Beliefs for Sudden Stops and Current Account Reversals: An Analysis with a Regime Switching Small Open Economy Model

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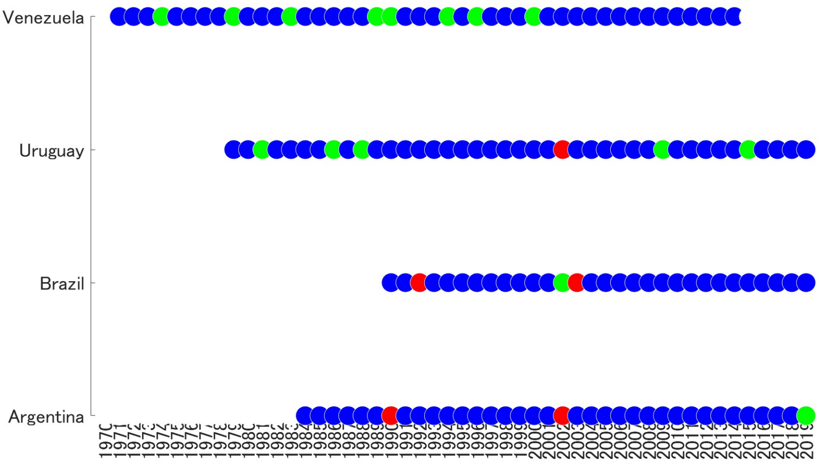
July 25-26, 2024

Introduction

- Sudden stops in emerging economies.
  - Sudden stop of capital inflows represented by the drastic current account reversal and the deterioration of the economy.
- How do the beliefs for losing access to the international financial market matter?
  - Countries with high (low) frequency of current account reversals experience few (many) sudden stops.
  - People may have different beliefs for the stop of capital inflows.

Introduction



Introduction

- Small open economy model with occasionally binding collateral constraints
  - Replicates the dynamics of sudden stops. (Mendoza (2010), Bianchi (2011))
- How do the beliefs for the stop of capital inflows matter?
  - High beliefs motivate saving.
  - High precautionary saving allows more capital inflows during episodes of current account reversals.
  - Less probability of leading to the severe sudden stops.
- Utilize the rational expectation regime switching DSGE model.
  - Model the regime of normal time and of current account reversal.
    - Occasionally binding collateral constraint as regime switching problem (Binning and Maih (2017)).
  - People forms rational expectation depending on transition probabilities.

We Show

- High beliefs for current account reversals alter the adjustment to the negative income shocks.
  - Improve the current account instead of deteriorating.
  - No consumption smoothing.
  - Larger reaction on impact.
- Once the current account reversal realizes, high precautionary saving due to high beliefs mitigates reversals.
- All the numerical analyses are conducted with RISE toolbox (Maih (2015)).

The Model

- A two-sector (Tradable-Nontradable) endowment small open economy. (Bianchi (2011)).
- Occasionally binding collateral constraint.
  - Borrowing from the rest of the world is limited to a fraction of current income.
  - Following the endowment shocks, the collateral constraint endogenously binds. $\Rightarrow$ Loss of the access to the international capital market.
  - Overborrowing due to pecuniary externality and amplification mechanism of the debt-deflation.

Households

$$\max_{c_t^T, c_t^N, d_{t+1}} E_0 \sum_{t=0}^{\infty} \beta^t \frac{c_t^{1-\sigma} - 1}{1-\sigma}$$

subject to

$$c_t = \left[a \left(c_t^T \right)^{1-\frac{1}{\xi}} + (1-a) \left(c_t^N \right)^{1-\frac{1}{\xi}} \right]^{\frac{1}{1-\frac{1}{\xi}}}$$

$$c_t^T + p_t c_t^N + d_t + \frac{\phi}{2} \left(d_{t+1} - \bar{d} \right)^2 = y_t^T + p_t y_t^N + \frac{d_{t+1}}{1+r}$$

$$d_{t+1} \leq \kappa \left(y_t^T + p_t y_t^N \right)$$

Households

$$\lambda_t = c_t^{-\sigma+\frac{1}{\xi}} a \left(c_t^T\right)^{-\frac{1}{\xi}}$$

$$p_t = \frac{1-a}{a} \left(\frac{c_t^T}{c_t^N}\right)^{\frac{1}{\xi}}$$

$$\lambda_t \left\{ \frac{1}{1+r} - \phi \left(d_{t+1} - \bar{d}\right) \right\} - \mu_t = \beta E_t \lambda_{t+1}$$

$$\mu_t \left\{ \kappa \left(y_t^T + p_t y_t^N\right) - d_{t+1} \right\} = 0$$

$$d_{t+1} \leq \kappa \left(y_t^T + p_t y_t^N\right), \ \mu_t \geq 0$$

Market Clearing and Endowments

Nontradable goods market.

