Seðlabanki Íslands

Monetary policy regimes and exchange rate fluctuations

The views are of the author and do not necessarily reflect those of the Central Bank of Iceland

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Introduction

- It is sometimes claimed that inflation targeting (IT) leads to increased exchange rate volatility
  - The argument being that the overriding emphasis on price stability leads to benign neglect of exchange rate stability
- A common claim by many Icelandic commentators
  - Point out that exchange rate volatility is greater now than in the previous policy regime

Introduction

- The fact that IT usually requires some exchange rate flexibility which necessarily leads to higher exchange rate volatility is, however, not a very interesting and insightful observation
  - It is an obvious fact that floating exchange rates move more than fixed ones
- Not all exchange rate movements are bad
  - Exchange rates are relative prices and some relative price movements is both necessary and helpful for economic adjustment to shocks

Introduction

- The problem is if exchange rates move too much
  - Exchange rate volatility is greater than is warranted by economic fundamentals
  - Exchange rates become a source of shocks in addition of being a shock absorber
- Exchange rate noise is the part of exchange rate movements not explained by economic fundamentals
  - A number of explantions: thin and inefficient FX markets; irrationality; noise traders; bandwagon behaviour; etc

Goal of this paper

- Does the monetary policy regime affect the volatility of multilateral exchange rate noise?
  - In particular, does the adoption of IT increase the volatility of exchange rate noise?
  - In addition, does membership in EMU affect the volatility of exchange rate noise?

The effects of inflation targeting

- A large number of studies available on the economic impact of IT
- IT has improved inflation performance
  - IT seems to have reduced inflation levels, volatility and persistence
  - Reduced the effects of temporary supply shocks on inflation
  - Stabilised long-term inflation expecations and made inflation more predictable
- Improved inflation performance is not achieved at the cost of real economy performance
  - Some studies suggest that IT has reduced business cycle volatility and even the sacrifice ratio
- IT has improved monetary policy conduct
- IT has reduced exchange rate pass-through

Exchange rate noise

- Use a general signal-extraction approach suggested by Durlauf and Hall for rational expectations models
- Models are a sum of two unobserved components
  - Combination of the data implied under the null hypothesis that the model is true
  - Combination of the data under the alternative: model noise
- They show how this model noise can be extracted from the data and how a lower-bound of the variance of this noise component can be constructed

Exchange rate noise

- In the context of this paper I use the standard workhorse of exchange rate determination
  - Money market eq. $m_t - p_t = \varphi y_t - \lambda i_t$
  - PPP condition $p_t = s_t + p_t^*$
  - UIP condition $i_t = i_t^* + \mathrm{E}(s_{t+1} | \Theta_t) - s_t + \xi_t$
- A time-varying risk premium has been added to the standard UIP condition
  - Can also be interpreted as the rational expectations deviation from the model – i.e. the non-fundamental part of exchange rate behaviour or model noise

Exchange rate noise

- This can be solved to give the standard present-value condition

$$s_t = \sum_{j=0}^{\infty} \left(\frac{\lambda}{1+\lambda} \right)^j \mathrm{E}(f_{t+j} \,|\Theta_t\,) + \kappa_t$$

- Where

$$f_t = \left(\frac{1}{1+\lambda} \right) (m_t - \varphi y_t - p_t^* + \lambda i_t^*)$$

$$\kappa_t = \sum_{j=0}^{\infty} \left(\frac{\lambda}{1+\lambda} \right)^{j+1} \mathrm{E}(\xi_{t+j} \,|\Theta_t\,)$$

- f_t are economic fundamentals and κ_t the present value of the current and expected risk premium (or noise)

Exchange rate noise

- By defining the perfect-foresight riskless exchange rate as

$$s_t^* = \sum_{j=0}^{\infty} \left(\frac{\lambda}{1+\lambda} \right)^j f_{t+j}$$

