

Economics 487

Homework #6

The Joint Distribution of Stock Returns

Due Thursday 12/3

In this homework assignment, you will investigate the empirical validity of a number of statistical assumptions about the joint distribution of returns that underlie the CAPM analysis. In particular, you will examine whether CAPM parameters are stable over time, whether CAPM residual variances are constant over time, whether returns and residuals are normally distributed, and whether returns are correlated across time.

The data for the Excel exercises are available in the hw6.xls file.

ibm	Monthly returns on International Business Machines from 1987:1-2006:8
msft	Monthly returns on Microsoft from 1987:1-2006:8
market	Monthly returns on the S&P 500 index from 1987:1-2006:8
rktfree	Monthly returns on 3 month T-bills from 1987:1-2006:8

Data are continuously compounded.

A. Excel Exercises: (10 points)

1. Test the stability of the parameters (α and β) for the *excess return* market models of ibm and msft over the full sample of January 1987 – August 2006. Specifically, for both companies, use a Chow test for a breakpoint in December 1996 to determine whether the parameters change between the two subperiods of January 1987 – December 1996 and January 1997 – August 2006. You can construct your F-statistics using dummy variable regressions or by conducting separate regressions for the two subperiods. Use a 5% significance level. What do your results imply about whether return covariances are constant across the full sample?
2. Test whether the error terms in the full sample regressions (1987-2006) are homoskedastic (constant variance). In particular, use the White test and a 5% significance level. Construct the heteroskedasticity standard errors *regardless* of whether you find evidence of heteroskedasticity.
3. Test the normality of the return data using the Jarque-Bera (JB) statistic. Plot the histograms for the four return series. Comment on your results. Then, test the normality of the estimated residuals from the full sample regressions (1987-2006) using the JB statistic. Plot histograms for the two residual series. Comment on your results.

4. In this exercise, you will test for predictability of nominal asset returns (not excess returns) across time.
 - a. Compute and plot the 12 lag sample autocorrelation functions for the four return series using the full data sample. Comment on any statistically or economically significant autocorrelations. Do the returns of any of the assets appear to be predictable from their past returns? Are your results consistent with the random walk hypothesis? Remember to plot the 95% confidence bands for the autocorrelations.
 - b. Compute and plot the 12 lag sample cross-correlation functions for the pairs (ibm, msft), (ibm, market), and (msft, market). Comment on any significant cross-correlations. Do the returns of any of the stocks appear to be predictable from past returns on any of the other stocks?
 - c. Compute and plot the 12 lag sample autocorrelation function of the residuals from the full sample regressions (ibm and msft). Use the Box Q statistic to test the null hypothesis that the residuals are not autocorrelated at up to 12 lags

B. Reading Assignment: (10 points)

1. Discuss the findings in Campbell, Lettau, Malkiel, and Xu (2000) regarding the changes in market, industry, and idiosyncratic volatility over the last 40 years. Given the CAPM, why would anyone care about idiosyncratic volatility? What is a plausible explanation for why idiosyncratic volatility has changed?
2. Read through Part Four of [A Random Walk Down Wall Street](#). As you read, take notes of what each chapter is about. Write up an executive summary of each chapter. An executive summary should cover the main points of raised by the author without assuming that your reader has read the text. You can also comment on how effectively you think points are presented. The total write-up should be between 2-4 pages (typed and double-spaced).