Can time-varying currency risk hedging explain exchange rates?

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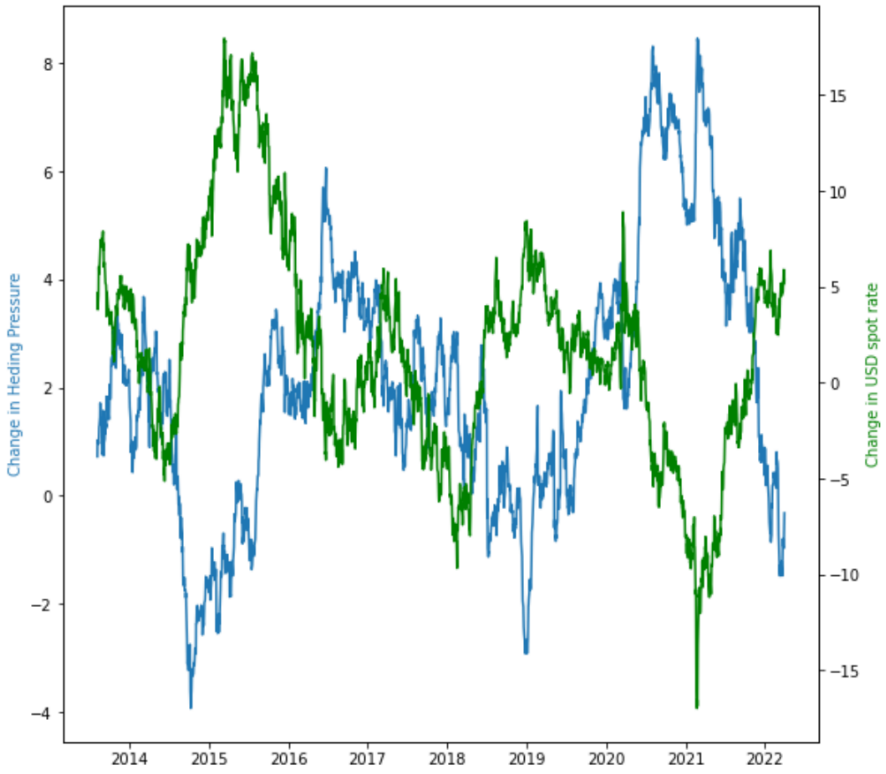
Paper identifies a robust relationship between net dollar forward trading and spot rates

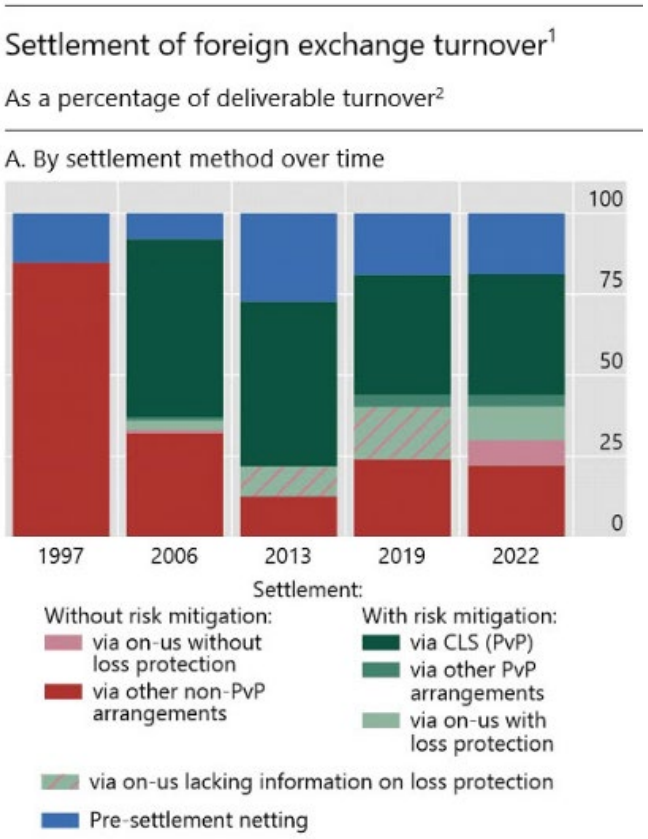
- Unique dataset from CLS
  - Ranaldo and Somogiy (2021)
  - Data on settlement of currencies bought and sold forward (a flow measure)
  - Focus on price-takers (ie customers)
  - Of these, on investment funds
- Studies the role of currency hedging in exchange rate determination
  - "The hedging channel" (Liao and Zhang, 2021)
  - Asymmetric hedging demands alter forward rates, spill into spot by arbitrage

