Monetary and Fiscal Policies Interactions in Mexico: 1981 – 2016
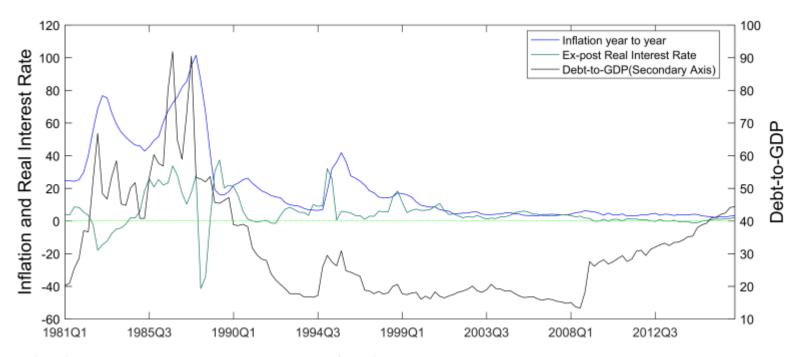
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CEMLA   BID   CEMLA & EGADE

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Inflation, ex-post real interest rates and debt to GDP in Mexico: 1981 - 2016

Fiscal (FP) and monetary policies (MP) stances may determine the evolution of macroeconomic variables such as debt and inflation and affect other policy objectives.

FP may influence the achievement of inflation control by MP: expansionary FP may lead to higher inflation.

MP may influence public balance and debt path: Central Bank transfers, real value of debt and real interest rates.

Inflation, central bank legislation, fiscal rules and fiscal councils

Average inflation	1980-1989	1990-1999	2000-2009	2010-2017	Positive reforms towards independence	Exchange rate flexibility	Year of Inflation Targeting introduction
Brazil	121.7	147.1	6.6	6.4	1988	1999	1999
Chile	19.9	11.8	3.5	2.5	1975 and 1989	1999	1999
Colombia	20.8	19.9	6.1	3.8	1992	1999	1999
Mexico	69.9	20.5	5.2	3.9	1985 and 1993	1995	2001
Peru	111.0	78.5	2.6	3.1	1992	2002	2002

	IMF Fiscal Rules Dataset, 2016			IMF Fiscal Council Dataset, 2017
	Expenditure	Budget Balance	Debt	
Brazil	2000		2000	
Chile		2001 (2008, 2009 and 2010)		Advisory Fiscal Council 2014
Colombia	2000	2011		Comité Consultivo para la Regla Fiscal 2012
Mexico	2013	2006 (2009 and 2013)		Centro de Estudios de las Finanzas Públicas 1998
Peru	2000 (2003, 2012, 2013)	2000 (2003, 2012, 2013)	2013	Consejo Fiscal 2015

This paper

- **What we do?** Analyze the role of fiscal and monetary policies in the determination of inflation and government debt in Mexico during the 1981-2016 period.

- **How we do it?** Estimating a Markov-switching DSGE model.

- **What we find?**
  - We identify five different periods of fiscal and monetary policy interactions, which are congruent with a historical account of the Mexican monetary and fiscal policy mix during the past 35 years.

  - Counterfactual exercises show that the low-frequency evolution of inflation is mainly determined by the monetary policy stance, while the low-frequency evolution of debt is mainly determined by the fiscal policy stance.

  - We show that if monetary dominance had prevailed throughout the whole period, average inflation would have been 13.2% rather than the 20.4% observed. On the other hand, complete fiscal dominance would have implied an average inflation of 42% and an average debt five times larger than the figure observed.

Policy Regimes:
Active / Passive FP and MP

Policy regimes: objectives, instruments and stances

- In our setting, policies have the following objectives:

1. FP seeks to smooth distorting taxes.

2. MP controls inflation.

- Policies may be active or passive, in function of the restrictions they face:
  - An **active policy** authority is free to pursue its objectives **unconstrained by the state of government debt**.
  - A **passive policy authority responds to debt shocks**.

