Corporate Basis and Demand for U.S. Dollar Assets

Grace Xing Hu
Tsinghua PBCSF

Zhan Shi
Tsinghua PBCSF

Ganesh Viswanath-Natraj
Warwick Business School

Junxuan Wang
Cambridge JBS

May 18, 2024
Five-Star Asia Pacific Workshop

Cross-border Bond Issuance (March 2021)

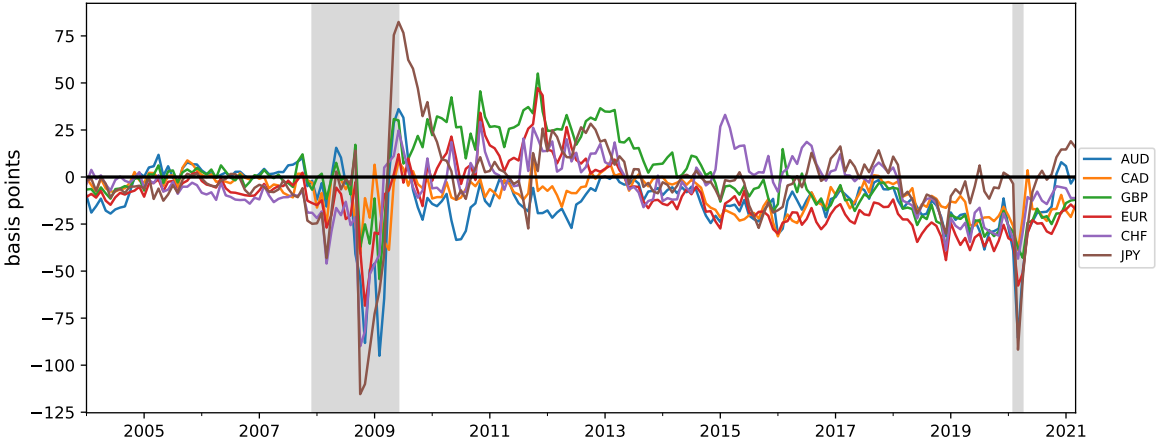
- The thickness of arrow line: e.g. the total size of USD bonds issued by EU firms
- The darkness of arrow line: e.g. the proportion of foreign currency bonds issued by EU firms that are denominated in USD

Motivation I

$$\Psi_t = \underbrace{y_{e,t}}_{\text{EUR-denominated bond yield}} - \underbrace{(y_{\$,t} + f_t - s_t)}_{\text{FX-hedged USD-denominated bond yield}} \tag{1}$$

- The corporate basis captures FX-hedged corporate bond pricing differences (e.g. in EU investors perspective)
  1. the return of EUR corporate bond ($\mathbf{y_{e,t}}$)
  2. the return of USD corporate bond ($\mathbf{y_{\$,t}}$) net of the FX hedging cost ($-(\mathbf{f_t - s_t})$)
- Under the no-arbitrage condition, the corporate basis should be zero.

Motivation II



Decomposition

$$\Psi_t = \underbrace{y_{e,t}}_{\text{EUR-denominated bond yield}} - \underbrace{(y_{\$,t} + f_t - s_t)}_{\text{FX-hedged USD-denominated bond yield}} \tag{2}$$

$$= \underbrace{\left[(y_{e,t} - y^G_{e,t}) - (y_{\$,t} - y^G_{\$,t})\right]}_{\text{Credit spread differentials}} + \underbrace{\left[(y^G_{e,t} + s_t - f_t) - y^G_{\$,t}\right]}_{\text{U.S. Treasury premiums}} \tag{3}$$

$$= \underbrace{\left[(y_{e,t} - y^G_{e,t}) - (y_{\$,t} - y^G_{\$,t})\right]}_{\text{Credit spread differentials}} + \underbrace{\left[(y^G_{e,t} - y^{r_f}_{e,t}) - (y^G_{\$,t} - y^{r_f}_{\$,t})\right]}_{\text{Convenience yield differentials}} + \underbrace{\left[(y^{r_f}_{e,t} + s_t - f_t) - y^{r_f}_{\$,t}\right]}_{\text{Cross-currency basis}} \tag{4}$$

- **Credit spread differentials (CSD):** From an foreign investor's perspective, it reflects the *unhedged* risky dollar asset demand (Liao 2020; Caramichael, Gopinath, and Liao 2021)

