Interdependence of Monetary Policy and Exchange Rates

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Introduction

- Exchange rates are a key macroeconomic variable
- Policymakers, businesses, traders and academics all pay attention
- Understandable since it affects a number of macro variables
  - current account
  - foreign exchange reserves
  - bank and firm balance sheets
  - other variables indirectly

Questions

- Three questions surround exchange rates
  - what factors determine exchange rate behavior?
  - how does monetary policy affect exchange rates?
  - what should the policy be towards exchange rates?
- Focus today is on first two
- Focus is on monthly/quarterly frequency, not daily

Exchange Rate Puzzles Everywhere

- Exchange rate behavior represents puzzles everywhere
- Profit logic cannot seem to explain standard medium term exchange rate movement
- Effects of monetary policy on exchange rates is also puzzling
- Some puzzles are solvable, others are harder

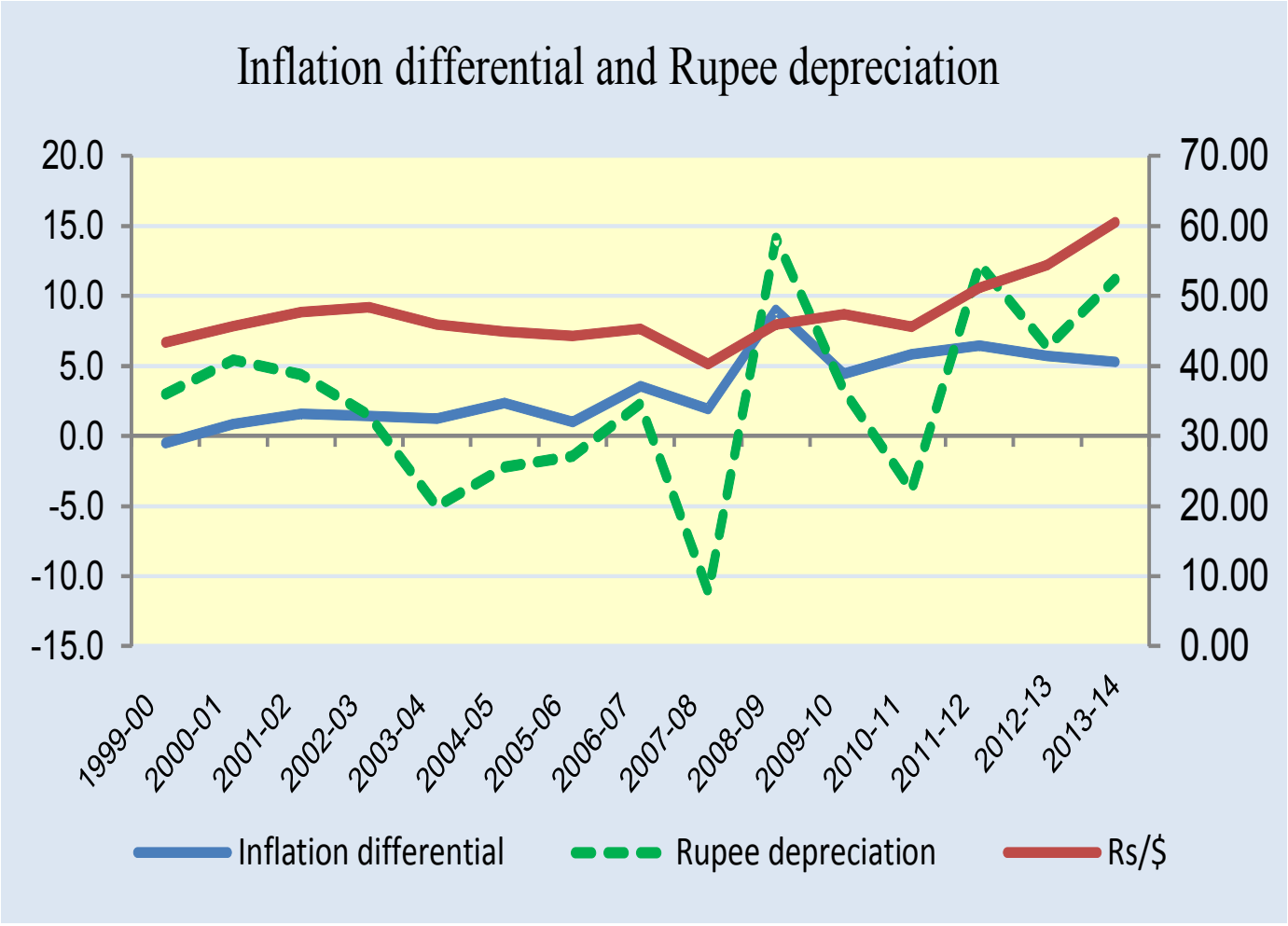
