Level II of the CFA® 2025 Exam

Study Notes - Economics

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Reading 8: Currency Exchange Rates: Understanding Equilibrium Value

LOS 6a: Calculate and interpret the bid-offer spread on a spot or forward currency quotation and describe the factors that affect the bid-offer spread

An exchange rate is the price of the **base currency** expressed in terms of the **price currency**. For example, assume that the USD/CAD rate is 0.7625. This implies that the Canadian dollar, the base currency, costs 0.7625 US dollars (One Canadian dollar is worth 0.7625 US dollars).

***Note**: You might come across different notations in different sources. For consistency, we will quote exchange rates using the convention "P/B," where the price of base currency "B" is expressed in terms of the price currency "P." CFA Institute's convention for exchange rate quotations is the reverse of what you see on most forex websites.*

The currency exchange rate for immediate delivery is called the **spot exchange rate**. On the other hand, the rate for an exchange to be done in the future is called the **forward exchange rate**.

The spot exchange rate is used for settlement on day T + 2, the second business day following the trade date. The only exception is CAD/USD, where the standard settlement is T + 1. In most financial markets, potential counterparties quote a two-sided price for market participants: the bid price and the offer price.

The **bid price** is expressed in terms of the price currency. It is the price at which a counterparty is willing to buy one unit of the base currency. On the other hand, the **offer price** is expressed in terms of the price currency. It is the price at which that counterparty is ready to dispose of (sell) one unit of the base currency. For example, a dealer might quote a USD/EUR exchange rate of 1.3849/1.3851. What does this imply?

This quote implies that the dealer is willing to pay USD 1.3849 to buy 1 euro. On the flip side, they are prepared to sell 1 euro for USD 1.3851. Intuitively, we expect the bid price to be slightly less than the offer price because the dealer's goal is to make a profit in every transaction. With that in mind, given a quote, it is easier to single out the bid price or the offer price.

The **bid-offer spread** is the amount by which the offer price exceeds the bid price. It is the difference between the highest price a purchaser is willing to pay and the least amount a seller is willing to accept.

Characteristics of Bid-offer Quotes

1. The offer price should always be higher than the bid price.
2. A market participant requesting the two-sided price quote has the option but not the obligation to transact at either the bid or the offer quoted by a dealer. If a party decides to trade at the quoted prices, they are said to have “hit the bid” or “paid the offer.” In other words, if a trader decides to sell to a dealer at the (dealer's) bid price, they are said to hit the bid. If they decide to buy at the offer price, they are said to have paid the offer.

Although most transactions involve a dealer and a client, dealers often transact amongst themselves in an environment referred to as the **interbank market**. Sales in the interbank market are usually large and involve at least a million units of the base currency.

The bid-offer spread is usually narrower in the interbank market than in the dealer-client market. This implies that dealers offer their fellow dealers slightly more favorable rates. Almost all currencies are quoted to four decimal places except the Japanese Yen, usually quoted to two decimal places. The last decimal point is called a pip.

Example: Calculating the Bid-offer Spread

The USD/GBP spot market rate is quoted at 1.3849/1.3851 in the interbank market. A dealer in the same market quotes the same spot rate as 1.3847/1.3852. Calculate the bid-offer spread in each case.

Solution

For the interbank quote, the spread is 2 pips wide (1.3851 – 1.3849 = 0.0002), while the dealer-client quote is 5 pips wide (1.3852 – 1.3847 = 0.0005).

In both cases, the bid-offer spread represents the compensation sought by a party in exchange for providing liquidity to other market participants.

Factors Affecting the Bid-offer Spread

The size of the bid-offer spread depends primarily on the following three factors:

1. **The bid-offer spread in the interbank foreign exchange market for the two currencies involved**: The spread in the interbank market is directly proportional to the spread in the dealer-client market. As the spread in the interbank market increases (decreases), the spread in the dealer-client market increases (decreases).
2. **The transaction size**: The spread increases as the transaction size increases to reflect the difficulties the dealer faces while trying to offset the risk of the position in the interbank market. For example, a client eyeing a transaction to the tune of $100 million will receive a wider spread than another client whose deal is worth, say, $10 million.
3. **The relationship between the dealer and the client**: For instance, a seasoned (repeat) client might be provided with a spread smaller than that offered to a first-time client.

