

Throwing Darts and Missing the Bullseye: Fiscal and Debt Sustainability in Open Economies

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The Problem and Argument

The Problem

- A debt-targeting Fiscal Rule **misses** its target \Rightarrow FX and debt crises.
- Cyclical oscillations around stock-flow equilibria: the **bullseye**.

Debt Analyses Require a Stock-Flow Consistent (SFC) Framework

$$\frac{\text{DOMESTIC DEBT (STOCK)}}{\text{GDP (FLOW)}}, \frac{\text{EXTERNAL DEBT (STOCK)}}{\text{EXPORTS (FLOW)}}$$

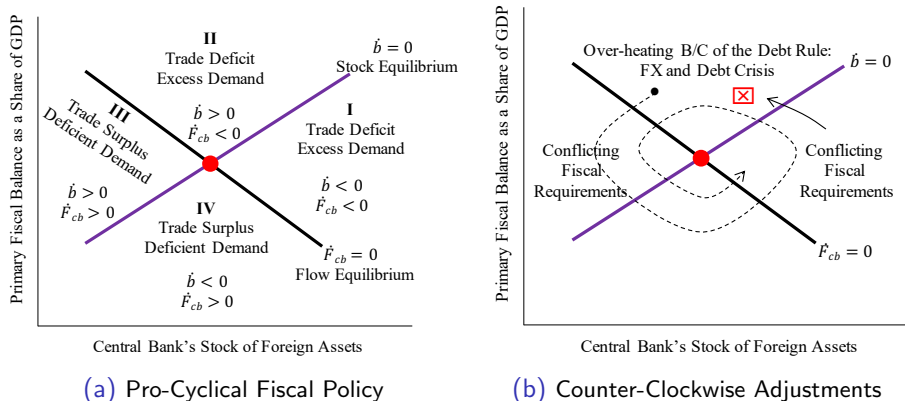
The Argument

- Only an **SFC** Fiscal Rule stabilises the **debt ratio** and **goods market**.

