Problem set # 1

Due date: 2/9

Answer the following questions. Show your work. As mentioned in class, you are encouraged to work in groups but must write your own answers.

1. **(Data query on exchange rates)** Download the exchange rate data for the following currencies against the US dollar (country currency per dollar): Canada, Mexico, China (i.e., FX Canada-US, México-US, China-US). You can find these data at the St. Louis Fed Federal Reserve Economics Database (FRED) database: https://fred.stlouisfed.org/. The data should be monthly and cover the January 1994-December 2024 period [1]

   (a) Compute the annual growth rates (depreciation rate) for each case. Report the standard deviation of each exchange rate. Report the correlation coefficient for each exchange rate pair (Canada-US vs. México-US, Canada-US vs. China-US, and México-US vs. China-US). [2]

   (b) Briefly, summarize the results you found in (a.). Why would the volatilities be different across rates? [Hint: think about the exchange rate regimes in these locations]

   (c) Plot the depreciation rates you found in (a). Put the three in the same graph and include labels.

   Note: you will usually find the "country currency per dollar" rates. That is because each country's central bank publishes the exchange rate and they do it in the typical home per foreign currency units we saw in class. The only difference is that, from their perspective, the home currency is their currency and the foreign currency is the US dollar. Thus: (1) that's why the data you found in FRED is given in other currencies per dollar, (2) you can always get the dollar price per foreign currency by taking 1/X where X is the currency quoted in foreign currency per dollar.

2. **(Vehicle currencies)** Why would you be able to compute the China-México exchange rate from the data you used in (1)? provide the formula you would use.

3. **(CIP and UIP) - FT problem 6, chapter 13** Consider a Dutch investor with €1000 to place in a bank deposit in either the Netherlands or Great Britain. The 1-year interest rate on bank deposits in Britain is 2% and 4.04% in the Netherlands. The 1-year forward euro-pound is 1.575 euros per pound ($F_{€/£}$) and the spot rate is 1.5 euros per pound. Answer the following questions using the UIP and CIP (exact equations, not the approximations) as necessary:

   (a) What is the euro-denominated return on Dutch deposits for this investor?

   (b) What is the (riskless) euro-denominated return on British deposits for this investor using a forward cover?

[1] Be careful, the data is available in 3 frequencies in most cases, daily, monthly, annually, pick the monthly one. This is the link for one of the rates: https://fred.stlouisfed.org/series/EXCAUS

[2] Feel free to use any software for this, e.g., MS Excel or R. In MS Excel the functions for the standard deviation and correlation are `stdev(data)` and `correl(array1,array2)`. In R the functions are `sd()` and `cor()`

(c) Is there an arbitrage opportunity here? explain why or why not. Is this an equilibrium in the forward exchange rate market?

(d) If the spot rate is 1.5 euros per pound, and the interest rates are as stated previously, what is the equilibrium forward rate, according to the CIP?

(e) Suppose the forward rate takes the value given by your answer to (d). Compute the forward premium on the British pound for the Dutch investor (where the exchange rates are in euros per pound). Is it positive or negative? Do investors require a premium/discount in equilibrium? if so, why?

(f) If the UIP holds, what is the expected depreciation of the euro (against the pound) over one year?

4. **(Demand and Supply for foreign currency)** Indicate whether each of the following desired transactions would increase the demand for or the supply of foreign currency units (FCU) in the FX market and whether it would constitute upward (UP) or downward (DOWN) pressure on the price of the FCU (in USD terms) [Hint: The U.S. is the home country and demand and supply of FCU are relative to the USD]

Desired transaction	**Increased Demand or Supply of FCU**	**Pressure on Price of FCU (USD/FCU)**
Example: UK firm, using GBP (pounds), imports software from US	Supply	Down
Belgian brewer, using EUR (euros), buys brewing equipment from US		
Canadian investors sell US stocks and repatriate proceeds to Canada (in CAD)		
Boeing, using USD, buys engines from Rolls Royce, which as a UK firm requires GBP		
French insurance company, using EUR, buys US Treasury bonds		
US share holders of UK firm receive dividend (in GBP) that they repatriate (to USD)		

5. **(Fixed Exchange Rate Regime: China (mainland))** Consider the USD/CNY FX market, where CNY is the Chinese currency, Yuan (also denoted RMB). Assume that China is operating a fixed exchange rate system. Suppose that there is an increase in Chinese exports to the US.

   (a) If the People's Bank of China (PBC), the Chinese central bank, wants the exchange rate to stay at its target level, how should it intervene in the FX market? (indicate which currency PBC buys and which it sells)