

Module 2 – Foreign Exchange

Background

This module focuses on using currency exchange rates, which represent the value of one country's money in terms of another. In this course exchange rates are expressed as a single number along with a ratio of monetary units (for example, 1.1567 USD/EUR). Such notation will always be interpreted as the quantity of the currency in the numerator that is equivalent to 1 unit of the currency in the denominator (for example, 1.1567 USD = 1 EUR).

- In looking up exchange rates, you may find two rates: a “selling” (bid) rate and a “buying” (ask) rate. More specifically, the **bid** rate for a currency is the amount you would receive, if you sold one unit of that currency. The **ask** rate for a currency is the amount you would pay, to buy one unit of that currency. These rates are not very far apart, but the small difference in the rates is how foreign exchange brokers (companies that exchange currencies for clients) make money.
- Currency exchange rates are in constant fluctuation. Not only will exchange rates change day-to-day, they can even change multiple times throughout one day. So, unless otherwise stated, you must use the exchange rates as stated in the course materials. Do not rely on an online currency converter to determine answers in this class since it may have different rates.
- The Excel workbook for this module consists of 3 tabs.
 1. The “Expenses” tab provides a table of travelling expenses from a recent international business trip and currency exchange rates relevant to countries visited.
 2. The “Historical Rates” tab provides a list of historical exchange rates between the U.S. Dollar and some foreign currencies.
 3. The “2 Dealers” tab provides a table of bid and ask rates used by two different dealers simultaneously on the same day. Note that the small differences in rates are reflective of the fact that because rates are in constant fluctuation, they are not in sync at every moment.

Part 0: Unit Conversions

The skill of *unit conversion* can be widely applied. Specifically, currency conversion can be classified as a specific kind of unit conversion.

- 1) To begin this Module, view the screencast [Unit Conversions](#).

Part 1: Travel Expenses

You were traveling internationally for business. Use the expenses and exchange rates provided on the first tab of the Excel workbook to answer the following questions. Note that the expenses are in the local currencies: (EUR), (INR), and (CNY) and that the exchange rates are between these currencies and U.S. Dollars.

- 1) How much, in terms of U.S. Dollars, did you spend on Food in Germany?
- 2) How much, in terms of U.S. Dollars, did you spend on Miscellaneous in China?
- 3) In which country did you spend the most on Lodging? How much was that expense, in USD?
- 4) In which country did you spend the most money on your trip? How much did you spend in that country, in USD?
- 5) Using the rates in the table:
 - a. You bought a present for your host for 50 CNY, how many USD was that?
 - b. If you had a limit of 100 USD to spend on a hotel room per night, how many CNY would that be?

Part 2: Less Favorable Rates

The exchange rates shown in Part 1 are the rates available to your company because it exchanges large amounts of currency. If you went to a bank or an exchange counter at a hotel or an airport, the rates for you would be less favorable.

- 1) What would the USD/EUR exchange rate be if it were 10% worse than the rate in shown in Part 1 (i.e., EUR is 10% weaker relative to USD)?

_____ USD/EUR

- 2) What would the USD/INR exchange rate be if it were 15% worse than the rate shown in Part 1 (i.e., INR is 15% weaker relative to USD)?

_____ USD/INR

- 3) If you change money at a tourist location, like an exchange counter at an airport, you may see “service charges” in addition to unfavorable rates. Say, on your trip, you decide to change some money at the airport in India. You want to change the 325 EUR you still have in your pocket to INR.

- a. Based on the exchange rates given in Part 1, how many INR could you get for 325 EUR? (Assume you exchange EUR for USD and then USD for INR.)
- b. What is the effective exchange rate from part a?

_____ INR/EUR

- c. Suppose the INR/EUR exchange rate at the airport is 17% worse than the rate you calculated in part b. How many could you get for 325 EUR?
- d. Now assume that in addition to the worse rate from part c, there is a 100 INR service charge. How many INR will you be left with after you exchange your 325 EUR?
- e. The net exchange from part d is equivalent to what rate?

_____ INR/EUR

- f. The rate calculated in part e is *what percent worse* than the rate in part b? (Hint: it has to be more than 17% worse; there is a service charge on top of the 17% from part b.)

Part 3: Current Rates

- 1) Use a foreign exchange website (such as www.oanda.com: try searching for the currency converter on that site) to find current exchange rates. If you see both an ask rate and a bid rate, then report your answers as the average of the two rates. Report the rate with the same amount of precision as you see on the website.

- a. Find the exchange rate between EUR and USD

Note that conventions vary about whether this is referred to as USD/EUR or EUR/USD. We use USD/EUR to denote the quantity of USD that is equivalent to 1 EUR.

