

Module 8: Currency Management

Review:

USD / EUR.

base currency

price/quote currency

e.g. $EUR / USD = 1.55$.
 $1 EUR = 1.55 USD$.

A quote of $0.9790 / 0.9810$ CAD / USD has 4 interpretation :

sell
↓
DELIVER MORE CAD \Rightarrow SELL 0.9810 CAD, BUY 1 USD
RECEIVE LESS CAD \Rightarrow BUY 0.9790 CAD, SELL 1 USD
↑
Step ①: Buy/ Sell.
↑
Step ②: side of the spread.

NOTE: THIS WORKS ONLY WHEN THIS IS. NUMERATOR.

not sure if this example is right.

Spot vs. Forward.

Always move the decimal in the points to the left by the same no. of decimal places. shown in the right. for the spot price.

e.g. Spot price = 1.33, Forward Points = 1.1.

Forward price = $1.33 + 1.1 / 100 = 1.341$.

Spot price = 2.554, Forward Points = -9.6

Forward price = $2.554 - 9.6 / 1000 = 2.5444$

EXAMPLE: Spot and forward bid/asked quotes of the Australian dollar/euro

Maturity/ Settlement	Spot Quote/ Forward Points
Spot AUD/EUR	1.2571/ 1.2574
30 days	-1.0/-0.9
90 days	+11.7/+12.0

- What is the 30 day forward bid/offer quote?
- If a manager sells 1,000,000 AUD forward 90 days, calculate what the manager will deliver and receive. When will the exchange take place?

$$1. \text{ Bid} = 1.2571 - 1.0 / 10000 = 1.2570$$

$$\text{Ask} = 1.2574 + 0.9 / 10000 = 1.25731.$$

2. 90 day sells 1000,000 AUD.

$$\text{bid} = 1.2571 + 11.7 / 10000 = 1.25827.$$

$$\text{ask} = 1.2574 + 12 / 10000 = 1.2586.$$

since 1.2586 AUD = 1 EUR.

\Rightarrow Manager delivers 1 MM AUD, receives 1MM / 1.2586

$$= 794,583.61 \text{ EUR.}$$

EXAMPLE: Offsetting transactions

Based on the initial quotes given in the previous example, a different manager entered into a trade to sell (deliver) 90 days forward, EUR 10,000,000 at the "all-in" forward quote of AUD/EUR 1.25827. Thirty days have passed and exchange rates are now the following:

Maturity/ Settlement	Spot Quote/ Forward Points	Market Reference Rates AUD
Spot AUD/EUR	1.3189/1.3191	
30 days	+1.1/+1.2	1.10%
60 days	+10.3/+10.5	1.20%
90 days	+15.3/+16.1	1.25%

- Identify the offsetting position the manager would take to close the initial transaction and calculate the resulting gain or loss. When will this gain or loss be settled?

- Calculate the mark to market the manager would report on day 30 of the original trade if the trade were not closed out early.

1. **Offsetting Position** = 60-day forward buy 10MM. EUR.

$$\begin{aligned} \text{60 day bid} &= 1.3189 + 10.3 / 10000 \\ &= 1.31993. \text{ AUD} = 1 \text{ EUR} \end{aligned}$$

$$\begin{aligned} \text{60 day ask} &= 1.3191 + 10.5 / 10000 \\ &= 1.32015. \text{ AUD} = 1 \text{ EUR.} \end{aligned}$$

\Rightarrow selling 1.31993 ~~10 MM AUD~~, buy 10 MM EUR.
1.32015. (SELL MORE)

$$\text{P\&L} = -1.32015 \cdot 10 \text{ MM} + 1.25827 \cdot 10 \text{ MM} = -618,800 \text{ AUD}$$

2. Mark-to-Market Value

$$= -618,800 \div (1 + 0.012 (60/360)).$$

↑
part ①.

$$= -617,564.87 \text{ AUD}$$

FX Swap

EXAMPLE: An FX swap

A manager purchased 10,000,000 South African rand (ZAR) three months forward at ZAR/USD 9.4518.

Two days before contract expiration the manager decides to extend the transaction for another 30 days. Explain the FX swap used to implement this decision.

9.4518 ZAR = 1 USD. (3M Forward contract).

Buy 10MM ZAR, SELL 10MM = 9.4518 MM USD.

- Strategy :
- ① Sell the 10MM ZAR at spot (offsetting trans.).
 - ② initial forward & offsetting spot will settle.
in 2 business days.
 - ③ New FX contracts.

Currency Option Basics.

