

# The reliability of equilibrium exchange rate models: a forecasting perspective (IJCB, 2022)

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# Motivation

Equilibrium exchange rates (EqER) fundamental for policy-makers:

- ▶ Exchange rate (ER) misalignments affect external sustainability, growth, financial stability, ...
- ▶ EqER assessment important part of IMF surveillance

Which EqER model should we trust?

1. **Normative:** ER level that supports macro-stability?
2. **Positive:** Which model predicts future ER adjustments?

# This paper

- ▶ Which EqER model delivers most reliable forecasts?
  1. Purchasing Power Parity (PPP)
  2. Behavioural Equilibrium Exchange Rate (BEER)
  3. Macroeconomic balance (MB)
  
- ▶ Does model complexity pay off?

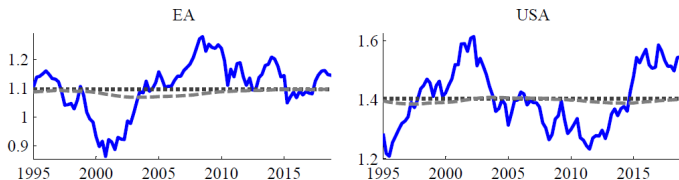
# Data

- ▶ G-10 currencies:  
AUS, CAN, CHE, EA, GBR, JPN, NOR, NZL, SWE, USA
- ▶ Quarterly, 1975:1 - 2018:4
- ▶ Real effective exchange rates (trade-weighted)

# 1. Purchasing Power Parity (PPP)

- ▶ Idea: ER neutralizes competitiveness changes from price movements
- ▶ Implication: Real ER is mean reverting
- ▶ PPP-implied EqER just sample mean of real ER

$$rer_{it}^{PPP} = \bar{r}_i$$

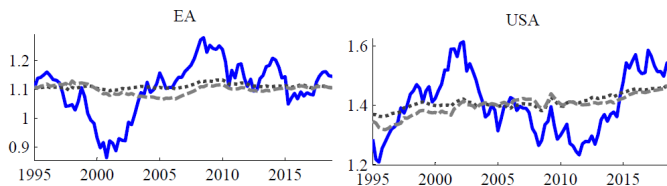


Blue line - real ER. Black line -  $rer_{it}^{PPP}$  (full sample). Grey line -  $rer_{it}^{PPP}$  (recursive)

## 2. Behavioural Equilibrium Exchange Rate (BEER)

- ▶ Idea: Real ER linked with economic fundamentals
- ▶ No consensus on fundamentals, but some common variables

$$rer_{it}^{BEER} = \mu_i + \alpha_1 gdp_{it} + \alpha_2 nfa_{it} + \alpha_3 tot_{it}$$

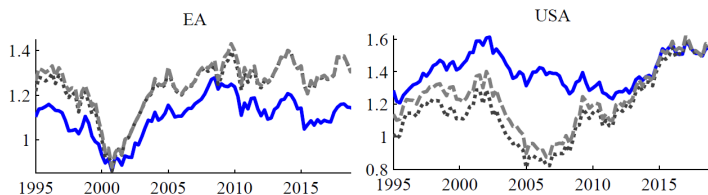


Blue line - real ER. Black line -  $rer_{it}^{BEER}$  (full sample). Grey line -  $rer_{it}^{BEER}$  (recursive)

### 3. Macroeconomic Balance (MB)

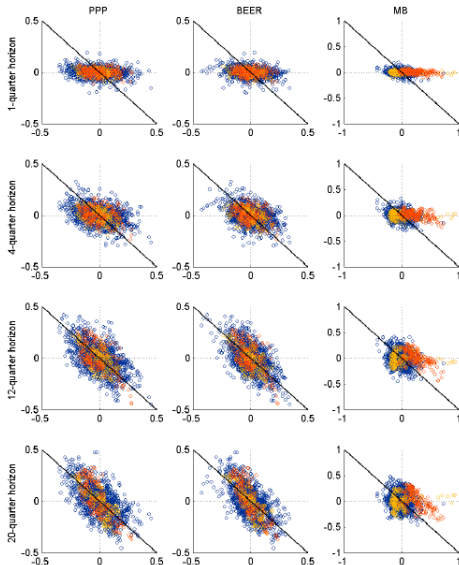
- ▶ Idea: ER consistent with external balance (current account) and internal balance (output gap)
- ▶ Requires:
  1. Current account (CA) gap = Cyclically-adjusted CA - CA norm
  2. Elasticity of CA to ER

$$rer_{it}^{MB} = rer_{it} - \frac{\tilde{ca}_{it} - ca_{it}^{norm}}{\eta_{it}}$$