_____ USD/EUR

- b. Find the exchange rate between INR and USD.

_____ USD/INR

- c. Find the exchange rate between CNY and USD.

_____ USD/CNY

- d. Where did you find your data? (What was the URL?)

Depending on which website you look at, and the time you look it up, the rates may differ from what your classmates find. However, they should be approximately the same.

2) Using the following rates:

Germany		India		China	
1.2431	USD/EUR	0.01337	USD/INR	0.1453	USD/CNY

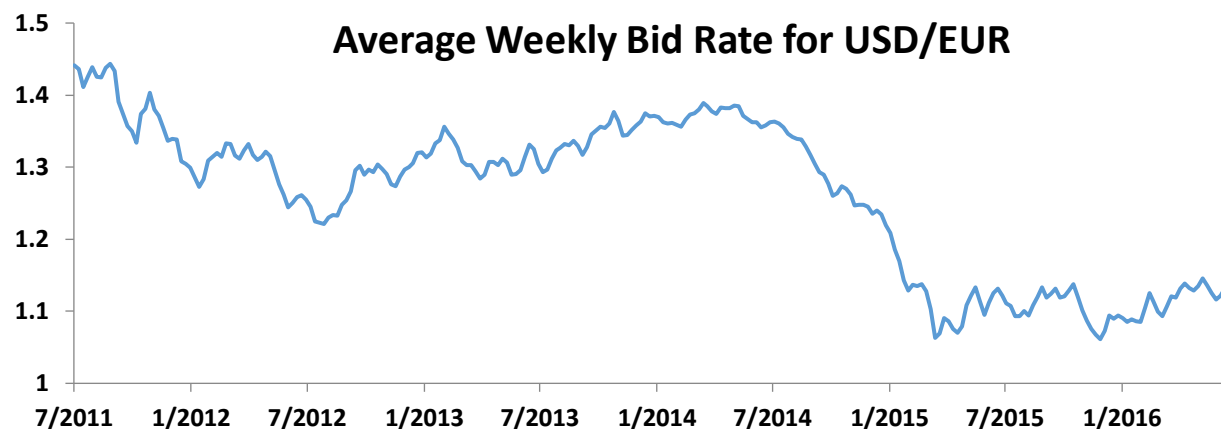
and the expense tables from Part 1, answer the following questions.

- How much, in terms of U.S. Dollars, did you spend on Food in China?
- How much, in terms of U.S. Dollars, did you spend on Miscellaneous in Germany?
- What was the total amount you spent, in USD, on the whole trip?

Part 4: Trends in Rates

Here is a graph of the average weekly rates for exchanging EUR for USD from July 2011 to June 2016.

Remember that conventions vary about the use of USD/EUR vs. EUR/USD. We use USD/EUR to denote the quantity of USD that is equivalent to 1 EUR.



- In approximately which month was the EUR the strongest compared to the USD? That is, in which month could one buy the most USD with one EUR?
- In approximately which month was the USD the strongest compared to the EUR? That is, in which month could one buy the most EUR with one USD?
- Use the rates for exchanging INR for USD on the “Historical Rates” tab.

- a. Create a graph like the one above, showing the rates for exchanging INR for USD.
 - b. Over the last **five** years, in approximately which month was INR strongest compared to USD?
 - c. In the **last year**, is there a trend? Specifically, is INR getting stronger or weaker compared to USD?
- 4) Use the rates for exchanging CNY for USD on the “Historical Rates” tab.
- a. Create a graph like the one above, showing the rates for exchanging CNY for USD.
 - b. Over the last **five** years, in approximately which month was CNY the strongest compared to USD?
 - c. In the **last year**, is there a trend? Is CNY getting stronger or weaker compared to USD?
- 5) When the USD got weaker compared to CNY, was it also weaker compared to INR? To answer that question, look at the correspondence in the two sets of historical rates.
- a. Create a scatter plot of the rates for exchanging CNY for USD and the rates for exchanging INR for USD. Make sure that the dates line up in the two data sets.
 - b. What is **the correlation coefficient** for the two sets of rates from part a? For this question, use the full five years. (If you are unfamiliar with what a correlation coefficient measures and how to compute it, view the screencast [Correlation Coefficient](#).)
 - c. Just looking at the most recent 12 months of data, what is the correlation (i.e., the correlation coefficient) between the two sets of rates?
 - d. Is the correlation stronger or weaker for the most recent year than for the longer data set?