Price of Base.	Call to Buy Base	Put to Sell Base
0 - K.	OTM, Delta is shifting towards 0.5 from 0 (as P↑).	ITM, Delta is shifting towards -0.5 from -1
K.	ATM, Delta is ~0.5.	ATM, Delta is ~ -0.5.
> K.	ITM, Delta is shifting towards 1.0.	OTM, Delta is shifting from -0.5 to 0.

Effects of Currency on Portfolio Risk & Return

$$R_{DC} = (1 + R_{FC}) (1 + R_{FX}) - 1$$
$$= R_{FC} + R_{FX} + (R_{FC})(R_{FX}). \quad ①$$

$$R_{DC} \approx R_{FC} + R_{FX} \quad ②$$

R_{FC} = Foreign Curr. Return

R_{FX} = % chg. in value of foreign currency

R_{DC} = domestic curr. return

3 ways to calculate R_{DC} : ①, ②, &

$$R_{DC} = \frac{EV - BV}{BV}$$

EXAMPLE: Calculating domestic currency returns

Consider a USD-based investor who invests in a portfolio of stocks that trade in euros. Over a one-year holding period, the value of the portfolio increases by 5% (in euros) and the euro-dollar exchange rate increases from 1.300 USD/EUR to 1.339 USD/EUR.

$$R_{DC} \approx R_{FC} + R_{FX}$$
$$\approx 5\% + (1.339 / 1.300 - 1)$$
$$\approx 8\%$$

Note: In this example, the answer will be wrong if we use EUR./USD:

$$(0.74683 (\text{ending}) - 0.76923 (\text{starting})) / 0.76923$$

$$= -2.92\%$$

Even if I flip the sign it is still not 3%

BE CAREFUL w/ this type of q. determine the foreign & domestic currency first.

$$R_{DC} = \sum_i^n w_i (R_{DC,i})$$

EXAMPLE: Domestic currency returns on an investment in two foreign markets

A euro-based investor has a 75% position in GBP denominated assets and a 25% position in USD denominated assets. The results for the past year are the following.

R_{FC} for the GBP assets = 12%

R_{FC} for the USD assets = 5%

Beginning EUR/GBP exchange rate: 1.1666

Ending EUR/GBP exchange rate: 1.1437

Beginning USD/EUR exchange rate: 1.332

Ending USD/EUR exchange rate: 1.324

Calculate the investor's return over the period in domestic (EUR) currency terms.

$$R_{DC} (\text{for GBP}) = (1 + 12\%) \left(\frac{1.1437}{1.1666} \right) - 1 = 9.8\%$$

$$\text{Beginning EUR/USD} = 1 / 1.332 = 0.7508$$

$$\text{Ending EUR/USD} = 1 / 1.324 = 0.7553$$

$$R_{DC} (\text{for USD}) = (1 + 5\%) \frac{0.7553}{0.7508} - 1 = 5.63\%$$

$$R_{DC} (\text{port}) = 75\% \cdot 9.8\% + 25\% \cdot 5.63\% = 8.76\%$$

Risk.

$$\sigma_{DC}^2 \approx w_{FC}^2 \sigma_{FC}^2 + w_{FX}^2 \sigma_{FX}^2 + 2 \cdot w_{FC} \sigma_{FC} w_{FX} \sigma_{FX} \rho(R_{FC}, R_{FX})$$

$$\approx \sigma_{FC}^2 + \sigma_{FX}^2 + 2 \sigma_{FC} \sigma_{FX} \rho(FC, FX) \quad (w=1)$$

Implication:

- σ_{DC} depends on σ_{FC} & σ_{FX}
- σ_{DC} might be higher b/c of σ_{FC} .
- $\text{Corr}(FC, FX) = (-) \Rightarrow \text{Volatility decreases}$
- $\text{Corr}(FC, FX) = (+) \Rightarrow \text{Volatility increases}$

if R_{FC} = risk-free rate

$$D_{R_{DC}} = D_{R_{FX}} (1 + R_{FC}).$$

Strategic Decisions.

No foregone conclusions on currency risk management.

Arguments made for not hedging currency risk:

- best to avoid time/cost of hedging/trading currencies
- unhedged currency effects are "zero-sum game"
- in the long run currencies revert to theoretical fair value.

Arguments made for hedging currency risk:

- Short-term currency movement can be extreme/volatile.
- inefficient pricing of currency can be exploited to add to total portfolio return.

