Carry Trade Reconsidered

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Carry Trade, UIP and Risk Premia

- Uncovered interest parity implies that the average payoffs to carry trades ought to be 0.
- Uncovered interest parity implies that conditional and unconditional risk premia are 0.

- UIP is a well-documented failure in industrialized economies
- Carry trades are profitable
- Currency risk premia are nonzero

- But how closely linked are these phenomena, and do they extend to emerging market currencies?

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Notation and parity conditions

- S: spot exchange rate in USD per foreign currency unit (FCU)
- F: one-month forward exchange rate in USD per FCU
- i: US one-month risk-free rate:
- i^*: foreign one-month risk-free rate

- UIP: $\mathbb{E}_t S_{t+1}/S_t = (1+i_t)/(1+i_t^*)$
- CIP: $F_t/S_t = (1+i_t)/(1+i_t^*)$
  - currencies at a forward premium have low interest rates

Risk premia

- Excess return to a long position in foreign currency:

$$z_{t+1}^{L} = (1 + i_t^*) \frac{S_{t+1}}{S_t} - (1 + i_t) = \left(\frac{S_{t+1} - F_t}{F_t} \right) (1 + i_t)$$

- The conditional risk premium

$$p_t \equiv \mathbb{E}_t z_{t+1}^{L}$$

- Uncovered interest parity

$$p_t = \mathbb{E}_t z_{t+1}^{L} = 0$$

Testing UIP

- Standard UIP regression with $H_0: \quad a \approx 0, \quad b \approx 1$:

$$\Delta \ln S_{t+1} = a + b(i_t - i_t^*) + \varepsilon_{t+1}$$

- "Equivalent" regression with $H_0: \quad \alpha = 0 \approx a, \quad \beta = 0 \approx b - 1$:

$$x_{t+1}^L = \alpha + \beta \frac{F_t - S_t}{F_t}(1 + i_t) + \varepsilon_{t+1}$$

- Classic result: $b \neq 1$ in fact $b < 0$ equivalent to $\beta \neq 0$ in fact $\beta < -1$