Question

Which of the following statements is *least likely* accurate?

A. The bid-offer spread is the difference between the offer price and the bid price.
B. The bid-offer spread is wider for larger transactions in the FX market.
C. The offer price is always smaller than the bid price.

Solution

The correct answer is C.

The offer price is always higher than the bid price since the market maker wants to make money for providing liquidity.

LOS 6b: Identify a triangular arbitrage opportunity and calculate the profit, given the bid-offer quotations for three currencies

Every bid-offer quote a dealer displays in the interbank FX market should possess the following properties to avoid the creation of arbitrage opportunity:

1. **The bid should not be higher than the current interbank offer**, **and the offer should not be lower than the current interbank bid**.

   If this rule is broken, an arbitrage opportunity will arise; that is, a market participant will buy from a cheaper source and sell to a more expensive source. This will eventually bring the two prices back in line.

   Example: Assume that the current spot USD/EUR is quoted as 1.3856/1.3858. Further, assume that a dealer's quote is 1.3859/1.361. Market participants in the interbank market will pay for the offer by purchasing EUR at USD 1.3858 and subsequently hit the dealer's bid by selling the EUR to them at 1.3859, making a riskless profit of 1 pip (1.3859 - 1.3858 = 0.0001).

2. **The dealer's cross-rate bids (offers) should be lower (higher) than the implied-rate offers (bids) available in the interbank market**.

   To illustrate this, consider the currency pairs X/Y and Z/Y. If we work out the cross-rate X/Z, it must be consistent with the X/Y and Z/Y rates. If this is not met, the arbitrageur will purchase currency Z from the dealer if its worth is undervalued with respect to the cross rate and sell X. Alternatively, if a dealer overvalues Z with respect to the cross rate, then it will be sold, and consequently, X will be purchased. This is called **triangular arbitrage**.

To identify triangular arbitrage, learning how to calculate the market-implied bid and offer rates is of utmost importance. Consider the examples below.

Example: Calculating the Market-implied Offer Rate

Assume that the bid-offers in a certain interbank for USD/EUR are 1.3850/1.3851, and JPY/USD is 75.66/75.68. The market-implied bid-offer on the JPY/EUR cross rate is *closest* to:

Solution

The relationship between the quotes above is represented as:

$$\left(\frac{JPY}{EUR}\right) = \left(\frac{JPY}{USD}\right)\left(\frac{USD}{EUR}\right)$$

When calculating the offer rate, the numerators of each term (both left- and right-hand sides of the above equation) are "sold," while the denominators are "bought." For instance, the left-hand side implies "sell JPY, buy EUR." That is, to get the implied cross-rate, we multiply the bid rates of the involved currencies (left-hand side of the above equation).

So,

$$\begin{aligned}\left(\frac{JPY}{EUR}\right)_{\text{offer rate}} &= \left(\frac{JPY}{USD}\right)_{\text{offer rate}}\left(\frac{USD}{EUR}\right)_{\text{offer Rate}}\\ &= 75.68 \times 1.3851\\ &= 104.824\end{aligned}$$

Example: Calculating the Market-implied Bid Rate

To compute the market-implied bid rate, we adopt a similar approach. However, the numerators of each term (both left-hand and right-hand sides of the cross-rate equation) are "bought" while the denominators are "sold." For instance, the left-hand side implies "Buy JPY, Sell EUR."

Therefore,

$$\begin{aligned}\left(\frac{JPY}{EUR}\right)_{\text{bid rate}} &= \left(\frac{JPY}{USD}\right)_{\text{bid rate}}\left(\frac{USD}{EUR}\right)_{\text{bid rate}}\\ &= 75.66 \times 1.3850\\ &= 104.789\end{aligned}$$

As expected, the implied cross-rate bid should be less than the offer rate.

