

Internal Capital Frictions in Intermediaries and Exchange Rate Dynamics

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This project in a nutshell

- **Motivation:** CIP violations are persistent and significant, matters for international macro
- **Research question:** Can internal funding frictions explain CIP violations?
- **Key mechanism:** An FX loss on one currency pair limits arbitrage in other currency pairs (due to internal funding constraints), this drives CIP wedges in other currency pairs in which the dealer is dominant
- **Data:** (UK-)EMIR data of all the derivative trades in the UK
- **Empirical strategy:** Shocks to the profit and loss statement (P&L) within the balance-sheet of big dealers that intermediate the market, moving to (G)IV

Motivation

A project in intermediary asset pricing... Why does it matter for (international) macro?

- MP setting: transmission, imported inflation, export competitiveness
- LOOP violation in one market can propagate in other markets
- Important policy question (e.g. 2017 BIS Symposium: *CIP - RIP?*): If CIP violations reflect imbalances, might require CB swap lines
- CIP deviations might distort market decisions and the real economy, e.g. (bond) issuances

Motivation

FINANCIAL TIMES

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Capital markets

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'Reverse Yankee' deals boom as Europe's low borrowing costs lure US groups

American companies issue €30bn in euro-denominated bonds as investor demand for European corporate debt grows

Motivation

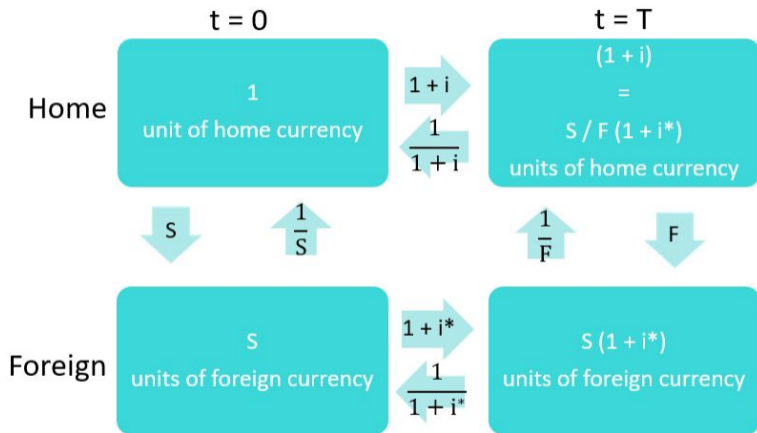
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Key messages:

- The FX rate is one of the main variables in the economy
- The FX market is one of the most liquid in the world (trading continuously 24h/6d). If there are limits to arbitrage there, then the limits might be significant in other, less liquid markets with a similar structure

The Covered Interest Rate Parity (CIP) - Theory




Pricing an FX swap:

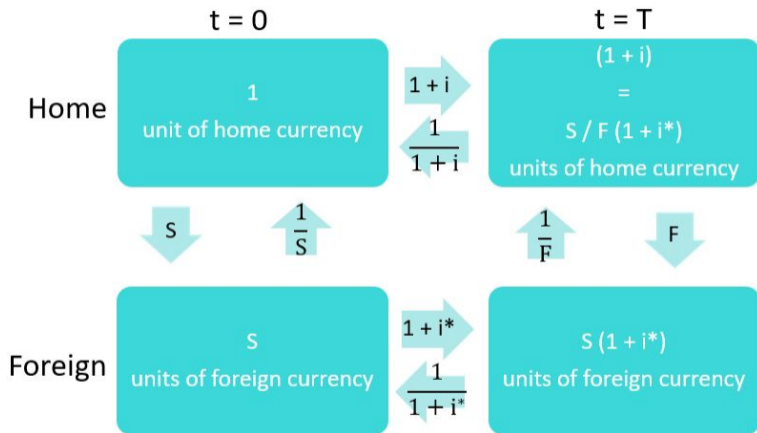
$$1 + i_{0,T} = (1 + i_{0,T}^*) \frac{S_0}{F_{0,T}}$$

\Leftrightarrow

$$F_{0,T} = S_0 \frac{1 + i_{0,T}^*}{1 + i_{0,T}}$$

where i is the interest rate in Home, i^* is the interest rate in Foreign, F is the forward rate Foreign/Home, S is the spot rate Foreign/Home. 