Figure 2: Hedging Pressure From Funds and the US Dollar Spot Rate



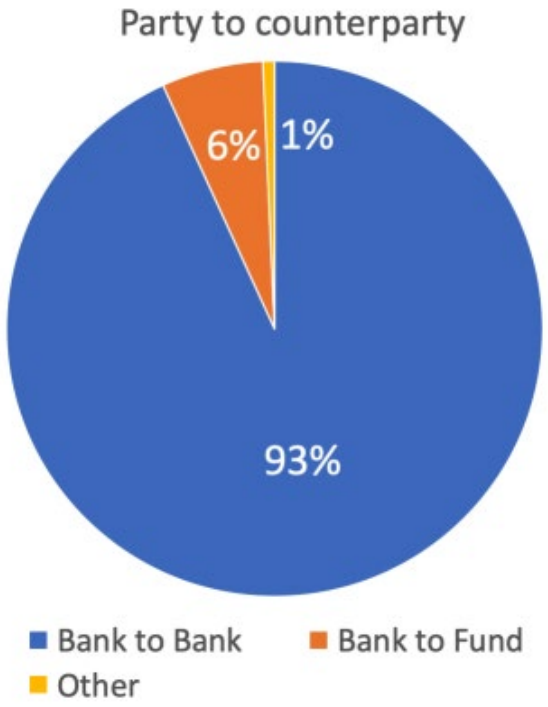
Notes: We graph the annual change in the hedging pressure emanating from forward contracts of funds (as reported by CLS) and the annual change in the (log) US dollar spot exchange rates. Both measures are computed as the cross-sectional average over all seven currencies. The negative correlation is −0.66.

Turnover based on CLS settlement records



Source: Glowka & Nilsson (2022), BIS QR Dec

CLS in April 2019



Source: Ranaldo (2022), SFI Papers 22-51

BIS Triennial in April 2019 (SPW & FWD)

- CLS data reflects part of the market: April 2022 SWP and FWD CLS $1,385 billion vs BIS $4,974 billion
- Dealers settle a lot of customer trades across their own books ("on-us") or net pre-settlement
- CLS may capture more inter-dealer volumes and customer volumes with higher price-impact

Main idea

- Foreign investors are net long USD bonds (US net asset position in bonds is negative)
- Massive FX hedging demand by foreign fixed income investors
  - Sell USD forward in FX swaps & forwards markets
- FX hedges supplied by intermediaries with limited risk-bearing capacity (à la Gabaix & Marriori, 2015)
- FX hedging activity impacts spot and forward exchange rate dynamics due to this friction

Empirical analysis in four stages:

- Determinants of net hedging pressure (HP_t): $HP_{c,t} = \alpha_c + \beta_1 NIP_{c,t} + \beta_2 VIX_t + \beta_3 NIP_{c,t} \times VIX_t + \epsilon_{c,t}$
- HP_t impact on s_t and f_t: $\Delta s_{c,t} = \alpha_c + \gamma_t + \beta_1 \Delta HP_{c,t} + \beta_2 \Delta(y^*_{c,t} - y^{\$}_{c,t}) + \beta_3 ECT_{c,t-1} + \epsilon_{c,t+1}$
- Supply & demand driven HP_t components: $\Delta HP_{c,t} = \widehat{\Delta HP}^{\Delta VIX}_{c,t} + \widehat{\Delta HP}^{\Delta(NIP \times VIX)}_{c,t} + \widehat{\Delta HP}^{ECT}_{c,t} + \Delta HP^{Residual}_{c,t}$
- VAR (2-variables, de-trended): $\mathbf{A x_t} = \mathbf{B x_{t-1}} + \mathbf{u_t}, \quad \mathbf{x}'_{c,t} = [HP_{c,t}, s_{c,t}]$ where $\mathbf{A}$ is a (lower) triangular 2×2 matrix

