MEP 1 - Structural Macroeconomic Model for Chile: An Overview

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Agenda

- Purposes and Uses of MEP 1
- Basic Model Description
- Standard Features
- Special Features
- Specific Issues

Purposes and Uses of MEP 1

Purposes

- Provide an analytical framework
  - Common framework for staff and Board
  - Facilitates communication of CB analysis
- Forecasting
  - Key ingredient of an inflation targeting framework
  - Flexible and allows to incorporate judgement and alternative forecasts to the model
- Policy Exercises
  - Includes main MP transmission channels
  - Again, it is possible to include other source insights

Uses

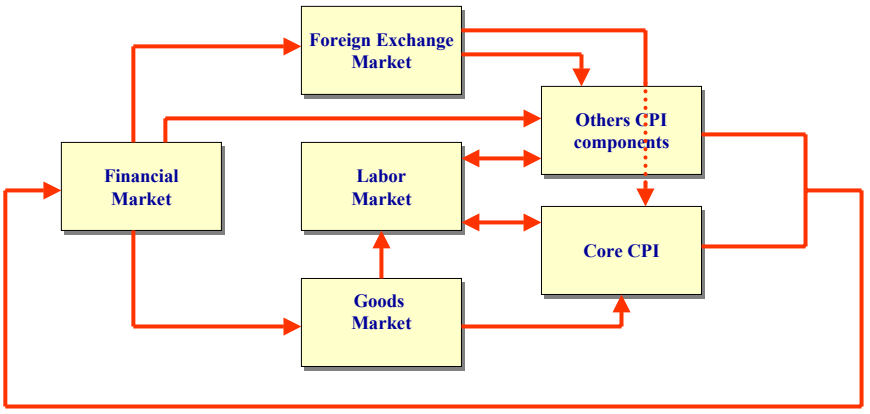
- Numerous runs when monetary policy report is under preparation
  - Interaction staff-Board to fix exogenous variables and alternative scenarios
  - Results coupled with judgement in successive meetings
- Uncertainty measurement
  - Stochastic simulations using both endogenous and exogenous variables shocks
- Policy Rules Evaluation
  - Construction of efficiency frontiers

Basic Model Description

MEP 1 Basic Description

- Main Characteristics
  - Quarterly
  - Simple and manageable
  - Short run dynamics carefully considered
  - Includes basic MP transmission mechanisms
  - Has a well defined steady state (that matters in specific ways)
  - Has important forward-looking ingredients (typical solution based on model consistent expectations)
  - 6 main blocks

MEP 1 Basic Description



MEP 1 Basic Description

- Limitations
  - Not micro founded
  - Needs substantial judgement
- Technicals
  - Implemented in both WinSolve™ and Troll™
  - 83 equations and identities, 53 exogenous variables
  - Log linear

MEP 1 Standard Features

Goods Market

- IS Equation
  - Output gap is what matters
    - » Potential output is exogenous
    - » Mean reversion
    - » GDP ex. natural resources (mining and others)
  - Determinants
    - » Difference between short and long term real interest rates (remember UF rates) and corresponding neutral rates
    - » Trading partners' GDP, terms of trade, and foreign interest rates
    - » Capital flows to Latin America

FX Market

- Uncover Interest Parity
  - Exogenous variables:
    - » Sovereign spread
    - » Long run (steady state) real exchange rate
  - Dynamics:

$$q = 0.6\,q_{+1} + 0.3\,q_{-1} + 0.1\,\overline{q} - \{r - (r^{*} + \rho)\}$$

$$e = q - cpi^{*} + cpi$$

Financial Market

- Expectation hypothesis for long term interest rate
  - Exogenous variable: Term spread
  - Dynamics:

$$R = 0.43R_{-1} + 0.54R_{+1} + 0.03(r + \phi_R)$$

$$r = i - \hat{\pi}$$

$$\hat{\pi} = \frac{1}{4}(\pi^e_{+2} + \pi^e_{+4} + \pi^e_{+6} + \pi^e_{+8})$$

Financial Market (cont'd)