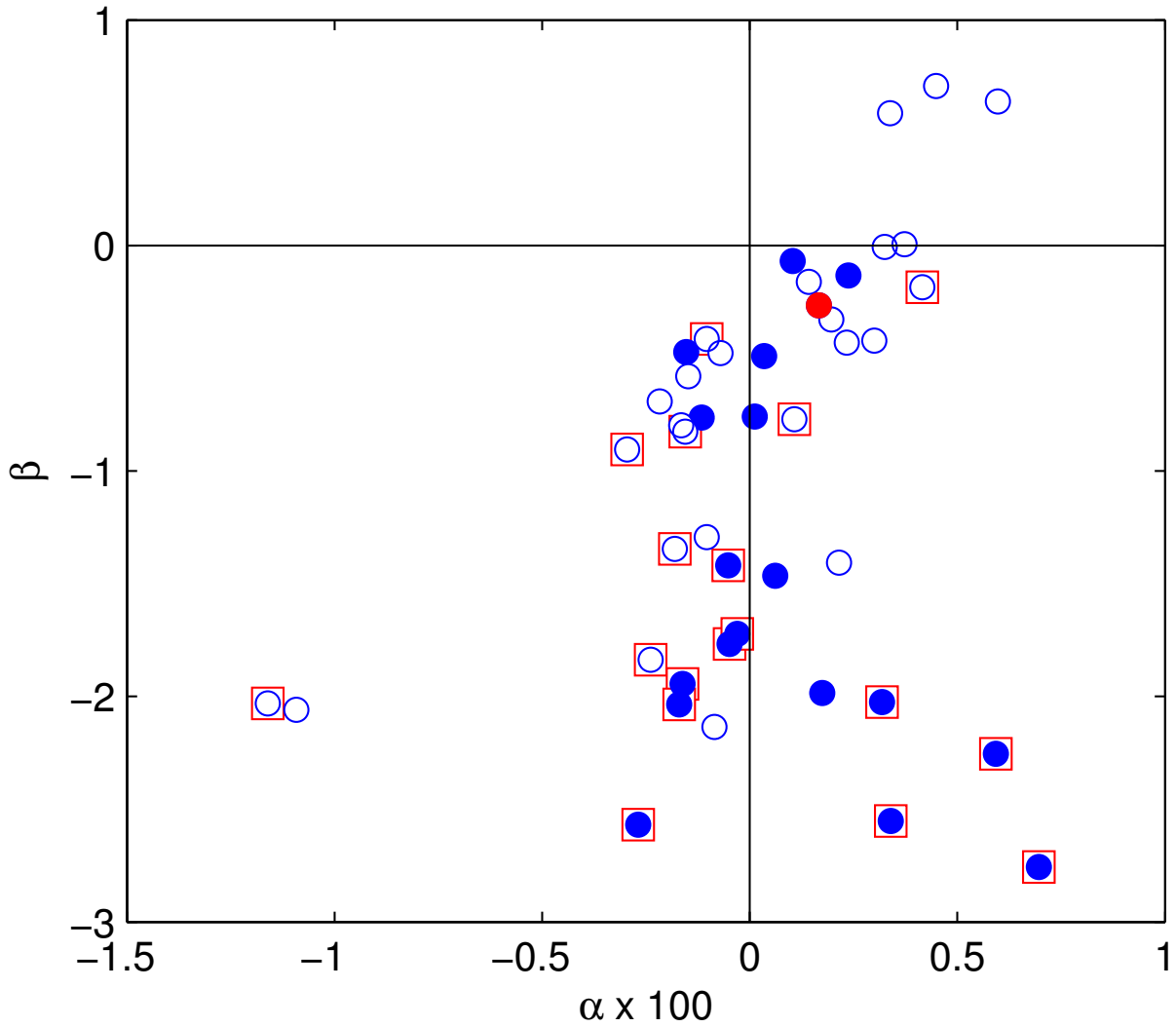
Results from UIP Regressions

Varying Sample Sizes, 1976–2013

- Industrialized country currencies (G18):
  - UIP is rejected at the 5% level for 10 , 10% level for 3, & all remaining currencies except SEK
  - $\hat{\beta} < -1$ in 12 cases
- Emerging market currencies (E26):
  - UIP is rejected at the 5% level for 8, 10% level for 1 more
  - Several rejections are for "crisis" or high inflation countries
  - $\hat{\beta} < -1$ in 6 cases
- First impression is that emerging markets are different but can't reject random walk for 13 of G18 and 19 of E26
  - Chile: can't reject UIP or RW

