



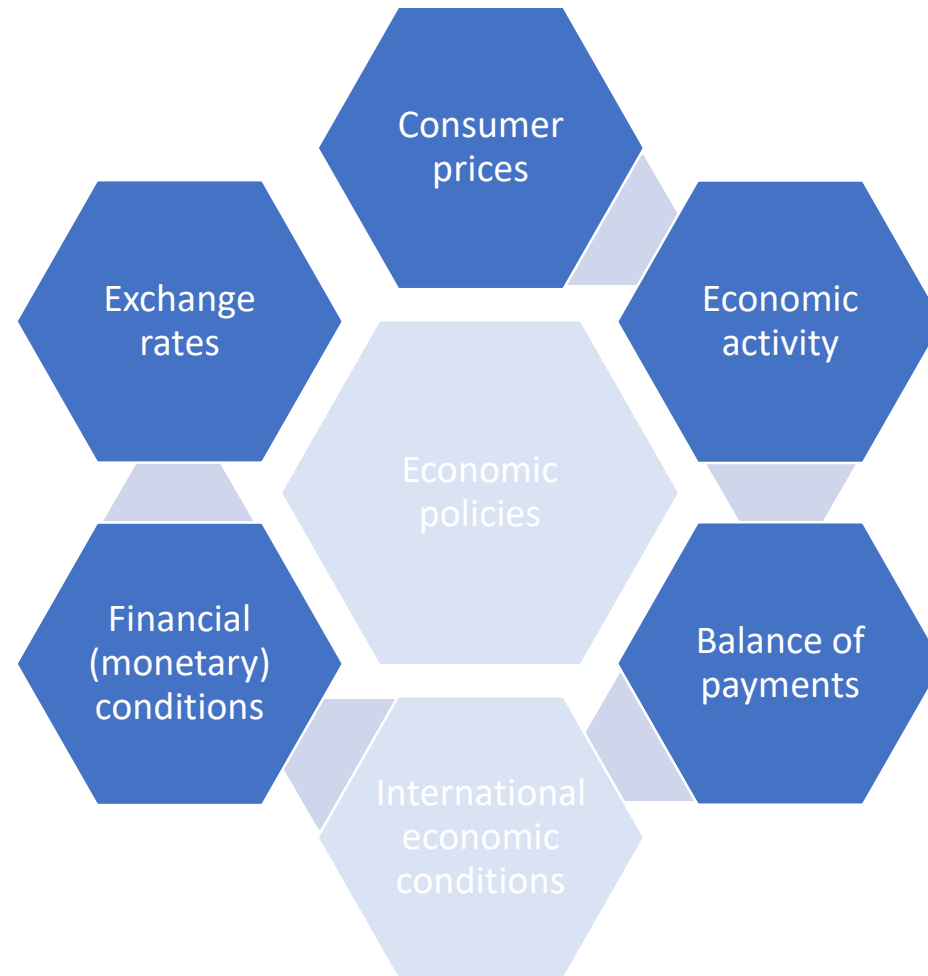
External balance assessment: Exchange rate

Macroeconomic Analysis Course
Prepared for Capital Alliance, Sri Lanka

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Macroeconomic assessment roadmap



Objectives

- Understand why central banks monitor exchange rates
- Understand where the monitoring sits in terms of overall macroeconomic assessment
- Strengthen essential skills for experts monitoring these sectors
- Learn basic tools for monitoring exchange rates

Outline

1. Setting the scene
2. Key data
3. Key economic concepts
4. Elementary measurement techniques



Setting the scene

Why do central banks monitor exchange rates developments?

What information are the sector experts expected to provide to policymakers?

What signals should they look for in the data, and recent data in particular?

Why do central banks monitor exchange rates developments?

- Monitor inflation pressures coming from exchange rates
- Monitor if exchange rates buffers external shocks (e.g. terms of trade shocks)
- Monitor potential exchange rate misalignments

What information are the sector experts expected to provide to policymakers?

- Is the currency overvalued or undervalued?
- Are the developments driven by fundamentals or speculation?
- Which direction are the market forces likely to drive the currency in the future?
- How does it affect the monetary policy mandate of price stability?

What signals should they look for in the data?

- Exchange rate gap – how far away is the current exchange rate from its long-term equilibrium value?
- It is a measure of currency misalignment, which helps to predict which way the currency is likely to move in the medium term (see CGER methodology, Lecture 4)

What are the implications of currency misalignments?

- The lack of competitiveness in the domestic economy could cause GDP to deviate from potential GDP.
- At home, if exchange rate is overvalued, this could lead to sluggish growth and a sustained current account deficit but could help lower inflation.
- At the same time for partner countries, the exchange rate would be undervalued, it could cause higher growth leading to overheating and inflationary pressures; BOP surplus and the accumulation of reserves.

What are the implications of currency misalignments? (cont.)

- In the long run the misalignments will disappear, however ...
- the larger and longer the deviations, the greater the misallocation of resources and the adjustment costs related to the correction of misalignments tend to be higher.

Question

How would you classify CBSL's exchange rate regime?