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Pricing an FX swap:

$$1 + i_{0,T} = (1 + i_{0,T}^*) \frac{S_0}{F_{0,T}}$$

\Leftrightarrow

$$F_{0,T} = S_0 \frac{1 + i_{0,T}^* + b_T}{1 + i_{0,T}}$$

where i is the interest rate in Home, i^* is the interest rate in Foreign, F is the forward rate Foreign/Home, S is the spot rate Foreign/Home, b_T is the cross-currency basis. ▶

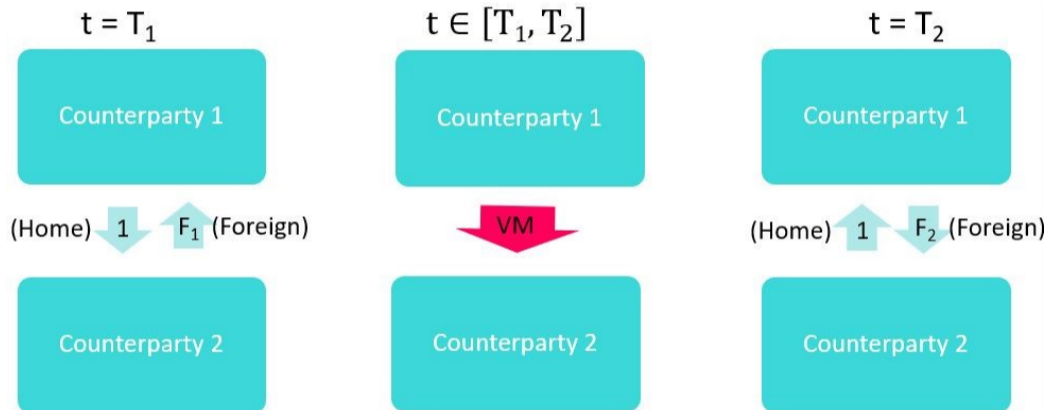
The Covered Interest Rate Parity (CIP) - Empirics





Figure: Counterparty network of gross notional in EUR/USD FX forwards (Abad et al., 2016)

Variation margin payments require internal liquidity



Is it about risk aversion or internal liquidity? Isomorphic: Funds Transfer Pricing (FTP)

Our contributions to the literature

The market for FX derivatives is OTC and intermediated by large dealers

- Search and matching for ad-hoc demand requires market dealers: Weill (2020). Alternatively, focus on the role of information: Collin-Dufresne et al. (2019).
- Financial networks and price formation: Hau et al. (2021), Eisfeldt et al. (2022).
- Recent changes: move away from phone orders (!), RFQ / MTF / SI, algorithmic trading.
- [We empirically confirm this structure is still prevalent with large, dominant dealers]

Because of limits to arbitrage, prices can move away from fundamentals

- [We study the role of internal liquidity in explaining CIP violations]

Idiosyncratic shocks can have effects on macroeconomic variables

- [We use P&L changes from other currency pairs as the shock]

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The market for FX derivatives is OTC and intermediated by large dealers

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Because of limits to arbitrage, prices can move away from fundamentals

- Theory:
 - The effect can be important: Shleifer and Vishny (1997), Vayanos and Vila (2021).
 - Exchange rate determination: Gabaix and Maggiori (2015), Itskhoki and Mukhin (2021).
- Empirically, many limits to arbitrage can explain CIP violations
- ▶ [We study the role of internal liquidity in explaining CIP violations]

Idiosyncratic shocks can have effects on macroeconomic variables

- ▶ [We use P&L changes from other currency pairs as the shock]

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Because of limits to arbitrage, prices can move away from fundamentals