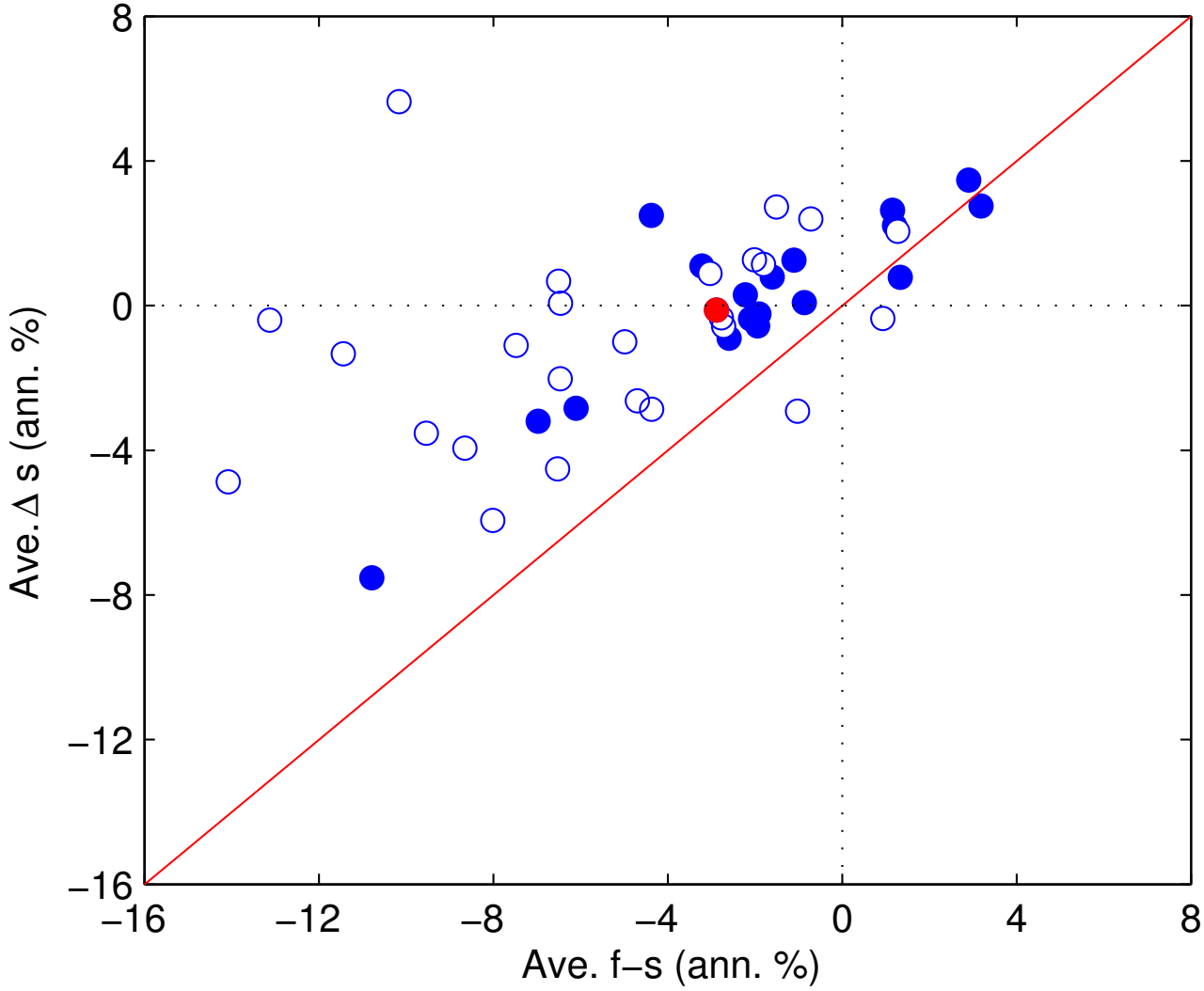
Results from UIP Regressions

Varying Sample Sizes, 1976–2013



Do High Interest Rate Currencies Appreciate?

No, most of the them depreciate (but not as much as they "should")! (Hassan and Mano, 2013)

