



# Global Portfolio Network and Currency Risk Premia

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## Motivation

### Idea:

- Large literature documents [violations of uncovered interest rate parity \(UIP\)](#)  
⇒ high interest rate currencies depreciate not enough → profitable carry trade strategy
- [Persistent differences in macroeconomic fundamentals across countries](#) translate into persistent interest rate differentials that are reversed by predictable exchange rate movements
- [Composition of external wealth](#) as potential source of heterogeneous exposure to global risk

### Question:

Does the position in a network of international asset allocations explain the cross-sectional variation in currency risk premia?

## Network structure

### Construction:

- Annual cross-country equity and debt holdings (IMF/CPIS) from 2020 - 2021
- Measure on [network centrality](#) borrowed from Richmond (2019) but with financial assets

$$v^i = \sum_{j=1}^N \left( \frac{A^{ij} + A^{ji}}{G^i + G^j} \right) \times s^j$$

- $A^{ij}$  and  $A^{ji}$ : bilateral asset holdings between country  $i$  and country  $j$
- $G^i$  and  $G^j$ : GDP of country  $i$  and country  $j$
- $s^j$ : share of foreign assets issued by country  $j$  relative to total foreign assets  $\frac{\sum_{i=1}^N A^{ij}}{\sum_{i=1}^N \sum_{j=1}^N A^{ij}}$

### Interpretation:

- Countries are central if they have large portfolio holdings of countries that are [important for global capital allocation](#) → rankings in centrality are persistent over time
- Financially developed countries take on larger proportion of global risk because financial intermediaries are better able to deal with funding problems after negative shocks