- **Active fiscal policy** (AF) implies that taxes don't respond to debt level, so fiscal authority isn't concerned to fulfill the intertemporal public budget constraint and debt follows a non-stationary process, impacting inflation.

- **Active monetary policy** (AM) means that Central Bank has a high reaction of the interest rate to inflation. It doesn't allow inflation to deflate real value of debt .

Policy regimes: Leeper 1991

Monetary/Fiscal policy space is composed by four regimes (Leeper, 1991 JME):

1. **Monetary dominance (AM/PF)**: FP guarantees future surpluses to cover debt, even in presence of fiscal shocks. MP focuses on inflation.

2. **Fiscal dominance (PM/AF)**: FP impacts inflation as it doesn't satisfy intertemporal budget constraint. MP accommodates to diminish debt and allows inflation.

3. **Both active (AM/AF)**: FP and MP determines inflation but it is an unstable policy mix as it doesn't exist a bounded debt equilibrium.

4. **Both passive (PM/PF)**: FP and MP stabilize debt and none focuses on inflation. Indeterminate equilibrium with multiple solution.

Relative power between policies given by the institutional framework (e.g. fiscal rules or Central Bank autonomy) may explain how regimes evolve.

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Model

Model: summary

- **IS Curve**

$$\left(1 + \frac{\Phi}{\gamma}\right)(y_t - g_t) = E_t\{y_{t+1} - g_{t+1} + a_{t+1}\} + \frac{\Phi}{\gamma}(y_{t-1} - g_{t-1} - a_t) - \left(1 - \frac{\Phi}{\gamma}\right)(R_t - E_t\{\pi_{t+1} + d_{t+1} - d_t\})$$

- **Phillips Curve**

$$(1 + \varsigma\beta)\pi_t = \beta E_t\{\pi_{t+1}\} + \varsigma\pi_{t-1} + \frac{\kappa}{\left(1 + \frac{\Phi}{\gamma}\right)}\left[\left(1 + \frac{\alpha}{1-\alpha}\left(1 - \frac{\Phi}{\gamma}\right)\right)y_t - g_t - \frac{\Phi}{\gamma}(y_{t-1} - g_{t-1} - a_t)\right] + \mu_t$$

- **Monetary Policy Rule**

$$R_t = \rho_{R,\xi_t^{sp}} R_{t-1} + \left(1 - \rho_{R,\xi_t^{sp}}\right)\left[\psi_{\pi,\xi_t^{sp}}\pi_t + \psi_{y,\xi_t^{sp}}(y_t - y_t^n)\right] + \sigma_{R,\xi_t^{vo}}\epsilon_{R,t}$$

- **Fiscal Rule**

$$\tilde{\tau}_t^{tax} = \rho_{\tau^{tax},\xi_t^{sp}}\tilde{\tau}_{t-1}^{tax} + \left(1 - \rho_{\tau^{tax},\xi_t^{sp}}\right)\left[\delta_{b,\xi_t^{sp}}\tilde{b}_{t-1} + \delta_e(e\tilde{x}p_t) + \delta_y\left(\hat{y}_t - \hat{y}_t^*\right)\right] + \sigma_{\tau,\xi_t^{vo}}\epsilon_{\tau,t}$$

- **Debt**

$$\tilde{b}_t = \beta^{-1}\tilde{b}_{t-1} + \beta^{-1}\left(\tilde{R}_{t-1}^m - \tilde{y}_t + \tilde{y}_{t-1} - \tilde{a}_t - \tilde{\pi}\right) - \frac{\tau^{tax}}{b}\tilde{\tau}_t^{tax} - \frac{\tau^{non-tax}}{b}\tilde{\tau}_t^{non-tax} + \frac{exp}{b}e\tilde{x}p_t + \frac{tp}{b}\widetilde{tp}_t$$

$$\tilde{b}_t = \left(\beta^{-1} - \frac{\tau^{tax}}{b}\left(1 - \rho_{\tau^{tax},\xi_t^{sp}}\right)\delta_{b,\xi_t^{sp}}\right)\tilde{b}_{t-1} + \cdots$$

Solution and estimation

Estimation

In the estimation, we allow for two possible values for every relevant policy parameter:

For fiscal policy, we obtain the high (PF) and low (AF) tax rate response to debt.

