Trade Credit, International Reserves and Sovereign Debt

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Discussion by
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Overview

- The paper studies the liquidity role of trade credit and int’l reserves in affecting equilibrium outcomes of sovereign debt negotiations.
- Liquidity of trade credit captured through a transaction cost with appropriate properties.
- Reserves dominated by undrawn credit lines in normal times, but valuable in distress times.
- Reserves may be dominated *ex-post*, but not *ex-ante* (because of the probability they are needed in times of distress).
- Questions: why accumulate reserves when trade credit is available (normal times)? Why not use reserves to buy-back issued debt?
Overview

Thumbs up

- Literature on sovereign debt has evolved...
  - Perfect international capital markets
  - Default with permanent exclusion from int’l capital markets
  - Exogenous re-entry (no debt renegotiations)
  - Bargaining with exogenous bargaining power
  - Endogenous bargaining power

- This paper constitutes a nice step forward
Overview

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**Model**

**Country**

- Utility over life-time consumption, risk-neutral regarding time: no consumption smoothing over time

  Crucial in sovereign debt literature: risk-averse agents adjust optimal plans to avoid binding borrowing limits

- Consumption smoothing over states of nature, high-low output

- Impatience within sub-periods of debt renegotiation. Impatience increases with time of negotiations: \( \beta(h), \quad \beta' \leq 0 \)

  Determines how fast debt negotiations occur

- Less patient than banks, \( \delta > r \): Consumption tilted forward, reserves have a liquidity role, given the transaction technology
Model

Country

- Endowment of exportable goods, perishable \((y, \text{ fixed})\) and durable \((Q(s), \text{ stochastic, produced from imports, available only at time} 1)\)

- After \(Q\) is known, decide to repay or engage in debt renegotiations

- Not clear what happens with \(B\) after default \((\text{erased? New debt issued? Stays the same?})\)
  
  - Important for dynamics \((\text{Yue, 2006; Benjamin and Wright, 2011})\)

  - Effects on future interest rates \((\text{in this paper, constant})\)
Model

Trade Finance

\[ T\left(\frac{L}{y}\right) \leq 0, \quad T' \leq 0, \quad \lim_{L/y \to L > 0} T\left(\frac{L}{y}\right) = 0 \]

Normal times:
- Satiation: \[ T\left(\frac{L}{y}\right) = 0, \quad T' = 0, \quad L \geq R + \bar{L}y \]
- \( p = 1 - T = 1; \quad c = y \) (high consumption);
- Reserves produce no liquidity services, only immediate consumption or interests accrued at \( r \)

When B not repaid
- Reserves more valuable: \[ T\left(\frac{L}{y}\right) > 0, \quad T' < 0, \quad L = R \]
- \( p\left(\frac{L}{y}\right) < 1, \quad p' > 0 \); \( c = py \) (low consumption);
• Punishment for non-repayment: assets partially seized in the event of repudiation (Bulow and Rogoff, 1989), and temporary exclusion from credit markets (during bargaining process)

**Bargaining (over \( \pi = R + Q(s) \))**

- Competitive lenders, bargain as one (haircuts not 100%)
- Banks and countries take turns on offers \( (q^*, q) \), banks start
- Three outcomes (2 really) conditional on non-repayment:
  \[
  q\pi + \text{future output (reschedule, country's proposal)}
  \]
  \[
  W = q^*\pi + \text{future output (reschedule, banks' proposal)}
  \]
  \[
  \lambda\pi + \text{future output (default)}, \quad \lambda\pi = [(1-\gamma)R + (1-\alpha)Q]
  \]
Model

- Banks:
  
  \[ W^* = \begin{cases} 
  (1-q)\pi & \text{(reschedule, country’s proposal)} \\
  (1-q^*)\pi & \text{(reschedule, banks’ proposal)} \\
  (1-\lambda-D)\pi & \text{(default, deadweight loss)} 
  \end{cases} \]

- Any outcome restores creditworthiness!
Solution: default is inefficient (uncertainty resolved, participation constraints satisfied at all times and states!)

- at time $t$, country gets $\max\{\text{default option, minimal counter offer}\}$
- at time $t+h$, banks get $\max\{\text{default option, minimal (next) counter offer}\}$
- $D=0$ (repudiation is costly), first option accepted ($h > 0$ is costly)
- Different solution if process starts with offer by country, unless $h \to 0$
- Off-equilibrium (when default occurs) determines scope for bargaining (higher $\lambda$ or $D$ lead to higher $\text{MAX}(q)$ and lower $\text{MAX}(1-q)$)
Model

Reserves

• Optimal R requires “consumption-value” equal to “liquidity-value” (increasing bargaining power of debtor)

• Also satisfies a “UIP” condition: $p' = \delta - r > 0$ (exchange rate appreciates by interest rate differentials)

  $\delta - r > 0$ by assumption: reserves have a liquidity role to play

• Optimal reserves + bargaining solution:

  Greater impatience reduces country’s shares on Q and R relative to the case where $\delta = r$ (when $R(\text{opt}) = L/y$ such that $T = 0$)
Model

Reserves

- If $R(\text{opt})$ too large, high pay-off to country, low pay-off to banks that may default.