Key data

Bilateral exchange rates

Effective exchange rates (nominal and real)

Foreign exchange market liquidity

Bilateral exchange rates

- Trade invoice currencies
- Trading partners' currencies
- Reserve currencies

Effective exchange rates

- Nominal effective exchange rate
- Real effective exchange rate

Market liquidity

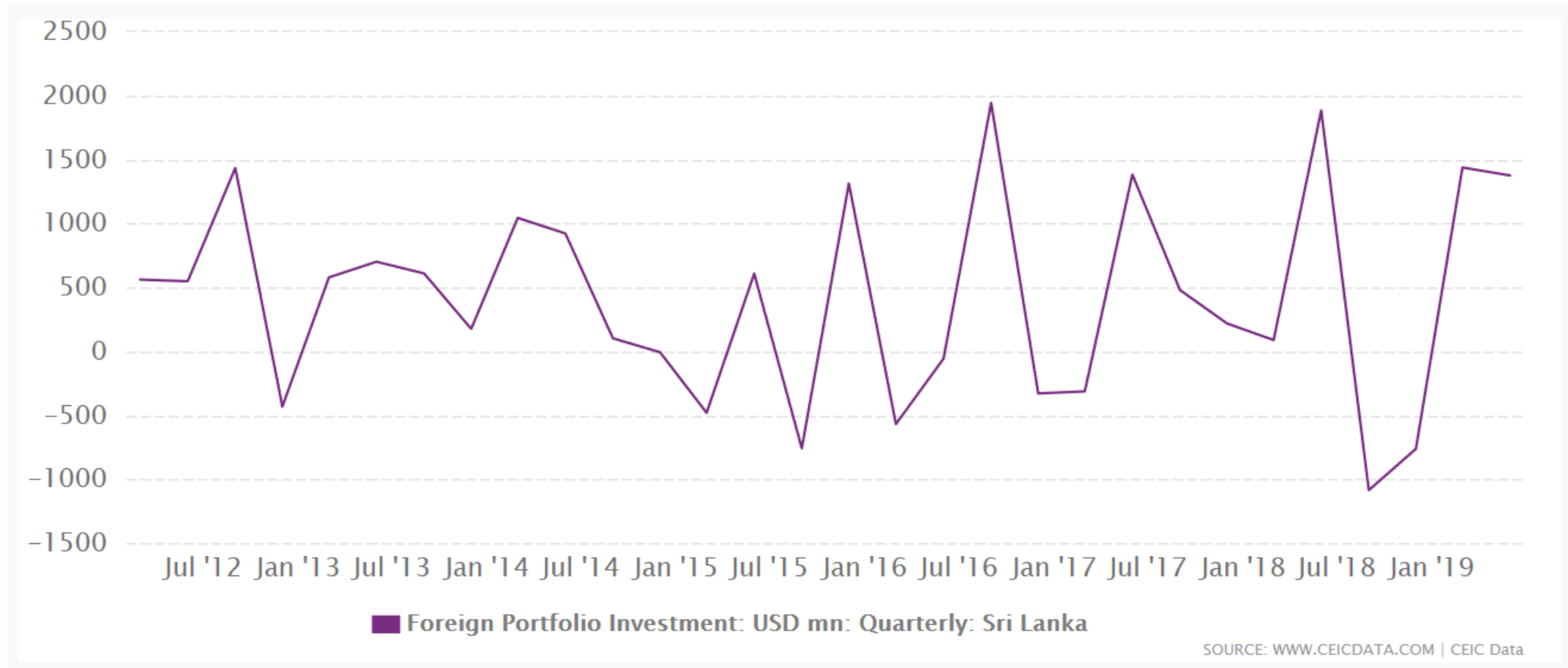
- Is the market deep and liquid?
- Market structural situation determines price
- What is the price discovery mechanism?
 - market with many participants
 - market with a few participants
 - central bank manages the market
- Are there any significant seasonal patterns/regularities in demand and supply (e.g., related to agricultural cycle)?
- Structure of capital flows (nature, term structure, etc.)
- There is a separate course on managing capital flows that look at this in detail