- Passive

$$\tilde{\tau}_t^{tax} = 0.79\tilde{\tau}_{t-1}^{tax} + (1-0.79)\left[0.0624\tilde{b}_{t-1} + 0.09(e\tilde{x}p_t) + 0.15(\hat{y}_t - \hat{y}_t^*)\right]$$
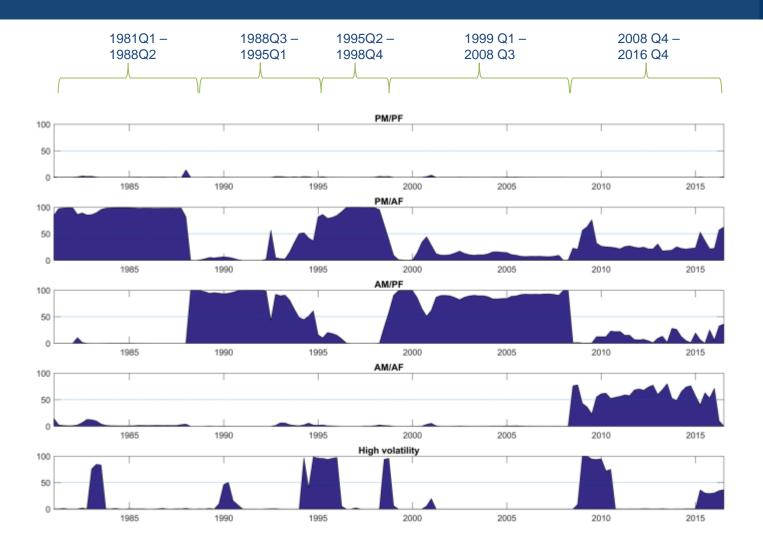
- Active

$$\tilde{\tau}_t^{tax} = 0.73\tilde{\tau}_{t-1}^{tax} + (1-0.73)\left[0.0003\tilde{b}_{t-1} + 0.09(e\tilde{x}p_t) + 0.15(\hat{y}_t - \hat{y}_t^*)\right]$$

For monetary policy, we estimate the low (PM) and high (AM) interest rate sensitivity to inflation.

- Passive

$$R_t = 0.58R_{t-1} + (1-0.58)\left[0.79\pi_t + 0.66(y_t - y_t^n)\right]$$

- Active

$$R_t = 0.55R_{t-1} + (1-0.55)\left[1.81\pi_t + 0.94(y_t - y_t^n)\right]$$

Smoothed probabilities

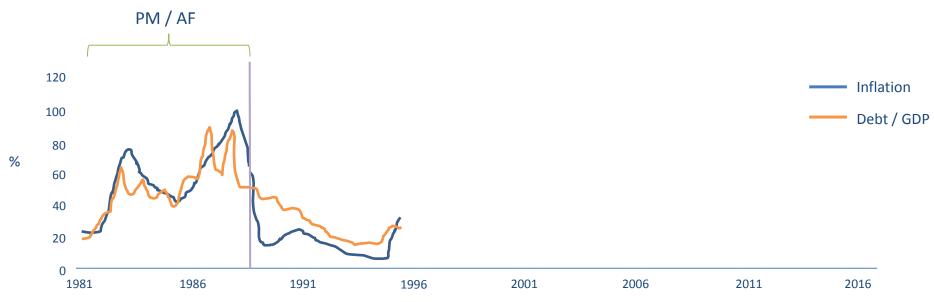# Historical Narrative

I. 1981Q1 – 1988Q2: PM / AF

- Many shocks: oil price decline, 1985 earthquake, 1987 financial crisis.
- Low growth, devaluations and deficit in external accounts.
- Price controls agreed by the government, labor unions, farmers and business chambers in the Pacto de Solidaridad Económica in December 1987.
- I. PM: Lack of central bank autonomy, exchange rate as a nominal anchor, **public deficit financed in part by money printing and high inflation.**
- II. AF: Fiscal policy in stress, shocks. Income dependent on oil and debt denominated in foreign currency. **Debt increased because of devaluation and deficits.**