$$c_t^N = y_t^N$$

Tradable goods market.

$$c_t^T + d_t + \frac{\phi}{2}\left(d_{t+1} - \bar{d}\right)^2 = y_t^T + \frac{d_{t+1}}{1+r}$$

Exogenous endowments.

$$\begin{bmatrix} \ln y_t^T \\ \ln y_t^N \end{bmatrix} = \begin{bmatrix} 0.901 & 0.495 \\ -0.453 & 0.225 \end{bmatrix} \begin{bmatrix} \ln y_{t-1}^T \\ \ln y_{t-1}^N \end{bmatrix} + \varepsilon_t$$

where $\varepsilon_t \sim N\left(\emptyset, \Sigma\right)$ and $\Sigma = \begin{bmatrix} 0.00219 & 0.00162 \\ 0.00162 & 0.00167 \end{bmatrix}$.

How Do Beliefs for Current Account Reversals Matter?

- Suppose $\mu_t = 0$ in period t. Iterate the Euler equation.

$$\frac{\lambda_t}{1+r} = \beta^2 (1+r) E_t \lambda_{t+2} + \beta (1+r) E_t \mu_{t+1}$$

Probability of the binding $(E_t \mu_{t+1}) \Uparrow \Rightarrow$ More incentive to save. Precautionary saving $\Uparrow$

- Suppose the constraint binds in period $t+1$.

Value of collateral and capital inflows $\Uparrow$.

$p_{t+1} = \frac{1-a}{a} \left(\frac{y^T_{t+1} + \frac{d_{t+2}}{1+r} - d_{t+1}}{c^N_{t+1}} \right)^{\frac{1}{\xi}} \Uparrow$. $d_{t+2} = \kappa \left(y^T_{t+1} + p_{t+1} y^N_{t+1} \right) \Uparrow$.

$\Rightarrow$ Less severe current account reversals and sudden stop crises.

Occasionally Binding Constraint as Regime Switching

Rewrite the slackness condition.

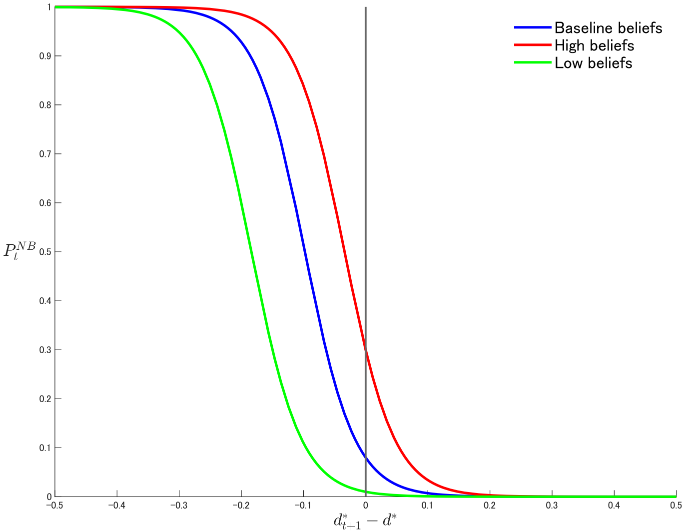
$$\boldsymbol{o}\left(s_t\right)\mu_t+\left(1-\boldsymbol{o}\left(s_t\right)\right)\left\{\kappa\left(y_t^T+p_t y_t^N\right)-d_{t+1}\right\}=0$$

where $s_t=N, B$, $\boldsymbol{o}\left(N\right)=1$ and $\boldsymbol{o}\left(B\right)=0$.
Switching from N to B with transition probability

