BCCR BANCO CENTRAL DE COSTA RICA

Interdependence between Fiscal and Monetary Policy: the case for Costa Rica

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The ideas expressed in this paper are those of the authors and not necessarily represent the view of the Central Bank of Costa Rica.

Motivation

- Relationship between the effectiveness of monetary policy and fiscal policy coordination (Sargent and Wallace, 1981).

- Tradeoffs between the degree of independence of the policies and their effectiveness (Aiyagari and Gertler, 1985).

- This is especially relevant for Costa Rica where the central government's debt level has reached levels over 50% of its GDP and the Central Bank has made remarkable efforts to strengthen its independence.

Objectives

Analyzing the interdependence between monetary policy and fiscal policy in Costa Rica in period 1991-2019:

1. Fiscal dominance test: analyze the relationship between primary fiscal balance and public sector liabilities.

2. To estimate the effect of fiscal variables on the Central Bank's monetary policy rate.

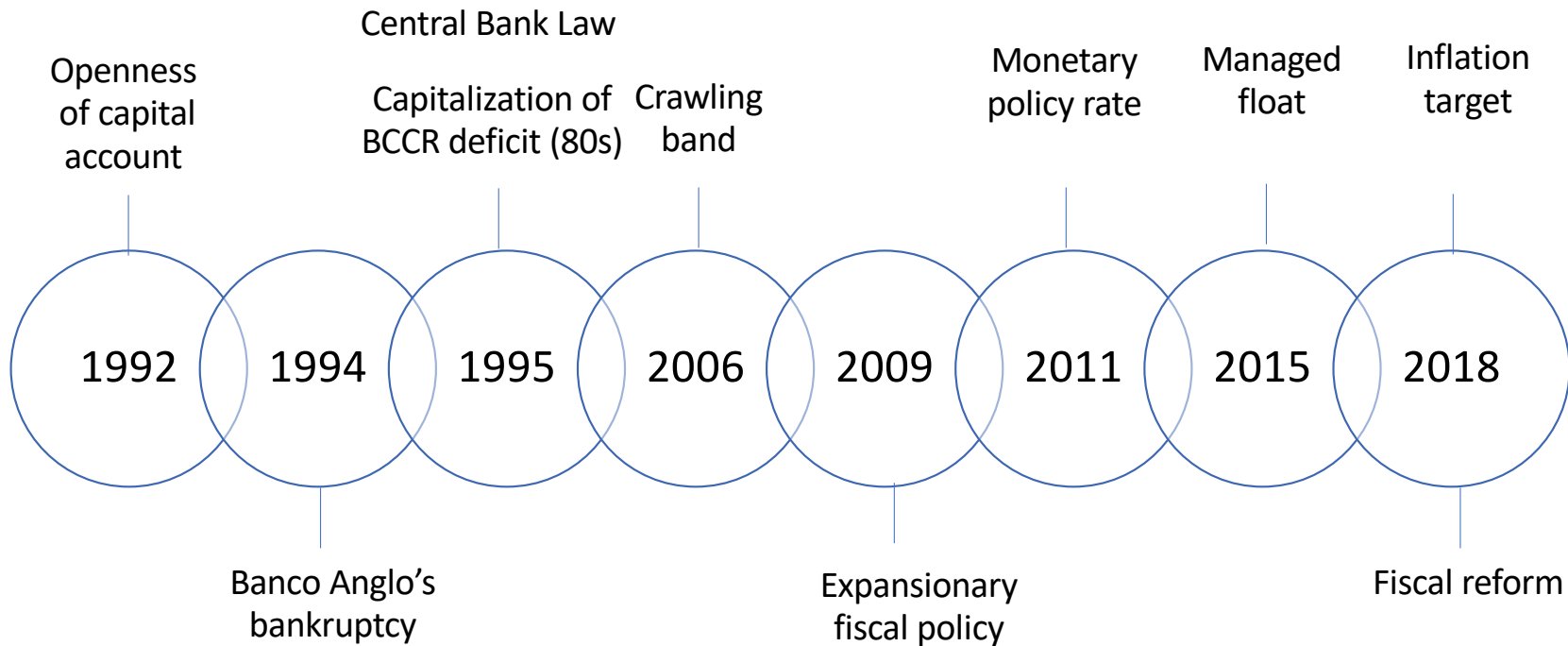3. To estimate the effect of the fiscal deficit on the inflation rate.