- Forward-looking policy rule for short term interest rate
  - Determinants:
    - » Inflation 4 and 8 quarters ahead
    - » Output gap deviations
  - Equation:

$$r = \lambda r_{-1} + (1-\lambda)rx, \text{ with}$$

$$rx = r^* + \rho + \gamma\Big[\alpha\{\tfrac{1}{4}(\pi^e_{+2} + \pi^e_{+4} + \pi^e_{+6} + \pi^e_{+8}) - 3\%\} + (1-\alpha)\{\tfrac{1}{2}(gap + gap_{-1})\}\Big]$$

MEP 1 Special Features

Non Core CPI details

Component	Share (%)
Core	69.71
Public Utilities (rule)	5.51
Financial Services (*i*)	1.92
Indexed Prices	7.12
Public Transp. (rule)	2.75
Meat and Fish	5.25
Fruit and Vegetables	3.77
Fuels (stabilization fund)	3.97

Example

- Public Transport (*transport*): follows a polynomial rule
  - Determinants:
    - » Diesel price (*pdi*)
    - » Nominal exchange rate
    - » Unit labor costs
  - Equation:

$$\Delta transport = -0.05 + 0.37\Delta\, pdi + 0.50\Delta\, e_{-1} + 3.29\Delta\, ulc_{-1} + 0.33\Delta\, transport_{-3}$$

Phillips Curve

- Core CPI
- Expected inflation has increasing importance
- Output gap has standard effects
- Keeps track of price levels and costs
  - Markups play a key role: Memory ("cab meter")
  - Static homogeneity and cointegration
  - Galí and Gertler (1999) and Gruen et al. (1999)
- Dynamic homogeneity

Phillips Curve (cont'd)

- Core inflation dynamics

$$\pi = \underbrace{0.78\pi^{e} + 0.20\pi_{-1,-2} + 0.02\pi^{*}}_{\text{Dynamic homogeneity}}$$

$$\underbrace{+0.04(y - \overline{y})}_{\text{"Brake" b/c output gap}} \underbrace{- 0.08(\mu - \overline{\mu})}_{\text{"Accelerator" b/c markup}}$$

Phillips Curve (cont'd)

- Markups
  - Determinants:
    - » CPI
    - » Unit labor costs (*ulc*)
    - » Imported inflation
  - Equation:

$$\mu = cpi - 0.95\,ulc - 0.05cpi^{*}$$

$$ulc = w - (y\text{-}l) + \log(1+iva)$$

Phillips Curve (cont'd)

- Imported inflation
  - Determinants:
    - » Unit value of imports (*ivum*)
    - » Nominal exchange rate
    - » Value added tax (*iva*)
    - » Tariffs (*tm*)
  - Equations:

$$cpi^* = ivum + e + \log(1 + iva) + \log(1 + tm)$$

$$\pi^* = \Delta cpi^*$$

Labor Market

- Demand
  - Long-term relation from standard firm problem solution (levels)
  - Steady-state dynamics evolve according to demographic variables
  - GDP deflator is the relevant price
  - Core CPI represent a subset of the economy

Labor Market (cont'd)

- Demand determinants:
  - » Wages (*w*)
  - » Labor share
  - » GDP deflator (*p*)
  - » GDP (*y*)
  - » Output gap (*gap*)

  – Equation:

$$\Delta l = -0.04\left(l_{-1} + w_{-1} - p_{-1} - y_{-1} - \ln(\alpha_{labor})\right) + \Delta\text{labor force} + 0.45\Delta gap$$

Labor Market (cont'd)

- Wages
  - – Determinants:
    - » Productivity (*prod*)
    - » Difference between actual and natural unemployment
    - » CPI lags (remember indexation)
  - – Equation:

$$\Delta w = \Delta\overline{prod} - 0.05(u_{-1,2} - \overline{u}_{-1,2}) + 0.56\Delta cpi_{-1} + 0.32\Delta cpi_{-2} + 0.23\Delta cpi_{-4}$$

