**University of California, Los Angeles**
**Department of Statistics**

**Statistics C183/C283** **Instructor: Nicolas Christou**

**Project** 4

Please answer the following questions assuming the single index model holds:

a. Use your project data in the period 01-Jan-2012 to 01-Jan-2017

   1. Compute estimates for $\alpha_i, \beta_i, \sigma^2_{\epsilon_i}$, $i = 1, 2, \ldots, 30$ by regressing each stock's return on the $S\&P500$.
   2. Construct the $30 \times 30$ variance covariance matrix based on the single index model.
   3. Answer the same question as in project 2, part (b), question (1) using the new inputs from (1) above. Draw the frontier on the same plot as in project 2. Now you will have two frontiers, one using the historical variance covariance matrix (project 2) and one using the variance covariance matrix with inputs from the single index model.

b. Adjusting the betas:
   Adjust the betas using Blume's and Vasicek's techniques. For the Blume technique use the two periods: 01-Jan-2012 to 01-Jan-2017 and 01-Jan-2017 to 31-Mar-2020. For the Vasicek technique use only the period 01-Jan-2012 to 01-Jan-2017.

   Note:
   For the Blume technique our goal is to adjust the betas in 01-Jan-2017 to 31-Mar-2020 to be better forecasts for the betas in period 01-Aor-2020 to 01-Apr-2024.

   For the Vasicek technique our goal is to adjust the betas in 01-Jan-2012 to 01-Jan-2017 to be better forecasts for the betas in period 01-Jan-2017 to 31-Mar-2020. Compute `PRESS` only for the Vasicek technique. (You can compute the `PRESS` only for the Vasicek technique because you have the actual betas in the period 01-Jan-2017 to 31-Mar-2020.)