Next: Proof of the problem

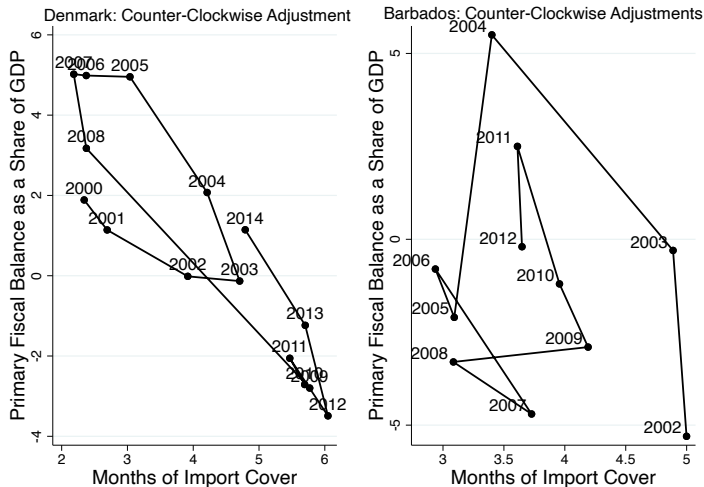
Proving the Problem: Fixed Peg

Figure 1: Stock-Flow Inconsistency and Missing the Bullseye



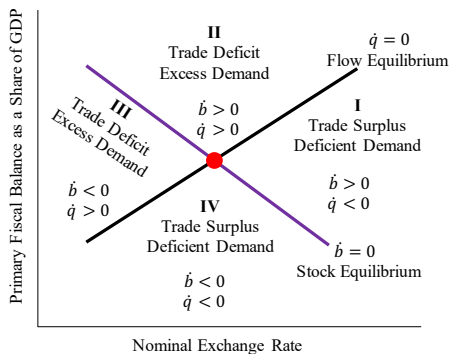
Evidence of the Problem: Fixed Peg

Figure 2: Primary Fiscal Balance and Months of Import Cover

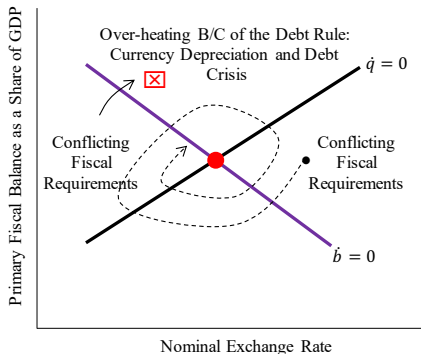


Proving the Problem: Pure Float

Figure 3: Missing the Bullseye: The Case of Contractionary Depreciation



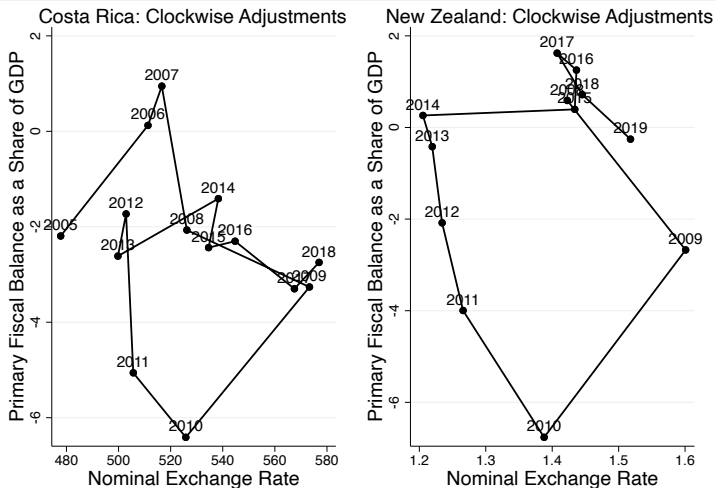
(a) Pro-Cyclical Nominal Exchange Rate



(b) Clockwise Adjustments

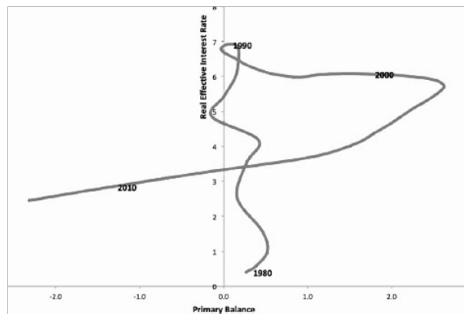
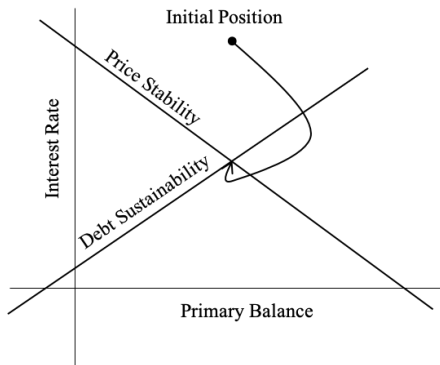
Evidence of the Problem: Pure Float

Figure 4: Primary Fiscal Balance and the Nominal Exchange Rate



The Tinbergen Rule as the Problem

Figure 5: Two Targets–Two Instruments in the USA: Mason & Jayadev 2016



Debt-Targeting Fiscal Rules

Debt Sustainability = stationarity \equiv a stable $\frac{\text{Debt}}{\text{GDP}}$ ratio.

- Domar Condition: $r > g \Rightarrow$ primary surpluses, otherwise deficits
 - Open-Economy: $r_F > g_{BP} \Rightarrow$ primary surpluses, otherwise deficits
- Mian et al. (2021): $r > g - \alpha \Rightarrow$ primary surpluses, otherwise deficits
 - α is the semi-elasticity of r to the level of debt
- Reis (2021): $r > m \Rightarrow$ primary surpluses, otherwise deficits
 - m is the marginal product of capital

The Standard Model

$$\begin{array}{ccccccc} & & \text{Government Budget Constraint} & & & & \\ & & \underbrace{\hspace{10em}} & & & & \\ \text{primary deficit} & & \text{debt dynamics} & & \text{high-powered money} & & \text{interest payments} \\ \underbrace{G - T} & = & \underbrace{\dot{B}} & + & \underbrace{\dot{H}} & - & \underbrace{iB} \end{array}$$

- No monetisation on the grounds of price stability: $\dot{H} = 0$.
- Debt-GDP ratio (b):

$$b = \frac{B}{PY} \Rightarrow B = (b)PY.$$

- Substitute and solve for debt **stock** dynamics (\dot{B}), where i is the nominal interest rate.