- Theory: The effect can be important, especially in the context of FX determination
- Empirically, many limits to arbitrage can explain CIP violations:
 - [Pre-GFC] Small deviations because of **credit risk** and transaction costs, capital controls.
 - **Balance-sheet constraints** on regulated arbitrageurs: Du et al. (2018), Cenedese et al. (2021); also impact unregulated ones: Boyarchenko et al. (2018)
 - **Funding segmentation**: Sushko et al. (2016), Rime et al. (2022), Anderson et al. (2021).
 - **Margins**: Gârleanu and Pedersen (2011), Augustin et al. (2024).
 - Growing evidence that **internal funding** matters: Duffie (2010), Siriwardane (2019).
- [We study the role of internal liquidity in explaining CIP violations]

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Idiosyncratic shocks can have effects on macroeconomic variables

- Arbitrage is driven by a limited number of market participants: Siriwardane et al. (2023).
- Granular Instrumental Variables: Gabaix and Koijen (2020).
- [We use P&L changes from other currency pairs as the shock]

(UK-)EMIR data: The Regulation

(United Kingdom) **European Market Infrastructure Regulation** (EMIR):

- Global push for transparency in derivatives markets post GFC (G20 and FSB)
- European Regulation 648/2012 + UK onshoring legislation post Brexit
- Technical standards (FCA, ESMA, with IOSCO, CPMI, GLEIF)
- Accesses: Bank of England and FCA
- Coverage: UK entities as (at least one) counterparty

3 pillars: **Clearing, Reporting, Risk mitigation**

Data cleaning

Big data: ~30 million open positions every day, with 129 fields by report for each counterparty.

(UK-)EMIR data: The Regulation

(United Kingdom) **European Market Infrastructure Regulation** (EMIR)

3 pillars:

- **Clearing obligation** for standardized contracts
- **Reporting obligation** of all the derivative contracts to a TR
- **Risk mitigation** techniques for non-centrally cleared contracts

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3 pillars: **Clearing, Reporting, Risk mitigation**

Data cleaning

- Usually only based on quotes, or order-flow from one dealer for a short period of time
- Even with EMIR, usually only one TR, and always only based on one report
- Transaction-based (LEIs, P, Q), representative universe given London's role in FX trading

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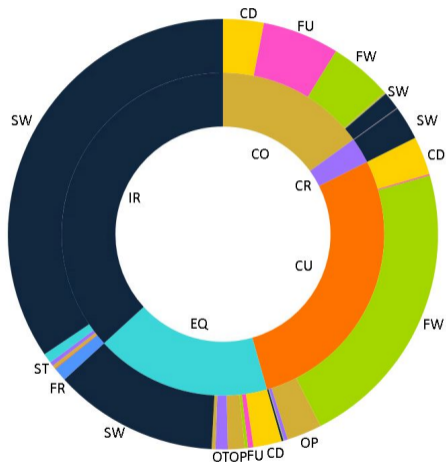
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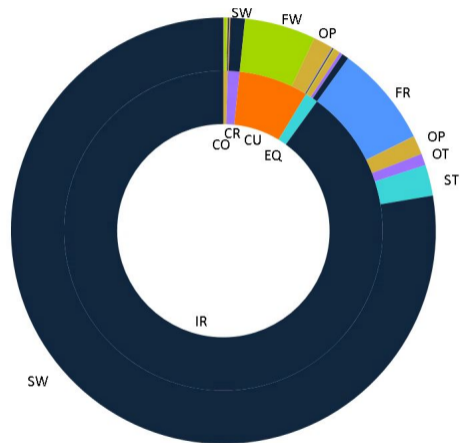
Data cleaning

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(UK-)EMIR data: Asset classes and Contract types



(a) Distribution of open positions (24 million) 



(b) Distribution of notional values (USD782 trillion)

