The views expressed here do not necessarily reflect the position of the Bank of England.
The U.S. (Dollar) in the Global Financial System

- Dollar perceived as safe in short run
  - Flights-to-safety appreciate dollar in bad times

[Magiori 2017; Kekre & Lenel 2021; Ostry 2023; ...]

- But in long run: near-zero excess returns on long-maturity dollar-bond portfolios (vs. G.7)

[Chinn & Meredith 2005; Lustig, Stathopoulos & Verdelhan 2019; ...]

- Treasuries viewed as special
  - Treasuries command convenience yield, but (now) only at short maturities

[Du, Im & Schreger 2018; Jiang, Krishnamurthy & Lustig 2021; Engel & Wu 2022; Diamond & Van Tassel 2022; ...]

- U.S. itself a safe haven
  - But U.S. equity premia high and rising

[Farhi & Gourio 2018; Atkeson, Heathcote & Perri 2022; ...]

How are these dimensions of U.S. (dollar) 'specialness' interlinked?
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▶ Dollar perceived as safe in short run

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[Farhi & Gourio 2018; Atkeson, Heathcote & Perri 2022; ...]

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[Maggiori 2017; Kekre & Lenel 2021; Ostry 2023; ...]
The U.S. (Dollar) in the Global Financial System

- Dollar perceived as **safe** in short run
  - Flights-to-safety appreciate dollar in bad times
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How are these dimensions of U.S. (dollar) ‘specialness’ interlinked?
Treasury (In)convenience: ‘Specialness’ at Different Maturities

**U.S. 6M Cross-Country Conv. Yield**

- Percentage Points

**U.S. 10Y Cross-Country Conv. Yield**

- Percentage Points

Rising U.S. Relative Equity Premia

U.S. Relative Equity Risk Premium

\[ \beta = 0.032^{***} \]

Rising U.S. Relative Equity Premia and Permanent Risk

**U.S. Relative Equity Risk Premium**

\[ \beta = 0.032^{***} \]

**U.S. Relative Permanent Risk**

\[ \beta = 0.043^{***} \]

*Note.* Relative U.S. equity risk premium and permanent risk (avg. vs. other G.7), 2000:M2 to 2020:M12.
Permanent Risk and Currency Risk Premia

Standard two-country, no-arbitrage setup predicts:

Relative U.S. Permanent SDF Volatility $= \text{Long-Run U.S. Dollar Premium}$

[McKibbin, Stathopoulos & Verdelhan 2019]
Permanent Risk and Currency Risk Premia

Standard two-country, no-arbitrage setup predicts:

\[
\text{Relative U.S. Permanent SDF Volatility} = \text{Long-Run U.S. Dollar Premium}
\]

But empirical evidence does not appear consistent:

**U.S. Relative Permanent Risk**

\[\beta = 0.043^{***}\]

**Carry-Trade Returns on 10Y Bonds**

\[\beta = -0.01\]
Theory: two-country, no-arbitrage setup to link U.S. safety across markets: FX, bond, equity

\[
\text{Relative U.S. Risk} = \text{Relative SDF Volatility} + \text{Pecuniary Return} + \text{Non-Pecuniary Return}
\]


In equilibrium, changes in U.S. relative risk induce movements in either the pecuniary or non-pecuniary returns to U.S. dollars/Treasuries in short- and long-run.

In long run: countries can have different 'permanent' risk, yet long-run carry-trade returns can be near zero because risk differences are reflected in convenience yields.

Our Paper

Theory: two-country, no-arbitrage setup to link U.S. safety across markets: FX, bond, equity

\[
\text{Relative U.S. Risk} = \text{U.S. FX Risk Premium} + \text{Relative U.S. Convenience Yield}
\]

- In equilibrium, changes in U.S. relative risk induce movements in either the pecuniary or non-pecuniary returns to U.S. dollars/Treasuries in short- and long-run
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Empirics: measure U.S. relative risk across markets/maturities and test model relationships

- Document rise in relative U.S. total risk vs G.7, driven by permanent risk
- Decline in long-maturity U.S. Treasury convenience and rise in relative U.S. permanent risk are two sides of the same coin

