Discussion of
‘A Preferred-Habitat Model of Term Premia and Currency Risk’ and ‘A Quantity-Driven Theory of Term Premiums and Exchange Rates’

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Downward sloping demand curves in bond markets. Implications for FX.

- GRV (2020) and GHSS (2020) bring equilibrium models of term structure with market segmentation (Vayanos and Villa, 2019) to FX markets: arbitrageurs in bond markets and FX markets (GM (2015))
- downward sloping demand curves for Treasurys.
  - increase in net US supply of long bonds: US arbitrageurs demand larger BRP on long USD bonds

$$\mathbb{E}_t rx_{t+j}^{US,N} = \mathbb{E}_t[hpr_{t+1}^{US,N} - y_t^{\$}] \nearrow$$

  - policy makers control long rates
- what are the implications of downward sloping demand in bond markets for the USD exchange rate?
- GHSS (2020) provide rich empirical evidence
- GRV (2020) let the model do most of the work

Outline

1. **Exchange Rates and Short Yields**
2. Exchange Rates and Long Yields
3. Empirical Evidence
4. Policy
5. Convenience Yields in Bonds

Exchange Rates and Short Yields

Result

The nominal exchange rate in FC/USD is:

$$s_t^{\frac{*}{\$}} = \mathbb{E}_t \sum_{\tau=0}^{\infty} (y_{t+\tau}^{\$} - y_{t+\tau}^{*}) - \mathbb{E}_t \sum_{\tau=0}^{\infty} rx_{t+\tau}^{\frac{*}{\$},FX} + \mathbb{E}_t [\lim_{\tau \to \infty} s_{t+\tau}].$$

(Campbell-Clarida (1987); Froot-Ramadorai (2005))

- does not rely on complete markets: $M_{t+1}^{*} = M_{t+1} \frac{S_{t+1}}{S_t}$
- relies only on bond investor's Euler equation

- dollar exchange rate **today** reflects **future**
  1. **cash flows**: short rate differences $(y_{t+\tau}^{\$} - y_{t+\tau}^{*})$
  2. **discount rates**: FXRP
     $\mathbb{E}_t rx_{t+\tau}^{\frac{*}{\$},FX} = y_{t+\tau}^{\$} - y_{t+\tau}^{*} + \mathbb{E}_{t+\tau} \Delta s_{t+\tau+1}$ earned by foreign investors going long in USD
- dollar appreciates when $y_{t+\tau}^{\$} \nearrow$ and dollar FXRP $rx_{t+\tau}^{\frac{*}{\$},FX} \searrow$

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Exchange Rates and Long Yields

- note $N y_t^{\$,N} = \sum_{j=1}^{N} rx_{t+j}^{\$,N-j+1} + \sum_{j=0}^{N} y_{t+j}^{\$}$.
- start from $s_t^{\frac{*}{\$}} - s_0^{\frac{*}{\$}} =$

$$\lim_{N\to\infty} N(y_t^{\$,N} - y_t^{*,N}) + \underbrace{\lim_{N\to\infty} \mathbb{E}_t^* \sum_{j=1}^{N} (rx_{t+j}^{*,N-j+1} - rx_{t+j}^{\$,N-j+1})}_{\text{deviations from EH}}$$

$$\underbrace{- \lim_{N\to\infty} \mathbb{E}_t \sum_{\tau=0}^{N} rx_{t+\tau}^{\frac{*}{\$},FX}}_{\text{deviations from short-run UIP}}$$

- dollar appreciates when
  1. long USD yields **today** $\nearrow$
  2. future LC US BRP $rx_{t+j}^{\$,N-j+1}$ $\searrow$
  3. future dollar FXRP $rx_{t+\tau}^{\frac{*}{\$},FX}$ *decrease* $\searrow$

Stationary Exchange Rates and Long Yields

- exchange rate reflects differences in long yields **today**

$$\frac{1}{N}\underbrace{(s_t - s_0) = \lim_{N\to\infty}(y_t^{\$,N} - y_t^{*,N})}_{\text{long-run UIP}}$$

$$+\lim_{N\to\infty}\frac{1}{N}\mathbb{E}_t^*\sum_{j=1}^{N}(rx_{t+j}^{*,N-j+1} - rx_{t+j}^{\$,N-j+1}) - \lim_{N\to\infty}\frac{1}{N}\mathbb{E}_t\sum_{\tau=0}^{N} rx_{t+j}^{\frac{*}{\$},FX}$$

- FXRP offset by LC BRP
- long-run U.I.P. if there is no additional long-run risk in long USD bond for foreign investor.
  1. exchange rates are stationary
  2. shocks to long-run exchange rates are not priced.