(UK-)EMIR data: Reporting

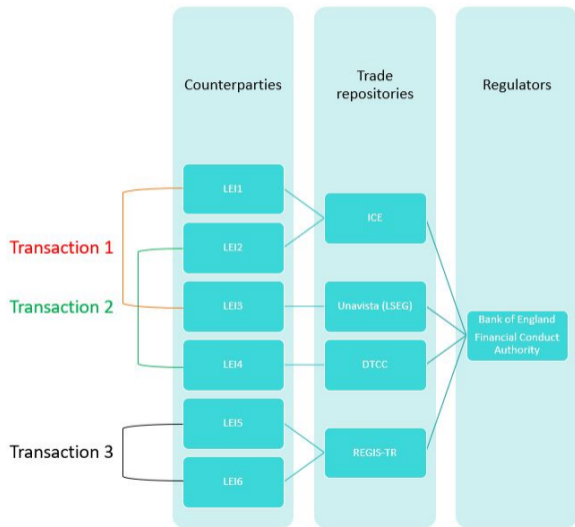


Illustration of the reporting process:

- 2 counterparties enter a derivative contract (suppose both UK-based)
- Each counterparty chooses a TR
- Regulators receive data from TRs

Double reporting:

- + Can compare the 2 sides
- Risk of double counting

(UK-)EMIR data: Trade repositories

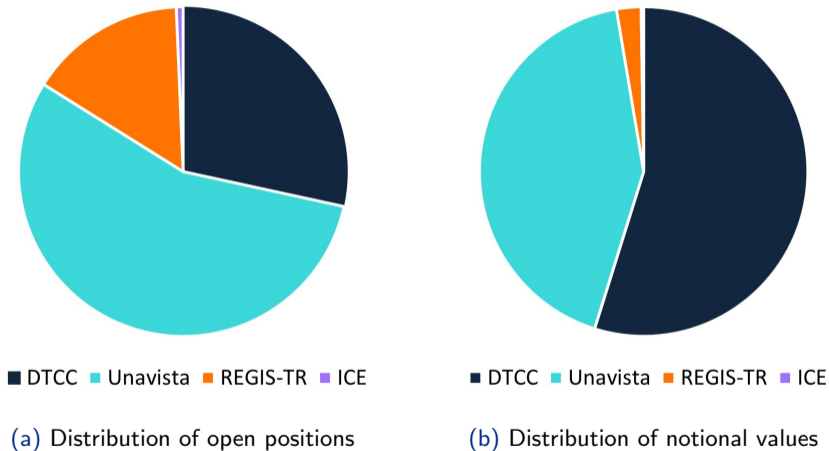


Figure: The market for reporting OTC FX derivatives

(UK-)EMIR data: Comparison to the BIS data (TRs, May 2024)

	(UK-)EMIR	BIS Triennial Survey	BIS OTC derivatives
Coverage	All derivatives	FX spot, FXD, IRD	OTC derivatives
Scope	All UK-based entities	“Reporting dealers” > 50 jurisdictions	Dealer banks 12 jurisdictions
Stock or Flow	Stock and Flow	Flow	Stock
Level	Individual	Jurisdiction-sector	Jurisdiction-sector
Consolidation	None	None	Worldwide excluding intragroup
Frequency	Daily	Every 3 years	Every 6 months
Access	Confidential Some public aggregates	Public (jurisdiction-sector)	Public (sector)