Exchange Rate Determination

- Two basic approaches to exchange rate determination
  - logic of goods trade
  - logic of asset trade
- Exchange rate pricing follows some arbitrage relationship
  - goods trade: purchasing power parity (PPP)
  - asset trade: interest parity (IRP)

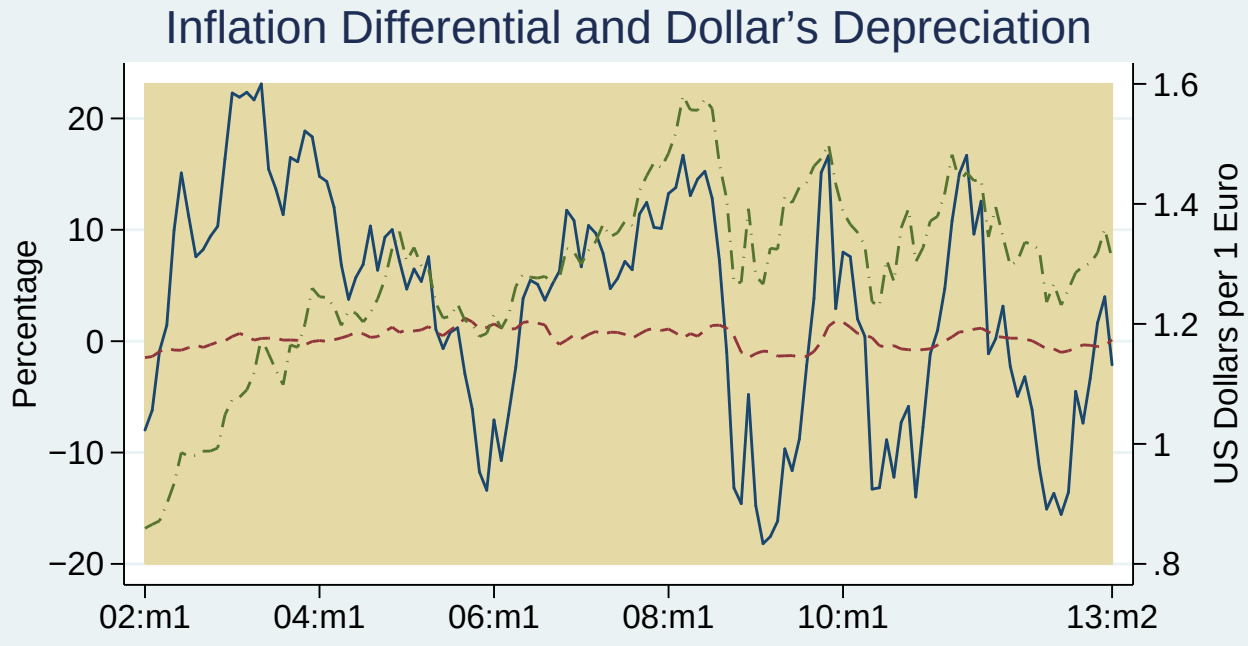
Purchasing Power Parity

- PPP: $P = EP^*$
- Cost of living should be changing at same rate across countries when expressed in the same currency
- This preserves the relative purchasing power of the rupee compared with the dollar
- Holds better for developing countries
- Not a good fit for developed countries: **excess volatility puzzle**

The Developing World: Rupee against the USD



The Developed World: USD against the Euro



Sources: NY Fed, Eurostat, IMF

Interest Parity Conditions

- Two conditions:
  - covered interest parity
  - uncovered interest parity
- Covered interest parity typically holds
- Uncovered interest parity fails
  - forward premium anomaly
  - carry trade profits
- **Puzzle???**