Corsetti, Lloyd, Marin & Ostry (BoE, EUI, UC Davis)
Our Paper

Theory: two-country, no-arbitrage setup to link U.S. safety across markets: FX, bond, equity

\[
\text{Relative U.S. Risk} = \text{U.S. FX Risk Premium} + \text{Relative U.S. Convenience Yield}
\]

Relative SDF Volatility \hspace{1cm} \text{Pecuniary Return} \hspace{1cm} \text{Non-Pecuniary Return}

- In equilibrium, changes in U.S. relative risk induce movements in either the pecuniary or non-pecuniary returns to U.S. dollars/Treasuries in short- and long-run
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- Document rise in relative U.S. total risk vs G.7, driven by permanent risk
- Decline in long-maturity U.S. Treasury convenience and rise in relative U.S. permanent risk are two sides of the same coin
Our Model of Convenience and Risk

- Two countries: $H$ (U.S.) and $F$ (*)

**Representative investor pricing kernels:**

$\Lambda_t$, $\Lambda^*_t$ (SDF: $M_{t,t+1} = \Lambda_t + k/\Lambda_t$)

$\Lambda_t = \Lambda_P t \Lambda_T t$ such that $\Lambda_P t$ is a martingale ($\Lambda_P t = E_t[\Lambda_P t+1]$)

- Transitory component reflects intertemporally 'smoothable' cons. growth affected by, e.g., business-cycle risk, risk associated with adjustment to permanent shocks

- Permanent component reflects long-run effects of shocks to cons. growth affected by, e.g., steady-state risk of financial crisis or changes to long-run growth prospects

**Conditional entropy (volatility) of SDF to measure country risk:**

$L_t(M_{t,t+1}) = E_t ln M_{t,t+1} - ln(E_t M_{t,t+1}) \approx 1/2 var_t(M_{t,t+1})$

**Trade in:**

- Bonds: earning pecuniary returns and non-pecuniary convenience yields
- Foreign Exchange: earning pecuniary currency movements
- Equities: pecuniary returns tied to country-specific risk
Our Model of Convenience and Risk

- Two countries: $H$ (U.S.) and $F$ (*)
- Representative investor pricing kernels: $\Lambda_t, \Lambda^*_t$ (SDF: $M_{t,t+k} = \Lambda_{t+k}/\Lambda_t$)
Our Model of Convenience and Risk

- Two countries: $H$ (U.S.) and $F$ (*).

- Representative investor pricing kernels: $\Lambda_t$, $\Lambda_t^*$ (SDF: $M_{t,t+k} = \Lambda_{t+k}/\Lambda_t$).

- $\Lambda_t = \Lambda_t^P \Lambda_t^T$ such that $\Lambda_t^P$ is a martingale ($\Lambda_t^P = \mathbb{E}_t[\Lambda_{t+1}^P]$) [Alvarez & Jermann 2005]
  - $M_{t,t+1}^T = \Lambda_{t+1}^T/\Lambda_t^T$: Transitory component reflects intertemporally ‘smoothable’ cons. growth affected by, e.g., business-cycle risk, risk associated with adjustment to permanent shocks
  - $M_{t,t+1}^P = \Lambda_{t+1}^P/\Lambda_t^P$: Permanent component reflects long-run effects of shocks to cons. growth affected by, e.g., steady-state risk of financial crisis or changes to long-run growth prospects.

- Conditional entropy (volatility) of SDF to measure country risk:
  
  \[ L_t(M_{t+1}) = \mathbb{E}_t \ln M_{t+1} - \ln(\mathbb{E}_t M_{t+1}) \approx \frac{1}{2} \text{var}_t(M_{t+1}) \]
Our Model of Convenience and Risk