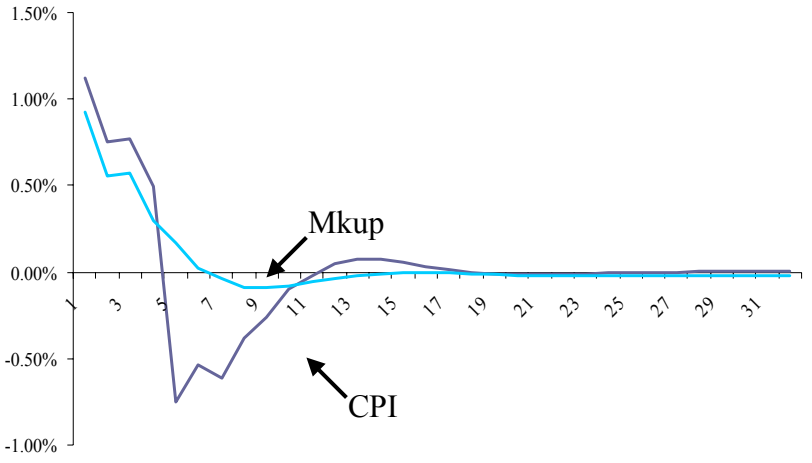
Steady State Conditions

$$r = r^* + \rho$$
$$R = r + \phi$$
$$q = \bar{q}$$
$$Y = \bar{Y}$$

$$\text{Core CPI} = (1 + \bar{\mu})\text{costs}$$
$$P \cdot Y = \alpha \cdot W \cdot L$$
$$U = \bar{U}$$
$$\text{Non CPI } \pi = 3\%$$