Monetary Policy and Exchange Rates

- Old question: how does monetary policy affect exchange rates?
- Conventional wisdom: monetary tightening (higher interest rates) appreciate the currency
- Evidence mostly for developed countries: it holds

New Evidence on Monetary Policy and Exchange Rates

- Joint work by Hnatkovska-Lahiri-Vegh (2016)
- Look at a broader set of 72 countries
  - 25 developed and 47 developing
  - monthly data for 1974-2010
- Re-examine the empirical relationship between monetary policy and exchange rates

Empirical approach

- Monetary policy proxied by interest rates
  - T-Bill rates
  - Discount rate (if T-Bill not available)
- Exchange rates are defined as LCU/USD
- Examine relationship using simple correlations and VARs

Exchange rate regimes

- Use flexible exchange rates regimes taken from Reinhart-Rogoff (2004)
- A country could have multiple flexible rate episodes during the sample period
  - minimum 24 months data for each episode
  - 80 country-episodes pairs in total: 25 developed, 55 developing

Simple correlations

	Developed	Developing
$corr(\ln E_t, i_t - i_t^{us})$		
mean	-0.09	0.24
median	-0.08	0.36
$corr(\Delta_t \ln E, \Delta_t (i - i^{us}))$		
mean	-0.10	0.13
median	-0.11	0.13
$\ln E_t = \beta_0 + \beta_1(i_t - i_t^{us}) + \varepsilon_t$		
mean($\hat{\beta}_1$)	-0.74	2.19
95% c.i.($\hat{\beta}_1$)	[-0.94; -0.54]	[1.99; 2.39]
$\Delta_t \ln E_t = \alpha_0 + \alpha_1 \Delta_t(i_t - i_t^{us}) + u_t$		
mean($\hat{\alpha}_1$)	-0.44	0.24
95% c.i.($\hat{\alpha}_1$)	[-0.57; -0.31]	[0.09; 0.38]

Vector AutoRegressions (VARs): Exogenous interest rate rule

Bivariate VAR specification:

- ordering: $i - i^{US}, \ln E$

	(a). Levels		
	impact	1 month	3 months
Industrial countries: appreciation	84%	88%	84%
Developing countries: depreciation	75%	75%	75%
	(b). First-differences		
	impact	1 month	3 months
Industrial countries: appreciation	84%	88%	52%
Developing countries: depreciation	70%	62%	60%

Exchange Rate Response to Monetary Policy

- Developing countries behave differently from developed countries
- Developing country response is contrary to convention wisdom
- Exchange rate response **puzzle???**

Explanations?

- Central banks in different countries may be responding to domestic conditions differently
- Different ability of monetary authorities to precommit to not responding to exchange rate changes in two groups of countries?
- Risk premium shocks hitting developed and developing countries may be different

VARs: Endogenous interest rate rules

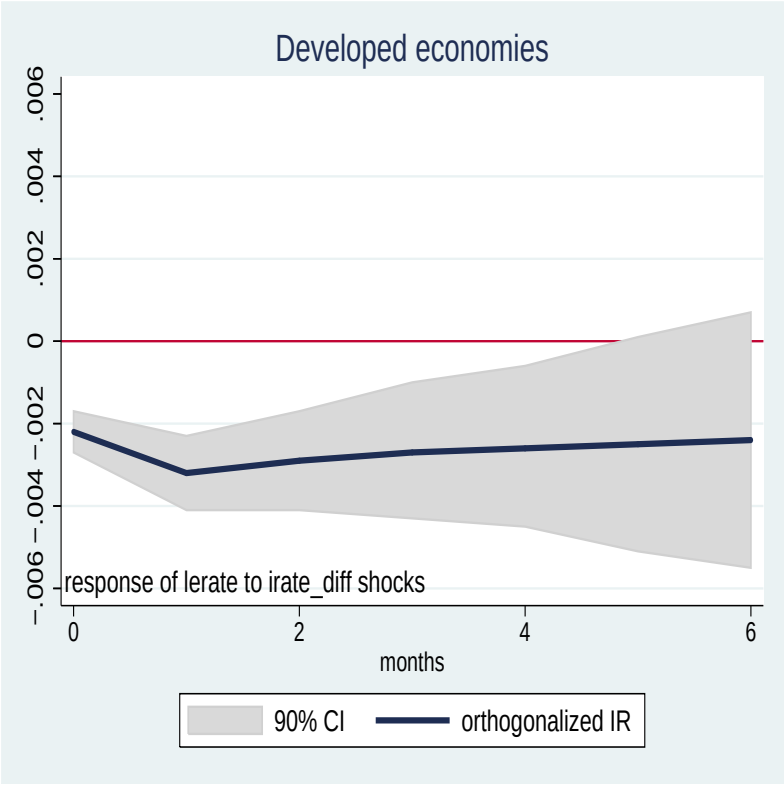
- Specification 2. With price level: $\ln P, i - i^{US}, \ln E$
- Specification 3. With CPI inflation: $\pi, i - i^{US}, \ln E$
- Specification 4. With expected inflation: $\pi_{t+1} - \pi_{t+1}^{US}, i_t - i_t^{US}, \ln E_t$
- Specification 5. With risk premium shocks: $rp, i - i^{US}, \ln E$
- Specification 6. With output: $\ln y, i - i^{US}, \ln E$
- Specification 7. All shocks: $rp, \ln y, \ln P, i - i^{US}, \ln E$
- Specification 8. Structural VAR:
  - interest rates have no long-run effects on the *real* exchange rate

