# FINA4380 Stock Return Model

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## 1 Our model

We model return of stock i as

$$r_i = \beta_{i0} + \beta_{i1}PC_1 + \beta_{i2}PC_2 + \beta_{i3}PC_3 + \beta_{i4}PC_4 + \beta_{i5}PC_5 + \varepsilon_t$$

where $PC_i$ is the ith principal component obtained by PCA and $\beta_i$ is state variable that follows random walk. We select the first n (not necessarily 5) principal components such that the proportion of variance explained exceeds 0.9.
We assume that

$$y_{it} = \mu + \sum_{j=1}^{p} a_i y_{t-j} + \sum_{j=1}^{q} b_j \varepsilon_{t-j} + \varepsilon_{it}$$

$$\varepsilon_{it} = \sigma_{it}\epsilon_{it}, \quad \sigma_{it}^2 = \alpha_{i0} + \sum_{j=1}^{m} \alpha_{ij}\varepsilon_{it}^2 + \sum_{j=1}^{s} \beta_{ij}\sigma_{i,t-j}^2$$