Modern Debt Sustainability Analysis

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Motivation

- **How much government debt can the market absorb?**
  - When can governments run a deficit without ever paying back its debt, like a Ponzi scheme?
  - “Debt Laffer Curve” and debt sustainability analysis?

- **Advanced Economies: Safe asset nature of government debt**
  - Service flow and cash flow (primary surplus)
  - Flight-to-Safety into government debt
  - Government debt as a countercyclical safe asset (negative $\beta$)
  - Role of emergency fiscal space to fend off crisis

- **Emerging Economies: Competition with US Treasury**
Value of Government Debt

- Value of Gov. Debt $= E_t[PV_{SDF}(\text{cash flows})] + \cdots$

- For Gov. Debt: Cash flows = primary fiscal surpluses
  (Taxing power)

- Procyclicality, $\beta$, of cash flow lowers value
  - High in booms
  - Low in recessions
Primary Surpluses of Governments

- United States
  - Average surplus ≈ 0
  - Procyclical surplus (≥ 0 in booms, < 0 in recessions)
Primary Surpluses of Governments

- **United States**
  - Average surplus $\approx 0$
  - Procyclical surplus ($>0$ in booms, $<0$ in recessions)

- **Japan**
  - Negative for most of the years – and future
Value of Government Debt

- Two valuation puzzles from standard perspective:
  (Jiang, Lustig, van Nieuwerburgh, Xiaolan, 2019, 2020)

1. “Public Debt Valuation Puzzle”
   - Empirical: $E[PV(\text{surpluses})] < 0$, yet real value $\frac{b}{\phi} > 0$
   - Add bubble/service flow term

2. “Gov. Debt Risk Premium Puzzle”
   - Cash flow $\beta$ is positive, but market don’t price it this way
   - bubble/service flow term has negative $\beta$
3 Forms of Seigniorage – Interaction with Monetary Policy

\[
\frac{B_t + M_t}{\varnothing_t} = E_t \int_t^\infty \frac{\xi_s}{\xi_t} (T_s - G_s) ds + E_t \int_t^\infty \frac{\xi_s}{\xi_t} \Delta i_s \frac{M_s}{\varnothing_s} ds + \lim_{T \to \infty} E_T \frac{\xi_T}{\xi_t} \frac{B_T + M_T}{\varnothing_T}
\]

1. **Surprise devaluation**
   - Irrational expectations
   - Small (Hilscher, Raviv, Reis 2014)
     - Inflation options imply likelihood of exceeding 5% of GDP is less than 1%
     - Depends on maturity of debt

2. **Exploiting liquidity benefits of “narrow” cash**
   - Only for “narrow” cash that provides medium-of-exchange services
   - \( \Delta i = i - i^M \)
   - 0.36 % of GDP, NPV = 20% (at most 30%) of GDP, (Reis 2019)

3. **Ponzi scheme with inflation**
Adding service flow

- Asset Price = $E_t[PV_{SDF}**(\text{cash flow})] + E_t[PV_{SDF}**(\text{service flow})]$
  
  - Service flows/convenience yield
    1. Money (narrow): relax double-coincidence of wants
    2. Collateral: relax constraints (Lagrange multiplier)
    3. Safe asset: [good friend analogy]
      - When one needs funds, one can sell at stable price since others buy
        - Personal/idiosyncratic shocks
        - Aggregate shocks
      - Partial insurance through re-trading - market liquidity!

- Higher Asset Price = lower expected return

- Problem: safe asset + money status might burst like a bubble
  - Multiple equilibria: [safe asset tautology]
What’s a Safe Asset?  What is its Service Flow?

\[ P_t = E_t [PV_{\xi^*}(\text{cash flows})] + E_t [PV_{\xi^*}(\text{service flows})] \]

Example: = 0

Portfolio of Safe asset

Cash flow asset
What’s a Safe Asset?  What is its Service Flow?

- \( P_t = E_t[PV_{\xi^*}(\text{cash flows})] + E_t[PV_{\xi^*}(\text{service flows})] \)
- Value comes from re-trading
- Insures by partially completing markets
- Reduces \( \text{Var}_t[\tilde{g}_c] \)
- Service flow has self-fulfilling component: higher price of asset = higher service flow
What’s a Safe Asset? What is its Service Flow?

- \( P_t = E_t[\text{PV}_{\xi}^*(\text{cash flows})] + E_t[\text{PV}_{\xi}^*(\text{service flows})] \)

- Value come from re-trading
- Insures by partially completing markets

In recessions:
- Risk is higher
  - Service flow is more valuable
  - Cash flows are lower (depends on fiscal policy)

- Service flow has self-fulfilling component: higher price of asset = higher service flow
Safe Asset – Cash flow and Service flow

- Asset Price = $E[PV(\text{cash flows})] + E[PV(\text{service flows})]$
Negative primary surplus forever? When Ponzi scheme?

