Problem Set 2.

Testing Capm in long-run buy-and-hold portfolios

In this problem set you are going to test the CAPM using historical US stock prices.

Step 1: Download the CRSP monthly dataset including the variables for:

1. Monthly returns including dividend distributions
2. Share Price
3. Common Shares Outstanding
4. Share code
5. CRSP permanent company identifier (Permno and or Permco)
6. Delisting return
7. Date
8. CRSP value-weighted index returns

Keep only companies with share code < 13 (US common equities)

Step 2: Construct the sample.

The sample will consist of the 500 largest firms by market capitalization (price*shares) in each of 8 time periods give in the table below. Also, please require 36 non-missing return observations in the three-year beta estimation window. For example, for the 1990 sample find the 500 largest market capitalization firms with 36 non-missing return observations over 1988-1990 inclusive. You should have a total sample of 8*500=4,000 firm-period unit observations.

Step 2: Pre-calculate firm level betas.

For your sample, using three-year windows for the following 8 sample periods, estimate firm level market betas by regressing firm level returns on the value weighted CRSP portfolio return.

	Beta Estimation		Holding Period	
Period	Start	Finish	Start	Finish
1	1973	1975	1976	1980
2	1978	1980	1981	1985
3	1983	1985	1986	1990
4	1988	1990	1991	1995
5	1993	1995	1996	2000
6	1998	2000	2001	2005
7	2003	2005	2006	2010
8	2008	2010	2011	2015

For each firm-level regression, collect estimated market betas and the number of observations. Keep only those firms with 36 monthly observations over the three-year window (this should be redundant if you constructed your sample right!). Using the estimated market betas, sort the sample into 10 portfolios based on beta from portfolio 1 (lowest betas) to portfolio 10 (highest betas).

Step 3: Construct portfolio betas

Take the 10 beta-sub-samples you formed each period based on the firm level beta estimates and form 10 value-weighted monthly portfolios for each three-year window. Remember, the weights for each monthly return should be based on the previous month market capitalization. Be sure the weights sum to one each period! You should now have 10 time-series of monthly beta-portfolio returns in each period for a total of 10portfolios*36months*8periods=2,880 observations.

For each of the 10-beta portfolios each estimation period, estimate portfolio level market betas by regressing the 36 monthly beta-portfolio returns on the value weighted CRSP portfolio return. You should now have 10portfolios*8periods=80 estimated portfolio betas. Keep these someplace safe.

Step 4: Calculate buy-and-hold portfolio returns

Now, let's go back to the return data and calculate the [t+1,t+60] month value weighted holding period returns for each period. Using the same beta portfolio definitions, calculate the value weighted returns to each portfolio over the next 5 years. For example, in 1990, you should have a sample of 200 firms sub-divided in 10 portfolios based on their past 3-year-monthly betas. Form a value-weighed portfolio return for each of the 10 portfolios over the period 1991-1995, again being sure to use the December 1990 market capitalization weights as your first portfolio weight for the January 1991 return, etc. Take the arithmetic average of your portfolio return over the 5-year holding period.

Step 5: Test the CAPM

You should now have a sample of 80 observations with 80 pre-holding period betas and 80 average 5-year buy-and-hold arithmetic average returns. Test the CAPM by using the betas to explain the variation in returns. Does the CAPM hold?