II. 1988Q3 – 1995Q1: AM / PF
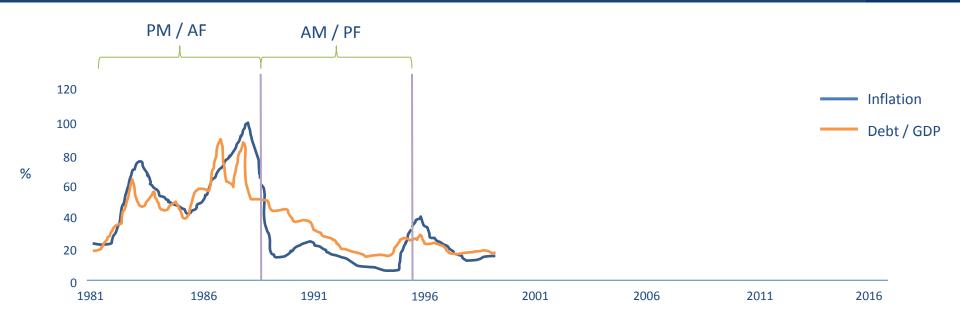

PM / AF

— Inflation
— Debt / GDP

- Macroeconomic stabilization and structural reforms: NAFTA, bank privatization and sale of public enterprises.
- Short term capital inflows, semi fixed exchange rate and economic growth.
- 1993 constitutional law granting autonomy to the Central Bank which sets price stability as its primary mandate.
- I. AM: Based on exchange rate, which had less pressure and more stability. **Inflation diminished and reach single digits in 1993Q1. Interest rates dropped**.
- II. PF: Adjustment of public expenditure and Brady Plan led to a **reduction in debt and its financial cost**. Public balance improves reaching **fiscal surpluses from 1991 to 1994.**

III. 1995Q2 – 1998Q4: PM / AF
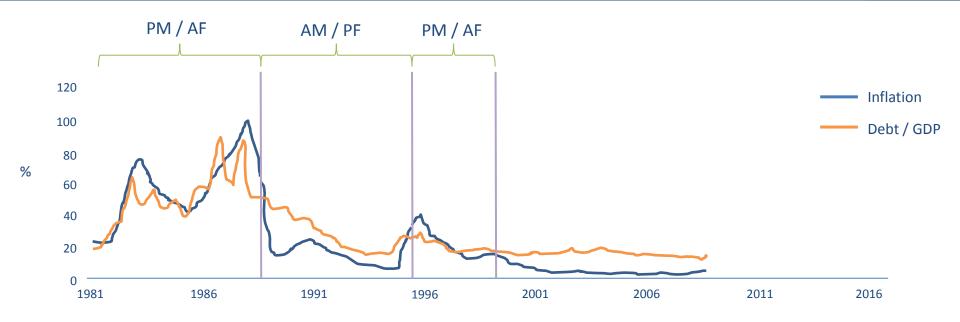
PM / AF   AM / PF

- By 1994, political domestic events and an accumulation of imbalances triggered a sharp devaluation. Drop in economic growth but stabilization policy allowed a quick recovery.
- I. PM: Peso floated becoming a shock absorber. Inflation followed the pattern of the depreciated exchange rate.
- II. AF: Debt increased because of depreciation but public deficit not large.
- **Short period of regime F apparently because of the shock and not because of a switch stance in which monetary policy accommodates to fiscal policy**.
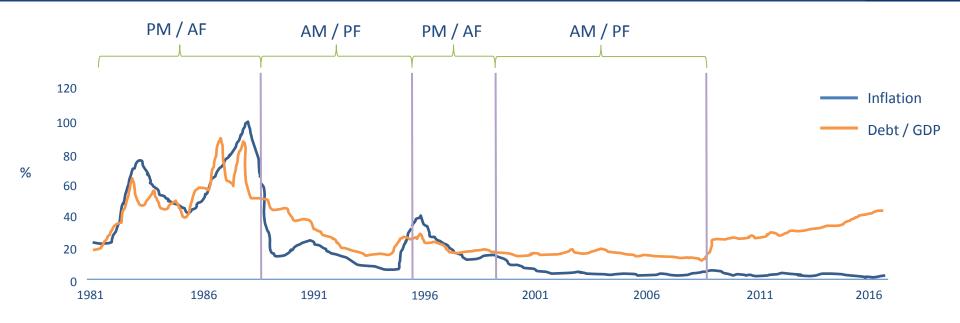
IV. 1999Q1 – 2008Q3: AM / PF