Example: Calculating the Market-implied Bid and Offer Rates Via Inversion

Assume that the USD/GBP is 1.5846/1.5848, and the USD/EUR is 1.3850/1.3851. Calculate the implied GBP/EUR cross rate.

Solution

It is easy to see that:

$$\left(\frac{\text{GBP}}{\text{EUR}}\right) \neq \left(\frac{\text{USD}}{\text{GBP}}\right)\left(\frac{\text{USD}}{\text{EUR}}\right)$$

We need to invert the first term on the right-hand side so that:

$$\left(\frac{\text{GBP}}{\text{EUR}}\right) = \left(\frac{1}{\frac{\text{USD}}{\text{GBP}}}\right)\left(\frac{\text{USD}}{\text{EUR}}\right) = \left(\frac{\text{GBP}}{\text{USD}}\right)\left(\frac{\text{USD}}{\text{EUR}}\right)$$

So,

$$\begin{aligned}\left(\frac{\text{GBP}}{\text{EUR}}\right)_{\text{bid rate}} &= \left(\frac{\text{GBP}}{\text{USD}}\right)_{\text{bid rate}}\left(\frac{\text{USD}}{\text{EUR}}\right)_{\text{bid rate}}\\ &= \left(\frac{1}{1.5848}\right)(1.3850)\\ &= 0.8739\end{aligned}$$

And

$$\begin{aligned}\left(\frac{\text{GBP}}{\text{EUR}}\right)_{\text{offer rate}} &= \left(\frac{\text{GBP}}{\text{USD}}\right)_{\text{offer rate}}\left(\frac{\text{USD}}{\text{EUR}}\right)_{\text{offer rate}}\\ &= \left(\frac{1}{1.5846}\right)(1.3851)\\ &= 0.8741\end{aligned}$$

Note that arbitrage constraints on the implied cross-rates also apply to the spot rates. Further, note that any violations of these constraints will cause arbitrage opportunities, which will naturally disappear in a short time.

Example: Identifying a Triangular Arbitrage Opportunity and Calculating the Profit

Consider the following spot rates in an interbank market.

Currency	Quotation
SEK/USD	6.7738/6.7740
JPY/USD	80.86/80.88
CAD/USD	0.9543/0.9545
USD/EUR	1.35458/1.3560

Assume that an inexperienced dealer quotes a bid-offer rate of JPY/CAD as 84.63/84.70. To identify the triangular arbitrage, we need to calculate JPY/CAD:

$$\frac{JPY}{CAD} = \frac{JPY}{USD} \times \frac{USD}{CAD} = \frac{JPY}{USD} \times \left(\frac{CAD}{USD}\right)^{-1}$$

But,

$$\frac{USD}{CAD} = \left(\frac{CAD}{USD}\right)^{-1} = \frac{\left(\frac{1}{0.9545}\right)}{\left(\frac{1}{0.9543}\right)} = \frac{1.04767}{1.04789}$$

So that, USD/CAD is quoted as 1.04767/1.04789 and:

$$\left(\frac{JPY}{CAD}\right)_{Bid} = 80.86 \times 1.04767 = 84.71$$
$$\left(\frac{JPY}{CAD}\right)_{Offer} = 80.88 \times 1.04789 = 84.75$$

The implied interbank cross-rate for JPY/CAD is now 84.71/84.75. Going back to the dealer's quote of 84.63/84.70, the dealer is offering to sell CAD at a lower price (below the interbank quoted rate, 84.71). A prudent market participant would utilize this triangular arbitrage by purchasing CAD from the dealer and selling it in the interbank market, making a profit of $84.74 - 84.70 = 0.01$ per CAD involved.

Question

Consider the following spot rates in an interbank market.

Currency	Quotation
SEK/USD	6.7738/6.7740
JPY/USD	80.86/80.88
CAD/USD	0.9543/0.9545
USD/EUR	1.3558/1.3560

Using the table above, the SEK/EUR implied cross-bid (offer) rate is *closest to*:

A. 9.1839/9.1855.

B. 9.1825/9.1839.

C. 9.1849/9.1865.

Solution

The correct answer is A.