Currency hedging strategies:

- **Passive Hedging** (matches currency exposure to the BM).
- **Discretionary Hedging** (e.g. allowing 5% deviations from the hedge ratio)
- **Active Currency management**. (i.e. greater deviation from bm currency exposure to **CREATE ALPHA** rather than reduce risk)
- **Currency Overlay** (outsourcing currency management and treating currency as an asset class)

EXAMPLE: Choosing a hedging approach

A client with a USD based portfolio has little need for liquidity and is focused on short-term performance results. The client evaluates performance relative to a global equity index, which fully hedges currency exposure back to the USD and rebalances the hedge monthly.

1. Discuss how this information would affect the manager's views on hedging currency exposure in the portfolio.
2. Explain why rebalancing of currency exposure could be needed even if no changes are made to asset holdings.

1. For hedging b/c. the manager cares about short-term performance which can be volatile.

2 possible strategies:

- 1) (if manager lacks currency expertise) fully hedge.
curr. risk & rebalance monthly
- 2) (if manager has insight) buy currency expected to appreciate.

2. Suppose 10% of port is UK asset & currency risk is fully hedged,
if UK stock BM fall in value ($-R_{FC}$) & UK stocks in the port raises ($+R_{FC}$),
the manager needs to increase GBP short positions.
to reflect the decreased GBP asset value.

Rebalancing the hedge must consider not only the explicit transactions by the manager but also the differentials b/w the index & the portfolio.

Strategic Diversification Issues

- long-term currency volatility is lower \Rightarrow less of a need to hedge
- Correlation b/w R_{FC} & R_{FX} might be negative.
 \Rightarrow damped total volatility
- a varying hedge ratio is appropriate b/c corr. varies

- Correlation b/w bond & currency is higher than stock.
- hedge ratio varies by manager preference.

Strategic Cost Issues :

- Single b/a currency transaction cost is low but repeated transaction will add up.
- premium for currency option
- Forward contracts are often shorter than hedging period
=> requires rollover creating CF volatility w/ realized gain & loss.
- Overhead cost
- 100% hedge eliminates the possibility of favorable currency movement.
- Hedging every currency movement can be costly



MODULE QUIZ 8.1

Use the following information for Questions 1 and 2.

A Djiboutian (DJF) investor holds an international portfolio with beginning investments of USD 1,253,000 and EUR 2,347,800. Measured in the foreign currencies, these investments appreciate 5% and depreciate 7%, respectively.

Additional information:

Beginning Spot Exchange Rate	Beginning Forward Exchange Rate	Ending Spot Exchange Rate
DJF/USD 179.54	DJF/USD 185.67	DJF/USD 192.85
EUR/DJF 0.00416	EUR/DJF 0.00413	EUR/DJF 0.00421

1. The ending value of the USD investment is closest to:
 - A. USD 1,150,000.
 - B. DJF 236,200,000.
 - C. DJF 253,700,000.
2. The unhedged return to the investor of the U.S. investment is closest to:
 - A. -3%.
 - B. +3%.
 - C. +12%.

3. A European investor holds a diversified portfolio. From the euro perspective, the portfolio is weighted 60% and 40% in U.S. and U.K. investments.

Assets	Returns measured in foreign currency	Returns measured from investor's perspective	Standard deviation of asset's returns measured in foreign currency	Standard deviation of the foreign currency's returns
U.S.	5%	6%	4.5%	3.7%
U.K.	7%	8%	3.5%	4.7%

The correlation between the foreign-currency asset's returns and returns on the foreign currency are 0.81 and 0.67, respectively, for the U.S. and English assets. **Compute** the standard deviation for the investor in the U.S. assets. **Show** your work.

4. The strategic decision to hedge currency risk will be *least* affected by the:
 - A. manager's market views.
 - B. correlation between asset and currency returns.
 - C. investor's time horizon, risk aversion, and liquidity needs.
 5. Which of the following clients would *most likely* allow a manager to implement discretionary currency hedging?
 - A. One with a shorter time horizon and higher liquidity needs.
 - B. One with more confidence in the portfolio manager and high income needs.
 - C. One very concerned with minimizing regret and higher allocation to equity investments.
6. Jane Simms manages a German portfolio and has a 1,000,000 long position in South Korean won (KRW) through a forward contract that is about to come due. The current spot exchange rate is EUR/KRW 0.00067/0.00068. The forward points for a three-month forward contract are -1.2/-1.1. She expects the KRW to depreciate significantly and has the authority to increase or decrease the contract size by 10%. **Explain** whether she will increase or decrease the size of the forward contract and the forward exchange rate at which she will contract.
7. Jane Archer manages a Swiss-based (CHF) hedge fund. A portion of the fund is allocated 60% and 40%, respectively, to EUR and AUD investments. She has collected the following information.