$$\dot{B} = G - T + i(b)PY \quad (1)$$

The Standard Model Cont'd

Recall:

$$B = (b)PY.$$

Take the total differential and divide by nominal GDP (PY):

$$\frac{\dot{B}}{PY} = \frac{\dot{b}PY + \dot{P}bY + \dot{Y}bP}{PY}.$$

Solve for \dot{b} , where $g = \dot{Y}/Y$ and $\pi = \dot{P}/P$:

$$\dot{b} = \frac{\dot{B}}{PY} + b(-\pi - g)b. \quad (2)$$

The Standard Model Cont'd

Substitute Equation (1) into (2):

$$\dot{b} = \frac{(G - T)}{PY} + (i - \pi - g)b.$$

Invoke the Fisher equation ($r = i - \pi$):

$$\dot{b} = \frac{(G - T)}{PY} + (r - g)b, \quad (3)$$

Theorem 1 (IBC and Stock-Flow Inconsistency)

Absent expansionary depreciation: any debt sustainability condition derived from the IBC is not SFC.

This Paper

Develops a stock-flow consistent debt model

- **A long-run primary deficit stabilises debt and the goods market,**
 - unless the weighted $r > g$ is implausibly large.
- No more overshooting/undershooting of the **bullseye**.

In contrast to the standard model:

- Starts from goods market equilibrium: internal and external balances.
- Accounts for the **endogenous** source of high-powered money, H .
- Includes foreign-currency debt.

Roadmap

- Stock-Flow Consistent Accounting
- Stock-Flow Equilibria
- Key Results
- The Case Against a Long-Run Primary Surplus
- Appendix: includes the case of Jamaica and expansionary depreciation

Environment: Households

Definition 1 (Rich and Poor Households)

Rich households own banks and firms, while poor households do not.

Poor Households' Balance Sheet

$$\underbrace{\text{Assets}}_{\text{bank deposits}} = \underbrace{\text{Liabilities}}_{\text{domestic debt}}$$

Poor Households (PH)

- No foreign-currency denominated assets/liabilities.
- Too poor to hold gov. securities.

Rich Households' Balance Sheet \approx the net worth of banks and firms.

Firms' Balance Sheet

$$\overbrace{\text{gov. debt} + \text{foreign assets} + \text{bank deposits}}^{\text{Assets}} = \overbrace{\text{domestic} + \text{foreign debt}}^{\text{Liabilities}}$$

- Foreign-currency denominated assets and liabilities:
 - To finance investment and engage in international exchange.
- Recall rich HHs own the firms.

Environment: Banks

Banks' Balance Sheet

$$\begin{array}{c} \text{Assets} \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \text{Liabilities} \\ \hline \text{H} + \text{gov. debt} + \underbrace{\text{domestic debt}}_{\text{HHs} + \text{firms}} + \text{foreign assets} = \underbrace{\text{bank deposits}}_{\text{HHs} + \text{firms}} \end{array}$$

- No foreign-currency denominated liabilities.
- High-powered money (bank reserves) are not remunerated.
- Banks dominate the trade in FX to HHs and firms.
- Hold gov. debt for liquidity and regulatory purposes:
 - OM(Type)Os via the **primary market** in LICs.
 - OMOs via the secondary in EMEs and AEs.
- Recall rich HHs own the banks.

Environment: Consolidated Public Sector

Central Bank

Fixed Peg

- Maintains a credible peg via sterilised FXI.
- Gov. bonds are used for sterilisation purposes via OMTOs or OMOs.
- No Monetisation: money supply is endogenous.

Pure Float

- Inflation targeting: policy rate \approx UIP.
- Gov. bonds are used for OMTOs or OMOs.
- No Monetisation: money supply is endogenous.

Government

- Issues local-currency debt to the private sector in the primary market.
- External debt is denominated in foreign currency (Original Sin).
- **Redundant Balance Sheet** via Adding-Up Constraint
 - The consolidated public sector's balance sheet is a **residual**:
 - Given the balance sheets of HHs, firms and banks.

