Exercise 2

The goal of this exercise is for you to demonstrate how the two models of exchange rate determination that we have studied in class can be used to interpret exchange rate movements for your selected country. Also, in predicting the success of a currency depreciation in improving a country’s balance of trade position, we are interested in how additional income is spent on imports or saved, and you will calculate those two terms.

Part one: Retrieving data from the IFS database

Following the steps detailed in Exercise 1 retrieve the following data from the IMF web site for your country and a second country. In most cases let that second country be the United States. If your country is more closely integrated with another country, however (e.g. Senegal and France), then use that alternative country and include its dollar exchange rate on a separate line as well. For the exchange rate calculations, you will want to retrieve:

- Exchange rate, Country A
- Price level for Country A (preferably wholesale or industrial prices)
- Price level for Country B
- Interest rate for Country A (preferably money market or Treasury bill rate)
- Interest rate for Country B

To determine whether your country spends extra income on imports, you need to download the data series for GDP (the same one you used in Exercise 1 to scale the current account position, from line 99B) and in that same section of the data table on National Income, the entry for Imports of Goods and Services (line 98C). Both these entries should be given in the domestic currency. Because we will be interested in their ratio, we do not need to worry about converting them into expressing them into dollars or some other foreign currency.

Save the resulting spreadsheet in your Storageserver space as an Excel spreadsheet.

Part two: Analyzing data within Excel

- Launch Microsoft Excel
- Open the spreadsheet you created in part one:

First make sure you are working with dollars per unit of A's currency. If your series is given as units of A's currency per dollar, invert that series to give the value of Country A’s currency, as shown in Part III of exercise 1. As a refresher, those steps are repeated, as follows:
- Label a new row "Actual exchange rate for A"
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- For the first value of this series, move to that cell (in this case cell H11)
- Type an = sign to tell Excel you are going to enter a formula
- Type 1/ then click in the cell for the first value you hope to transform. In this case, where we are going to transform Austria's Official Rate, the first value is in cell H6.

- Then press Enter to tell Excel to calculate the rate.
- Format the cell as a number:
  - Click on the cell
  - Click on Format in the Cells group
  - Click on Format Cells
  - Choose Number
  - Change the decimal places to 3, if necessary
  - Click on OK

You can ask Excel to repeat a procedure for subsequent columns by filling in the appropriate equation:
- Click in the box into which you entered the first equation.
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- Click on the drag handle on the lower right corner of the active cell.
- Drag it across the rest of the row:
- When you let go of the mouse, Excel will invert the rate for each year:

I: Exchange rates based on purchasing power parity

Now we are ready to apply this technique to the first theory, which is purchasing power parity.

- In your spreadsheet, create a new row labeled "Purchasing Power Parity Rate for A"
- We want to compare the value of the exchange rate in each single year to the value for a constant base year. To make such a comparison in Excel, we will be holding constant that base year as we move from cell to cell.
- If we chose the first value of this series, for the year 1992, as the base year, we would want to enter the following formula in that cell:

\[ \frac{1}{S_6} \times \frac{K_5}{K_5} \times \frac{K_7}{S_7} \]

Note the dollar signs in the denominator indicate constants, which apply to the year 1992. Also, note that row seven gives prices in Country A and row five gives prices in the United States. This calculation says the PPP value of Country A’s currency will rise when US prices rise and fall when A’s prices rise. In other words, for consumers to have the same purchasing power in terms of Austrian and U.S. goods in 1993, the value of the schilling must rise in 1993 if U.S. prices rise more than Austrian prices. Alternatively, we can say by how much the schilling can rise in value without the competitiveness of Austrian goods falling if U.S. prices rise more rapidly than Austrian prices.

- Take the handle on the active box and drag it across the rest of the row.
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You will be calculating how the PPP rate varies with respect to the value it took in the very first year of the series, 1992. Thus you are looking at a cumulative effect that has occurred since 1992.