Decomposition

$$\Psi_t = \underbrace{y_{e,t}}_{\text{EUR-denominated bond yield}} - \underbrace{(y_{\$,t} + f_t - s_t)}_{\text{FX-hedged USD-denominated bond yield}}$$

$$= \underbrace{\left[(y_{e,t} - y^G_{e,t}) - (y_{\$,t} - y^G_{\$,t})\right]}_{\text{Credit spread differentials}} + \underbrace{\left[(y^G_{e,t} - y^{r_f}_{e,t}) - (y^G_{\$,t} - y^{r_f}_{\$,t})\right]}_{\text{Convenience yield differentials}} + \underbrace{\left[(y^{r_f}_{e,t} + s_t - f_t) - y^{r_f}_{\$,t}\right]}_{\text{Cross-currency basis}}$$

- **Convenience yield differentials (CYD):** It reflects the *unhedged* safe dollar asset demand of foreign investors (Du, Im, and Schreger 2018; Jiang, Krishnamurthy, and Lustig 2021)

Decomposition

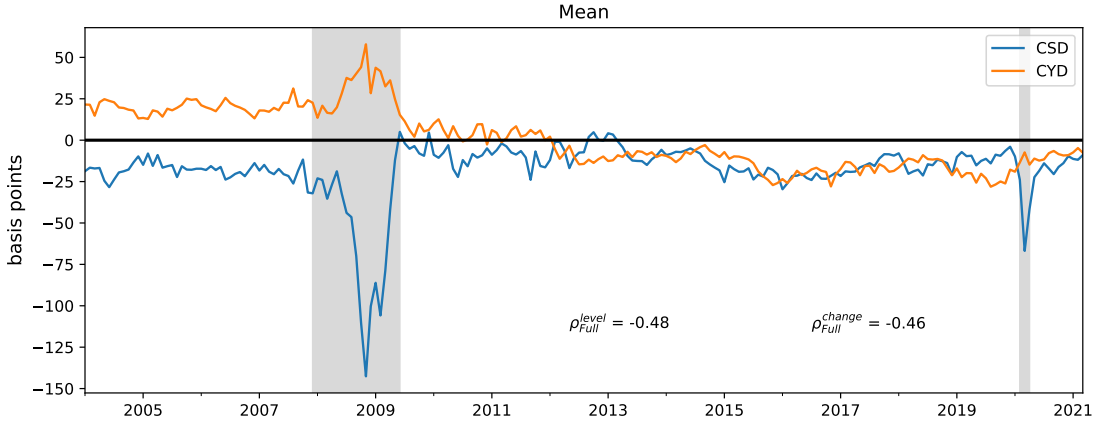
$$\Psi_t = \underbrace{y_{e,t}}_{\text{EUR-denominated bond yield}} - \underbrace{(y_{\$,t} + f_t - s_t)}_{\text{FX-hedged USD-denominated bond yield}}$$

$$= \underbrace{\left[(y_{e,t} - y^G_{e,t}) - (y_{\$,t} - y^G_{\$,t})\right]}_{\text{Credit spread differentials}} + \underbrace{\left[(y^G_{e,t} - y^{r_f}_{e,t}) - (y^G_{\$,t} - y^{r_f}_{\$,t})\right]}_{\text{Convenience yield differentials}} + \underbrace{\left[(y^{r_f}_{e,t} + s_t - f_t) - y^{r_f}_{\$,t}\right]}_{\text{Cross-currency basis}}$$

- **Cross-currency basis (CCB):** It measures deviations from the CIP condition and is a proxy for the scarcity of cross-border dollar liquidity (Du, Tepper, and Verdelhan 2018; Bahaj and Reis 2021; Ferrara et al. 2022)

Main Findings

- A substitution effect between safe (CYD) and risky (CSD) dollar assets' demand.



Main Findings

- Substitution effect evidence based on capital flows
  - A large increase in foreign investors' purchase of safe dollar assets & sell-off of risky dollar assets during crises
- Substitution effect evidence from SVAR with external instruments (Gertler and Karadi, 2015)
  - CSD: Corporate bond market frictions
    - Active investors (e.g., bond mutual funds) have a strong preference for liquid bonds (Bretscher et al. 2022).
    - A deterioration in the (relative) US corporate bond liquidity leads to a substitution toward safe dollar assets.
  - CSD: Credit market sentiment (*not presented today*)
  - CYD: US monetary policy surprises (Nakamura and Steinsson 2018)
- Spillovers of CSD shocks to other markets (FX, equities) and real economic activity.

