

### Covered and Uncovered Interest Parity

Suppose there are no impediments to trade in financial assets (currencies, bonds) between countries. Then consider the decision to save \$1 in the US or abroad (say the Euro area). One could save in a US certificate of deposit and receive  $\$1 \times (1+i)$  over the course of the year. Alternatively, one could convert the \$1 into a foreign currency by exchange rate  $E$  (measured in  $\$/\epsilon$ ), then receive  $(1+i^{Eu})$  over the course of the year on those euros. At the end of the year, provided one had entered into a forward contract on euros, one could convert back to US\$ at rate  $F$  (measured in  $\$/\epsilon$ ).

The two choices yield:

$$1 \times (1+i) \quad \text{in dollars}$$

$$F \times (1+i^{Eu}) / S \quad \text{in dollars}$$

Since  $F$  is set at the time one initially converts from US\$ to euros, then there is no uncertainty, and one can compare the two choices without worrying about risks. If everybody tries to get the highest returns, then in the end, neither alternative will yield a higher return than the other.

$$F(1+i^{Eu}) / S = (1+i) \quad (1)$$

Rearranging:

$$F / S = (1+i) / (1+i^{Eu}) \quad (2)$$

When (2) holds, this is called “covered interest parity” (CIP). Notice that if the interest rates are small (say 0.05 or 5%), then (2) can be approximated by:

$$f - s = (i - i^{Eu}) \quad (3)$$

where  $f = \log(F)$  and  $s = \log(S)$ . The term on the left hand side is called the forward discount, that on the right hand side, the interest differential.

Now suppose that one doesn't use the forward market. One can then make a bet, depending upon what one expects the exchange rate to be one year from today; call that  $S^e$ . That leads to the following expression analogous to (2).

$$S_{+1} / S = (1+i) / (1+i^{Eu}) \quad (4)$$

$$(S_{+1} / S) - 1 = [(1+i) / (1+i^{Eu})] - 1$$

$$(S_{+1} - S) / S = \frac{(1+i) - (1+i^{Eu})}{(1+i^{Eu})} \approx (i - i^{Eu}) \quad (4a)$$

Equation (4) in log terms becomes:

$$\Delta s_{t+1}^e \equiv s_{t+1}^e - s_t = (i_t - i_t^{Eu}) \quad (5)$$

The expression on the left hand side of the equal sign of (5) is called “expected depreciation”. In words, this is the percent depreciation that is expected over the next period, based on the information available today. It also means that “expected” returns expressed in a common currency are equalized. When this holds, the condition is often called “uncovered interest parity” (UIP).

While it appears to be a simple step, equation (5) is actually much more contentious than (3). Equation (5) holds if individuals are risk neutral or treat government bonds issued by different governments as being identical.

What is the empirical evidence regarding UIP? This is difficult to answer, since one never observes expected depreciation. One does observe ex post, or actual after-the-fact, depreciation. If people do not make systematically biased errors (so that they are on average correct – the so called “rational expectations hypothesis”), then one can run the following regression corresponding to equation 5:

$$\Delta s_{t+1} \equiv s_{t+1} - s_t = \alpha + \beta(i_t - i_t^{Eu}) + \varepsilon_{t+1} \quad (6)$$

where  $\varepsilon$  is a regression error arising from expectations errors. If UIP and rational expectations holds, the  $\beta$  should equal one.

Table 1. Estimates of  $\beta$

Currency	Maturity				
	3 mo.	6 mo.	12 mo.	5 years	10 years
Japanese yen	-3.440* (0.998)	-3.387* (0.783)	-2.996* (0.706)	-	0.564* (0.146)
Deutschemark	-0.646 (1.160)	-0.861* (0.839)	-0.581* (0.682)	0.914 (0.360)	0.836 (0.128)
U.K. pound	-2.036* (1.211)	-1.963* (1.176)	-1.268* (1.062)	1.084 (0.415)	0.719* (0.109)
Canadian dollar	-0.516* (0.589)	-0.535* (0.391)	-0.464* (0.477)	1.337 (0.410)	-

Notes: Point estimates from the regression in equation 1 (serial correlation robust standard errors in parentheses, calculated assuming k-1 moving average serial correlation). Sample for 3, 6, and 12 month maturity data is 1980Q1-1998Q1. Sample for 5 and 10 year maturity data is 1983Q1-1998Q1, except for the Canadian dollar (1985Q4-1998Q1).

\* Different from null of unity at 5 percent significance level. Source: Meredith and Chinn (1998).

Clearly, this condition does not appear to hold at short horizons. This can mean either (1) individuals are not risk neutral; (2) government bonds are not treated as being perfectly substitutable; or (3) expectations are not “rational” in the sense defined above.