VAR results

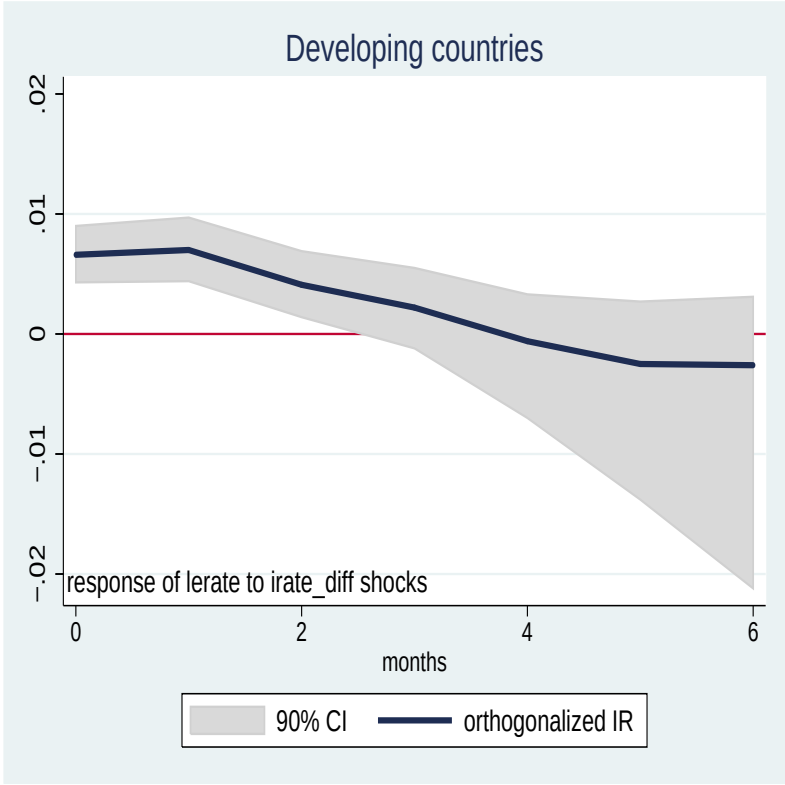
Impulse response of exchange rate to interest rate shock

	(a). Levels		
	impact	1 month	3 months
(2): $\ln P, i - i^{US}, \ln E$			
Industrial: *appreciation*	82%	82%	82%
Developing: *depreciation*	76%	67%	74%
(3): $\pi - \pi^{US}, i - i^{US}, \ln E$			
Industrial: *appreciation*	82%	82%	82%
Developing: *depreciation*	67%	69%	69%
(4): $\pi_{t+1} - \pi^{US}_{t+1}, i_t - i^{US}_t, \ln E_t$			
Industrial: *appreciation*	82%	82%	82%
Developing: *depreciation*	71%	69%	71%
(5): $rp, i - i^{US}, \ln E$			
Industrial: *appreciation*	72%	84%	84%
Developing: *depreciation*	72%	72%	69%
(6): $\ln y, i - i^{US}, \ln E$			
Industrial: *appreciation*	84%	89%	84%
Developing: *depreciation*	64%	73%	64%
(7): $rp, \ln y, \ln P, i - i^{US}, \ln E$			
Industrial: *appreciation*	83%	92%	92%
Developing: *depreciation*	70%	60%	70%