Inflation and fiscal deficit, 1991-2019
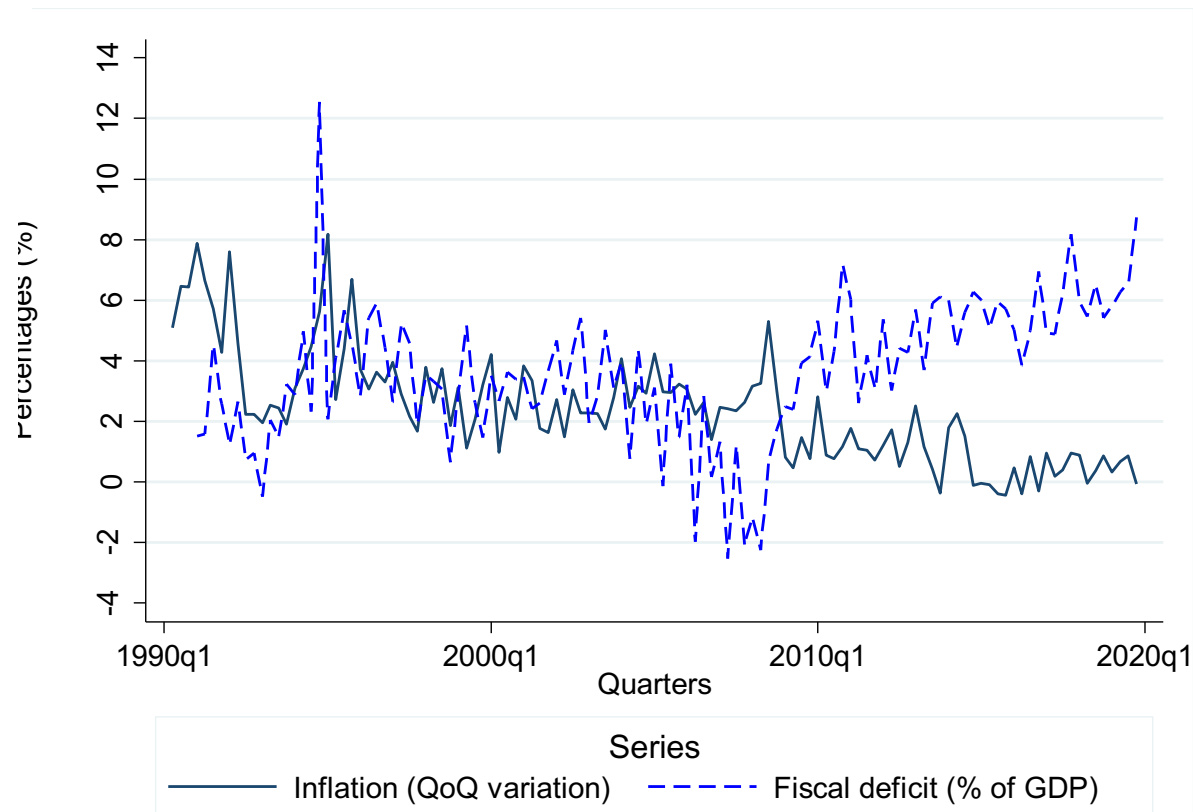
Source: Central Bank of Costa Rica.
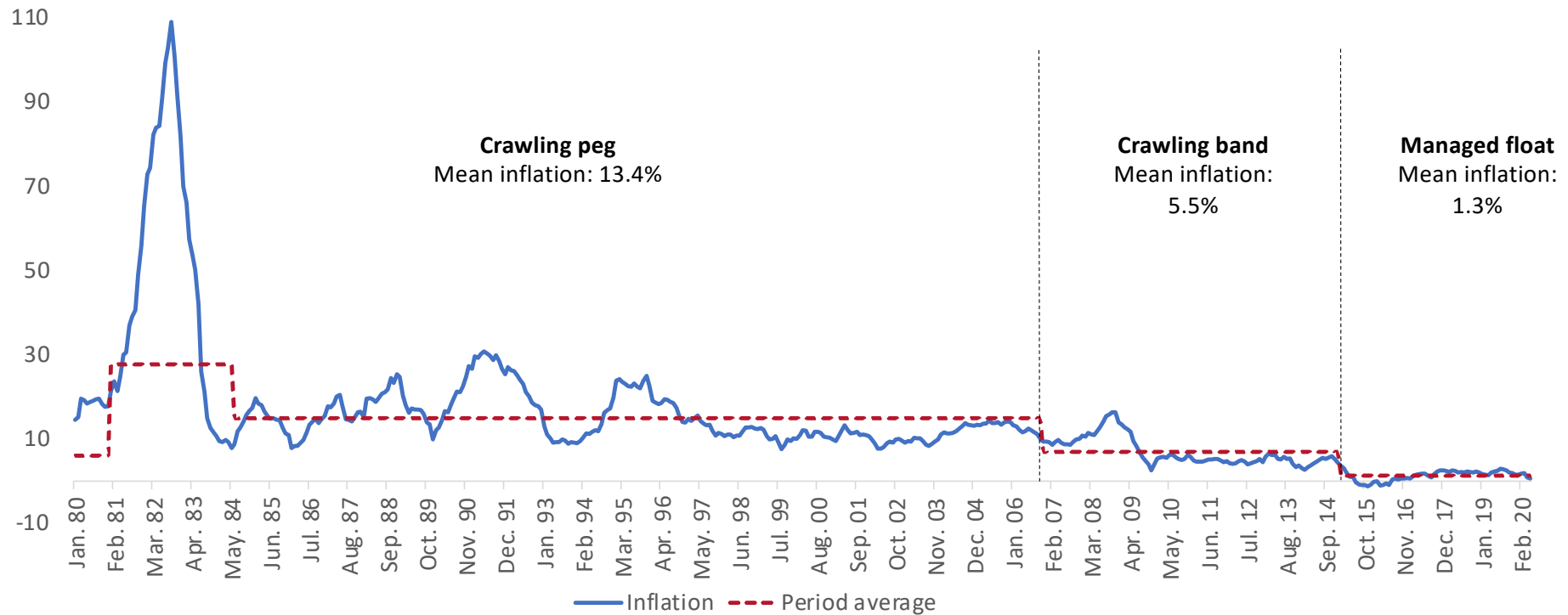
Costa Rica: monetary policy and fiscal events

MONETARY POLICY

Central Bank Law

Openness of capital account

Capitalization of BCCR deficit (80s)