- Economic growth and stability in exchange rate.
I. AM: Central Bank switched to an inflation target regime, linking more directly inflation and interest rates. **Inflation became low, less persistent, predictable and stable.**
II. PF: Fiscal policy incurred in low deficits favored by high oil prices, allowing a **declining path of debt, reaching historical minimums.** The 2006 Federal Budget and Fiscal Responsibility Law (LFPRH acronym in Spanish), which among other things set a zero fiscal deficit rule, but with escape clause.

V. 2008Q4 – 2016Q4: AM / AF

- International financial crisis led to a sharp drop of GDP and depreciation.
- I. AM: Interest rates have responded to inflation consistently. **AM.**
- II. AF: Countercyclical fiscal policy was implemented. Deficits and increasing public debt has lasted from 2009 to 2016.
- **Unstable policy mix and risk of having unbounded debt as none policy's posture has taken care of debt.**
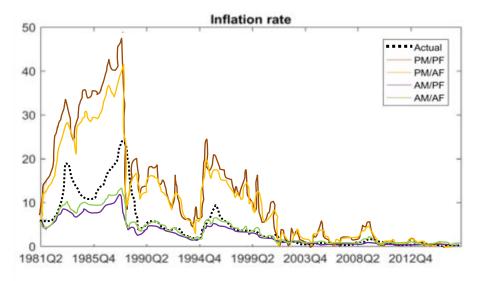
Counterfactuals

- We run two counterfactuals that allow us to understand better the role of expectations, policy mix and shocks in the evolution of the macroeconomic variables. We suppose what it would have happened if:

1. Fiscal and monetary policy regime had stayed within a single regime in the whole sample, 1981 – 2016.
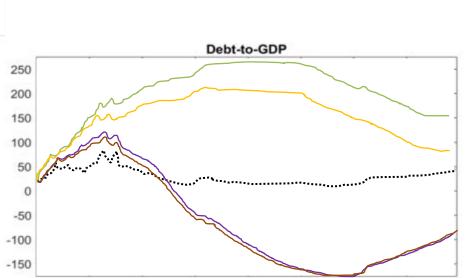
Counterfactual single regime

Inflation rate

Legend: Actual, PM/PF, PM/AF, AM/PF, AM/AF

Debt-to-GDP

- In a **PM/PF regime**, inflation would have been in average higher (49) and debt lower (-62).

- **Fiscal dominance** would have led to both higher inflation (42) and debt (154).

- **Monetary dominance** would have resulted in both lower inflation (13) and debt (-57).

- In an **AM/AF regime** inflation would have been lower (15) and debt higher (202).

- **Counterfactuals illustrate the relevance of macroeconomic policy stance for the evolution of macro variables.**

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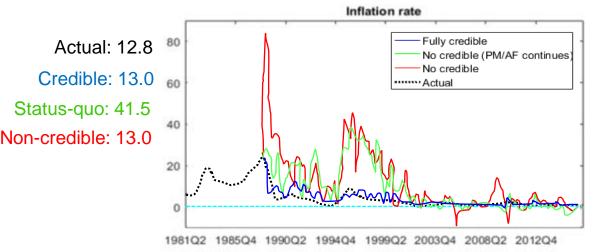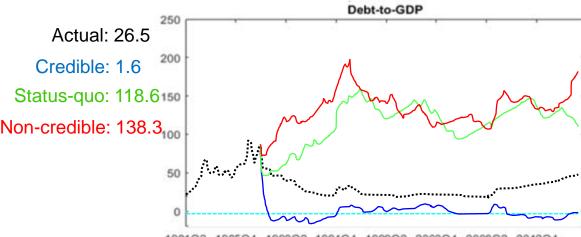EGADE Business School
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Counterfactuals