Intraday trades in USD/LKR market

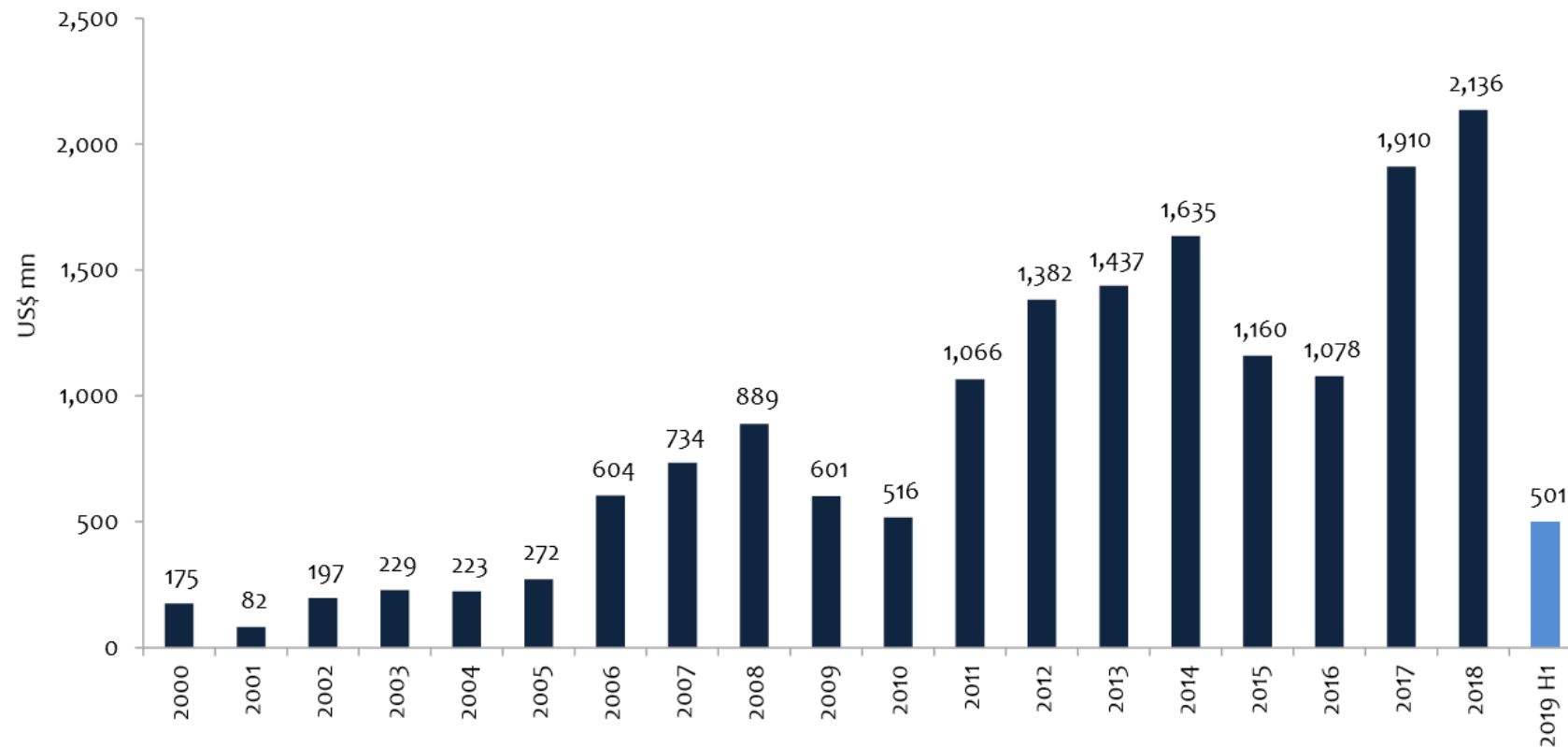


Source: TradeView

Demand for Rupees is weak, as portfolio investment inflows moderate...

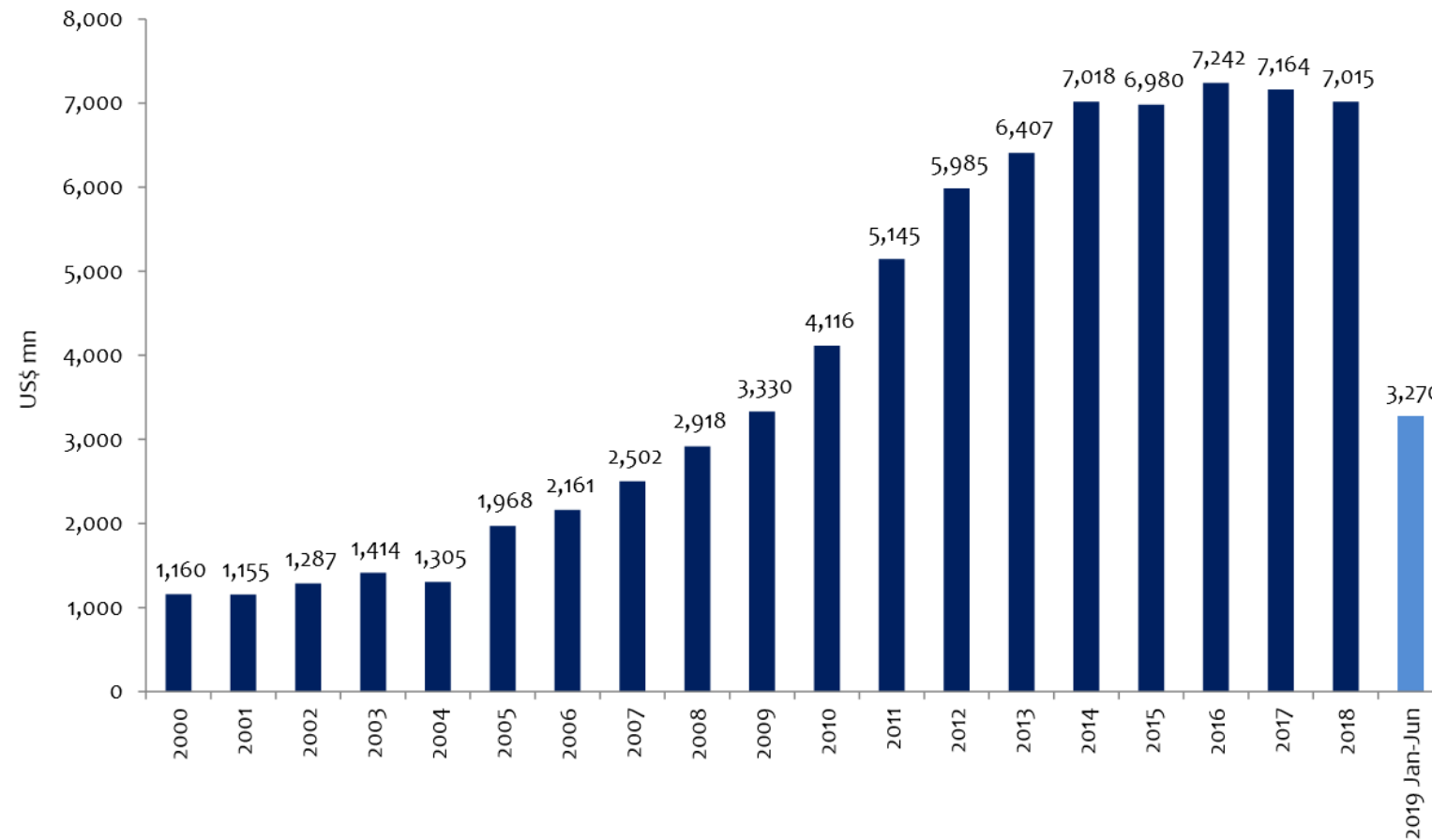


... foreign direct investment inflows are subdued...