- without creating inflation (devaluing debt)?
- Yes, if \( r + \text{risk permium} < g \)

\[
\frac{B_t}{\varphi_t} = E_t[PV_{SDF}(\text{primary surpluses})] + \lim_{T \to \infty} PV_{SDF} \frac{B_T}{\varphi_T}
\]

- discount at \( r \) (agents’ SDF) grows at \( g \) with constant deficit/GDP \(-\infty \to +\infty\)

- “Emergency fiscal space”
$r$ vs. $g$ for the United States

- $g$ GDP growth
- $r$
- $r - g$
Understandings $r_s$ for log utility, $\gamma = 1$

\[ r = \rho + E[g_c] - \{Var_t[g_c] + Var_t[\tilde{g}_c]\} + - \{\lambda(Collateral\ Constr) + \Delta i\} \]

- **Time Preference rate**
- **Expected Growth**
- **Precautionary savings/self-insurance**
  - aggregate risk
  - idiosyncratic risk

**Risk-free rate** $r^f = \ldots$
Debt Laffer Curve ≠ MMT  

Debt Sustainability Analysis 1

- Issue bonds at a faster rate $\check{\mu}^B$ (esp. in recessions)
  - $\Rightarrow$ tax precautionary self insurance $\Rightarrow$ tax rate
  - $\Rightarrow$ real value of bonds, $\frac{B}{\phi}$, $\Rightarrow$ “tax base”
- Less so in recession due to flight-to-safety

- Diagram showing primary deficit/GDP (E[s/a]) vs. $E[\check{\mu}^B]$ with dynamic model and steady state with larger $\check{\sigma}$.
1. Safe asset: Retrading requires low bid-ask spread
   - Informationally insensitive asset
   - Central Banks as Market Maker of Last Resort
   - 10-year US Treasury in March 2020

2. Bubbles can pop ⇒ more difficult to maintain $\beta < 0$
   - Able to prop up the bubble/safe-asset status by (off-equilibrium) hiking taxes (fiscal space)
   - Bubble condition: $r = r^f + \text{risk premium} < g$
   - + credible “Emergency Fiscal Space” to fend off bad equilibrium
     - Depends on political system and cohesion
     - Commitment power to raise taxes for a long time
If safe-asset-status is “wobbly”

- If government bond is risky, Bubble/Ponzi Scheme is possible if
  \[ r + \text{risk premium} < g \quad (1) \]

Risk premium
- Negative if safe asset appreciates in crises times (AE)
  - (1) easy \(\rightarrow\) Safe asset status easy to maintain
- Positive if safe asset status might burst (EMDE)
  - (1) fails occasionally \(\rightarrow\) loss of safe asset status

- Capital controls: Gov. debt only safe asset
- Next, no capital controls: US Treasury competes as safe asset
EMDE safe asset status is even more wobbly

\[ r + \text{RISK PREMIUM} < g \]
\[ r > r^\$ \]

Note: risk is endogenous
due to self-fulfilling expectations

- So is the risk premium
  = price of risk * (exogenous + endogenous risk)

Note: growth \( g \) is endogenous

Multiple equilibria (invites speculative attacks)

Conclusion

- **Safe Asset = good friend** \( \Rightarrow \) lowers \( r \)
  - **Individually:** allows self-insurance through retrading
  - **Aggregate:** appreciates in bad times (**negative** \( \beta \))

- **Fiscal Debt Sustainability Analysis**
  - \( r < g \) gov can “mine the bubble” within limits (max 2% of GDP)
  - Extra space, but **Debt Laffer Curve (\( \neq \) MMT)**
  - Bubble can pop: loss of safe asset status
    - Need credible “emergency fiscal space”

- **Asset pricing with safe assets**
  - Service Flow term >> convenience yield
  - Flight to Safety creates
    - Countercyclical safe asset valuation
    - Large stock market volatility

- **Remark:** Competing Safe Assets
  - Within country: private bonds are partial safe assets
  - Across countries \( \Rightarrow \) **Spillover of US Monetary Policy**
Based on

- Brunnermeier and Sannikov, 2016, “The I Theory of Money”
- Brunnermeier, Merkel and Sannikov, 2019, “Fiscal Theory of the Price Level with a Bubble”
- Brunnermeier, Merkel and Sannikov, 2020, “Debt as Safe Asset”