Related Literature

Our contribution: Identify the substitution effect through a novel decomposition and from investors' perspective

- **Demand for dollar assets**
  - Liquidity/safety premiums on the US Treasuries: Jiang, Krishnamurthy, and Lustig (2021), Augustin et al. (2021), Duffie (2020), Klingler and Sundaresan (2020), and He, Nagel, and Song (2022)
  - Demand for risky dollar assets: Maggiori, Neiman, and Schreger (2019, 2020)
- **Global corporate bond pricing**: Valenzuela (2016), Geng (2021), and Huang, Nozawa, and Shi (2023)
- **CIP deviation**
  - LIBOR/swap rates: Du, Tepper, and Verdelhan (2018), Rime, Schrimpf, and Syrstad (2022), and Viswanath-Natraj (2020)
  - Government bonds: Du, Im, and Schreger (2018)
  - Corporate bonds: Liao (2020) and Caramichael, Gopinath, and Liao (2021)

Data and Definitions

Estimation on Corporate Basis

Cross-sectional regression (Liao 2020):

$$Z_{i,t} = \underbrace{\alpha_{c,t}}_{\text{Currency FE}} + \underbrace{\beta_{f,t}}_{\text{Firm FE}} + \underbrace{\gamma_{m,t}}_{\text{Maturity FE}} + \underbrace{\delta_{r,t}}_{\text{Rating FE}} + \epsilon_{i,t} \tag{2}$$

- USD: $Z_{i,t}^{(\tau)} = CS_{i,t}^{(\tau)}$, τ denotes bond i's time to maturity
- non-USD: $Z_{i,t}^{(\tau)} = CS_{i,t}^{(\tau)} + \text{CYD}_{c,t}^{(\tau)} + \text{CIP}_{c,t}^{(\tau)}$
- The corporate basis: $\Psi_{c,t} = \alpha_{c,t} - \alpha_{USD,t}$
- The credit spread differential: $CSD_{c,t} = \Psi_{i,t} - \text{CYD}_{c,t}^{(5)} - \text{CIP}_{c,t}^{(5)}$
- The average time to maturity is around five years.

Data Sources I

Corporate Bond Data

- Bond issuance level data: SDC Platinum Global New Issues
- **Criteria**: straight bonds; maturity $\geq$ 1 year; notional principal $\geq$ \$50 million, currency denominated in AUD, CAD, CHF, EUR, GBP, JPY or USD; the ultimate parent has bonds denominated in multiple currencies (one is USD)
- Month-end price: Bloomberg
- Credit rating: S&P Global Rating, Moody's Deafult & Recovery and Bloomberg;
- Sample period: January 2004 to March 2021
- 32,008 bonds; 1,852 issuers; total notional of \$24.2 trillions

Summary Statistics

Data Source II

Default-Free Interest Rates and Exchange Rates (Bloomberg)

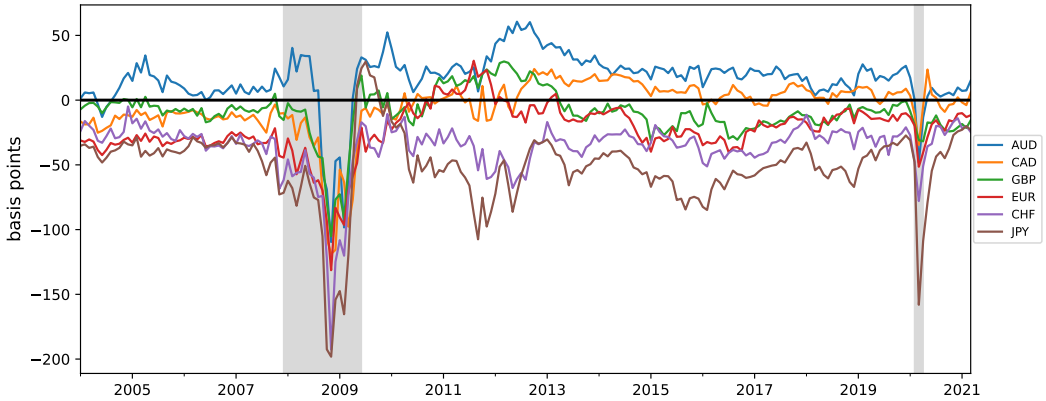
- Government bond yields; fixed rates of interest rate swaps; cross-currency swap basis (**Libor-based**, as the CIP deviation); spot exchange rates
- **Alternative risk-free rates to Libor**: SOFR (U.S.), AONIA (Australia), CORRA (Canada), SARON (Switzerland), ESTR (Euro Area), SONIA (UK), TONA (Japan)