Goods Market Flow Condition: Fixed Peg

$$\overbrace{\tilde{G} + X + I = T + M + S,}^{\text{Goods Market Flow Condition}}$$

where

$$\tilde{G} = \underbrace{G}_{\text{Goods/Services}} + \underbrace{iB}_{\text{interest payments}}$$

After substitution: **primary balance**.

$$\overbrace{\underbrace{G - T}_{\text{primary balance}} = \underbrace{M - X}_{\text{trade balance}} + \underbrace{S - I}_{\text{S-I balance}} - \underbrace{iB}_{\text{interest payments}}}_{\text{Goods Market Flow Condition}} \quad (4)$$

Goods Market Stock-Flow Condition: Fixed Peg

External balance: stock-flow dynamics:

$$M - X = \overbrace{\dot{B}_g^f - \dot{F}_{cb}}^{\text{Public Sector}} + \overbrace{\dot{B}_c^f - \dot{F}_c - \dot{F}_b}^{\text{Rich Household}}, \quad (5)$$

where

- B is public debt and F is the stock of foreign assets.
- Superscript f is foreign-currency denomination.
- Subscripts: g is gov, cb is central bank, and c is corporation or firm.

Goods Market Stock-Flow Condition: Fixed Peg

Internal balance: stock-flow dynamics:

$$\begin{aligned}
 S - I = & \overbrace{\overbrace{\overbrace{\dot{H} + \dot{B}_g^b + \dot{B}_c + \dot{B}_{ph} + \dot{F}_b - \dot{D}_c - \dot{D}_{ph}}^{\text{Commercial Bank}} + \overbrace{\dot{B}_g^c + \dot{F}_c + \dot{D}_c - \dot{B}_c - \dot{B}_c^f}^{\text{Corporation}}}^{\text{Rich Household}} + \underbrace{\overbrace{\dot{B}_g^{ph} + \dot{D}_{ph} - \dot{B}_{ph}}^{\text{Poor Household}}} \\
 & + \dot{B}_g^{ph} + \dot{D}_{ph} - \dot{B}_{ph}
 \end{aligned}$$

Simplify:

$$\begin{aligned}
 S - I = & \overbrace{\overbrace{\overbrace{\dot{H} + \dot{B}_g^b + \dot{F}_b}^{\text{Commercial Bank}} + \overbrace{\dot{B}_g^c + \dot{F}_c - \dot{B}_c^f}^{\text{Corporation}}}^{\text{Rich Household}} + \underbrace{\overbrace{\dot{B}_g^{ph}}^{\text{Poor Household}}} \\
 & = 0
 \end{aligned} \tag{6}$$

Stock-Flow Consistent Primary Balance: Fixed Peg

Substitute Conditions (5) and (6) into (4):

$$\overbrace{G - T = (\dot{B}_g^f + \dot{B}_g) + \dot{H} - \dot{F}_{cb} - iB}^{\text{A Stock-Flow Consistent Primary Balance}} \quad (7)$$

In contrast to:

$$\overbrace{G - T = (\dot{B}_g^f + \dot{B}_g) - iB}^{\text{Government Budget Constraint}}$$

- Accounts for \dot{F}_{cb} and \dot{H} .
- Why \dot{H} ? To account for **endogenous** credit creation.

Evolution of Public Debt: Fixed Peg

$$\dot{B} = \dot{B}_g^f + \dot{B}_g,$$

where

$$B_g = B_g^c + B_g^b.$$

Substitute this Definition into Condition (7) and solve in terms of \dot{B} :

$$\dot{B} = (G - T) - \dot{H} + \dot{F}_{cb} + iB \quad (8)$$

Recall:

$$B = (b)PY,$$

and

$$\dot{b} = \frac{\dot{B}}{PY} + b(-\pi - g)b.$$

Stock-Flow Consistent Debt Dynamics: Fixed Peg

Substitute (8) into (2) and

The **dynamic evolution of the public debt-GDP ratio** is given below:

$$\dot{b} = \frac{(G - T) - \dot{H} + \dot{F}_{cb}}{PY} + (r - g)b, \quad (9)$$

where

- r is the **weighted** real interest rate.
- The weights are: $\alpha = B_g^f/B$ and $1 - \alpha = B_g/B$.
- We now need dynamic Equations for \dot{H} and \dot{F}_{cb} to solve the stock-flow model.

Dynamics of High-Powered Money

$$\dot{H} = \delta(H^T - H), \quad (10a)$$

where $1 < \delta < 0$ is an adjustment parameter.

