

Currency Returns Over Short Horizon and Over Long Horizon : Parity Conditions and Purchasing Power Parity

Three main approaches

- Goods market -> FX market
 - Assume exchange rates driven by trade balance.
 - This approach dominated thought-processes pre-1970s.
- Assets market -> FX market
 - Currency demand driven by trade and demand for assets.
 - This approach emerged during the 1970s.
- Microstructure -> FX market
 - Stems from assets market approach, but connects information, players, and institutions with weaker assumptions.

Goods market approach hypothetical

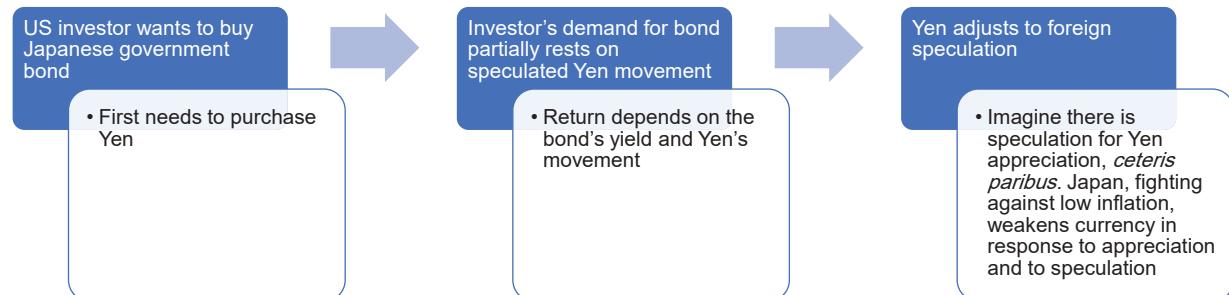
- Imagine a country that prioritizes balancing trade...



Bretton-Woods

- Many currencies pegged to USD (and gold)
 - i.e. fixed exchange rates.
- Collapse of Bretton-Woods system in 1973 led to free-floating currencies
 - Expected to be short-lived.
- Imports/exports were expected to drive most changes in exchange rates
 - This was not the case.

Asset market approach example



Microstructure approach incorporates

- Information: microstructure models recognize that some information relevant to exchange rates is not publicly available.
- Players: microstructure models recognize that market participants differ in ways that affect prices.
- Institutions: microstructure models recognize that trading mechanisms differ in ways that affect prices.

Balance of Payments Accounting

Balance of payments is the statistical record of a country's international transactions over a certain period of time presented in the form of double-entry bookkeeping

Important to study for a few reasons:

1. Provides detailed information concerning the demand and supply of a country's currency
2. May signal its potential as a business partner for the rest of the world
3. Used to evaluate the performance of the country in international economic competition

Balance of Payments Accounts

International transactions can be grouped into the following three main types:

1. **Current account** includes the export and import of goods and services
2. **Financial (and capital) account** (excluding official reserves) includes all purchases and sales of financial assets, such as stocks, bonds, bank accounts, etc.
3. **Official reserve account** covers all purchases and sales of international reserve assets

Summary of the U.S. Balance of Payments for 2018 (\$b)¹

	Credits	Debits
<i>Current Account</i>		
[1] Exports	2,500.7	
[1.1] Goods	1,672.3	
[1.2] Services	828.4	
[2] Imports		-3,122.9
[2.1] Goods		-2,563.7
[2.2] Services		-559.2
[3] Primary income	1,060.4	-816.1
[4] Secondary income	140.6	-251.2
Balance on current account [[1] + [2] + [3] + [4]]		-488.5
<i>Capital Account</i>	9.4	0
Balance on capital account	9.4	

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Summary of the U.S. Balance of Payments for 2018 (\$b)²

	Credits	Debits
<i>Financial Account</i>		
[5] Direct investment	267.1	50.6
[6] Portfolio investment	340.3	-210.4
[6.1] Equity securities	147.2	-97.2
[6.2] Debt securities	172.8	-113.2
[6.3] Derivatives, net	20.3	
[7] Other investment	213.8	-136.9
Balance on financial account [[5] + [6] + [7]]	524.5	
[8] Statistical discrepancies		-40.5
Overall balance	4.9	
<i>Official Reserve Account</i>		-4.9

Source: The U.S. Bureau of Economic Analysis.

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The Current Account₁

Divided into four finer categories:

1. **Goods trade** represents exports and imports of tangible goods (for example, oil, wheat, clothes, automobiles, computers, etc.)
2. **Services** include payments and receipts for legal, consulting, financial, and engineering services; royalties for patents and intellectual properties; shipping fees; and tourist expenditures
3. **Primary income** consists largely of payments and receipts of interest, dividends, and other income on foreign investments that were previously made
4. **Secondary income** involves “unrequited” payments

The Current Account₂

Current account balance, especially the trade balance, tends to be sensitive to exchange rate changes

- Currency depreciation or devaluation can improve (worsen) the trade balance if imports and exports are responsive (inelastic)

J-curve effect refers to the initial deterioration and eventual improvement of trade balance following the depreciation of a country's currency

The Financial Account

Measures the difference between U.S. sales of assets to foreigners and U.S. purchases of foreign assets

Can be divided into three categories:

1. **Foreign direct investment (FDI)** occurs when the investor acquires a measure of control of the foreign business
2. **Portfolio investment** mostly represents sales and purchases of foreign financial assets, such as stocks and bonds, that do not involve a transfer of control
3. **Other investment** includes transactions in currency, bank deposits, trade credits, etc.