Other Data

- Bloomberg: VIX, equity indexes and the commodity index
- ICE BofAML: Daily corporate bond quotes to estimate (monthly) effective bid-ask spreads
- Thomson Reuters TickHistory: 1-month Overnight Indexed swaps
- Federal Reserve Economic Data: Macroeconomic variables

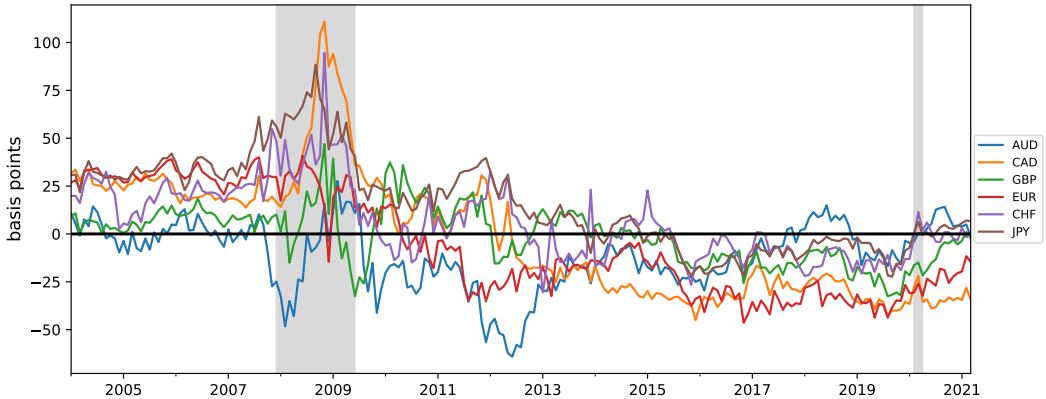
Time-series of CSD

$$\Psi_{i,t} = \underbrace{\left[(y_{i,t} - y^{G}_{i,t}) - (y_{\$,t} - y^{G}_{\$,t})\right]}_{\text{Credit spread differentials}} + \underbrace{\left[(y^{G}_{i,t} - y^{r_f}_{i,t}) - (y^{G}_{\$,t} - y^{r_f}_{\$,t})\right]}_{\text{Convenience yield differentials}} + \underbrace{\left[(y^{r_f}_{i,t} + s_t - f_t) - y^{r_f}_{\$,t}\right]}_{\text{Cross-currency basis}}$$



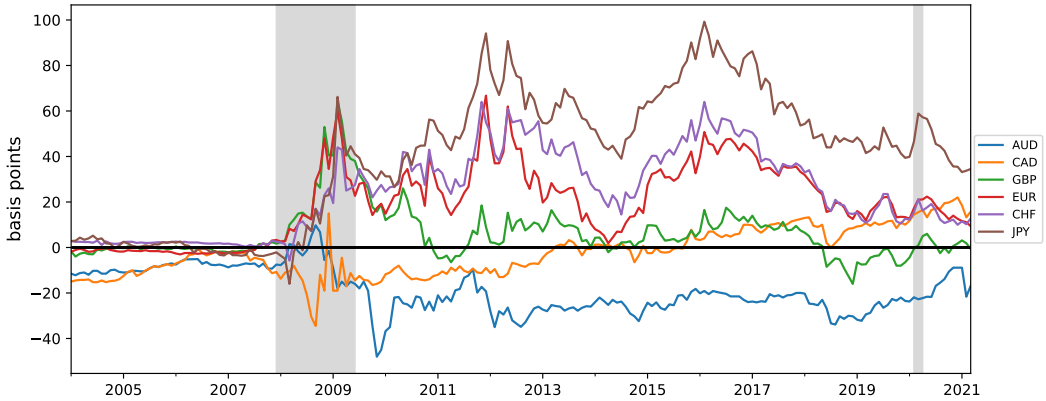
Time-series of CYD

$$\Psi_{i,t} = \underbrace{\left[(y_{i,t} - y^{G}_{i,t}) - (y_{\$,t} - y^{G}_{\$,t})\right]}_{\text{Credit spread differentials}} + \underbrace{\left[(y^{G}_{i,t} - y^{r_f}_{i,t}) - (y^{G}_{\$,t} - y^{r_f}_{\$,t})\right]}_{\text{Convenience yield differentials}} + \underbrace{\left[(y^{r_f}_{i,t} + s_t - f_t) - y^{r_f}_{\$,t}\right]}_{\text{Cross-currency basis}}$$