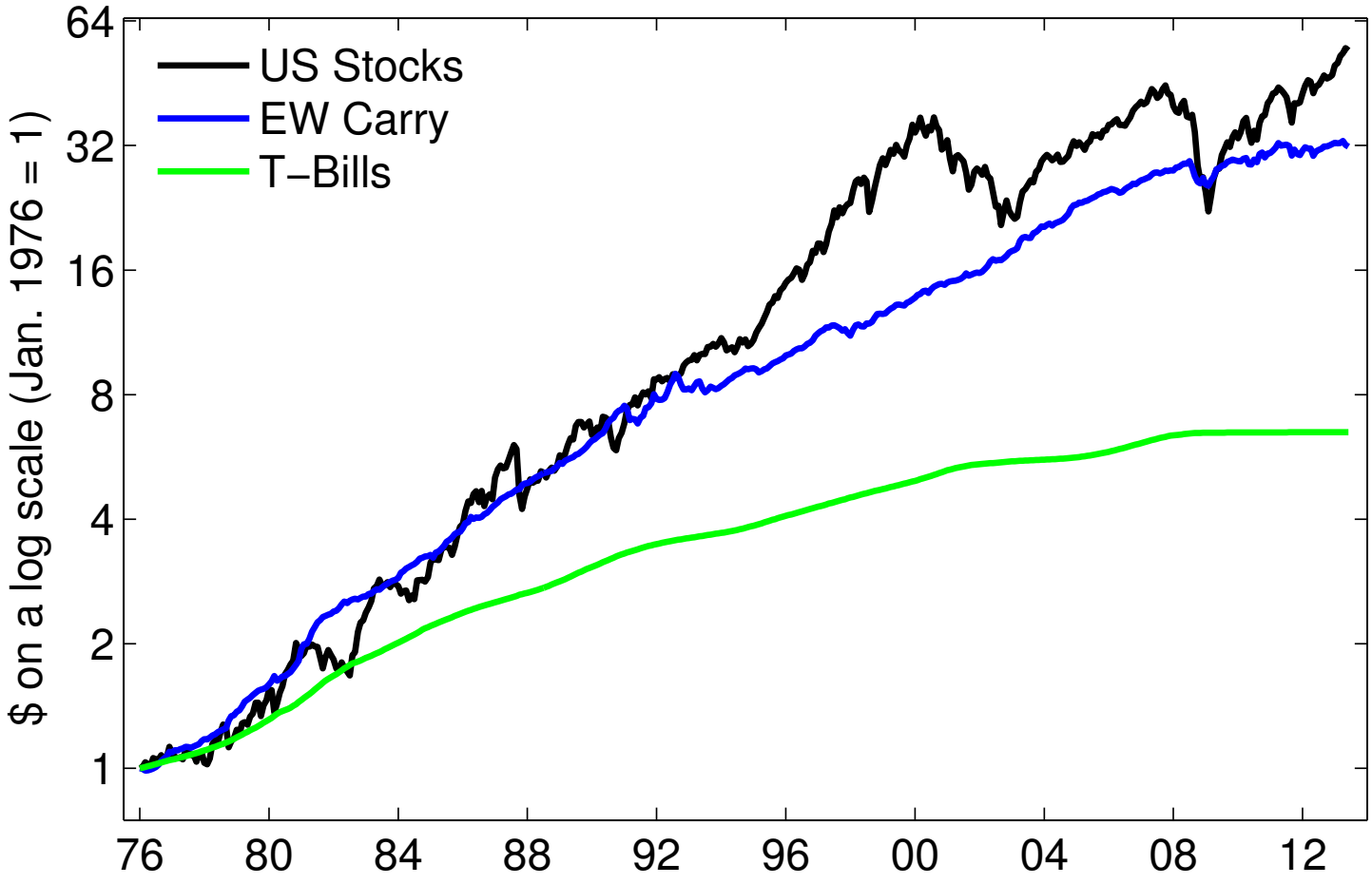


Profits of the Carry Trade

$$x_{jt+1}^{\text{STD}} = \text{sign}(i_{jt}^* - i_t) x_{jt+1}^L = \text{sign}(S_{jt} - F_{jt}) x_{jt+1}^L.$$

- On a currency-by-currency basis
  - Carry trades were profitable in every G18 currency
    - ★ Significant at the 5% level in 9, at 10% level in 2 more
  - Carry trades were profitable in 24 of the E26 currencies (not Chile)
    - ★ Significant at the 5% level in 6, at 10% level in 4 more
    - ★ Biggest profits are in currencies with a history of crises or high inflation
- Equally-weighted portfolios of currencies were also highly profitable and have Sharpe ratios that outperform the stock market