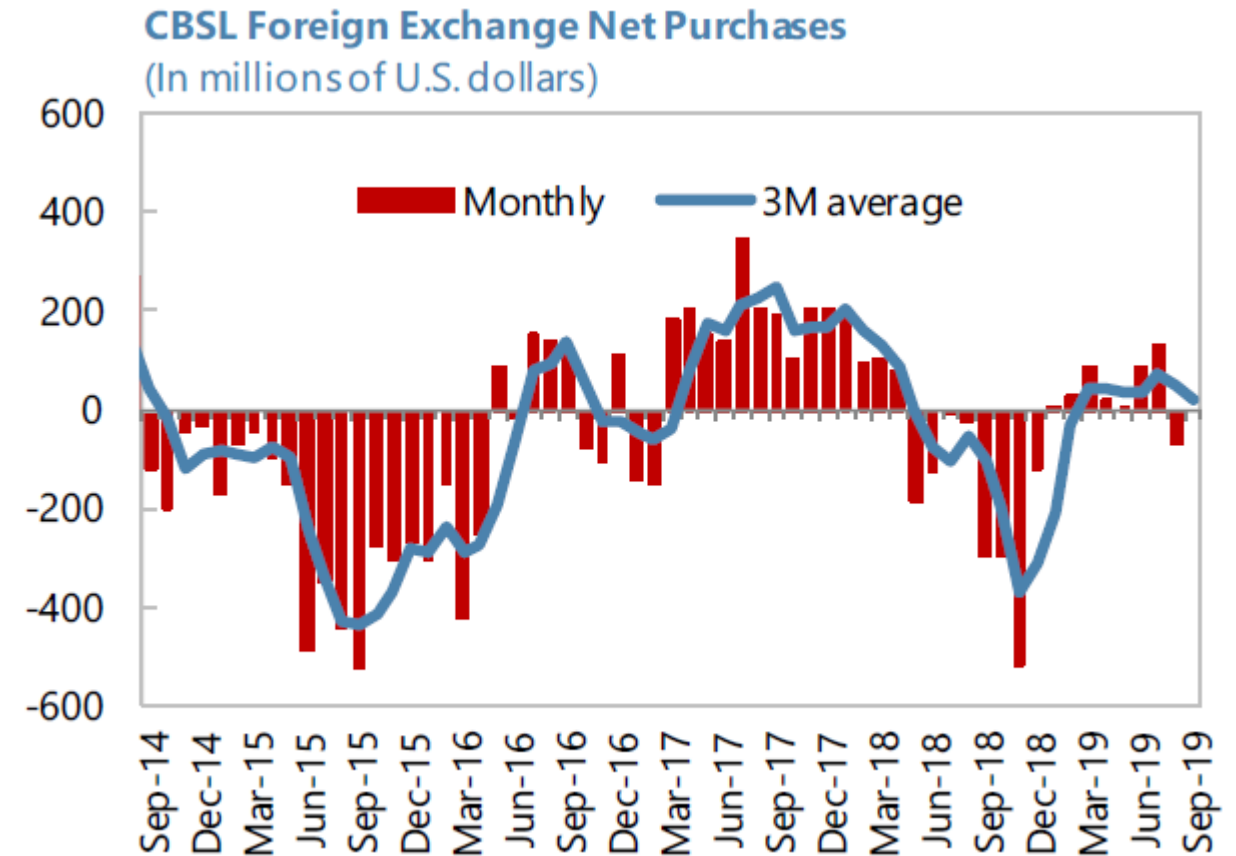
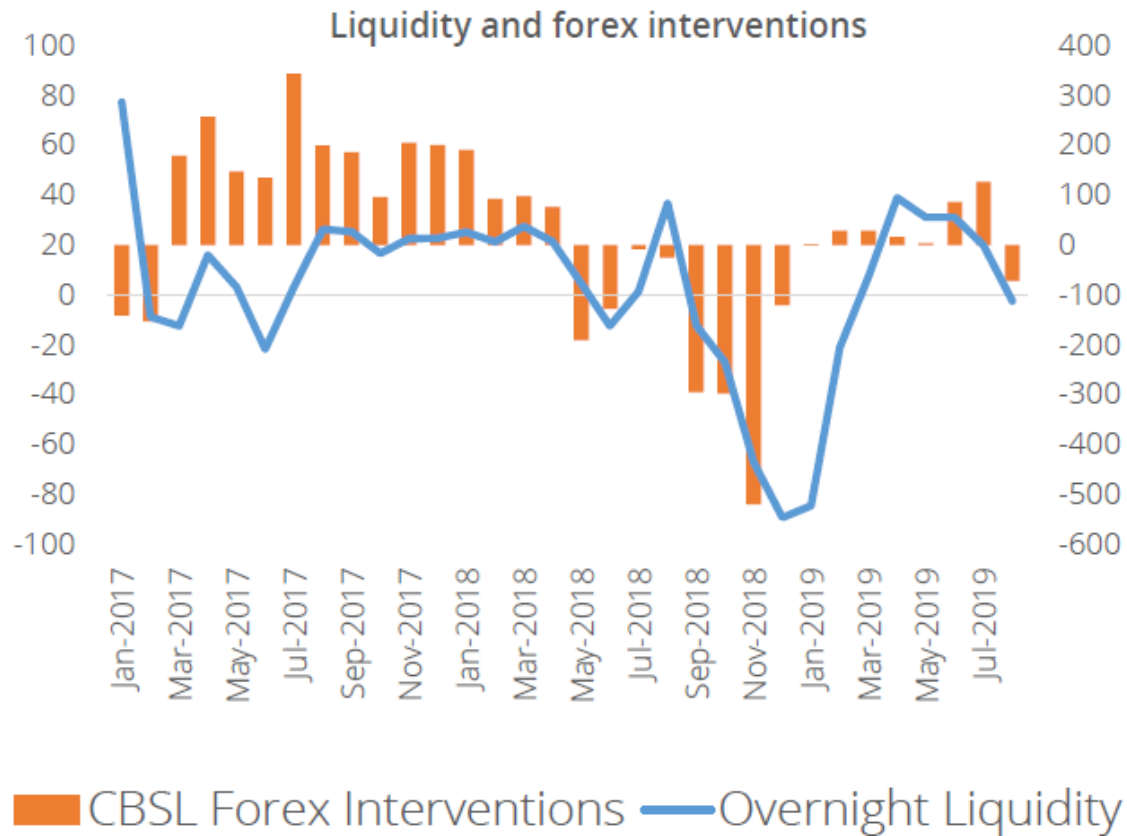
Source: CBSL