We can write the equation for the SEK/EUR spot rate as:

$$\frac{SEK}{EUR} = \frac{SEK}{USD} \times \frac{USD}{EUR}$$

So that:

$$\begin{aligned}\left(\frac{SEK}{EUR}\right)_{\text{bid rate}} &= \left(\frac{SEK}{USD}\right)_{\text{bid rate}} \times \left(\frac{USD}{EUR}\right)_{\text{bid rate}} \\ &= 6.7738 \times 1.3558 \\ &= 9.1839\end{aligned}$$

And

$$\begin{aligned}\left(\frac{SEK}{EUR}\right)_{\text{offer rate}} &= \left(\frac{SEK}{USD}\right)_{\text{offer rate}} \times \left(\frac{USD}{EUR}\right)_{\text{offer rate}} \\ &= 6.7740 \times 1.3560 \\ &= 9.1855\end{aligned}$$

Therefore SEK/EUR implied cross-bid (offer) rate is 9.1839/9.1855.

LOS 6c: Explain spot and forward rates and calculate the forward premium/ discount for a given currency

A **spot exchange rate** is the general price level in the market used to directly trade one currency for another, with the exchange occurring at the earliest possible time. The standard delivery time for spot currency transactions is no longer than T+2 (days), after which it will be deemed a forward contract.

A **forward exchange rate** is the price at which one currency is traded against another at some specified time in the future. The forward exchange rate must respect the arbitrage relationship, which states that the returns from two alternative but equivalent investments must be equal. We will derive the relationship between the spot and forward exchange rates from this fact.

While ignoring the bid-offer spread and the effect of market instruments, consider an investment of one unit of domestic currency for one year with the following alternatives:

- **Alternative 1**: A cash investment for one year at a risk-free domestic rate (i_d). The investment will be worth $(1 + i_d)$ at the end of one year.

- **Alternative 2**: Converting domestic currency into foreign currency at the spot rate $S_{f/d}$, then investing the proceeds for one year at a risk-free foreign rate of interest of i_f. At the end of the investment period, the investment will be worth $S_{f/d}(1 + i_f)$ units of foreign currency which must be converted back to domestic currency by a forward rate $F_{f/d}$. Therefore, $\frac{1}{F_{f/d}}$ units of domestic currency would be obtained for each unit of foreign currency sold forward. In terms of the domestic currency, therefore, the investment will be worth $S_{f/d}(1 + i_f)\frac{1}{F_{f/d}}$.

It is important to note that the notation (f/d) denotes "foreign/domestic currency," where the domestic currency is assumed to be the base currency.

Back to our discussion, investments 1 and 2 are risk-free and, therefore, should give a similar return. That is, there is no chance of arbitrage opportunities. If this is true, equating the gains of the alternative investments leads us to the following formula:

$$(1+i_d) = S_{f/d}(1+i_f)\frac{1}{F_{f/d}}$$

We made things simple in our derivation by assuming a time horizon of one year. However, the argument holds for an investment horizon of any length. The risk-free assets used in this arbitrage relationship are typically bank deposits quoted using the reference rate (Libor until 2021, then SOFR, SONIA, etc.) for each currency involved. The day count convention for almost all deposits is Actual/360. This notation means that interest is calculated as if there were 360 days in a year.

