=0}^{\infty} \): a price system \( \{p_t, w_t, q_t\} \) and an allocation \( \{c^T_t, c^N_t, h_t, d_{t+1}\} \) such that everybody maximizes and markets clear.
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- Resource constraint

\[
c_t^T = y_t^N - (1 - I_t)L(y_t^N) + I_t[q_t d_{t+1} - d_t]
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- Optimal policy: choose \( \{\tau_t^d, \epsilon_t, I_t\}_{t=0}^\infty \) to maximize utility of the household subject to conditions of the CE.
Equivalence with Eaton-Gersovitz-Arellano

- Eaton-Gersovitz-Arellano:
  1. Government issues public debt that it can default on.
  2. Agents are hand-to-mouth and receive transfers from the government.
  3. Government acts as a monopolist of the security, i.e. takes into account how debt increases default premia.

- Main result: If exchange rate $\epsilon_t$ and capital controls $\tau_d t$ can be chosen freely, then
  1. Full employment is optimal $\Rightarrow c_N t = F(\bar{h})$.
  2. Allocation $c_T t, d t + 1$ and default choices same as in Arellano, but accompanied with the proper choice of \{ $\tau_d t, \epsilon_t$ \}.

- A model with centralized external borrowing delivers the same predictions as a model with the decentralized external borrowing, a government that can confiscate external payments as long as the government has free access to exchange rate policy and capital controls.
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Why?

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- Full-employment real wage

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- Choose capital controls as a residual:

\[ 1 - \tau^d_t = \beta (1 + r^*) \frac{E_t \frac{U_{T,t+1}}{U_{T,t}}}{\text{Prob}_t(\text{repayment})} \]
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The private agent is ignorant of the government policy sequence of \( \{I_t\}_{t=0}^{\infty} \) but not of \( \{\tau^d_t, \epsilon_t\} \).

This is reflected in his Euler equation. This is justified only if private agent takes as given total transfers \( \{f_t\} \) and \( \{\tau^d_t, \epsilon_t\} \) and if the private agent does not realize that \( q^d_t = q^d_t \).

If the agent took into account \( \{I_t\} \) and that \( q^d_t = q^d_t \) (one market instead of two), then the Euler equation would be

\[
(1 - \tau^d_t) q^d_t = \beta E_t I_{t+1} + U^T_{t+1} + U^T_{t+1}.
\]

Same equivalence would hold but different capital controls.

Is it possible to interpret the current setup as private agents borrowing from the government (at \( q^d_t \)) and government borrowing from abroad?
Question/Comment

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The private agent does not take into account that the government can confiscate external payments and default on his debt.

The private agent is ignorant of the government policy sequence of \( \{I_t\}_{t=0}^{\infty} \) but not of \( \{\tau^d_t, \epsilon_t\} \).

This is reflected in his Euler equation.

This is justified only if private agent takes as given total transfers \( \{f_t\} \) and \( \{\tau^d_t, \epsilon_t\} \) and if the private agent does not realize that \( q^d_t = q_t \).

If the agent took into account \( \{I_t\} \) and that \( q_t = q^d_t \) (one market instead of two), then the Euler equation would be

\[
(1 - \tau^d_t)q_t = \beta E_t I_{t+1} \frac{U_{T,t+1}}{U_{T,t}}
\]

Same equivalence would hold but different capital controls.

Is it possible to interpret the current setup as private agents borrowing from the government (at \( q^d_t \)) and government borrowing from abroad?
Mechanism for Twin D’s

- Assume that $c_t^T \downarrow \Rightarrow$ demand for $c_t^N \downarrow \Rightarrow$ price $p_t$ falls $\Rightarrow w_t/p_t \uparrow \Rightarrow$ demand for labor falls. To restore full employment need to reduce $w_t$ by devaluing.

- Thus, “bad” shocks like bad endowment shocks $\Rightarrow$ lead to devaluation $\Rightarrow$ to restore full employment.

- Given a level of debt $d$, bad endowment shocks are more probable to lead to default.