... and so are workers remittances



Source: CBSL

CBSL's market intervention activity was muted in early 2019



Source: CBSL



Key economic concepts

Bilateral and multilateral nominal exchange rate

Purchasing power parity, bilateral and multilateral real exchange rate

Competitiveness, Balassa-Samuelson theory of real appreciation, equilibrium exchange rate

Bilateral nominal exchange rate

The bilateral nominal exchange rate is the price of one unit of a currency in units of another currency. The two conventions for quoted an exchange rate are:

- Price of home currency in terms of foreign currency (e)
- Price of foreign currency in terms of home currency (s)

$$e = 1 / s$$

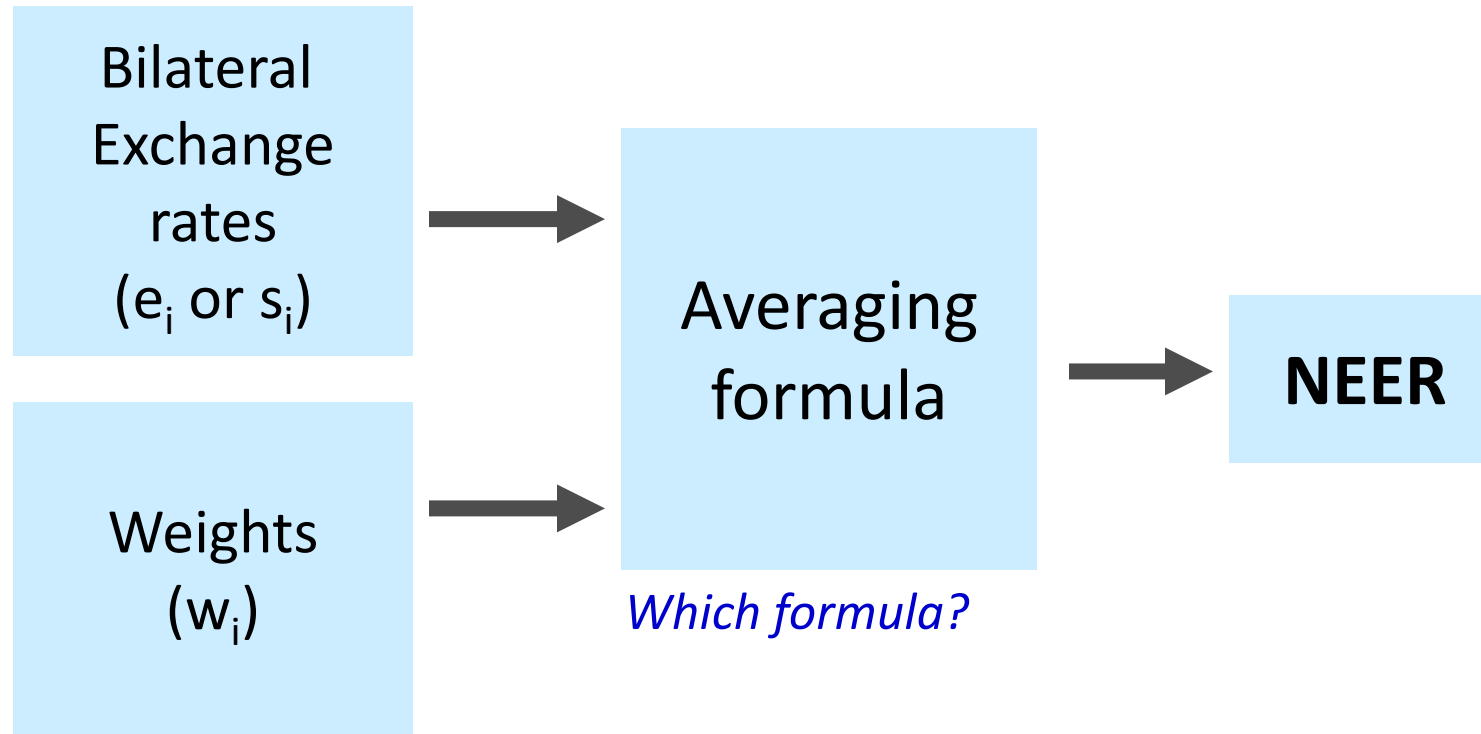
| Symbol | Units | Appreciation | Depreciation |
|--------|--------------|--------------|--------------|
| e | Foreign/Home | ↑ | ↓ |
| s | Home/Foreign | ↓ | ↑ |

Multilateral (effective) nominal exchange rate

- Nominal effective exchange rate (NEER) is a weighted average of bilateral NERs versus:
 - Actual and potential competitors
 - Competitors in domestic and foreign markets
- Weights often reflect relative importance of countries in world economy or in the bilateral foreign trade flows:
 - Import or export or total trade weights
 - Market shares of competitors in the foreign or domestic market
- Often bilateral rate vis-à-vis the main partner is sufficient

How is NEER calculated?

Which currencies?



Which weighting system?