- We run two counterfactuals that allow us to understand better the role of expectations, policy mix and shocks in the evolution of the macroeconomic variables. We suppose what it would have happened if:

1. Fiscal and monetary policy regime had stayed within a single regime in the whole sample, 1981 - 2016.

2. *Around each regime switch, 1988Q3, 1995Q2, 1999Q1 and 2008Q4:*

   a) *The regime changed and there was full credibility (100% probability of remaining in the new regime).*

   b) *The regime had not changed remaining in the status-quo (100% probability of remaining in the previous regime).*

   c) *The regime changed but there was no credibility (0% probability of remaining in the new regime).*

1988Q3: from PM / AF to AM / PF

Actual: 12.8

Credible: 13.0

Status-quo: 41.5

Non-credible: 13.0

Inflation rate

Legend:
- Fully credible
- No credible (PM/AF continues)
- No credible
- Actual

Actual: 26.5

Credible: 1.6

Status-quo: 118.6

Non-credible: 138.3

Debt-to-GDP

Switch was **relatively credible** as inflation resembles its actual trajectory and debt didn't explode.
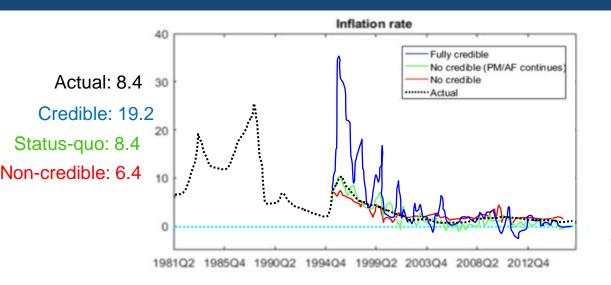
After the high inflation of 1987, monetary policy became centered on controlling inflation granting CB independence in 1993.

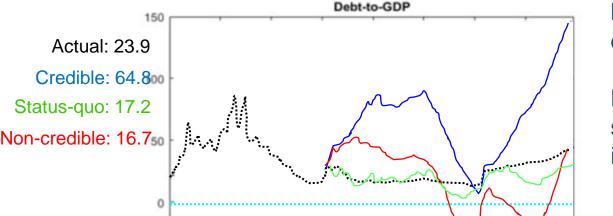Fiscal policy started a more prudent management of lower deficits and a sustainable debt path.

1995Q2: from AM / PF to PM / AF

Actual: 8.4

Credible: 19.2

Status-quo: 8.4

Non-credible: 6.4

Inflation rate

- Fully credible
- No credible (PM/AF continues)
- No credible
- Actual

Actual: 23.9

Credible: 64.8

Status-quo: 17.2

Non-credible: 16.7

Debt-to-GDP

Regime switch was not credible, with variables moving very closely to the **AM/PF status-quo** trajectory.

Otherwise, inflation would have been much larger and debt would have exploded.

New regime originated by a shock and not a real switch in policy stances.
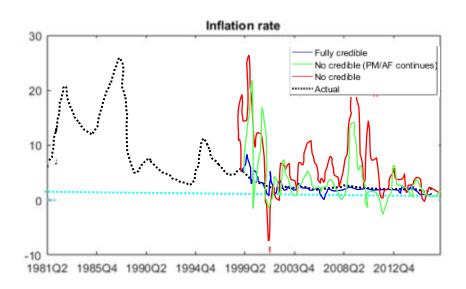
1999Q1: from PM / AF to AM / PF

