Fiscal Rules as Alternatives for the Design of Fiscal Policy: The Case for Central America and the Dominican Republic

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Outline

- Motivation
- Fiscal indiscipline: the deficit bias
- Fiscal discipline: rule versus discretion
- Alternatives for fiscal policy design in CA and the DR: Is there room for improvement?
Motivation

- Fiscal authorities build credibility from achieving policy goals (i.e. fiscal sustainability).
- However, it is evident the bias towards fiscal deficits in major groups of economies.

Source: IMF
Motivation

- The fiscal deficit exhibited by different economies could:
  - undermine the credibility of authorities
  - threaten fiscal sustainability
  - limit the response to shocks

- There is the case in favor of the implementation of legal and institutional mechanisms that predefine a path of fiscal policy consistent with long-run goals, in order to deal with this "failure" of discretionary policy.
Economies of Central America and the Dominican Republic are not the exception.
Literature suggest two general causes explaining the bias towards fiscal deficit:

- myopia/impatience during political cycle (see: Rogoff (1990), Alesina and Tabellini (1990), Debrum (2011)).

- problem of common resources (see: Hallerberg and Von Hagen (1999), Velasco (1999), Wren - Lewis (2011)).
The deficit bias is not a problem if fiscal deficits are compensated with future superavits that guarantee government solvency.

In the literature we can identify two approaches to solve the described problem:

- Delegation (discretion)
- Contracts (rules)
Fiscal discipline: discretion versus rules

- The discretion approach implies the delegation to an non elected agent (i.e. an independent fiscal agency) the power to decide the formulation of fiscal policy and the coordination of budget process.

- This strategy can eliminate the fiscal bias, because fiscal policy decisions are disconnected from the participants in the budget process.
Fiscal discipline: discretion versus rules

- Different from the delegation approach, rules imply explicit limits over budget aggregates (i.e. revenues, expenditures, fiscal balance).

- Sometimes rules are accompanied by institutional arrangements oriented to improve transparency and predictability of budget process (i.e. delegation of tasks).

- On the negative side, by construction, rules suffer of dynamic inconsistency. Rules are effective if the cost of deviation from the rule is greater than the benefit of keep them.
### Fiscal discipline: discretion versus rules

- Properties of the different types of rules:

<table>
<thead>
<tr>
<th>Type of Fiscal Rule</th>
<th>Debt Sustainability</th>
<th>Economic Stabilization</th>
<th>Size of the Government</th>
</tr>
</thead>
<tbody>
<tr>
<td>General balance</td>
<td>++</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Primary balance</td>
<td>+</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Cyclical-adjusted balance</td>
<td>++</td>
<td>++</td>
<td>0</td>
</tr>
<tr>
<td>Balanced Budget during the cycle</td>
<td>++</td>
<td>+++</td>
<td>0</td>
</tr>
<tr>
<td>Public debt (%GDP)</td>
<td>+++</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Expenditure</td>
<td>+</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Revenues</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Revenue ceiling</td>
<td>-</td>
<td>-</td>
<td>++</td>
</tr>
<tr>
<td>Revenue floor</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Limits to revenues windfalls</td>
<td>+</td>
<td>++</td>
<td>++</td>
</tr>
</tbody>
</table>

Positive signs (+) indicate stronger property, negative signs (-) indicate weaker property, zeros (0) indicate neutral property with regard to objective.
Alternatives for fiscal policy design in CA and the DR: Is there room for improvement?

- To explore this question, we evaluate different fiscal rules using a DSGE model that considers the main features CADR economies, which business cycle is dominated by productivity and term of trade shocks.

- We compare the macroeconomic volatility and welfare of different fiscal rules and the discretionary case.

- Greater volatility is associated with lower welfare, so that rules that reduce volatility are ranked up better than rules that increase volatility.

- The DSGE model is a modified version of Bi, et. al. (2014).
The model

- Government Budget Restriction:

\[ \tau_t^c c_t + \tau_t^i (w_t l_t + r_t^N k_{t-1}^N + r_t^T k_{t-1}^T) - (s_t b_{t-1}^* - p_t^g g_t - z_t) = q_t s_t b_t^* \]

- where

\( \tau_t^c \): Consumption tax; \( \tau_t^i \): Income tax; \( w_t \): real wage; \( l_t \): labor; \( r_t^N \): return to capital non-tradable sector; \( r_t^T \): return to capital tradable sector; \( s_t \): real exchange rate; \( p_t^g \): relative price of public goods; \( g_t \): public expenditure in goods; \( z_t \): lump sum transfers; \( q_t \): price of foreign bonds; \( b_t^* \): foreign bonds
Fiscal rules evaluated:

- Debt - Revenue Rule:
  \[ \tau_t = \alpha_0 \tau_{t-1} + \alpha_1 \left( \frac{b_t^*}{y_t} - \frac{b^*}{y} \right) ; \alpha_0 > 0, \alpha_1 > 0 \]

- Debt - Expenditure Rule:
  \[ g_t = \alpha_0 g_{t-1} + \alpha_1 \left( \frac{b_t^*}{y_t} - \frac{b^*}{y} \right) ; \alpha_0 > 0, \alpha_1 < 0 \]

- Debt - Balance Rule:
  \[ bp_t = \alpha_0 bp_{t-1} + \alpha_1 \left( \frac{b_t^*}{y_t} - \frac{b^*}{y} \right) ; \alpha_0 > 0, \alpha_1 > 0 \]

- where

\( \tau_t \): taxe rate; \( g_t \): public expenditure in goods; \( y_t \): GDP; \( bp_t \): primary balance.
Fiscal rules evaluated:

- **Revenue Rule**

  \[ \tau_t = \tau \]

- **Expenditure rule**

  \[ \frac{g_t}{y_t} = \frac{g^*}{y} \]

- **Primary balance rule**

  \[ \frac{bp_t}{y_t} = \left( \frac{bp}{y} \right)^* \]
Characterizing discretionary fiscal policy

- Fiscal expenditure is acyclic in CADR economies.

This fact suggests that, in the discretionary set-up, public spending follows an AR(1) process:

$$g_t = \delta g_{t-1} + \epsilon_t^g$$
Governments rely on fiscal adjustments through tax rates to deal with non-sustainable deficit dynamics. Then, in the discretionary case, we link the “average” tax rate in terms of deviations of debt to GDP ratio to its long-run level.

\[ \tau = \phi \left( \frac{b_t}{y_t} - \frac{b^*}{y} \right) \]
Households

- Households derive utility from a basket that considers private goods \((c_t)\) and public good \((g_t)\).

\[
\tilde{c}_t = \left[ \omega(c_t)^{\frac{\nu-1}{\nu}} + (1 - \omega)(g_t)^{\frac{\nu-1}{\nu}} \right]^{\frac{\nu}{\nu-1}}
\]

- Preferences are characterized by:

\[
E_t \sum_{t=0}^{\infty} \beta^t U_t
\]

\[
U_t = \left( \log(\tilde{c}_t) + \phi \frac{(1 - l_t)^{1-\sigma}}{1 - \sigma} \right)
\]
Subject to the following budget restriction:

\[
(1 + \tau_t^c) c_t + i_t^N + i_t^T + \frac{\kappa}{2} \left( \frac{i_t^N}{k_{t-1}^N} - \delta \right)^2 k_{t-1}^N + \frac{\kappa}{2} \left( \frac{i_t^T}{k_{t-1}^T} - \delta \right)^2 k_{t-1}^T = \\
(1 - \tau_t^i)(w_t l_t + r_t^N k_{t-1}^N + r_t^T k_{t-1}^T) + z_t
\]

- There are adjustment costs on investment expenditures (Schmith-Grohe and Uribe, 2004).
Laws of movement of capital are:

\[ k_t^N = (1 - \delta)k_{t-1}^N + i_t^N \]

\[ k_t^T = (1 - \delta)k_{t-1}^T + i_t^T \]

And the aggregate investment is:

\[ i_t = i_t^N + i_t^T \]
Private consumption and investment are CES aggregates of nontradables and tradables with the intra-temporal elasticity of substitution $\chi$ and the degree of home bias $\varphi$.

\[
c_t = \left[ \varphi \frac{1}{x} (c_t^N)^{\frac{x-1}{x}} + (1 - \varphi) \frac{1}{x} (c_t^T)^{\frac{x-1}{x}} \right]^{\frac{x}{x-1}} \tag{3.18}
\]

\[
i_t = \left[ \varphi \frac{1}{x} (i_t^N)^{\frac{x-1}{x}} + (1 - \varphi) \frac{1}{x} (i_t^T)^{\frac{x-1}{x}} \right]^{\frac{x}{x-1}} \tag{3.19}
\]
In terms of the distribution of intersectoral labor the CES aggregator results in:

\[ l_t = \left[ (\varphi^I) \frac{1}{\chi^I} (l_t^N) \frac{1+\chi^I}{\chi^I} + (1 - \varphi^I) \frac{1}{\chi^I} (l_t^T) \frac{1+\chi^I}{\chi^I} \right] \frac{\chi^I}{1+\chi^I} \quad (3.20) \]

where \( \varphi^I \) as the steady-state participation of the non-tradable sector in total employment, and \( \chi^I \) the elasticity of substitution between sectors.
The representative household chooses the amount of labor that will be assigned to each sector solving the following optimization problem subject to (3.20):

\[
\min w_t^N l_t^N + w_t^T l_t^T
\]  

