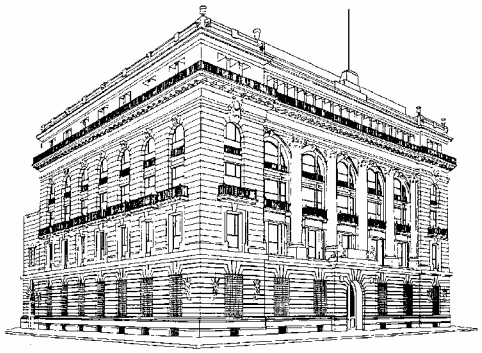
Monetary Policy and Uncertainty: evidence from Mexico

Ana M. Aguilar



BANCO DE MEXICO

March 2, 2007

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I. Introduction

- During the last years, Mexico achieved important progress in terms of macroeconomic performance.
- Among the elements that have contributed the most to this goal are:
  - ✓ Central Bank autonomy
  - ✓ Fiscal discipline
  - ✓ Floating exchange rate
  - ✓ Sustainability of external accounts
  - ✓ Financial sector reforms
- These achievements also reflect a favorable external environment:
  - ✓ International liquidity conditions
  - ✓ Low inflation rates
  - ✓ Solid economic growth
  - ✓ High oil prices

II. Conduct of Monetary Policy

1. Initial Strategy

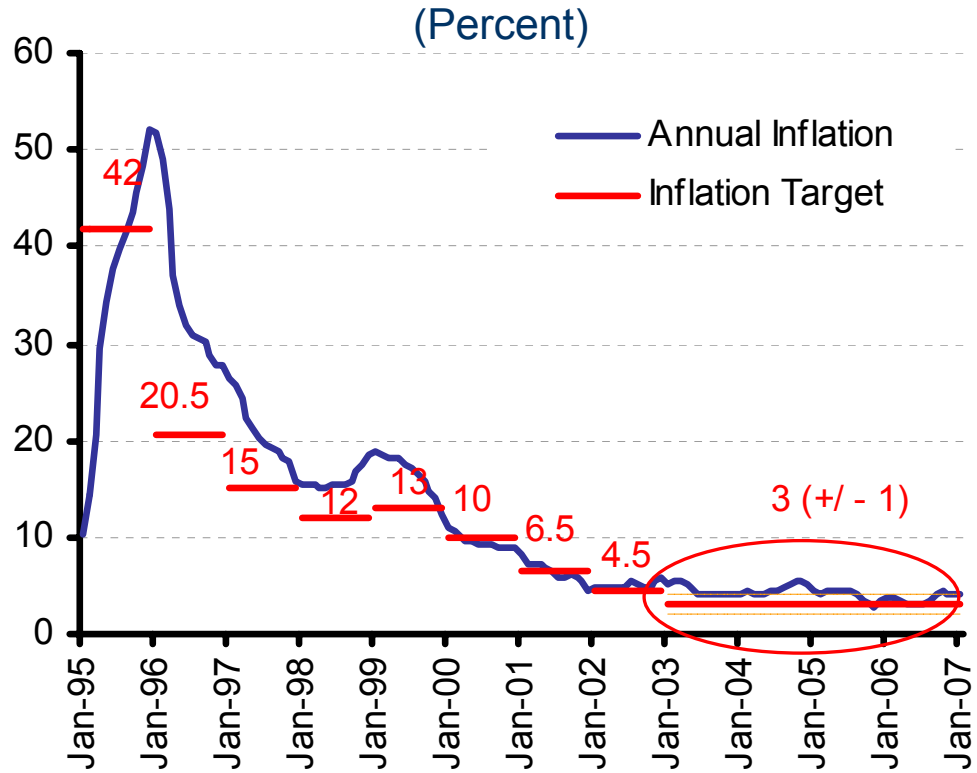
- Containment of inflationary pressures associated to the 1995 crisis. Reestablishing orderly financial market conditions.
- Once it was clear that control over the public finances no longer represented a threat for macroeconomic stability, monetary policy became more oriented towards attaining the inflation target:

1999	Medium-term inflation target: Inflation, in 2003, similar to that of major trading partners.
2000	A 3% CPI inflation target for 2003.
2001	Formal adoption of IT.
2002	Long-term inflation target: 3% (+/-1 percentage point) from December 2003.

II. Conduct of Monetary Policy

- The conduct of monetary policy in Mexico over the last years focused on obtaining a gradual disinflation by establishing yearly inflation targets. Since 2003, monetary policy has tried to coordinate inflation expectations towards the inflation target of 3 percent (with a variability interval of +/- 1%).

Inflation and Inflation Targets:



II. Conduct of Monetary Policy

2. Response to inflationary pressures

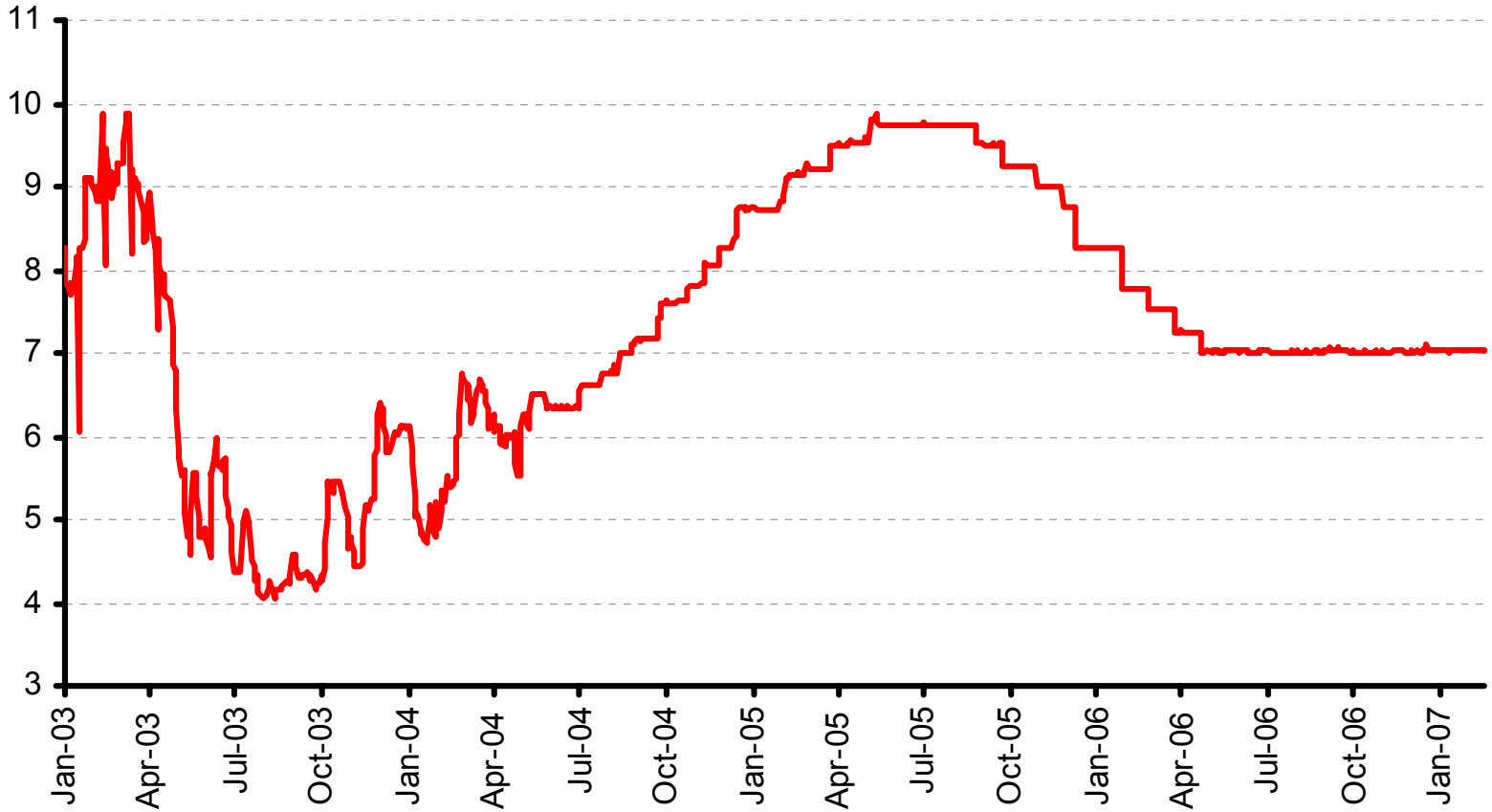
- On top of the effort to gradually lead the economy towards a low inflation equilibrium, monetary policy had to respond to different shocks (that could have altered the disinflation process).
- Identification of the sources of inflationary pressures.
- Reaction Function.
  a) Inflationary pressures arise from the demand side.
  b) Inflationary pressures arise from supply-side shocks and inflation expectations are affected (second round effects).