Core results

Determinants of net hedging pressure (HP_t):

$$HP_{c,t} = \alpha_c + \beta_1 NIP_{c,t} + \beta_2 VIX_t + \beta_3 NIP_{c,t} \times VIX_t + \epsilon_{c,t}$$

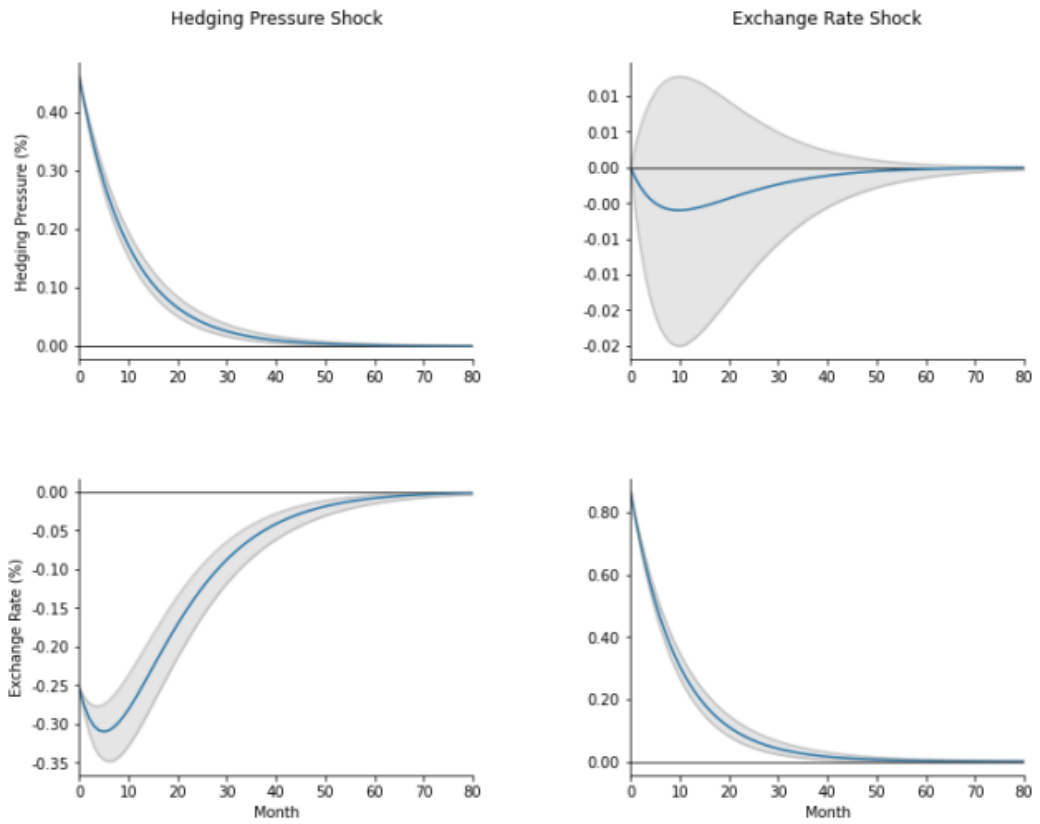
- Hedging pressure (funds selling more USD forward) increasing in:
  - Net foreign investment in US bonds (TIC data) & financial market volatility & uncertainty (the VIX)
  - Sensitivity to the VIX_t higher when $NIP_{c,t}$ is higher
  - ECM indicates long-run mean-reversion if $HP_{c,t}$ deviates too far from the level based on $NIP_{c,t}$ and the VIX_t

HP_t impact on s_t and f_t:

$$\Delta s_{c,t} = \alpha_c + \gamma_t + \beta_1 \Delta HP_{c,t} + \beta_2 \Delta (y^*_{c,t} - y^{\$}_{c,t}) + \beta_3 ECT_{c,t-1} + \epsilon_{c,t+1}$$

- Net short-selling by funds associated with USD depreciation in spot and forward market
- Have *both* currency depreciation and the widening of forward discount
- Forward depreciates more (so, a higher hedging cost ($f_t - s_t$)). Focusing on the ECM specifications:
  - A one s.d increase in $HP_{c,t}$ is associated with 0.5634% (0.5643%) depreciation of the dollar spot (forward)
  - " " associated with 0.3935% (03943%) depreciation of the dollar spot (forward), ECM with time *F.E.*
  - Forward discount/premium, quoted as forward points in pips.. small units but important in CIP literature