Now, if we include the London Interbank Offered Rate (Libor) day count convention of $\frac{\text{Actual}}{360}$, our formula will transform into:

$$\left(1+i_d\left[\frac{\text{Actual}}{360}\right]\right) = S_{f/d}\left(1+i_f\left[\frac{\text{Actual}}{360}\right]\right)\frac{1}{F_{f/d}}$$

By simple rearrangement, we can make the forward rate ($F_{f/d}$) the subject:

$$F_{f/d} = S_{f/d}\left(\frac{1+i_f\left[\frac{\text{Actual}}{360}\right]}{1+i_d\left[\frac{\text{Actual}}{360}\right]}\right)\ldots\ldots\ldots(i)$$

Equation (i) is a description of **covered interest rate parity** as discussed in Level I. It can be rearranged to give an equation for the forward premium or discount. That is:

$$F_{f/d} - S_{f/d} = S_{f/d}\left(\frac{\left[\frac{\text{Actual}}{360}\right]}{1+i_d\left[\frac{\text{Actual}}{360}\right]}\right)(i_f - i_d)$$

When $F_{f/d} > S_{f/d}$, the domestic currency is trading at a forward premium. This will happen only if $i_f > i_d$. Otherwise, the domestic currency is said to trade at a forward discount.

We have been using the (f/d) notation all through. Note that we have a free hand to also switch to the P/B (Price/Base) conventional notation and substitute it accordingly. For instance, the forward rate would be:

$$F_{P/B} = S_{P/B}\left(\frac{1 + i_P\left[\frac{\text{Actual}}{360}\right]}{1 + i_B\left[\frac{\text{Actual}}{360}\right]}\right)$$

Question

Assume that the spot (USD/CAD) is 1.0146, the 200-day Libor for USD is 1.5%, and the 200-day Libor for CAD is 5.21%. The forward premium (discount) for a 200-day forward contract for USD/CAD is *closest to*:

A. 0.03578.

B. -0.02532.

Solution

The correct answer is A.

The forward premium (discount) is given by:

$$F_{P/B} - S_{P/B} = S_{P/B}\left(\frac{[\frac{\text{Actual}}{360}]}{1 + i_B\,[\frac{\text{Actual}}{360}]}\right)(i_P - i_B)$$

Noting that the CAD is the base currency, then:

$$\begin{aligned} F_{USD/CAD} - S_{USD/CAD} &= 1.0146\left(\frac{[\frac{200}{360}]}{1 + 0.0521\,[\frac{200}{360}]}\right)(0.015 - 0.0521) \\ &= -0.02032 \end{aligned}$$

LOS 6d: Calculate the Mark-to-Market Value of a forward contract

A **forward contract** is an agreement between two parties to trade one currency for another on a specified future date and at a pre-determined rate. In other words, it is an exchange rate transaction whose settlement timeline exceeds T+2.

The **mark-to-market value** of a contract is a value that a party is willing to pay if they decide to close out a position before the scheduled settlement date. In other words, it indicates the profit or loss resulting from dissolving a forward contract sometime before the settlement date.

Closing out a contract position means offsetting it with a similar and opposite forward position. This process involves the utilization of the current spot exchange rate and forwards points available in the market at the time the offsetting position is created. Essentially, a forward contract has a long and short position. For instance, we offset a long position by taking a short position, thereby either making a profit or suffering a loss.

The mark-to-market value of a forward contract is zero at the time the contract is initiated (time 0). It, however, changes during the life of the contract to reflect changes in spot exchange rates and/or interest rates in either of the currencies involved.

Example: Calculating the Mark-to-Market Value of a Forward Contract

An investor purchases USD 100 million, which is to be delivered in one year against the CAD at an "all-in" forward rate of 1.8045 CAD/USD. Six months later, the investor decides to close out the forward contract.

The bid-offer quotes for spot and forward points six months prior to the settlement date are as follows:

Spot rate (CAD/USD)	1.8245/1.8250
Six-month points	140/150

Assuming that the annual CAD Libor is 5%, Calculate the mark-to-market value of this forward contract.

***Note**: The all-in forward rate is equal to the sum of the spot rate and the scaled forward points.*

Solution

The base currency (USD) is sold to offset the investor's position. In other words, we are computing the bid part of the market. Therefore, the applicable forward rate is:

$$1.8245 + \frac{140}{10,000} = 1.8385$$

The investor bought 100 million USD at the initial rate of 1.8045 and is now selling the same at a new rate (1.8385). As such, the cash flow at the settlement date is:

$$(1.8385 - 1.8045)100 = +\text{CAD } 3.4 \text{ million}$$

This is a cash inflow since the USD appreciated (CAD/USD increased).