- One can show that

$$s_t - s_t^* = \kappa_t - v_t$$

- Where v_t is the rational expectations forecast error that satisfies

$$\mathrm{E}(v_t \,|\Theta_t) = 0$$

Exchange rate noise

- From this one can show that

$$\mathrm{proj}(s_t - s_t^* \,|\, \Upsilon_t) = \mathrm{proj}(\kappa_t \,|\, \Upsilon_t) = \widehat{\kappa}_t \qquad \Upsilon_t \subseteq \Theta_t$$

- And by defining

$$\zeta_t = \mathrm{proj}(\kappa_t \,|\, \Theta_t) - \mathrm{proj}(\kappa_t \,|\, \Upsilon_t) = \kappa_t - \widehat{\kappa}_t$$

- One obtains an estimate of model noise from

$$\kappa_t = \widehat{\kappa}_t + \zeta_t$$

- Where ζ_t is an orthogonal error term and a lower-bound of the true variance of model noise is given as

$$\sigma^2_{\widehat{\kappa}} \leq \sigma^2_{\kappa}$$

Country sample

- Use quarterly data for 1985-2005 as sample period
- IT countries (21 countries)
  - Australia, Brazil, Canada, Chile, Columbia, Czech Rep., Hungary, Iceland, Israel, Korea, Mexico, New Zealand, Norway, Poland, South Africa, Sweden Switzerland, Thailand and the UK
- 2 former ITers and current EMU countries
  - Finland and Spain
  - Sometimes in treatment group and sometimes in control group

Country sample

- Non-targeting countries (23 countries)
  - Non-ITers with GDP per capita and GDP (both PPP adjusted) below the poorest and smallest OECD members (Turkey and Iceland) are excluded
  - 10 EMU countries: Austria, Belgium, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands and Portugal
    - Plus 2 former ITers: Finland and Spain
  - 13 other countries: Cyprus, Denmark, Estonia, Hong Kong, Japan, Latvia, Lithuania, Malta, Slovakia, Slovenia, Taiwan, Turkey and the US

Country sample

- The non-targeting group therefore includes a very heterogenous group of countries
  - Ranging from very small to very large and from emerging market economies to very developed industrial countries
  - Wide array of monetary policy frameworks ranging from pegs, currency boards, monetary unions to floating rates with monetary targets or hybrid frameworks
- Therefore offers a very interesting “control” group to test against the “treatment” group of IT countries (and EMU countries)

IT effect in a GARCH framework

- Estimate a component GARCH model for each country
- The level noise equation

$$\widehat{\kappa}_t = \mu + \rho\widehat{\kappa}_{t-1} + \epsilon_t$$

- Specification of noise variability

$$\begin{aligned}(\sigma^2_{\epsilon,t} - \omega_t) &= \alpha(\epsilon^2_{t-1} - \omega_{t-1}) + \beta(\sigma^2_{\epsilon,t-1} - \omega_{t-1}) \\ \omega_t &= \varpi + \psi(\omega_{t-1} - \varpi) + \delta(\epsilon^2_t - \sigma^2_{\epsilon,t-1}) + \gamma D_t\end{aligned}$$

- Other GARCH specifications are also tried to check robustness

IT effect in a GARCH framework

- IT effect usually found to be statistically insignificant
- Few exceptions
  - IT has significantly decreased volatility of exchange rate noise in AUS, SWI, UK, COL and MEX – most very successful ITers
  - IT has significantly increased volatility of exchange rate noise in ICE, POL and SAF – all relatively less successful ITers with thinly traded currencies and less developed FX markets
- IT effect therefore seems correlated with economic development (or FX market development more precisely)
  - Typically positive (although usually insignificant) in emerging market economies
  - Typicall negative (although usually insignificant) in industrial countries

IT effect in a panel framework

- An alternative approch to measure the effect of IT on volatility of exchange rate noise is to use a panel approach
  - Simultaneously utilises the cross-country and time dimensions of the whole data sample
- Panel specification

$$V_{j,t} = \upsilon + \eta_j + \theta(L)V_{j,t-1} + \gamma D_{j,t} + \varepsilon_{j,t}$$