Main result confirmed in a VAR



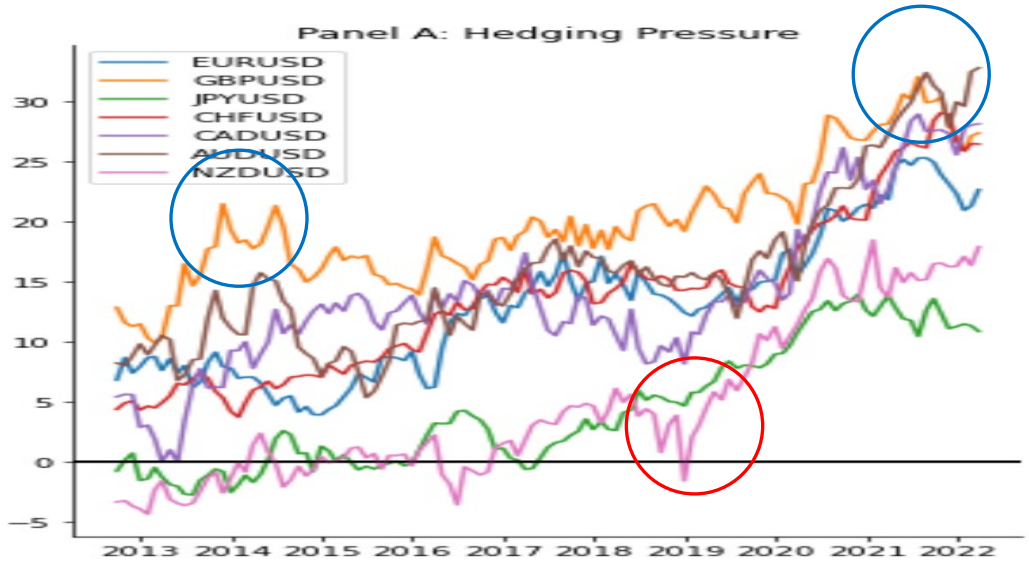
- Intriguing result. For instance, if $HP_{c,t}$ was just an indirect proxy for the concurrent *unhedged* USD bond investment (due to partial hedging), then impulse response expected to be positive

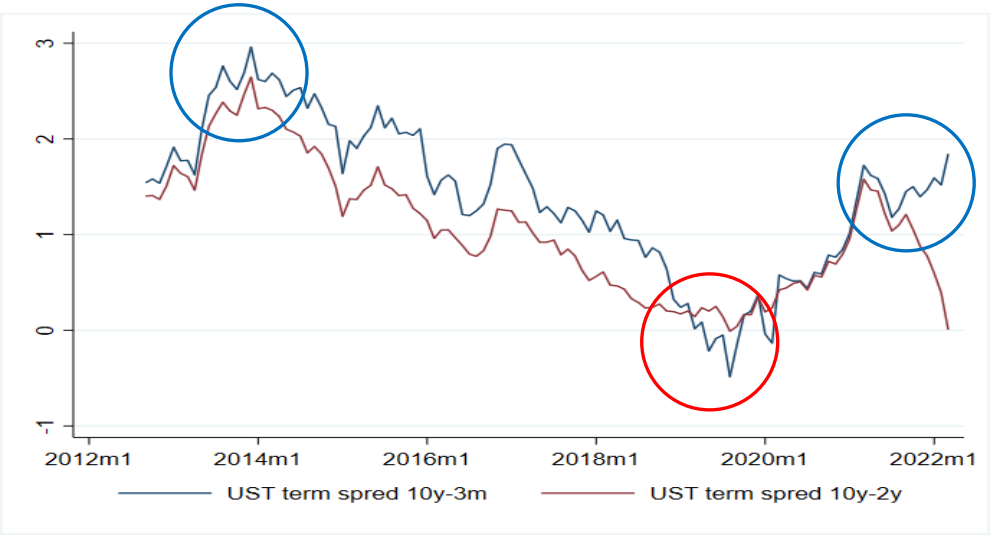
Comment 1: drivers of currency hedging pressure