Crawling band

Monetary policy rate

Managed float

Inflation target

1992 **1994** **1995** **2006** **2009** **2011** **2015** **2018**

Banco Anglo's bankruptcy

Expansionary fiscal policy

Fiscal reform

FISCAL EVENTS

Inflation and exchange rate regime

Central Bank has modified its monetary policy regime toward inflation targeting

Crawling peg
Mean inflation: 13.4%

Crawling band
Mean inflation:
5.5%

Managed float
Mean inflation:
1.3%

Inflation — — Period average

Source: Central Bank of Costa Rica

Deficit of the Central Bank (% of GDP), 1983 - 2019

BCCR has a deficit since the crisis of the 80's, but it has decreased over time
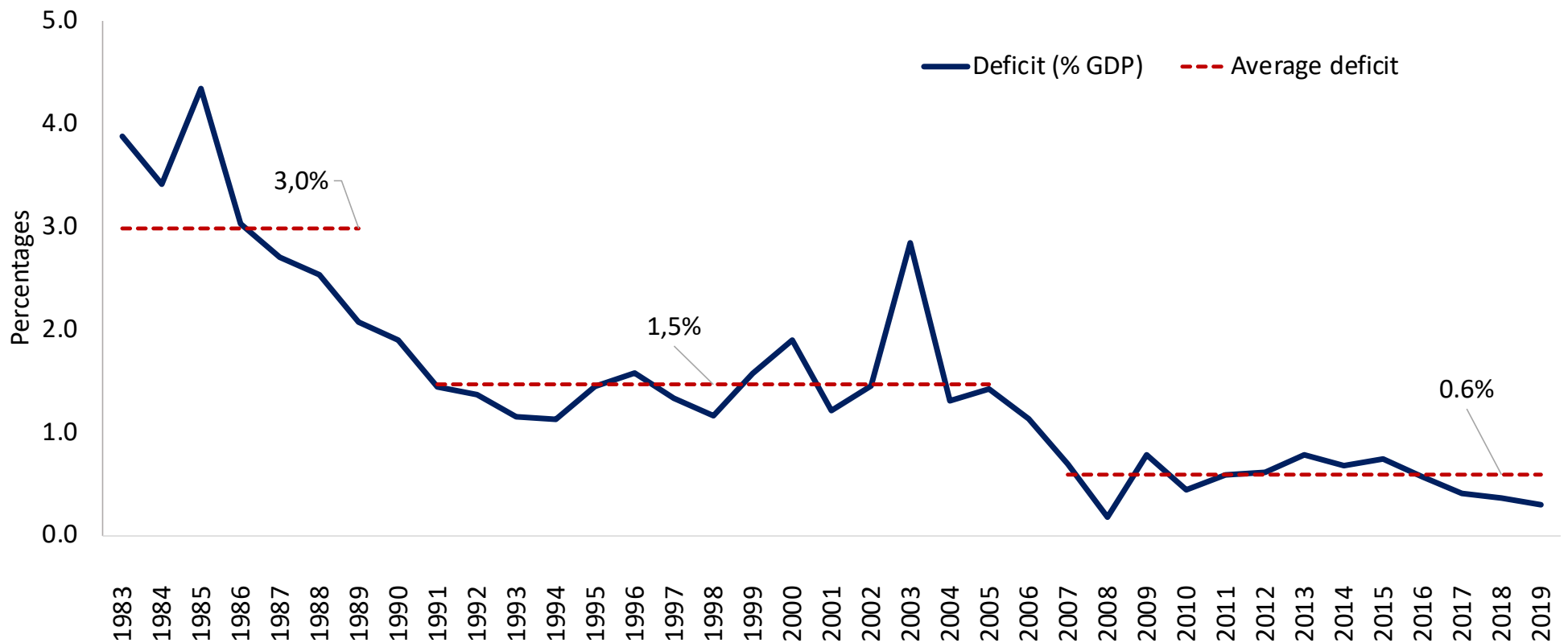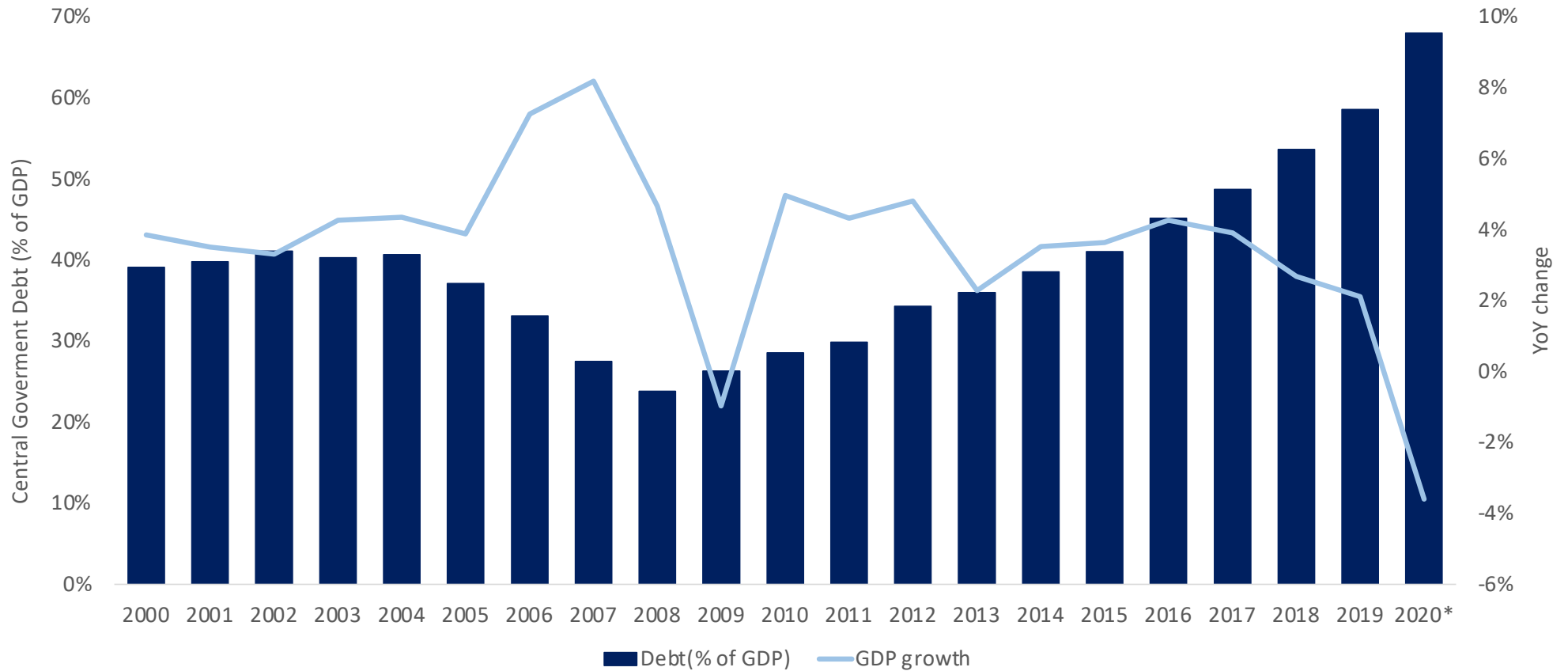

