

## 20. Deriving Forecasts of the Future Spot Rate

As of today, assume the following information is available:

	U.S.	MEXICO
Real rate of interest required by investors	2%	2%
Nominal interest rate	11%	15%
Spot rate	—	\$20
One-year forward rate	—	\$19

- Use the forward rate to forecast the percentage change in the Mexican peso over the next year.
- Use the differential in expected inflation to forecast the percentage change in the Mexican peso over the next year.
- Use the spot rate to forecast the percentage change in the Mexican peso over the next year.

20.

$$\begin{aligned} a. \quad \frac{F - S_0}{S_0} &= \frac{0.19 - 0.2}{0.2} = -0.05 \\ &= -5\% \# \end{aligned}$$

$$b. \quad 11\% - 15\% = -4\% \#$$

$$c. \quad \frac{2\% - 2\%}{2\%} = 0 \#$$

24. IFE Beth Miller does not believe that the international Fisher effect (IFE) holds. Current 1-year interest rates in Europe are 5 percent, while 1-year interest rates in the United States are 3 percent. Beth converts \$100,000 to euros and invests them in Germany. One year later, she converts the euros back to dollars. The current spot rate of the euro is \$1.10.

- According to the IFE, what should the spot rate of the euro in 1 year be?
- If the spot rate of the euro in 1 year is \$1.00, what is Beth's percentage return from her strategy?
- If the spot rate of the euro in 1 year is \$1.08, what is Beth's percentage return from her strategy?
- What must the spot rate of the euro be in 1 year for Beth's strategy to be successful?

$$\begin{aligned}
 \text{a. IFE} \Rightarrow \frac{E(S_1) - S_0}{S_0} &= \frac{i_e^1 - i_f^1}{1 + i_f^1} \\
 \frac{E(S_1) - 1.1}{1.1} &= \frac{0.03 - 0.05}{1.05} \\
 \frac{E(S_1) - 1.1}{1.1} &= -0.01905
 \end{aligned}$$

$$E(S_1) = 1.079 \text{ \$}$$

b. ① 先将 \$ 换成 € :

$$FC = \frac{100,000}{1.1} = 90,909.09$$

$$\text{② 寄存一年: } 90,909.09 \times (1 + 0.05) = 95,454.55$$

$$\text{③ 再换成 $ 转回 $: } 95,454.55 \times 1 = 95,454.55$$

$$\text{④ return rate: } \frac{95,454.55 - 100,000}{100,000} = -0.0455 = -4.55\% \#$$

$$\text{c. ① } \frac{100,000}{1.1} = 90,909.09$$

$$\text{② } 90,909.09 \times (1 + 0.05) = 95,454.55$$

$$\text{③ } 95,454.55 \times 1.08 = 103,090.91$$

$$\text{④ return rate: } \frac{103,090.91 - 100,000}{100,000} = 0.0309 = 3.09\% \#$$

d. spot rate of the euro in 1 year should higher than 1.079 #

25. Integrating IRP and IFE Assume the following information is available for the United States and Europe:

	U.S.	EUROPE
Nominal interest rate	4%	6%
Expected inflation	2%	5%
Spot rate	—	\$1.13
One-year forward rate	—	\$1.10

- a. Does IRP hold?  
 b. According to PPP, what is the expected spot rate of the euro in 1 year?

25.

$$\begin{aligned}
 \text{a. IRP} \Rightarrow \frac{F - S_0}{S_0} &= \frac{i_o^d - i_o^f}{(1 + i_o^f)} \\
 \frac{1.1 - 1.13}{1.13} &= \frac{0.04 - 0.06}{1 + 0.06} \\
 -0.027 &\neq -0.019
 \end{aligned}$$

$\therefore$  No, doesn't hold #

$$\begin{aligned}
 \text{b. PPP} \Rightarrow \frac{E(S_1) - S_0}{S_0} &= \frac{E(I_o^d) - E(I_o^f)}{1 + E(I_o^f)} \\
 &= \frac{0.02 - 0.05}{1 + 0.05} \\
 \frac{E(S_1) - 1.13}{1.13} &= -0.0286
 \end{aligned}$$

$\therefore E(S_1) = 1.098$  #

**26. IRP** The 1-year risk-free interest rate in Mexico is 10 percent. The 1-year risk-free rate in the United States is 2 percent. Assume that interest rate parity exists. The spot rate of the Mexican peso is \$.14.

- What is the forward rate premium?
- What is the 1-year forward rate of the peso?
- Based on the international Fisher effect, what is the expected change in the spot rate over the next year?
- If the spot rate changes as expected according to the IFE, what will be the spot rate in 1 year?
- Compare your answers to (b) and (d) and explain the relationship.