The Official Reserves Account

Official reserve account includes transactions undertaken by the authorities to finance the overall balance and intervene in foreign exchange markets

Post-1945, international reserve assets comprise:

1. Gold
2. Foreign exchanges
3. Special drawing rights (SDRs)
4. Reserve positions in the IMF

The Balance of Payments Identity (BOPI)

$$BCA + BFA + BRA = 0$$

where

BCA = balance on current account

BFA = balance on financial account

BRA = balance on the reserves account

Under fixed exchange regime, countries maintain official reserves that allow them to have BOP disequilibrium

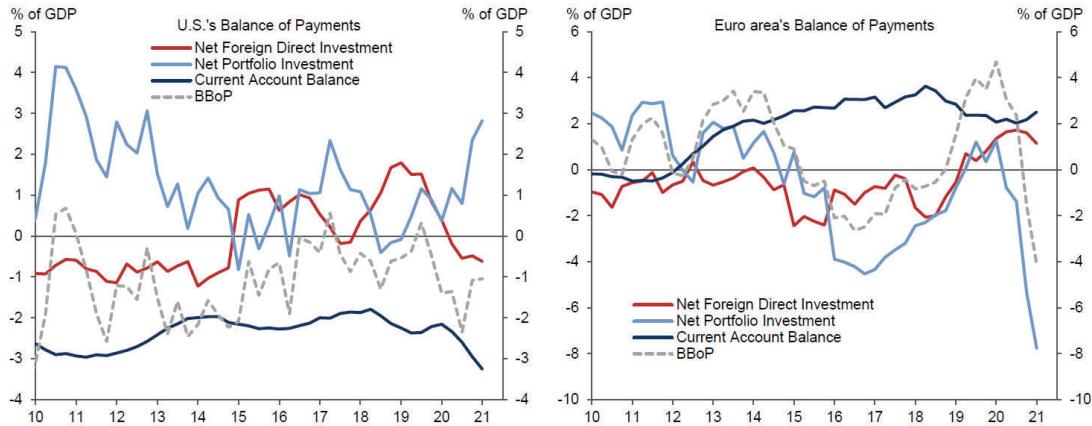
BOP Trends in Major Countries³

China tends to have a surplus on the current account, as well as the financial account (until recently)

“Global imbalance”

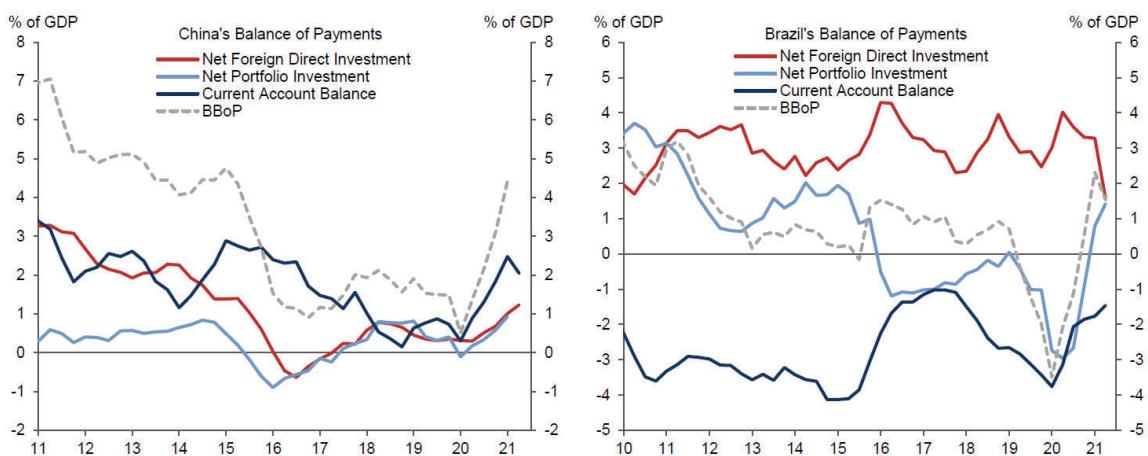
- Overall, U.S. and U.K. generally use up more outputs than they produce, whereas the opposite holds for China, Japan, and Germany

Basic Balance of Payments



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Basic Balance of Payments



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Purchasing Power Parity₁

When the law of one price is applied internationally to a standard consumption basket, we obtain the theory of **purchasing power parity (PPP)**