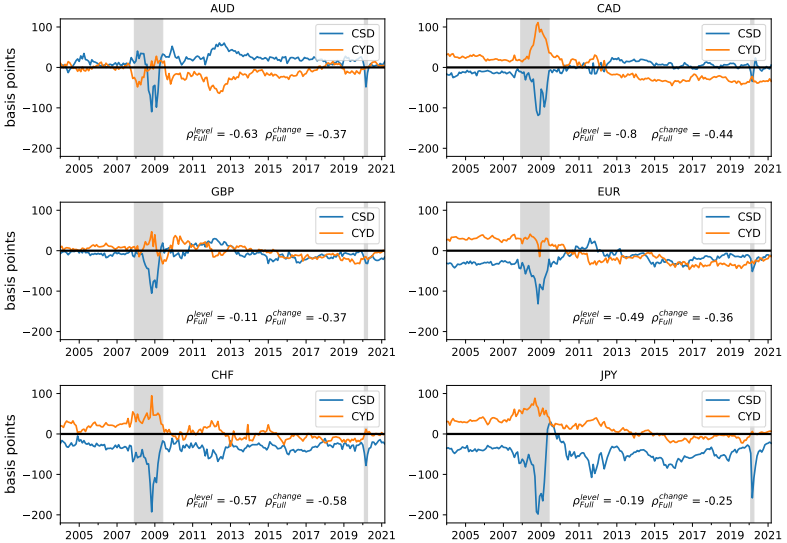


Time-series of CCB

$$\Psi_{i,t} = \underbrace{\left[(y_{i,t} - y^{G}_{i,t}) - (y_{\$,t} - y^{G}_{\$,t})\right]}_{\text{Credit spread differentials}} + \underbrace{\left[(y^{G}_{i,t} - y^{r_f}_{i,t}) - (y^{G}_{\$,t} - y^{r_f}_{\$,t})\right]}_{\text{Convenience yield differentials}} + \underbrace{\left[(y^{r_f}_{i,t} + s_t - f_t) - y^{r_f}_{\$,t}\right]}_{\text{Cross-currency basis}}$$



Substitution Effect for Each Currency



Empirical Findings

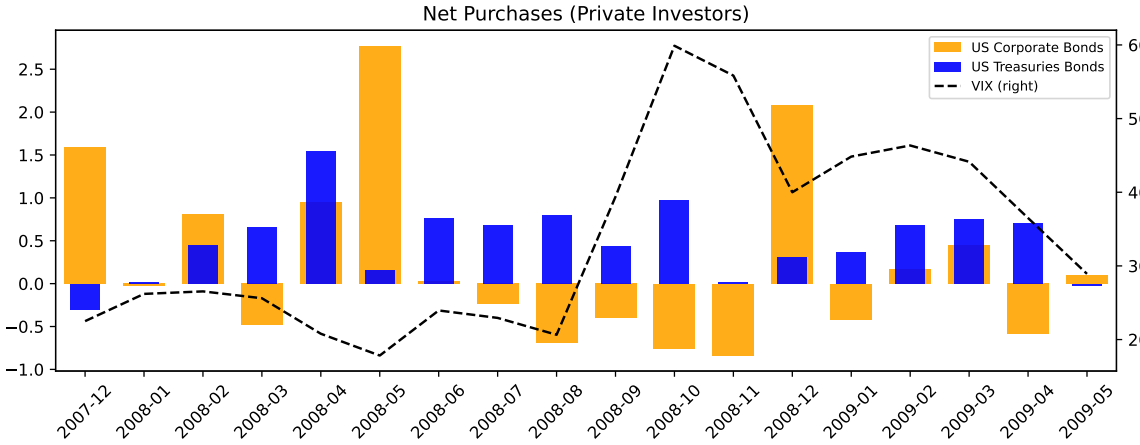
Preview of Findings

- Holding-level evidence: Foreign investors substitute toward safe dollar assets around the 2008 financial crisis
- Substitution Effect between risky and safe dollar assets:
  - Exploit shocks to CSD through frictions in the global corporate bond markets
  - A (relative) decrease in the US corporate bond liquidity $\Rightarrow$ a decreased demand for risky assets (CSD $\downarrow$) and a **substitution** toward safe assets (CYD $\uparrow$)
- Spillovers to other markets: A negative shock to demand for risky dollar assets (CSD $\downarrow$):
  - Leading to an appreciation of the USD.
  - Spillovers to equity and commodity markets and real economic impacts