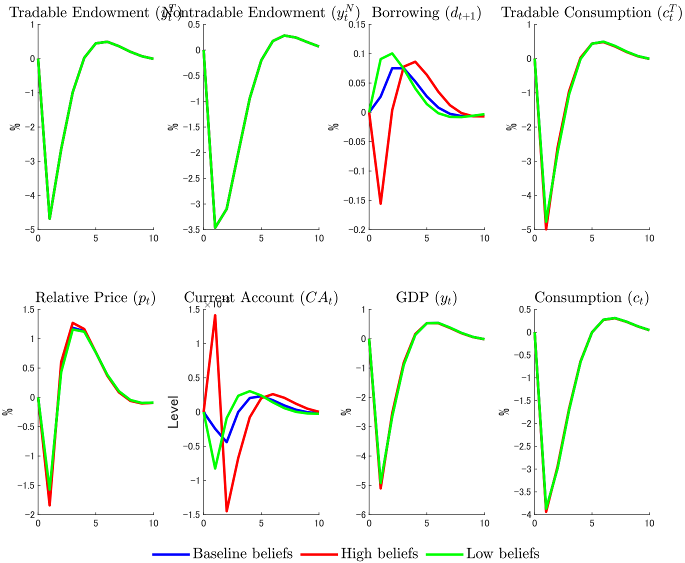
$$P_t^{NB}=\frac{1}{1+\left(\frac{1}{\varphi}-1\right)\exp\left\{g_1\left(d_{t+1}^*-d^*\right)\right\}}$$

where $d_{t+1}^*=\kappa\left(y_t^T+p_t y_t^N\right)-d_{t+1}$.

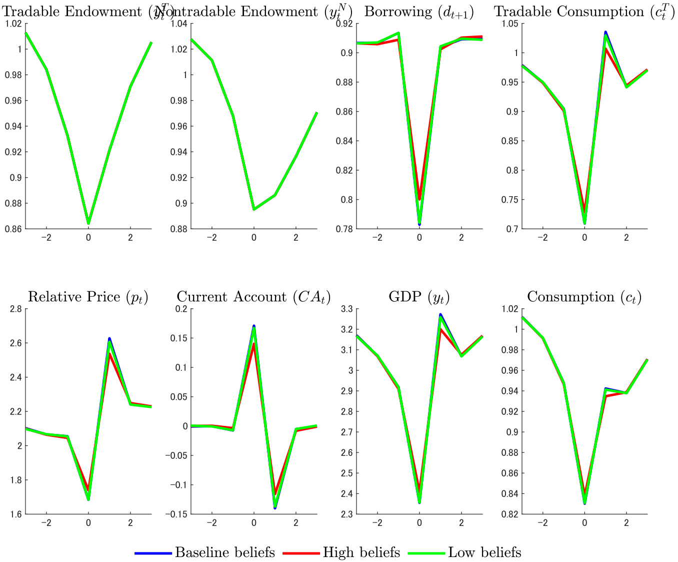
Transition Probabilities and Beliefs



IRFs in Non-Binding Regime: Negative Income Shock



Dynamics around Sudden Stops



Conclusion

- We demonstrates how beliefs for losing access to the international financial market matter for macroeconomy.
- When people believe that capital inflows stop with high probability, they no longer smooth consumption using current account. The economy becomes more volatile.
- High precautionary saving mitigates the effects of stop of capital inflows.

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Appendix

Related Literature

- Sudden stops in small open economy
  - Mendoza (2002), Mendoza (2010), Bianchi (2011), Benigno et al. (2016), Schmitt-Grohé and Uribe (2017), Bianchi and Mendoza (2018), Devereux et al. (2019), Ottonello (2021), Coulibaly (2023), Davis et al. (2023), Chi et al. (2021), Korinek and Sandri (2016), Benigno et al. (2023), Durdu and Mendoza (2006), Schmitt-Grohé and Uribe (2021), Ottonello et al. (2022)
- Role of expectation for economic regimes
  - Liu et al. (2009), Bianchi (2013), Bianchi and Ilut (2017), Binning and Maih (2017), Lhuissier and Tripier (2021)
- Occasionally binding constraint as regime switching
  - Binning and Maih (2017), Benigno et al. (2020)

Self-Fulfilling Sudden Stops

Self-full filling binding of the collateral constraint can happen.

$$d_{t+1} \downarrow \leq \kappa \left(y_t^T + p_t \downarrow y_t^N \right)$$

Pessimistic view forces people to reduce borrowing, the price of collateral falls more than one for one, and the collateral constraint get endogenously tightened.
We exclude the possibility of this type of binding of the constraint (Schmitt-Grohé and Uribe (2021)).

