CEMLA
CENTRO DE ESTUDIOS MONETARIOS LATINOAMERICANOS

Debt Sustainability and Monetary Policy Attainment in EMEs

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Motivation

1. Our objective is to explore a possible relation between debt sustainability and monetary policy attainment for EMEs.
2. As known, there is an important relation between the monetary and the fiscal policy.
   - **Sargent and Wallace (1981).** Some unpleasant monetary arithmetic.
   - **Sargent (2018)** "In Latin America inflation is always and everywhere a fiscal phenomenon."

Motivation

1. For EMEs, resources obtained through seigniorage have been historically much more important than for AE (Click, 1998)
2. In general, inflation levels have been higher in EMEs. Thus, trade-offs between fiscal and monetary policies might be, or become, more important than in AEs
3. EMEs fiscal and monetary variables are closely observed by market participants, probably more so than for AEs.
4. During financial stress markets could differentiate more closely between EMEs.

Basic Blocks

1. Consider the (theoretical) price of an asset that pays all primary balances plus seigniorage. Under standard assumptions, this price should be equal to the debt of the government (Ljungqvist and Sargent, 2012).
2. Government debt should be backed by (present and future) **net taxes** and **seigniorage**.

$$B_{t-1} = \sum_{k=0}^{\infty} \mathbb{E}_t[S_{t+k}((T_{t+k} - G_{t+k}) + \Delta M_{t+k})]$$

SDF

$$B_{t-1} = \sum_{k=0}^{\infty} \mathbb{E}_t[S_{t+k}(PB_{t+k} + \Delta M_{t+k})] \qquad (*)$$

Basic Blocks

$$B_{t-1} = \sum_{k=0}^{\infty} \mathbb{E}_t[S_{t+k}]\,\mathbb{E}_t[PB_{t+k} + \Delta M_{t+k}] + \mathrm{cov}_t[S_{t+k}, PB_{t+k} + \Delta M_{t+k}]$$

We can think of S_{t+k} as:

$$S_{t+k} = \frac{\beta^k u'(c_{t+k})}{u'(c_t)}$$

3. In some regressions, we include a term that approximates part of the covariance as a control.

Basic Blocks

1. We use a test to assess whether equation $(*)$ leads to a sustainable levels of debts (Bohn, 1995 y 1998; and Mendoza and Ostry, 2008):

$$PB_t = \rho\, B_{t-1} + \mu_t + e_t$$

$$\mu_t = \beta_0 + \boldsymbol{\beta}^{\boldsymbol{T}} \boldsymbol{x_t}$$

2. **Null hypothesis:** ρ is statistically significant, positive and strictly less than one.
3. **Sufficient test**. Rejecting the null says nothing about the unsustainability of the debt.

Controls

1. **Seigniorage** components associated with inflation and real growth**.**

$$\frac{M_t - M_{t-1}}{P_{t-1}Y_{t-1}} = \underbrace{\Delta\left(\frac{M_t}{P_tY_t}\right)}_{\text{Change in the demand for money}} + \frac{\Delta(Y_tP_t)}{Y_{t-1}P_{t-1}}\frac{M_t}{P_tY_t}$$

- The government aggregate budget constraint includes seigniorage. We focus on the components associated with inflation and real growth.

Controls

2. **Risk premium for primary balance:** a moving-covariance between global consumption growth and a hypothetical asset that pays the primary balance of the economy each period.

$$\left(\frac{b_t + pb_t}{b_{t-1}}\right)$$

- A global investor cares about the co-movements between the primary balances and the state of the world. This component, however, might be subject to measurement error.

Controls

3. Three additional controls, following Mendoza and Ostry (2008) and Bohn (1998).
4. **Current account.** To consider the possibility of twin deficits.
5. **Output and government expenditure gaps.**
   - Deviations with respect to trend, in percent. Trend and cyclical component of the log-output (log-expenditure) $\tilde{y}_t$ ($\tilde{g}_t$) and y_t^T (g_t^T), built using the Hamilton filter.
   - Measures of temporal fluctuations of output and government expenditures (Barro, 1986): GVAR, YVAR.

$$GVAR_t = \frac{g_t - g_t^T}{y_t}$$

$$YVAR_t = \frac{y_t^T - y_t}{y_t^T} \frac{g_t^T}{y_t}$$

Data

1. **34 EMEs:** Argentina, Brazil, Bulgaria, Chile, China, Colombia, Costa Rica, Croatia, Ecuador, Egypt, Hungary, India, Indonesia, Israel, Ivory Coast, Jordan, S. Korea, Malaysia, Mexico, Morocco, Nigeria, Pakistan, Panama, Peru, Philippines, Poland, Romania, Russia, South **Africa**, Thailand, Turkey, Ukraine, Uruguay and Venezuela.
2. **Time series:** Gross debt and total expenditures general government, primary balance and current account (as a proportion of GDP), annual variation of consumer prices and real global consumption (USD) and M1.
3. Data 1980-2016.