- Two countries: $H$ (U.S.) and $F$ (*)
- Representative investor pricing kernels: $\Lambda_t, \Lambda_t^*$ (SDF: $M_{t,t+k} = \Lambda_{t+k}/\Lambda_t$)
- $\Lambda_t = \Lambda_t^P \Lambda_t^T$ such that $\Lambda_t^P$ is a martingale ($\Lambda_t^P = \mathbb{E}_t[\Lambda_{t+1}^P]$) [Alvarez & Jermann 2005]
  - $M_{t,t+1}^T = \Lambda_{t+1}/\Lambda_t^T$: **Transitory** component reflects intertemporally ‘smoothable’ cons. growth affected by, e.g., business-cycle risk, risk associated with adjustment to permanent shocks
  - $M_{t,t+1}^P = \Lambda_{t+1}^P/\Lambda_t^P$: **Permanent** component reflects long-run effects of shocks to cons. growth affected by, e.g., steady-state risk of financial crisis or changes to long-run growth prospects
- Conditional entropy (volatility) of SDF to measure country risk:
  $$\mathcal{L}_t(M_{t+1}) = \mathbb{E}_t \ln M_{t+1} - \ln(\mathbb{E}_t M_{t+1}) \approx \frac{1}{2} \text{var}_t(M_{t+1})$$
- Trade in:
  #1. **Bonds**: earning pecuniary returns and non-pecuniary convenience yields
  #2. **Foreign Exchange**: earning pecuniary currency movements
  #3. **Equities**: pecuniary returns tied to country-specific risk
Agents invest in term structure of $H$ and $F$ bonds, with maturity $k = 1, 2, ..., \infty$:

**Home Investor (U.S.):**

\[
e^{-\theta^H_{t,H}(k)t} = \mathbb{E}_t \left[ M_{t,t+k} R_t^{(k)} \right]
\]

\[
e^{-\theta^H_{t,F(k)}t} = \mathbb{E}_t \left[ M_{t,t+k} \frac{\mathcal{E}_{t+k}}{\mathcal{E}_t} R_t^{(k)} \right]
\]

**Foreign Investor:**

\[
e^{-\theta^F_{t,F(k)}t} = \mathbb{E}_t \left[ M^*_{t,t+k} R_t^{(k)*} \right]
\]

\[
e^{-\theta^F_{t,H}(k)t} = \mathbb{E}_t \left[ M^*_{t,t+k} \frac{\mathcal{E}_t}{\mathcal{E}_{t+k}} R_t^{(k)*} \right]
\]

where $\mathcal{E}_t$ exchange rate $\uparrow$ is a Foreign currency appreciation.

**Assumption 1 (Convenience-Yield Term Structure)**

*Term structure of convenience yields $\theta^i_{t,j}(k)$ (investor $i$, bond $j$, maturity $k$) is observable at time $t$.***
Assumption 2 (Equities and Convenience)

Investors trade in domestic risky asset (return $R^g_{t,t+1}$) whose convenience is normalised to zero.

\[
1 = \mathbb{E}_t \left[ M_{t,t+1} R^g_{t,t+1} \right] \\
1 = \mathbb{E}_t \left[ M^*_{t,t+1} R^g_{t,t+1} \right]
\]
Assumption 2 (Equities and Convenience)

Investors trade in domestic risky asset (return $R_{t,t+1}^g$) whose convenience is normalised to zero.

\[
1 = \mathbb{E}_t \left[ M_{t,t+1} R_{t,t+1}^g \right]
\]

\[
1 = \mathbb{E}_t \left[ M_{t,t+1}^* R_{t,t+1}^{g*} \right]
\]

Equilibrium FX Process

\[
\frac{\mathcal{E}_{t+1}}{\mathcal{E}_t} = \frac{M_{t,t+1}^*}{M_{t,t+1}} e^{\theta_{t}^{F,H(1)} - \theta_{t}^{H,H(1)}}
\]

Investors across countries and time face same FX process, so no-arbitrage implies agreement on convenience yields: $\theta_{t}^{F,H(1)} - \theta_{t}^{F,F(1)} = - (\theta_{t}^{H,F(1)} - \theta_{t}^{F,F(1)})$

+ restrictions on term structure of convenience yields
Total, Permanent and Transitory SDF Risk

Lower bound for Total SDF risk:

\[ \mathcal{L}_t(M_{t,t+1}) \geq \mathbb{E}_t \log \left( \frac{R_{t,t+1}}{R_t} \right) - \theta_t^{H,H}(1) \]

We derive new bounds for permanent SDF risk:

**Proposition**

Lower bound for Permanent SDF risk:

\[ \mathcal{L}_t(M_{t,t+1}^P) \geq \mathbb{E}_t \log \left( \frac{R_{t,t+1}^g}{R_t} \right) - \mathbb{E}_t \left[ r x_{t+1}^{(\infty)} \right] - \theta_t^{H,H}(\infty) + \mathbb{E}_t \left[ \theta_{t+1}^{H,H}(\infty) \right] \]

where \( r x_{t+1}^{(k)} = \log \left( \frac{R_{t,t+1}^{(k)}}{R_t} \right) \)
Measuring SDF Risk with Equity Premia