• Create a new row entry to measure the overvaluation of country A’s currency, measured as the actual rate minus the PPP rate, divided by the PPP rate: $\frac{100(K_{11} - K_{12})}{K_{12}}$. We multiply by 100 to express this overvaluation/undervaluation in percentage terms.

• If your calculation shows that the currency was either undervalued for every year after 1992 or undervalued for every year after 1992, we might question whether 1992 is a good choice of an equilibrium year to use in this comparison. Suppose we felt instead that 1997 was a better choice of an equilibrium year, perhaps because your country’s current account was balanced that year. To make that change, we would want to edit the formula cell we typed above, but now recognize that the base year data we want to use is contained in column P. Our entry should now appear as $\frac{(1/SPS6)*(K5/SPS5)/(K7/SPS7)}{SPS11*(K5/SPS5)/(K7/SPS7)}$ or $\frac{K5}{K7}$.

Drag that formula box across your row for the PPP value of the currency. You should see that the PPP value is the same as the actual value in 1997 now. If you again calculate the extent of overvaluation or undervaluation of the currency, does your new base year seem to be a better choice?

• Print a table and graph of the actual exchange rate and the PPP rate.

II. Exchange rates based on interest rates

Our examination of annual interest rates and exchange rates does not yield a cumulative measure of the change in value of the exchange rate over several years compared to some base year, as we calculated above for the PPP model. Instead, our approach will project an annual rate of change in the exchange rate. Consider the gap between the interest rate in Country A and in the United States to predict the decline in the value of A’s currency. For example, if the interest rate in A is 30% and the U.S. interest rate is 5%, investors must expect A’s currency will decline in value by approximately 25%. That is, I can earn 5% by leaving my savings in the U.S. for a year or I can earn 30% by putting my savings in Country A for a year. But at the end of the year when I convert currency A back into U.S. dollars, I will find that they buy 25% fewer dollars. Thus, the equilibrium rate of return is the same in each
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country. If A’s currency were only to fall by 10%, I would want to take funds out of U.S. dollars and instead acquire assets in Country A.

To make this calculation more accurate where high interest rates are observed, we use the formula \((i_{US} - i_A) / (100 + i_A)\), where we are expressing the interest rates in percentage form. This calculation will give a smaller expected rate of decline in A’s currency, only 19% rather than 25%. (See our class handout entitled “Determining the Value of an Exchange Rate.”)

Take the following steps to make this comparison:

- Create a new row entry to represent the interest parity prediction of the change in the exchange rate, based on the difference between interest rates in this country and the United States: \((i_{US} - i_A)/(100 + i_A)\), or \(=100*(K4 - K9)/(100 + K9)\). Recognize that the interest rates reported in the IMF statistics are given in percentage form. (That is, they are reported as 7%, not 0.07.) Therefore we want 107 in the denominator. Because we want to express our new result in percentage form, too, we multiply by 100.

- Create a new entry row to calculate the actual percentage change in the value of A’s currency. Label this new row “Actual change in value of A’s currency” and in cell L15 the appropriate formula will be \(= 100*(L11 - K11)/K11\).

- Print a table and graph comparing the percentage change in the exchange rate with the interest rate differential.
The interest differential calculated above often does not give a very accurate measure of the actual change in the exchange rate one year from now, because many other changes influence the rate observed then. Nevertheless, the formula we use does represent an equilibrium condition, based on our expectation today of what the exchange rate will be one year in the future.

Another simple indication of monetary policy is to consider whether the country allowed the real interest rate to become negative. Without making a careful comparison to returns available in other countries, we predict that individuals will try to take funds out of the country when returns are negative. That capital outflow would cause a depreciation of its currency. To see whether this possibility applies to your country, make the following calculations to determine the real interest rate.