(3.21)

subject to

\[
l_t = \left[ \varphi^l - \frac{1}{\lambda^l} (l_t^N) \frac{1+\lambda^l}{\lambda^l} + (1 - \varphi^l) - \frac{1}{\lambda^l} (l_t^T) \frac{1+\lambda^l}{\lambda^l} \right] \frac{\lambda^l}{1+\lambda^l}
\]  

(3.20)
The labor supply of each sector arise from the first order conditions:

\[ l_t^N = \varphi'(\frac{w_t^N}{w_t}) \chi' l_t \] (3.22)

\[ l_t^T = (1 - \varphi')\left(\frac{w_t^T}{w_t}\right) \chi' l_t \] (3.23)

The aggregate wages arises from the problem of cost minimization (3.21):

\[ w_t = \left[ \varphi'(w_t^N)^{1+\chi'} + (1 - \varphi')(w_t^T)^{1+\chi'} \right]^{\frac{1}{1+\chi'}} \] (3.24)
In this model, prices are presented as relative prices with respect to the price of the private compound good, which is normalized to 1. Defining the relative price of nontradables as $p^N_t$, and the real exchange rate $s_t$ (assuming that it is met single price law), the price index of private goods:

$$1 = \left[ \varphi(p^N)^{1-\chi} + (1 - \varphi)(s_t)^{1-\chi} \right] \frac{1}{\chi - 1} \quad (3.25)$$
Firms

Firms produce tradable and nontradable goods in perfectly competitive markets, through a Cobb-Douglas function:

\[ y_t^N = a_t(k_t^N)^{1-\alpha^N}(l_t^N)^{\alpha^N} \]  
\[ y_t^T = a_t(k_t^T)^{1-\alpha^T}(l_t^T)^{\alpha^T} \]  

\[ \ln \frac{a_t}{a} = \rho_a \ln \frac{a_t-1}{a} + \varepsilon_t^a \]  

\[ \varepsilon_t^a \sim N(0, \sigma_a^2) \]

Where \( y_t^N \) and \( y_t^T \) are the production levels, \( a_t \) is the total factor productivity that follows a first-order autoregressive process and \( \varepsilon_t^a \) the productivity shock, common to both sectors.
Each firm takes the prices of the factors as given and obtains the labor and capital demands of each sector maximizing benefits, subject to their respective production functions:

\[
\max \Pi_t^N = p_t^N y_t^N - w_t^N l_t^N - r_t^N k_{t-1}^N
\]  
(3.30)

\[
\max \Pi_t^T = p_t^T y_t^T - w_t^T l_t^T - r_t^T k_{t-1}^N
\]  
(3.31)
The demand for labor and capital of each sector is derived from the first order conditions:

\[
I_t^N = \alpha^N \left( \frac{p_t^N}{w_t^N} \right) y_t^N \quad (3.32)
\]

\[
I_t^T = \alpha^T \left( \frac{p_t^T}{w_t^T} \right) y_t^T \quad (3.33)
\]
\[ k_{t-1}^N = (1 - \alpha^N) \left( \frac{p_t^N}{r_t^N} \right) y_t^N \] (3.34)

\[ k_{t-1}^T = (1 - \alpha^T) \left( \frac{\xi_t s_t}{r_t^T} \right) y_t^T \] (3.35)

Where \( \xi_t = p_t^x/s_t \) are the terms of trade, which follow an exogenous process:

\[ \ln \frac{\xi_t}{\xi} = \rho_\xi \ln \frac{\xi_{t-1}}{\xi} + \varepsilon_\xi \] (3.36)

\[ \varepsilon_\xi \sim N(0, \sigma_\xi^2) \] (3.37)
General equilibrium

In the aggregate the supply of labor and capital must match their respective demands:

\[ k_t = k_t^N + k_t^T \] \hspace{1cm} (3.38)

\[ l_t = l_t^N + l_t^T \] \hspace{1cm} (3.39)

In addition, the product in units of local currency results in:

\[ y_t = p_t^N y_t^N + \xi_t s_t y_t^T \] \hspace{1cm} (3.40)
The equilibrium condition in the non-tradable goods market is:

\[
y_t^N = (p_t^N)^{-\chi} \{ \varphi \left[ c_t + i_t + \frac{\kappa}{2} \left( \frac{i_t^N}{k_{t-1}^N} - \delta \right)^2 k_{t-1}^N \right. \\
+ \frac{\kappa}{2} \left( \frac{i_t^T}{k_{t-1}^T} - \delta \right)^2 k_{t-1}^T \left. \right] + \varphi^g (p_t^g)^\chi g_t \} \tag{3.41}
\]