HP_t determined by NIP_t, hedging policy (and currency volatility) and **hedging costs**

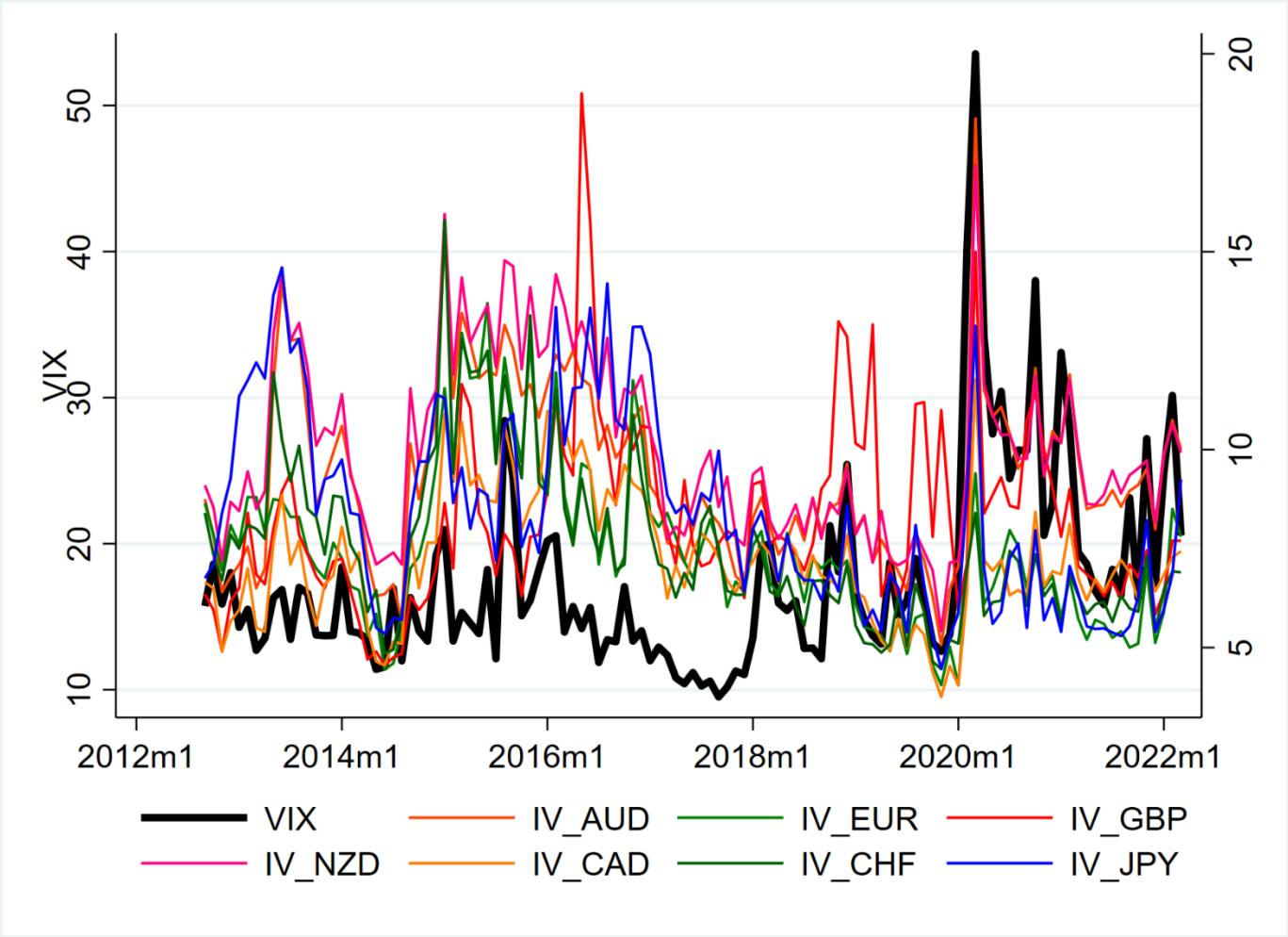
- NIP_t includes both hedged and unhedged USD bond investments
  - Eg GPIF does not hedge FX bond holdings, but JP insurers do