- Rel. risk measures assuming bounds hold with equality (maximised by equity indices)

\[
\theta_{H,H,t} \quad \text{using swap-Treasury spreads} \quad \text{[Du, Hébert & Li 2022]}
\]

Proxy (log) equity risk premium according to Gordon growth formula:

\[
E_t \log \left( R_{g,t+1} + R_t \right) := D_t/P_t + g_t - r_t + \pi_{et} \cdot D_t/P_t
\]

- dividend-price ratio from G.7 equity price indices (Global Financial Data)
- \( g_t \): proxy exp. future dividend gr. with avg. annual dividend gr. in 10 years prior to \( t \)
- \( r_t - \pi_{et} \): 6-month nominal zero-coupon bond yield and inflation forecasts (Consensus Economics)

Key finding: U.S. Total risk now higher than G.7, driven by Permanent risk
Measuring SDF Risk with Equity Premia

- Rel. risk measures assuming bounds hold with equality (maximised by equity indices)
- Measure $\theta_t^{H,H}$ using swap-Treasury spreads

[Du, Hébert & Li 2022]

Proxy (log) equity risk premium according to Gordon growth formula:

$$E_t \log \left( R_{g_{t,t+1}} + R_t \right) := D_t P_t + g_e - r_t + \pi_e \cdot D_t / P_t$$

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$$\mathbb{E}_t \log \left( \frac{R_{t,t+1}}{R_t} \right) := \frac{D_t}{P_t} + g_t^e - r_t + \pi_t^e$$

- $D_t/P_t$: dividend-price ratio from G.7 equity price indices

- $g_t^e$: proxy exp. future dividend gr. with avg. annual dividend gr. in 10 years prior to $t$

- $r_t - \pi_t^e$: 6-month nominal zero-coupon bond yield and inflation forecasts

[Du, Hébert & Li 2022]

[Farhi & Gourio 2018]

(Global Financial Data)

(Consensus Economics)
Measuring SDF Risk with Equity Premia

- Rel. risk measures assuming bounds hold with equality (maximised by equity indices)
- Measure $\theta_{t,H}^{H,H}$ using swap-Treasury spreads
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$$E_t \log \left[ \frac{R_{t,t+1}}{R_t} \right] := \frac{D_t}{P_t} + g_t^e - r_t + \pi_t^e$$

- $D_t/P_t$: dividend-price ratio from G.7 equity price indices
- $g_t^e$: proxy exp. future dividend gr. with avg. annual dividend gr. in 10 years prior to $t$
- $r_t - \pi_t^e$: 6-month nominal zero-coupon bond yield and inflation forecasts

Key finding: U.S. Total risk now higher than G.7, driven by Permanent risk
Our Measures of U.S. Relative Risk

U.S. Relative Equity Risk Premium

\[ \beta = 0.032^{***} \]

U.S. Relative Permanent Risk

\[ \beta = 0.043^{***} \]

Relationship to Other Measures of U.S. Relative Risk

U.S. Relative Permanent Risk

Ex Ante Equity-Based Measure

\[ \beta = 0.043^{***} \]

U.S. Long-Run Risk

Schorfheide, Song & Yaron 2018

\[ \beta = 0.03^{***} \]

\[
\mathcal{L}(M_{t,t+1}^{\text{P}}) - \mathcal{L}(M_{t,t+1}^{\text{P}*}) - \lim_{k \to \infty} \frac{1}{k} \mathbb{E} \left[ r_{t+k}^{FX} \right] + \lim_{k \to \infty} \frac{1}{k} \left\{ \mathbb{E} \left[ \theta_{t}^{F,H(k)} \right] - \mathbb{E} \left[ \theta_{t}^{F,F(k)} \right] \right\} = 0
\]

Proposition

U.S. Relative Permanent Risk
LR UIP Deviation
LR Treasury Convenience

where \( r_{t+k}^{FX} = r_t^{(k)*} - r_t^{(k)} + \Delta e_{t+k} \)