- Target Stock of High-Powered Money:

$$H^T = \omega_0 + \omega_1 B_p \quad (10b)$$

where B_p is the stock of private sector debt ($B_p = B_c + B_{ph}$).

- $\omega_1 > 0$ b/c of inter-bank clearing and the demand for cash.
- There is **no monetisation here**.

Dynamics of Foreign Assets held by the Central Bank

$$\dot{F}_{cb} = \gamma(F^T - F_{cb}) \quad (11a)$$

$$F^T = \rho_0 + \rho_1 B\alpha - \rho_2(q^e) \quad (11b)$$

where

- $B\alpha$ is the stock of external debt: $\alpha = B_g^f/B$.
- q^e is expected devaluation.

Assumption 1 (A Credible Peg)

The central bank maintains a credible peg: $q^e = 0$.

- Therefore, $B\alpha \Rightarrow$ long-run F_{cb}^* .

Stock-Flow Equilibria: Fixed Peg

Substitution of Equations (10a-11b) into (9) yields:

$$\overbrace{\dot{b} = \Omega - \underbrace{\delta\omega_1 b_p + \delta h}_{\text{Negative Net Effect}} - \gamma f_{cb} + \left[(r + \gamma\rho_1\alpha) - g \right] b}_{\text{Stock-Flow Consistent Debt Dynamics}} \quad (12)$$

where

- Lower case represents share of GDP: b_p , h , f_{cb} .
- Ω is the primary deficit as a share of GDP.

Channel I: Demand Constraint

Channel: $\partial \dot{\mathbf{b}} / \partial \mathbf{b}_p < \mathbf{0} \Rightarrow$ debt repayment \Downarrow demand for Gov. Bonds.

- Firms or HHs **retire** bonds or **reduce** bank deposits to repay debt.
 - So, they buy fewer Gov. Bonds in the primary market (AEs and EMEs).
- **Also**, \Downarrow bank deposits to repay debt \Rightarrow excess bank reserves.
 - Excess bank reserves \Rightarrow excess bank liquidity \neq profit maximisation.
 - **Banks** in **LICs** buy fewer Gov. Bonds in **primary market** and \Uparrow FX.

Channel: $\partial \dot{\mathbf{b}} / \partial \mathbf{f}_{cb} < \mathbf{0} \Rightarrow$ FX acc. \Downarrow demand for Gov. Bonds.

- Government **repays** external debt.
- Firms or HHs retire bonds or reduce bank deposits to \Uparrow FX.

Overall: HHs, firms and banks disinvest from Gov. Bonds as b_p and f_{cb} increase.

Channels II and III: Voluntary and Forced Savings

Channel II: Voluntary Savings

- High-Powered (Endogenous) Money \uparrow public debt ratio b/c :
 - An $\uparrow h \approx$ the rise in wealth that accrues to rich households or shareholders of the banks.
 - Rich HHs increase their savings in the form of government bonds as **private debt transfers assets from debtors to creditors.**

Channel III: Forced Savings

- External Debt Share \uparrow public debt ratio b/c :
 - As more FX service external debt obligations \Rightarrow fewer FX available for private consumption and investment.
 - Thus, the private sector accumulates public sector domestic debt as a form of forced savings.

Key Result I: Fixed Peg

Theorem 2 (Dynamic Efficiency and the Augmented-Domar Condition)

A primary deficit stabilises debt, if and only if:

$$-\delta\omega_1\mathbf{b}_p - \gamma\mathbf{f}_{cb} > \delta\mathbf{h} + (\mathbf{r} + \gamma\rho_1\alpha - \mathbf{g})\mathbf{b}.$$

- The avg. size of \mathbf{f}_{cb} is 30% in EMEs in 2018 (Arslan and Cantu 2019).
- Stylised fact: \mathbf{b}_p ranges from 50% to more than 100%.
- Efficient bankers minimise \mathbf{h} , and foreign currency risks limit α .
- Ergo, a primary deficit stabilises the debt ratio under reasonable values for \mathbf{r} , α , and \mathbf{g} .

Key Result II: Fixed Peg

Proposition 1 (Money Creation and Debt Sustainability)

(a). *Money-financed fiscal deficits $\downarrow f_{cb}$ and undermines the government's ability to service external debt and compromises overall debt sustainability.*

(b). *When there is incomplete sterilisation, monetisation $\uparrow h \Rightarrow$ bank deposits and \uparrow for Gov. Bonds. Thus, $\dot{b} > 0$.*

- What happens if the Gov. refuses to satisfy the higher demand for bonds?