- PPP states the exchange rate between currencies of two countries should be equal to the ratio of the countries' price levels of a commodity basket
- Let $P_{\$}$ be the dollar price of the standard consumption basket in the U.S. and $P_{£}$ the pound price of the same basket in the U.K.
- **Absolute version of PPP** states the exchange rate between the dollar and pound should be:

$$S = P_{\$}/P_{£}$$

Purchasing Power Parity₂

When the PPP relationship is presented in the "rate of change" form, instead of price level as in the absolute version of PPP, we obtain the **relative version of PPP**:

$$e = \left[\frac{\pi_{\$} - \pi_{£}}{1 + \pi_{£}} \right] \approx \pi_{\$} - \pi_{£}$$

Where:

e is the rate of change in the exchange rate

$\pi_{\$}$ and $\pi_{£}$ are the inflation rates in the United States and U.K., respectively

PPP Deviations and the Real Exchange Rate

If there are deviations from PPP, changes in nominal exchange rates cause changes in the **real exchange rates**, affecting the international competitive positions of countries

Real exchange rate, q , is found by:

$$q = \frac{1 + \pi_{\$}}{(1 + e)(1 + \pi_{\text{fx}})}$$

If PPP holds, the real exchange rate will be unity (that is, $q = 1$), but when PPP is violated, the real exchange rate will deviate from unity

Actual USD/GBP and PPP Exchange Rates

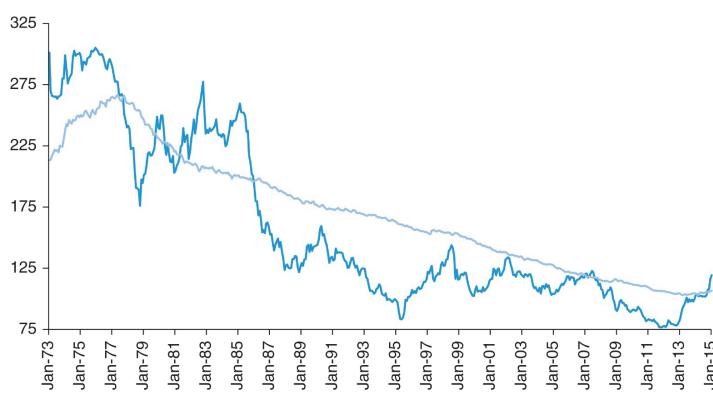


Actual USD/EUR and PPP Exchange Rates



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Actual JPY/USD and PPP Exchange Rates



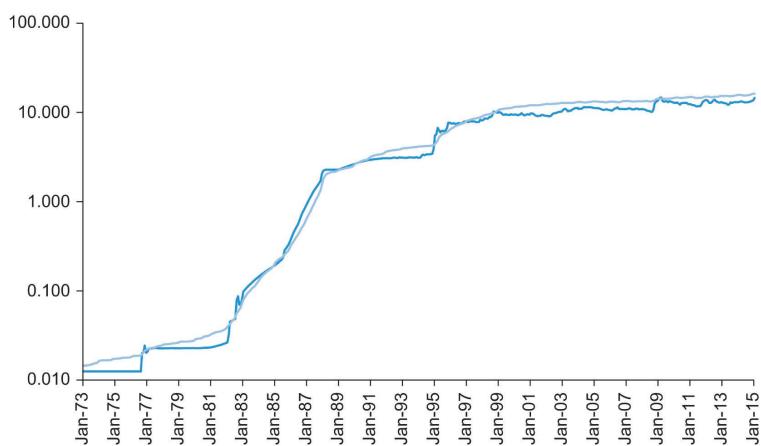
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Actual CAD/USD and PPP Exchange Rates



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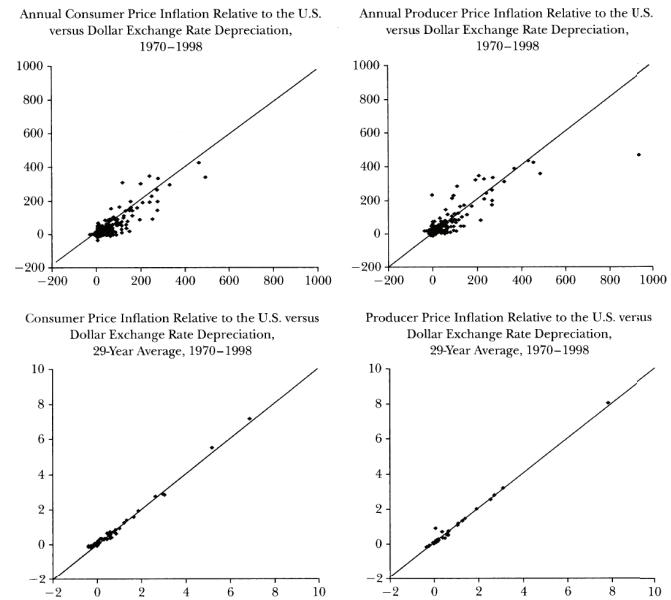
Actual MXN/USD and PPP Exchange Rates



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Evidence on PPP

- The longer the time horizon, the better is the relative PPP performance.