Part 5: Buying and Selling Currencies

1) The (bid) rate for selling 1 CNY for INR is 9.74534. The (ask) rate for buying 1 CNY with INR is 10.8418.

a. If you start with 1000 CNY and sell them to buy INR, how many INR do you have?

b. If you then take those INR and buy CNY, how many CNY do you have?

c. How much money did the broker make? What currency is your answer in?

2) Use the same rates as in Question 1.

a. If you start with 1000 INR and sell them to buy CNY, how many CNY do you have?

b. If you then take those CNY and buy INR, how many INR do you have?

- c. How much money did the broker make? What currency is your answer in?

- 3) The bid and ask rates for three currencies (EUR, JPY, and MXN) in terms of the U.S. Dollar (USD) offered by two different dealers are in the "2 Dealers" tab. Use that information to answer the following questions.
 - a. For Dealer 1:
 - i. If you have 1 JPY, how many USD can you get?

 - ii. If you have 1 USD, how many JPY can you get?

 - iii. If you have 1 JPY, how many EUR can you get (assuming you convert via USD)?

 - iv. If you have 1 MXN, how many JPY can you get (assuming you convert via USD)?

 - b. For Dealer 2: answer the same questions as you did for Dealer 1.

i.

ii.

iii.

iv.

c. Comparisons

- i. If you have 1200 MXN, from which dealer can you get more EUR? How many EUR?
- ii. If you use both dealers instead of just one, can you get more EUR for your 1200 MXN than you can from one dealer alone? If so, how many EUR can you get?

Part 6: Revenues and Expenses

Suppose your company has international operations and is generating revenue in CNY but has to pay expenses in USD.

In the questions below, you will compute a profit margin, which is the profit as a percentage of revenue. The profit margin answers the question: “Of all the revenue a company makes, what percentage of that is profit?”

$$\begin{aligned}\text{Profit margin} &= (\text{revenue} - \text{expenses}) / \text{revenue} \\ &= \text{profit} / \text{revenue}\end{aligned}$$

- 1) If the revenue last quarter was 9.3 million CNY and the expenses were 1.2 million USD, what was the profit margin, using the USD/CNY rate from Part 1? (You can ignore the difference between bid and ask prices and just use the rate given in Part 1.)

_____ %

- 2) If the revenue last quarter was 9.3 million CNY and the expenses were 1.2 million USD, what would the exchange rate have to be for the profit margin to be 17.00%?

_____ USD/CNY

- 3) Create a graph in Excel that shows the profit margin (%) as a function of the exchange rate (USD/CNY). Show USD/CNY rates from 0.1 to 0.2 in your graph.

- 4) If the USD gets stronger compared to the CNY, does that increase or decrease the profit margin?

Selected Answers

Part 1

- 1) \$831.02
- 2) \$260.02
- 3) You spent the most on Lodging in Germany (\$761.42).
- 4) You spent the most total in Germany (\$1,818.00).
- 5) a) \$7.52 b) 665.34 CNY

Part 2

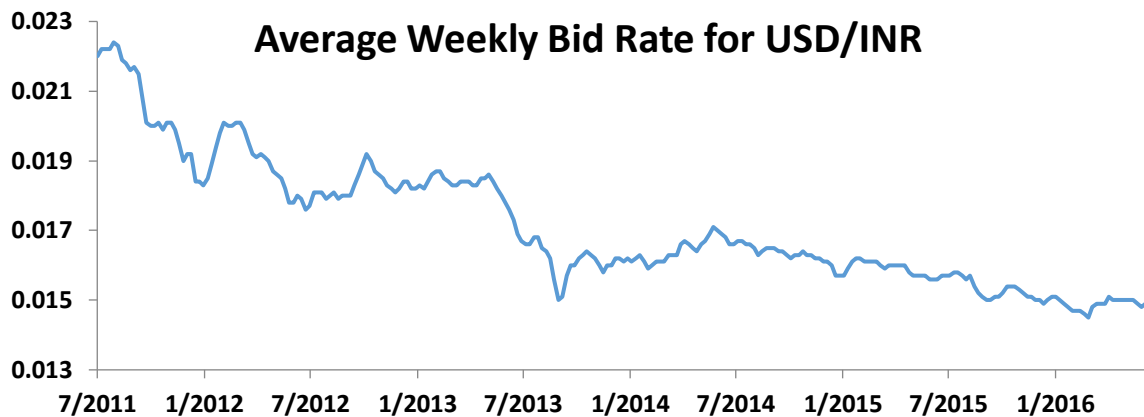
- 1) 1.0410 USD/EUR (rounded to four decimal places)
- 2) 0.0139 USD/INR
- 3) a) 22,964.42 INR b) 70.6597 INR/EUR c) 19,060.47 INR d) 18,960.47 INR e) 58.3399 INR/EUR
f) 17.44%

