How important are commodity price shocks?

Sergio Serván Lozano

University of Chicago

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INTRODUCTION

- What drives business cycles in small open economies?
  1. Total factor productivity (TFP)
  2. Foreign interest rates
  3. External demand/supply
  4. Commodity prices

- This paper explores the **dynamic effects of commodity price shocks** for a set of small commodity exporters through the estimation of a **Panel VAR model with lagged inter-dependencies and time varying parameters**.

MOTIVATION

- Recent large swings in country's terms of trade, mostly due to fluctuations in commodity prices.

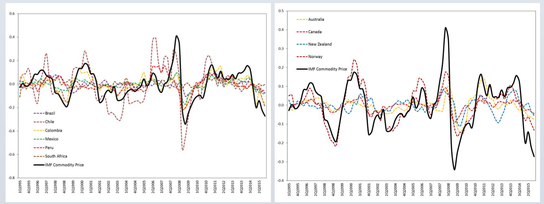

Figure 1. Terms of Trade and IMF Commodity Price Index (1995 = 100) (Cyclical Component)

- However, the quantitative importance is still an open question:
  1. Large impact: Mendoza (1996) and Kose (2002)
  2. Small impact: Schmitt-Grohé and Uribe (2018)

TERMS OF TRADE VS COMMODITY PRICES

- Are terms of trade really exogenous? (Bodenstein et. al., 2018)

  1. More plausible for developing economies (small and homogeneous set of exportable goods).
  2. Advanced commodity exporters present a more pronounced difference between the commodity and non-commodity traded goods sector.

- Recent studies have preferred to use commodity prices instead of terms of trade (computed using unit value indices):

  1. Unit value indices are subject to **biases** that produce important discrepancies (Silver, 2009).
  2. Unit value indices are more possible to be **endogenous** with respect to country-specific shocks than global commodity prices.
  3. Nominal rigidity and incomplete pass-through **prevent** terms of trade indices **from correctly incorporate contemporaneous shocks** that induce immediate effects **on the exchange rate** (Chen and Rogoff, 2003)

RESULTS

A comparison between emerging and advanced countries

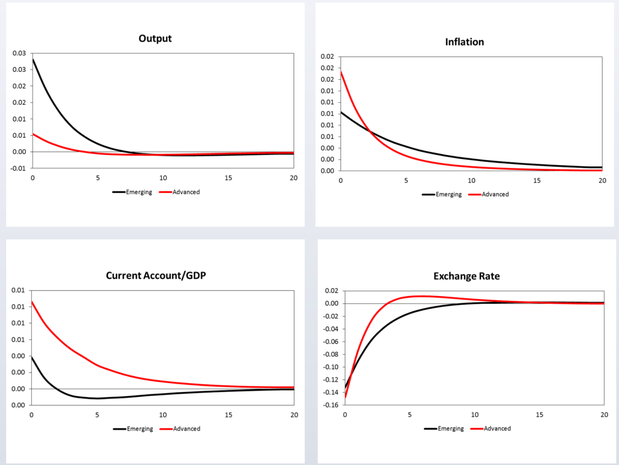

Figure 2. Impulse Response Functions to a unit shock on Commodity Prices

Average Results

1. ***Currency appreciation:*** substitution + income effects
   - No much heterogeneity on impact, but more persistence for emerging economies.
2. ***CA improves***: HLM effect (↑ exports > ↑ imports)
   - Emerging economies experience lower improvement because of profit repatriation.
3. ***GDP expansion***: consistent with the effect of an income shock
   - Higher effect for emerging economies.
4. ***Inflationary pressures***: higher demand > currency appreciation

1. ***Emerging economies:***
   - Highest impact on CA for Colombia and Mexico (exports concentrated in energy products).
   - HLM effect not present in Peru (dual effect of commodity prices due to the high share of foreign-owned commodity firms: profit repatriation > trade balance improvement).
   - Exchange rate response aligned with the degree of exchange rate flexibility (Brazil vs Peru – active ER intervention).

2. ***Advanced economies:***
   - Similar responses for ER and inflation.
   - Main difference on output (decreases for Australia) and CA (highest impact for Norway).