Source: Central Bank of Costa Rica

Central Government Debt, 2000-2020*

Public finance's behavior changed significantly after the financial crisis in 2008
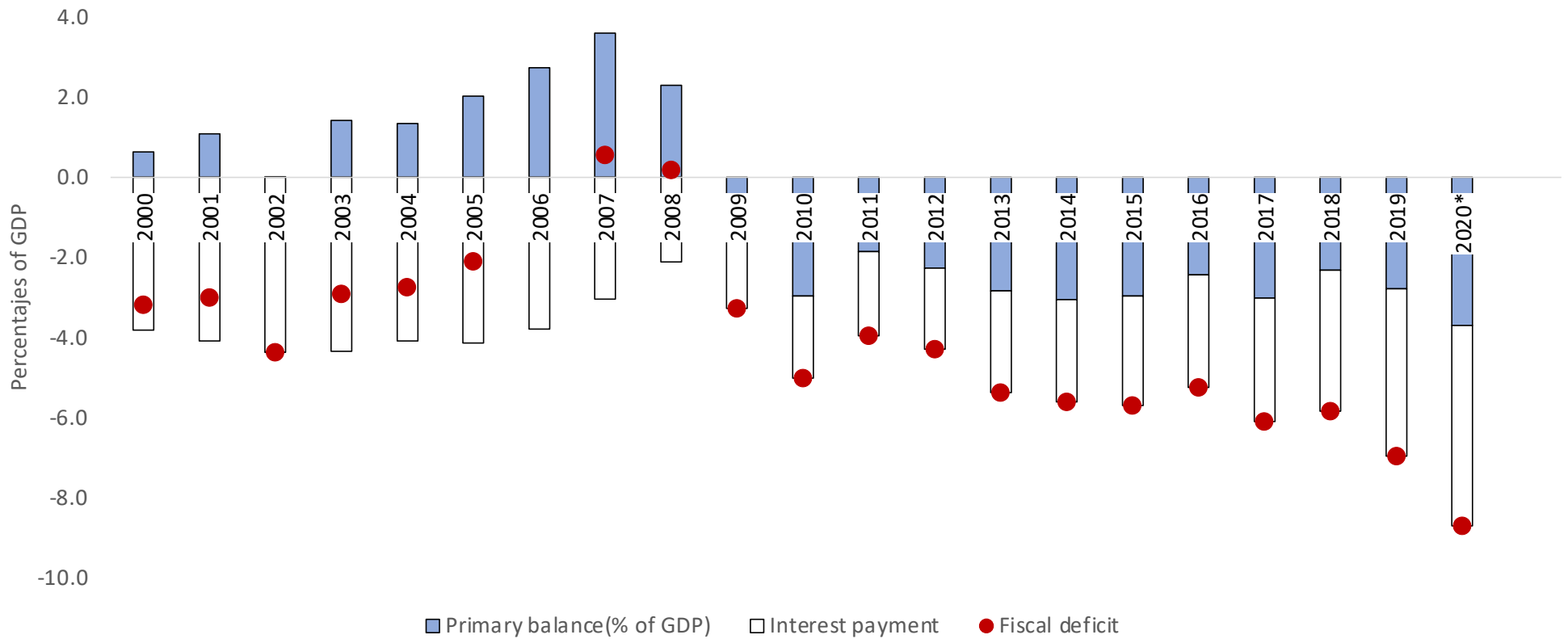