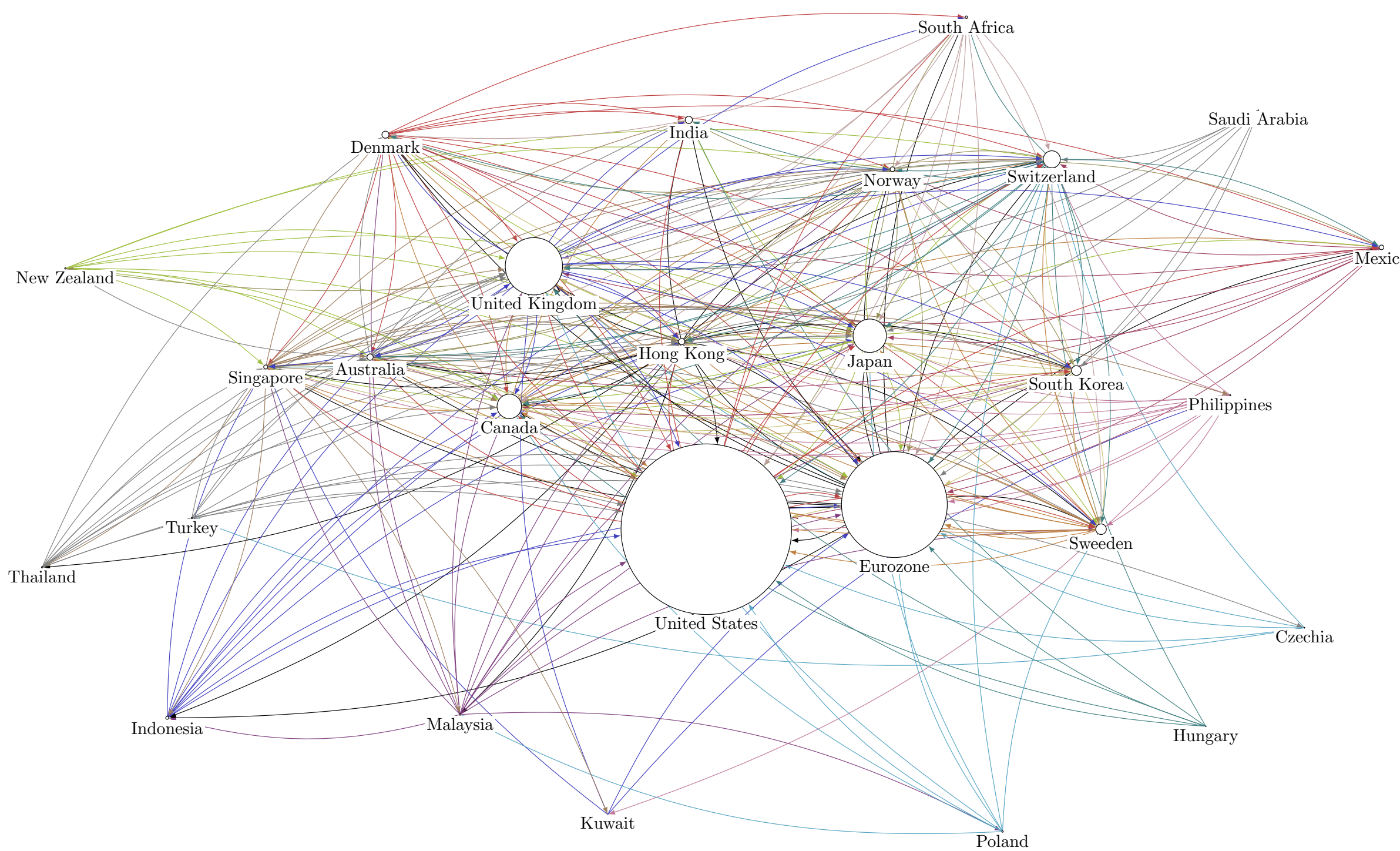


Figure 1: Global portfolio network in 2020

## Cross section

### Panel analysis:

- Run regressions with monthly variables  $y$

$$y_t^i = \alpha + \delta_t + \beta v_{t-12}^i + X_{t-12}^i + \varepsilon_t^i$$

|                       | rx                 | rx                | rx                 | rx               | fd                | fd               | fd                 | fd               |
|-----------------------|--------------------|-------------------|--------------------|------------------|-------------------|------------------|--------------------|------------------|
| Investment centrality | -0.93***<br>(0.27) | -0.89**<br>(0.32) | -0.73***<br>(0.19) | -0.58*<br>(0.28) | -1.29**<br>(0.48) | -1.61*<br>(0.80) | -0.87**<br>(0.36)  | -0.79*<br>(0.41) |
| GDP share             |                    | -0.05<br>(0.30)   |                    |                  |                   | 0.44<br>(0.51)   |                    |                  |
| Investments/GDP       |                    |                   | -0.55***<br>(0.18) |                  |                   |                  | -1.14***<br>(0.41) |                  |
| Trade centrality      |                    |                   |                    | -0.66*<br>(0.38) |                   |                  |                    | -0.95*<br>(0.52) |
| Num. obs.             | 5,728              | 5,728             | 5,728              | 5,728            | 5,728             | 5,728            | 5,728              | 5,728            |
| R <sup>2</sup>        | 0.46               | 0.46              | 0.46               | 0.46             | 0.17              | 0.17             | 0.22               | 0.20             |

Table 1: Regressions for currency excess returns and forward discounts with month fixed effects

### Results:

- Currencies of central countries have [lower currency excess returns and interest rate differentials](#)
- Centrality in a global portfolio network captures information different from country size, financial openness, and trade network centrality

## Asset pricing tests

### Currency portfolios:

- Sort currencies on lagged network centrality into four equal-weighted currency portfolios
- [Long-short strategy](#): peripheral (PF1) minus central (PF4) =  $CEN$
- [Average excess returns decrease](#) from first portfolio (3.03% p.a.) to last portfolio (0.58% p.a.)

|                              | PF1  | PF2  | PF3  | PF4   | CEN   |
|------------------------------|------|------|------|-------|-------|
| Previous centrality mean     | 0.12 | 0.36 | 1.40 | 4.80  | -4.68 |
| Currency excess returns mean | 3.03 | 3.44 | 1.40 | 0.58  | 2.45  |
| std                          | 7.10 | 8.83 | 7.34 | 7.34  | 4.50  |
| Forward discount mean        | 3.41 | 3.86 | 0.47 | -0.43 | 3.84  |
| Sharpe ratio mean            | 0.43 | 0.39 | 0.19 | 0.08  | 0.54  |