Estimates	Euro zone	Australia
Asset return in foreign currency	2.0%	2.5%
Change in spot exchange rate versus the CHF	-1.0%	3.0%
Asset risk measured in foreign currency (σ)	15.0%	25.0%
Currency risk (σ)	7.0%	9.0%
Correlation of asset and currency return	+0.85	+0.65
Correlation of returns (CHF/EUR, CHF/AUD)		+0.70

The following questions are from the portfolio perspective, measured in CHF.

- a. **Calculate** the expected return of the portfolio.
- b. **Calculate** the standard deviation of the portfolio.
- c. **Calculate** the expected return to the portfolio if Archer takes a leveraged position with a 150% positive weight in Australia and a 150% negative weight in the euro zone.
- d. **Calculate** the expected standard deviation of returns to the portfolio if Archer takes a leveraged position with a 150% positive weight in Australia and a 150% negative weight in the euro zone.

Module Quiz 8.1.

$$1. C / 1,253,000 \times 1.05 \times 192.85 \\ = 253,723,102.5$$

$$2. C / (192.85 \div 179.54) \times 1.05 - 1$$

3. 60% US., 40% UK

$$\sigma^2 = (0.6)^2 \cdot (3.7\%)^2 + (0.4)^2 \cdot 1 \\ + 2 \cdot 0.6 \cdot 0.4 \cdot 0.81$$

$$\sigma_{DC}^2 = \sigma_{FC}^2 + \sigma_{FX}^2 + 2\sigma_{FC}\sigma_{FX}P_{FC,FX}$$

no need to consider
Weight b/c. FC &
FX is 100% exposure

$$\text{variance} = (1.0)^2 \cdot (4.5)^2 + (1.0)^2 \cdot (3.7)^2 \\ + 2 \cdot (1.0) \cdot (1.0) \cdot (0.81) \cdot (4.5) \cdot (3.7) \\ = 60.913 \\ S.D = 60.913^{1/2} = 7.8\%$$

4. C. A) Portfolio & market circumstances determine the strategic decision.

think of os c.
stock?!

$$5. C. / \begin{array}{lll} \text{Spot} & \text{BID} & 0.0067 \text{ EUR/KRW} \\ & \text{ASK} & 0.0068 \text{ EUR/KRW} \end{array}$$

$$6. 0.0067 / 0.0068 \text{ EUR / KRW}$$

IMM. long in KRW $\times 0.000658$

$$\begin{array}{lll} \text{Fwd} & \text{BID} & 0.0055 \text{ EUR/KRW} \\ & \text{ASK} & 0.0057 \text{ EUR/KRW} \end{array}$$

expected to depreciate KRW \rightarrow her long position will soon lose money

\rightarrow decrease position

$$7.a) R_{DC} \text{ (für eurozone)} = 1.02 \times 0.99 - 1 \\ = 0.0098$$

$$R_{DC} \text{ (für aus.) } = 1.025 \times 1.03 - 1 \\ = 0.05575$$

$$E(R) = 0.0098 \cdot 60\% + 0.05575 \cdot 40\% \\ = 2.82\%$$

² Variance, not SD.

$$b) \overline{D}_{R_{DC}}^2 \text{ (für eurozone)} = (15.0\%)^2 + (7.0\%)^2 \\ + 2 \cdot 15\% \cdot 7\% \cdot 0.65$$

$$\overline{D}_{R_{DC}}^2 \text{ (für aus.) } = (25.0\%)^2 + (9.0\%)^2 \\ + 2 \cdot 25\% \cdot 9\% \cdot 0.65 \\ = 0.09985$$

$$D_p^2 = 0.60 \cdot 0.04525 + 0.40^2 \cdot 0.09985 \\ + 2 \cdot 0.60 \cdot 0.40 \cdot \sqrt{0.04525} \cdot \sqrt{0.09985} \cdot 0.70$$

$$c) E(R) = 0.0098(150\%) + 0.05575(150\%) \\ = 6.90\%$$

$$d) D_p^2 = -1.50^2 \cdot 0.04525 + 1.50^2 \cdot 0.09985 \\ + 2 \cdot -1.50 \cdot 1.50 \cdot \sqrt{0.04525} \cdot \sqrt{0.09985} \cdot 0.70 \\ = 33.87$$

Active Strategies: Fundamentals & Technical Analysis

Economic Fundamentals.

Assumes currency value will revert to long-term fair value.