Blue line - real ER. Black line -  $rer_{it}^{MB}$  (full sample). Grey line -  $rer_{it}^{MB}$  (recursive)

# In-sample: Exchange rate adjustment to equilibrium



Table

X-axis: ER deviation from equilibrium. Y-axis: ER adjustment after  $h$  quarters.



# Out-of-sample: Forecast race

## Setting:

- ▶ EqER models estimated recursively
- ▶  $h$  quarters ahead point forecasts,  $h = \{1, 2, 3, \dots, 20\}$
- ▶ Random Walk as benchmark

## Procedure:

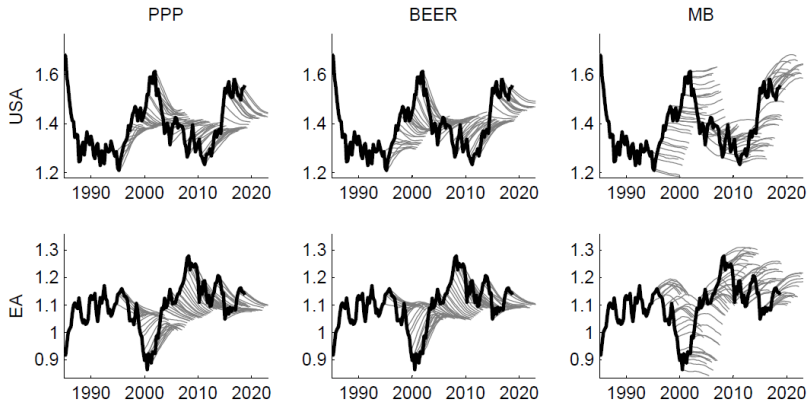
- ▶ For each model  $M$ , vintage period  $s$  and forecast horizon  $h$  we estimate:

$$\Delta rer_{it,h} = \omega_{ih} + \delta_h(rer_{i,t-h} - rer_{i,t-h|s}^M) + \epsilon_{it} \quad (1)$$

- ▶ and calculate value of the forecast as:

$$rer_{i,s+h}^f = rer_{is} + \omega_{ih|s} + \delta_{h|s}(rer_{is} - rer_{is|s}^M) \quad (2)$$

# Forecast race - Results



Black line - Real ER. Grey lines -  $h$ -step ahead forecasts for  $h = \{1, 2, 3, \dots, 20\}$

Other countries I

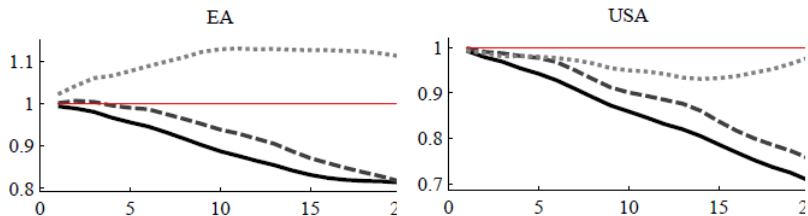
Other countries II

RMSFE ratios

Table

# Forecast race - Results

## Comparison of RMSFE ratios across models



Red line - RW benchmark. Black line - PPP. Dashed line - BEER. Dotted line - MB

# Robustness

## **Pace of equilibrium reversion: ✓**

- ▶ Imposed half-life
- ▶ Country-specific adjustment parameters

## **Alternative BEER regressors ✓**

## **MB alternatives: ✓**

- ▶ Imperfect pass-through and lower volume elasticities
- ▶ Alternative current account norms

## **Rolling forecasting scheme ✓**

## **Nominal exchange rates ✓**

# Conclusion

- ▶ Trade-off between storytelling and predictive power:
  1. PPP performs well in ER forecasting
  2. BEER almost equally competitive
  3. MB almost always outperformed
- ▶ Weak link between ER and macro-fundamentals
- ▶ Mean-reversion key for exchange rate forecasting