Profits of the Carry Trade

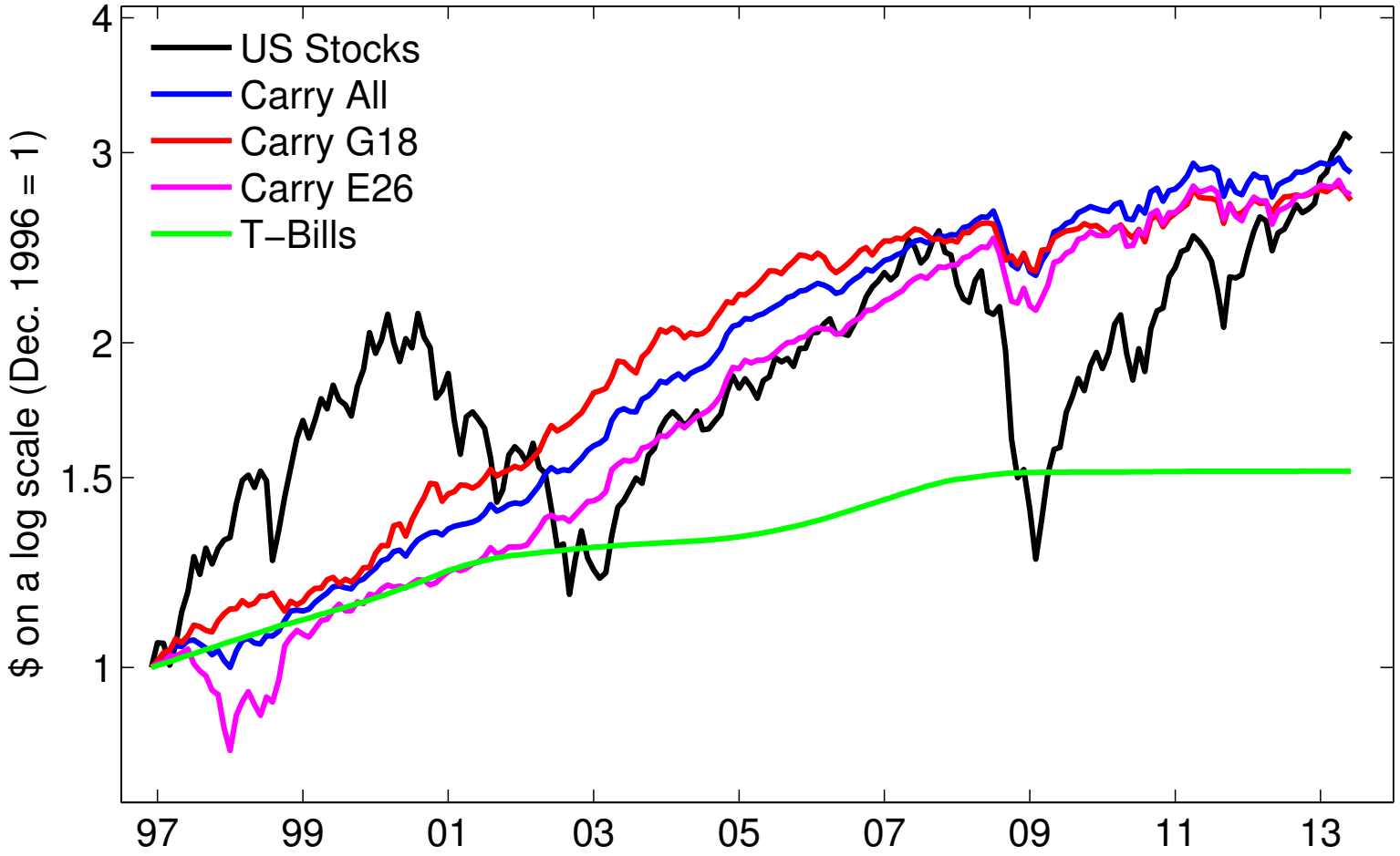


Profits of the Carry Trade

1976-2013

	Mean	SD	SR	Skew	Kurt
G18 currencies	0.045	0.052	0.87	-0.55	3.84
	(0.009)	(0.004)	(0.19)	(0.35)	(1.37)
All currencies	0.044	0.048	0.92	-0.65	4.16
	(0.009)	(0.004)	(0.21)	(0.33)	(1.13)
US stock market	0.069	0.155	0.45	-0.73	2.28
	(0.026)	(0.009)	(0.18)	(0.17)	(1.16)

