Monetary Policy Challenges in a Changing Global Environment
Foreign Effects of Higher U.S. Interest Rates

Matteo Iacoviello*       Gaston Navarro*

*Federal Reserve Board

Asia Economic Policy Conference – SF Fed

November 17, 2017

Disclaimer: The views expressed are solely the responsibility of the authors and should not be interpreted as reflecting the views of the Board of Governors of the Federal Reserve System or of anyone else associated with the Federal Reserve System.
The Fed Funds Rate from 1965 through 2016

Figure 1: U.S. Interest Rates

Note: Shaded Areas denote interest rate tightenings.

Shaded areas: periods of monetary tightenings
Last six tightenings: a mixed picture

1. 1978q1 - 1981q2 Tightening

2. 1983q3 - 1984q3 Tightening

3. 1987q2 - 1989q2 Tightening

4. 1993q4 - 1995q2 Tightening

5. 1999q3 - 2000q3 Tightening

6. 2004q2 - 2006q3 Tightening

GDP growth relative to ARMA forecast, Advanced and Emerging regions
How large are the foreign GDP spillovers from higher U.S. interest rates?

Many authors — Canova (2005), Maćkowiak (2007), Georgiadis (2016), Rey (2015), Dedola, Rivolta, and Stracca (2017) — argue that these spillovers are very large.

Few systematic cross-country attempts to tell the channels of transmission apart.

Most studies focus on limited countries, or short time periods.
This Paper

- Measure foreign GDP spillovers from U.S. interest rate surprises
  - 50 countries covering 1965 Q1–2016 Q4 (≈10,000 observations)
  - Effect allowed to depend on country’s conditions

- Methodology: panel version of local projections method, amended to allow for the spillovers to depend on country-specific, time-varying characteristics:
  - trade exposure with the U.S.
  - exchange rate regime against the dollar
  - a country’s financial position
Findings: U.S. Foreign Spillovers are substantial

- A 100 bps policy surprise reduces GDP after 3 years by:
  - 0.7% in the U.S.
  - 0.5% in Advanced Foreign Economies (AFEs)
  - 0.8% in Emerging Market Economies (EMEs)

- Effects depend on country’s conditions
  - AFE effects magnified by trade and exchange rate regime.
  - EME effects magnified by country’s financial conditions.

- The Mundell-Fleming-Dornbusch model appears to work well for AFEs, not so much for EMEs
Plan for the talk

1. Data
2. Measuring the channels of international interest rate transmission
3. Methodology
4. Results
Data

Key ingredients needed:

1. Measures of U.S. interest rate surprises
2. Foreign GDP

To understand transmission:

1. exchange rate regime vis--vis U.S.
2. trade with U.S.
3. other controls (inflation, current account)

To verify transmission:

1. foreign exchange rates
2. foreign interest rates
3. foreign macro variables
Three Channels of Transmission...

1. **Exchange Rate Channel**
   - GDP of countries anchoring to the dollar should drop more following U.S. monetary shock

2. **Trade Channel**
   - GDP of countries trading more with the U.S. should drop more following U.S. monetary shock

3. **Financial Channel**
   - Capital market frictions may magnify the impact on a country of U.S. monetary shocks
   - These frictions can be exacerbated when fundamentals are weak
...and their Data Counterparts

1. Exchange Rate Exposure
   - We draw on Ilzetzki, Reinhart, and Rogoff (2017) to construct a 0/0.5/1 index that is higher the more a country pegs to the dollar

2. Trade Exposure
   - We construct an index of trade openness with U.S. by taking the sum of exports to, and imports from the U.S., and dividing by GDP

3. Financial Exposure
   - Construct vulnerability index: first principal component of
     - Year-on-year inflation (+)
     - Current account deficit, expressed as a share of GDP (+)
     - Cyclical GDP (−)

See paper for details on smoothing, trimming, transformations, and so on
Exposure Measures $e_{i,t}$

### AFE Exposure Indexes

#### Dollar Peg

Canada | Japan | United Kingdom

#### Trade with U.S.


0.75 0.5 0.25 0

#### Vulnerability Index


0.75 0.5 0.25 0

### EME Exposure Indexes

#### Dollar Peg

Mexico | Korea | China

#### Trade with U.S.


0.75 0.5 0.25 0

#### Vulnerability Index


0.75 0.5 0.25 0

The indexes are logistic transformations of the original variables.
Local Projection Method: Average Effects

Estimate GDP spillovers to foreign economies of U.S. shocks from:

\[ y_{i,t+h} = \alpha_{i,h} + \beta_h u_t + A_{h,i} Z_{i,t} + \epsilon_{i,t+h} \]

- \( y_{i,t} \) GDP of country \( i \) in quarter \( t \)
- \( \alpha_{i,h} \) country fixed effect
- \( u_t \) is the identified monetary shock, using residuals of VAR-style feedback rule
- \( Z_{i,t} \) controls
- IRF: \( \beta_h \) (average) response to monetary shock
Local Projection Method: Channels of Transmission