  - Incentives to consume the extra-reserves to induce banks to participate in negotiations (seems counterfactual)

- If $R(\text{opt}) = 0$, the opposite follows: default by debtors becomes credible → non-convexities really complicates the solution

  - Better to look at cases where $R(\text{opt}) > 0$

- $B$ has no effect on $p$, $R$, $q$, and $q^*$. Only on the size of haircut, $H$.

  - Because countries are only liable to the minimum of what it owes and what can be bargained into repayment
Haircuts

- Increasing on B (banks have more to loose), r (less int'l liquidity)
- Decreasing on Q (richer/larger exporting countries) and \( \delta \) (more impatient countries, if transaction costs are high enough)
- In the case of B: endogenous, countries do not buyback debt (it would reduce the haircut!)

Given that countries do not smooth consumption over time
Findings

• Liquidity and net wealth roles of reserves: debtors can move from a high consumption state (debt repaid) to low consumption state (re-scheduled)

• Competitive, risk-neutral banks lend for reserve accumulation (take some risk away from debtors)

• Arrears and default (non-repayment) reduces trade flows in the data, but not in the model. (problem?)

• $R$ may increase repayments but always better to borrowers than lenders (welfare of borrowers increase with $R$).

  • This may explain why we don’t see buyback in debt crises, and default occurs with positive $R$
Testable Implications

- Model predicts determinants of haircut:
  - Support from data regarding B, r, and Q

- Settlements are fast, with initial offer accepted

- R leads to low bargaining power of debtors and to more debt repayments? or less? (true in the data?)

- Higher R leads to more favourable concessions from creditors (true?)
Discussion

Check the model’s implications against empirical findings by Benjamin and Wright (2011):

90 defaults, 73 countries, settlements over 1989-2006

1. Sovereign defaults take time to resolve (8 years on average)
2. Haircuts (H) are substantial (44%, on average)
3. Longer defaults (higher h) associated with larger H (corr = 2/3)
4. Larger output declines in the year of default are associated with modestly longer defaults and larger haircuts
5. Defaults occur when output is below trend (64% of cases), and settlements occur when output has returned to trend (49% of cases end when output is above trend)
6. Default resolution not associated with decreased indebtedness
Some concerns

- Debt restructuring may produce gains for debtors both now and in the future.
- Debt renegotiations involve new debt issuance, with new price.
- New price of debt (interest rate) depends on fundamentals and also on the probability of future default.
- This must affect the outcome of the bargaining during debt restructuring! (Yue 2006)
- For example, both country and creditors may find it privately optimal to delay restructuring until future default risk is low (good times).
The Maturity Structure of Debt, Monetary Policy and Expectations Stabilization

Stefano Eusepi and Bruce Preston

Discussion by
Carlos de Resende
Bank of Canada

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Overview

• It’s an interesting paper!

• Wide range of implications for the design of fiscal and monetary policies

• Nice contribution to the literature and current policy-related issues
  – Interactions between FP and MP
  – Macroeconomic effects of fiscal policy, QE, fiscal consolidation

• New channel for the effect of gov’t debt (size, maturity) on the macro economy in standard NK models
  – Departure from REE based on recursive learning
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  - Departure from REE based on recursive learning
Rational Expectations

- Agents know the model of the economy (DGP) and use it to form expectations about the future.

- Ricardian equivalence holds, under “passive” fiscal policy (Leeper 1991) with no distortionary taxation and infinite horizon.

- Given \( \{g_t\}_0^\infty, \{M_t\}_0^\infty \), changes in debt size \( (B_t^m) \) and maturity \( (\rho) \):
  - \( \Delta \) timing of taxation, but not its expected discounted value.
  - No changes in permanent income.
  - No effect on consumption and pricing decisions.
Recursive learning

- Incomplete understanding of the economy’s DGP
- Beliefs about the “true” model evolve through recursive LS
  - Convergence to RE (E-stability)?
- Agents:
  - Attach positive probability that taxes over the life span will change → Ricardian equivalence breaks down
  - Interpret Δ debt size or maturity as net wealth
- Wealth-effect: Δ consumption and labour decisions
- Effects on the Phillips curve: Δ pricing decisions
Recursive learning

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Model

Households

- Work, own firms (profits), consume, save (gov’t bonds, no capital), pay taxes

- CRRA preferences on labour and consumption + \( v(G) \)