Notes: This figure shows countries' cumulative inflation rate differentials against the United States in percent (vertical axis) plotted against their cumulative depreciation rates against the U.S. dollar in percent (horizontal axis). The charts on the left show CPI inflation, those on the right PPI inflation. The charts in the top row show annual rates; those in the bottom row 29-year average rates from

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Fisher Effects₁

The **Fisher effect** holds that an increase (decrease) in the expected inflation rate in a country will cause a proportionate increase (decrease) in the interest rate in the country

Formally, the Fisher effect is written as follows:

$$i_{\$} = \rho_{\$} + E(\pi_{\$}) + \rho_{\$}E(\pi_{\$}) \approx \rho_{\$} + E(\pi_{\$})$$

Fisher effect implies that the expected inflation rate is the difference between the nominal and real interest rates in each country, that is,

$$\boxed{E(\pi_{\$}) = (i_{\$} - \rho_{\$}) / (1 + \rho_{\$}) \approx i_{\$} - \rho_{\$}}$$

$$\boxed{E(\pi_{\ell}) = (i_{\ell} - \rho_{\ell}) / (1 + \rho_{\ell}) \approx i_{\ell} - \rho_{\ell}}$$

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Fisher Effects₂

If we assume the real interest rate is the same between countries, that is, $\rho_{\$} = \rho_{£}$, we obtain the **international Fisher effect (IFE)**, which suggests the nominal interest rate differential reflects the expected change in exchange rate

$$E(e) \approx i_{\$} - i_{£}$$

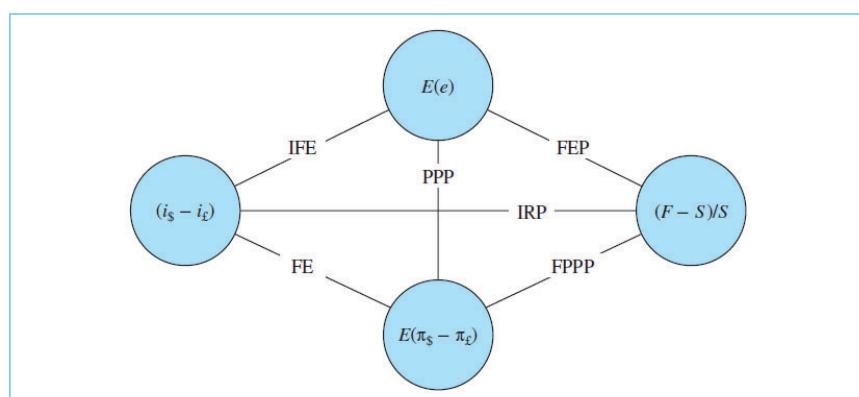
When the international Fisher effect is combined with IRP, we obtain the **forward expectations parity (FEP)**, which states any forward premium or discount is equal to the expected change in the exchange rate

$$(F - S)/S = E(e)$$

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EXHIBIT 6.9: International Parity Relationships among Exchange Rates, Interest Rates, and Inflation Rates



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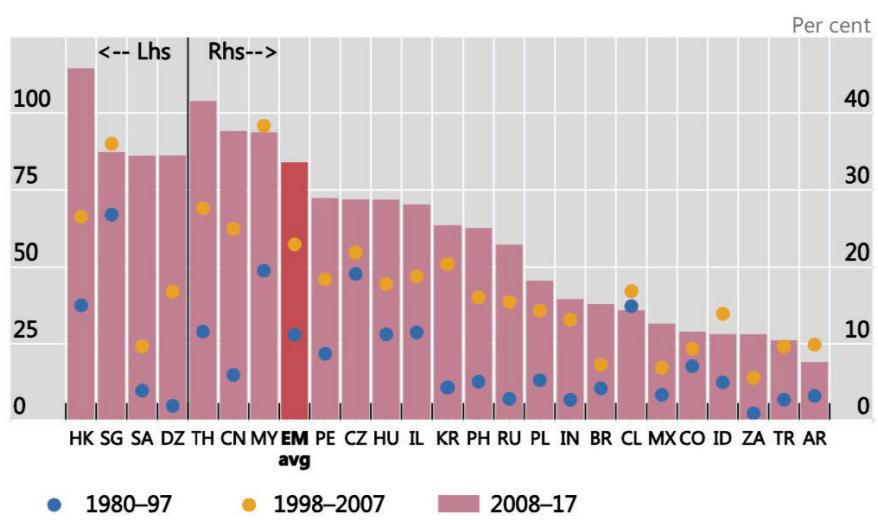
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Why PPP does not hold in short run?