Increase in currency value might be associated w/ currencies:

- that are more undervalued relative to their fundamental value
- that have greatest rate of increase in their fundamental value
- with higher real / nominal interest rate
- with lower inflation relative to other countries
- of countries with decreasing risk premium.

Technical Analysis

based on 3 principals:

- past price data can predict future price mvt
- fallible human beings react to similar events in similar ways
- unnecessary to know what the currency should be worth

Typical Patterns to exploit:

- overbought/oversold market has gone up/down too much & will revert.

- Support level exists. When substantial bids from customers to buy. if price falls below that level, it will likely rebound & bounce higher (visc versa w/ resistance levels).

The Carry trade

review: carry trade = borrow in currency w/ lower interest & invest. the proceeds in higher int. rate.

① Covered Interest Rate Parity (CIRP) holds by arbitrage. & diff. b/w spot (S_0) & forward (F_0). exchange rate = diff b/w periodic int. rates of. the two countries

② carry trade violates Uncovered Int. Rate Parity (UCIRP) which asserts that forward FX rate calculated by CIRP is an unbiased est. of spot rate in the future. if UCIRP holds, carry trade will earn NO PROFIT.

③ Carry trade is referred to as the forward rate bias. Historically,

- Generally, the higher int. rate. Currency has depreciated LESS. than predicted by int. rate parity (i.e. carry trade earned a profit)
- Small % of time, the higher int. rate. Currency has depreciated SUBSTANTIALLY MORE than predicted by int. rate parity

Generally, Carry trade borrows from developed countries & invest in emerging markets. In periods of financial stress, currencies of emerging market will depreciate sharply (relatively) & the carry trade will generate huge loss.

Hence if the FX rate volatility increases, the traders will exit their carry. trade positions.

EXAMPLE: A carry trade

The spot exchange rate is BRL/USD 2.41. The interest rates in the two countries are 6% and 1%, respectively.

1. Estimate the one-year forward exchange rate for the Brazilian Real.
2. State the steps to initiate the carry trade and the theory on which it is based.
3. What is the profit on the trade if the spot exchange rate is unchanged and the trade is initiated by borrowing 100 currency units? Show your work.
4. What is the primary risk in this trade?

$$1. 2.41 \times (1.06) \div 1.01 = 2.529 \text{ BRL/USD}.$$

2. Borrow USD, invest in BRL, pay off USD.

3. Borrow 100 USD, Invest in 241. BRL loan, get $241 \times 1.06 \div 2.41$

Pay back 101, Earn 5 dollars. = 106

4. if BRL depreciates significantly.

Summary of Carry Trade :

- borrowing lower yield currency & investing in higher yield currency.
- IS TRADING the forward rate bias : selling at the spot market the currency w/ forward prem. & buying the currency w/ forward discount

Volatility Trading :

- profit from predicting chgs to current volatility
- use delta-hedging to gain/loss value as the imp. vol. reflected on the option changes.
- long vol. \Rightarrow use straddle.
short vol. \Rightarrow use short straddle.
- STRANGLE (use OTM puts & calls w/ the same absolute delta). requires more movement on the underlying but will have lower initial cost.



MODULE QUIZ 8.2, 8.3

1. A currency overlay manager will most likely implement a carry trade when the yield of investing currencies is:
 - lower and volatility is falling.
 - higher and currency volatility is rising.
 - higher and currency volatility is stable.
2. Which of the following statements about volatility and interest rates is most likely true?
 - Falling currency volatility leads traders to exit a carry trade.
 - Rising currency volatility will increase the cost of a collar more than the cost of a protective put.
 - A delta neutral hedging strategy is more likely to tilt to a net long position in the euro when the euro zone is experiencing rising real interest rates.

1. A **C**) carry trade is likely when
low/stable volatility
+ investing currency yield is **HIGHER**

2. B **C**)
A is wrong b/c falling vol. leads to traders entering carry trade
B is wrong b/c volatility increases the price of both put & call. protective put is long put & collar is long put + short call

Implementations & Forwards

Expectation		Actions
Relative Currency	Appreciates.	Reduce hedge or increase long position
	Depreciates	Increase hedge or decrease long position
Volatility	Rising	Long Straddle
	Falling	Short Straddle
Market Conditions	Stable	Carry trade
	Crisis	Exit Carry trade

Currency Management Tools

1. Identify the currency exposure needed to be hedged
2. Easier to work with FX quotes when the foreign currency is the base currency.
3. Assume directions is referring to base curr.
4. Buy forward / call option on base currency
 - ↑ exposure on base currency
 - Sell forward / buy put option on base currency
 - ↓ exposure on base currency
5. Hedging is not free
 - hedging w/ forwards has no initial cost but **high opportunity cost**.
 - hedging w/ options has high initial cost but retains upside.