To find the mark-to-market value, we need to discount the cash inflow using the USD Libor rate:

$$\text{Mark-to-market value} = \frac{3.4}{1 + 0.05 \times \frac{180}{360}} = \text{CAD } 3.317 \text{ million}$$

This is the mark-to-market value of the extended forward contract of USD 100 million if it is closed out six months before the settlement date.

From the example above, the process of computing the mark-to-market value comprises the following steps:

1. **Construct an offsetting forward position that is equal but opposite to the original position**: In the example above, the investor had initially been long USD 100 million, and thus the offsetting forward contract is short USD 100 million.
2. **Determine the applicable all-in forward rate for the new contract position**: If the base currency was sold, then we calculate the bid rate. Otherwise, we calculate the offer rate.
3. **Calculate the cash flow that results from the transaction on the settlement date**: The size of the cash flow will be a product of the original contract size and the difference

between the initial forward rate and the new forward rate in step II. It will either be a cash inflow (positive) or a cash outflow (negative). In our example above, the cash flow was positive; hence it is a cash inflow.

4. **Finally**, **calculate the present value of this cash flow on the future settlement date**: While at it, the discount rate used must match the currency of the cash flow. In the example above, the cash flow was in CAD, so we must use the CAD Libor.

Question

An investment manager at CMY Inc. decides to take a long position in CAD 5 million forward against AUD at an “all-in” of 1.1300 (AUD/CAD). Six months before the settlement date, the manager decides to close out the forward contract. At this time, the following are listed in the market:

Spot rate (AUD/CAD)	1.2525/1.2530
6-month pips (points)	$-10.1/-8.1$
6-month AUD Libor	4.5%
6-month CAD Libor	0.5%

The mark-to-market value of the position is *closest to*:

A. -AUD 506,088.

B. +CAD 507,197.

C. -AUD 597,506.

Solution

The correct answer is C.

Since the manager bought CAD 5 million, he will sell CAD 5 million to offset the original position, six months forward to the settlement date. Since CAD is the base currency, purchasing it implies that the manager pays the offer. Therefore, the “all-in” forward rate is:

$$1.2525 - \frac{10.1}{10,000} = 1.25149$$

Therefore, the net cash flow at the settlement date is:

$$5,000,000 \times (1.1300 - 1.25149) = -\text{AUD } 607,450$$

To get the mark-to-market value, we need to discount using the AUD Libor. So,

$$\text{Mark-to-market value} = \frac{-607,450}{1 + 0.045 \times \frac{180}{360}} = -\text{AUD } 594,083.13$$

LOS 6e: Explain international parity conditions (covered and uncovered interest parity, forward rate parity, purchasing power parity, and the international Fisher effect)

International parity conditions refer to the economic theories that link exchange rates, price levels (inflation), and interest rates. These theories describe the interrelationships that help determine long-run fluctuations in exchange rates, interest rates, and inflation.

Assumptions of International Parity Conditions

- There are no transaction costs.
- Market participants have access to perfect information.
- Market prices can easily be adjusted.
- Transactions occur in a risk-neutral environment.

1. Covered Interest Rate Parity

This no-arbitrage condition states that an investment in a foreign market that is entirely hedged against exchange rate risk should give the same return as a similar investment in a domestic market. Mathematically, it is represented as:

$$F_{f/d} = S_{f/d}\left(\frac{1 + i_f\left[\frac{\text{Actual}}{360}\right]}{1 + i_d\left[\frac{\text{Actual}}{360}\right]}\right)$$

Where:

i_d = The interest rate in the base currency (domestic country).

i_f = The interest rate in the foreign currency or the quoted currency.

$S_{f/d}$ = The current spot exchange rate.

$F_{f/d}$ = The forward foreign exchange rate.

Under the covered interest rate parity, the interest rate differential between any two currencies in the cash money markets should equal the differential between the forward and spot exchange rates. In other words, any forward premium or discount exactly offsets differences in interest rates. As a result, an investor would earn the same return investing in either currency.