Actual: 5.2

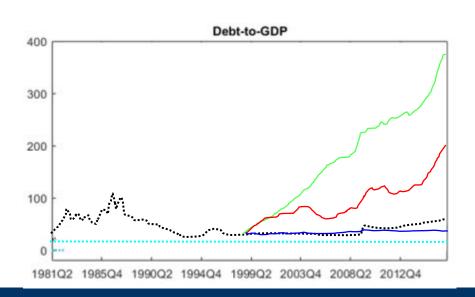Credible: 4.9

Status-quo: 11.2

Non-credible: 12.9

Inflation rate

Legend:
- Fully credible
- No credible (PM/AF continues)
- No credible
- Actual

Actual: 24.1

Credible: 20.6

Status-quo: 187.0

Non-credible: 80.9

Debt-to-GDP

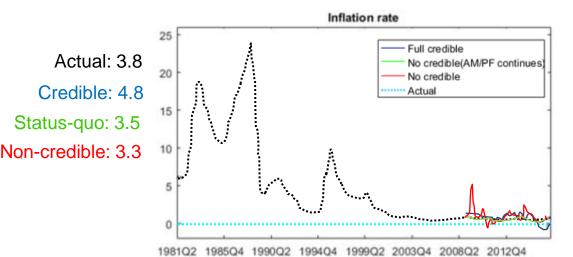Switch was **credible** as inflation and debt resembles their actual trajectory.

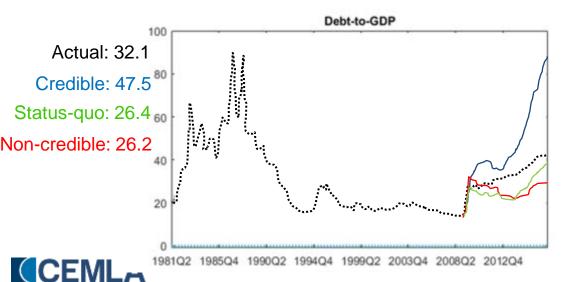Since 1999, monetary policy was instrumented through an inflation target scheme.

Fiscal policy incurred in low deficits that allowed debt to follow a sustainable path.

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2008Q4: from AM / PF to AM / AF

Actual: 3.8

Credible: 4.8

Status-quo: 3.5

Non-credible: 3.3

Inflation rate

Legend:
- Full credible
- No credible(AM/PF continues)
- No credible
- Actual

Actual: 32.1

Credible: 47.5

Status-quo: 26.4

Non-credible: 26.2

Debt-to-GDP

Switch was **not credible** as, fiscal authority commitment of reducing deficit in the following years was credible according to the **AM/PF status-quo**.

Monetary policy has kept focusing in inflation control.

In the following years, need of change of regime: perhaps from the fiscal side.

MP has been active since 1988, except for a couple of years: autonomy of central bank has shown to be critical to control inflation and avoid fiscal dominance.

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Conclusions

- In this paper we characterize and rationalize the interaction between monetary and fiscal policies observed in Mexico during the last 35 years.

- Identification of the role of monetary and fiscal policies on evolution of debt and inflation is relevant from policy perspective as we have found hard evidence that different policies stances impact macroeconomic variables.

- Prospectively, Mexico macroeconomic policy could be heading to a period of monetary dominance. This will depend on how successful the fiscal consolidation will be.

- We are doing a similar analysis for Brazil, Chile, Colombia and Peru.

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ANNEX

A Monetary Small Open Economy Markov-Switching Dynamic General Equilibrium Model

- Open-economy IS curve:
$$y_t = E_t\{y_{t+1}\} - \left(\tau + \alpha(2-\alpha)(1-\tau)\right)\left(r_t - E_t\pi_{t+1} - \rho_a a_t + \alpha E_t\{q_{t+1}\}\right) + \alpha(2-\alpha)\frac{1-\tau}{\tau}E_t\{\Delta y_{t+1}^*\}$$

