Problem Sets 3

Note: Choose five questions out of six and extra credit will be given for extra work done correctly.

1. Consider the United States and the countries it trades with the most (measured in trade volume): Canada, Mexico, China, and Japan. For simplicity, assume these are the only four countries with which the U.S. trades. Trade shares (trade weights) and U.S. nominal exchange rates for the four countries are as follows:

Country (currency)	Share of Trade	$/FX in 2015	$/FX in 2016
Canada (dollar)	36%	0.8271	0.6892
Mexico (peso)	28%	0.0683	0.0538
China (yuan)	20%	0.1608	0.1522
Japan (yen)	16%	0.0080	0.0086

1) Compute the percentage change from 2015 to 2016 in the four U.S. bilateral exchange rates (defined as U.S. dollars per unit of foreign exchange, or FX) in the table provided.
2) Use the trade shares as weights to compute the percentage change in the nominal effective exchange rate for the U.S. between 2015 and 2016 (in U.S. dollars per foreign currency basket).
3) Based on your answer to (2), what happened to the value of the U.S. dollar against this basket between 2015 and 2016? How does this compare with the change in the value of the U.S. dollar relative to the Mexican peso? Explain.

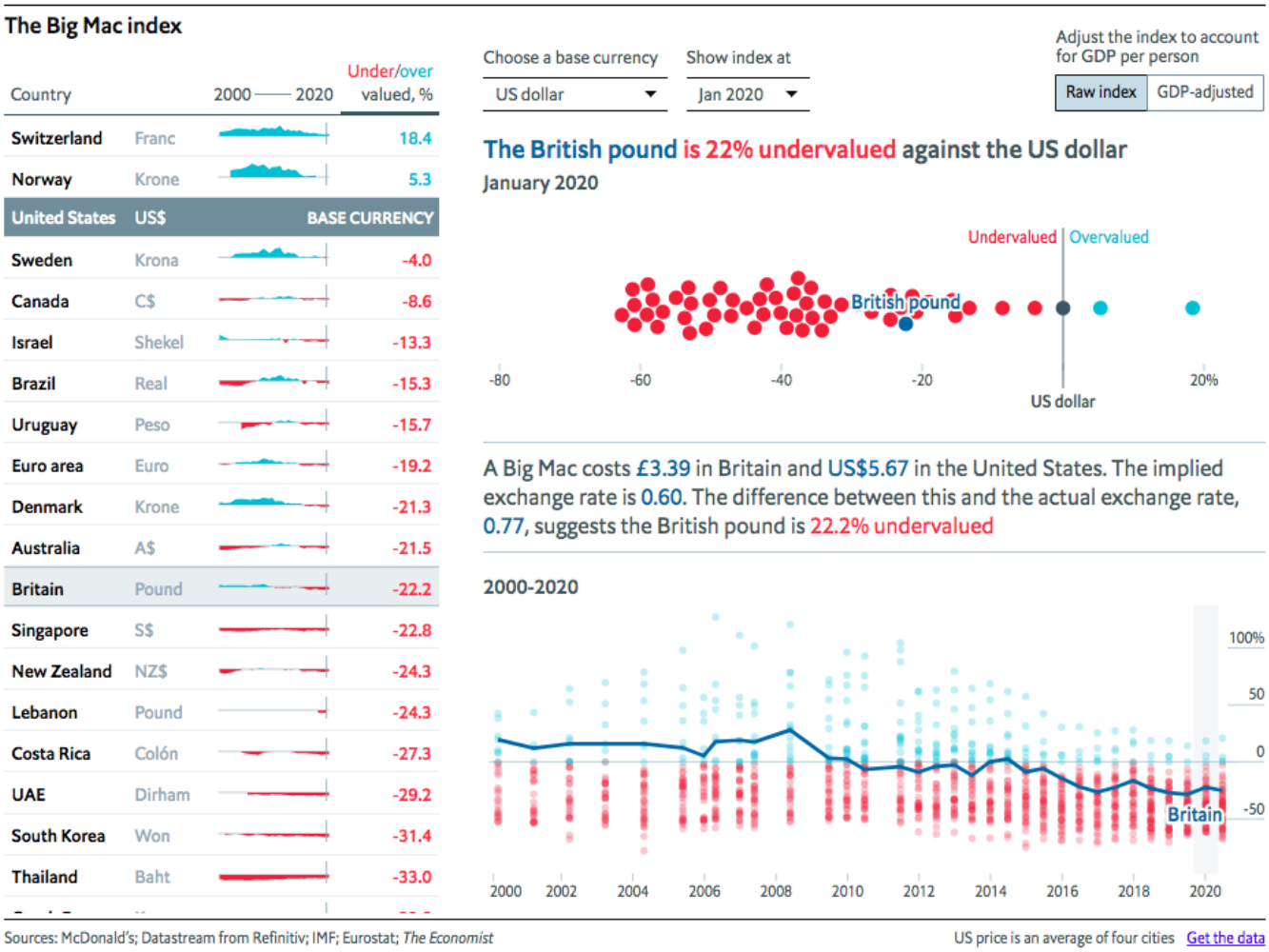
2. A U.S. corporation expects to receive a payment of 60 million Japanese yen in 180 days for goods exported to Japan. The current spot rate is 100 yen per U.S. dollar (E$/¥=0.01000). The company CFO is concerned that the U.S. dollar is going to appreciate against the yen over the next six months.