- For those economies that have not concluded the disinflationary process, regardless of the presence of inflationary pressures, monetary policy must maintain a restrictive bias.

II. Conduct of Monetary Policy

3. Monetary Policy Interest Rate

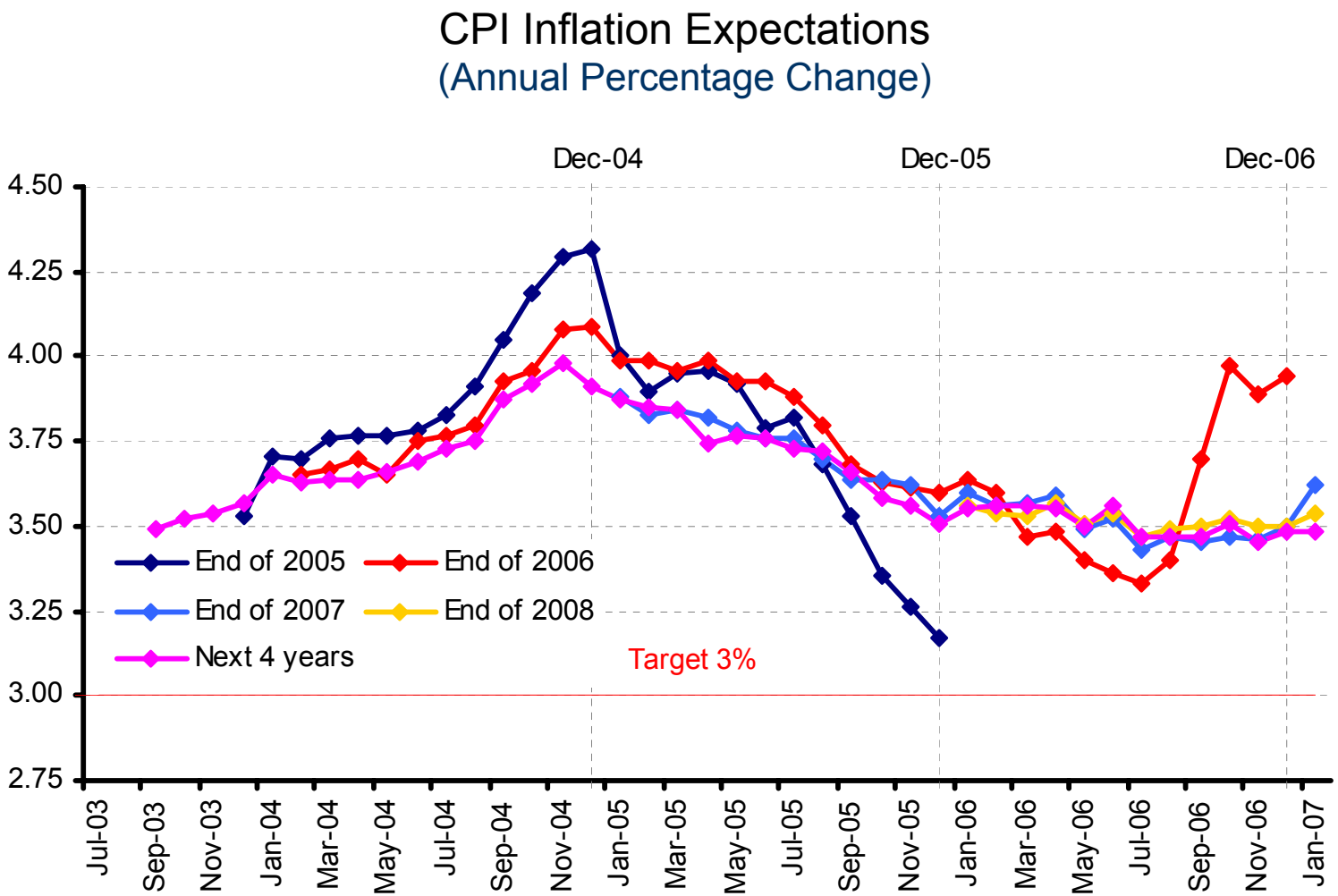
Overnight Nominal Interest Rate*
(Annual Percent)



Source: Banco de México.

II. Conduct of Monetary Policy

4. Inflation Expectations: Banco de Mexico's Survey

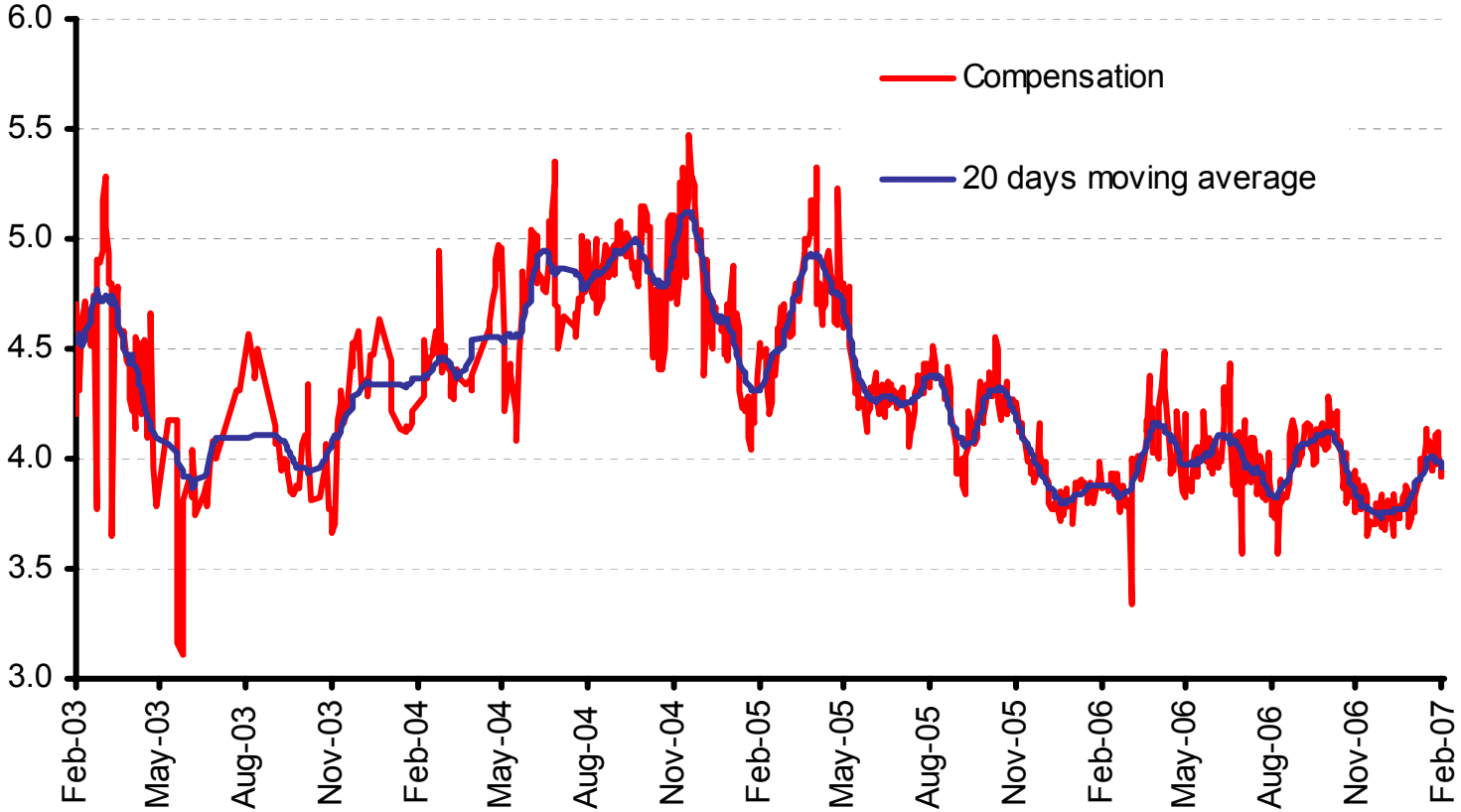


Source: Banco de México's survey.

