

An Out-of-Sample Test of the *CAPM*

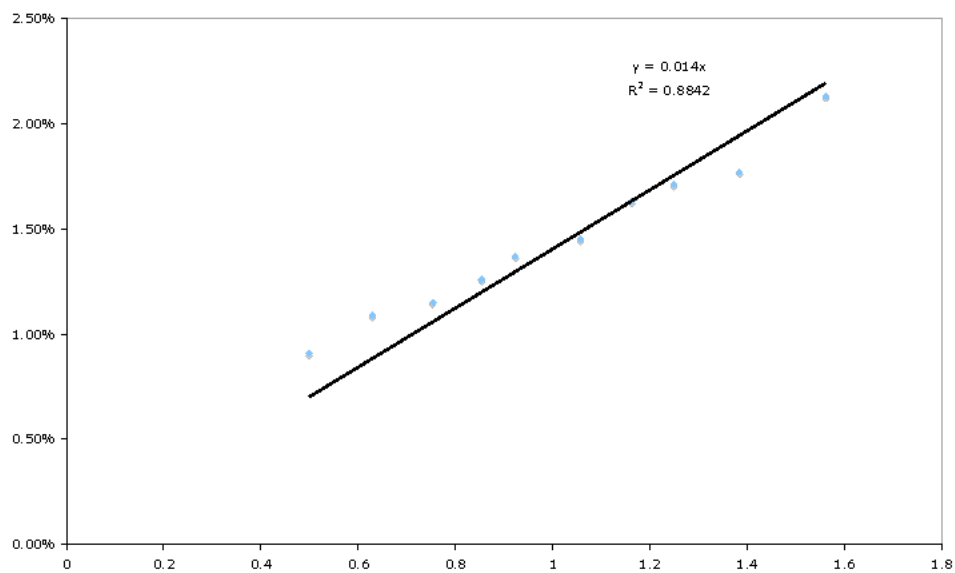
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1 Portfolio creation in CAPM tests

Cross sectional tests: measurement error of $\hat{\beta}_i$ generates $\hat{\gamma}_1 < \gamma_1$. Create portfolios.

$$\bar{z}_i = \gamma_0 + \gamma_1 \hat{\beta}_i + \tilde{u}_i$$

Figure 1: Black Jensen Scholes (1972) Results



Multivariate Tests: Gibbons, Shanken, and Ross (1989)

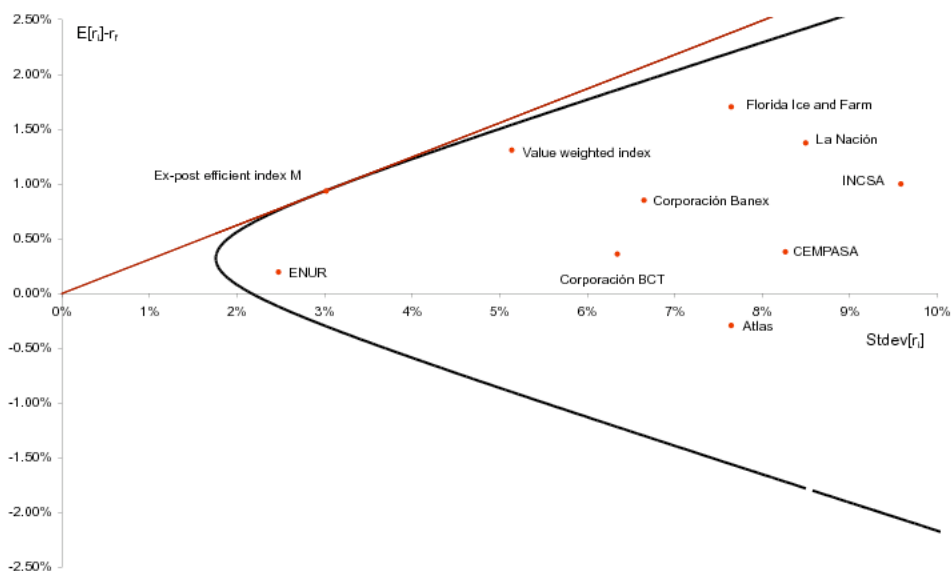
$$J_1 = \frac{T - N - 1}{N} \left(\frac{\hat{S}R_q^2 - \hat{S}R_m^2}{1 + \hat{S}R_m^2} \right) \sim F_{N, T-N-1}$$

$$\hat{S}R_q = \sqrt{z'V^{-1}z}$$

Where V is an $(n + 1) \times (n + 1)$ variance-covariance matrix estimate, and z is an $(n + 1) \times 1$ vector of the sample excess returns. For the invertibility of V we need $\Rightarrow N < T - 1$. Create portfolios.