1) Assuming the exchange rate remains the same, how much does the firm expect to receive in $?
2) How much would the firm receive (in U.S. dollars) if the dollar appreciated to 110 yen per U.S. dollar (E$/¥ = 0.00909)?
3) Describe how the firm could use an options contract to hedge against the risk of losses associated with the potential appreciation in the U.S. dollar.

3. Follow the trading strategies in the lecture to profit from spatial arbitrage in foreign exchange markets. Assume zero transaction cost for the traders. (£–British pound. $–U.S. dollar. ¥–Japanese yen)

1) Bilateral arbitrage. London: 1£=2$. New York: 1£=2.1$. How to profit from $100? What are the profit and the rate of return? How to profit from £1000? What is the profit rate?
2) Triangular arbitrage. London: 1£=2$. New York: 1$=120¥. Tokyo: 1£=200¥.
   a. How to profit from 1£? What is the profit rate?
   b. How to profit from 1$? What is the profit rate?
   c. How to profit from 200¥? What is the profit rate?

4. The Economist Magazine: Big Mac Index https://www.economist.com/news/2020/01/15/the-big-mac-index



1) According to the Jan 2020 index, which currency is most overvalued against USD? By how much?
2) According to the PPP theory, why does the Big Mac Index imply an overvaluation of that currency against USD? Verify the rate of overvaluation based on the burger prices and actual exchange rate.
3) To arbitrage the difference between PPP valuation and actual market valuation, what would be the profit rate if an investor holds 1M USD, assuming zero transaction cost? Explain the strategy.
4) To arbitrage the difference between PPP valuation and actual market valuation, what would be the profit rate if an investor holds 1M CHF, assuming zero transaction cost? Explain the strategy.
5) Check the Big Mac Index from Dec 2015 to Jan 2020, what pattern do you find from the data? Was the overvaluation gradually disappearing? Provide a theoretical explanation.

5. In June 2006, a Korean investor is considering investing in bank deposits in Korea and Japan. The annual interest rate on Korean deposits is 6.25%, versus 3.75% on deposits in Japan. Suppose that the forward rate in June 2006 is equal to Fwon/¥ = 8.2. In June 2006, the expected exchange rate is 8.25 won/¥. For the remainder of this question, please use the linear approximations for uncovered and covered interest rate parity. The spot exchange rate in June 2006 is Ewon/¥ = 8.

1) Does covered interest parity hold in this example? If so, how do you know? Calculate the expected return in Japanese deposits (denominated in Korean won) in this case.
2) Does uncovered interest parity hold in this example? If so, how do you know? If not, what is the implied risk premium? Which deposits pay a higher expected return? Calculate the return on Japanese deposits (denominated in Korean won) in this case.
3) Suppose the exchange rate in June 2007 is equal to 8.528 won per yen. Calculate the Korean investor's actual return, assuming that he invests in Japanese deposits in June 2006. How do these answers compare with those from (2)?
4) Consider two Korean investors: one uses speculation and the other uses hedging. Based on your previous answers, which one earned a higher return (or smaller loss) on Japanese assets between June 2006 and 2007? Explain briefly why.

6. Discovering Exchange Rate Patterns: Not all pegs are created equal!
Access the St. Louis Federal Reserve's Economic Data (FRED) https://research.stlouisfed.org/fred2/ Download the daily U.S. exchange rates with Venezuela, India, and Hong Kong from 1990 to present. These can be found most easily by searching for the country names and "daily exchange rate."

1) Plot the Indian rupee to U.S. dollar exchange rate over this period. For what years does the rupee appear to be pegged to the dollar? Does this peg break? If so, how many times?
2) How would you characterize the relationship between the rupee and the dollar from 1998–2008? Does it appear to be fixed, crawling, or floating during this period? How would you characterize it from 2008 onward?
3) The Hong Kong dollar has maintained its peg with the United States dollar since 1983. Over the course of the period that you have downloaded what are the highest and lowest values for this exchange rate?
4) Venezuela has been less successful in its attempts to fix against the dollar. Since 1995 how many times has the Venezuelan bolívar peg to the dollar broken? What is the average length of a peg? What is the average size of a devaluation?