II. Conduct of Monetary Policy

4. Inflation Expectations: Financial Market Instruments

Compensation for Inflation and Inflation Risk Implicit in 10-year Bonds*
(Percent)

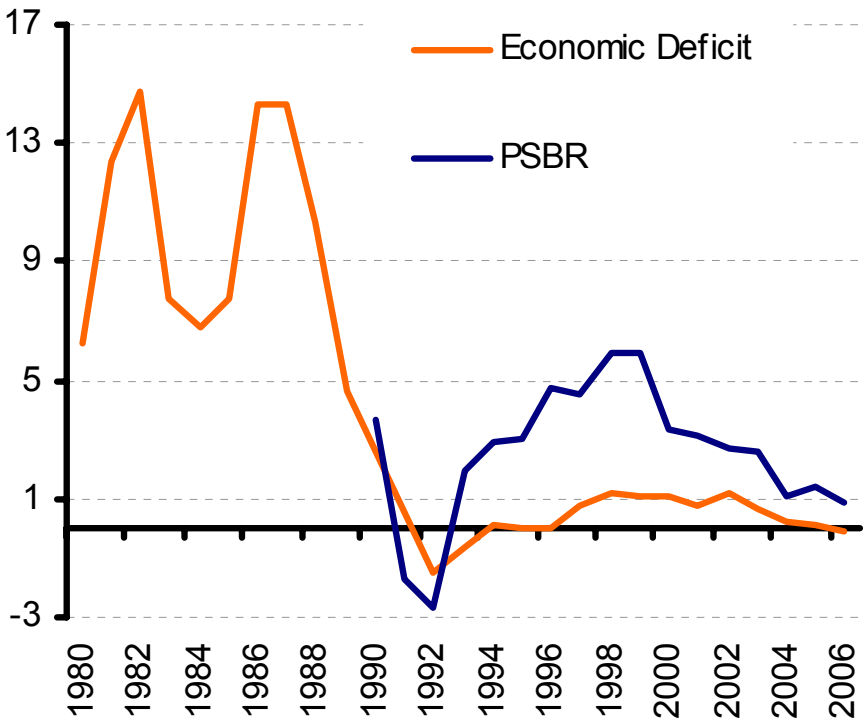


* Computed using nominal and inflation-indexed bonds.

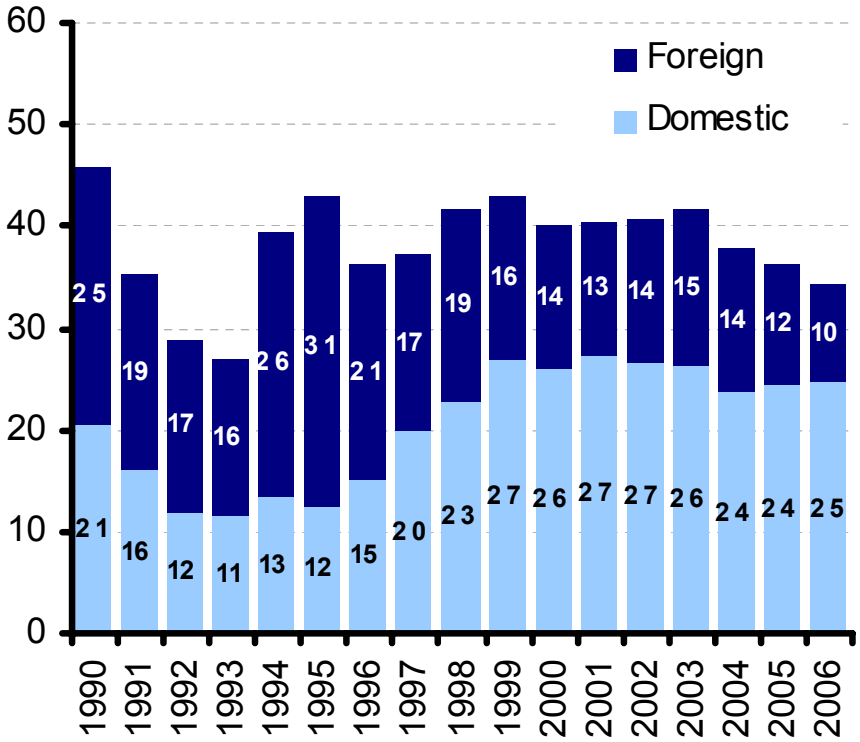
III. Macroeconomic Stability

1. Fiscal Discipline

Fiscal Deficit
(Percent of GDP)



Foreign and Domestic Government Debt
(Percent of GDP)

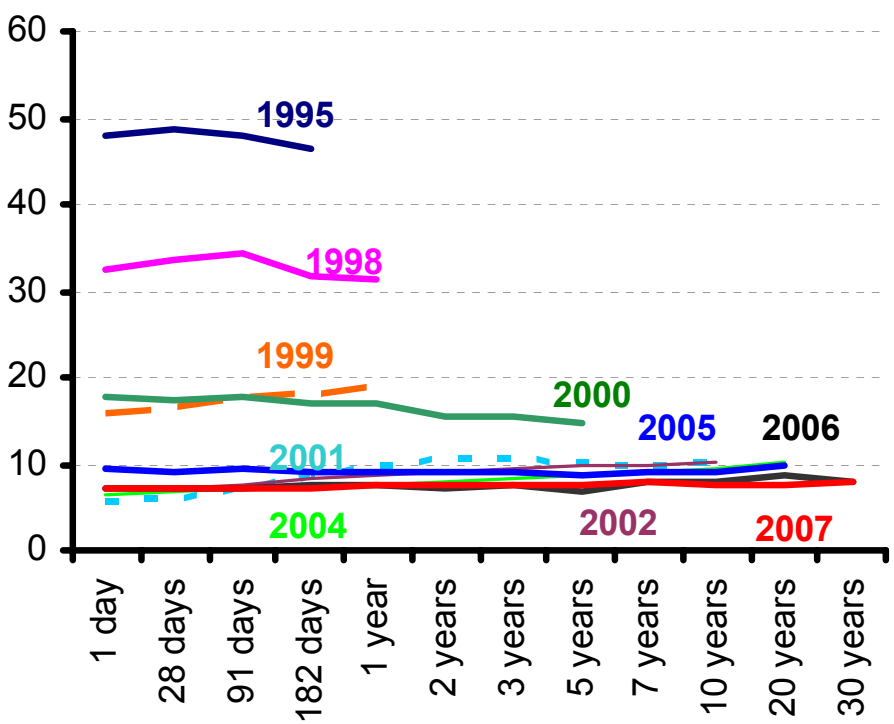


Source: SHCP.

