FOREIGN EXCHANGE RATES.

Several candidates have done student projects on foreign exchange rates. You can do a regression analysis student project on purchasing power parity and interest rate parity. These concepts are discussed in the macroeconomics on-line course as well as on the actuarial exams. You can then do a time series student project fitting the residuals from your regression model to an ARIMA process.

We show eleven time series for foreign exchange rates on the attached Excel spread-sheet. The time period is January 4, 1994, to August 15, 1997. Once the Euro was adopted by Western European countries, many of these currencies ceased to exist.

These are stable countries with no serious political or economic changes during the period of the time series. They trade relatively freely with the United States and their currencies float. Their interest rates and inflation rates are similar but not identical. No country had severe (or run-away) inflation, but their rates differ by up to 5% in some years.

These currencies are an excellent data sample to test purchasing power parity and interest rate parity. Financial economists argue about the strength of these parity relations. This project template gives suggestions for student projects. You must decide the specifics of your project, collect data, state hypotheses, form regression models or time series models, and test the hypotheses.

The instructions here are general. We avoid giving too much information so that you can design the project yourself. You can change any piece or choose a different hypothesis.

(0) Define your data sets and the parity relations you will test. For instance, your student project should test *relative* purchasing power parity, not absolute purchasing power parity. In your write-up, explain what these terms mean and state clearly the null hypothesis.

(1) Choose a currency or currencies and collect data. Search the internet for interest rates and inflation rates in the foreign currency. The interest rates and inflation rates for the United States are on the NEAS web site, but you may want to use a different index for the U.S. as well.

You don't have to use these currencies. You can use Euro - Dollar exchange rates in the 2000's, along with Euro and dollar interest rates or inflation rates.

Illustration: Since 2000, the U.S. has had lower risk-free interest rates and lower inflation rates than the Euro countries. We would expect the dollar to appreciate relative to the Euro over these years. In the first year after the Euro was introduced, the dollar did appreciate. The strong U.S. economic growth compared to Western Europe and the looming public pension problems in European states with falling populations also support an appreciating dollar. Instead, the Euro is at its *highest* exchange rate relative to the dollar.

If you want a more ambitious student project, collect forward exchange rates and regress the forward exchange rates on interest rates or inflation rates as well. Interest rate parity has a stronger effect on the forward exchange rates than on the actual exchange rates.

(2) Purchasing power parity and interest rate parity are multiplicative models. Take logarithms of all values to transform the multiplicative model into an additive model. If the interest rate is 5%, use $ln(1.05)$.

You are predicting the change in the foreign exchange rate, or the ratio of the current exchange rate to the previous exchange rate. You can take ratios of the foreign exchange rates, or you can take logarithms of the foreign exchange rates and first differences.

(3) Regress the first differences of the logarithms of the exchange rates on the logarithms of the interest rates (or inflation rates). You have daily exchange rates and monthly interest rates. Average the exchange rates in the month or use the first exchange rate in the month.

(4) Compare the model for interest rate parity with the model for purchasing power parity. Many financial economists believe interest rate parity is more powerful than purchasing power parity. See if the regression model fits better for interest rate parity.

(5) Determine your null hypothesis. If your null hypothesis is that interest rate parity or purchasing power parity is true and entirely explains foreign exchange rate movements, the betas are compared to ±1. If your null hypothesis is that foreign exchange rates movements have nothing to do with interest rates or inflation rates, the betas are compared to zero. State what you are testing and what your conclusions are. (See the next paragraph for hypotheses that better portray interest rate parity and purchasing power parity.)

(6) Even if other items affect foreign exchange rates, interest rate parity and purchasing power parity assume the two betas are of opposite signs and equal magnitude. If one beta is +0.800 and other beta is –0.800, interest rate parity may explain 80% of the change in the foreign exchange rate. Use an F ratio to test if this hypothesis is true. State exactly the constrained and unconstrained regression equations. Even if interest rate parity does not explain much of foreign exchange rate movements, this F ratio may still support the null hypothesis.

(7) If interest rate parity (or purchasing power parity) is correct and entirely explains foreign exchange rate movements, the two betas should be +1 and –1. This hypothesis is less likely to be supported, but you should test it.

(8) Don't hesitate to use other currencies or time periods. Use currencies which float and whose countries have open economies (free trade). It is easier to form models of the U.S. - Japan foreign exchange rate than of the U.S. - China foreign exchange rate.

(9) The currencies on the attached Excel spread-sheet are

AUD: Australian dollar

BEF: Belgian franc
ESP: Spanish peseta
DEM: German mark
DKK: Danish Krone
FRF: French franc
GBP: British pound
ITL: Italian lira
SEK: Swedish krona
CHF: Swiss franc
NLG: Dutch Guilder

(10) You can do a student project on a currency that has had a major re-valuation by comparing the periods before and after the re-valuation. Many Latin American and Asian countries had currency crises in the past ten years,