Evaluating Macroeconomic Strategies with a calibrated model

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Outline

• Motivation, references
• Main features
• Specification
• Simulations
• Discussion
Motivation, references

- Is pre-accession exuberance justified?
- Can expenditure booms be explained by reasonable consumption smoothing? No, if we believe in externalities and country risk

- Background:
  - ECB research: Fagan-Gaspar-Pereira
  - calibrated macromodels (Canada, New Zealand)
  - endogenous growth models
  - REER models
Main features

• Saving-investment linkage is not constrained to a closed economy
  – permanent: cons - risk premium - interest rate
  – transitory: cons - exchange rate - interest rate

• Factors of catch-up from 50-80/100 percent
  – capital accumulation
  – externalities from foreign capital
  – autonomous TFP
Specification

- Some definitions and mnemonics: Steady-state and particular solution divided, returns normalized by steady state, volumes by GDP, long and short returns:

\[
\pi\pi_t = \overline{\pi}_t + \pi_t \\
rr_t = \overline{r}_t + r_t
\]

\[
1 + \pi_t = 1 + \sum_{k=t}^{\infty} \pi_k \\
1 + r_t = 1 + \sum_{k=t}^{\infty} r_k
\]

\[
1 + prem_t = 1 + \sum_{k=t}^{\infty} prem_k
\]
Saving-investment linkage

\[ r_t = \theta \cdot q_t + \text{prem}_t \]

• premium – interest rate channel

\[ \text{prem}_t^s = \alpha + \beta \cdot nfa_t \]

\[ c_t = \alpha_c \cdot w_t + \beta_c \cdot y_{LAB,t} \]

\[ w_t = nfa_t + k_{d,t} \]

\[ nfa_{t+1} = \frac{\left(1 + rr_t^s\right) nfa_t - c_t - i_{d,t} + y_{LAB,t} + \pi \pi_{d,t} k_{d,t}}{1 + g_t} \]
• **exchange rate – interest rate channel**

  • **demand:**

  $$\max \left( A_T (c + i)_T^{-\beta} + A_{NT} (c + i)_{NT}^{-\beta} \right) \frac{1}{\beta_d}$$

  $$s.t. (c + i)_T + q(c + i)_{NT} = 1 - tr$$

  • **supply:**

  $$\max \left( y_T + qy_{NT} \right)$$

  $$s.t. \left( B_T y_T^{-\beta} + B_{NT} y_{NT}^{-\beta} \right) \frac{1}{\beta_d} = c + i - 1$$

  • **Adjustment to the equilibrium weight:**

  $$B_{2,t} = B_{2,t-1} - \lambda \left( B_{2BS,t-1} - B_{2,t-1} \right)$$
- **interest rate – investment link**

- **path of** \( k, \pi \) **not explicitly derived from the production function, but forward lookingly in the spirit of Tobin-q**

\[
k_t^f = \gamma k_{t-1} + \beta (\pi - r) + (1 - \gamma) k_t^f
\]

\[
k_t^d = \gamma k_{t-1} + \beta (\pi - r) + (1 - \gamma) k_t^d
\]

\[
\pi_{f,t} = \pi_{f,t+1} + \lambda (k_f - k_{f,t})
\]

\[
\pi_{d,t} = \pi_{d,t+1} + \lambda (k_d - k_{d,t})
\]

\[
y_{LAB,t} = 1 - \pi \pi_{d,t} k_{d,t} - \pi \pi_{f,t} k_{f,t}
\]

\[
i_t^f = (1 + g_t) k_{t+1}^f - (1 - \delta) k_t^f
\]

\[
i_t^d = (1 + g_t) k_{t+1}^d - (1 - \delta) k_t^d
\]
Production function and externalities

- production function determines \( g \)

\[
Y_t = A_0 \left( \frac{K_f}{Y} \right)^{\gamma_{\mu}} (1 + \mu)^t K_{f,t}^{\alpha_f} K_{d,t}^{\alpha - \alpha_f} L_t^{1-\alpha}
\]

- equilibrium cost ratios not explicitly modelled

\[
q_{BS,t} = q_{BS,t+1} - \tau(\underline{g}_t - g^*)
\]
Model calibration

- **Parameters**
  - growth = 2%
  - int. rate = 5%
  - $\alpha_{KD} = 0.2$
  - $\alpha_{KF} = 0.1$
  - $\alpha_L = 0.7$
  - amort = 8%
  - $\beta_{RISK} = 0.1$

- **Starting values**
  - $K/Y = 1.6$
  - $KD/Y = 1.1$
  - $KF/Y = 0.5$
  - NFA/Y = -0.25
  - Reer misalignment 7%

- **Steady state**
  - $K/Y = 2.14$
  - $KD/Y = 1.43$
  - $KF/Y = 0.71$
  - NFA/Y = 0
  - $W/Y = 1.43$
  - $C/Y = 0.76$
  - $I/Y = 0.21$
  - TR/Y = 0.03