→ b.

$$\begin{aligned}
 \text{a. } \frac{F - S_0}{S_0} &= \frac{i_0^d - i_0^f}{(1 + i_0^f)} \\
 \text{forward rate premium} &= \frac{0.02 - 0.1}{1 + 0.1} \\
 &= -0.07273 \#
 \end{aligned}$$

$$\text{b. } \frac{F - 0.14}{0.14} = -0.07273$$

$$F = 0.12982 \#$$

$$\begin{aligned}
 \text{c. } \text{IFE} \Rightarrow \frac{E(S_1) - S_0}{S_0} &= \frac{i_0^d - i_0^f}{1 + i_0^f} \\
 \text{expected change spot rate} &= \frac{0.02 - 0.1}{1 + 0.1} \\
 &= -0.07273 \\
 &= -7.273\% \#
 \end{aligned}$$

$$\text{d. } \frac{E(S_1) - 0.14}{0.14} = -0.07273$$

$$E(S_1) = 0.12982 \#$$

e. (b) & (d) are same. When IRP hold, the forward rate premium and expected percentage change in the spot rate are same manner. Therefore, the forward rate premium serves as the forecasted percentage change in the spot rate according to IFE.

**39. PPP and Real Interest Rates** The nominal (quoted) U.S. 1-year interest rate is 6 percent, while the nominal 1-year interest rate in Canada is 5 percent. Assume you believe in purchasing power parity. You believe the real 1-year interest rate is 2 percent in the United States, and that the real 1-year interest rate is 3 percent in Canada. Today the Canadian dollar spot rate is \$.90. What do you think the spot rate of the Canadian dollar will be in 1 year?

→ 9.

expected inflation in the US.  $\Rightarrow \overset{N}{6\%} - \overset{R}{2\%} = 4\%$

expected inflation in the Canada  $\Rightarrow 5\% - 3\% = 2\%$

expected % change in Canadian dollar  $\Rightarrow \frac{1 + 0.04}{1 + 0.02} - 1 = 0.0196 = 1.96\%$

future spot rate of Canadian dollar in one year  $\Rightarrow 0.9 \times (1 + 1.96\%) = 0.9176\#$

**44. IFE and Forward Rate** The one-year Treasury (risk-free) interest rate in the U.S. is presently 6%, while the one-year Treasury interest rate in Switzerland is 13%. The spot rate of the Swiss franc is \$.80. Assume that you believe in the international Fisher effect. You will receive 1 million Swiss francs in one year.

- a. What is the estimated amount of dollars you will receive when converting the francs to U.S. dollars in one year at the spot rate at that time?
- b. Assume that interest rate parity exists. If you hedged your future receivables with a one-year forward contract, how many dollars will you receive when converting the francs to U.S. dollars in one year?

44.

$$a. \text{ IFE: } \frac{E(S_1) - S_0}{S_0} = \frac{i^d - i^f}{1 + i^f}$$

$$\frac{E(S_1) - 0.8}{0.8} = \frac{0.06 - 0.13}{1 + 0.13}$$

$$\frac{E(S_1) - 0.8}{0.8} = -0.0619$$

$$E(S_1) = 0.75044$$

$$1,000,000 * 0.75044 = 750,440 \#$$

$$b. \text{ IRP: } \frac{F - S_0}{S_0} = \frac{i^d - i^f}{(1 + i^f)}$$

$$\frac{F - 0.8}{0.8} = \frac{0.06 - 0.13}{1 + 0.13}$$

$$\frac{F - 0.8}{0.8} = -0.0619$$

$$F = 0.75044$$

$$\text{received: } 1,000,000 * 0.75044$$

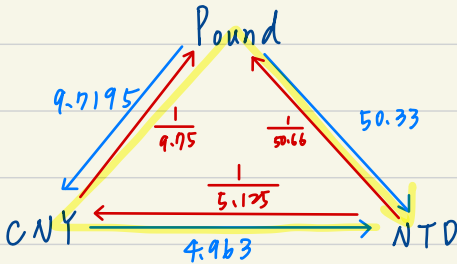
$$= 750,440 \#$$

皆不考慮交易成本

5. Central Bank quotes the following for the British pound and the China CNY:

	Quoted Bid Price	Quoted Ask price
Value of a British Pound in NTD	50.33 NTD	50.66 NTD
Value of a China CNY in NTD	4.963 NTD	5.125 NTD
Value of a British Pound in China CNY	9.7195 CNY	9.75 CNY

Assume you have NTD 10,000 to conduct triangular arbitrage. What is your profit from implementing this strategy?



$$\textcircled{1} \text{ 逆時針 : } 10,000 * \frac{1}{50.66} * 9.7195 * 4.963$$
$$= 9,521 \text{ NTD}$$

$$\therefore 9,521 < 10,000$$

$\therefore$  無套利

$$\textcircled{2} \text{ 順時針 : } 10,000 * \frac{1}{9.75} * 50.33 * \frac{1}{5.125}$$
$$= 10,072 \text{ NTD}$$