- Specify the cross-country effect as a fixed effect or a random effect

IT effect in a panel framework

- Volatility of exchange rate noise measured in three ways
  - 2 year rolling standard deviation
  - 4 year rolling standard deviation
  - The permanent component from a component GARCH model without the regime dummies
- In the presentation I will only report results for the first measure – the two other give same results
- Use 2 control groups
  - All 23 countries
  - 13 industrial countries
  - Both control groups account for temporary IT in FIN and SPA

IT effect in a panel framework

Panel estimates of IT effect on exchange rate noise

Measuring variance of exchange rate noise with a rolling 2 year horizon

	Group 1		Group 2	
	Fixed	Random	Fixed	Random
IT coefficient estimate	-0.00014	-0.00008	-0.00014	-0.00008
t-value	1.03	0.63	1.04	0.58
Number of observations	2,826	2,826	2,328	2,328
Standard error of regression	0.0017	0.0017	0.0017	0.0017
First order serial correlation	0.21	0.13	0.31	0.21

T-values are absolute values obtained using robust cross-section panel corrected standard errors. The random effect specification is estimated using feasible GLS. The test for first-order serial correlation reports p-values. The first country group includes all the 44 countries used in the paper: the 21 IT countries and a control group of 23 additional countries. The second country group includes 34 countries: the 21 IT countries and a control group of 13 industrial countries.

Joint analysis of IT and EMU

- The country sample also includes another important monetary policy regime change
  - Has EMU membership affected volatility of exchange rate noise?
- GARCH results
  - EMU dummy negative in 11 of 12 EMU countries and significantly negative in 9 of them
  - No sign of positive effects
  - EMU membership therefore seems to have reduced volatility of exchange rate noise
- Panel results confirm these results

Joint analysis of IT and EMU

Panel estimates of IT and EMU effects on exchange rate noise

Measuring variance of exchange rate noise with a rolling 2 year horizon

	Group 1		Group 2	
	Fixed	Random	Fixed	Random
IT coefficient estimate	-0.00015	-0.00009	-0.00015	-0.00009
t-value	1.08	0.71	1.08	0.66
EMU coefficient estimate	-0.00014	-0.00019	-0.00014	-0.00019
t-value	2.53	2.95	2.52	2.86
Number of observations	2,826	2,826	2,328	2,328
Standard error of regression	0.0017	0.0017	0.0017	0.0017
First order serial correlation	0.20	0.20	0.31	0.22

T-values are absolute values obtained using robust cross-section panel corrected standard errors. The random effect specification is estimated using feasible GLS. The test for first-order serial correlation reports p-values. The first country group includes all the 44 countries used in the paper: the 21 IT countries and a control group of 23 additional countries. The second country group includes 34 countries: the 21 IT countries and a control group of 13 industrial countries.

Robustness tests

- Results found to be robust to a battery of alterations in the country sample and model specification
  - Timing of IT adoption
  - Specification of control group
  - Different model specification
    - Specification of dependent variable, period fixed effects, lagging regime dummies [IT no longer significant in Iceland]
  - Different estimation methods
    - Difference-in-difference estimation, instrumental variables

Concluding remarks

- Adopting IT does not lead to excessive exchange rate volatility
  - No obvious effects of IT on volatility of exchange rate noise are found
  - There are a few individual countries where IT seems to have reduced volatility of exchange rate noise
    - Mainly successful industrial ITers
  - There are few individual countries where IT seems to have increased volatility of exchange rate noise
    - Mainly less successful ITers with less developed FX markets and thinly traded currencies
- EMU membership, however, seems to have reduced volatility of exchange rate noise

Concluding remarks

- Floating exchange rates therefore seem not only to serve as a shock absorber but are also a source of shocks
- Inflation targeting by itself does not seem to lead to excessive exchange rate volatility
- These excessive exchange rate fluctuations can be reduced by joining a monetary union
- Results found to be robust to a battery of alterations in the country sample and model specification