Topics for Today

1.) The Monetary Model of Ex. Rate (from last time)

2.) Testing the Monetary Model (from last time)
   - Excess Volatility & Bubbles

3.) Uncovered Interest Parity
   - Risk Premia in the FX Market

Uncovered Interest Parity (UIP)

The monetary model of ex. rates assumes UIP holds. Maybe this is the source of the problem.

UIP states that expected (nominal) rates of return are equated across countries (in common currency units)

$$1 + i_t = (1 + i_t^*) \frac{E_t S_{t+1}}{S_t}$$

S_t = spot price of fx $/£e

Note,

1.) Assets must have same risk (usually riskless govt. securities)

2.) Assets must have same maturity (usually 1, 3, 12 months)

UIP is often interpreted as an equilibrium condition under risk neutrality (see below for caveat), or as an expression of fx market "efficiency".

In contrast, Covered Interest Parity (CIP), is a no arbitrage condition

$$1 + i_t = (1 + i_t^*) \frac{F_t}{S_t}$$

F_t = Forward rate. Price set today for future delivery.

Note, CIP + UIP $\Rightarrow$ $E_t S_{t+1} = F_t$

$\Rightarrow$ Forward rate is an unbiased predictor of the future spot rate

So UIP can be interpreted as a test of forward rate unbiasedness, since CIP holds to a close approx.

What if $F_t > E_t S_{t+1}$?

1.) Sell fx forward at F_t

2.) Buy it back later at $E_t S_{t+1}$

Or equivalently,

1.) Borrow fx at i^*

2.) Convert to \$ and lend at i

In practice, the combo. of buying spot and selling forward (or vice versa) is typically done via swap contracts.

Testing UIP

Write UIP as,

$$\frac{E_t S_{t+1}}{S_t} = \frac{1 + i_t}{1 + i_t^*} = \frac{F_t}{S_t}$$

Take logs of both sides

$$\ln E_t S_{t+1} - \ln S_t = \ln F_t - \ln S_t = \log(1+i_t) - \ln(1+i_t^*)$$
$$\approx i_t - i_t^*$$

Fact: If $\ln x \sim N(\mu, \sigma^2)$, then $x \sim$ log-Normal and $E(x) = e^{\mu + \frac{1}{2}\sigma^2}$

So if $S_t \sim$ log-Normal,

$$E_t s_{t+1} + \tfrac{1}{2} \mathrm{var}_t(s_{t+1}) - s_t = f_t - s_t$$
$$= i_t - i_t^*$$

where $s_t = \log(S_t)$ $f_t = \ln(F_t)$

Assuming RE, $s_{t+1} = E_t s_{t+1} + \varepsilon_{t+1}$

$$\boxed{\Delta s_{t+1} = \alpha + \beta(f_t - s_t) + \varepsilon_{t+1}}$$

$H_0: \beta = 1$ $\quad$ $H_A: \beta \neq 1$

Table 1
Regressions of Quarterly Depreciation on 3-Month Forward Premium
$\Delta s_{t+1} = \alpha + \beta(F_t - s_t) + \varepsilon_{t+1}$

	USD/GBP	USD/DEM	USD/JAY	GBP/DEM	GBP/JAY	DEM/JAY
			1976:I-1994:I			
$\hat{\alpha}_{OLS}$	-1.340	0.638	3.294	1.622	7.702	1.041
	(0.895)	(0.886)	(0.964)	(1.116)	(1.687)	(0.648)
$\hat{\beta}_{OLS}$	-1.552	-0.136	-2.526	-0.602	-4.261	-0.755
	(0.863)	(0.839)	(0.903)	(0.782)	(1.133)	(1.042)

Table 1: Predictable Excess Returns

$q_{t+1} = \alpha + \beta(i_t - i_t^*) + \epsilon_{t+1}$			
Currencies	β	$\sigma(\beta)$	R^2
DEM	-1.8344**	0.8189	0.05
GBP	-2.9537***	1.1214	0.10
JPY	-4.0626***	0.7438	0.16
CND	-1.5467***	0.5305	0.05
CHF	-2.3815***	0.8068	0.09
EW Average	-2.5558***	0.6192	0.09
GDP Average	-2.9821***	0.6223	0.11

Note: $q_{t+1} = \Delta s_{t+1} - (i_t - i_t^*)$. Δs_{t+1} refers to the 3-month change in the log exchange rate. The exchange rate is measured as net-of-period rate from IFS. Interest rates are 3-month rates as quoted in the London Euromarket and were obtained from Datastream (Thomson Financial). *** and ** denote significance at respectively the 1% and 5% level. SUR system estimated from 109 quarterly observations over sample from December 1978 to December 2005. Newey-West standard errors with 1 lag. "EW Average" refers to the equally weighted average of the regression coefficients. The last row reports the GDP weighted average.

Caveats

1.) UIP works better for developing countries
- Bansal & Dahlquist (JIE, 2000)

2.) UIP works better at very low frequencies (Chinn & Meredith (2015) and very high frequencies, [Chaboud & Wright (JIE, 2005)]

Potential Explanations

1.) Jensen's Inequality

2.) Real vs. Nominal Returns

3.) Risk Aversion / Time-Varying Risk Premia

4.) Peso Problems. $E_t S_{t+1}$ not well approximated by sample average. Infrequent "regime changes".

5.) Simultaneity Bias / Endogenous Monetary Policy
- McCallum (JME, 1994)

6.) Adaptive Learning
- Evans + Chakraborty (2007)

7.) Non-Rational Expectations (Froot + Frankel)
- Noise-Traders (Mark + Wu (EJ, 1998))
- Distorted Beliefs [Gourinchas + Tornell (JIE, 2004)]

8.) Info. Processing Constraints [Bacchetta + VanWincoop (2006)]

9.) Heterogeneous Beliefs / Higher-Order Belief Dynamics
- Bacchetta + vanWincoop (AER, 2006)
- Kasa, Walker, Whiteman (2007)