Monetary policy spillovers, global commodity prices and cooperation

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Motivation

Commodities, price index (2010=100)
Motivation

- Conventional wisdom on commodity prices: MP should respond only to fluctuations in commodity prices that lead to second-round inflationary effects (strong focus on core inflation). This is consistent with exogoneous driven commodity prices.

- Endogeneity of commodity prices (Kilian 2009, 2015): while in the last years fluctuations in commodity prices were associated to global demand shocks, recent decline in commodity prices (oil) is associated to both demand and supply shocks.

- Global MP spillovers: given endogeneity of global commodity prices to monetary policy choices, are central banks sufficiently internalising MP spillovers and spillbacks (Rajan 2014; Caruana, Filardo and Hoffmann 2014).
Related literature


- MP + endogenous commodity (oil) prices: Nakov and Pescatori (2010).
What do we do?

- Our model: analyse MP + endogenous commodity prices. What happens when monetary authority misdiagnoses the drivers of commodity price fluctuations?

Main results:

- Demand shocks: "fully against the wind".
- Supply shocks: optimal to partially stabilise the impact of fluctuations in commodity prices on headline inflation.
- It is important to distinguish between external supply and global demand shocks when responding to commodity prices.
- Misdiagnosis of the drivers of commodity price fluctuations can contribute to increase the pro-cyclicality of global inflation, output and commodity prices.
The model

Commodity goods in the domestic (importing) economy

The commodity good is used for both consumption and as input for production:

- **Headline inflation** = **core inflation** + **commodity price inflation**.
- **Marginal costs** depend on **wages** and **commodity prices**.
The model

The commodity market

- **Players:** 1 commodity importing country, 1 dominant commodity exporter and a fringe of small competitive commodity exporters.
- **Dominant commodity exporter** sets prices taken into account: demand from importer country and supply from competitive exporters.
- **The (real) commodity price** \( (Q_t) \) is given by:

\[
Q_t = \Psi_t Z_t^{-1}
\]

where \( \Psi_t \) is the price markup over marginal costs \( (Z_t^{-1}) \).

The larger (lower) the size of the fringe of competitive exporters, the lower (larger) the markup.

- When \( \Psi_t \to 1 \): perfect competition.
- \( \Psi_t \to \infty \): single monopolist case.
The model

Other characteristics

- **Commodity importing country:**
  - Monopolistic competition and nominal rigidities in final goods production.
  - Central bank sets MP using a Taylor rule.
  - No capital

- **Commodity exporting countries:**
  - Produce only commodity goods (input: final goods from the importing country).
  - No nominal rigidities.

- Cross-border financial autarky (no cross-border borrowing).
- Trade is carried out in a common world currency (exchange rates are not defined)
Characterising optimal policy:

Policy benchmarks

- **Natural output gap** \((\hat{y}_t^n)\): gap with respect to output consistent with flexible price equilibrium.

\[
\hat{y}_t^n = \left( \frac{\alpha}{1 - \alpha} - \frac{1}{1 + \nu} \frac{\gamma}{\gamma} Y \right) mc_t
\]

- **Efficient output gap** \((\hat{y}_t^e)\): gap with respect to output consistent with flexible price equilibrium and perfect competition in commodity and final goods.

\[
\hat{y}_t^e = \hat{y}_t^n - \left( \frac{\alpha}{1 - \alpha} - \frac{1}{1 + \nu} \frac{\gamma}{1 - \gamma} Y \right) \psi_t - \frac{1}{1 + \nu} \frac{\gamma}{1 - \gamma} (Y - Y^e) z_t
\]

- Similarly we characterise the **natural interest rate** and the **efficient interest rate**.
Characterising optimal policy:

**Inflation dynamics and optimal Taylor rules**

- Headline and core inflation are determined by:

  \[ \pi_t = \pi_{Y,t} + \frac{\gamma}{1-\gamma} \Delta q_t \]  
  \[ \pi_{Y,t} = \kappa_y \hat{y}_t^n + E_t \pi_{Y,t+1} \]  

- The Phillips curve in terms of the welfare relevant output gap (\( \hat{y}_t^e \)):

  \[ \pi_{Y,t} = \kappa_y \hat{y}_t^e + E_t \pi_{Y,t+1} + u_t \]  

where \( u_t = f(\psi_t, z_t) \) is an endogenous cost-push shock. The divine coincidence is broken.

- Taylor rules that implement (closely) optimal policy:

  \[ r_t = r_t^j + \phi_{\text{core}} \pi_{Y,t} + \phi_y \hat{y}_t^j \]  
  for \( j = \{n, e\} \)
Optimal response to a demand shocks

Natural vs efficient policies

- Inflation (a)
- Commodity Market (b)
- Commodity Market (c)
- Output (d)
- Output gap (e)
- Interest rate (f)
Optimal resp. to a comm.supply shock

Natural vs efficient policies

- Inflation (a)
- Commodity Market (b)
- Commodity Market (c)
- Output (d)
- Outputgap (e)
- Interestrate (f)
Signal-extraction problem (1)

- Central bank does not observe $z_t$ and $\psi_t$
- Commodity price:
  \[ q_t = -z_t + \psi_t = H'\xi_t \]
- By Kalman filtering we have:
  \[ E_{cb}^t \begin{bmatrix} z_t & \psi_t \end{bmatrix}' = Mq_t \]
  where $M$ is a weighted average of the variance and covariances (signal/noise ratios).
Policy misperception

- Misperception types

  Case A: if $\sigma_\psi / \sigma_z \to 0$, $E^{cb}_t \begin{bmatrix} z_t & \psi_t \end{bmatrix}' \to \begin{bmatrix} 0 & q_t \end{bmatrix}'$

  Case B: if $\sigma_\psi / \sigma_z \to \infty$, $E^{cb}_t \begin{bmatrix} z_t & \psi_t \end{bmatrix}' \to \begin{bmatrix} -q_t & 0 \end{bmatrix}'$

  Case C: general case

given this, the central bank estimates the policy benchmarks $[E^{cb}_t (r^e_t)$ and $E^{cb}_t (\hat{y}^e_t)]$ to be used in the policy rule (4).

- Taylor rule with misperception error

  $r_t = E^{cb}_t (r^e_t) + \phi_\pi \pi_y,t + \phi_y E^{cb}_t (\hat{y}^e_t)$

  $= r^e_t + \phi_\pi \pi_y,t + \phi_y \hat{y}^e_t + e_t$ \hspace{1cm} (5)

  where $e_t \equiv [E^{cb}_t (r^e_t) - r^e_t] + \phi_y [E^{cb}_t (\hat{y}^e_t) - \hat{y}^e_t]$ corresponds to a misperception error.
Resp. to a commodity supply shock

(Misperception type A)
Resp. to a demand shock

(Misperception type B)
Resp. to a commodity supply shock

(Misperception type C)
Resp. to a demand shock

(Misperception type C)
Conclusions

- We present a framework to analyse MP spillovers on commodity prices and issues of global coordination.
- When commodity prices are endogenous, the divine coincidence is broken.
- The optimal response to demand shocks is to fully lean against the wind.
- The drivers of commodity prices matter to characterise the optimal MP.
- The failure to correctly identify such drivers would exacerbate fluctuations in commodity prices, inflation and output.