Debt(% of GDP)   GDP growth

Note: *IMF projection
Source: Central Bank of Costa Rica

Fiscal and primary balance of the Central Government (% of GDP), 2000-2020*

The country has reached a critical fiscal situation

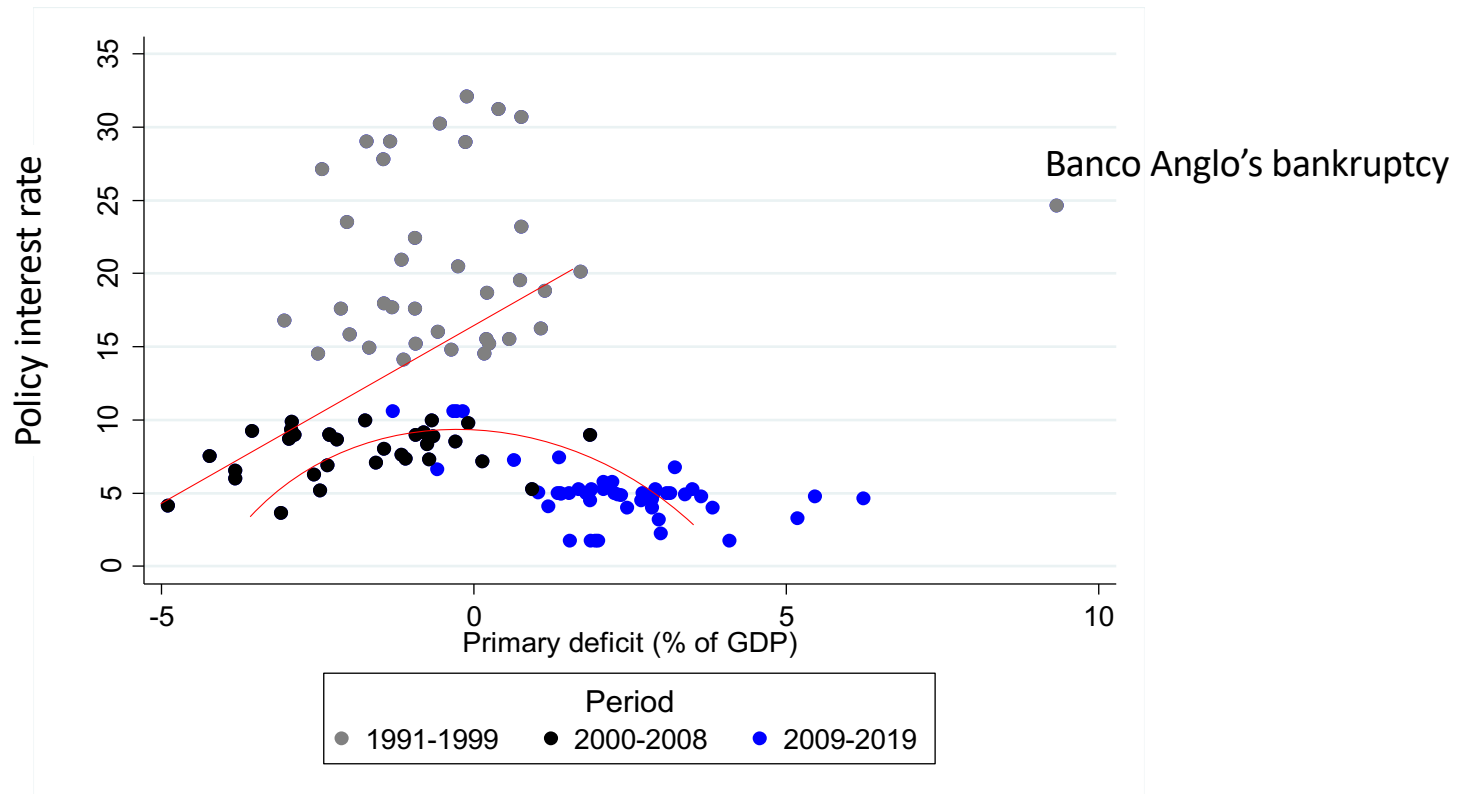Primary balance(% of GDP) · Interest payment · Fiscal deficit

Percentajes of GDP

Note: *IMF Projection
Source: Central Bank of Costa Rica

Data suggests a different relationships through time

Policy interest rate vs primary deficit (% GDP), 1991-2019

Source: Central Bank of Costa Rica.

Theoretical framework: consolidated government's budget identity

- Budget identity of the government for one period (Wahls,2010):

$$\underbrace{g_t + r_{t-1}b_{t-1}}_{\text{Expenditures}} = \underbrace{\tau_t + (b_t - b_{t-1}) + s_t}_{\text{Revenues}} \qquad (1)$$

Expenditures

Revenues

- Intertemporal budgetary balance:

$$(1+r)b_{t-1} + \sum_{i=0}^{\infty} \frac{g_{t+i}}{(1+r)^i} = \sum_{i=0}^{\infty} \frac{\tau_{t+i}}{(1+r)^i} + \sum_{i=0}^{\infty} \frac{s_{t+i}}{(1+r)^i} \qquad (2)$$

$$Rb_{t-1} = -\sum_{i=0}^{\infty} \frac{(\boldsymbol{g-\tau-s})_{t+i}}{R^i} \qquad R = 1+r \text{ and primary deficit } = g - \tau - s$$

Theoretical framework: consolidated government's budget identity

- Government budgetary constraint:

$$b_{t-1} = R^{-1} \sum_{i=0}^{\infty} R^{-i} (\tau - g)_{t+i} + R^{-1} \sum_{i=0}^{\infty} R^{-i} s_{t+i} \qquad (3)$$

- If debt is positive (b>0) the present value of incomes (τ, s) should be higher than expenditures (g).

- The adjustment can be done through reducing expenditures or increasing revenues from taxes or seigniorage.