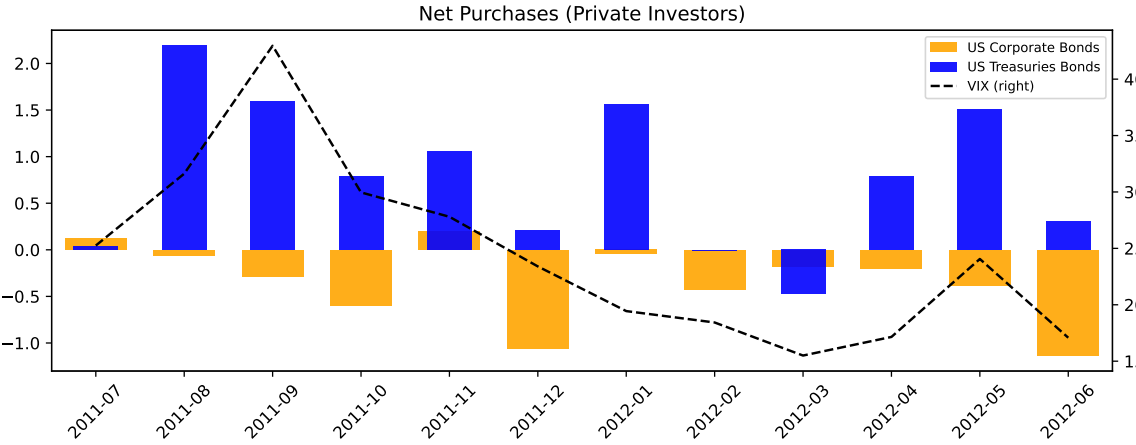
Holding-level Evidence: TIC Data

- TIC forms collect the monthly transaction data on cross-border purchases and sales of U.S. assets from U.S.-resident broker-dealers that are responsible for securities transactions with nonresidents, issuers, investors, and money managers.
- We record:
  - **Corporate Bonds:** US Corporate Bonds (Long-term), Net Purchases
  - **Government Bonds:** Treasury Bonds & Notes, and Treasury Bills.

Holding-level Evidence: Global Financial Crisis



Holding-level Evidence: European Debt Crisis



SVAR Model

$$AY_t = \sum_{j=1}^{\rho} A_j Y_{t-j} + \epsilon_t \tag{3}$$

- $Y_t = [CSD_t\ CYD_t\ CCB_t]'$; $\epsilon_t = [\epsilon_t^{\text{CSD shock}}\ \epsilon_t^{\text{CYD shock}}\ \epsilon_t^{\text{CCB shock}}]'$
- ρ is 1 based on the BIC criteria of VAR model

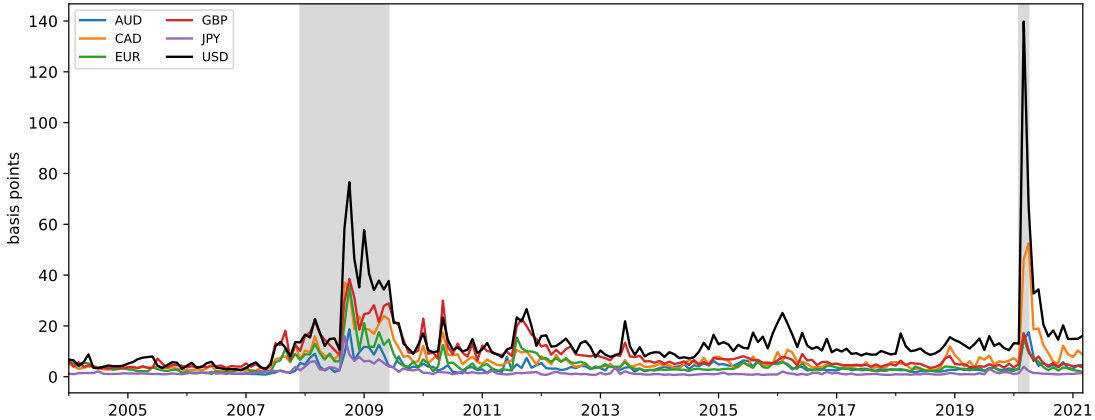
SVAR Model with Corporate Bond Liquidity Shocks I