Absent convenience, long-horizon UIP holds \( (\lim_{k \to \infty} \frac{1}{k} \mathbb{E} \left[ r_{t+k}^{FX} \right] = 0) \Rightarrow \) permanent risk equalised across countries \( \mathcal{L}(M_{t,t+1}^{\text{P}}) = \mathcal{L}(M_{t,t+1}^{\text{P}*}) \)

With convenience, changes in relative permanent risk generate adjustment through non-pecuniary convenience yields: \( (\mathcal{L}(M_{t,t+1}^{\text{P}}) - \mathcal{L}(M_{t,t+1}^{\text{P}*})) \uparrow \leftrightarrow \left( \theta_{t}^{F,H(\infty)} - \theta_{t}^{F,F(\infty)} \right) \downarrow \)
Measures of U.S. Relative Risk and Long-Run Treasury Convenience

<table>
<thead>
<tr>
<th>Regression Dependent Variable: $\tilde{\theta}<em>{i,t}^{F,H(\infty)} - \tilde{\theta}</em>{i,t}^{F,F(\infty)}$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>US Relative Equity Prem.</strong></td>
</tr>
<tr>
<td>-0.08***</td>
</tr>
<tr>
<td>(0.02)</td>
</tr>
<tr>
<td><strong>US Relative Equity Return</strong></td>
</tr>
<tr>
<td>-0.03***</td>
</tr>
<tr>
<td>(0.01)</td>
</tr>
<tr>
<td><strong>US Relative Equity net Term Prem.</strong></td>
</tr>
<tr>
<td>-0.05***</td>
</tr>
<tr>
<td>(0.01)</td>
</tr>
<tr>
<td><strong>US Relative Permanent Risk</strong></td>
</tr>
<tr>
<td>-0.06***</td>
</tr>
<tr>
<td>(0.01)</td>
</tr>
<tr>
<td><strong>Observations</strong></td>
</tr>
<tr>
<td>1,657 1,657 1,657 1,544</td>
</tr>
<tr>
<td><strong>Country FE</strong></td>
</tr>
<tr>
<td>YES YES YES YES</td>
</tr>
<tr>
<td><strong>Within R-squared</strong></td>
</tr>
<tr>
<td>0.0564 0.0402 0.0402 0.0616</td>
</tr>
<tr>
<td><strong>Pedroni Panel Cointegration t Test</strong></td>
</tr>
<tr>
<td>-5.43*** -5.36*** -4.86*** -4.46***</td>
</tr>
</tbody>
</table>

Pedroni (1999, 2004) Test Details: $H_0$: No cointegration in all panels; $H_1$: Cointegration in every panel
Conditional Long-Run SDF Risk, FX Premia and Convenience Yields

Carry-trade return long Foreign $\infty$-maturity bond, short Home $\infty$-maturity bond for one period:

$$
\mathbb{E}_t[r x_{t+1}^{(\infty)}, CT] = \mathbb{E}_t[r x_{t+1}^{FX}] + \mathbb{E}_t[r x_{t+1}^{(\infty)*}] - \mathbb{E}_t[r x_{t+1}^{(\infty)}]
$$

Currency Returns

Difference in Local Bond Returns

Proposition

U.S. Relative Permanent Risk

$$
\mathcal{L}_t(M_{t,t+1}^{P}) - \mathcal{L}_t(M_{t,t+1}^{P*}) - \mathbb{E}_t[r x_{t+1}^{(\infty)}, CT] + \left(\theta_t^{F,H(\infty)} - \theta_t^{F,F(\infty)}\right)
\left(\mathbb{E}_t[\theta_{t+1}^{F,H(\infty)}] - \mathbb{E}_t[\theta_{t+1}^{F,F(\infty)}]\right) = 0
\triangle LR Treasury Convenience
$$
Long-Run Risk, Treasury Convenience & FX Premia in the Data

\[
\tilde{\theta}_{i,t}^{F,H(\infty)} - \tilde{\theta}_{i,t}^{F,F(\infty)} = \beta_0 + \beta_1 \left[ \tilde{\mathcal{L}}_t(M_{i,t,t+1}^P) - \tilde{\mathcal{L}}_t(M_{i,t,t+1}^{P*}) \right] \\
+ \beta_2 r_{x_{i,t+1}} + \beta_3 \left[ \tilde{\theta}_{i,t+1}^{F,H(\infty)} - \tilde{\theta}_{i,t+1}^{F,F(\infty)} \right] + f_i + \varepsilon_{i,t}
\]

