ECON 1550: International Finance

Exchange Rates and the Foreign Exchange Market: An Asset Approach

A model of exchange rate determination

Exogenous variables

Variable	Description
R	Domestic interest rate
R^*	Foreign interest rate
E^e	Expected exchange rate

Endogenous variables

Variable	Description	Equation	Type of equation
E	Exchange rate	$R = R^* + \frac{E^e - E}{E}$	Equilibrium condition

A model of exchange rate determination

- Two investment opportunities
  - Domestic bond with return $R_{\$}$ in Dollars
  - Foreign bond with return R^* in Euros
- To be indifferent between the two investments, the **uncovered interest parity condition** must hold:

$$\text{(UIP):}\ R_{\$} = R^* + \frac{E^e_{\$/\text{EUR}}}{E_{\$/\text{EUR}}} - 1$$

Exchange Rates

Bonds

Realized vs Expected Returns

Expected Returns of Foreign Bond

Approximations

Uncovered Interest Parity

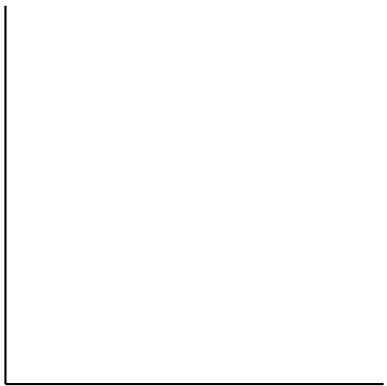
- For both strategies to have the same expected return

$$1 + R_{\$} = \frac{E^e_{\$/\text{EUR}}}{E_{\$/\text{EUR}}}(1 + R^*)$$

- Approximating

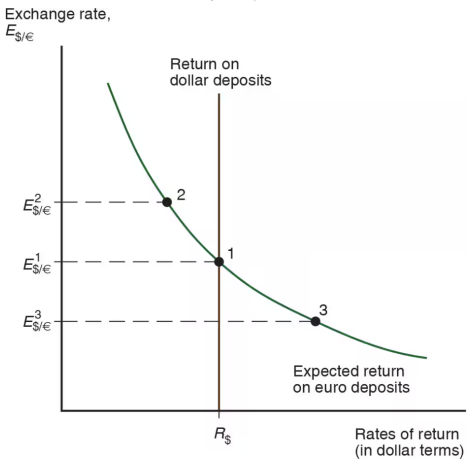
$$R_{\$} = R^* + \frac{E^e_{\$/\text{EUR}}}{E_{\$/\text{EUR}}} - 1$$

Equilibrium in Foreign Exchange Market



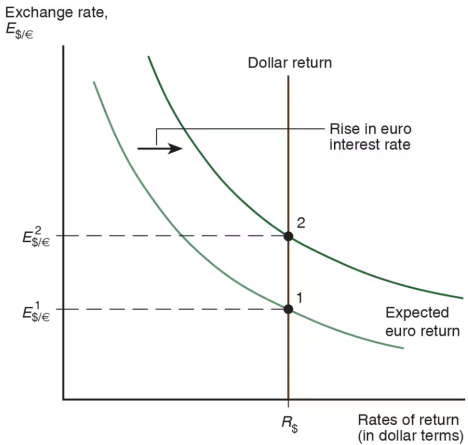
UIP: $R_{\$} = R^* + \dfrac{E^e_{\$/\text{EUR}}}{E_{\$/\text{EUR}}} - 1$

Equilibrium in Foreign Exchange Market



$$\text{UIP: } R_\$ = R^* + \frac{E^e_{\$/\text{EUR}}}{E_{\$/\text{EUR}}} - 1$$

Shocks: Rise in Euro Interest Rate



The carry trade

- Borrowing at "low" rate R and lending at "high" rate R^* is a **carry trade**

$$\begin{array}{c}\text{expected return} \\ \text{on carry trade}\end{array} = R^* + \left(\frac{E^e}{E} - 1\right) - R + \text{risk premium}$$

- Risk: Future exchange rate is not known when we start the carry trade, E^e can be different from the realized future exchange rate

Empirical Failure of UIP

Eight currency portfolios sorted by interest rate differential (portfolio 1 = lowest rates, portfolio 8 = highest).

High interest rate currencies earn higher mean excess returns and have higher Sharpe ratios.

Annual data, 1953–2002, US investor perspective.