Key Result I: Pure Float

$$\text{Stock-Flow Consistent Debt Dynamics, } r' = i + g_q - \pi$$
$$\dot{b} = \Omega - \delta\omega_1 b_p + \delta h + \overbrace{(i + g_q - \pi - g)} b, \quad (13)$$

where \mathbf{g}_q is the long-run rate of nominal depreciation.

Theorem 3 (Dynamic Efficiency and Debt Sustainability)

A primary fiscal deficit stabilises debt, if and only if:

$$-\delta\omega_1 \mathbf{b}_p > \delta \mathbf{h} + (\mathbf{r}' - \mathbf{g})\mathbf{b}.$$

Key Result II: Pure Float

Proposition 2 (Money Creation and Debt Sustainability)

When the central bank monetises the fiscal deficit, it undermines debt sustainability through two channels:

- (i). It raises the stock of high-powered money as a share of GDP, and*
- (ii). It increases the long-run rate of nominal depreciation, which raises the local currency burden of external debt.*

- Overall, strong case against monetisation.
- See the Appendix for additional arguments.

The Case Against a Long-Run Primary Surplus

- A Long-Run Primary Surplus \Rightarrow a long-run private sector deficit:
 - \Rightarrow **HH** and/or **firm-level debt crisis** \Rightarrow high unemployment.
- Or, a long-run trade surplus:
 - \Rightarrow external imbalances: external debt crisis for deficit country.
 - **Collapse of trade surplus** \Rightarrow high unemployment.
- Absent a long-run private sector deficit or trade surplus:
 - **Domestic demand stagnation** \Rightarrow high unemployment.
- SIDS and Natural Disasters:
 - Require emergency spending but NOT in local currency units.
 - Need to **save FX** or maintain a **stable FXR** for creditworthiness.
- Solution: a **long-run primary deficit** in each case.
 - What about debt? An SFC fiscal rule \Rightarrow stable debt.

Conclusion

[...] sustained large surpluses have been less common, [...] Out of a sample of 87 countries [...] less than 20 percent sustained primary surpluses [...] — IMF 2011: pp.8.

- **Main result:** A primary deficit stabilises debt and the goods market.
- **Channels:** Demand constraint, forced and voluntary savings.
- **Policy:** An SFC fiscal rule yields an optimal primary deficit.

$$\overbrace{\Omega^* = \delta\omega_1 b_p - \delta h + \gamma f_{cb} + (g - r - \gamma\rho_3\alpha_F)b}^{\text{SFC Primary Deficit: Fixed Peg}}$$

$$\overbrace{\Omega^* = \delta\omega_1 b_p - \delta h + (g - r')b}^{\text{SFC Primary Deficit: Pure Float}}$$

Appendix

Fiscal Space

Definition 2 (Fiscal Space)

Fiscal space refers to the extent of resource availability (foreign assets held by the central bank as a share of GDP) and the degree of resource utilisation (the long-run growth rate, private debt, high-powered money, and interest income) consistent with full employment equilibrium and a stable debt ratio.

- Tax revenue in LCU do not affect fiscal space: why?

Optimal Foreign Reserves

Proposition 3 (Optimal Stock of Foreign Assets held by the Central Bank)

The optimal stock of foreign assets as a share of GDP is given as follows:

$$f_{cb}^* = \frac{\Omega - \delta\omega_1 b_p + \delta h + (r + \rho_1\alpha - g)b}{\gamma},$$

where f_{cb}^ is consistent with stable debt and goods market equilibrium at potential output.*

SFC Fiscal Policy and Exchange Rate Stability

Proposition 4 (SFC Fiscal Rule and Exchange Rate Stability)

A fiscal rule that adheres to the augmented-Domar condition $\Omega_{ADC}^{f \times r}$ provides for both debt and exchange rate stability.