Part 3

- 2) a) 364.31 USD
- b) 242.40 USD
- c) 3917.64 USD

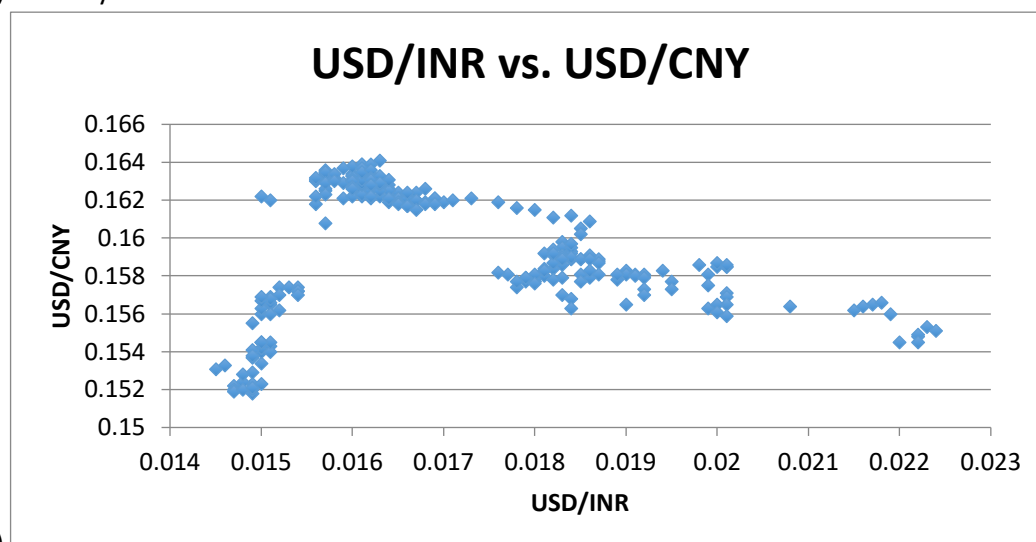
Part 4

- 1) August 2011
- 2) November 2015
- 3) a)



- b) July 2011

4) b) January 2014



5) a)

b) -0.178817209

c) 0.925855969 (using the data from 6/21/15 to 6/19/16)

Part 5

1) a) 9745.34 INR b) 898.87 CNY c) 101.13 CNY

2) a) 92.24 CNY b) 898.87 INR c) 101.13 INR

3) a) (i) 0.00888 USD (ii) 112.48594 JPY (iii) 0.00774 EUR (iv) 6.39258 JPY

b) (i) 0.00895 USD (ii) 111.60714 JPY (iii) 0.00773 EUR (iv) 6.38728 JPY

c) (i) You can get 59.4446 EUR from Dealer 1 (vs. 59.2852 from Dealer 2)

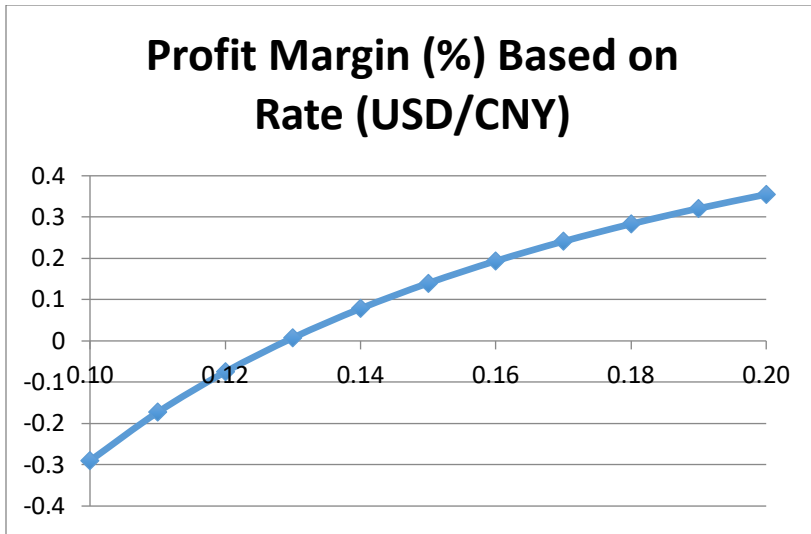
(ii) Hint: Yes, you can get more (59.863) if you use both. Can you see how?

Part 6

1) 14.15%

2) The answer is 0.15546 USD/CNY.

3)



4) The profit margin decreases as USD gets stronger.

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