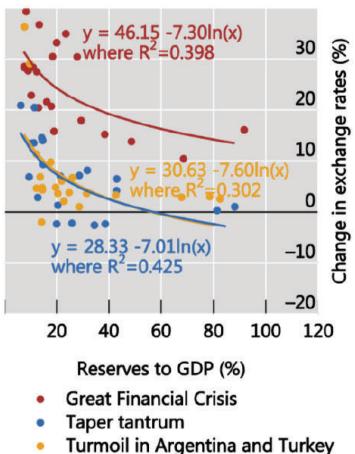
- Non-traded goods and cost of housing
- Technological change
 - Harrod-Blassa-Samuelson effect
- Balance of payment

Reserves relative to GDP (source:BIS)

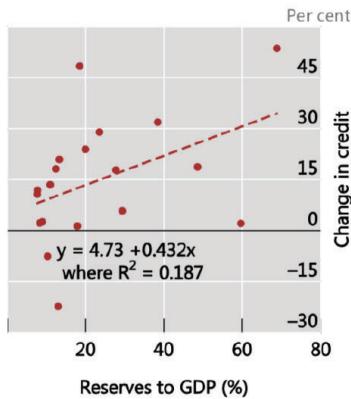


Reserves, exchange rate and cost of borrowing

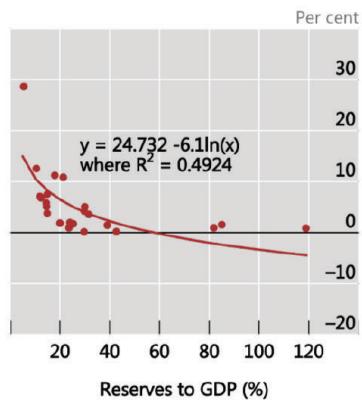
Nominal exchange rates: GFC, taper tantrum and turmoil in Argentina and Turkey²



Reserves in 2006 and changes in credit during the GFC³



Reserves and three-month borrowing costs⁴



Uncovered Interest Rate Parity

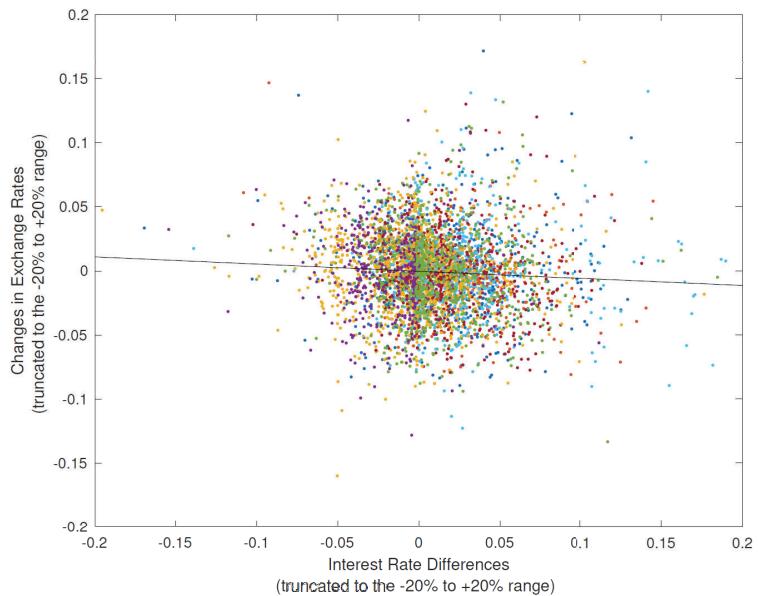
When the forward exchange rate F is replaced by the expected future spot exchange rate, $E(S_{t+1})$, we obtain:

$$(i_{\$} - i_{£}) \approx E(e)$$

Uncovered interest rate parity

- Interest rate differential between a pair of countries is (approximately) equal to the expected rate of change in the exchange rate

UIP in Data



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Currency Carry Trade

Unlike IRP, the uncovered interest rate parity often does not hold, giving rise to uncovered interest arbitrage opportunities

Currency carry trade involves buying a high-yielding currency and funding it with a low-yielding currency, without any hedging

The carry trade is profitable if the interest rate differential is greater than the appreciation of the funding currency against the investment currency

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Carry Trade in Data

means, standard deviations, and Sharpe ratios of real excess returns on eight annually rebalanced currency portfolios for a US investor.

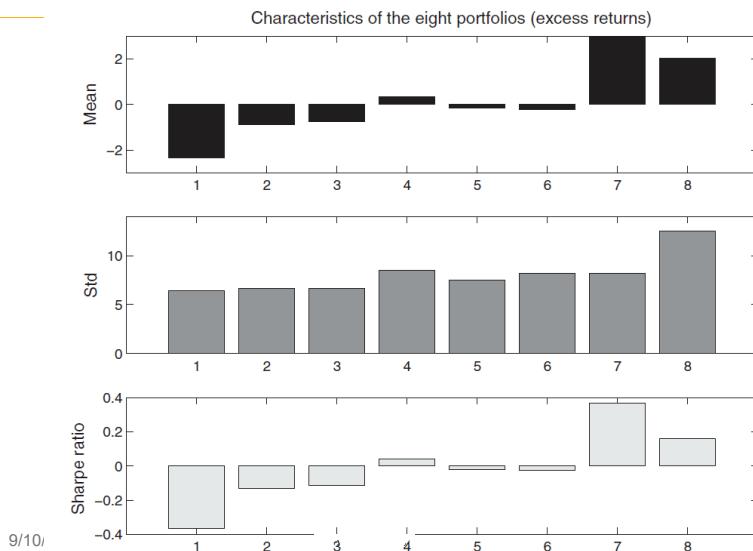
data are annual and the sample is 1953–2002.