$$J_1 = \frac{51}{8} \left(\frac{0.1026 - 0.0647}{1.0647} \right) = 0.2274 < 3.0186$$

Figure 2: GRS Test, Costa Rican Stocks



Portfolio creation & data snooping: sort on attributes x_i (size, book to market value ratios) related to $\hat{\alpha}$. Suppose that the sample correlation ρ between x and $\hat{\alpha}$ is nonzero; if the null hypothesis is true ($\alpha = 0$), then ρ measures a correlation with the measurement error $\hat{\zeta}$. Suppose that we created N portfolios based on ranked values of x . This will create an induced order statistic $\hat{\alpha}_{[i_j; N]}$, where j represents the relative rank for a given asset. Lo and MacKinlay 1990

find:

$$\hat{\alpha}_{[i_j;N]} \stackrel{d}{\sim} N(\rho\sigma_\alpha\Phi^{-1}(\xi_j), \sigma_\alpha^2(1-\rho^2))$$

2 United States Data: 1900-1914

2.1 Risk free rates

Before 1948 there were no monthly T-Bills.

Table 1: Yields for Selected Bonds, 1900-1914

Bond	US 2s 1930	US 4s 1925	DC 3.65 1924	C. Bonds	C. Paper
Begins	April 1900	Jan 1900	Jan 1900	Jan 1900	Jan 1900
Ends	Jun 1914	Jun 1914	Nov 1911	June 1914	Jun 1914
Average	1.83	2.32	2.43	3.70	5.57
Maximum	2.28	2.96	3.08	4.24	7.60
Minimum	1.55	1.84	2.07	3.24	4.15
St Dev	0.15	0.34	0.22	0.28	na

Sources: US 2s, 1930; US 4s, 1925; DC 3.65s 1924: New York Times, various issues. C. Bonds = Prime Corporate Bonds, Homer & Sylla (1996), Table 45. C. Paper, Prime Commercial Paper, Table 49.

The second point that we need to establish is the relationship between short and long term rates. The only data that we have to calculate a yield curve comes from debt instruments issued by New York City, which span a wide range of maturities. The difference in yields between the shortest (6 months) and longest (4 48-49 year bonds) is 76 basis points.

Figure 2 shows the risk free yield constructed by averaging the yields of the two US government bonds.

2.2 Questions

1. Flat Yield Curve & Gold Standard
2. NYSE v. Curb Stocks
3. Impossibility of Cross sectional tests serious errors in variables bias
4. Test of Fama-French Factors

Figure 3: Yield Curve, New York City April 20, 1908

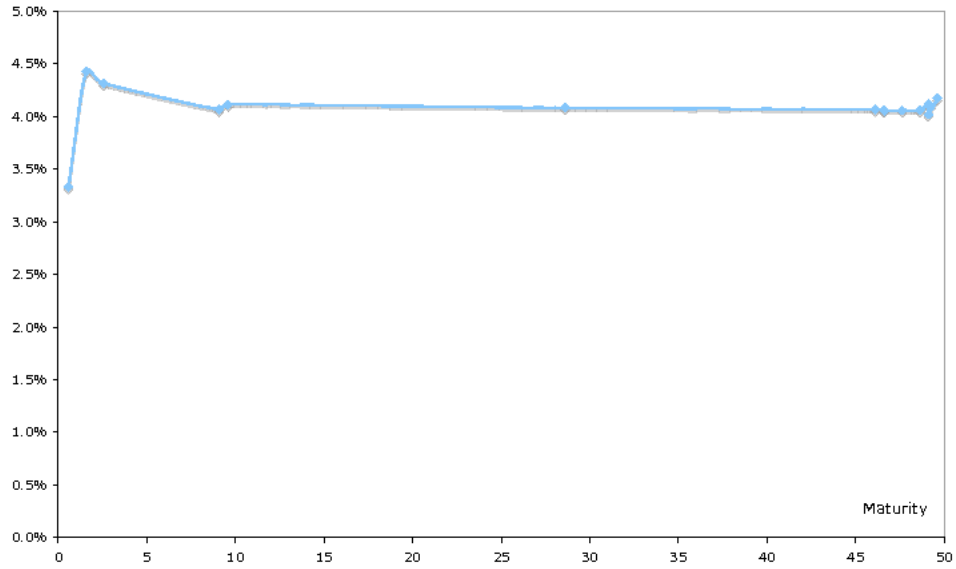


Figure 4: Risk Free Rate, Estimated Time Series 1900-1914