Profits of the Carry Trade



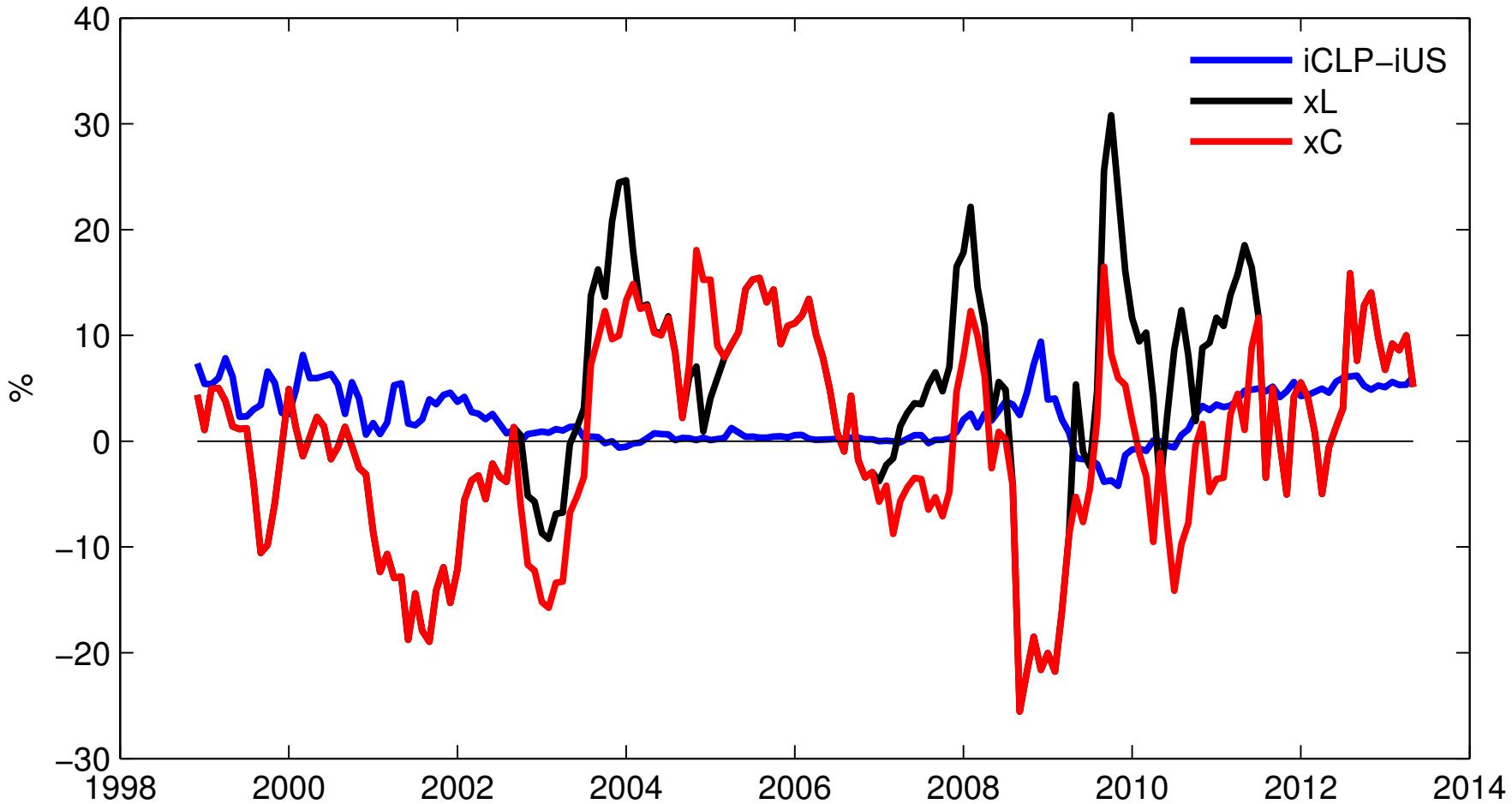
Profits of the Carry Trade

1996-2013

	Mean	SD	SR	Skew	Kurt
G18 currencies	0.037	0.054	0.68	-0.22	0.88
	(0.013)	(0.004)	(0.26)	(0.19)	(0.35)
E26 currencies	0.038	0.067	0.57	-0.34	3.26
	(0.018)	(0.008)	(0.31)	(0.34)	(1.07)
US stock market	0.056	0.165	0.34	-0.65	0.76
	(0.045)	(0.013)	(0.29)	(0.20)	(0.58)