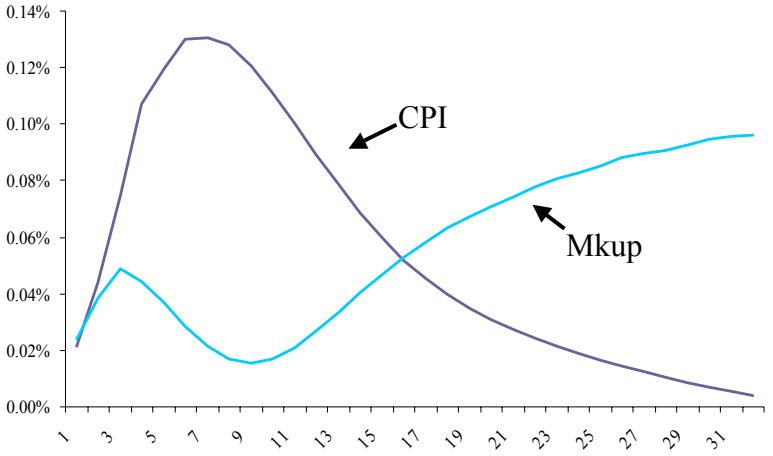
Example 1: CPI Shock

- Endogenous dynamics for mark-up and CPI



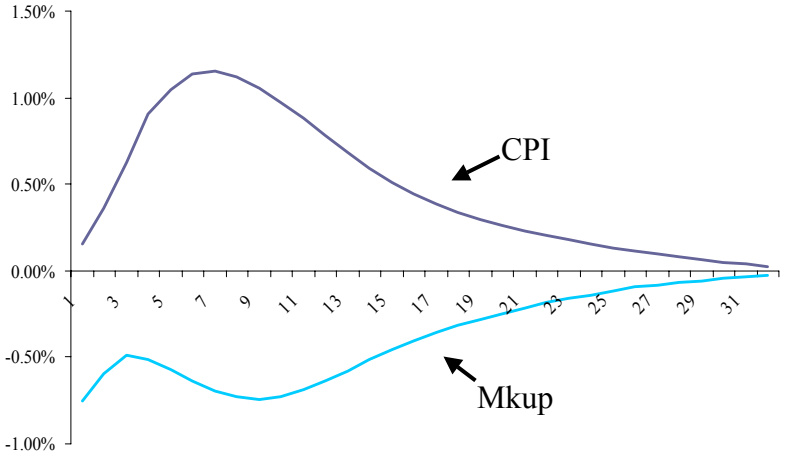
Example 2: Permanent Mark Up Shock

- Equilibrium mark-up increases by 0,1%



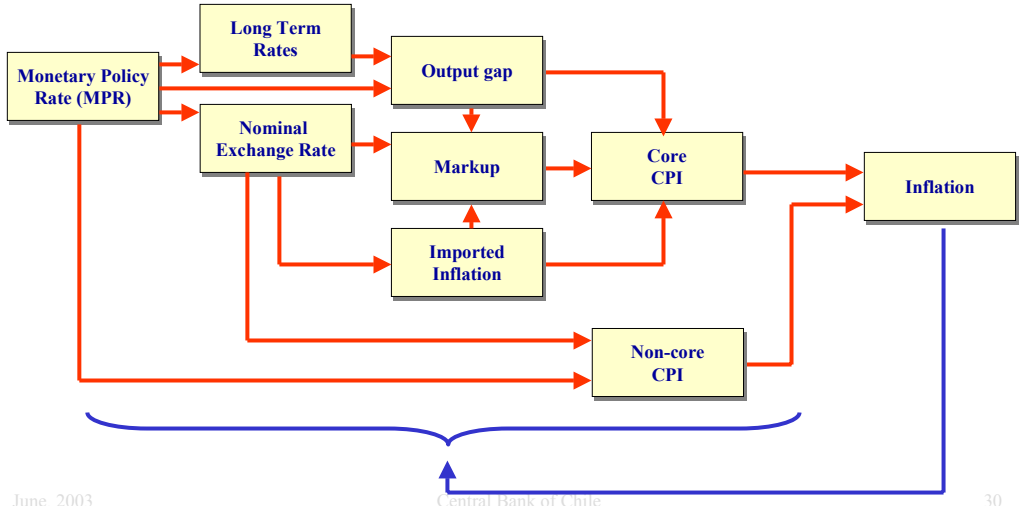
Example 3: Wage Shock

- 1% shock in both private and public nominal wages



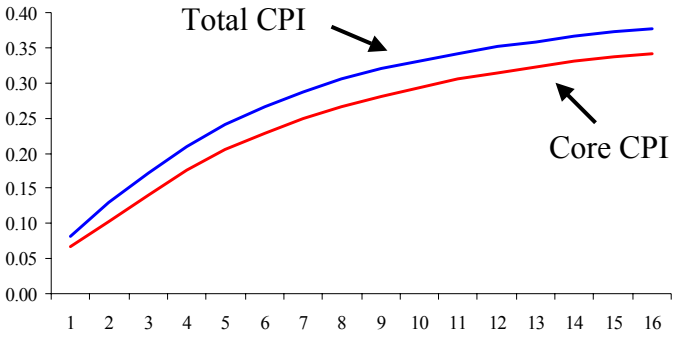
Specific Issues

MP Transmission Mechanisms



Example 4: Pass-through

- Shock in long term real exchange rate
- Ratio between *cpi-cpi(0)* and *e-e(0)*



Example 5: VAT Change

- Structural interpretation of effects
  - Direct effects
  - Indexation and labor market
  - Expected Inflation
  - Reaction function and anchoring

MEP 1.5 and MEP 2.0

- In addition to MEP 1 equations:
  - Domestic demand
    - » Consumption (durable and non-durable goods)
    - » Investment (machinery and equipment, and construction)
  - Trade balance
    - » Exports (by type)
    - » Imports (by type)
  - Deflators and nominal figures
- MEP 2.0
  - Endogenous steady state

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