Portfolios were constructed by sorting currencies into eight groups at time t based on the nominal IR differential with the home country at the end of period $t-1$.

Portfolio 1 contains currencies with the lowest interest rates. Portfolio 8 contains currencies with the highest interest rates.

Source: Lustig, Verdelhan (AER 2007)

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Should UIP hold in data? (from Verdelhan)

- ▶ Start from the definition of a currency excess return:

$$\mathbb{E}_t(r_{t+1}^e) = i_t^* - i_t - \mathbb{E}_t(\Delta s_{t+1})$$

where s_t : spot exchange rate in foreign currency per U.S. dollar (when $s_t \nearrow$, the dollar appreciates and the foreign currency depreciates), i_t is the U.S. risk-free interest rate, and i_t^* is the foreign one.

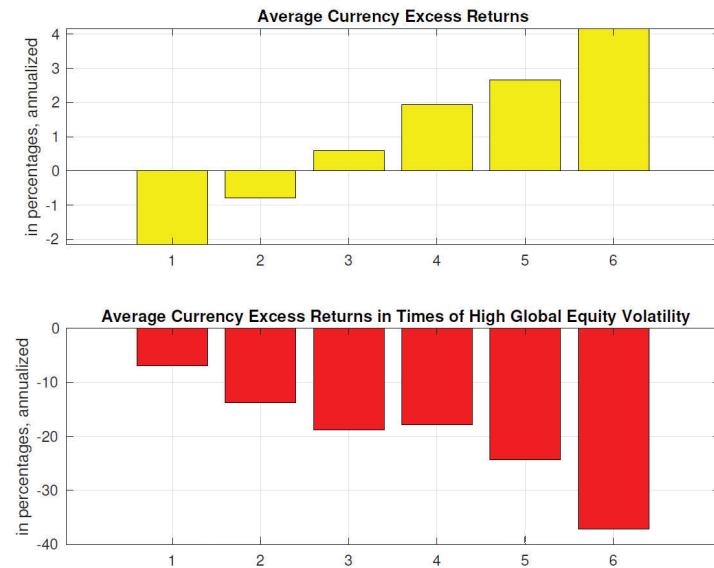
- ▶ Iterate forward to obtain:

$$s_t = \mathbb{E}_t \sum_{\tau=0}^{\infty} (i_{t+\tau} - i_{t+\tau}^*) + \mathbb{E}_t \sum_{\tau=0}^{\infty} r_{t+\tau}^e + \mathbb{E}_t [\lim_{\tau \rightarrow \infty} s_{t+\tau}].$$

- ▶ The exchange rate **today** reflects **future**
 1. **cash flows**, ie. short rate differences, $i_{t+\tau}^* - i_{t+\tau}$
 2. **risk premia**: $\mathbb{E}_t[r_{t+\tau}^e]$
- ▶ The dollar appreciates when $i_{t+\tau} \nearrow$ and the currency risk premium $\mathbb{E}_t[r_{t+\tau}^e] \nearrow$

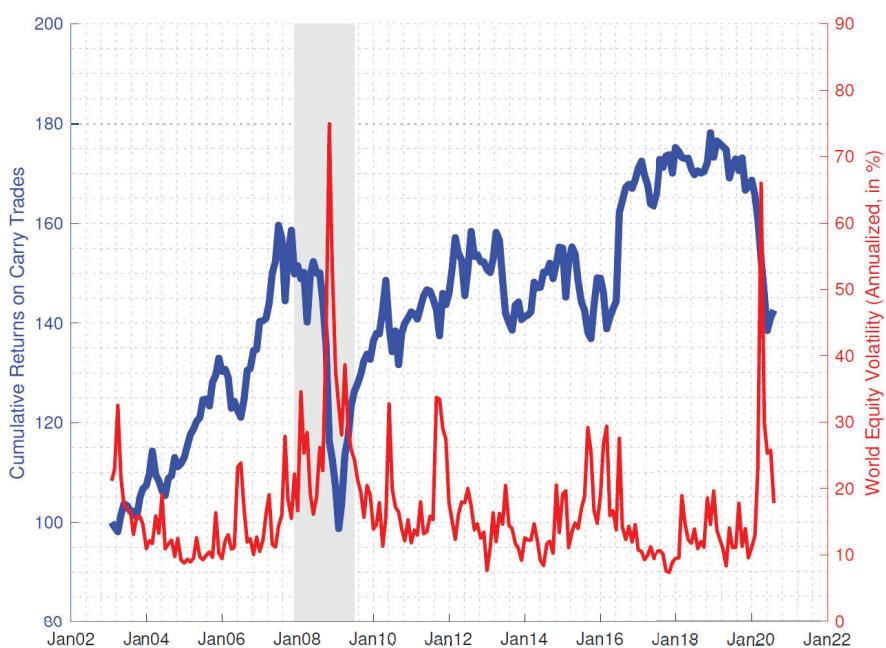
- UIP assumes risk neutral investors.
- No wonder it is rejected in the data.
- More importantly: exchange rate is affected by risk premia!