$\approx$ GRV (2020) and GHSS (2020) models

or any model without permanent, country-specific priced innovations (see also Backus, Boyarchenko and Chernov, 2018)

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Empirical Evidence: TS of Carry Trade FXRP

- GRV (2020) and GHSS (2020) better match for data ✓
- high FXRP offset by negative LC BRP (Lustig, Stathopoulos and Verdelhan, 2019)
  - in X-section: no currency carry premium at long maturities

$$\mathbb{E}_t[rx_{t+1}^{\$,N}] \approx \mathbb{E}_t[\underbrace{rx_{t+1}^{JPY,N}}_{high} + \underbrace{rx_{t+1}^{\frac{USD}{JPY},FX}}_{low}] \approx \mathbb{E}_t[\underbrace{rx_{t+1}^{AUD,N}}_{low} + \underbrace{rx_{t+1}^{\frac{USD}{AUD},FX}}_{high}]$$

  - in Time-Series: current interest rates/term spread do not predict long GBP bond excess returns converted into USD

$$rx_{t+j}^{GBP,N} + rx_{t+j}^{\frac{USD}{GBP},FX}$$

- consistent with evidence in favor of long-run U.I.P. (Meredith and Chinn, 1998; Boudoukh, Richardson and Whitelaw, 2016)

Empirical Evidence: TS of Carry Trade FXRP

- GRV (2020) and GHSS (2020) better match for data ✓

$$\underbrace{s_t - s_0 = \lim_{N\to\infty} N(y_t^{\$,N} - y_t^{*,N})}_{\textit{long-run UIP}}$$

$$+ \lim_{N\to\infty} \mathbb{E}_t^* \sum_{j=1}^{N} (rx_{t+j}^{*,N-j+1} - rx_{t+j}^{\$,N-j+1}) - \lim_{N\to\infty} \mathbb{E}_t \sum_{\tau=0}^{N} rx_{t+j}^{\frac{*}{\$},FX}$$

- exchange rates should be spanned by long rates.
- in data, exchange rates sensitive to long rates (GHSS (2020)), but maybe not enough? (see work by Chernov and Creal, 2019)

Why Traditional DAPMs Fail to Match Evidence

- see habit model (Verdelhan, 2010) and LRR model (Bansal and Shaliastovich, 2013)
  - large permanent innovations to pricing kernel to generate large equity premium relative to long BRP (AJ, 2005; Hansen and Scheinkman, 2009)
  - GRV (2020) and GHSS (2020) not pricing equities
- permanent innovations to (real) exchange rate that are priced by marginal investors in FX and bond markets

$$\lim_{N\to\infty} \mathbb{E}_t^* \sum_{j=1}^{N} rx_{t+j}^{*,N-j+1} \neq \lim_{N\to\infty} \mathbb{E}_t \sum_{\tau=0}^{N} [rx_{t+j}^{\$,N-j+1} + rx_{t+j}^{\frac{*}{\$},FX}]$$

  - permanent country-specific innovations to the pricing kernel lead to deviations from long-run PPP and long-run U.I.P
  - no downward sloping TS of carry trade FX RP (no offset of BRP and FXRP)

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Policy Experiment: Bond Supply Shock

- increase in US supply of long bonds: US arbitrageurs demand larger BRP;

  1. increase in LC BRP in U.S. $\rightarrow \nearrow$ in USD long yields $\rightarrow$ USD appreciates right away to offset the effect of the higher USD yield. $s_t - s_0 \nearrow = \lim_{N\to\infty} N(y_t^{\$,N} - y_t^{*,N}) . \nearrow$
     e.g. if $y_t^{\$,20} \nearrow$ by 5 bps, then we expect 5 bps $\searrow$ p.a. of the USD over the next 20 years; USD $\nearrow$ by 100 bps now.
  2. increase in BRP in U.S $\rightarrow$ offset by FXRP $rx_{t+j}^{\frac{*}{\$},FX} \searrow$

$$\lim_{N\to\infty} \mathbb{E}_t^* \sum_{j=1}^{N} rx_{t+j}^{*,N-j+1} = \lim_{N\to\infty} \mathbb{E}_t \sum_{j=0}^{N} [rx_{t+j}^{\$,N-j+1} \nearrow + rx_{t+j}^{\frac{*}{\$},FX} \searrow]$$

- in **long run** foreign investor does not need higher return for holding long USD bonds than foreign bonds; no long-run exchange rate risk.

