TIME-VARYING EXCHANGE RATE PASS-THROUGH INTO TERMS OF TRADE

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U.S. Dollar: A Dominant Currency

- U.S. pays for 97% of its foreign imports and sells 90% of its exports to the rest of the world using the U.S. dollar (Gopinath and Rigobon (2008)).
- This pattern hardly changed throughout 1995-2015 (Gopinath (2015)).
- U.S. dollar also dominates trade invoicing for other countries (Gopinath et al. (2020)).
- If U.S. import and export prices are sticky in U.S. dollars, then the U.S. dollar depreciations cause the U.S. import (export) prices to increase by 30% (3%).
- U.S. terms of trade, measuring the relative price of imports to exports, would therefore deteriorate by 7%. This magnitude is unusually low.

Is Dollar Invoicing the Same as Dollar Pricing?

- Not all prices are equally sticky.
- Bils and Klenow (2004) show that primary commodity prices adjust far more frequently than non-commodity prices (i.e. manufactured goods and services).
- One quarter and one-tenth of U.S. imports and exports, respectively, are primary commodities (see Figure 1).
- Hypothesis 1: If U.S. terms of trade respond to U.S. dollar depreciations by more than 7%, controlling for confounding factors, then not all prices that are invoiced in U.S. dollars are sticky in U.S. dollars.
- Hypothesis 2: If the amount by which the U.S. terms of trade respond to U.S. dollar depreciations changes over time, controlling for changes in other fundamentals, then price stickiness also changes over time.

Exchange Rate Pass-Through (ERPT)

- Notation: \( \Delta TOT = \tau_i - \tau_{i-1} \) and \( \Delta EX = \phi_i - \phi_{i-1} \) are the log differences in terms of trade (TOT) and nominal exchange rate (NEER), respectively.

1. **Definition 1**: ERPT measures "how much" and "how fast": \( \phi_i \) is transmitted into \( \Delta TOT \) where \( h = 0, 1, 2, \ldots \) is the time horizon.

2. **Definition 2**: Transmission of \( \Delta EX \) into \( \Delta TOT \) is said to be: (i) short-run when \( h = 0 \), (ii) medium-run when \( 0 < h < \infty \), and (iii) long-run when \( h \to \infty \).

- Standard measurement equation of time-invariant ERPT (e.g. Campa and Goldberg (2005), Burstein and Gopinath (2014)).

\[ \Delta TOT = \lambda \Delta \tau_{i-1} + \phi_i \Delta EX + \xi_i, \]

\[ \Delta \tau_i = \phi \Delta \tau_{i-1} + \delta \tau_i + u_{i-1}, \]

where \( \Delta \tau_i = [\Delta \tau_{1-i}, \Delta \tau_i, \xi_i] \) is a 1 x k vector of control variables, \( \phi_i = [\phi_1, \phi_2, \ldots, \phi_i] \) is a k x 1 vector of observable state variables, and \( \gamma_i = [\gamma_{1-i}, \gamma_i] \) is a 1 x 1 measurement variable.

- Time-varying ERPT into TOT is defined as: (i) Kalman (1960) filter; (ii) fixed interval Kalman smoother (de Jong (1989)); (iii) quasi maximum likelihood (Durbin and Koopman (2012)); and (iv) parametric bootstrapping (Rodriguez and Ruiz (2009)).

- If \( \Delta EX \) and \( \xi_i \) are uncorrelated, ERPT at any time horizon \( h = 0, 1, 2, \ldots \) is given by

\[ \mu_{h,i} = \phi_h \sum_{i=1}^{h} \Delta TOT_i = \phi_h \sum_{i=1}^{h} \Delta \tau_i, \]

- In the short-run, \( \mu_{h,i} = \phi_h \). In the long-run, \( \mu_{h,i} = \phi_h/(1 - \lambda) = \tau_i \).

U.S. Terms of Trade and the U.S. Dollar

- I find a robust time-varying relationship between the U.S. TOT (i.e. incl. commodity and non-commodity prices) and U.S. NEER (see Figure 2).
- By contrast, in the paper, I show that ERPT into TXT (i.e. TOT excl. commodity prices) is virtually constant over time.
- I conclude that ERPT time-variation stems from commodity prices.
- I show that ERPT is counter-cyclical: in 2008-2009 ERPT into TOT peaks at 60-70%, but in 1992-1999 and 2010-2014 it less than 30%.
- Implication: despite being invoiced in U.S. dollars, commodity prices are not always sticky in U.S. dollars, especially not when the U.S. slips into a recession.

References