- / /
6. Discretionary hedging allows manager to deviate from a policy neutral hedge position (i.e. will increase the risk & potential return)
7. IPS should define the policy neutral hedge position.

How to hedge with forwards & Fx swaps.

Forwards are usually more favorable:

- easy to customize / find the currency pair
- futures require margin calc
- better liquidity than futures

Types of Hedges:

- Static Hedge (established & held till expiration)
- Dynamic Hedge (periodically rebalanced)

Consider a EUR-based manager who must hedge an initial CHF 10,000,000 of asset exposure. One month later, the asset has appreciated to CHF 11,000,000.

Assume the manager can initially sell a one- or three-month contract

1. Sell 1 Month Forward & roll over the hedge
③ contract expiration.

Rollover can be done via Fx Swap:

- Buy 10MM CHF at the spot market (cover the fwd).
- Sell 11 MM CHF at a new forward

if CHF declines by 0.01 EUR \Rightarrow PdL = + 0.01 \times 10MM
 $= 100K$ EUR

2. Sell 3-month forward contract. It will be underhedged after one month

- with static hedge : nothing to do

- with dynamic hedge :

Selling an additional 2-month fwd contract worth
1 MM CHF

Factors of hedging strategy, choice:

- transaction cost

- Risk Aversion

Roll Yield

- return from the movement of the forward price over time.

- 2 factors of roll yield produces profit/loss :

1) is currency trading at fwd premium or discount

2) is currency purchased or bought.

if held to expiration, contract roll yield = $(F_0 - S_T) / S_0$

For example consider an investor who sells CHF 1 million six-month forward for USD 1.05 when the spot rate is 1.04.

$1.05 > 1.04 \Rightarrow$ Forward premium

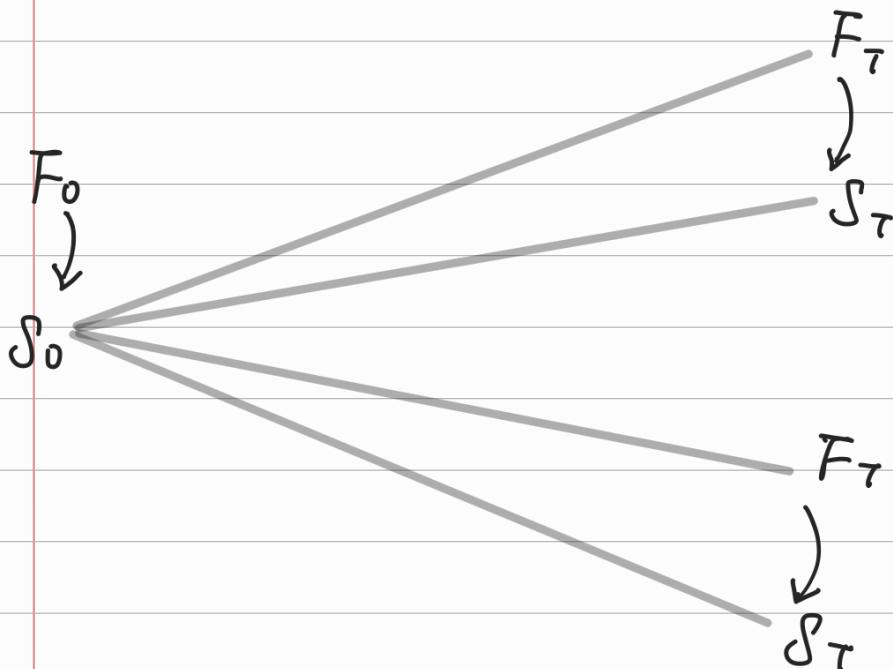
think of it as selling it at a high & the price rolled down
for a gain

Roll yield (unannualized) = $0.01 / 1.04 = 0.96\%$

/ /
 Breakdown (foreign assets are in currency B).

Current Foreign Assets Position	Shape of forward price curve	
Short	Upward-sloping	downward-sloping
Lung	Positive. Roll Yield	Negative Roll Yield

positive roll yield \Leftrightarrow lower hedging cost.



EXAMPLE: Roll yield and interest rates

A USD-based investor has exposure to the South African rand (ZAR). The USD interest rate is 2.8% and the ZAR interest rate is 3.6%. Determine the roll yield for the investor if he hedges his ZAR exposure with a six-month forward.