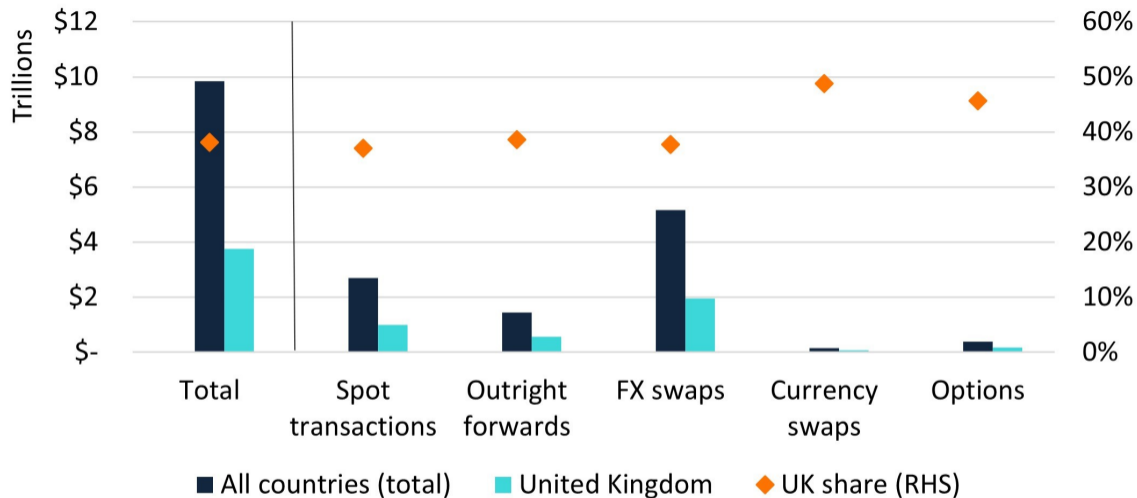


Figure: Daily average turnover (OTC foreign exchange “net-gross”, BIS, 2022) 

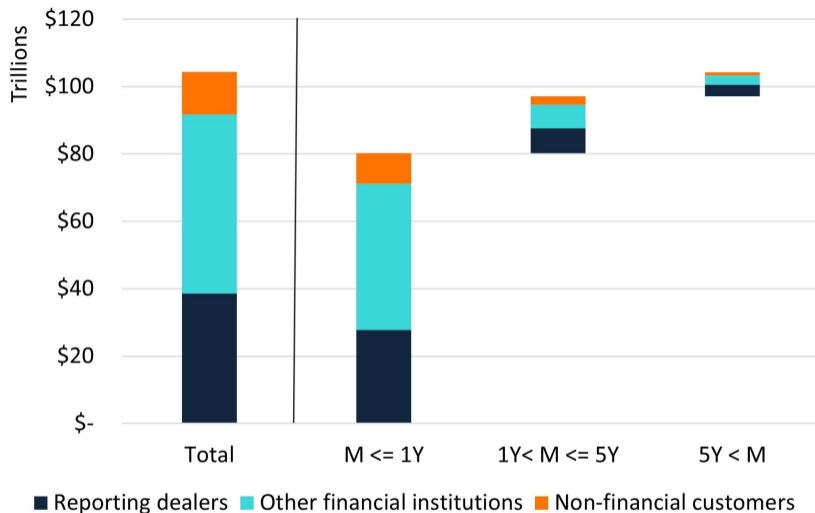


Figure: **Notionals outstanding** (Outright forwards, forex swaps and currency swaps, BIS, S1-2023)

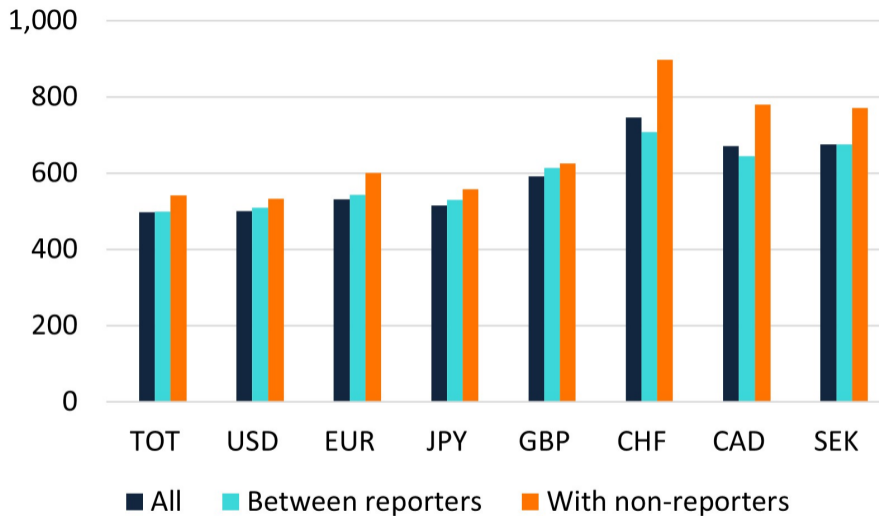


Figure: HHI (Outright forwards, forex swaps and currency swaps, BIS, S1-2023)