- Who adjusts to maintain balance define dominance :
  - Monetary dominance (MD)
  - Fiscal dominance (FD)

Previous literature from developing economies

Evidence suggests that the scope for monetary policy has been contingent on fiscal policy:

- Primary balance is found to be exogenously determined from public liabilities (Tanner and Ramos, 2005; Jevđović and Milenković, 2018)

- Monetary policy rate reacts to fiscal variables:
  - Positively (Kuncoro and Sebayang (2013), Ahmed et al. (2019))
  - Not significantly (Zoli, 2005) Afondo et al. (2019)

- Fiscal deficit seems to have a significant long-run effect on inflation (Catao and Terrones, 2005; Jalil, Tariq and Bib, 2014)

Quarterly data from 1991-2019

o **Monetary variables:**
monetary policy interest rate[1], inflation rate, core inflation rate, inflation target[2], monetary base, nominal exchange rate, international reserves

o **Fiscal variables:**
Fiscal deficit, primary deficit, central government debt (total, external, and internal debt)

o **Other variables:**
Product gap, public liabilities, Central Bank deficit, WTI oil prices

Objective 1: Fiscal dominance test

To estimate the relationship between primary balance and liabilities

- **VAR Model:**

$$primbal_t = \alpha_0 + \sum_{j=1} \alpha_j \, primbal_{t-j} + \sum_{j=1} \boldsymbol{\beta_j} \, liab_{t-j} + \varepsilon_t \qquad (1)$$

$$liab_t = \gamma_0 + \sum_{j=1} \boldsymbol{\delta_j} \, primbal_{t-j} + \sum_{j=1} \gamma_j \, liab_{t-j} + \omega_t \qquad (2)$$

- **Classifying the results on fiscal or monetary dominance regimes:**

Impulse Response Functions

Sign	Prim. Balance response ($\boldsymbol{\beta_j}$)	Liabilities response($\boldsymbol{\delta_j}$)
Zero	FD	FD
Negative	FD	MD
Positive	FD or MD	MD

Granger causality test

Granger causality	Dominance
Primary balance → Public liabilities	Fiscal
Public liabilities → Primary balance	Monetary

Objective 1: Fiscal dominance test

Granger causality test results

Empirical considerations:
- Variables as GDP percentages and in first differences (unit root)
- Number of lags: 4 according to HQIC and SBIC information criteria
- Controls for seasonality effects including dummies
- Controls for Banco Anglo's bankruptcy in 1994, international financial crisis in 2008 and 2009 fiscal events

Granger causality test results by period

Period	H0 of NO causality A→B	Chi2	P-value	Conclusion
1991-2019	Liabilities → PB	2.21	0.70	Ambiguous
	PB → Liabilities	6.47	0.17	
1991-2007	Liabilities → PB	5.32	0.26	Fiscal dominance
	PB → Liabilities	10.32	0.04	
2008-2019	Liabilities → PB	3.73	0.44	Ambiguous
	PB → Liabilities	3.29	0.51	

Notes: VAR satisfices stability condition.
Source: Central Bank of Costa Rica.
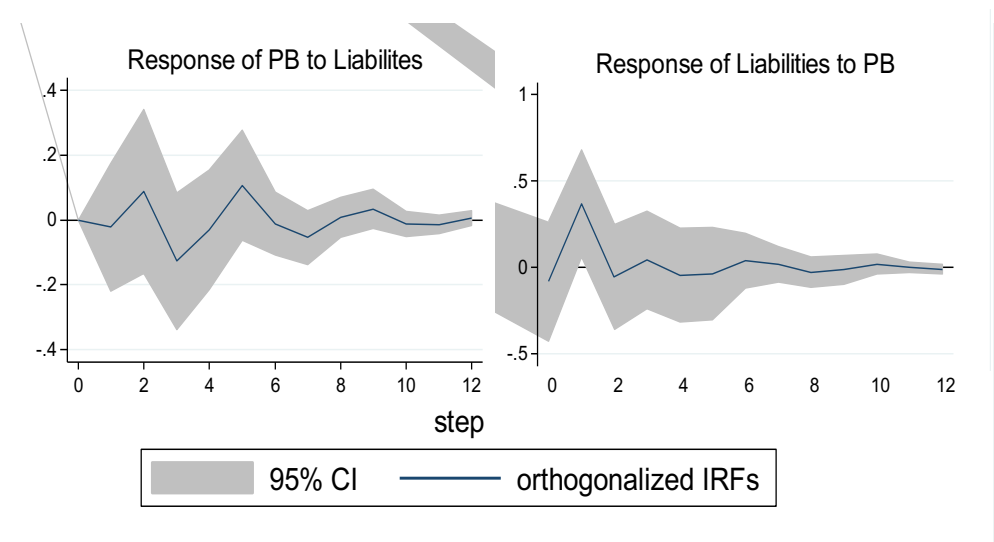
Objective 1: Fiscal dominance test

Impulse Response Function test

Sign	Prim. Balance response (β_j)	Liabilities response (δ_j)
Zero	FD	FD
Negative	FD	MD
Positive	FD or MD	MD

Results suggest fiscal dominance, but:

- PB response to cicles
- Identification problem

Impulse-Response Functions 1991-2019

Notes: VAR satisfices stability condition.
Source: Central Bank of Costa Rica.

Objective 2: reaction function of the Central Bank

General approach: considering the fiscal space

- Taylor Rule (1993)

- Evidence for Costa Rica between 1991-2002: a positive and significant effect of domestic debt (0.23) on the basic passive interest rate was found (Muñoz and Sáenz, 2003).