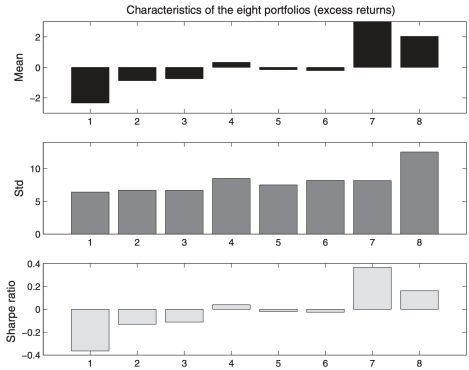


FIGURE 1. EIGHT CURRENCY PORTFOLIOS

Source: Lustig & Verdelhan (2007), *American Economic Review*

Explanations For Carry Risk Premium

- Crash risk / peso problem
- Correlation with consumption
- Global Volatility Risk
- Liquidity
- Constrained intermediaries

Crash Risk

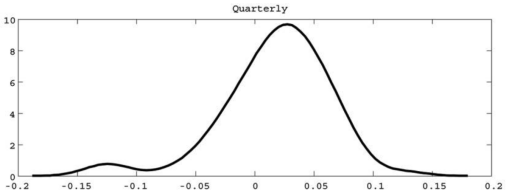


Fig. 1. U.S. dollar/Japanese yen exchange rate from 1996 to 2000

Kernel density of excess returns on a carry trade portfolio (long three high interest currencies, short three low interest currencies). Right: USD/JPY exchange rate, 1996–2000.

Source: Brunnermeier, Nagel, and Pedersen (2008), *NBER Macroeconomics Annual*

Consumption Risk

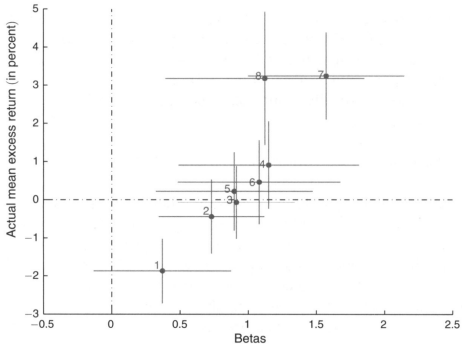


FIGURE 3. DURABLE CONSUMPTION GROWTH BETAS AND AVERAGE CURRENCY EXCESS RETURNS

The dots represent point estimates; the lines represent one standard deviation above and below. The sample is 1953–2008, annual data. Higher consumption betas correspond to higher currency excess returns.

Source: Lustig & Verdelhan (2011), *American Economic Review*

Global Volatility Risk

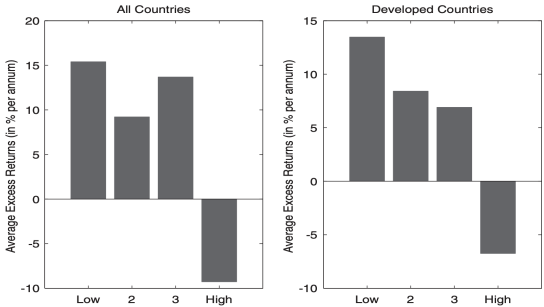
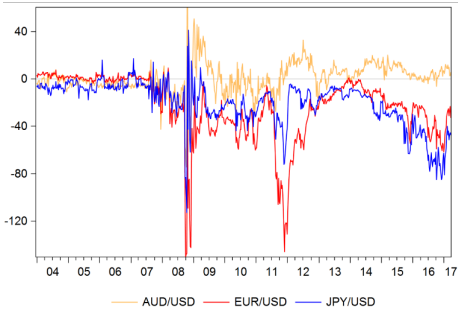


Figure 2. Excess returns and volatility. The figure shows mean excess returns for carry trade portfolios conditional on global FX volatility innovations being within the lowest to highest quartile of its sample distribution (four categories from "Low" to "High" shown on the x-axis of each panel). The bars show average excess returns for being long in portfolio 5 (largest forward discounts) and short in portfolio 1 (lowest forward discounts). The left panel shows results for all countries, while the right panel shows results for developed countries. The sample period is November 1983 to August 2009.

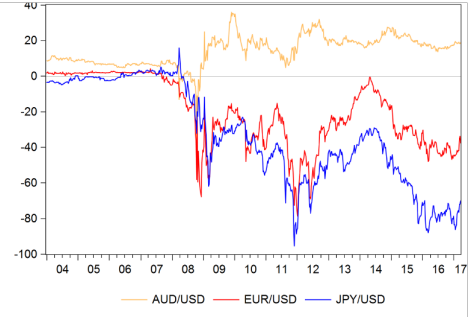
Mean excess returns for carry trade portfolios conditional on global FX volatility innovations being within the lowest to highest quartile. Carry trade earns high returns when volatility is low, but suffers large losses when volatility is high.