Shorting ZAR b/c it has ZAR exposure.
(i.e. sell ZAR fwd).

$$\text{Forward premium/discount} = \frac{2.8\%}{2} - \frac{3.6\%}{2} = -0.4\%$$

(i.e. ZAR is trading at 0.4% fwd discount).

$$F_{P/B} = S_{P/B} \left(\frac{1 + i_p}{1 + i_B} \right) \text{ then } \frac{F - S}{S} = \text{roll yield}$$

$$\begin{aligned} \text{roll yield} &= 1 \left[(1 + 2.8\%) / (1 + 3.6\%) \right]^{0.5} - 1 \\ &= -0.387\% \end{aligned}$$

Roll yield vs. Carry trade

Similarity : Buying higher yield currency.

Difference :

Carry Trade : Buy @ spot market
Roll Yield : Buy @ forward market

EXAMPLE: Hedging and roll yield

A portfolio's reporting currency is the Korean won (KRW) and the portfolio holds investments denominated in EUR, USD, and CHF. Current exchange rate information is provided below along with the manager's expectation for the spot rate in six months.

	Spot FX Rate	Six-Month Forward FX Rate	Manager's Forecast
KRW/EUR	1,483.99	1,499.23	1,450.87
KRW/USD	1,108.78	1,112.56	1,146.63
KRW/CHF	1,265.22	1,257.89	1,212.55

- Which foreign currencies trade at a forward premium or discount?
- Which foreign currency hedges would earn a positive roll yield?
- Which foreign currencies would an active currency manager hedge?
- Comment on how the roll yield affects the decision to hedge the EUR or USD.
- Calculate the implied unannualized roll yield of a currency hedged for the portfolio's long exposure to CHF.

1. EUR & USD premium, CHF discount
2. EUR & USD will have a positive roll yield
(i.e. forward sale & sale @ forward premium)

3.* Active hedge only applies where the hedge is expected to improve return.

$$\text{Unhedged (EUR)} : (1450.87 - 1483.99) \div 1483.99 \\ = -2.23\%$$

$$\text{Hedged (EUR)} : (1499.23 - 1483.99) \div 1483.99 \\ = 1.06\%$$

$$\text{Unhedged (USD)} : (1146.63 / 1108.78) - 1 \\ = 3.41\%$$

$$\text{Hedged (USD)} : (1112.66 / 1108.78) - 1 \\ = 0.34\%$$

$$\text{Unhedged (CHF)} : (1212.55 / 1265.22) - 1 \\ = -4.16\%$$

$$\text{Hedged (CHF)} : (1257.89 / 1265.22) - 1 \\ = -0.58\%$$

\Rightarrow CHF & EUR require active hedging

4. USD & EUR both provide positive roll yield but that's only one of the factors. Others being price appreciation which makes hedging USD less attractive

5. Implied roll yield = Forward premium / discount.
= -0.58%

P13.

↑
Currency that dominates the
Currency

Implementation of Option

Forward hedging incurs opportunity costs &
Perfect hedging is expensive.

1. Over/under hedging w/ forward Contract

the rest proceeds from highest to lowest initial option cost

2. Buy ATM put (i.e. protective puts).

3. Buy OTM put (less exp. than ② but cheaper)

4. Collar

5. Put Spread

6. Seagull Spread (Put Spread + Short Call)

(e.g. buy 35-delta put, sell 25-delta put, sell 35-delta call)

Exotic Options :

1) Knock-in options (options come into existence if underlying reaches prespecified level)

2) Knock-out options (options cease to exist if underlying reaches prespecified level)

3) Binary / Digital Options (pays a fixed amount that doesn't vary with the diff b/w strike & underlying)

Steps to select the hedge :

1. Determine the base currency

2. Determine the base currency will be bought/sold.

long short

(short)

long & quoted \$ ↑ → gain

~~short & quoted \$↑ → loss.~~

4. higher risk tolerance / stronger view from PM
⇒ less likely a 100% hedge is needed

More Advanced Implementation Issues.

Cross Hedge (or Proxy Hedge) :

Hedging w/ instrument w/ imperfect correlation w/ the exposure.

e.g. hedge U.S. equity portfolio w/ S&P index port.

Generally unnecessary b/c all currency pairs are usually available.

Upside : improve efficiency

Downside : may introduce residual risk

USD / CHF

P \nearrow $B/Q.$ \nearrow

(if quote price ↑, base currency appreciates)

Macro Hedge :
hedge portfolio-wide risk factors (i.e. int. rate risk,
Credit risk)

One type of currency macro hedge : a fixed basket
of currency

Minimum-Variance Hedge Ratio (MVHR) :

regression of the past changes in value of the portfolio. (R_{DC}) to past changes in value of the hedging instrument. hedge ratio is the beta / slope.
Coefficient.