Panel VARs: Impulse response (levels)



(a) industrial countries



(b) developing markets

Figure: Exchange rate response to interest rate shock

Resolving the Puzzle

- Higher interest rates typically have three effects
  - increased demand for domestic currency denominated assets: liquidity demand effect
  - higher cost of credit: output effect
  - increase in debt service: fiscal effect
- Liquidity demand effect: appreciates currency
- Credit and fiscal effects depreciate currency
- Net effect depends on relative strengths of these offsetting forces

Key to puzzle: Liquidity Demand effect

Liquidity demand effect much stronger in developed countries:

Dependent variable: 1–appreciation, 0–depreciation

	(i)	(ii)	(iii)	(iv)
1-developing, 0-developed	-0.4073***	-0.1835	0.0362	0.2452
	(0.1658)	(0.2763)	(0.2577)	(0.3467)
d/h		0.0440		0.0460
		(0.0336)		(0.0498)
m/y			0.0545***	0.0551***
			(0.0164)	(0.0169)
N	36	36	36	36

Main Takeaway

- Financial development and financial deepening are key factors underlying puzzle
- Developed countries have much higher deposit base which strengthens the positive effect
- The lower dependence on bank finance and better fiscal institutions also help

Inflation Targeting and Exchange Rates

- Since early 1990s inflation targeting has become popular amongst central banks
- India recently joined this group
- Key principle of pure inflation targeting
  - only target of policy is the (CPI) inflation rate
  - target inflation rate and policy instrument to achieve target should be clearly communicated
  - no other variable will be targeted by monetary policy

Implications of Inflation Targeting Policy

- Policy is ***supposed*** to ignore employment and output developments
- Implicit idea: stable inflation is best way to attain output stability
- Monetary transmission from interest rates to demand (and output) will affect inflation
- Exchange rate is supposed to ***float freely*** to stabilize relative prices and output markets

Exchange Rate Behavior of Inflation Targeters

- How do markets price exchange rates in countries without an exchange rate target?
- Example of Canada
- 1.1.74-31.12.91: Flexible rates but not inflation targeter
  - Correlation between exchange rate and oil prices: +43 percent
  - CAD tended to **depreciate** when world oil prices rise
- 1.1.92–present: Inflation targeting period
  - Correlation between exchange rate and oil prices: -82 percent
  - CAD tends to **appreciate** when the world oil price rises

Inflation Targeters and Oil Prices

- Canadian dollar appears to have become an oil currency since inflation targeting
- What about other inflation targeting countries?
- I looked at 27 countries during the period 1.1.74 to 31.7.17
- Countries adopted inflation targeting at various points during this period

Baseline Results

Variables	Exchange Rate	Exchange Rate
Oil Price	7.987***	13.90***
Oil Price*Inflation Target	-9.190***	-15.03***
Oil Net Exports share		-0.767***
Observations	9,221	5,976

$***p < 0.01$ $**p < 0.05$ $*p < 0.1$

Puzzle???

- What is going on?
- Possibility: markets need a nominal anchor to price
  - it could be either a quantitative target or a price target
  - traditional monetary policy has a quantity target for either money supply or for output
- Pure inflation targeting does not provide any anchor
- Targeting inflation may not be enough to anchor currency value
- Markets could be using oil prices as a substitute anchor

Implications

- Exchange rate behavior of inflation targeters raises issues
  - rising oil prices may imply appreciating currencies of inflation targeters
  - if INR stays stable against the USD then rupee may depreciate against inflation targeting currencies
  - overall effective nominal exchange rate would tend to depreciate
- Even an implicit exchange rate target could help to stabilize the currency

Conclusions

- Exchange rate behavior in the medium/long term is often puzzling
- Some of the puzzles are resolvable with structural approaches
- Others are more difficult and require further study
- Anchoring of expectations for exchange rates may be an important factor that monetary policy may need to take into account