- Open-economy Phillips curve:
$$\pi_t = \frac{\beta}{1+\beta\chi_p\xi_t^{pc}}E_t\{\pi_{t+1}\} + \frac{\chi_p\xi_t^{pc}}{1+\beta\chi_p\xi_t^{pc}}\pi_{t-1} + \alpha\beta E_t\{\Delta q_{t+1}\} - \alpha\Delta q_t + \frac{\kappa\xi_t^{pc}}{\tau+\alpha(2-\alpha)(1-\tau)}(y_t - \bar{y}_t)$$

- Interest rate rule:
$$r_t = \rho_r\xi_t^{mp}r_{t-1} + \left(1-\rho_r\xi_t^{mp}\right)\left(r_\pi\xi_t^{mp}\pi_t + r_y\xi_t^{mp}y_t + r_{\Delta e}\xi_t^{mp}\Delta e_t\right) + \sigma_{r,\xi_t^{vol}}\varepsilon_{r,t}$$

- Nominal exchange rate $\left(\frac{\#\ of\ LCU}{1\ USD}\right)$ determination:
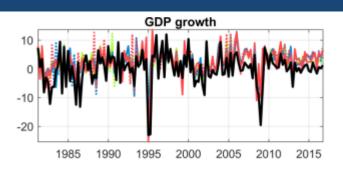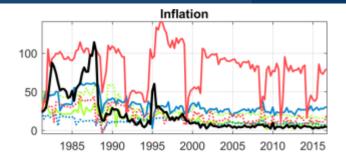$$\pi_t = \Delta e_t + (1-\alpha)\Delta q_t + \pi_t^*$$

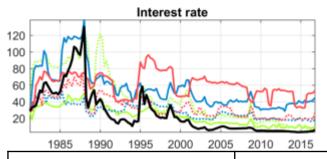# Mexico: switching parameters and shocks estimates and regime probabilities

High interest rate response	Low interest rate response
$r_t = 0.68 r_{t-1} + (1 - 0.68)(1.70\pi_t + 0.28y_t + 0.13\Delta e_t)$	$r_t = 0.48 r_{t-1} + (1 - 0.48)(0.91\pi_t + 0.56y_t + 0.74\Delta e_t)$

High Phillips curve	Low Phillips curve
$\pi_t = 0.62 E_t\{\pi_{t+1}\} + 0.38\pi_{t-1} - 0.16\Delta q_t + 2.80(y_t - \bar{y}_{t-1})$	$\pi_t = 0.56 E_t\{\pi_{t+1}\} + 0.44\pi_{t-1} - 0.16\Delta q_t + 2.17(y_t - \bar{y}_{t-1})$

High shocks volatility	Low shocks volatility
$\sigma_{a,\xi_t^{vol=h}} = 7.51$	$\sigma_{a,\xi_t^{vol=l}} = 3.03$

$H_{h,l}^{mp} = 0.06$
$H_{l,h}^{mp} = 0.09$

$H_{h,l}^{pc} = 0.14$
$H_{l,h}^{pc} = 0.09$

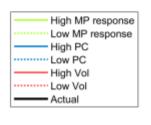$H_{h,l}^{vol} = 0.10$
$H_{l,h}^{vol} = 0.19$

Mexico: counterfactuals

In Mexico, regime switch to H_MP, L_PC and especially L_Vol help to explain the observed reduction of inflation and its volatility without implying higher interest rates, neither lower or more volatile output.

GDP growth

Inflation

Interest rate

Legend:
- High MP response
- Low MP response
- High PC
- Low PC
- High Vol
- Low Vol
- Actual

	Output Growth		Inflation		Interest Rate	
	M	SD	M	SD	M	SD
High MP	2.69	4.41	15.26	8.30	23.23	11.38
Low MP	2.97	5.17	29.55	12.29	45.58	31.77
High PC	2.46	4.33	32.38	11.04	55.90	24.04
Low PC	2.42	3.99	11.08	3.89	28.91	9.46
High Vol	2.34	4.71	81.99	27.70	60.41	14.72
Low Vol	2.58	5.08	19.81	10.31	33.71	13.19
Actual	0.00	5.73	21.00	24.78	25.76	26.36

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