- USD investment yield and FX hedging costs driven by different parts of the yield curve:
  - FX hedging costs driven by the short-end
  - But investment yields derive from longer-term USTs
  - **When UST yield curve flattens, FX hedged returns drop and hedged UST investments fall**
  - **UST term spread** key to FX hedged return





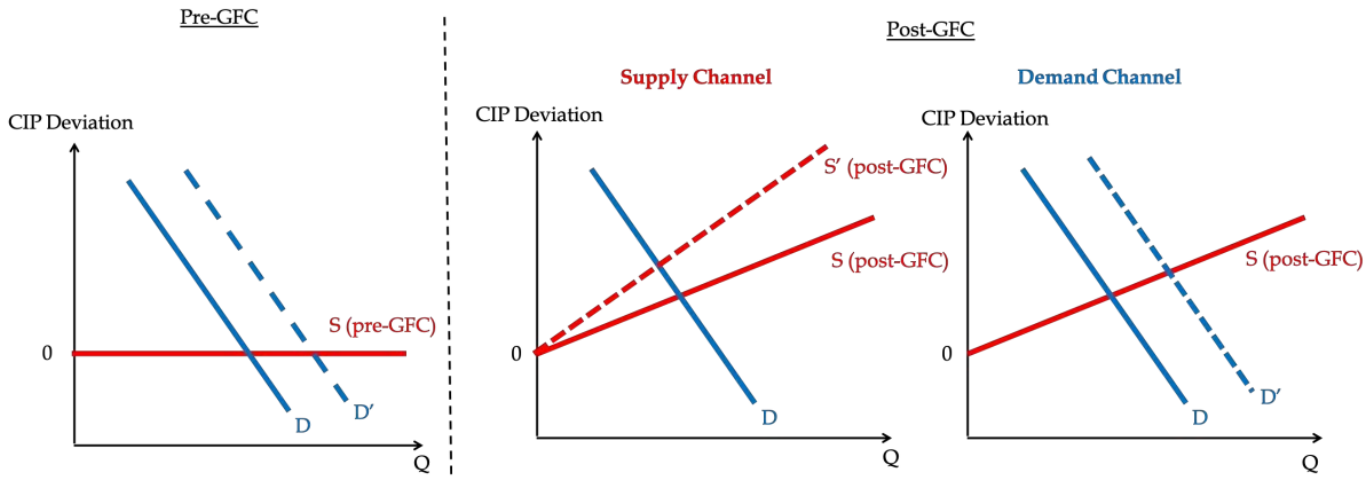
Comment 2: for risk, best to use currency rather the equity options-based indicators



- Suggest using implied volatilities of individual currency pairs, not the VIX, as they can behave differently

Comment 3: would be interesting to see HP_t impact on the hedging costs, then moving to spot

Figure 6: Supply and Demand for Dollar Funding in the FX Swap Markets



Notes: This figure shows supply and demand diagrams for dollar funding in the FX swap market pre- and post-GFC. The vertical axis shows the the price of FX swap market dollar funding relative to the cash market dollar funding, as measured by the CIP deviation for bank rates. The horizontal axis shows the quantity of dollar funding (and hedging activities).

Source: Du and Schreger (2021), NBER WP 28777

- If s_t and f_t respond in the same way, then dealers not compensated via "the points"
- ΔHP_t price impact should show up in $\mathbf{\Delta(f_t - s_t)}$, or some version of $(f_t - s_t) - (i_t^* - i_t^{\$})$
- Empirically, identification challenging since ΔHP_t responds to hedging costs as well

Comment 3 (cont'd): hedging activity also responds to hedging costs, yields and FX levels

- Causality difficult to establish
- $NIP_{c,t}$ seems like a perfect instrument, because it affects $(f_t - s_t)$ only via $HP_{c,t}$
- Why not instrument for $HP_{c,t}$ using $NIP_{c,t}$, and, possibly also $IV_{c,t}$ and the *US term spread*?
- Suggest first to establish any impact on the pricing of FX hedges: **$\Delta(f_t - s_t)$ or the basis**
- Can do this by using the instrumented $HP_{c,t}$ in the VAR (Equation (7))?