What is the source of Carry Trade returns?



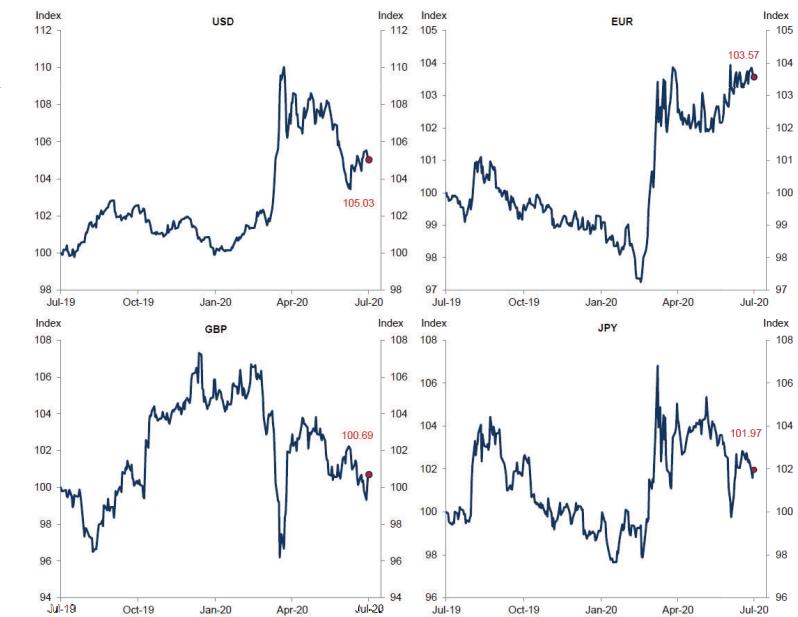
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Carry Trades and Equity Volatility (11/1983–7/2020, sample of developed countries)



Trade-Weighted Exchange Rates

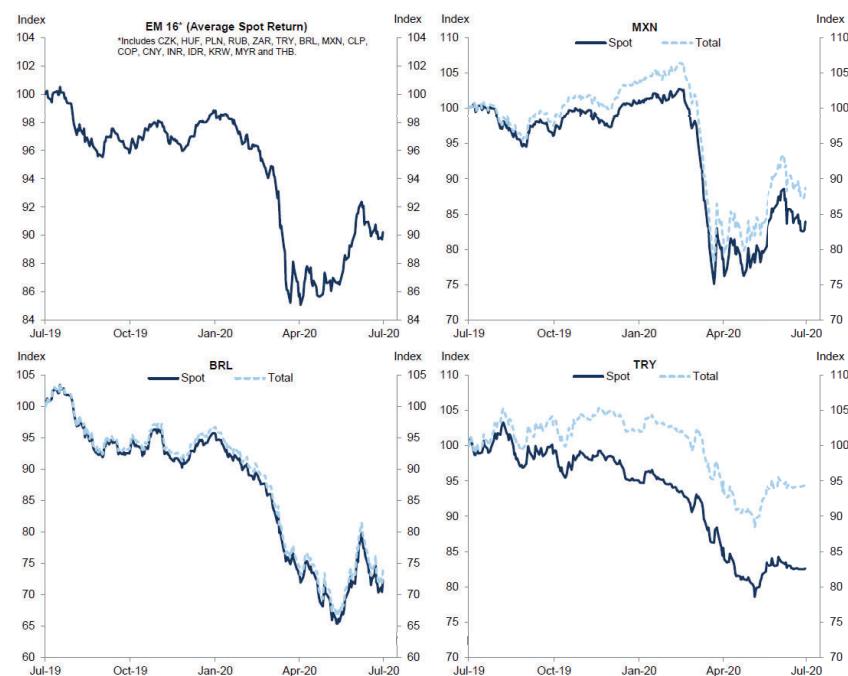
- DM Currency performance during COVID-19
- Source: GS and Bloomberg