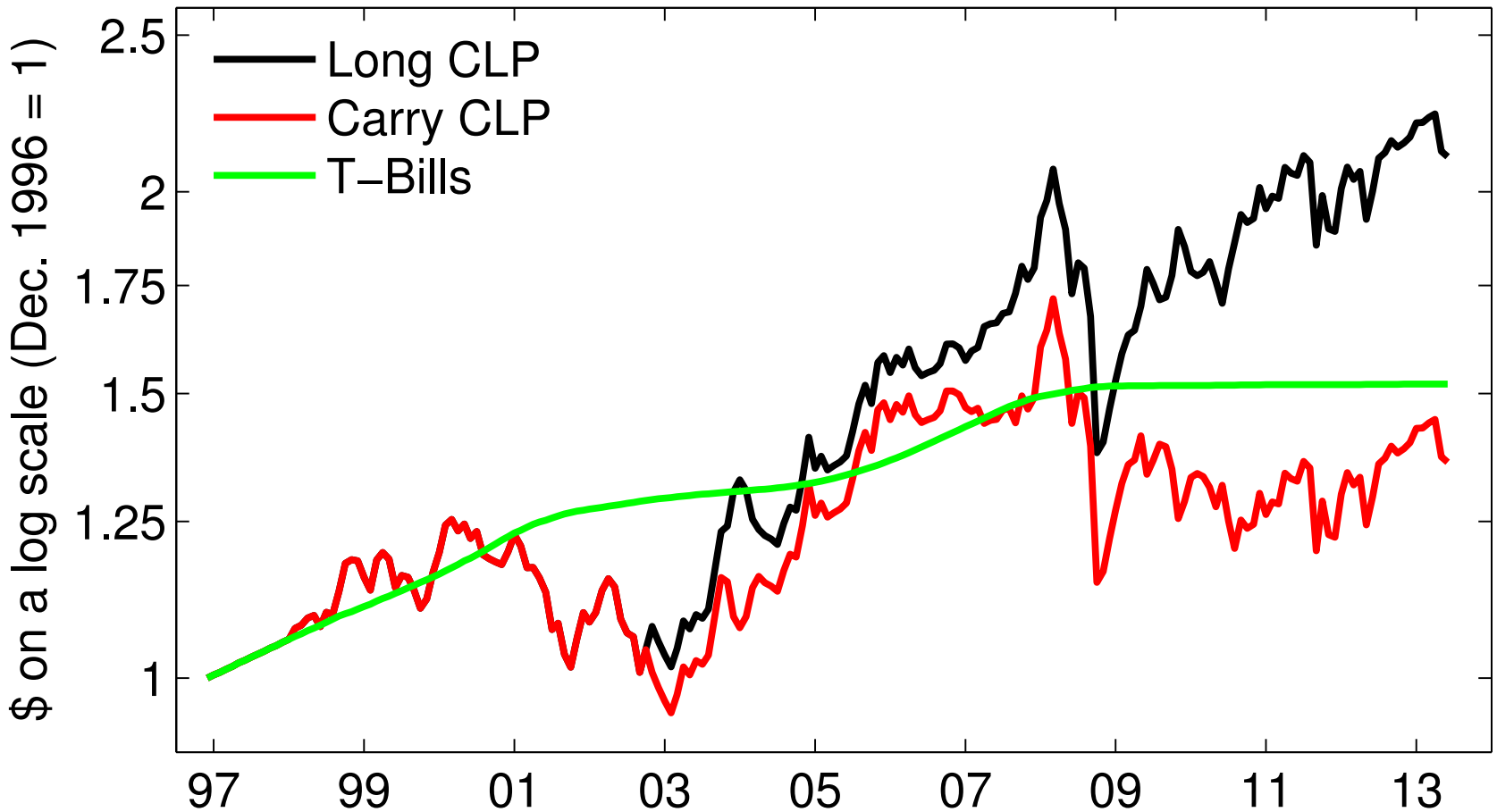
Profits of the Carry Trade vs CLP

One-Month Interest Differential and Moving Averages of Payoffs



Profits of the Carry Trade vs CLP

Cumulative Returns



Risk Premia

$$p_{jt} = p_j + p_t + v_{jt} \qquad E(p_{jt}) = p_j \quad E(p_t) = E(v_{jt}) = 0$$

- What components of the risk premium do UIP regressions reflect?
  - Obviously the slope coefficient, β, reflects the covariance of the time varying component with the interest differential
  - The constant is $\alpha \approx p_j + \beta(i^* - i)$ and depends on the size of the country-specific mean
- What aspects of the risk premium do the average payoffs to the carry trade reflect?
  - If carry trades are always in one direction they are just long positions, so they could only reflect the country-specific mean (story is disconnected from β)
  - But if carry trades switch sign the time-varying component matters for average payoffs.

Static vs. Standard Carry Trade

$$x_{jt+1}^{\text{STATIC}} = \text{sign}[E(i_{jt}^* - i_t)]x_{jt+1}^L = \text{sign}\, E[(S_{jt} - F_{jt})]x_{jt+1}^L.$$