III. Macroeconomic Stability

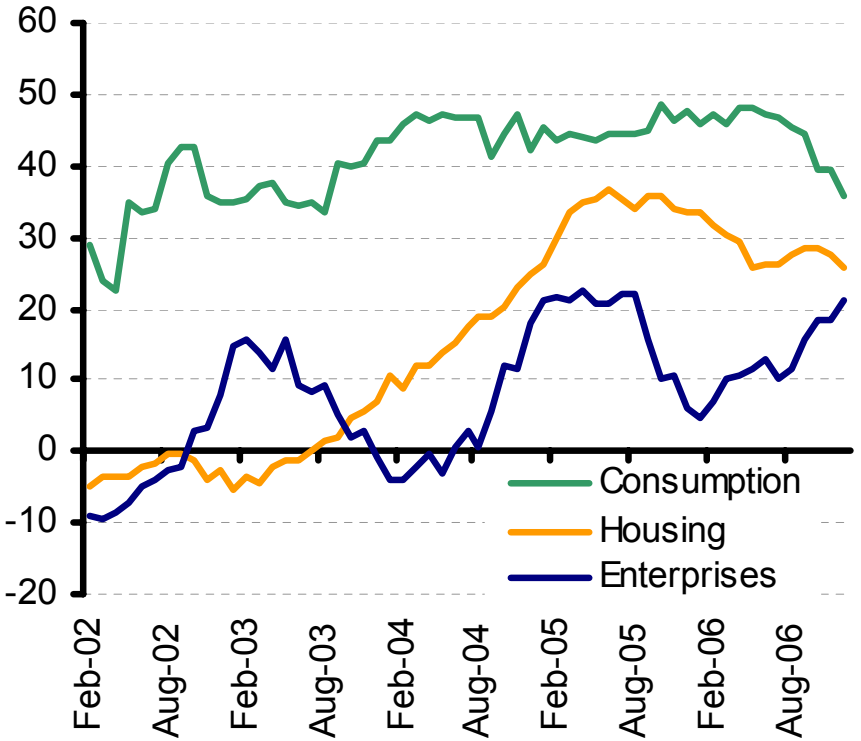
2. Development of the Financial System

Yield Curve of Government Bonds*
(Percent)



Annual Average. To 2007, January-February Average.
Source: Banco de México

Outstanding Commercial Bank Lending to the Private Sector/*
(Real Annual Percentage Change)

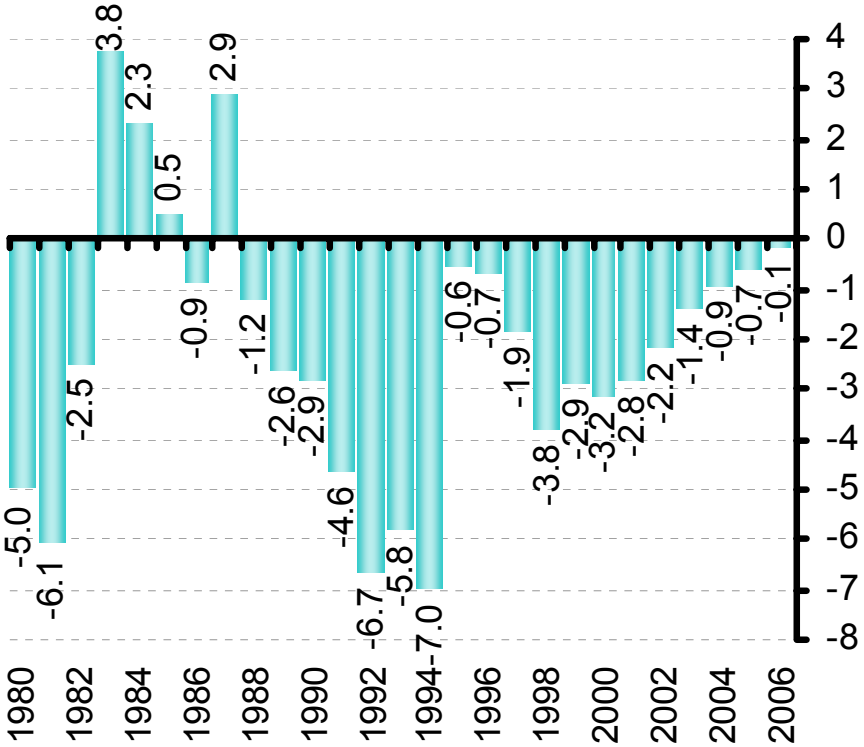


*/ Restructuring programs portfolio not included

III. Macroeconomic Stability

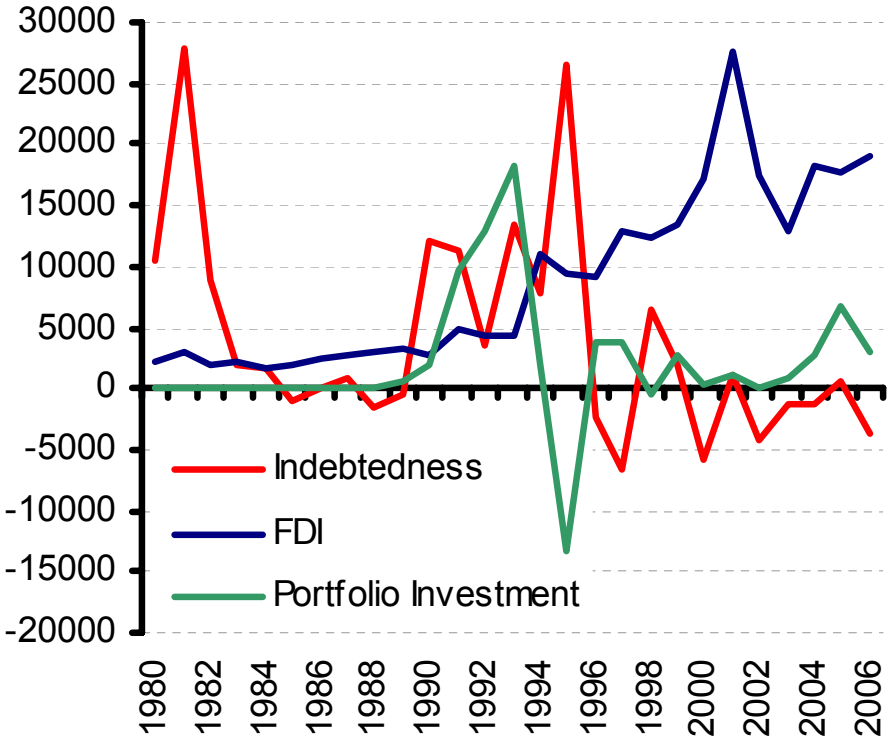
3. Sustainability of External Accounts

Current Account Balance
(Percent of GDP)



Source: Banco de México

Inflows in the Capital Account
(Million Dollars; Seasonally Adjusted)