<table>
<thead>
<tr>
<th>Variables</th>
<th>Dependent Variable: $\tilde{\theta}<em>{i,t}^{F,H(\infty)} - \tilde{\theta}</em>{i,t}^{F,F(\infty)}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\tilde{\mathcal{L}}<em>t(M</em>{i,t,t+1}^P) - \tilde{\mathcal{L}}<em>t(M</em>{i,t,t+1}^{P*})$</td>
<td>-0.015** (0.008)</td>
</tr>
<tr>
<td>$\tilde{\mathcal{L}}<em>t(M</em>{i,t,t+1}^P)$</td>
<td>-0.024*** (0.009)</td>
</tr>
<tr>
<td>$\tilde{\mathcal{L}}<em>t(M</em>{i,t,t+1}^{P*})$</td>
<td>0.002 (0.01)</td>
</tr>
<tr>
<td>$\tilde{\mathcal{L}}<em>t(M</em>{i,t,t+1}^P) - \tilde{\mathcal{L}}<em>t(M</em>{i,t,t+1}^{P*})$ ex post</td>
<td>-0.012*** (0.004)</td>
</tr>
</tbody>
</table>

| Observations | 1,508 | 1,508 | 1,508 |
| Country FE | Yes | Yes | Yes |
| Within $R^2$ | 0.682 | 0.688 | 0.688 |
Conclusion

★ Framework to assess dimensions of U.S. ‘specialness’ jointly in FX, bond and equity markets

★ In equilibrium, changes in U.S. relative risk induce movements in either the pecuniary or non-pecuniary returns to U.S. dollars/Treasuries

★ Combine theory with novel measures of SDF risk (from equity markets) as well as convenience yields (from CIP) and returns (from FX and bond markets) for G.7 countries

★ Document rise in relative U.S. total risk vs G.7, driven by permanent risk

★ Decline in long-maturity U.S. Treasury convenience and rise in relative U.S. permanent risk are two sides of the same coin

★ Mechanism: re-assessment by investors of U.S. risk following the recent large global crises (Dot-Com and GFC) that originated in the U.S

[Kozlowski, Veldkamp, & Venkateswaran 2019]
Appendix
Lemma (Term Structure of Convenience Yields)

Given $M_{t,t+1}$, $M^*_{t,t+1}$, the Euler equations, and the exchange-rate process, term structure of convenience yields satisfies the following conditions:

$$\theta_t^{F,H}(k) - \sum_{\tau=0}^{k-1} \theta_{t+\tau}^{F,H}(1) = \theta_t^{H,H}(k) - \sum_{\tau=0}^{k-1} \theta_{t+\tau}^{H,H}(1)$$

for all $k$ and all $t$. There is an analogous expression for the Home and Foreign investors’ convenience yields on Foreign bonds.
Short-Run SDF Risk, FX Premia and Convenience Yields

Euler equations & FX process imply tight link between relative total risk, pecuniary one-period currency returns \( r_{X_{t+1}} = r^{(1)*}_t - r^{(1)}_t + \Delta e_{t+1} \) and one-period non-pecuniary convenience yields.

Proposition

\[
\mathcal{L}_t(M_{t,t+1}) - \mathcal{L}_t(M^{*}_{t,t+1}) - \mathbb{E}_t[r_{X_{t+1}}] + \theta^{F,H(1)}_t - \theta^{F,F(1)}_t = 0
\]

Higher U.S. relative total risk can generate adjustment through two channels:

#1 **FX Risk Premia**: U.S. dollar depreciates \( \rightarrow \) U.S. investor earns higher returns to net-long positions in Foreign currency bond: \( r_{X_{t+1}} \uparrow \)

#2 **Convenience Yields**: U.S. investor earns higher convenience yield on Foreign bond vis-à-vis U.S. Treasury: \( (\theta^{F,H(1)}_t - \theta^{F,F(1)}_t) \downarrow \)
Interest Rates and Exchange Rates

