Dollar Asset Holding and Hedging Around the Globe

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The views expressed in this presentation are those of the authors and not necessarily those of the Federal Reserve Bank of New York or the Federal Reserve System.
**Research Question**

- US dollar has been the dominant currency in the past century.

- Studies of international finance often take stance on agents’ FX activities:
  - Exchange rate determination, e.g., Koijen and Yogo (2020), Liao and Zhang (2021), Camanho et al. (2021).
  - Dollar dominance, e.g., He et al. (2016), Coppola et al. (2023).

- Yet data on dollar asset holdings and hedging behaviors are scattered.

- This paper: **Which foreign investors hold what kind of USD securities and how do they manage their FX exposure?**
**Approach**

- Challenge 1: to estimate holdings of dollar and not just US securities.
  - Typical sources (TIC, CPIS) track holdings of securities issued by US residents.
  - **Our approach:** adjust for foreign-issued USD securities and US-issued non-USD securities.

\[
\text{Total Foreign Holding of USD Securities} = \text{Foreign USD Holding of U.S. Issuers} + \text{Foreign USD Holding of Non-U.S. Issuers} = (\text{TIC Foreign Holding of U.S. Securities} - \text{TIC Foreign Holdings of Non-USD Securities}) + (\text{USD Securities Outstanding Outside the U.S.} - \text{U.S. Investors' Cross-border USD Holdings}).
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- **Challenge 2:** to analyze USD holding and hedging, by sector, and relative to investor’s portfolio.
  - Typical sources do not distinguish between types of investor, nor do they track investors’ overall portfolio or hedging behavior.
    - CPIS has sectoral breakdown, but highly incomplete.
  - **Our approach:** hand-collect company filings and industry statistics to track, by country and sector, overall portfolio size and USD holdings and hedging.
Data: investor’s portfolio allocation

• We hand collect company filings and industry statistics to gather portfolio data from seven sectors:
  • Insurance: 34 countries.
  • Pension: 16 countries.
  • Mutual funds: 64 countries.
  • Banks: 48 countries.
  • Hedge funds: 53 countries.
  • The official sector: 237 countries.
  • The non-financial sector: 56 countries

• We focus on three key aspects:
  • Total portfolio size.
  • Holding of USD debt vs. equity.
  • Hedging of USD debt vs. equity.
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- **Challenge 3:** to benchmark investor’s portfolio allocation.
  - No existing framework on allocation when facing joint decision of domestic asset vs. USD asset vs. hedging.
  - **Our approach:** construct mean-variance investor’s optimal portfolio of three types of returns and take the model prediction to data.
**Key results**

- Three facts on Holding:
  - Foreign investors are increasing their portfolio allocation to USD.
  - They (mostly) prefer debt over equity.
  - A significant fraction of their exposure comes from non-US issuers.

- Three facts on Hedging:
  - Foreign investors hedge a substantial amount.
  - Increased hedging post-GFC despite deviations from covered interest-rate parity.
  - There is considerable heterogeneity in hedging practice.

- Investor behavior benchmarked:
  - Optimal behavior differs across currencies.
  - Investors' allocations show consistency with the optimum in some aspects.
  - Notable deviation in hedging suggests that investors are not FX price-takers.
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Fact 1: Foreign investors show increasing preference for USD securities

Foreign holding of USD securities

![Graph showing foreign holding of USD securities over time.](image-url)
**Fact 1 cont’d**

Portfolio allocation to USD across industries

(A) Insurance

(B) Mutual funds

(C) Pensions
Fact 2: Foreign investors prefer holding USD bonds over equities

Foreign USD holding by security type

Foreign-held USD debt and equity as share of total outstanding
Fact 3: A large fraction of foreign investors’ holdings of USD bonds is issued by non-U.S. issuers.
Fact 4: There is a substantial amount of hedging in actively-managed industries, especially post-GFC

Foreign holding of USD by industry and hedging status, June 2020
**FACT 4 CONT’D**

USD hedging by industry

[Graph showing USD hedging by industry for insurance, pensions, and mutual funds over time.]
Quick aside: cost of hedging

- **CIP:** $f_{t,\tau} = s_t + r^c_{t,\tau} - r^s_{t,\tau}$.

- **CIP basis:**
  $$x^c,^s_{t,\tau} = r^s_{t,\tau} - (s_t + r^c_{t,\tau} - f_{t,\tau}).$$

- **Exchange rates:** unit of foreign currency per USD.
  - An increase in $s$ or $f$, is a depreciation of the foreign currency.

- **Interest rates:** log of annualized rate; $c$ denotes foreign.

![Three-month IBOR-based CIP basis](image)
Fact 5: Investors’ hedging demand not deterred by rising hedging costs

Taiwanese insurers’ hedging

(A) CIP basis vs. hedging volume

(B) Total hedging cost

Total hedging cost across insurers and pensions in 2020: $2.7B.
Fact 6: Hedging behaviors show persistence and heterogeneity across sectors and countries.

(A) Insurance

(B) Pensions
Model environment

- Two assets: local bonds ($b$) and USD bonds ($\$b$).
  - $r_{x_t+1}^b = r_{t+1}^b - r_{f_t}$.
  - $r_{x_t+1}^{\$b} = r_{t+1}^{\$b} - r_{f^\$}$.
Model environment

• Two assets: local bonds ($b$) and USD bonds ($$b$).
  
  • $r x_{t+1}^b = r_{t+1}^b - r f_t$.
  