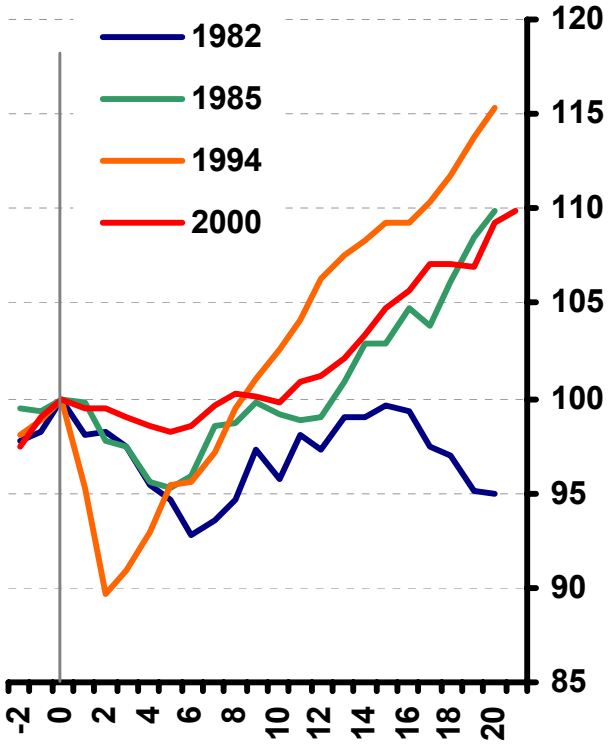


Source: Banco de México

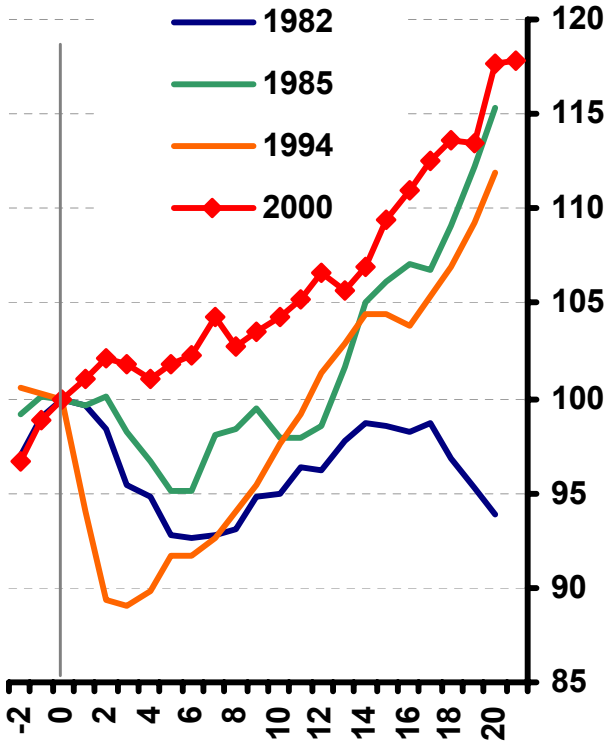
III. Macroeconomic Stability

4. Less Volatile Macroeconomic Aggregates

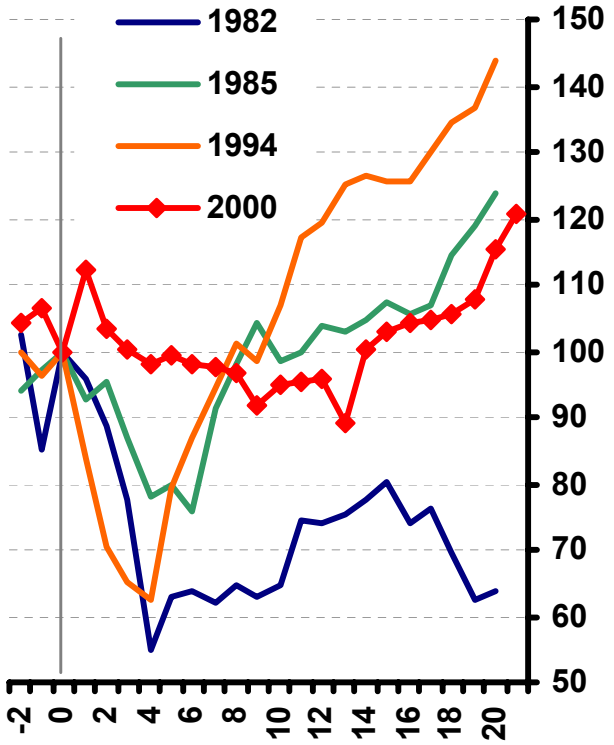
Gross Domestic Product (Peak=100)*



Private Consumption (Peak of GDP100)*



Gross Fixed Investment (Peak of GDP=100)*

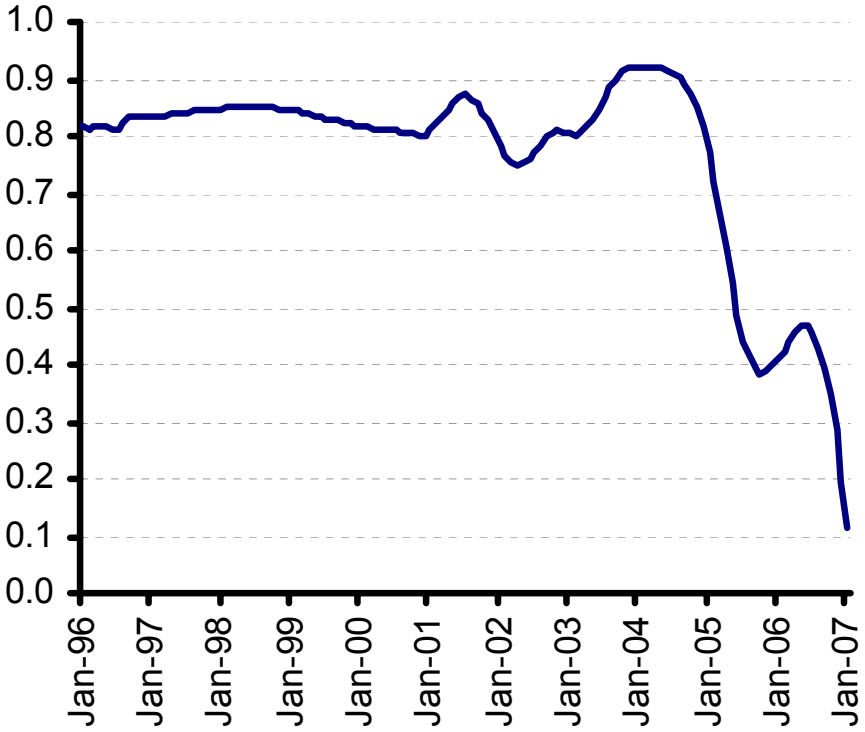


* Seasonally Adjusted Data
Source: INEGI

IV. Changes to the Monetary Transmission Mechanism

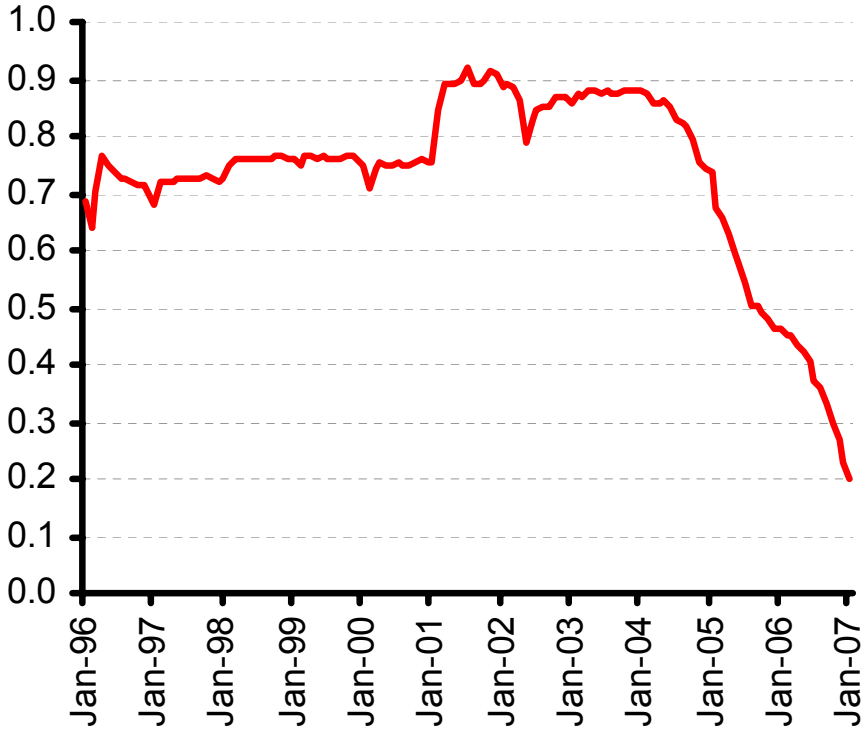
Change in the Dynamics of the Inflation Process

Inflation Persistence, Sum of the Coefficients from an AR(12) Model*
(7 Month Moving Average)



* Corresponds to the sum of the 12 coefficients from an AR(12) process estimated using a window for the previous 6 years.

Inflation Persistence, Coefficient from an AR(1) Model*



* Corresponds to the coefficient from an AR(1) process on seasonally adjusted monthly inflation using a window for the previous 6 years.