Policy Experiment: QE

- shrink net supply of long bonds: US arbitrageurs earn smaller BRP

  1. decrease in LC BRP in U.S. $\rightarrow \searrow$ in USD long yields $\rightarrow$ USD depreciates right away to offset the effect of the lower USD yield. $s_t - s_0 \searrow = \lim_{N\rightarrow\infty} N(y_t^{\$,N} - y_t^{*,N})$. $\searrow$
     e.g. if $y_t^{\$,20} \searrow$ by 5 bps, then we expect 5 bps $\nearrow$ p.a. of the USD over the next 20 years; USD $\searrow$ by 100 bps now.

  2. decrease in LC BRP in U.S $\rightarrow$ offset by FXRP $rx_{t+j}^{\frac{*}{\$},FX} \nearrow$

$$\lim_{N\rightarrow\infty} \mathbb{E}_t^* \sum_{j=1}^{N} rx_{t+j}^{*,N-j+1} = \lim_{N\rightarrow\infty} \mathbb{E}_t \sum_{j=0}^{N} [rx_{t+j}^{\$,N-j+1} \searrow + rx_{t+j}^{\frac{*}{\$},FX} \nearrow]$$

- in **long run** foreign investor does not accept lower LC return for holding long USD bonds than foreign bonds; no long-run exchange rate risk.

Policy Implications

- inside this model, Fed can certainly lower long yields and cause the USD to depreciate.
- GRV (2020) & GHSS (2020) models silent on whether this is a good idea
    - QE: redistribution of rents from Treasury arbitrageurs to FX arbitrageurs.
- FX channel seems less potent because ECB, BoJ, BoE and others can respond

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Exchange Rates and Convenience Yields

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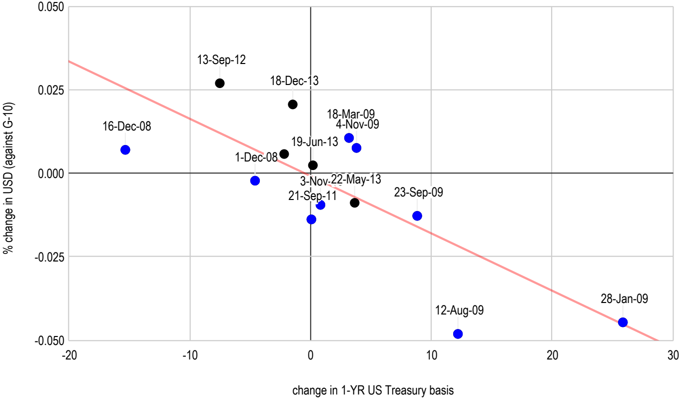
$$s_t^{\frac{*}{\$}} = \mathbb{E}_t \sum_{\tau=0}^{\infty} (\lambda_{t+\tau}^{\$,*} - \lambda_{t+\tau}^{*,*}) + \mathbb{E}_t \sum_{\tau=0}^{\infty} (y_{t+\tau}^{\$} - y_{t+\tau}^{*}) - \mathbb{E}_t \sum_{\tau=0}^{\infty} rx_{t+\tau}^{\frac{*}{\$},FX} + \ldots$$

Jiang, Krishnamurthy and Lustig (2019)

- measured by CIP deviation in Treasury $(1-\beta)(\lambda_{t+\tau}^{\$,*} - \lambda_{t+\tau}^{*,*}) = -x_t$ also in Du and Schreger (2019)
  - dollar appreciates when future US Treasury CY $\lambda_{t+\tau}^{\$,*} \nearrow$
  - CY channel also creates a role for flows/quantities.
    1. QE: when Fed buys long-dated Treasurys, $\lambda_{t+\tau}^{\$,*} \nearrow \rightarrow s_t \nearrow$ (wrong way?)
    2. QE: when Fed buys MBS and issues reserves, $\lambda_{t+\tau}^{\$,*} \searrow \rightarrow s_t \searrow$
    3. QE: when Fed buys long-dated Treasurys and issues reserves??

G-10 Dollar appreciation against change in basis around QE event dates.



Sample of 14 QE event dates. 2-day window after QE-event dates.

Krishnamurthy and Lustig (2019). controlling for long rates.

Conclusion

- GRV (2020) & GHSS (2020): important contribution to our understanding of exchange rate determination, role for quantities and flows (distinct from Gabaix and Maggiori, 2015).
  - if Fed can lower BRP (e.g. through QE) and long rates, it increases FXRP, and cause the USD exchange rate to depreciate **now**
    - Fed gains control over the exchange rate through long rates
  - plausible mechanism
    - fits the data much better than existing models: U.I.P. restored in long-run through inverse relation between LC BRP and FXRP
    - has different predictions from convenience yield channel.
- insights about relation between BRP and FXRP apply more generally in large class of models without permanent, priced shocks to pricing kernels and exchange rates