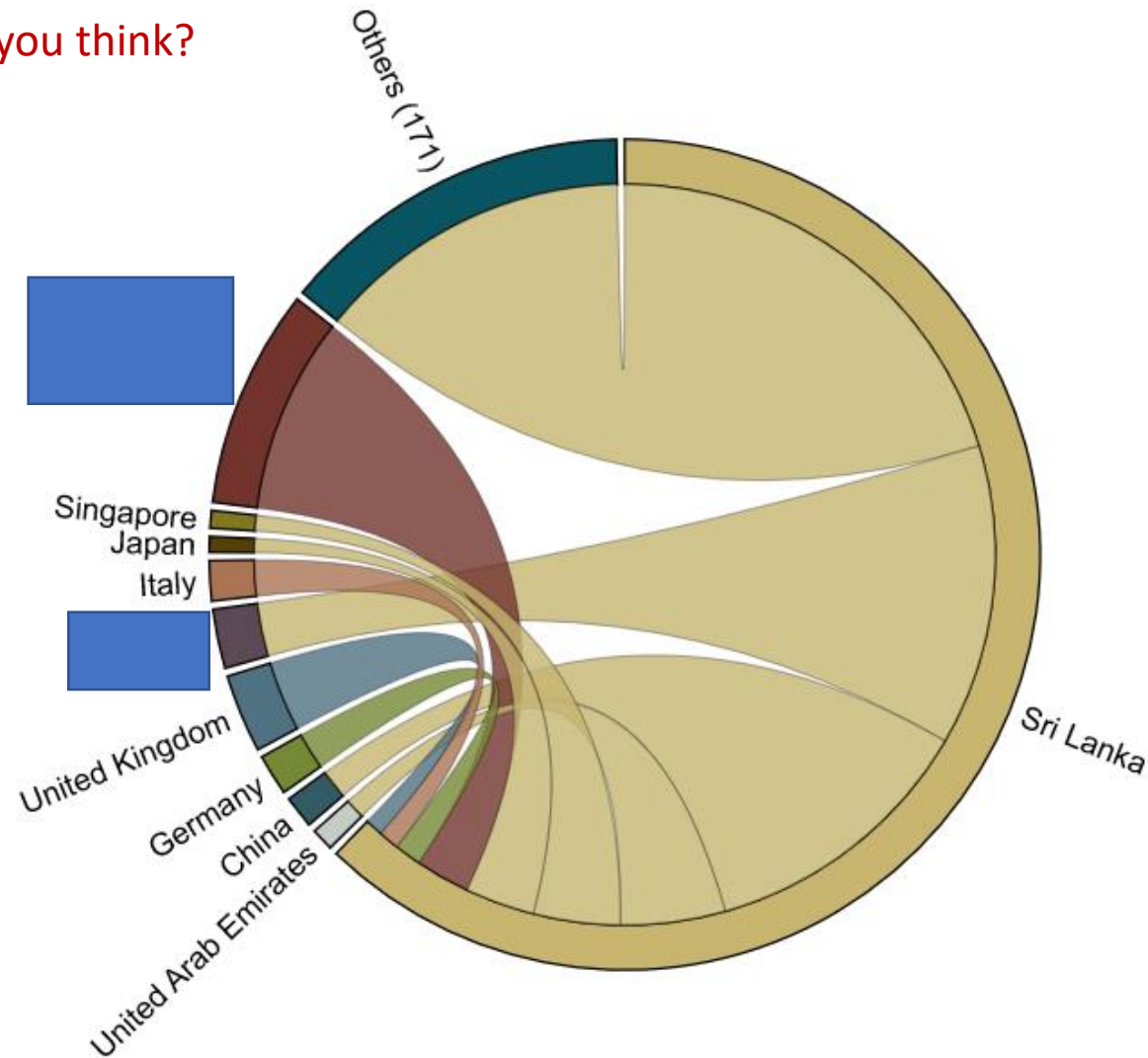
Multilateral (effective) real exchange rate

- The REER index is a NEER index adjusted for relative price or cost indices of the home and foreign countries
- Apply geometric averaging method:

$$REER = \prod_i \left(\frac{s_{it} P_{it}^*}{P} \right)^{w_i} = \frac{\prod_i (P_{it}^*)^{w_i}}{P} NEER,$$
$$NEER = \prod_i (s_{it})^{w_i}$$

Exports and imports to Sri Lanka in 2017, country shares

What countries are these do you think?



Source: World Integrated Trade Solution

Question

How do you define the weights for effective exchange rates?

Are the weights regularly updated?

Purchasing power parity

- Idea of PPP: nominal exchange rate reflects relative purchasing powers of two currencies

- Measured by foreign and domestic price levels P^* and P

- Two versions of PPP:

- Absolute Purchasing Power Parity

- is unlikely to hold due to transport costs, barriers to trade, goods differentiation, imperfect competition, etc.

- Relative Purchasing Power Parity terms instead:

- Change in the NER equals inflation differential

$$P = SP^* \quad s = p - p^*$$

$$\Delta s = \pi - \pi^*$$

Bilateral real exchange rate

- Define now a deviation from PPP in relative terms

$$\Delta z_t = \Delta s_t + \pi_t^* - \pi_t$$

- This is a change in the Real Exchange Rate
- Then we can also write in logs

$$z_t = s_t + p_t^* - p_t$$

- ... and define RER in levels

$$Z_t = S_t \frac{P_t^*}{P_t}$$

- RER will be a focal point in the rest of the lecture

Real economic convergence

- Poorer countries have little capital per worker and, hence, a high marginal product of capital (MPK)



Real exchange rate and Balassa-Samuelson

- Economic convergence → prices of nontradables grow faster than prices of tradable goods (the Balassa-Samuelson effect)
- Without the B-S effect the real exchange rate would be constant in equilibrium
- If productivity grows faster in the T sector than in the NT sector
 - higher wages in the T sector
 - upward pressure on wages in the NT sector
 - resulting in a higher NT goods and overall inflation
 - real (trend!) appreciation



Key measurement techniques

Real effective exchange rate, equilibrium, and real exchange rate gap

Calculating long-term trend in nominal exchange rate

Steps in computing real exchange rate gap

- 1) Compile data on bilateral nominal exchange rates, domestic and relevant foreign CPI indices, direction of trade or other data to be used to construct weights
- 2) Construct nominal and real effective exchange rates