EXAMPLE: Determining and applying the MVHR

A U.S.-based portfolio is long EUR 2,000,000 of exposure. The portfolio manager decides to jointly hedge the risk of the asset returns measured in EUR and the risk of the currency return to minimize the volatility of the portfolio's returns measured in USD. The manager first adjusts all currency quotes to measure the value of the foreign currency by expressing the currency quotes as USD/EUR. He then calculates weekly percentage changes in value of the EUR (the R_{FX}) and unhedged percentage changes in value of the portfolio position measured in the portfolio's domestic currency (the R_{DC}). He performs a least squares regression analysis and determines based on the historical data that:

$$R_{DC} = 0.12 + 1.25(\% \Delta S_{USD/EUR}) + \epsilon$$

With a correlation between R_{FX} and R_{DC} of 0.75

1. Calculate the size of and state the currency hedge to minimize expected volatility of the R_{DC} .
2. Comment on how effective the hedge is likely to be.

1. Short $2MM \times 1.25 = 2.5 MM$. EUR.
to hedge 2MM exposure

$$USD = P$$

$$EUR = B.$$

2. A cross hedge based on past correlation. Correlation can change so the hedge will perform better / worse than expected.

Managing Emerging Market Currency

additional challenges :

1. higher additional cost / "markup"
2. Increased probability of extreme events.
3. non-normal return distribution & negative skew

Non-deliverable Forwards (NDF).

- require a cash settlement of developed country currency (rather than currency exchange) b/c some emerging countries restrict movement of their currencies.

EXAMPLE: Calculating cash settlement values for an NDF

A trader buys EUR 1,000,000 six months forward at RUB/EUR 39. Six months later, the spot exchange rate is RUB/EUR 40.

Calculate the cash flows that will occur at settlement.

Buy 1,000,000 EUR , sells 1MM \times 39 = 39MM RUB
② contract expire, 1MM \times 40 = 40MM RUB

$$P/L = 1MM \text{ RUB}$$

$$\Rightarrow 1MM \div 40 = 25,000 \text{ EUR}$$



MODULE QUIZ 8.4, 8.5, 8.6

1. Peter Perkins has a U.S.-based portfolio and decides to hedge his exposure to the Swiss franc (CHF) with a protective put strategy. However, he also decides he is willing to reduce the downside protection to lower the initial cost. Which of the following strategies will accomplish his objective?
 - A. Buy 50-delta calls and puts on the CHF.
 - B. Buy a 40-delta put and sell a 20-delta put on the CHF.
 - C. Buy a 40-delta put and sell a 35-delta call on the CHF.
2. Jane Archer manages a Swiss-based (CHF) hedge fund. GBP 1,000,000 is currently invested in a diversified portfolio of U.K. stocks. Archer regresses the monthly returns of a diversified U.K. stock index (returns measured in CHF) versus the monthly change in value of the CHF/GBP. The regression coefficients are intercept = 0.11 and slope coefficient = 1.25. Determine the quantity of GBP Archer will short to implement a hedge of direct currency risk and a minimum-variance hedge.

<u>Direct currency hedge</u>	<u>Minimum-variance hedge</u>
A. GBP 1,000,000	GBP 1,000,000
B. GBP 1,000,000	GBP 1,250,000
C. GBP 1,250,000	GBP 1,250,000
3. A trader enters a short three-month non-deliverable forward on 2,000,000 CNY at CNY/USD 6.1155. At the end of the period, the spot exchange rate is USD/CNY 0.1612. The trader's gain or loss is closest to:
 - A. USD 4,600 loss.
 - B. USD 4,700 loss.
 - C. USD 4,650 gain.

1. C (B) selling a call doesn't reduce downside protection
2. B /

direct currency hedge = 1.0 hedge ratio

hedge ratio (Min-variance hedge) = slope coefficient
= 1.25 .

3. Short 2,000,000 CNY. (sell CNY to buy USD)
→ gain after the CNY depreciates against USD
($1 \div 0.1612 = 6.2035$) .

Detailed calc:

size of trade in USD in the fwd rate:

CNY 200,000 \div 6.1155 = 327,037.85 USD.

Ending P/L

$(6.2035 - 6.1155) \cdot 327,037.85 = 28,769.52$. CNY
(or 4,637.65)