IV. Changes to the Monetary Transmission Mechanism

- These changes imply that the transmission mechanism of monetary policy has been changing in two dimensions:
  - ✓ *Relative importance of the different channels.*
  - ✓ *Speed with which the economy adjusts to shocks.*

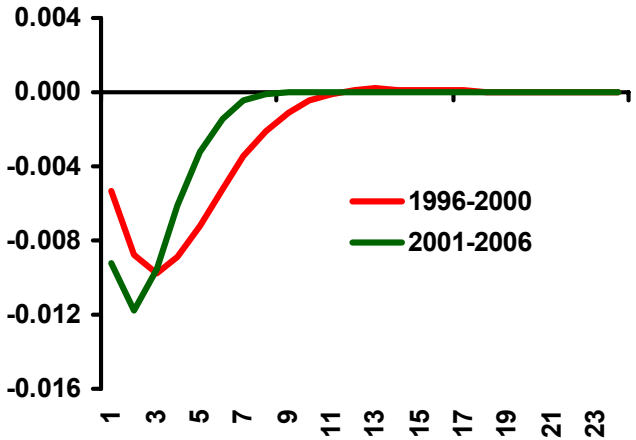
IV. Changes to the Monetary Transmission Mechanism

- To illustrate the changes to the monetary transmission mechanism, a hybrid macroeconomic model with four structural equations is used.
  - ✓ The same model was estimated for two samples: January 1996 to December 2000, and January 2001 to June 2006.
  - ✓ Impulse responses for four different shocks are presented:
    - Monetary policy shock.
    - Exchange rate shock (pass-through).
    - Cost-push shock.

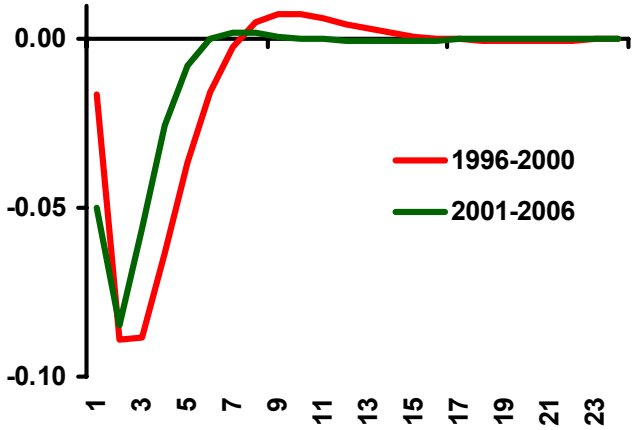
IV. Changes to the Monetary Transmission Mechanism

1. Monetary Policy Shock: 1 percent increase in nominal interest rate.

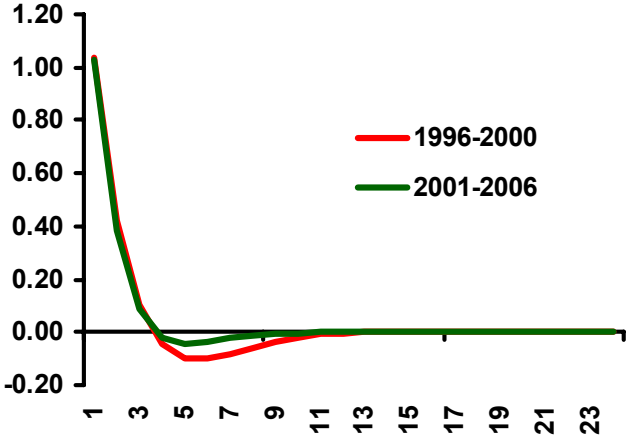
Inflation (1a)



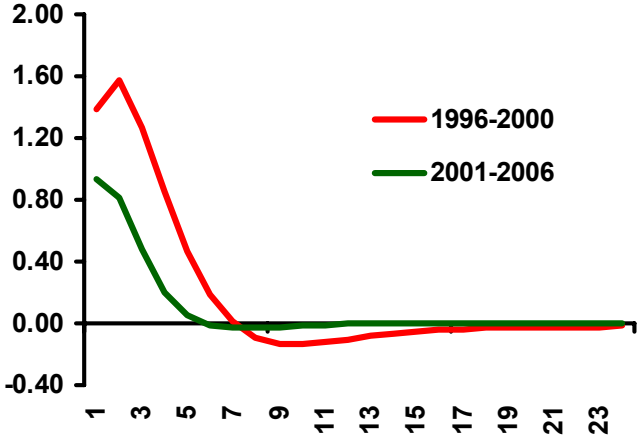
Output Gap (1b)



Nominal Interest Rate (1c)



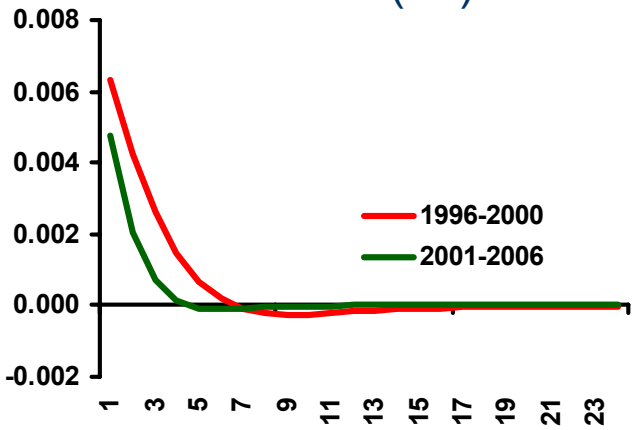
Real Interest Rate (1d)



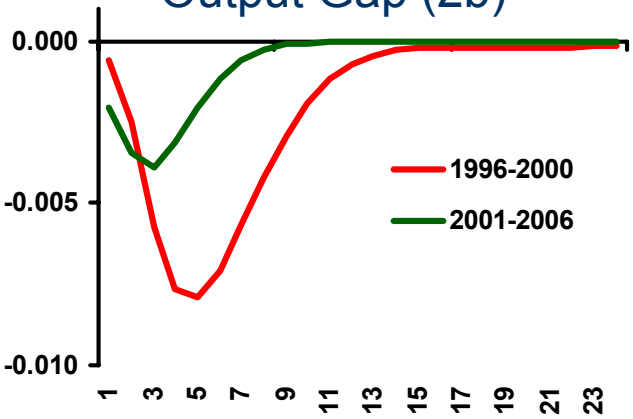
IV. Changes to the Monetary Transmission Mechanism

2. ER Shock: 1 percent depreciation of the real exchange rate.

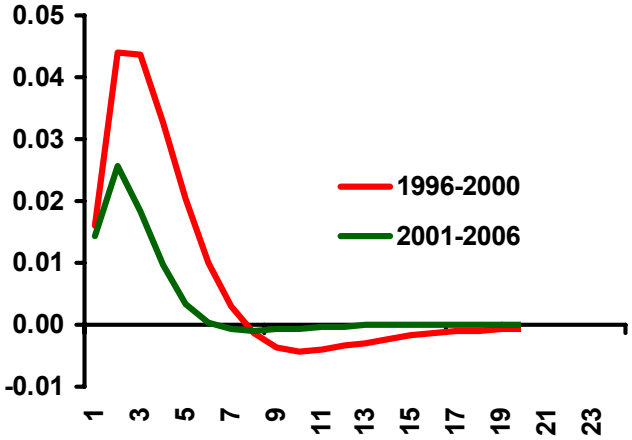
Inflation (2a)



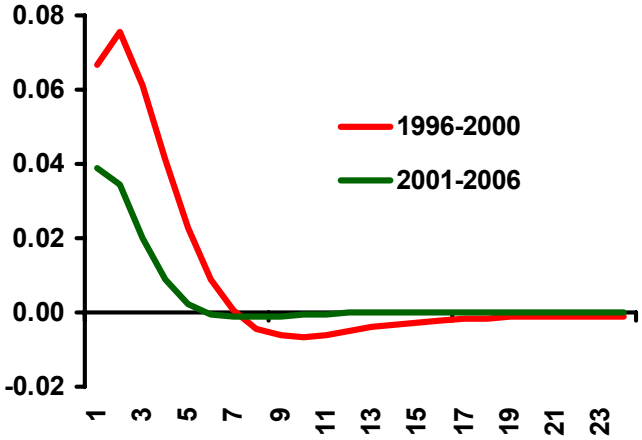
Output Gap (2b)



Nominal Interest Rate (2c)



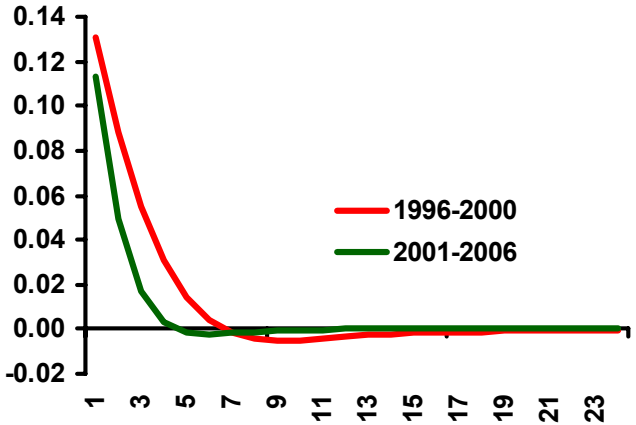
Real Interest Rate (2d)