Incorporate country-specific economic conditions:

\[ y_{i,t+h} = \alpha_{i,h} + \beta_h u_t + \sum_v \beta^v_h (e^v_{i,t-1} u_t) \perp + A_{h,i} Z_{i,t} + \epsilon_{i,t+h} \]

- \( e^v_{i,t-1} \): centered transformation of exposure measure
- \( (e^v_{i,t-1} u_t) \perp \): interaction effect, orthogonal to \( u_t \) and previous interactions
- \( \beta^v_h \): marginal effect of moving from \textit{median} to \textit{high} exposure

- Ordering: exchange rate channel, trade channel, financial channel
- We estimate the local projection separately for AFEs and EMEs. Within group, effects only allowed to differ according to exposure.
Results I: Average Effects of U.S. Monetary Shocks

Response to Monetary Shocks

- **US GDP**
- **Fed Funds Rate**
- **AFE GDP**
- **EME GDP**

Note: Impulse Response to a U.S. Monetary Shock in the Benchmark Specification.
Results II: Exposure Matters

**AFE GDP Response by Index**

- Dollar Peg
- Trade with U.S.
- Vulnerability Index

**EME GDP Response by Index**

- Dollar Peg
- Trade with U.S.
- Vulnerability Index

---

Note: Matteo will add something here

---

Figure 6: GDP Response % to a Monetary Shock by Index

---
Summary of Main Results

1. Strong foreign effects

2. Larger effects for emerging economies

3. Trade and exchange rate channels explain well the cross-section of responses for AFEs

4. Vulnerability channel explains well the cross-section of responses for EMEs
Marginal Effects: Foreign Interest Rate Responses

**AFE Interest Rate Response by Index**
- **Dollar Peg**
- Median and High

**EME Interest Rate Response by Index**
- **Dollar Peg**
- Low Exposure

**Note:** Response of foreign interest rates to a 100 basis points surprise increase in the U.S. Interest Rate.

Figure 8: Interest Rate Response (Percentage Points) to a Monetary Shock by Index
Marginal Effects: Foreign Exchange Rate Responses

**AFE Exchange Rate Response by Index**

- **Dollar Peg**
- **Trade with U.S.**
- **Vulnerability Index**

**EME Exchange Rate Response by Index**

- **Dollar Peg**
- **Trade with U.S.**
- **Vulnerability Index**

Figure 7: Real Exchange Rate Response % to a Monetary Shocks by Index

Note: Response of Foreign Real Exchange Rate Indexes to a 100 basis points increase in U.S. interest rates. Higher values indicate an appreciation of the real exchange rate.
Summary of Channels

1. Interest rates rise more in AFE peggers, consistent with larger decline in GDP for AFE peggers

2. Slight dollar appreciation for AFE peggers, consistent with larger decline in GDP

3. Interest rates rise a lot in vulnerable EMEs, consistent with larger GDP decline
Robustness: Alternative Shocks and Periods

Impulse Responses: Romer & Romer Shocks

US GDP
Fed Funds Rate
AFE GDP
EME GDP

Impulse Responses: Excluding ZLB period

US GDP
Fed Funds Rate
AFE GDP
EME GDP
Robustness: U.S. Demand causes FFR ↑100 bps

Source of higher interest rate matters!
How Large? Historical Decompositions

Canada

Japan

Mexico

Korea

4-quarter percent change

GDP

Median Effect

Dollar Peg

Trade w U.S.

Vulnerability Index


1. We find large foreign effects of U.S. monetary shocks

2. In advanced economies, effects consistent with Mundell-Fleming-Dornbusch model

3. In emerging economies, importance of financial factors suggests importance of global financial cycle driven by U.S. monetary policy
Shock calculated as residual of regression of U.S. interest rate on own lags, current and lagged GDP, inflation, foreign GDP, BAA spread.

We replace the FFR with the Wu and Xia (2016) shadow rate from 2009 to 2015.
Robustness: No Backfilling

**AFE GDP Response by Index**

- **Dollar Peg**
- **Trade with U.S.**
- **Vulnerability Index**

**EME GDP Response by Index**

- **Dollar Peg**
- **Trade with U.S.**
- **Vulnerability Index**

---

Note: Matteo will add something here.
# Data Coverage

## Table 1: Data Availability

<table>
<thead>
<tr>
<th>Country</th>
<th>GDP first</th>
<th>GDP firstQ</th>
<th>GDP last</th>
<th>Dollar Peg first</th>
<th>Dollar Peg last</th>
<th>Trade with U.S. first</th>
<th>Trade with U.S. last</th>
<th>Inflation first</th>
<th>Inflation last</th>
<th>Current Account first</th>
<th>Current Account last</th>
</tr>
</thead>
</table>
## Data Coverage contd.

<table>
<thead>
<tr>
<th>Country</th>
<th>Year Start</th>
<th>Year End</th>
<th>Year Start</th>
<th>Year End</th>
<th>Year Start</th>
<th>Year End</th>
<th>Year Start</th>
<th>Year End</th>
<th>Year Start</th>
<th>Year End</th>
</tr>
</thead>
</table>

Data coverage for each of the variables included in the panel.
Papers Cited