$$\Omega_{ADC}^{f \times r} = \delta \omega_1 b_p - \delta h + (g - r')b$$

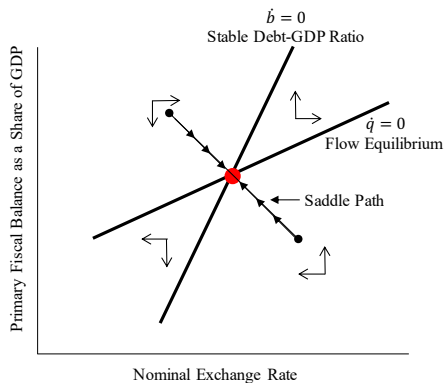
Expansionary Depreciation I

Proposition 5 (Hitting the Bullseye: Expansionary Depreciation)

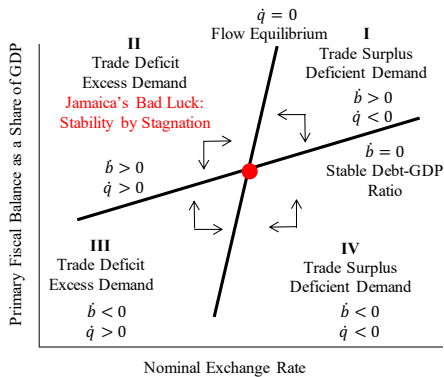
The Domar fiscal rule Ω_{DC} is akin to a stock-flow consistent fiscal rule when a nominal depreciation is expansionary.