- **Assumption:**
- We use an external instrument for CSD to identify the exogenous shock to dollar risky asset demand
- Hasbrouck (2009) develops a Gibbs sampler estimation of the extended Roll model,

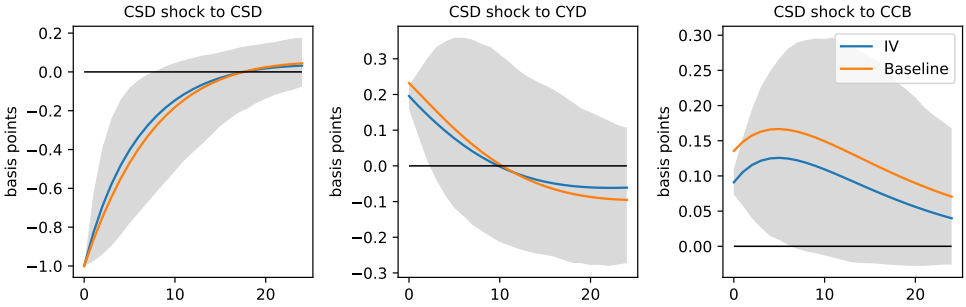
$$r_t = \theta \cdot \Delta D_t + \beta r_t^M + \epsilon_t, \tag{4}$$

- Instrument: Changes in the aggregate θ difference between the US and non-US corporate bond markets.

Time Variations in the Corporate Bond Market Liquidity



SVAR Model with Corporate Bond Liquidity Shocks II



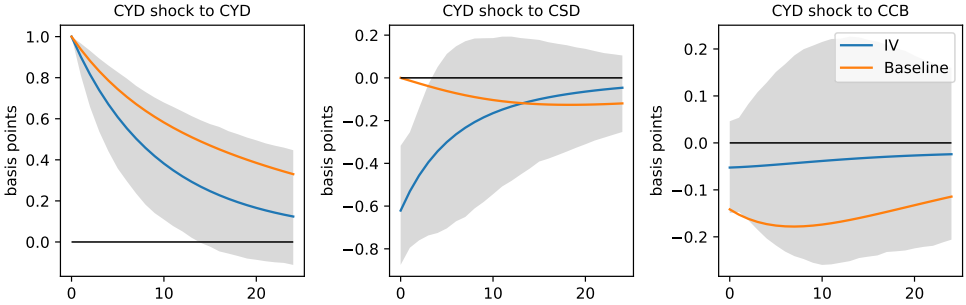
Note: First stage regression: Coefficient: 0.42; F-statistics: 48; R^2: 0.19.

- A negative shock to USD corporate bond liquidity relative to non-USD ones ⇒ sell risky dollar bonds (CSD ↓)
- A substitution toward safe dollar asset (CYD ↑) and limited CIP arbitrage (CCB ↑)
- One standard deviation (18.6 bps) decrease in CSD leads to a 3.6 bps increase in CYD, and a 1.7 bps increase in CCB.

SVAR Model with Monetary Policy Shock I

- We use an external instrument for CYD to identify the exogenous shock to dollar safe asset demand
  - A tightening of the US monetary policy makes Treasuries more attractive to passive international investors (Yellen, 2011)
  - Instrument: the first principal components of high-frequency changes in interest rates around FOMC announcements (Nakamura and Steinsson 2018)