- Why \( G \) in the utility function? (no effect on optimal conditions)

- Consumption profile follows permanent income

\[
\hat{C}_t = \frac{(1 - \beta)(b/y)}{s_C(\sigma, \gamma, \theta)} \hat{E}_t IBG_t + \hat{E}_t PI_t
\]

\[
IBG_t = IBG(\text{deb}_t, \hat{E}_t \{s_t, r_t\}_0^\infty; \rho) + \hat{E}_t PI_t
\]

\[
PI_t = PI(\hat{E}_t \{w_t, G_t\}_0^\infty; \sigma, \gamma, \theta)
\]

- \( \sigma^{-1} \) = intertemporal elast. subst. \( C \)
- \( \gamma^{-1} \) = Frisch elasticity
- \( \theta \) = elast. subst. \( c(j) \)
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\[
\hat{C}_t = \frac{(1 - \beta)(b/y)}{s_c(\sigma, \gamma, \theta)} \hat{E}_t IBG_t + \hat{E}_t PI_t = 0, \text{ under RE}
\]

\[
IBG_t = IBG(\text{debt}_t, \hat{E}_t \{s_t, r_t\}_0^\infty; \rho)
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\]

Expectations ~ belief system updated by recursive learning
Model

Firms

• Standard problem of maximizing expected profits with Rotemberg-type price stickiness

• NK Phillips curve: expected inflation computed using $\hat{E}_t$

Beliefs

$u_t = [\pi_t, i_t, w_t, \Gamma_t, s_t, b_t], \quad q_t = [1, u_t, G_t, z_t, \zeta_t]$

• First, use estimated parameters from $u_j = \Omega_{j} q_{j-1} + e_j$ at $j=t-1$

• Compute $\hat{E}_t u_{t+1} = \hat{\Omega}_{t-1} q_t$ then decide $C_t(i), H_t(i), P_t(i)$

• Use recursive LS estimator to map $\hat{\Omega}_{t-1}$ into $\hat{\Omega}_t$

• Updates after $C_t(i), H_t(i), P_t(i)$, ignoring the effects of agents’ decisions/learning on aggregate outcomes
**Model**

**Firms**

- Standard problem of maximizing expected profits with Rotemberg-type price stickiness

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**Beliefs**

\[
\begin{align*}
&u_t = [\pi_t, i_t, w_t, \Gamma_t, s_t, b_t] ,
&q_t = [1, u_t, G_t, z_t, \zeta_t]
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- **Updates after** \( C_t(i), H_t(i), P_t(i) \), ignoring the effects of agents’ decisions/learning on aggregate outcomes
Monetary Policy

• Taylor-type reaction of short-term interest rates \(i\) to inflation \(\pi\) and output gap, with smoothing

• With learning, Taylor Principle not enough to deliver a stable equilibrium
  
  – Model-uncertainty about how short-term interest rates reacts will affect price of longer-term debt

  – Break-down of Ricardian equivalence requires departure from Taylor Principle:

Metric used to evaluate instability
Fiscal Policy

- lump-sum taxes, surplus reacts to outstanding gov’t debt
- Short-term debt: pays $i$, zero net supply.
Fiscal Policy

- lump-sum taxes, surplus reacts to outstanding gov’t debt
- Short-term debt: pays $i$, zero net supply. Interpretation?
  - Agents lend to gov’t? Flip side is money reserves at central bank?
  - Symmetric equilibrium \[ \int_{0}^{1} B^s(i) di = B^s = 0 \Rightarrow B^s(i) = 0, \forall i \]
Model

Fiscal Policy

• lump-sum taxes, surplus reacts to outstanding gov’t debt
• Short-term debt: pays $i$, zero net supply.

- A

- S

• long-term debt:

\[ B_t^m P_t^m = B_{t-1}^m (1 + \rho P_t^m) + P_t G_t - T_t \]

\[ P_{t+j}^m = \rho^j P_{t+j}^m \]

- No-arbitrage:

\[ \frac{1}{1+i_t} = \hat{E}_t \left[ \beta \frac{\lambda_{t+1}}{\lambda_t} \right] = \hat{E}_t \left[ \beta \frac{\lambda_{t+1}}{\lambda_t} \frac{1 + \rho P_{t+1}^m}{P_t^m} \right] \]

\[ \hat{P}_t^m = -\hat{E}_t \sum_{j=t}^{\infty} (\beta \rho)^{j-t} \hat{i}_j \Rightarrow \text{maturity} = (1 - \beta \rho)^{-1} \]
Under which conditions expectations formed through learning are “E-stable” (i.e., converge to RE)?
Experiments

What monetary policy’s response to inflation required to guarantee E-stability under learning?