Table 2: Network centrality currency portfolios

### Three-factor model:

- Stochastic discount factor (SDF) model estimated via GMM for the factors  $DOL$ ,  $HML$ , and  $CEN$
- Positive and significant estimate of  $\lambda^{CEN}$ : returns with positive comovement with centrality factor  $CEN$  pay higher risk premia

## Time-varying risk aversion

### Interaction effects:

- Run regressions with monthly spot exchange rate returns

$$\Delta s_t^i = \alpha^i + \delta_t + \beta_1 v_{t-12}^i + \beta_2 \Delta VIX_t + \beta_3 \Delta VIX_t \times v_{t-12}^i + \varepsilon_t^i$$

|   | $\Delta s$         | $\Delta s$         |
|---|--------------------|--------------------|
| Investment centrality                           | -1.61<br>(3.66)    | -5.25**<br>(2.53)  |
| $\Delta VIX$                                    | -0.22***<br>(0.04) |                    |
| Investment centrality $\times \Delta VIX$       | 1.48*<br>(0.75)    |                    |
| $\Delta VIX$ dummy                              |                    | -2.61***<br>(0.67) |
| Investment centrality $\times \Delta VIX$ dummy |                    | 16.95*<br>(9.29)   |
| Num. obs.                                       | 5,728              | 5,728              |
| Adj. R <sup>2</sup>                             | 0.14               | 0.09               |

Table 3: Regressions for spot returns with year and country fixed effects

### Results:

- [Currencies of central countries appreciate](#) in bad times
- Marginal effects: rate of exchange rate depreciation decreases with increasing network centrality

## Consumption-based model

### Framework:

- Consumption capital asset pricing model (CCAPM) with complete financial markets
- $N$  countries, representative agents with CRRA utility, one consumption good, two periods  $[0, 1]$   
⇒ in  $t$ : allocation of wealth across assets; in  $t+1$ : consumption of portfolio returns

### Assets:

- [Heterogeneous exposure to global shocks](#) measured by country-specific payoff innovations

$$X^j = 1 + \varepsilon^j + \theta^j \varepsilon^g, \quad \varepsilon^j, \varepsilon^g \sim N(0, \sigma^2)$$

- $\theta^j \in (0, 1)$ : share of country  $j$  in world market capitalization  
⇒ countries with [greater ability to supply financial assets](#), take on [larger proportion of global risk](#)

### Exchange rates:

- SDF:  $M_{t+1}^i = \beta \left( \frac{C_{t+1}^i}{C_t^i} \right)^{-\gamma}$
- Change in exchange rate equals differences in consumption growth

$$\frac{Q_{t+1}^{ij}}{Q_t^{ij}} = \frac{M_{t+1}^i}{M_{t+1}^j} \Rightarrow \Delta q_{t+1}^{ij} = m_{t+1}^i - m_{t+1}^j$$

### Question:

How does a country's network centrality affect the exposure to global consumption growth?

### Results:

- $v_t^i > v_t^j$ :  $\varepsilon_{t+1}^g < 0 \rightarrow m_{t+1}^i > m_{t+1}^j \rightarrow \Delta q_{t+1}^{ij} > 0 \rightarrow$  currency of country  $i$  appreciates
- [Lower consumption growth in central countries](#) when global risk aversion is high
- Countries with relative low prices receive transfer to take advantage of cheap consumption

## Summary of results

1. Currency excess returns and interest rates decrease in countries' network centrality
2. Differences in network centrality risk factor explains cross-section of currency excess returns in standard asset pricing model
3. In bad times, currencies of peripheral countries depreciate more than of central countries: risk premia compensate for time-varying risk exposure
4. Variation of exchange rates in a global portfolio network is driven by heterogeneity in consumption growth risk