For this condition to hold, it is assumed that:

- There is no transaction cost.
- The domestic and foreign market instruments should be identical in terms of liquidity, time to maturity, and default risk.

Example: Covered Interest Rate Parity

The U.S. dollar interest rate is 10%, and the GBP interest rate is 8%. The spot USD/GBP exchange rate stands at $1.40 (per GBP), and the 1-year forward rate is $1.48. Determine whether a profitable arbitrage opportunity exists.

Solution

According to the CIP equation, the one-year forward rate should be $1.43, i.e.,

$$\$1.40(1.1/1.08) = \$1.4259$$

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As such, there is an arbitrage opportunity, and here's how it could be exploited:

At the onset (time 0):

Step 1: Borrow $1,000 at 10%.

Step 2: Use the borrowings to purchase 1,000 / 1.40 = 714.29 GBPs in the spot market.

Step 3: Invest the pounds at 6%.

Step 4: Enter a forward contract to sell the expected proceeds at the end of one year (i.e., 714.29

× 1.08 = 771.43 pounds), at $1.48 each.

After one year:

Step 1: Sell the 771.43 pounds under the forward contract at $1.48 to get $1,141.72.

Step 2: Repay the $1,000 loan plus 10% interest, which requires $1,100.

Step 3: Keep the difference of $41.72 as an arbitrage profit.

2. The Uncovered Interest Rate Parity

This condition postulates that the expected yield from a risky foreign investment must be equal to that of an equivalent domestic currency investment. While using the (f/d) notation with the domestic (d) currency as the base currency, assume that an investor has a choice of venturing either into a one-year domestic market investment or a risky (unhedged) foreign market investment over a similar horizon.

The uncovered parity condition compels the investor to weigh between the **certain** return from domestic investment and the **expected** return from the risky foreign investment (in terms of foreign currency). The foreign investment return in domestic currency will be given by:

$$(1 + i_f)(1 - \%\Delta S_{f/d}) - 1$$

Where:

i_f = Foreign rate of interest.

$\%\Delta S_{f/d}$ = Percentage change in the spot rate.

In case we were to interpret the above equation, we'd say that the investor's return on foreign investment is a function of both the foreign interest rate and the change in the spot rate. Note that a depreciation in the foreign currency reduces the investor's return.

The percentage change in $S_{f/d}$ enters with a minus sign. This is because a decline in the value of the foreign currency occasions an increase in $S_{f/d}$, consequently reducing the all-in return from the domestic currency perspective of the investor.

The all-in return given above can also be approximated as:

$$\approx i_f - \%\Delta S_{f/d}$$

Also, the uncovered interest rate parity implies that the expected change in the spot exchange rate over the investment period should be equal to the difference between the foreign and domestic interest rates. This is mathematically represented as:

$$\%\Delta S^e_{f/d} = i_f - i_d$$

Where ΔS^e is the future change in the spot exchange rate.

Therefore, the assumption brought forward by the uncovered interest rate is that when a country has higher interest rates, its currency will depreciate. Currency depreciation offsets the higher yield and brings the return of the investment to the level of the other country's return.

Example: Uncovered Interest Parity

The spot exchange rate quote for the Kenyan shilling (KES) versus the U.S. dollar is 110.125 (KES/USD = 110.125, where USD is the base currency). The one-year nominal rate in the U.S. is 8%, while the one-year nominal rate in Kenya is 12%. Using uncovered interest rate parity, the expected percentage change in the exchange rate over the coming year is *closest* to:

Solution

The shilling interest rate is higher than the dollar interest rate. Thanks to this, uncovered interest rate parity predicts that the value of the shilling will fall. In a year, it will take more shillings to buy one dollar as a result of the higher interest rate in Kenya.

The dollar is, therefore, expected to appreciate by approximately 4% (= 12% − 8%) relative to the shilling.

This means that the exchange rate will change from 110.125 to 114.53.