Constrained-Efficiency (Pecuniary Externarity is Internalized)

$$\lambda_t = c_t^{-\sigma+\frac{1}{\xi}} a \left(c_t^T\right)^{-\frac{1}{\xi}} + \mu_t \kappa \frac{\partial p_t}{\partial c_t^T} y_t^N$$

$$\frac{\lambda_t}{1+r_t} - \mu_t = \beta E_t \lambda_{t+1}$$

$$\mu_t \left\{ \kappa \left(y_t^T + \frac{1-a}{a} \left(\frac{c_t^T}{y_t^N - g_t} \right)^{\frac{1}{\xi}} y_t^N \right) - d_{t+1} \right\} = 0$$

$$d_{t+1} \leq \kappa \left(y_t^T + \frac{1-a}{a} \left(\frac{c_t^T}{y_t^N - g_t} \right)^{\frac{1}{\xi}} y_t^N \right), \ \mu_t \geq 0$$

Pecuniary Externality and Ex-Ante Overborrowing

- Pecuniary externality results in ex ante overborrowing.
- Suppose at time t the collateral constraint is not binding.

$$\text{Private}: \frac{c_t^{-\sigma+\frac{1}{\xi}} a \left(c_t^T\right)^{-\frac{1}{\xi}}}{1+r_t} = \beta E_t \left[c_{t+1}^{-\sigma+\frac{1}{\xi}} a \left(c_{t+1}^T\right)^{-\frac{1}{\xi}} \right]$$

$$\text{Efficient}: \frac{c_t^{-\sigma+\frac{1}{\xi}} a \left(c_t^T\right)^{-\frac{1}{\xi}}}{1+r_t} = \beta E_t \left[c_{t+1}^{-\sigma+\frac{1}{\xi}} a \left(c_{t+1}^T\right)^{-\frac{1}{\xi}} + \mu_{t+1} \kappa \frac{\partial p_{t+1}}{\partial c_{t+1}^T} y_{t+1}^N \right]$$

When the binding is expected, the planner has a higher marginal value of saving.

Severity of Sudden Stops

	Low	Baseline	High
CA_t	0.1650	0.1620	0.1427
y_t	-0.2364	-0.2338	-0.2216
c_t	-0.1451	-0.1441	-0.1389
p_t	-0.2149	-0.2109	-0.1923
y_t^T	-0.0890	-0.0890	-0.0890
y_t^N	-0.1212	-0.1212	-0.1212

Calibration

	Parameter	Value
σ	Inverse of intertemporal elasticity of substitution	2
ξ	Intratemporal elasticity of substitution	0.83
a	Weight of tradables	0.31
κ	Collateral	0.3328
r	Real interest rate	0.04
β	Subjective discount factor	$\frac{1}{1+r}$, 0.91
ϕ	Debt adjustment cost	2, 0
φ	P^{NB} in the non-binding steady state	0.08

Solution Method and Stability

- First order perturbation via Maih (2015).
  - Regime specific steady state and policy functions.
- Stationary-inducing mechanism for small open economy models: Schmitt-Grohe and Uribe (2003).
  - Only in the non-binding regime.
  - No mechanism for the stationarity in the binding regime.
- The system can be mean square stable when the possibility of being in the binding regime is small.

Regime-Specific Steady State

	Non-binding regime	Binding regime
$\kappa\left(y^T + py^N\right) - d$	0.1341	0
μ	0	0.0170
d	0.9084	1.0381
c^T	0.9651	0.9601
p	2.1324	2.1192

Definitions

Real exchange rate

$$RER_t \equiv \frac{\left[{a^*}^{\frac{1}{\sigma^*}} + (1-a^*)^{\frac{1}{\sigma^*}} (p_t^*)^{\frac{\sigma^*-1}{\sigma^*}} \right]^{\frac{\sigma^*}{\sigma^*-1}}}{\left[a^{\frac{1}{\sigma}} + (1-a)^{\frac{1}{\sigma}} (p_t)^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}}}$$

GDP

$$y_t \equiv y_t^T + p_t y_t^N$$

Trade balance

$$TB_t \equiv y_t^T - c_t^T$$

Current account

$$CA_t \equiv d_t - d_{t+1}$$