- Model

$$i_t = \beta_0 + \beta_1 i_{t-1} + \beta_2 (\pi - \pi^*)_{t-1} + \beta_3 (y - y^*)_{t-1} + \beta_4 e_{t-1} + \boldsymbol{\beta_5} fiscal_{t-1} + \beta_6 dIR_{t-1} + u_t$$

- Empirical considerations:
  - Controls for seasonality effects including dummies
  - Controls for Banco Anglo´s bankruptcy in 1994, international financial crisis in 2008 and 2009 fiscal events, also for exchange regime
  - Trend variable included
  - Newey-West standard errors

Estimated relationship between policy rate and primary deficit

Estimated effect of primary deficit on policy rate, 1991-2019
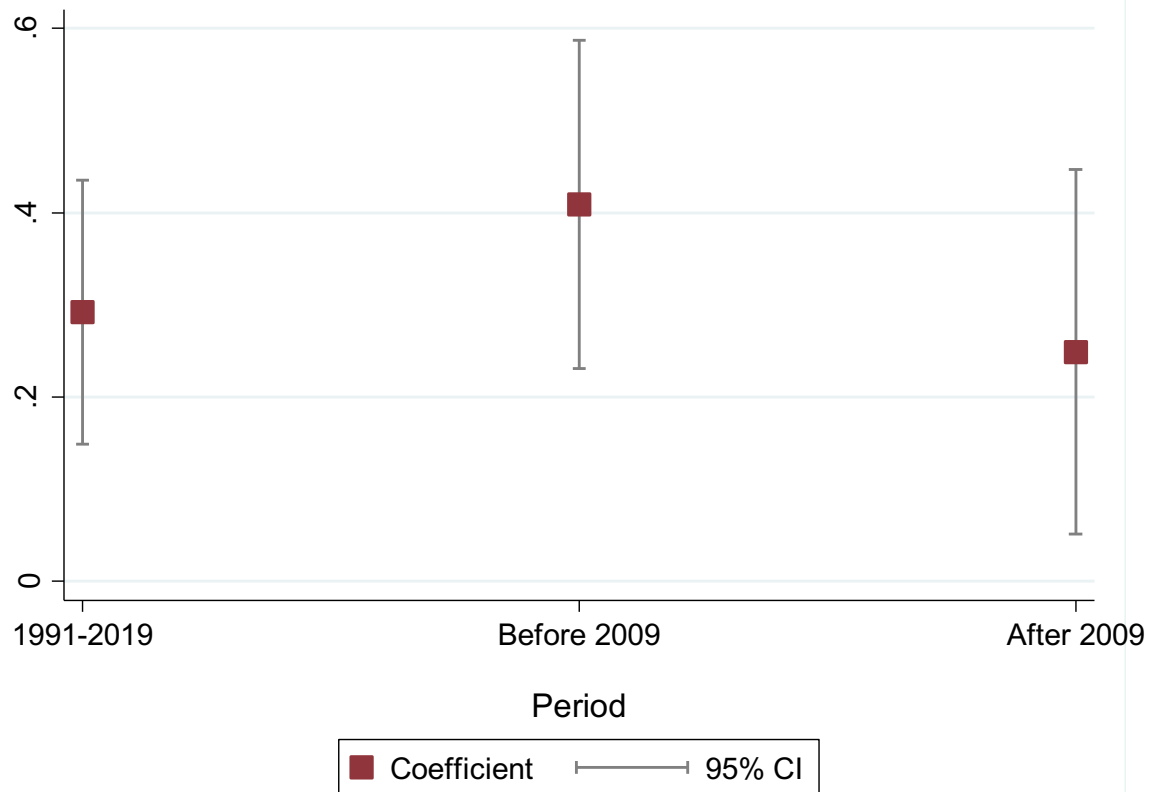
Notes: Quaterly data. Newey-west standard errors in brackets. Controls for seasonality effects and crisis and fiscal events.
Source: Central Bank of Costa Rica.

Inclusion of nonlinear effects, controlling for risk rating variable and internal and external debt.