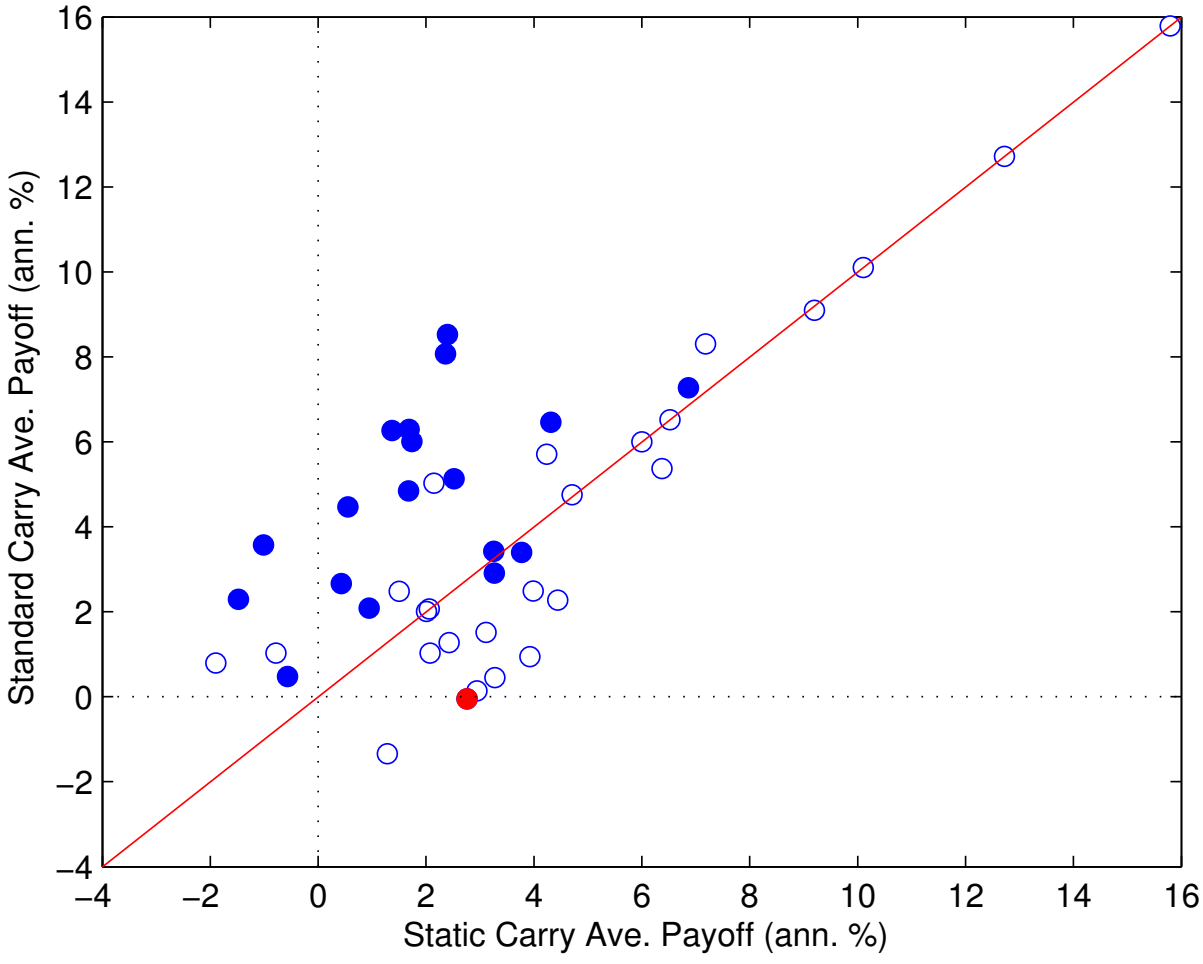
- If risk premia are constant and the same sign as the forward discount this kind of trade should outperform standard carry trade

$$E(x_j^{\text{STATIC}}) = \text{sign}[E(S_{jt} - F_{jt})]p_j.$$

$$E(x_j^{\text{STD.}}) = [2\,\text{Pr}(S_{jt} - F_{jt} > 0) - 1]p_j.$$

- It doesn't, in fact an equally weighted portfolio of standard carry trades outperforms one of static carry trades by a wide margin.
  - This largely reflects the behavior of G18 currencies

Static vs. Standard Carry Trade



Conclusion

- Emerging markets are different
  - Departures from UIP seem smaller
  - Overall profits to carry trades are similar to G18 currencies but are concentrated in crisis currencies
- Time variation in risk premia plays a role in both UIP regressions and the returns to the carry trade
  - If you really want to see how time varying premia play a role have to look at conditional means of carry trade payoffs
- Chile
  - UIP is a reasonable approximation, but so is the random walk
  - Carry trading on the CLP was unprofitable in my historical sample (1998–2013)