Monetary policy and quantitative easing in an open economy

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A tough discussion

- I agonized over the paper.
  - Ambitious, dense, written for the happy few.
  - Builds on earlier work by Polemarchakis and coauthors.
  - Inconsistent notations, patchwork, many typos.

- I almost understand the structure of the model and the derivations, but still struggling with the economic intuitions.

- I believe it is a great framework to study many interesting issues in an open monetary economy setting.

Plan for the discussion

- ► My (imperfect) understanding of the paper
  - ► Setup
  - ► Results

- ► A few comments

Setup

- Three dates $t = 0, 1, (2)$.
- Two countries $i = H, F$.
- One good.
- Linear production technology: $y_t^i = \ell_t^i$.
- Country-specific fiat money introduced through CIA constraint.
  - Price level p_{it}.
- Uncertainty at $t = 1$ described by state s, probabilities $f(s)$.
- Nominal assets
  - At $t = 0$, complete set of one-period, nominal, state-contingent securities, with prices $q_i(s)$.
  - At $t = 1$, non-contingent one-period nominal bond in each country.
- No friction on international trade in good, assets, currencies.

Households

- At $t = 0$
  - Start with exogenous nominal wealth.
  - Trade in money and state-contingent nominal securities
  - Buy good under CIA constraint
  - Produce y_0^i, sell in domestic currency, carry monetary proceeds to the next period

- At $t = 1$
  - Trade in money and one-period nominal bonds.
  - Buy good under CIA constraint
  - Produce $y_1^i(s)$, carry monetary proceeds to the next period

- At $t = 2$
  - End with zero nominal wealth.

Households

- If monetary policy sets positive nominal interest rates $r_{i0}, \{r_{i1(s)}\}$, then CIA binding.

- Intertemporal budget constraint:

$$p_{i0}c_0^i + \sum_s q_i(s)p_{i1}(s)c_1^i(s) \leq w_0^i + \frac{p_{i0}y_0^i}{1+r_{i0}} + \sum_s q_i(s)\frac{p_{i1}(s)y_1^i(s)}{1+r_{i1(s)}}.$$

- Nominal interest rate r_{it} works as a tax on production and drives marginal rate of substitution between consumption and leisure.

  - Higher r_{it} results in lower production at date t.

Households

- Preferences:

$$u(c_0^i, \ell_0^i) + \beta \sum_s f(s) u[c_1^i(s), \ell_1^i(s)].$$

- Utility function over consumption and labor, e.g.,

$$u(c, \ell) = \frac{c^{1-\rho}}{1-\rho} + \frac{(\bar{\ell} - \ell)^{1-\rho}}{1-\rho}.$$

Monetary/fiscal authority

Budget constraints

- Starts with net nominal liabilities W_0^i

$$W_0^i = M_0^i - \sum_i q_i(s) B_0^i(s).$$

- Flow budget constraint at $t = 1$ in state s

$$\frac{B_1^i(s)}{1 + r_{i1}(s)} = B_0^i(s) + M_1^i(s) - M_0^i.$$

- Zero net liabilities at $t = 2$ imposes $B_1^i(s) = M_1^i(s)$ for all s.

Policy

- Monetary/fiscal authority in country i sets
  - nominal interest rates r_{i0}, $\{r_{i1}(s)\}$,
  - composition of its bond holdings, i.e., set of weights

$$\xi^i(s) = \frac{B_0^i(s)}{\sum_{s'} B_0^i(s')}.$$

Equilibrium

Taking government policies as given, determine

- price level $p_{i0}, p_{i1}(s)$,
- exchange rate $e_0, e_1(s)$ pinned down by LoOP,
- security prices $q_i(s)$,
- consumption and production $c_0^i, c_1^i(s), y_0^i, y_1^i(s)$,
- money holdings and money supplies $m_{j0}^i, m_{j1}^i(s), M_0^i, M_1^i(s)$,
- household bond holdings $b_{j0}^i(s), b_{j1}^i(s)$.

Result 1: determinacy vs. indeterminacy

- ▶ Entire path of the price level uniquely determined.

- ▶ Contrast with QE type of monetary policy.
  - ▶ Indeterminacy under QE is an unappealing feature.

Result 2: Bad state of the world

- From now on, suppose $r_{F1}(s)$ independent of s.

- Let (s, s') such that $r_{H1}(s) > r_{H1}(s')$, then

$$
\begin{aligned}
y_1^i(s) &< y_1^i(s') \\
c_1^i(s) &< c_1^i(s')
\end{aligned}
$$

- Determines real risk premia.

Risk premia under alternative policy regimes

- Study implications of three types of monetary/fiscal policies for bond and currency risk premia.

- Three alternative policies:
  - Price stability (inflation targeting), i.e., policy such that

  $$p_{H1}(s) = p_{H1} \quad \forall s.$$

  - Monetary stability (nominal GDP targeting), i.e., policy such that

  $$M_1^H(s) = M_1^H \quad \forall s.$$

  - 'Financial stability', where

  $$\xi^H(s) = \frac{1}{S} \quad \forall s.$$

- Determinacy is guaranteed under all three policy types.

Result 3: AD prices and nominal yield curve

- Euler equation (state-by-state)

$$q_H(s) = \beta f(s) \frac{p_{H0}}{p_{H1}(s)} \left(\frac{c_0^H}{c_1^H(s)} \right)^\rho.$$

- Implication for nominal yield curve at $t = 0$ via no-arbitrage pricing of nominal, two-period, non-contingent bond.

Result 4: Currency risk premia

- Exchange rate (price of foreign currency in terms of domestic currency)

$$e_0 = \frac{p_{H0}}{p_{F0}}, \qquad e_1(s) = \frac{p_{H1}(s)}{p_{F1}(s)}.$$

- Forward exchange rate pinned down by covered interest rate parity

$$x_0 = e_0 \frac{1 + r_{H0}}{1 + r_{F0}}.$$

- Study the sign of $x_0 - \sum_s f(s) e_1(s)$.

- Can potentially account for failure of UIP (aka 'forward premium puzzle').

Comments (1)

▶ Major need of rewriting, merge two parts (ideally in infinite horizon setup), clean the proofs, and give intuitions about economic mechanisms.

▶ Do not assume too much prior knowledge from the reader, e.g., carefully define 'Non-Ricardian fiscal policy'.

▶ Discuss more the link between QE in practice and the way it is captured in the model.

▶ Better discuss differences with Dupor (JME, 2000).

▶ Describe full construction of equilibrium (numerical algorithm used for computation).

▶ Say something about the mapping between policy objectives and the $\{\xi^i(s)\}$ that implement them.

▶ Give better characterization of current account, and emphasize more the results that are specific to the open-economy setting.

Comments (2)

- ► Here LoOP in good market implies RER=1.
  - ► Extension with differentiated goods and home bias in preferences.

- ► How crucial is the assumption that production has to be sold for domestic currency?

- ► For conceptual clarity, it would help to distinguish central bank from fiscal authority.
  - ► Government taxes and debt issuance, central bank holds government debt.
  - ► Under what conditions are we fine considering just one monetary/fiscal authority? Game government vs. central banks?

- ► Would be nice to extend this setup to analyze the impacts of central bank foreign reserves policy.