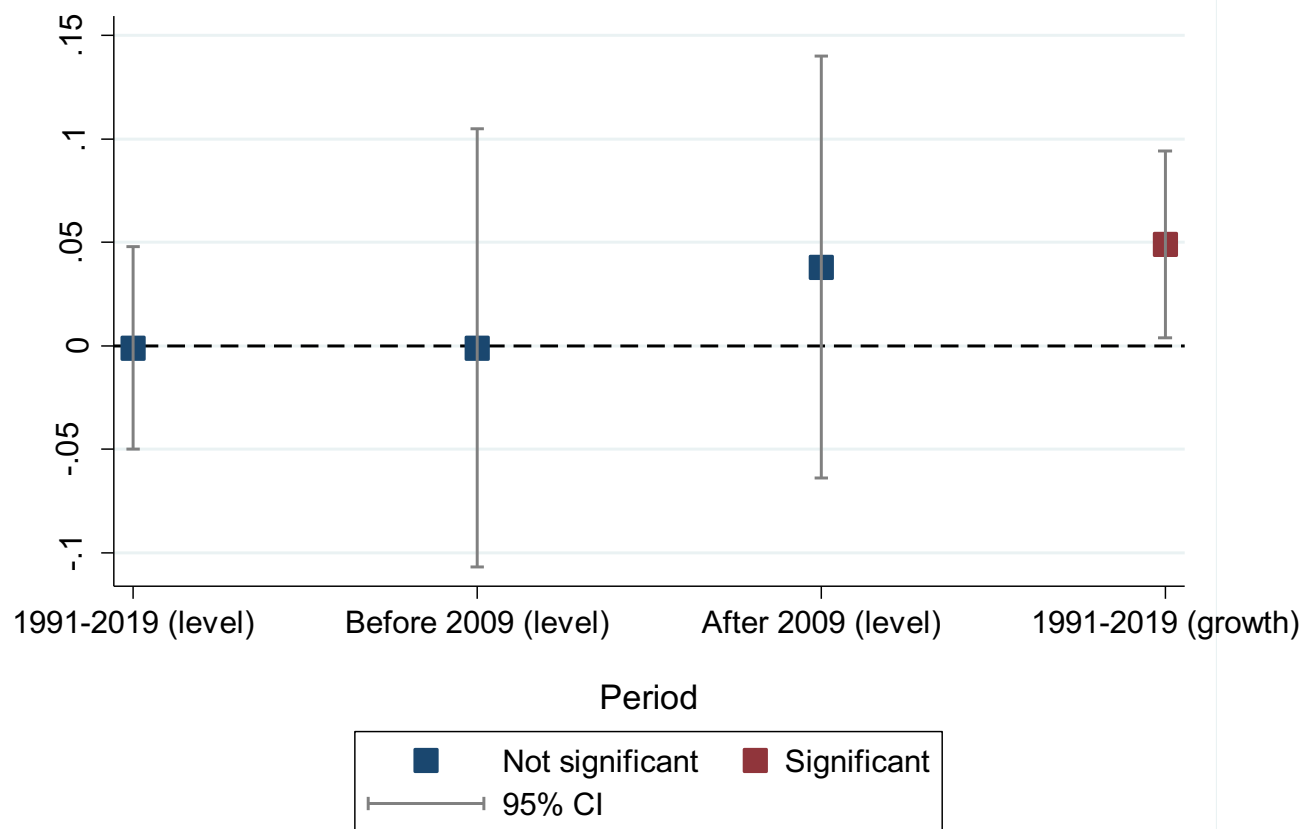## Estimated effect of public debt on policy rate, 1991-2019

Notes: Quaterly data. Newey-west standard errors in brackets. Controls for seasonality effects and crisis and fiscal events.
Source: Central Bank of Costa Rica.

We also included external and domestic debt separately, nonlinear effects, and other variables.

Objective 3: Fiscal deficit and inflation

Error Correction Model

- Autoregressive distributed lag (ARDL) model with error correction :
- Catao and Terrones (2005) and Jalil et al. (2014)

$$\Delta \boldsymbol{\pi}_t = \alpha_0 + \phi[\boldsymbol{\pi}_{t-1} - \boldsymbol{\theta'} \boldsymbol{x}_t] + \sum_{j=1}^{p-1} \lambda_j \, \Delta \boldsymbol{\pi}_{t-j} + \sum_{i=1}^{q-1} \beta'_i \, \Delta \boldsymbol{x}_{t-i} + \varepsilon_t$$

where:

$\boldsymbol{\pi}_t$ is the inflation rate

$\boldsymbol{x}_t$ is the vector of explanatory variables that includes fiscal deficit, monetary base, oil prices growth, an openness index and real exchange rate, and Central Bank's deficit.

$\boldsymbol{\phi}$ is the speed of adjustment to the long-run value of a change in $\boldsymbol{x}_t$

$\boldsymbol{\theta}$ represents the equilibrium relationship between the explanatory variables included in $\boldsymbol{x}_t$ and $\boldsymbol{\pi}_t$

Objective 3: Fiscal deficit and inflation

Estimates of fiscal deficit on inflation (scaled by GDP), 1992-2019

Long-run Coefficient (θ)	1 1992-2019	2 1992-2007	3 2008-2019
Fiscal deficit	**0.291****	**0.450****	**0.134**
	[0.117]	[0.154]	[0.100]
Constant	0.394	4.179**	-10.491**
	[2.280]	[3.053]	[4.476]
EC coefficient (ϕ)	-0.768***	-0.690***	-1.059***
	[0.083]	[0.111]	[0.166]
Observations	111	63	48
R^2	0.631	0.643	0.769

Notes: Quarterly data. Standard error in brackets. Controls for seasonality effects, financial crisis and fiscal events.
Source: Central Bank of Costa Rica.

Final remarks

1991-2019

We used three methodological approaches :
- From the VAR analysis, primary balance seems to be exogenously determined.
- Primary deficit seems to affect positively the policy rate.
- Fiscal deficit seems to have a significant log-run effect on inflation.

1991-2007	2008-2019
• Primary balance Granger causes public liabilities • Policy rate increases to primary deficit increses • Fiscal deficit is inflacionary in the long-run	There is no evidence of a statistically significant relationship

In general, there is evidence of a statistically significant effect of fiscal policy on monetary variables, but not a full accommodation of the monetary policy. That indicates policy objectives are not coordinated.

Annex: Reaction function estimation

Lineal effect

Variables	TPM
MPR_{t-1}	0.774***
	[0.043]
Inflation deviation from target (CPI)_{t-1}	0.013
	[0.086]
Product gap_{t-1}	0.445***
	[0.158]
Nominal devaluation _{t-1}	0.147**
	[0.068]
Primary deficit (% GDP)_{t-1}	0.292***
	[0.073]
Reserves gap_{t-1}	-0.578***
	[0.179]
Trend	-0.077***
	[0.023]
Constant	5.062***
	[1.439]
Observacions	114
R2	0.968