- Devaluation + Default.
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Pegging

- Assume $\epsilon_t = 1$ and *no other fiscal instrument except for the capital controls.*
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- Assume $\epsilon_t = 1$ and no other fiscal instrument except for the capital controls.
- Government has to take into account past wages. Default decision depends on $(d, w_-, y)$. 

\[
V_r(d, w_-, y) = \max_c \max_h \max_{d'} w U(A(c, F(h))) + \beta E_y |y V_r(d', w, y') \]

subject to
\[
c + d = y + q(d', w, y')
\]
\[
d' w = A_2(c, F(h)) A_1(c, F(h)) F'(h) \]
\[w \geq \gamma w - h \leq \bar{h}
\]
Pegging

- Assume $\epsilon_t = 1$ and *no other fiscal instrument except for the capital controls*.

- Government has to take into account past wages. Default decision depends on $(d, w_-, y)$.

- Value of repayment

\[ V^r(d, w_-, y) = \max_{c, h, d', w} U(A(c, F(h))) + \beta E_{y' \mid y} V(d', w, y') \]

subject to

\[
\begin{align*}
  c + d &= y + q(d', w, y)d' \\
  w &= \frac{A_2(c, F(h))}{A_1(c, F(h))} F'(h) \\
  w &\geq \gamma w_- \\
  h &\leq \bar{h}
\end{align*}
\]
Comparison of debt choice

- With optimal devaluation

\[ u'(A)A_1(c, F(h)) \left[ \frac{\partial q(d', y)}{\partial d'} d' + q(d', y) \right] = -\beta \frac{\partial}{\partial d'} E_{y'|y} V(d', y') \]

\[ MR_{\text{optimal}} = -\beta \frac{\partial}{\partial d'} E_{y'|y} V(d', y') \]

- With pegging

\[ \left[ u'(A)A_1(c, F(h)) \right] + \mu F'(h) \frac{\partial A_2}{\partial c} \]

\[ MR_{\text{pegging}} = -\beta \frac{\partial}{\partial d'} E_{y'|y} V(d', y') \]

- When constrained, one unit of tradeable consumption allows to increase the wage and relax the constraint.

- Additional marginal benefit of borrowing if \( MR_{\text{optimal}} = MR_{\text{pegging}} \).
Comparison of debt choice

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\[
\begin{align*}
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\text{MR}_{\text{optimal}}
\end{align*}
\]

- With pegging

\[
\begin{align*}
[u'(A)A_1(c, F(h)) + \mu F'(h) \frac{\partial A_2/A_1}{\partial c}] \times M_{R_{\text{pegging}}} &= -\beta \frac{\partial}{\partial d'} E_{y' | y} V(d', w, y') \\
\end{align*}
\]
Comparison of debt choice

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- Play around with the intertemporal and intratemporal substitutability in order to see how default/repayment regions change. For the current exercise marginal utility of tradeables does not depend on labor.
Optimal firm subsidies and currency pegging

- Subsidize purchases of labor by firms. Finance firm-subsidy by lump-sum taxes on consumer.

- After-subsidy wage: \((1 - \kappa)W\).

- Profits:

\[
\Pi_t = P_t^N F(h_t) - (1 - \kappa_t)W_t h_t \Rightarrow F'(h_t) = (1 - \kappa_t) \frac{W_t}{P_t^N} = (1 - \kappa_t) \frac{w_t}{p_t}
\]

- Even with currency pegging can achieve the full-employment wage by choosing properly \(\kappa_t\).
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• \(\Rightarrow\) Equivalence of Eaton-Gersovitz-Arellano with a model with private external debt, optimal capital controls and optimal firm subsidies.
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- Schmitt-Grohe and Uribe (2013) have also considered this firm subsidy.
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- Schmitt-Grohe and Uribe (2013) have also considered this firm subsidy.
- Would be interesting to see \(\{\tau_t^d, \kappa_t\}\) induced by the optimal default allocation.