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Figure 1. FY22 investment plans of major life insurers

	Domestic bonds	Foreign bonds
Nippon	Increase; secure yield through JPY-denominated corporate bonds and foreign corporate bonds converted to JPY rates through currency swaps; environment conducive to investing in JGBs with 30y yields at 1.5%, but less so with average liability costs of 2%.	Reduce FX-hedged foreign bonds; sell sovereign bonds/switch to foreign corporate bonds for spread pick-up amid rising FX hedge costs; flat to lower in FX-unhedged foreign bonds, adjusting to FX/yield levels whie monitoring FX risk exposures
Sumitomo	Increase by JPY100bn; steadily reduce domestic interest rate risk utilizing superlong bonds and interest rate swaps; invest more when yields rise; 30y yields are investable at the upper-1% level based on medium/long-term liability costs.	Reduce FX-hedged foreign bonds by several hundreds of billions of yen; increase investment in corporate bonds; for low-yielding FX-hedged foreign bonds, consider shifting funds to domestic bonds and switching/selling issues; flat in FX-unhedged foreign bonds; consider while monitoring FX/yield levels; invest to cover for sales of foreign currency insurance.
Daiichi	Increase through constant purchases; accumulate, centered around 30y/40y sectors; accelerate buying in H2	FX-hedged foreign bonds to depend on yield and FX levels; FX-unhedged foreign bonds to depend on risk tolerance and FX levels

Comment 4: supply-side/dealers' willingness to accomodate

- So far, this is proxied by the VIX terms:
- Possible to dig a bit deeper:
  - The size and direction of banks' own FX swap position a first-order constraint that affects aggregate pricing (Borio et al, 2016 BIS WP 590).
  - Banks marginal funding costs in dollar money markets (Rime et al, 2017 BIS WP 651)
  - Non-risk weighted and risk-weighted capital requirements (Du et al, 2018)

$$\Delta HP_{c,t} = \widehat{\Delta HP}_{c,t}^{\Delta VIX} + \widehat{\Delta HP}_{c,t}^{\Delta(NIP \times VIX)} + \widehat{\Delta HP}_{c,t}^{ECT} + \Delta HP_{c,t}^{Residual}$$

The elephant in the room… can FX hedging explain exchange rates?

- Difficult. A relatively new area of active research, so theoretical channel to clear
- Assumed to work through intermediaries' frictions. But how?
  - "In addition to affecting the forward exchange rates, investor demand for forwards can spillover to the spot exchange rate market. Intermediaries that supply yen forward must buy yen in the spot market" (Liao and Zhang, 2020)
  - "Banks often eliminate their FX exposure through a synthetic hedge, which combines a spot transaction […] with a short and long bond positions in the USD and EUR bond markets" (present paper)
- Inter-bank FX swap market is extremely deep, and is the first stop for pricing and hedging customer forwards
  - In fact, global banks largely rely on their internal capital markets to move funding across currencies
  - Almost one-third of all inter-dealer FX swap trading is "non-market facing" (BIS Triennial, 2022)
  - Whether or not a banking system is net long or short USD via currency swaps is key (Borio et al, 2016)

Comment 5: further ideas for identifying the impact of FX hedging demand on exchange rates

- First-order impact on spot exchange rate expected to be greater for unhedged flows
  - Does the coefficient on $HP_{c,t}$ remain significant if $NIP_{c,t}$ also included?
- A basis on the RHS may introduce endogeneity (s_t on both sides) and multicollinearity (with $HP_{c,t}$)
- Take greater advantage of the higher frequency and dimensionality of CLS data
  - Daily or intraday frequency, more lead-lag analysis, granger-causality tests?
  - Does CLS data on banks' settlement of FX spot support "the synthetic hedging" of the forwards sold?
  - Note: careful matching with spot returns data may also be important (T+2 settlement) at higher frequencies
- Favor a VAR approach (building on Equation (7) in the paper)
  - Instrumental variable VAR (à la Danielsson & Love (2006); application in Breeden et al (2021))
  - But finding the right instrument difficult..
  - At a lower frequency, funds' currency hedge ratios could constitute a good instrument

In sum

- The paper uses a unique dataset to lend support for “the hedging channel” of exchange rates
- Identification is difficult, but this is fairly a common problem in related literature
- Suggest to leverage high frequency CLS data more, and to think about instruments
- Some minor comments will share directly with the authors

Enjoyed reading the paper and thank you for the opportunity to discuss