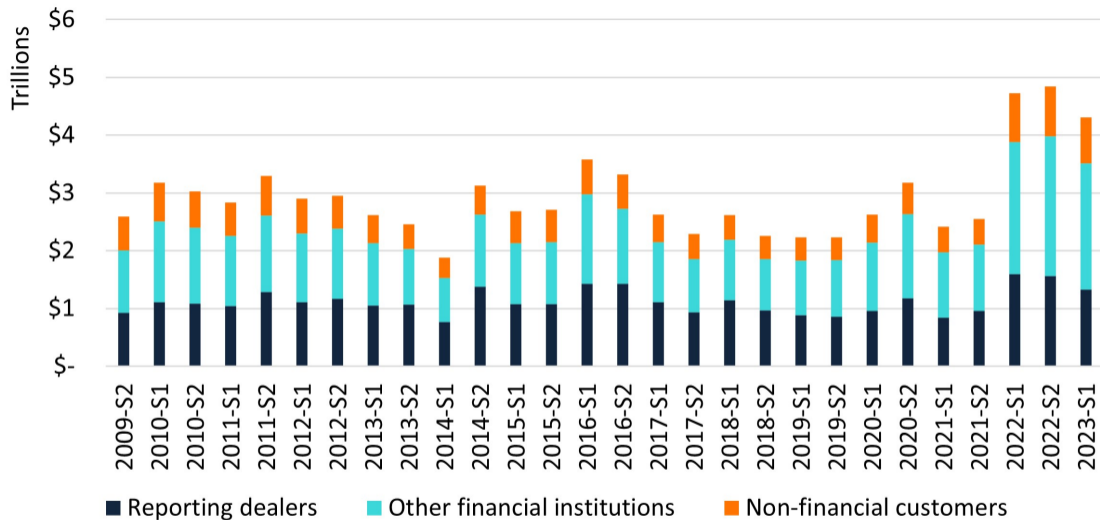


Figure: **Gross market value** (Outright forwards, forex swaps and currency swaps, BIS, S1-2023)

Main regression

$$\Delta FX_{i,t} = \beta \times \sum_{d(i) \in \mathbb{D}(i)} \omega_{d(i)} \sum_{j \in \mathcal{S} \setminus \{i\}} \Delta P\&L_{d(i),j,t} + controls_t + \epsilon_{i,t} \quad (1)$$

where:

- $FX_{i,t}$ is the CIP deviation at time t in currency pair i ,
- $\mathbb{D}(i)$ is the set of the main dealers in currency pair i ,
- $\omega_{d(i)}$ is the weight of dealer $d(i)$ in currency pair i (degree / share of total notionals),
- $P\&L_{d(i),j,t}$ is the profit and loss statement of dealer $d(i)$ in currency pair j (other than i).

Next steps

- Idiosyncratic shocks: Crédit Suisse's exit of the market, the PRA fine on Citigroup (and similar regulatory shocks or announcements of a big trading loss), Archegos...
- Look at what happened during (the announcement of) central bank swap lines
- Granular Instrumental Variables (GIV): in the regression, remove the common component (market impact) that will affect (or be affected by) the CIP, and then look at the effect of the idiosyncratic shocks on the granular dealers (that are orthogonalized / independent as it is only the effect of the differentiated exposures on the CIP)
- Flow (activity) as well as stock (state)?
- Add the cross-currency swaps (maturity longer than 1Y, flt/flt with exchange of the basis) to the analysis?

Conclusion

Feedback on the approach and suggestions very welcomed!