  • $r x_{t+1}^{\$b} = r_{t+1}^{\$b} - r f_\$t$.

• Foreign investors cannot earn $r x_{t+1}^{\$b}$ without buying USD bonds; the local currency return on holding USD bonds depends on currency hedging strategy.
  
  • $r x_{t+1}^{\$b,NH} = r_{t+1}^{\$b} + \Delta s_{t+1} - r f_t \equiv r x_{t+1}^{\$b} + r x_{t+1}^{FX}$.
  
  • $r x_{t+1}^{\$b,H} = r_{t+1}^{\$b} + (f_t - s_t) - r f_t = r x_{t+1}^{\$b} + x_t$.  

We therefore have three types of returns:

• $r x_{t+1}^b$.

• $r x_{t+1}^{\$b}$.

• $r x_{t+1}^{FX}$; $x_t$ is not a return but determined at time $t$. 
Two assets: local bonds ($b$) and USD bonds ($\$b$).

- \( r x^b_{t+1} = r^b_{t+1} - r f_t \).

- \( r x^{\$b}_{t+1} = r^{\$b}_{t+1} - r f^{\$} \).

Foreign investors cannot earn \( r x_{t+1}^{\$b} \) without buying USD bonds; the local currency return on holding USD bonds depends on currency hedging strategy.

- \( r x^{\$b,NH}_{t+1} = r^{\$b}_{t+1} + \Delta s_{t+1} - r f_t \equiv r x^{\$b}_{t+1} + r x^{FX}_{t+1} \).

- \( r x^{\$b,H}_{t+1} = r^{\$b}_{t+1} + (f_t - s_t) - r f_t = r x^{\$b}_{t+1} + x_t \).

We therefore have three types of returns:

- \( r x^b \).

- \( r x^{\$b} \).

- \( r x^{FX} \); \( x_t \) is not a return but determined at time \( t \).
The investor chooses $w_{US}$ and $w_{NH}$ to maximize her utility:

$$\max_{w_{US},w_{NH}} \mathbb{E}r_{x_{t+1}}^P - \frac{\gamma}{2} \mathbb{V}(r_{x_{t+1}}^P),$$

where $r_{x_{t+1}}^P$ is the log excess return of the entire portfolio given by:

$$r_{x_{t+1}}^P = (1 - w_{US}) r_{x_{t+1}}^b + w_{US} r_{x_{t+1}}^{sb} + w_{NH} r_{x_{t+1}}^{FX} + (w_{US} - w_{NH}) x_t.$$
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$$r_{x_t+1}^P = (1 - w_{US}) r_{x_t+1}^b + w_{US} r_{x_t+1}^b + w_{NH} r_{x_t+1}^F + (w_{US} - w_{NH}) x_t.$$

- We solve for optimal $w_{US}^*$ and $w_{NH}^*$.
  - Functions of expected returns and conditional (co)variance.

- We focus on comparative statics:
  - How do $w_{US}^*, w_{NH}^*$ change w.r.t. $r_{x_t+1}^b - r_{x_t+1}^b$, $r_{x_t+1}^F$, and $x$?
  - Functions of covariance: estimate assuming stationarity and using realized 1M holding returns from 2010/07 to 2022/08.
Model predictions

**Model-implied optimal comparative statics**

<table>
<thead>
<tr>
<th>Currency</th>
<th>Share of USD ($w_{US}$)</th>
<th>Share of Not-hedged USD ($w_{NH}$)</th>
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</thead>
<tbody>
<tr>
<td>JPY</td>
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- Intuitive predictions for $w_{US}^b, w_{FX}^{NH}, w_{x}^{NH}$.
- For others, optimal allocation depends on relative covariance and volatility.
## Model predictions

### Model-implied optimal comparative statics

<table>
<thead>
<tr>
<th>Currency</th>
<th>$rx^{Sb} - rx^b$</th>
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- Intuitive predictions for $w_{US}^{\$b}, w_{NH}^{FX}, w_{NH}^{\$b}$.
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Testing investors’ portfolio against model predictions

• Regression of changes in investors’ portfolio allocation on changes in expected returns.

• Investors make portfolio allocations at time $t$ based on expected returns and covariance structure.
  • $E[rx_{t+1}] = y_{10Y,t} - rf_t$.
  • $E[rx_{Ft}^{x_{t+1}}] = f(s_t), f'(s_t) > 0$ due to momentum.
  • Expected returns are calculated using period average, where the period is the investor’s reporting frequency.

• Investors (observation frequency): Japanese insurers (SA), Australian pensions (Q), Taiwanese insurers (M), Israeli insurers (M), Israeli pensions (M).
## Investor’s USD Allocation

### Empirical determinants of change in USD allocation

*red denotes consistency with model prediction*

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**Investor’s FX allocation**

Empirical determinants of change in *non-hedged* USD allocation

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Empirical determinants of *change* in *non-hedged* USD allocation  
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Conclusions

• Foreign investors hold increasingly more USD securities and they hedge a substantial amount of their USD FX exposure.

→ Dollar demand not necessarily driven by dollar’s strength during crises.

• Investors’ USD allocation is largely consistent with mean-variance trade-off but hedging shows striking deviation from what CIP deviation would predict.

→ Investors may not be FX price takers: CIP deviations are likely driven by investors’ hedging demand.
### Data detail 1

<table>
<thead>
<tr>
<th>Industry</th>
<th>Region / Country</th>
<th>Company filings</th>
<th>Industry or national statistics providers</th>
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<th>End</th>
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