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EM FX Returns

- EM Currency performance during COVID-19



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Downside Risk- CAPM

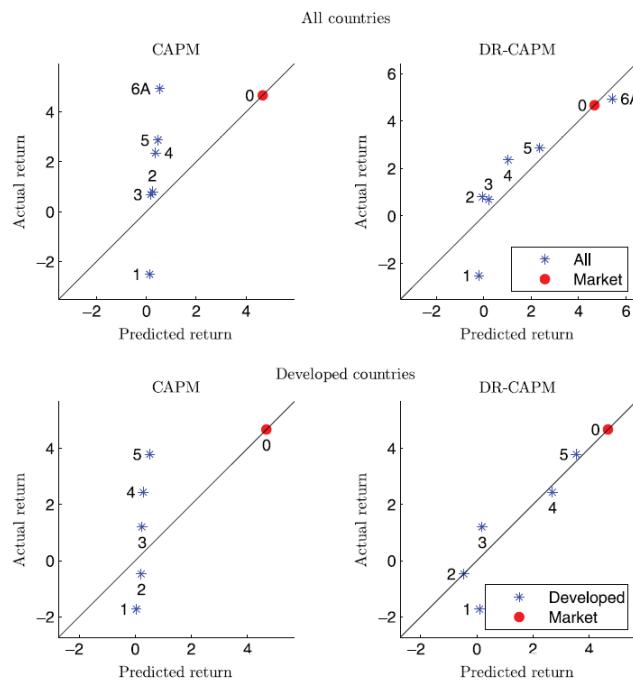
(Lettau, Maggiori, Weber 2014)

Normal beta:

$$r_{it} = a_i + \beta_i r_{mt} + \epsilon_{it}, \quad \forall t \in T,$$

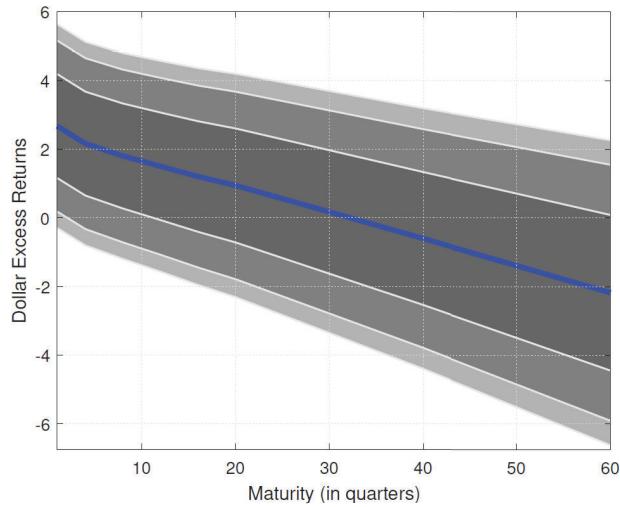
Downside beta:

$$r_{it} = a_i^- + \beta_i^- r_{mt} + \epsilon_{it}^- \quad \text{whenever } r_{mt} \leq \bar{r}_m - \sigma_{r_m},$$



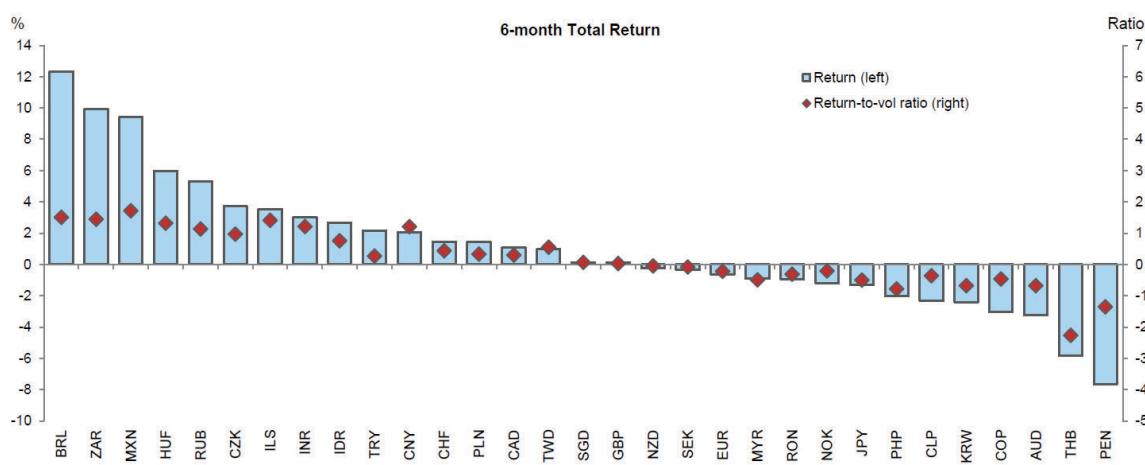
Maturity Structure of Returns:

G10 Countries, Zero-Coupon Bonds, 4/1985–12/2015



The countries are sorted by the slope of their yield curves into three portfolios. The holding period is one quarter. The returns are annualized. Data are monthly. Maturities are 4, 8, 12, 16, 20, 40, and 60 quarters. The dark shaded area corresponds to one-standard-error bands around the point estimates. The gray and light gray shaded areas correspond to the 90% and 95% confidence intervals. Standard deviations are obtained by bootstrapping 10,000 samples of non-overlapping returns. Source: Lustig, Stathopoulos, and Verdelhan (2019)

Carry Performance (9/3/2021)



Conclusion

- Some evidence for relative PPP in the long-run.
- UIP does not hold in the data.
- Currency risk premia seems to be at the heart of the most puzzles in international finance.
- What is next: Importance of flows and institutions!!!