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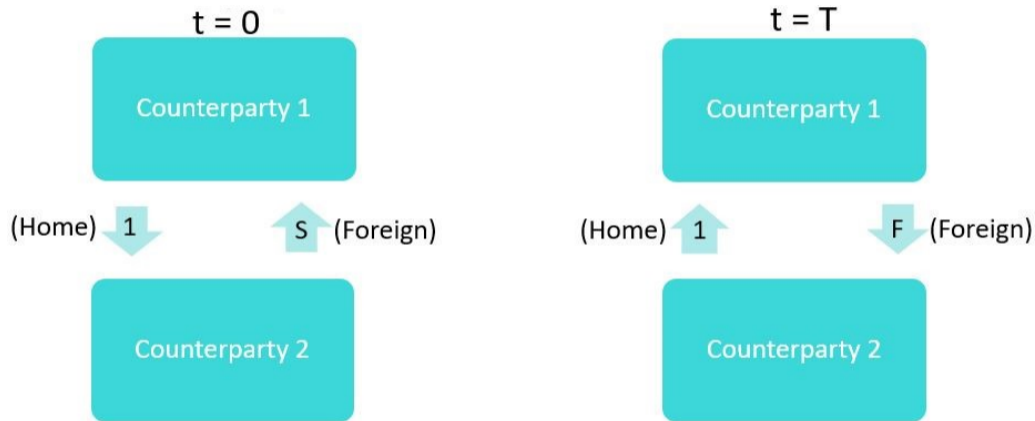
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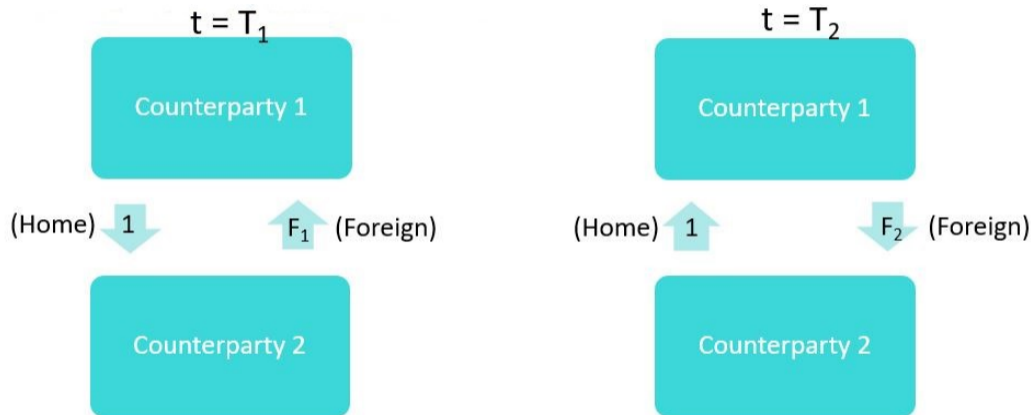
FX swaps as FX forwards? (1)



EMIR is about derivatives, not spot transactions.

- Only the forward leg is a derivative, hence the transaction reported as an FX forward.

FX swaps as FX forwards? (2)



This FX swap should be reported as a swap, given that it has two forward legs.

- ▶ Market convention is to report the two FX forwards independently. ◀

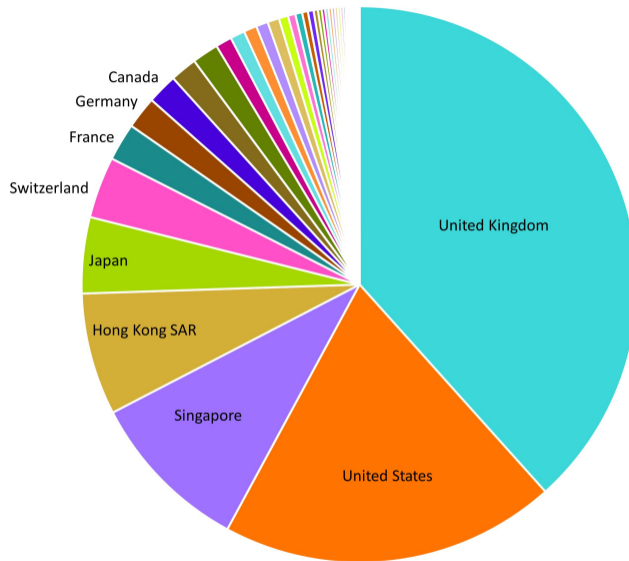


Figure: Turnover by country (Outright forwards, forex swaps and currency swaps, BIS, 2022) ◀