Expansionary Depreciation II

Figure 6: Two Possibilities but One is Ruled Out by Evidence



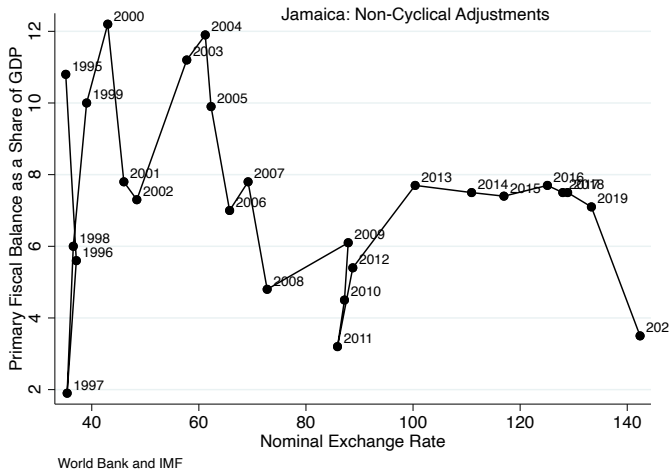
(a) Saddle-Point (Unstable) Equilibrium



(b) Stable Node

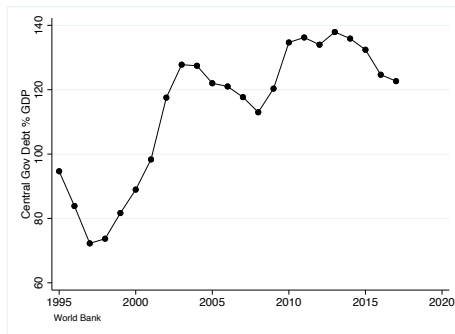
Expansionary Depreciation: Evidence

Figure 7: The Case of Jamaica

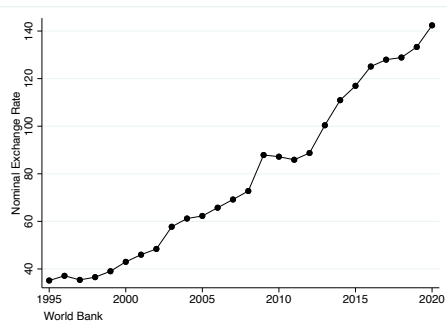


The Case of Jamaica: Quadrant II

Figure 8: Empirical Properties of Figure 6(b): Quadrant II



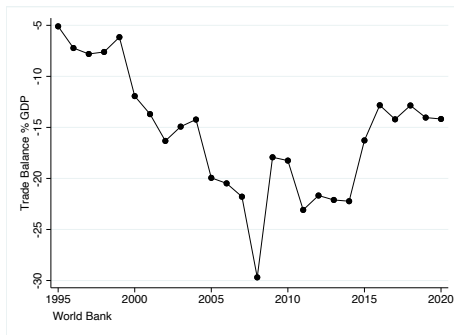
(a) Rising Debt Ratio



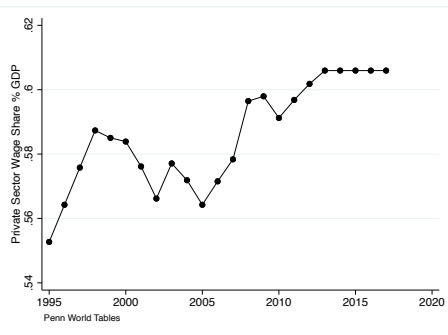
(b) Persistent Nominal Depreciation

The Case of Jamaica: Quadrant II

Figure 9: Empirical Properties of Figure 6(b): Quadrant II



(a) Trade Deficit

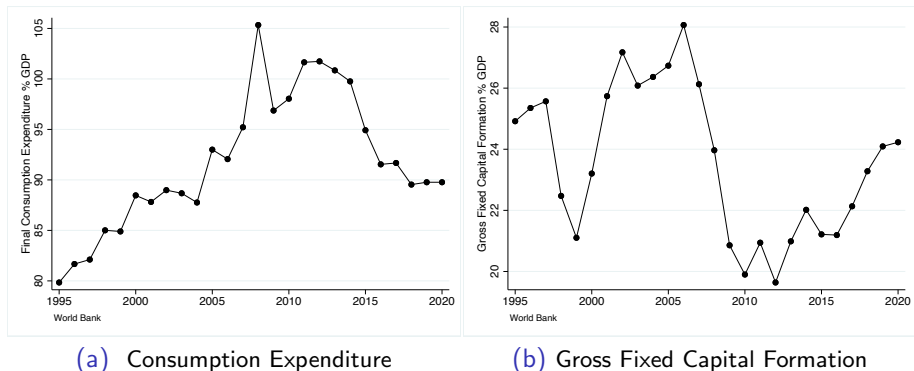


(b) Rising Wage Share: Stability Requires ↓

The Case of Jamaica: Rising Wage Share

Jamaica's Growth **Puzzle** is a Misnomer

Figure 10: Price of Fiscal Austerity is Investment



The Case Against Monetisation

- Monetisation \uparrow high-powered money and bank deposits
- Case of an Inter-Bank Market
 - Lowers the inter-bank interest rate independent of the stance of monetary policy, hence the term fiscal dominance.
- Case without an Inter-Bank Market
 - The deposit interest cost rises, which lowers banks' net income.
 - Banks increase the interest rate spread—the difference between lending and deposit rates—independent of the stance of monetary policy.

Axiom 1 (Monetisation and Ineffective Monetary Policy)

Monetised-fiscal deficits or fiscal dominance undermines the effectiveness of monetary policy.

The Case Against Monetisation: An Illustration

Figure 11: Monetisation of the Fiscal Deficit by 10 LCU

Central Bank		Bank		Non-Bank	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
NFA	H +10 LCU	H + 10 LCU	D_{nb} +10 LCU	D_{nb} +10 LCU	L
B	D_g - 10 LCU	L		B	
		B			

- If no reserve requirements: excess reserves = 10 LCU.
- In the case of a RRR of $z < 1$: excess reserves = 10 LCU – z 10 LCU.
- **Monetisation** \Rightarrow **non-borrowed excess reserves**.

The Case for Bond-Financed Fiscal Deficits

Axiom 2 (Bond-Financed Fiscal Deficits and Effective Monetary Policy)

Bond-financed fiscal deficits have a net-zero effect on the creation of high-powered money and banks' net interest income.

Proof I: The Case of an Inter-Bank Market.

Central government issues bonds to banks in exchange for reserves, which permits the central bank to maintain its target inter-bank interest rate. \square

- This is why central governments issue debt or why central banks issue liabilities like sterilisation bonds in the primary market.
- Public sector debt does not exist to fund fiscal deficits.

The Case for Bond-Financing Cont'd

Proof II: The Case without an Inter-Bank Market.

Central government issues bonds to banks in exchange for reserves, which permits them to cover their deposit interest costs without increasing the interest rate spread. □

- In both cases Axiom 2 holds.
- **Sovereigns should bond-finance their fiscal deficits.**
- Poor understanding of money and banking lead to unnecessary pathologies:
 - Monetisation \Rightarrow non-borrowed excess reserves in commercial banks \Rightarrow comparatively higher interest rate spreads.
 - Or, large devaluations or rapid depreciations as lower inter-bank interest rates lead to capital outflows.
- Axiom 2 \Rightarrow the debt sustainability problematic.