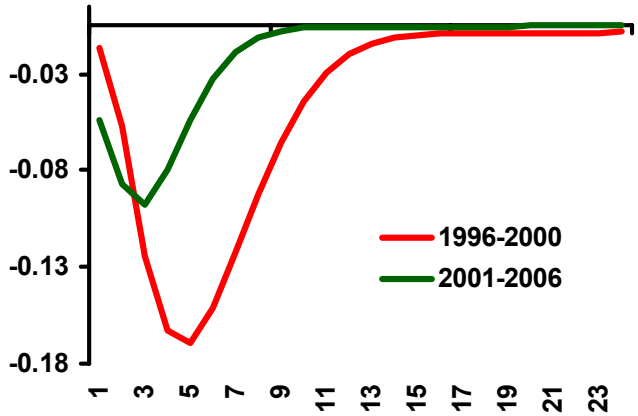
IV. Changes to the Monetary Transmission Mechanism

3. Cost-push Shock: 1 percent increase in annual inflation.

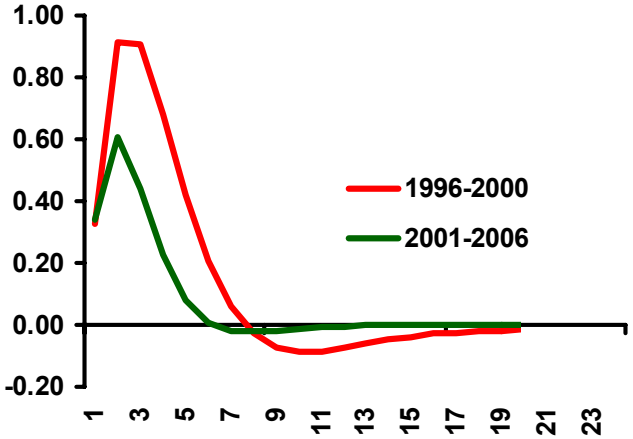
Inflation (3a)



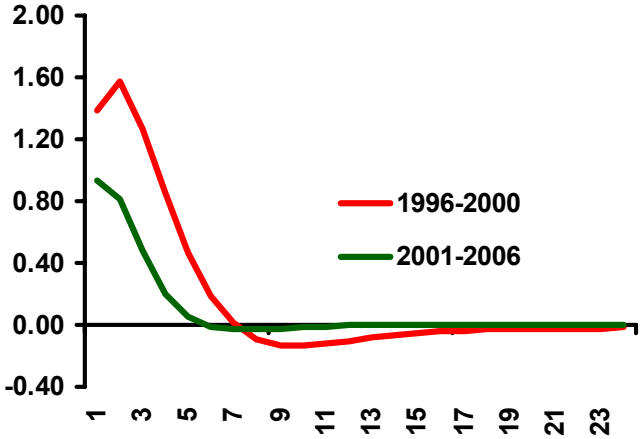
Output Gap (3b)



Nominal Interest Rate (3c)



Real Interest Rate (3d)



IV. Changes to the Monetary Transmission Mechanism

- The previous exercises show that the monetary transmission mechanism in Mexico has changed:
  - ✓ The development of financial markets has eased credit constraints for households. This has allowed consumer to smooth their consumption (intertemporal substitution).
  - ✓ Monetary policy has become more effective in reducing inflation and such reduction can be attained with a lower output cost.
  - ✓ The importance of the expectations channel of monetary policy has increased in recent years. This has allowed the economy to better adjust to shocks.
  - ✓ The reduction in the exchange rate pass-through makes the economy (e.g. inflation and output) less vulnerable to external shocks.

V. Monetary Policy and Uncertainty

- Changes in the transmission mechanism of monetary policy represent a challenge for the conduct of monetary policy.
- A risk management approach to monetary policy involves describing the uncertainty and assessing the costs associated with each of the possible policies.
- It also evaluates monetary policy under a wide range of scenarios, considering not only the scenario with the highest probability to occur since the cost of incurring a mistake is not symmetric.
- There are three types of uncertainty affecting monetary policy:
  i. About the type, size and persistence of shocks affecting the economy.
  ii. About the estimation of key economic relationships, which include both data and parameter uncertainty.
  iii. About the structure of the economy, namely about the model that best describes the true structure of the economy.

V. Monetary Policy and Uncertainty

- In emerging market economies, uncertainty associated to monetary policy becomes more relevant since:
  1. These economies are more vulnerable, and uncertainty about the size and persistence of shocks is greater.
  2. Economic performance may be subject to a higher measurement error.
  3. These economies face structural changes more frequently and of greater magnitude in general.
  4. The costs associated to adverse economic outcomes are subject to a greater uncertainty.
- Clearly, these uncertainties make more difficult the elaboration of forecasts for these economies.

V. Monetary Policy and Uncertainty

- To analyze the optimal monetary policy response under uncertainty, a small scale hybrid macroeconomic is used.
  - ✓ Impulse responses for a cost-push shocks are presented under changes in the persistence of inflation.
  - ✓ The response of monetary policy is modeled with an optimal policy rule.
  - ✓ Optimal monetary policy rule defined to minimize a standard loss function:

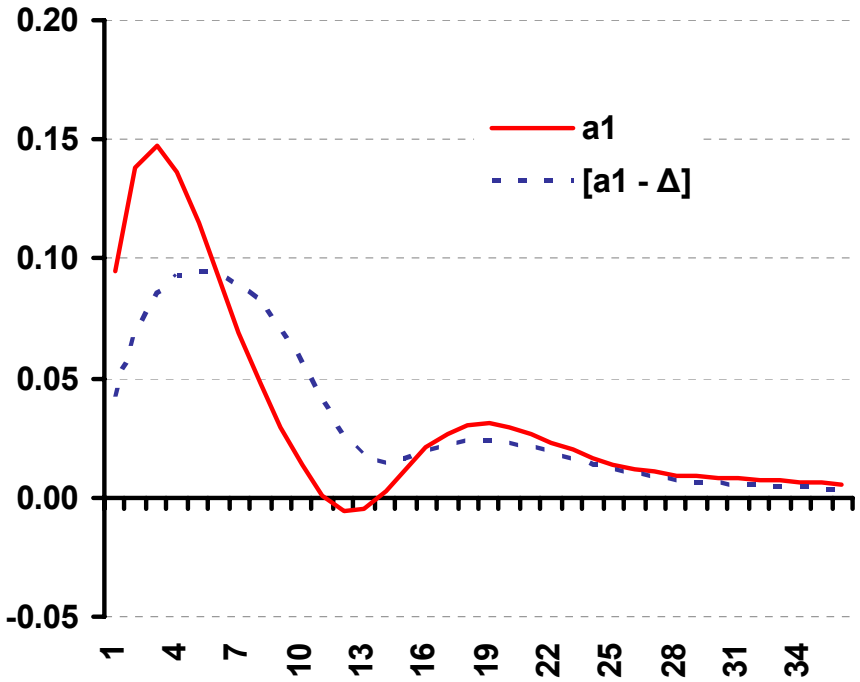
$$L = E_t \left\{ \sum_{j=0}^{\infty} \beta^j \left[(1-\theta) \left(\alpha (\pi^A_{t+j} - \pi^{A*}_{t+j})^2 + (1-\alpha) x^2_{t+j} \right) + \theta (i_{t+j} - i_{t+j-1})^2 \right] \right\}$$

  - ✓relative weight given to inflation deviations form its target;
  - ✓relative weight assigned to output gap;
  - ✓importance of interest rate variations.