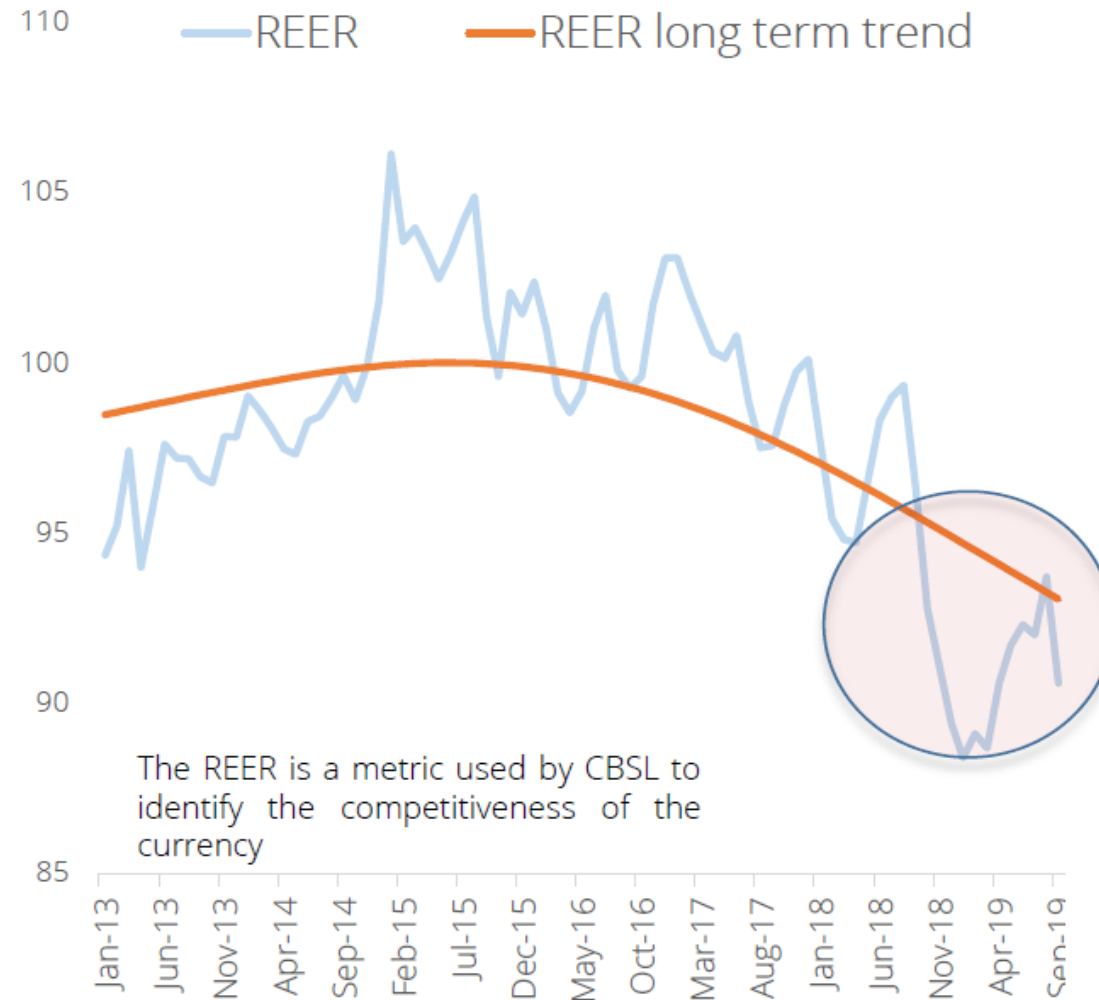
$$REER = \prod_i \left(\frac{s_{it} P_{it}^*}{P} \right)^{w_i} = \frac{\prod_i (P_{it}^*)^{w_i}}{P} NEER,$$

- 3) Estimate long-term trend in real effective exchange rate
- 4) Compute the exchange rate gap: REER gap = 100*(REER/REER trend -1)

Estimating the long-term real appreciations

- Real appreciation is given by economic fundamentals
- Monetary policy should take it as given
- To estimate the trend in real exchange rate, we can use approaches like
 - linear trend models
 - non-linear trends filtration (Hodrick-Prescott filter)
 - structural models

Illustration of long-term trend estimate



Source: CBSL, CAL

Estimating long-term trend in nominal exchange rate

- Change in the real exchange rate....

$$\Delta z_t = \Delta s_t + \pi_t^* - \pi_t$$

- ... written for the long-run values:

$$\Delta \bar{z}_t = \Delta \bar{s}_t + \bar{\pi}_t^* - \bar{\pi}_t$$

- where $\Delta \bar{z}_t, \Delta \bar{s}_t, \bar{\pi}_t^*, \bar{\pi}_t$ - changes in the long-run trends or objectives (or average values) over the long-run
- Implies that long-term nominal depreciation is

$$\Delta \bar{s}_t = \Delta \bar{z}_t + \bar{\pi}_t - \bar{\pi}_t^*$$

Choice of long-term inflation (target) determines the long-term nominal depreciation, and vice versa

- Impossible trinity is encoded in this long-term relationship

$$\Delta \bar{s}_t = \Delta \bar{z}_t + \bar{\pi}_t - \bar{\pi}_t^*$$

this given or given
this

Central bank either control

- Hypothetical examples: Foreign inflation target = 2%, trend real appreciation = -5%

- Foreign exchange rate is fixed ($\Delta \bar{s}_t = 0$). Then inflation is the residual variable

$$\bar{\pi}_t = \Delta \bar{s}_t - \Delta \bar{z}_t + \bar{\pi}_t^* = 0 - (-5) + 2 = 7\%$$

- Inflation target = 5%. Then nominal exchange rate is the residual variable

$$\Delta \bar{s}_t = \Delta \bar{z}_t + \bar{\pi}_t - \bar{\pi}_t^* = -5 + 5 - 2 = -2\%$$

Uncovered interest rate parity

- Do we observe trends in domestic and foreign interest rates, and sovereign risk premium?
- Is there a link btw. the real exchange rate and the interest rate trends and the sovereign premium?
- UIP links the domestic and foreign economies/financial markets...