- Create a new entry row to represent the real interest rate in Austria. In Ecn 111 you probably used the approximation that the real interest rate is just the nominal interest rate minus the inflation rate. For countries with high inflation rates, however, that will be misleading. Therefore, the expression we use is \( \frac{100 \times (i - \Delta P/P)}{100 + \Delta P/P} \), where \( \Delta P/P \) is the percentage inflation rate. Our first entry will be for 1993 in cell L16, because we must calculate inflation based on the change in prices from 1992 to 1993. Our entry is \( \frac{100 \times (L9 - 100 \times (L7-K7)/K7)}{100+100 \times (L7-K7)/K7} \).

- Print a table and graph comparing the percentage change in the exchange rate that you used above with the real interest rate.

### III. Other Important Economic Variables

Conditions for a successful depreciation in part depend upon the size of a country’s marginal propensity to save (mps) relative to its marginal propensity to import (mpm). For example, our models of a Keynesian economy suggest that a high mpm and a low mps will make a depreciation less successful in improving the trade balance even if the economy has many idle resources. The reason is that extra demand for Country A’s goods will generate more income in A and more spending on imports.

A simple model proposed by the IMF assumes that the mpm can be approximated by dividing Imports of Goods and Services by GDP, both measured in the domestic currency. For the data table below, we want “=K10/K8”. Drag this formula across the row.
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You can then take the average of these values which you might label in cell Z17 and then calculate in Y17. Type = in Y17, Click on the \( \text{paste function button, choose “average” as the function, click OK, click on the down arrow by Number 1, select the cells in row 17 where you have calculated the MPM, click the down arrow again, then click OK.} \)

If you want to try some additional ways to measure the mpm, see me for alternatives.

You will note that for Austria two lines have been selected to measure Imports of Goods and Services and GDP. That is because in 1999 Austria adopted the euro as the common currency within the European Monetary Union. The second line, therefore, gives these two values measured in euros for 1999 and subsequent years.

For some countries you may find a very high mpm, perhaps even greater than 1.0. In such cases, it is likely that many imports are used as inputs in the production of goods that will be exported. Thus, a reduction in imports also implies a reduction in exports, and correcting a trade deficit is more complicated than our simple model implies. See me if you get a suspiciously high number for the mpm.

With respect to gross savings in the economy, recall the calculation you made in Exercise 1, where \( \text{GS/GDP = CA/GDP + I/GDP} \). Although this measure is at best an approximation of the concept we would like to know (the amount of extra saving that occurs if income rises by a dollar) use it to calculate an average for the entire period and compare that average to the M/GDP figure in answering question 3.

Part three: Interpretation

1. Based on PPP, did you observe significant periods of overvaluation or undervaluation of your country’s currency over this period, or was any variation between undervaluation and overvaluation much more frequent?

   Does the overvaluation (undervaluation) of A’s currency reflect a major capital inflow (outflow) into the country? What can you find with respect to the financial account of the balance of payments to substantiate that interpretation?

2. We are interested in whether your country offers a high interest rate to offset expected depreciation of its currency (or the risk of such a depreciation, even if it does not occur during that year). Did your second graph show that as the interest rate differential became more negative (your country offered a relatively higher interest rate than in the US), the value of your country’s currency in fact did fall that year or the next year?

   Of course, we cannot observe the expected depreciation directly, and can only calculate the actual depreciation that occurs. Also, the relevance of the interest parity prediction falls under several circumstances that may characterize your country: Does the country controls international capital flows? Is it much riskier holding...
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assets in your country than in the United States? Has the riskiness of US and foreign assets changed over this period?

How successful was your country in maintaining a positive real interest rate over this period? You may find it useful to compare the real interest rate in your country to the real interest rate in the United States (which I will post in my results for Mexico); if savers don’t have a very attractive alternative to invest in the United States, they may not be so anxious to take funds out of your country, even if the real interest rate is negative.

3. What mpm did you find for your country? If a country has a high mpm, explain why it will find income adjustment to a balance of payments deficit less painful than will a country with a low mpm. What mps did you find for your country? If a country has a small mps relative to its mpm, why does that situation suggest that a depreciation that successfully promotes exports nevertheless will not result in much improvement of the trade balance?