Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ECO 141

Berkeley ID\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ *Spring 2016*

**Homework 3**

1. *The Economist* regularly publishes data on the so called Big Mac index and exchange rates between countries. The data for 45 countries published on the July 16, 2015 is listed in the file BigMac.xls.

The concept of **purchasing power parity** or **PPP** (“the idea that similar foreign and domestic goods … should have the same price in terms of the same currency,” Abel, A. and B. Bernanke, *Macroeconomics*, 4th edition) suggests that the ratio of the Big Mac priced in the local currency to the U.S. dollar price should equal the exchange rate between the two countries.

**(a)** Calculate the predicted exchange rate per U.S. dollar by dividing the price of a Big Mac in local currency by the U.S. price of a Big Mac.

**(b)** Run a regression of the actual exchange rate on the predicted exchange rate. Write down your regression output in a normal form. Include regression output generated by your regression analysis program.

**(c)** Interpret the coefficient of determination.

**(d)** If purchasing power parity held, what would you expect the slope and the intercept of the regression to be? Is the value of the slope and the intercept “far” from the values you would expect to hold under PPP?

**(e)** State the *two* null hypotheses under which PPP holds. Should you use a one-tailed or two-tailed alternative hypothesis?

**(f)** Test these hypotheses using a 5% significance level. Are you concerned with the fact that you are testing the two hypotheses sequentially when they are supposed to hold simultaneously?

**(g)** How would your answers change in the presence of *Heteroskedasticity*?

**(h)** What assumptions had to be made for you to use Student’s *t*-distribution?

1. Suppose you were given a task of evaluating the performance of a particular stock by estimating stock’s beta. A stock’s (or portfolio’s) *β* (beta) is a measure of the volatility of that stock relative to the volatility of the market—therefore, the market has a *β* equal to one. For individual securities, *β* can take on any value, negative or positive.

Some basic facts about *β*:

* If an individual security has *β* = 1, then that security tends to move in line with the market.
* If *β* = 0 the returns on the security are uncorrelated with returns of the market.
* If 0 < *β* <1 the security tends to move in the same direction as the market, but is less volatile than the market.
* If *β* >1 the security tends to move in the same direction as the market, but is more volatile than the market.
* If *β* < 0 the security tends to move in the opposite direction of the market. Above average returns on the market would tend to be associated with below average returns on the security and vice versa.

A stock’s *β* is calculated from a least-squares regression of the returns of the stock on the returns of the market. If *Rst* is the return of the stock on day *t*, *Rmt* is the return of the market at time *t* and *Rf* is a risk free return, then we ﬁt the linear regression model



and use the estimate of the slope as the *β* for the stock.

In this exercise you will calculate β for “YOUR stock” using all available data from February 2, 2015 to present. We will use the returns of the S&P 500 to serve as our “market returns” in the calculation and the return on three month treasury bonds as a risk free return. The steps below walk you through the calculation.

**(a)** Find and download the daily closing values of the S&P 500 and YOUR stock for the time period starting Feb 2, 2015 and ending Feb 2, 2016 from the internet. Import both data sets into a spreadsheet. What website did you use to download the data?

**(b)** Calculate the daily percentage returns for the S&P 500 and YOUR stock. The daily percentage return for day *t* is:

where *v*t is the closing value of the security on day t. What was the daily percentage return of the S&P 500 on January 20, 2016?

1. Create a new data series measuring excess market return  and excess return on YOUR stock.
2. Produce a scatterplot of the excess return of YOUR stock versus the excess market returns on S&P500. Com­ment on the strength, direction, and form (e.g., linear, quadratic, non-linear) of the scatterplot. Copy and paste the scatterplot into your document.
3. Use OLS regression to estimate the *β* for YOUR stock. Include all relevant information about the regression equation. Interpret both *α* and *β* of YOUR stock.
4. Comment on statistical significance of estimated coefficients.
5. Graph the data points and the estimated regression line. Does the regression error appear to be homoskedastic or heteroskedastic? Explain
6. Compute the correlation coefficient between *excess market return* and *excess return on* YOUR *stock*, and compare its square to the R2. How are the correlation coefficient and the R2 related?
7. Is YOUR stock more volatile than the market? Prove it.
8. Use the information above to ﬁnd the predicted (ﬁtted) percentage return of YOUR stock when the percentage excess market return on the S&P 500 is 1%.
9. You are on the airplane going to the meeting to report your findings. The colleague of yours claims that the risk free rate you chose is incorrect. He proposes you adopt two alternative methods of compensating for the error. You are unable to run new regressions as you don’t have access to Stata/Gretl on the plane but you do need to update your results, namely the numbers on *α* and *β* of YOUR stock. For each of the methods below evaluate the impact of the adjustments on the regression results (on *α* and *β*)

**(k.1)** **(10 p.)** You can add 0.05% to the data for both *Y* and *X* for each observation.

**(k.2.) (10 p.)** You can increase the figures for both *X* and *Y* by 10 percent.

YOUR stock - is any stock that starts with the 1st letter of your Last name

For example: For Evgeniya Duzhak

“YOUR stock” is *DIS* for Walt Disney