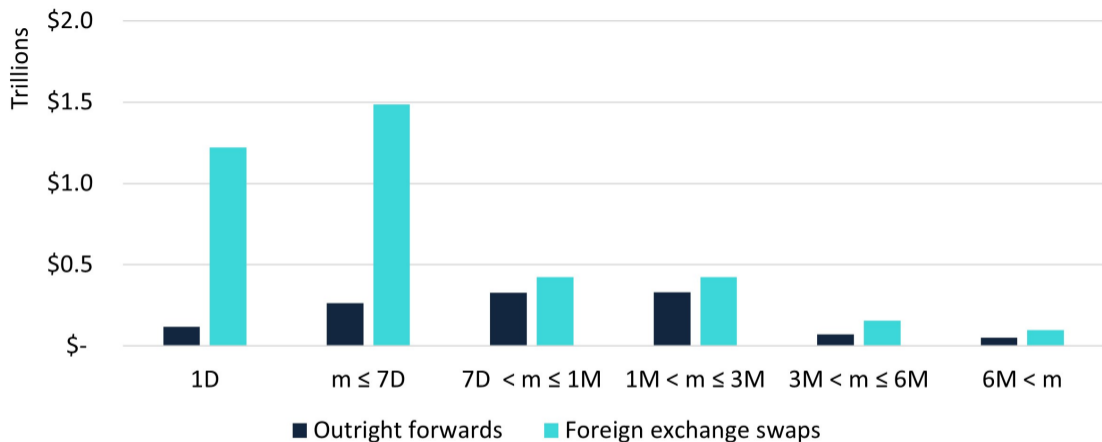


Figure: Turnover by maturity (Outright forwards, forex swaps and currency swaps, BIS, 2022) ◀

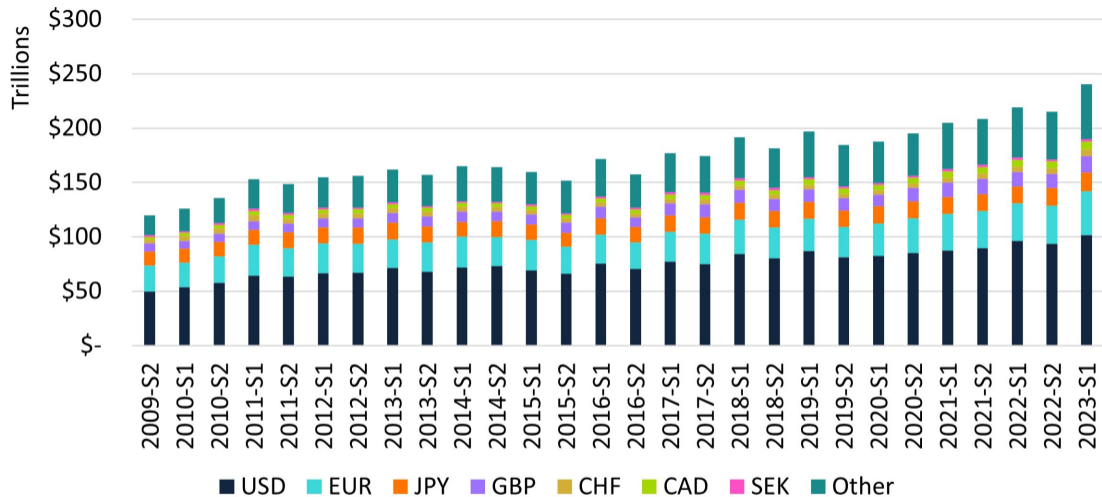


Figure: **Outstanding by currency** (Outright forwards, forex swaps and currency swaps, BIS, S1-2023)