A comparison across countries

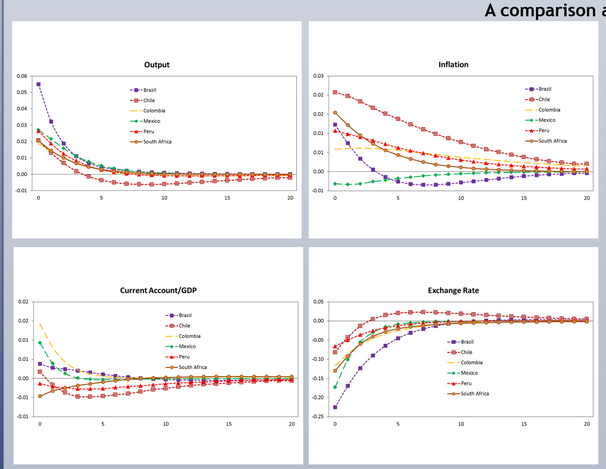

Figure 3. Emerging Economies - IRF to a unit shock on Commodity Prices

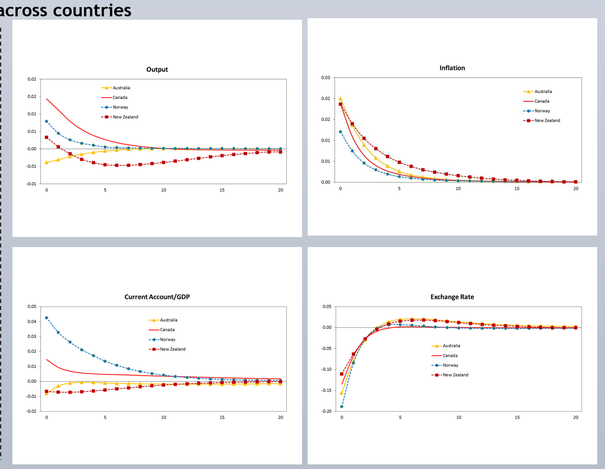

Figure 4. Advanced Economies - IRF to a unit shock on Commodity Prices

EMPIRICAL MODEL

$$y_{it} = D_{it}(L)Y_{t-1} + F_{it}(L)Z_t + c_{it} + e_{it}$$

where y_{it} is a $M \times 1$ vector of endogenous variables for each country, $Y_t = (y'_{1t}, \cdots y'_{Nt})'$, Z_t is a $M_2 \times 1$ vector of exogenous variables, and c_{it} and e_{it} are $M \times 1$ vectors of intercepts and random disturbances, respectively. $D_{it}(L)$ is a polynomial that contains $M \times NM$ matrices for each lag "p" and $F_{it}(L)$ contains $M \times M_2$ matrices for each lag "q".

- *Advantages*: (i) Cross-unit lagged inter-dependencies if $D_t(L) = [D_{1t}(L), \cdots, D_{Nt}(L)]'$ is not block diagonal, (ii) coefficients vary over time and (iii) dynamic relationships are unit-specific.
- *Disadvantages*: $k = NMp + M_2(1+q) + 1$ parameters to estimate.

- *Solution*: Factor δ_t (contains the elements of D_{it} and F_{it}) as

$$\delta_t = \Xi_1\theta_{1t} + \Xi_2\theta_{2t} + \Xi_3\theta_{3t} + \Xi_4\theta_{4t}$$

(i) Estimate $\theta_t = [\theta'_{1t}, \theta'_{2t}, \theta'_{3t}, \theta'_{4t}]'$ and variances with **Bayesian procedures**.

(ii) Set **conjugated priors** and use a **Gibbs sampling routine**.

CONTRIBUTION

- I follow the work of Shousha (2016) with two differences:

  1. Data: **IMF Commodity Price Index**
     - Exogenous variable common to all countries.
     - Shocks are not comparable among countries under a country specific price index.
     - Country specific commodity price indices share an important common global factor (Fernández et. al., 2018)

  2. Empirical Methodology: **Panel VAR with cross-country lagged interdependencies** (Canova and Ciccarelli, 2009)
     - Estimate country's behavior simultaneously (all countries are subject to the same external shock)
     - Shousha (2016) imposes common parameters to every country.
     - Flexible approach to allow inter-linkages among countries and variables as well as time varying parameters.

CONCLUSIONS

1. **On average, positive effects for output and inflation, ER appreciation and CA improvements (Figure 1).**
2. **Heterogeneous responses for individual countries (Figure 2 and Figure 3).**
3. **The impact of commodity prices on GDP has increased.**

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CONTACT

Sergio Serván Lozano

MAPSS (Economics), University of Chicago

Email: sservanlozano@uchicago.edu