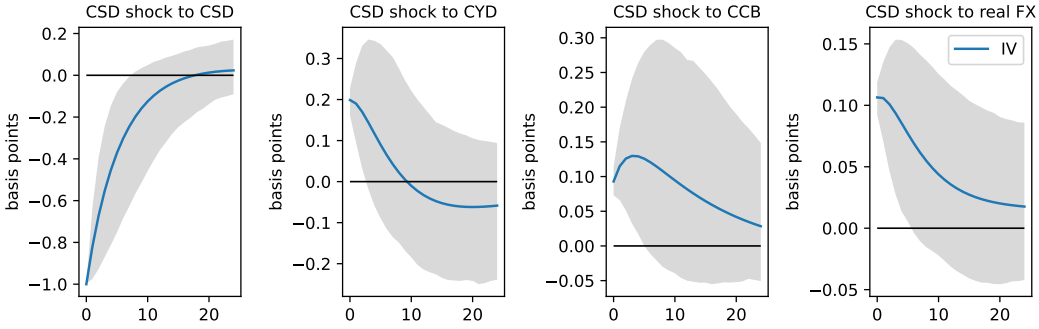
SVAR Model with Monetary Policy Shock II



Note: First stage regression: Coefficient: 59.6; F-statistics: 17; R^2: 0.08.

Substitution effect: One standard deviation (18 basis points) increase in CYD contemporaneous leads to a decrease in CSD of 11.2 basis points

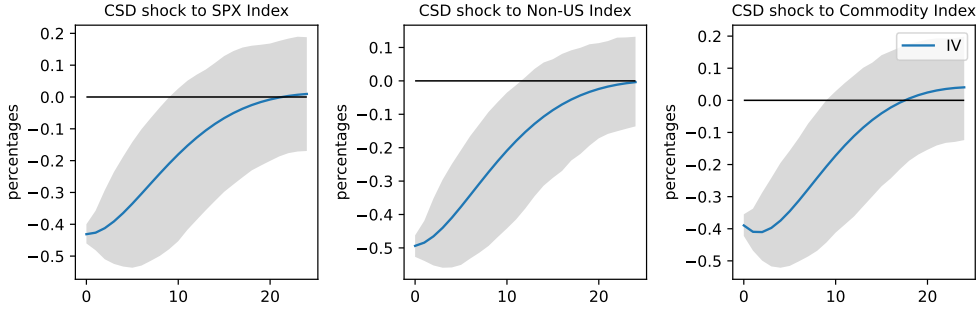
Spillover effects: FX Markets



Note: First stage regression: Coefficient: 0.42; F-statistics: 48; R^2: 0.19.

The declining US corporate bond liquidity also results in an appreciation of the dollar.

Spillover Effects: Equity and Commodity Markets

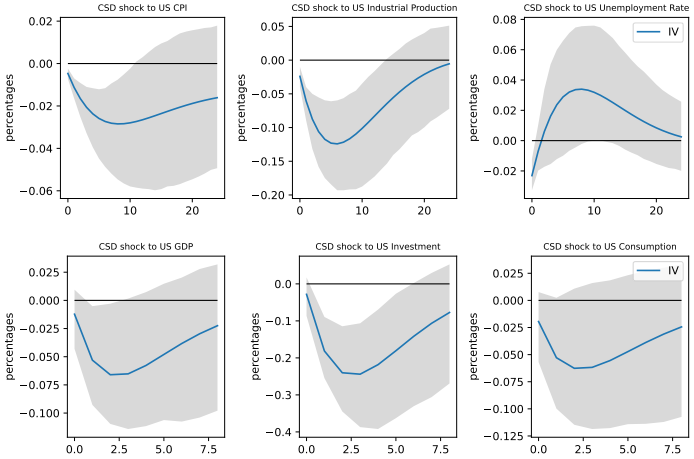


Note: First stage regression: Coefficient: 0.42; F-statistics: 49; R^2: 0.19.

A one standard deviation (18.6 basis points) decrease in CSD contemporaneously leads to a decline of 7.8%, 9.0% and 7.1% in one month of the SPX index, non-U.S. index and commodity index, respectively.

Spillover Effects: Economic Activities (U.S.)

One (negative) unit CSD shock to each variable. ⇒ a decline in the U.S. CPI, industrial production, investment, consumption and GDP with a rise in unemployment rates



We also find significant spillovers to non-U.S. Economic activities (Canada , Japan , Euro Area , UK , Switzerland and Australia)

Concluding Remarks

- This paper decomposes the corporate basis into components reflecting risky and safe asset demand by international investors, as well as a FX hedging cost reflecting cross-border dollar liquidity
- We document a substitution effect between safe and risky assets.
  - Time-series correlation
  - Quantity-based evidence with capital flows of international investors
  - Identification analysis in the SVAR framework
- The effect of the credit spread (CSD) shock spills over to FX, equity and commodity markets, and real economic activity.

Thank You!