Source: Menkhoff, Sarno, Schmeling, and Schrimpf (2012), *Journal of Finance*

Violations of *Covered* Interest Parity



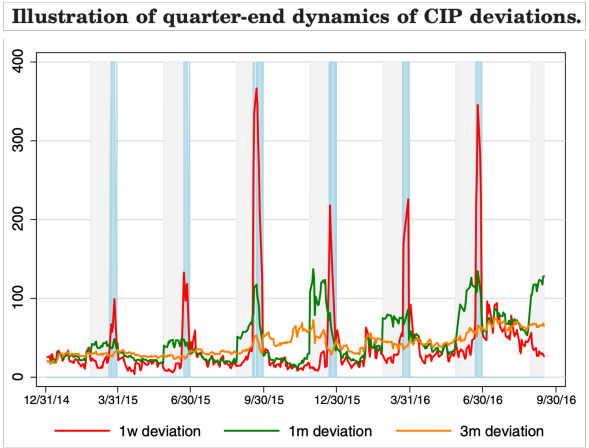
3-month basis: b_{3m}

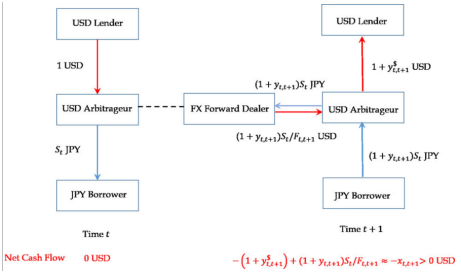


3-year basis: b_{3y}

Source: Sushko, Borio, McCauley, and McGuire, "The Failure of Covered Interest Parity"

Intermediaries are Constrained





Source: Du, Tepper, and Verdelhan, "Deviations from Covered Interest Rate Parity," *Journal of Finance*

ECON 1550: International Finance

Money, Interest Rates, and Exchange Rates

A model of the money market

Exogenous variables

Variable	Description
Y	Real income
M^s	Money supply
P	Price level

Endogenous variables

Variable	Description	Equation	Type of equation
R	Domestic interest rate	$M^d/P = L(R, Y)$	Behavioral equation
M^d	Money demand	$M^d = M^s$	Equilibrium condition

Description of the Money Market

- There are only two assets: money and domestic bonds
- Money
  - Can be used for transactions
  - Pays no interest
- Bonds
  - Cannot be used for transactions
  - Pay interest $i \geq 0$

Money Demand

- Money demand is higher when:
  - Higher price level $P \rightarrow$ need more money to buy goods
  - Lower nominal interest rate $R \rightarrow$ bonds less attractive
  - Higher income $Y \rightarrow$ want more money to buy more
- Capture idea with a behavioral equation

$$M^d = P \times L(\underset{(-)}{R}, \underset{(+)}{Y})$$

Real money demand

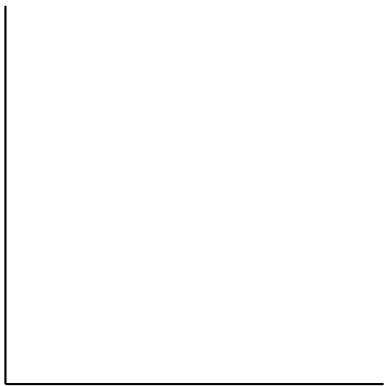
- Convenient to write in terms of real money demand

$$\frac{M^d}{P} = L(R, Y)$$

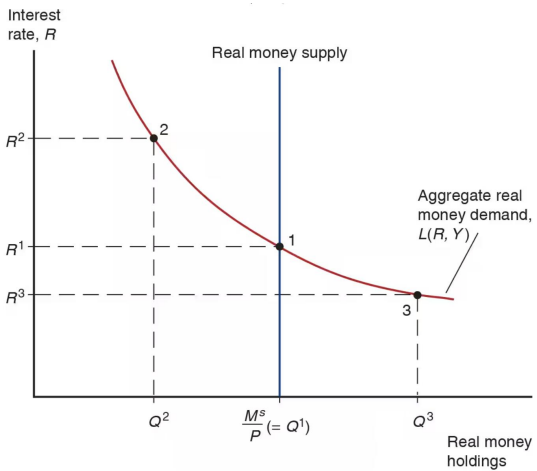
and real money supply

$$\frac{M^s}{P}$$

Equilibrium in money market



Equilibrium in money market



Money is defined by its function

- Medium of exchange
- Store of value
- Unit of account

Many types of money 1/2

- Commodity money: a physical commodity (like gold) that is used as money
- Convertible paper money: a piece of paper that can be exchanged by a commodity

Many types of money 2/2

- Fiat money: issued by a central bank, not backed by any commodity
- Digital currency: not backed by any commodity, privately issued, electronic payments

Fiat money

1. Central bank liabilities are special because they are the unit of account.
2. Currency is a promise to deliver future central bank liabilities.

Assets	Liabilities
\$0	\$0

$t = 0$

Assets	Liabilities
\$1 currency	\$1 money

$t = 1$

Assets	Liabilities
\$1 bonds	\$1 money

$t = 2$

Monetary policy

- Deposits at the Fed are called reserves
- “The” interest rate is just interest on reserves