- $\mathcal{E}_t$: FX data for U.S. vs. other G.7 economies: 1997:M1 to 2020:M12
- $r^{(k)}_t$: 6-month and 10-year zero-coupon government bond yields

U.S. Short-Run Dollar Premium $rx_{t+1}^{FX}$

U.S. Long-Run Carry Trade Return $rx_{t+1}^{(\infty),CT}$

Note. U.S. Short and Long-Run Carry-Trade Returns (avg. vs. other G.7), 2000:M2 to 2020:M12.
Mapping CIP to Cross-Country Convenience Yields

Measure relative U.S. Treasury convenience $\theta_{t}^{F,H(k)} - \theta_{t}^{F,F(k)}$ from CIP deviations

\[
\mathbb{E}_{t}[M_{t,t+k}^{*}\mathcal{E}_{t+k}\left(\frac{F_{t}^{(k)}}{\mathcal{E}_{t}}R_{t}^{(k)*}\right)] = e^{-\theta_{t}^{F,F(k)} - \beta_{k}^{*}(\theta_{t}^{F,H(k)} - \theta_{t}^{F,F(k)})}
\]

- $\beta_{k}^{*} = 1$: Foreign investor values a synthetic Treasury same as a U.S.-issued Treasury
  \[\Rightarrow\] U.S. Treasuries only convenient due to their currency and CIP deviations not informative
- $\beta_{k}^{*} < 1$: Intrinsic convenience from U.S. Treasury, beyond its currency denomination
  \[\Rightarrow\] $CIP_{t}^{(k)}$ suggests Foreigners value U.S. bonds more than Foreign ones

\[
\theta_{t}^{F,H(k)} - \theta_{t}^{F,F(k)} := \frac{1}{1 - \hat{\beta}_{k}^{*}}CIP_{t}^{(k)}
\]  
  [Jiang, Krishnamurthy & Lustig 2021]

<table>
<thead>
<tr>
<th>Maturity</th>
<th>6-month</th>
<th>1-year</th>
<th>10-year</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\hat{\beta}_{k}^{*}$</td>
<td>0.76</td>
<td>0.89</td>
<td>0.85</td>
</tr>
</tbody>
</table>
Cross-Country Convenience Yields

U.S. 6M Cross-Country Conv. Yield
\[ \theta_{t}^{F,H(1)} - \theta_{t}^{F,F(1)} \]

U.S. 10Y Cross-Country Conv. Yield
\[ \theta_{t}^{F,H(\infty)} - \theta_{t}^{F,F(\infty)} \]

U.S. Within-Country Convenience Yields

Measure using interest-rate swaps: $\theta_t^{H,H(k)} := r_{irs,t}^{(k)} - r_t^{(k)}$

[Du, Hébert & Li 2022]

U.S. 6M Within-Country Conv. Yield $\theta_t^{H,H(1)}$

U.S. 10Y Within-Country Conv. Yield $\theta_t^{H,H(\infty)}$

E.A. Within-Country Convenience Yields

Measure using interest-rate swaps: $\theta_{t}^{F,F}(k) := r_{irs,t}^{(k)*} - r_{t}^{(k)*}$

E.A. 6M Within-Country Conv. Yield $\theta_{t}^{F,F(1)}$

E.A. 10Y Within-Country Conv. Yield $\theta_{t}^{F,F(\infty)}$

Relative Equity Risk Premia

U.S. Relative Expected Equity Risk Premium

\[ \beta = 0.032^{***} \]

U.S. Relative Realised Equity Returns

\[ \beta = 0.06^{***} \]

Note. Ex ante and ex post relative U.S. equity risk premia (avg. vs. other G.7), 2000:M2 to 2020:M12.
## Panel Unit-Root Tests