Finally, the model closes with the definition of the balance of payments,

\[
y_t - c_t + i_t + \frac{\kappa}{2} \left( \frac{i_t^N}{k_{t-1}^N} - \delta \right)^2 k_{t-1}^N + \frac{\kappa}{2} \left( \frac{i_t^T}{k_{t-1}^T} - \delta \right)^2 k_{t-1}^T + p_t^g = s_t \left[ q_t b_t^* - b_{t-1}^* \right] \tag{3.42}
\]
### Structural Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\varphi$</td>
<td>Share of non tradables in consumption basket</td>
<td>0.5</td>
</tr>
<tr>
<td>$\sigma$</td>
<td>Inverse of Frisch labor supply elasticity</td>
<td>2</td>
</tr>
<tr>
<td>$\upsilon$</td>
<td>Elasticity of Substitution between $c_t$ and $g_t$</td>
<td>0.49</td>
</tr>
<tr>
<td>$\omega$</td>
<td>Share of $c_t$ in effective consumption basket</td>
<td>0.8</td>
</tr>
<tr>
<td>$\chi$</td>
<td>Elasticity of Substitution between tradables and non tradable in $c_t$ and $g_t$</td>
<td>0.44</td>
</tr>
<tr>
<td>$\chi^1$</td>
<td>Elasticity of substitution between $l_t^N$ and $l_t^T$ in $l$</td>
<td>1</td>
</tr>
<tr>
<td>$\varphi^1$</td>
<td>Share of non tradable income in steady state</td>
<td>0.5</td>
</tr>
<tr>
<td>$\kappa$</td>
<td>Adjustment cost of investment</td>
<td>1.7</td>
</tr>
<tr>
<td>$\alpha^N$</td>
<td>Share of labor income in the non tradable sector</td>
<td>0.5</td>
</tr>
<tr>
<td>$\alpha^T$</td>
<td>Share of labor income in the tradable sector</td>
<td>0.5</td>
</tr>
<tr>
<td>$\phi$</td>
<td>Share of leisure in steady state</td>
<td>0.25</td>
</tr>
<tr>
<td>$\delta$</td>
<td>Depreciation rate</td>
<td>0.1</td>
</tr>
</tbody>
</table>
## Calibration

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Definition</th>
<th>Methodology/Source</th>
<th>Estimated Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\frac{b}{y}$</td>
<td>Ratio Debt-GDP in steady state</td>
<td>Fiscal Limits/Ramírez and Wright (2014)</td>
<td>37 68 55 43 83 43</td>
</tr>
<tr>
<td>$\tau^i$</td>
<td>Effective income tax rate</td>
<td>2000-2017</td>
<td>4.4 5.4 3.3 4.8 4.4 4.0</td>
</tr>
<tr>
<td>$\tau^c$</td>
<td>Effective consumption tax rate</td>
<td>2000-2017</td>
<td>8.9 9.5 7.4 10.5 9.1 9.1</td>
</tr>
<tr>
<td>$\rho^a$</td>
<td>Persistence of productivity shock</td>
<td>OLS</td>
<td>0.7 0.6 0.6 0.6 0.8 0.7</td>
</tr>
<tr>
<td>$\rho^{tot}$</td>
<td>Persistence of term of trade shock</td>
<td>OLS</td>
<td>0.8 0.9 0.9 0.9 0.8 0.8</td>
</tr>
<tr>
<td>$\sigma_a$</td>
<td>s.d. productivity shock</td>
<td>OLS</td>
<td>1.9 2.0 1.2 1.8 2.7 2.3</td>
</tr>
<tr>
<td>$\sigma_{tot}$</td>
<td>s.d. term of trade shock</td>
<td>OLS</td>
<td>2.4 1.2 2.6 1.8 1.9 7.9</td>
</tr>
</tbody>
</table>
We want to compare rules considered with the discretionary case and between them, in order to, given the characteristics of the economy under study, to gain insight on the types of fiscal rules that better results can produce in these economies.

To that end, we propose two criteria:

- Volatility: fiscal rules that amplify volatility introduced by the shocks that affect the system, are less preferred.
- Welfare costs: fiscal rules that improve the welfare of households when they substitute discretionary policy, are desirable.
Results: Macroeconomic volatility under different rules

DISCR: Discretionary Fiscal Policy
DR1: Debt Rule based on the adjustment of tax rates to deviation to debt to GDP ratio from target. DR2: Debt Rule based on the adjustment of expenditure to deviation to debt to GDP ratio from target. DR3: Debt Rule based on the adjustment of primary balance to deviation to debt to GDP ratio from target. BBR: Fiscal balance rule. ER: Constant expenditure - GDP ratio rule. RR: Constant revenue - GDP ratio rule.
Thank you!!