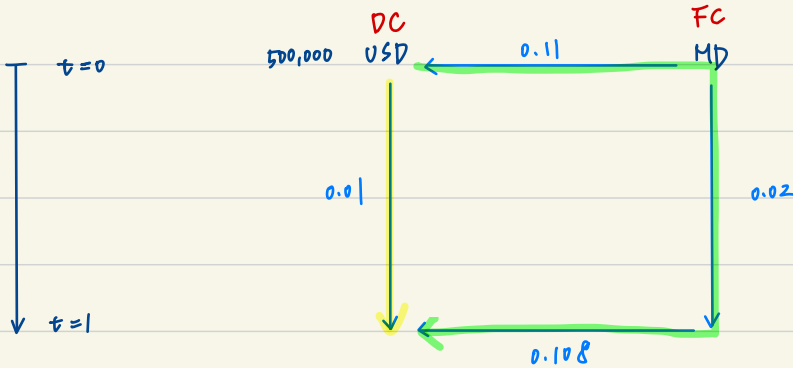
$$10,072 - 10,000 = 72$$

$\therefore$  有套利, 72 NTD, 所以採用順時針策略 #

1. Covered Interest Arbitrage in Both Directions. The following information is available:

- You have \$500,000 to invest
- The current spot rate of the Moroccan dirham is \$.110.
- The 60-day forward rate of the Moroccan dirham is \$.108.
- The 60-day interest rate in the U.S. is 1 percent.
- The 60-day interest rate in Morocco is 2 percent.

- What is the yield to a U.S. investor who conducts covered interest arbitrage? Did covered interest arbitrage work for the investor in this case?
- Would covered interest arbitrage be possible for a Moroccan investor in this case?



① Deposit in our own country (USA):

$$500,000 * (1 + 0.01) = 505,000$$

② CIA:

$$500,000 * \frac{1}{0.11} * (1 + 0.02) * 0.108 = 500,727$$

a. ① Yield:  $\frac{500,727 - 500,000}{500,000} = 0.15\% \#$

② No, CIA didn't work in this case, because the lower forward rate of Moroccan dirham offsets the higher interest rate in Moroccan

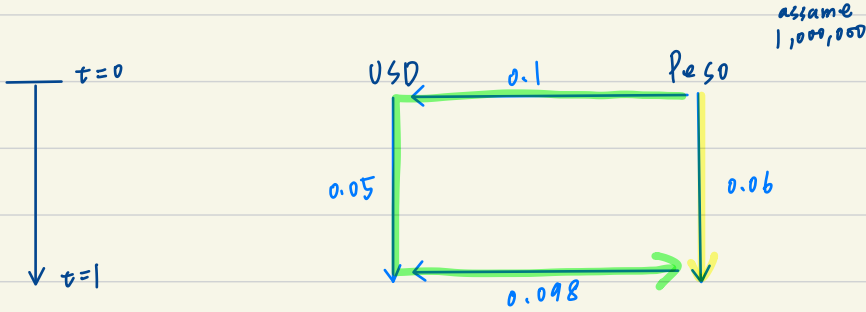
b. Yes, CIA might be possible for the Moroccan investors #



10. Covered Interest Arbitrage. Assume the following information:

Spot rate of Mexican peso	= \$.100
180-day forward rate of Mexican peso	= \$.098
180-day Mexican interest rate	= 6%
180-day U.S. interest rate	= 5%

Given this information, is covered interest arbitrage worthwhile for Mexican investors who have pesos to invest? Explain your answer.



假設投資 1,000,000 MP

① Deposit in our own country (Mexico)

$$1,000,000 * (1 + 0.06) = 1,060,000$$

② CIA:

$$1,000,000 * 0.1 * (1 + 0.05) * \frac{1}{0.098} = 1,071,429$$

$$\text{Yield: } \frac{1,071,429 - 1,000,000}{1,000,000} = 7.143\%$$

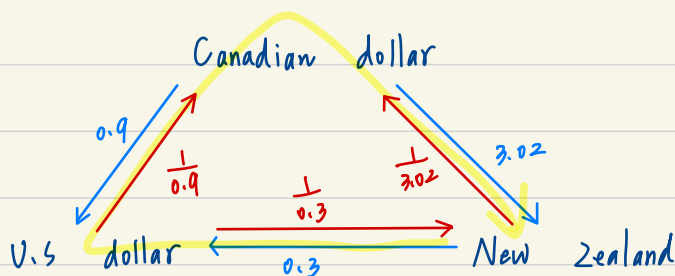
∴ It's worth to invest #

16. **Triangular Arbitrage.** Assume the following information:

Quoted Price

Value of Canadian dollar in U.S. dollars	\$ .90
Value of New Zealand dollar in U.S. dollars	\$ .30
Value of Canadian dollar in New Zealand dollars	NZ\$3.02

Given this information, is triangular arbitrage possible? If so, explain the steps that would reflect triangular arbitrage, and compute the profit from this strategy if you had \$1,000,000 to use. What market forces would occur to eliminate any further possibilities of triangular arbitrage?



① 逆時針:  $1,000,000 * \frac{1}{3.02} * 0.9 * \frac{1}{0.3}$   
 $= 993,377$

$\therefore 993,377 < 1,000,000$

$\therefore$  無套利

② 順時針:  $1,000,000 * \frac{1}{0.9} * 3.02 * 0.3$   
 $= 1,006,667$

$1,006,667 - 1,000,000 = 6,667$

$\therefore$  有套利, 因為交叉匯率又市場報價不同, 所以獲利 6,667,  
故採順時針策略