- Changes in preferences: $\alpha, \sigma, \gamma$
- Debt (average size and maturity)
- Response to expected inflation
- “Unanchored” expectations

Metric for E-instability

- Departure from the Taylor Principle
Findings

Larger indebtedness increases instability

More aggressive response to inflation:  
→ higher E-stability

Larger wealth effects

Nominal rigidity increases  \(\rightarrow\) less E-stability
Findings

Nominal rigidity increases instability

More aggressive response to inflation:
→ higher E-stability

Inflation more predictable, but sticky prices make it more difficult to inflate away the debt

Nominal rigidity increases → less E-stability
Findings

Nominal rigidity increases instability

Less fiscal dominance
≈
More aggressive response to inflation:
→ favourable to REE

sticky prices
make it more
difficult to raise
seigniorage

Nominal rigidity $\rightarrow$ less stability

- de Resende & Rebei (2007)
Findings

Low intertemporal elast. of substitution increases instability

- High $\sigma$ reduces the elasticity of $C$ w.r.t. current and future interest rates (more aggressiveness required)

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Findings

Low intertemporal elast. of substitution increases instability

• Steeper Phillips curve:
  – wages/marginal cost, inflation more responsive to $\Delta Y$

• More stability:
  – less $\Delta i$ required to affect prices (acts as less price rigidity)

• Less stability:
  – larger response of wages = stronger wealth-effects on $C$

$$PI_t = PI\left(\hat{E}_t \{w_t, G_t, r_t\}_0^\infty ; \sigma, \gamma, \theta\right)$$
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$$PI_t = PI\left(\hat{E}_t\{w_t, G_t, r_t\}^\infty_0; \sigma, \gamma, \theta\right)$$
Findings

Low Frisch elasticity of labour supply increases instability

- High $\gamma$ = steeper Phillips curve (destabilizing)
- Increases the effect of IBG (destabilizing)

\[
\hat{C}_t = \frac{(1-\beta)(b/y)}{s_C(\sigma,\gamma,\theta)} \hat{E}_t IBG_t + \hat{E}_t PI_t
\]

- Increases the wages elasticity of $C$ = stronger wealth-effects (destabilizing)
Findings

Maturity of debt has non-monotonic effect on E-stability

- Wealth effects from three different valuation effects
  1) Positive: interest rates on short-term (one period) debt
  2) Negative: interest rates on long-term debt (capital losses)
  3) Negative: inflation reduces the real value of debt

- Different types of valuation effects act differently for different maturities

- Medium-term debt maturity leads to expectations instability
Findings

**Different interest rate rules**

- Reaction to expected inflation introduces an additional layer of instability
  - Agents, including the central bank, know the rule but don’t observe/use the “true” (i.e., model-consistent) value of $E\pi$
  - Before, only long maturities were affected by $E\pi$; now, even the very short maturity are so
  - Room for history-dependent rules? (i.e., PLT?)
**Findings**

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Findings

GHH preferences

- No income-effect on labour supply
  - Results for nominal rigidities reversed for very high $\alpha$
  - Preferences no longer affect the scale of the wealth effect due to IBG (non-Ricardian WE)
  - More instability: endogenous response of labour supply has stabilizing effect
Findings

Asset price bubbles ("non-anchored expectations")

• Assume TVC on households optimization problem doesn’t hold
  – On aggregate, there is no-arbitrage between short and long-term debt, but agents don’t realize that
    – Agents estimate $\hat{P}_t^m$ instead of $i_t$ (when maturity = 1, no difference); before, it was implied by direct estimates of $i$ and $\pi$ satisfying the non-arbitrage
    – $\Delta i_t$ has no direct effect on expected future interest rates (only through beliefs) → only short-term $i$ matters for aggregate demand → more aggressiveness required

• More smoothing mitigates this effect (PLT? Response to asset prices?)
Discussion

Policy implications

• Break down of Ricardian equivalence through learning is necessary condition for instability: scope for credible fiscal rules, “clearly communicated
• Risk of “active” fiscal policy / fiscal dominance
• ZLB:
  – Expectations more susceptible to drift (why? See Sargent and Wallace 1975)
  – Would history-dependent rules (e.g., PLT) help?
• Optimality considerations? No costs for the government engaging in debt maturity management, interaction with (optimal monetary policy)
Discussion

- Other ways of introducing departures from Ricardian Equivalence would make timing of taxation matters (hence, debt maturity). Ex. Huixin Bi (2010)

- Interaction fiscal-monetary policies important. All the analysis is done under passive fiscal policy. Show instability in de Resende and Rebei (2007)

- Parameter in the surplus rule and smoothing also important (results not shown)

- How important channel is? Stochastic simulation with other channels to identify variance decompositions, estimation is a “plus”

- Effects beyond the that of lower long-term interest rates?
Thank you!