Uncovered interest rate parity (cont.)

Mechanics:

- At t , take **LC 1**, exchange it for foreign currency at S_t (in LC/FC)
- **Invest the amount** at i_t^* until the end of the investment period at $t+1$
- At $t+1$, convert the **proceeds back to domestic currency** — at time t you don't know what the FX rate will be so $E_t\{S_{t+1}\}$
- The amount should be the same as investing locally at i_t :

$$1 \cdot (1 + i_t) = \frac{1}{S_t} \cdot (1 + i_t^*) / E_t\{S_{t+1}\}$$

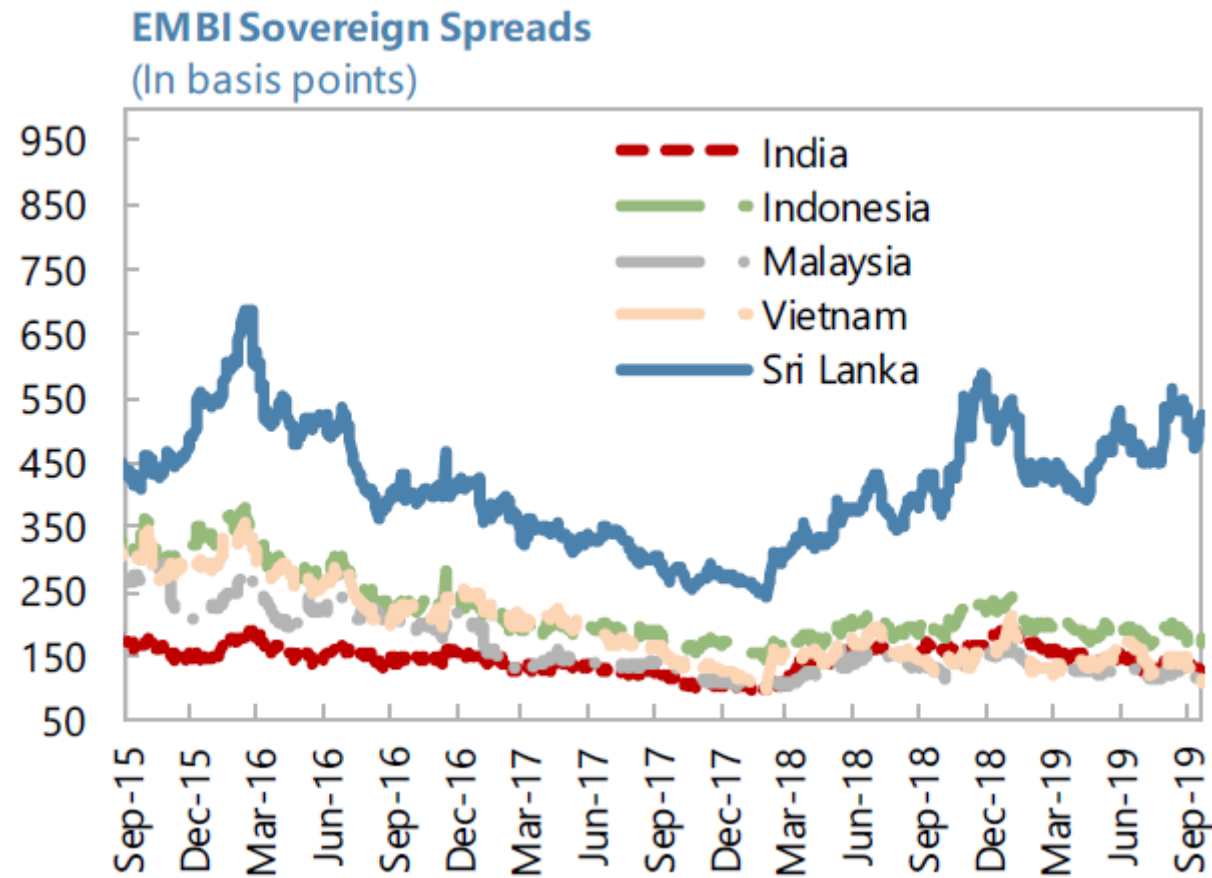
or rearranging and taking logs: $s_t = E_t\{s_{t+1}\} + (i_t^* - i_t)$

Hybrid uncovered interest rate parity

- If domestic and foreign assets were perfect substitutes
 - investors would react to the interest rate differential by moving funds and therefore equalizing returns...
- does it happen?... not really
 - In particular, less developed/illiquid markets are riskier
 - Investors would demand a “country” risk premium
- We modify the UIP:

$$s_t = E_t \{s_{t+1}\} + \{i_t^* - (i_t - prem_t)\}$$

Long-term risk premium can be gauged from interest rate spreads



Source: CBSL, Bloomberg, IMF

Exchange rate passthrough to CPI inflation

- To get a sense of the relative importance of exchange rate for consumer prices, we measure the so called exchange rate passthrough

$$\pi_t = \alpha_0 + \alpha_1 \Delta s_t + \varepsilon_t$$

where π_t is the CPI inflation rate (log-diff of CPI), Δs_t is the change in nominal exchange rate (log-diff of s), and ε_t is the random disturbance. α_1 captures the passthrough.

- Countries with a high propensity to import have high passthrough (α_1), with flexible exchange rate regimes
- Incentive to fix the exchange rate or intervene in the forex market to smooth “excess” volatility



Conclusion

Main takeaways

- Purchasing power parity defines the real exchange rate
- Uncovered interest parity relates nominal exchange rates to the differential between domestic and foreign interest rates
- Real exchange rate measures competitiveness
- Real exchange rate (RER) gap is the relative difference between the RER level and the equilibrium RER
- RER gap is an indicator of RER over or undervaluation and near term pressures on nominal exchange rate