Catching-up from 50% to 80% relative to EU average ($\gamma_{KF/Y} = 0.7$)
Simulation

• 3 alternative simulations:
  – “Baseline”: flexible factor allocation (production possibility curve), endogenous risk premium, external effect of foreign capital on TFP
  – “Alternative baseline”: no risk premium, no external effect of foreign capital on TFP
  – “NATREX”: fix factor allocation (production possibility curve)
Simulation: Baseline

Baseline (Catch-up relative to EU average)

Baseline (Real and Financial Assets)

Baseline (Real and B-S Real Exch. Rate)

Baseline (GDP Components)
Simulation: Baseline

- Gradual, 30-year-long catching-up period
- Catching-up from 50% to 80% relative to EU average
- Approx. 24% real appreciation (BS-effect)
• Real convergence similar to that of “Baseline”
• Main differences:
  – Risk premium zero → Interest rate lower
    (Lower than world rate due to the appreciation)
Simulation: NATREX

NATREX & Baseline (Catch-up relative to EU average)

RELATIVGDP NatrexBase RELATIVGDP BaseRun

0.4 0.5 0.6 0.7 0.8

2001 2009 2017 2025 2033 2041 2049

NATREX & Baseline (Real and Financial Assets)

NFA NatrexBase KD NatrexBase KF NatrexBase NFA BaseRun KD BaseRun KF BaseRun

-0.5 0 0.5 1 1.5

2001 2009 2017 2025 2033 2041 2049

NATREX & Baseline (Real and B-S Real Exch. rate)

Q NatrexBase QBS NatrexBase Q BaseRun QBS BaseRun

-0.3 -0.2 -0.1 0 0.1

2001 2009 2017 2025 2033 2041 2049

NATREX & Baseline (GDP Components)

C NatrexBase I NatrexBase TR NatrexBase C BaseRun I BaseRun TR BaseRun

0 0.2 0.4 0.6 0.8

2001 2009 2017 2025 2033 2041 2049
• Real convergence similar to that of “Baseline”
• Main differences:
  – Real exchange rate path → Interest rate is lower at the beginning but thereafter remains higher
Simulated shocks

• Assessing the effect of fiscal expenditure treated as a consumption shock

• Shocks:
  – Transitory fiscal (excess consumption) boom
    one period 1 % point increase in C/Y
  – Fiscal boom with raising debt-target
    “Permanent fiscal boom”
    one period 1 % point increase in C/Y and 1 pct.p decrease in steady state W/Y
Simulated shocks

- Transmission mechanism of a fiscal shock

C/Y shocked ↑ → NFA/Y ↓ → Risk premium ↑

Q appreciates

C/Y ↓ ← Relative GDP ↓ ← I/Y ↓
Simulation: fiscal boom

Transitory cons. shock (Catch-up relative to EU average)

RELATIVGDP C_Shock-BaseRun

Permanent change in NFA_SS (Catch-up relative to EU average)

RELATIVGDP NFA_Shock-BaseRun

Transitory cons. shock (Real and Financial Assets)

NFA C_Shock-BaseRun  KD C_Shock-BaseRun  KF C_Shock-BaseRun

Permanent change in NFA_SS (Real and Financial Assets)

NFA NFA_Shock-BaseRun  KD NFA_Shock-BaseRun  KF NFA_Shock-BaseRun
Simulation: fiscal boom

Transitory

Permanent

Transitory cons. shock (Real and B-S Real Exch. Rate)

Permanent change in NFA_SS (Real and B-S Real Exch. Rate)

Transitory cons. shock (GDP Components) %change

Permanent change in NFA_SS (GDP Components) %change

C_LEVEL CShock%BaseRun LLEVEL CShock%BaseRun

C_LEVEL NFA_Shock%BaseRun LLEVEL NFA_Shock%BaseRun
• 1 unit excess consumption results in:
  – 4.6 unit total loss in GDP
  – 3.6 unit consumption tightening (Time discount ~ 24%)

• A decrease in W/Y results in:
  – higher risk premium, inter.r,
  – lower C/Y, I/Y, K/Y, GDP, NFA/Y
• 1 unit excess consumption results in:
  – 0.13 unit total loss in GDP
  – 0.23 unit consumption tightening (Time discount ~ 6%)

• A change in steady state W/Y results in:
  – lower C/Y due to lower NFA/Y
  – other variables unchanged
Conclusion

• Sacrifice paid for consumption (fiscal) exuberance:
  – higher costs of disinflation. Not modeled here
  – lower investments, therefore
    • slower catching-up if growth is investment-dependent
    • lower steady-state output if investors perceive country-risk

• Costs may be very high, over the range of reasonable intertemporal optima
Thank You for Your Attention

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Effect of an increase in expenditure on the real exchange rate: short run

\[ y_T \]

\[ c+i \]

\[ y \]

\[ y_{NT} \]
Effect of an increase in expenditure on the real exchange rate: long run