<table>
<thead>
<tr>
<th>Currency Returns</th>
<th>Adj. ( t )</th>
<th>( p )-val.</th>
<th>Equity Risk Premium</th>
<th>Adj. ( t )</th>
<th>( p )-val.</th>
</tr>
</thead>
<tbody>
<tr>
<td>( r_{t+6m} )</td>
<td>-5.87</td>
<td>0.00</td>
<td>U.S.</td>
<td>-2.90</td>
<td>0.00</td>
</tr>
<tr>
<td>( r_{t+1y} )</td>
<td>-4.06</td>
<td>0.00</td>
<td>R.o.W.</td>
<td>-4.03</td>
<td>0.00</td>
</tr>
<tr>
<td>( r_{t+\infty},CT )</td>
<td>-6.30</td>
<td>0.00</td>
<td>ERP</td>
<td>-2.13</td>
<td>0.04</td>
</tr>
</tbody>
</table>

| Cross-Country Convenience | | | Equity Returns | | |
|---------------------------|-----------------------------|---------------------|---------------------|---------------------|
| \( \theta_{t}^{F,H}(6m) - \theta_{t}^{F,F}(6m) \) | -7.08 | 0.00 | Rel. Eq. Ret. | -6.20 | 0.00 |
| \( \theta_{t}^{F,H}(1y) - \theta_{t}^{F,F}(1y) \) | -5.55 | 0.00 | | | |
| \( \theta_{t}^{F,H}(10y) - \theta_{t}^{F,F}(10y) \) | -3.26 | 0.00 | | | |

| Within-Country Convenience | | | | |
|-----------------------------|-----------------------------|---------------------|---------------------|
| \( \theta_{t}^{H,H}(6m) - \theta_{t}^{F,F}(6m) \) | -4.68 | 0.00 | | |
| \( \theta_{t}^{H,H}(10y) - \theta_{t}^{F,F}(10y) \) | -2.18 | 0.03 | | |

| Relative Total Risk | | | | |
|---------------------|-----------------------------|---------------------|---------------------|
| \( DL_t(M_{t,t+1}), ERP \) | -1.91 | 0.12 | | |
| \( DL_t(M_{t,t+1}), Eq. Ret. \) | -4.89 | 0.00 | | |

Note. Im, Pesaran and Shin (2003) tests. \( H_0 \): all panels include unit root. \( H_1 \): at least one panel does not include a unit root.
## Panel Cointegration Tests

<table>
<thead>
<tr>
<th>Dependent Variable: $\theta_t^{F,H(10)} - \theta_t^{F,F(10)}$</th>
<th>Modified Phillips-Perron $t$</th>
<th>Phillips-Perron $t$</th>
<th>Augmented Dickey-Fuller $t$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$DL_t(M_{t,t+1}^P)$</td>
<td>-4.19</td>
<td>-3.64</td>
<td>-4.47</td>
</tr>
<tr>
<td>$p$-val</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>$DL_t(M_{t,t+1}^P)$ (smooth.)</td>
<td>-4.19</td>
<td>-3.64</td>
<td>-4.47</td>
</tr>
<tr>
<td>$p$-val</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Eq. net TP (smooth.)</td>
<td>-5.26</td>
<td>-3.79</td>
<td>-4.85</td>
</tr>
<tr>
<td>$p$-val</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Eq. Ret.</td>
<td>-5.75</td>
<td>-4.09</td>
<td>-5.36</td>
</tr>
<tr>
<td>$p$-val</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Testing Short-Run Relationship (Proposition 1)

\[
\tilde{\theta}_{i,t}^{F,H(6M)} - \tilde{\theta}_{i,t}^{F,F(6M)} = \beta_0 + \beta_1 [\tilde{\mathcal{L}}_t (M_{i,t,t+1}) - \tilde{\mathcal{L}}_t (M^*_{i,t,t+1})] + \beta_2 r x_{t+1}^{FX} + \beta_i + \xi_{i,t}
\]

<table>
<thead>
<tr>
<th></th>
<th>(\theta_t^{F,H(1)} - \theta_t^{F,F(1)})</th>
<th>(\theta_t^{F,H(1)} - \theta_t^{F,F(1)})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rel. Tot. Risk</td>
<td>-0.03**</td>
<td>-0.01</td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
<td>(0.01)</td>
</tr>
<tr>
<td>U.S. Eq. Risk Prem.</td>
<td></td>
<td>0.01***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.00)</td>
</tr>
<tr>
<td></td>
<td></td>
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</tr>
<tr>
<td>Observations</td>
<td>1,531</td>
<td>1,531</td>
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<tr>
<td># Countries</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Controls</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Country FE</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Within (R^2)</td>
<td>0.0184</td>
<td>0.0714</td>
</tr>
</tbody>
</table>