Panel Regressions

1. **We divide our EMEs intro three sets:**
   - EMEs with a historical inflation average **below** the median of their averages.
   - EMEs with a historical inflation average **above** the median of their averages.
   - All EMEs in database.
2. Fixed effects for each economy.
3. Error autocorrelation correction for each economy.

$$\epsilon_{i,t} = \gamma_i \epsilon_{i,t-1} + \eta_{i,t}$$

with $\eta_{i,t}$ i.i.d.

4. We vary number and type of controls used.

Results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Lower	Higher	Lower	Higher	All	Lower	Higher	Lower	Higher
ρ	**0.064*****	**0.045*****	**0.044*****	**0.045*****	**0.036*****	**0.028**	**0.042*****	**0.044***	**0.049*****
	(0.017)	(0.012)	(0.016)	(0.012)	(0.012)	(0.020)	(0.016)	(0.023)	(0.016)
Current Account			-0.013	0.12***	0.065**	0.021	0.095**	0.023	0.094**
			(0.036)	(0.038)	(0.028)	(0.042)	(0.038)	(0.045)	(0.038)
$\tilde{y}$			0.33***	0.93***	0.28***	0.24**	0.30*		
			(0.099)	(0.15)	(0.087)	(0.10)	(0.17)		
$\tilde{g}$			-0.079***	-0.026***	-0.046***	-0.081***	-0.034***		
			(0.015)	(0.0099)	(0.0100)	(0.019)	(0.012)		
Inflation Component					0.42***	0.32***	0.66***	0.32***	0.68***
					(0.074)	(0.092)	(0.13)	(0.099)	(0.12)
Risk Adjustment					-0.48***	-0.15	-0.51***	-0.055	-0.52***
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GVAR								-0.040	-0.0025
								(0.095)	(0.0070)
Constant	-3.49***	-2.59***	-2.66***	-2.19***	-2.70***	-3.09***	-2.89***	-4.15***	-3.25***
	(0.35)	(0.19)	(0.36)	(0.26)	(0.23)	(0.42)	(0.34)	(0.41)	(0.35)
N	173	470	161	418	445	114	331	114	331
N_i	8	26	8	25	28	6	22	6	22
adj. R^2	0.10	0.10	0.20	0.10	0.19	0.25	0.20	0.12	0.18

Notes: Standard errors in parentheses. *, ** and *** denote that the corresponding coefficient is statistically significant at the **90**, **95** and **99** percent confidence levels, respectively. . The panel is unbalanced with samples that cover mainly the 1980 – 2016 period. Under the regression number, it is indicated if the EMEs used have a lower or higher than the median of historical average inflation rates for each country (7.47).

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Next step: Assess sustainable long-run debt levels

- Debt level sustainable in the long-run (Bohn, 1998):

$$\mathbb{E}[b] = -\hat{\mu} / [\rho(1+\hat{r}) - \hat{r}]$$

  - $\hat{\mu}$ is the average of $\mu_t = \beta_0 + \boldsymbol{\beta x_t}$, with $\boldsymbol{x_t}$ the controls used.
  - $\hat{r}$ is the average real rate (r) less the average GDP per capita $(\bar{g})$.

- Our estimations suggest that a lower average inflation in EMEs seems to associated with a higher sustainable debt level in the long-run. A successful monetary policy seems to allow for more fiscal space.

Thank you

References

1. **Aiyagari, S. R., and Gertler, M. (1985).** The Backing of Government Bonds and Monetarism. *Journal of Monetary Economics*, *16*(1), 19-44.
2. **Barro, R. J. (1979).** U.S. Deficits since World War I. *The Scandinavian Journal of Economics*, 88(1), 195-222.
3. **Bohn, H. (1995).** The Sustainability of Budget Deficits in a Stochastic Economy. *Journal of Money, Credit and Banking*, 27(1), 257-271.
4. **Bohn, H. (1998).** The Behavior of US Public Debt and Deficits. *The Quarterly Journal of Economics*, 113(3), 949-963.
5. **Click, R. W. (1998).** Seigniorage in a Cross-section of Countries. *Journal of Money, Credit and Banking*, 154-171.
6. **Ljungqvist, L., and Sargent, T. J. (2012).** *Recursive Macroeconomic Theory*. MIT Press.
7. **Mendoza, E. G., and Ostry, J. D. (2008).** International Evidence on Fiscal Solvency: Is Fiscal Policy "Responsible"?. *Journal of Monetary Economics*, 55(6), 1081-1093
8. **Sargent, T. J., and Wallace, N. (1981).** Some Unpleasant Monetarist Arithmetic. *Federal Reserve Bank of Minneapolis Quarterly Review*, *5*(3), 1-17.
9. **Talvi, E., and Vegh, C. A. (2005).** Tax Base Variability and Procyclical Fiscal Policy in Developing Countries. *Journal of Development Economics*, 78(1), 156-190.