V. Monetary Policy and Uncertainty

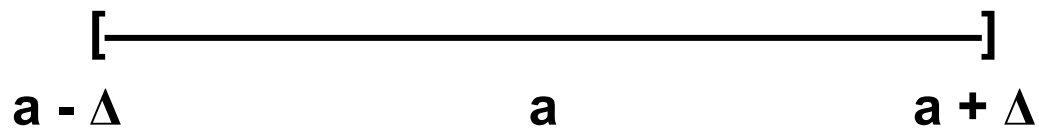
- The following exercise analyzes the responses with the corresponding optimal rule for a change in the inflation persistence parameter.
- The change in the parameter is assumed to be two standard deviation from the estimated parameter.

Nominal Interest Rates Response
to a Cost-Push Shock



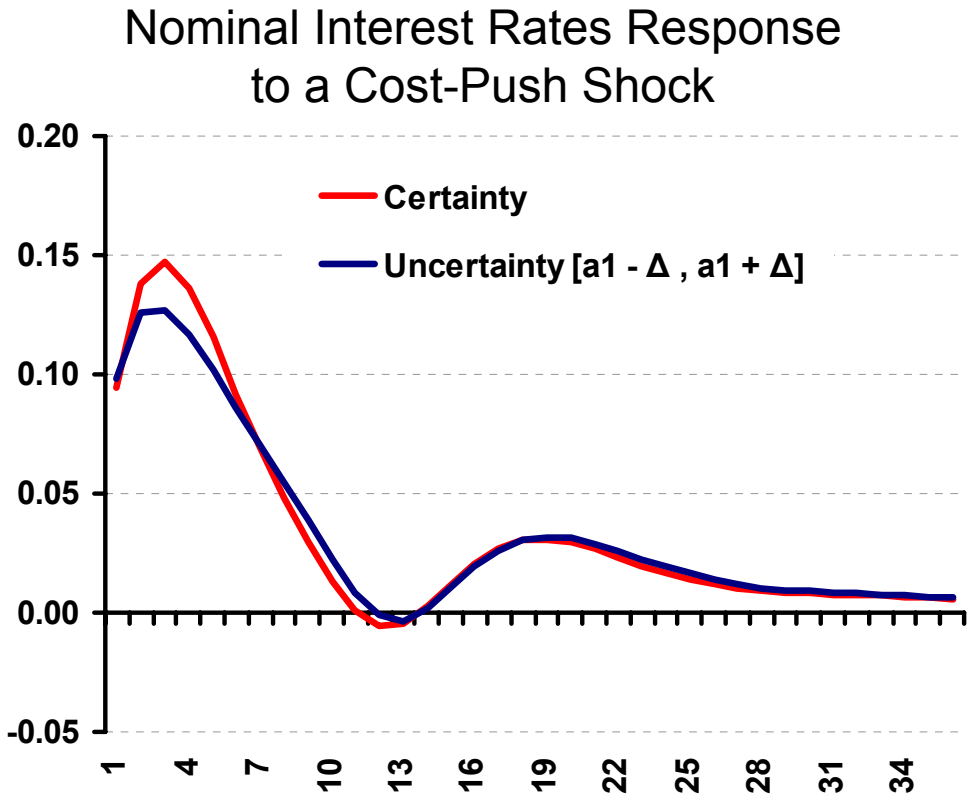
V. Monetary Policy and Uncertainty

- Under uncertainty, there is one monetary policy rule.
- A discrete uniform distribution over the parameter is assumed. The structure of the economy is not modified by uncertainty because private agents do not incorporate it in their decisions.
- The policy maker has a prior probability distribution of some parameters and minimize the expected loss subject to the structure of the economy (model's equations and the prior distributions).
- The resulting loss function is a weighted average of the loss evaluated for each possible value of the parameter in the distribution.
- There is a prior uniform distribution for each parameter within an interval of [a - Δ , a + Δ], where "a" is the estimated parameter.



V. Monetary Policy and Uncertainty

- A prior distribution is assumed for the parameters corresponding to the persistence of inflation, â1
- The results suggest that the optimal policy's response is not stronger (as in Moessner, 2004 results) even though the central bank's loss function penalizes inflation as well as output gaps.

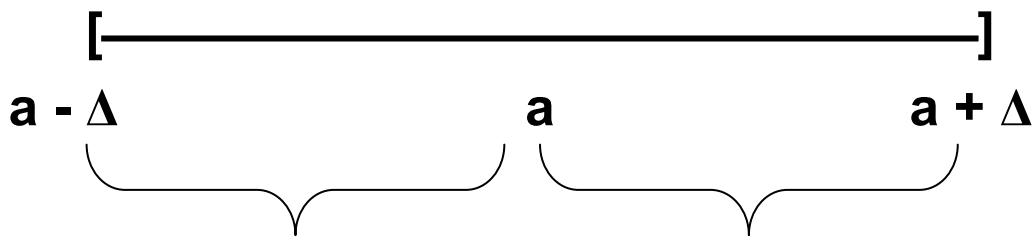


V. Monetary Policy and Uncertainty

MP Rule with uncertainty and judgment

- As mentioned before, while converging towards a low inflation equilibrium, some parameters will change. However, econometric analysis might help us to analyze the direction of these changes, i.e. which parameters will be weaker or stronger.
  - ➢ Persistence of inflation is likely to be weaker.
- Introducing this into the model we get a “biased” interval:

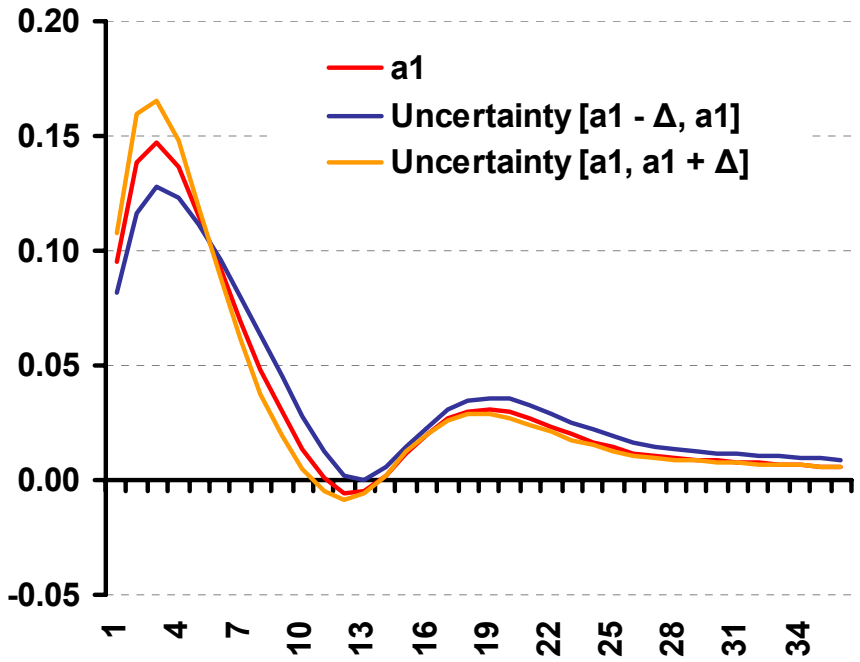
  Left: [a - Δ , a] and right: [a, a + Δ] instead of [a - Δ , a + Δ],



V. Monetary Policy and Uncertainty

- A “biased” prior distribution is assumed corresponding to a smaller persistence of inflation.
- The results suggest that, in this cases, the optimal policy’s response is different.

Nominal Interest Rates Response
to a Cost-Push Shock



V. Monetary Policy and Uncertainty

- Uncertainty is a challenge for monetary policy.
- The results show that for a small New Keynesian macro model estimated for the Mexican economy, parameter uncertainty has little effect.
- However, for a small open economy in transit to a low-inflation equilibrium and a monetary authority consolidating its credibility, parameter uncertainty becomes relevant.
- In particular, when some structural parameters are changing, judgment on how to incorporate uncertainty into the analysis could be important.

VI. Final Remarks

- ✓ The reduction of inflation has resulted on changes to the dynamics of inflation.
- ✓ The transition towards a low inflation environment has enhanced the importance of extending research on:
  - Changes in the transmission mechanism of monetary policy.
  - The microeconomic structure of domestic markets.