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Computational Investing, Part I

071: Capital Assets Pricing Model

Find out how modern electronic markets work, why stock prices change in the ways they do, and how computation can help our understanding of them. Learn to build algorithms and visualizations to inform investing practice.

Objectives:

- Understand assumptions of the CAPM.
- Understand implications of the CAPM.
- Reading: Grinold & Kahn, chapter 2

Live Market Example

Remember the Island?

Capital Asset Pricing Model

- Introduced by Jack Treynor, William Sharpe, John Lintner and Jan Mossin (1966).
- Sharpe, Markowitz and Merton Miller jointly received the Nobel Prize.

CAPM: Assumptions

- Return on stock has two components:
 - Systematic (the market)
 - Residual
- Expected value of residual = 0
- Market return:
 - Risk free rate of return +
 - Excess return

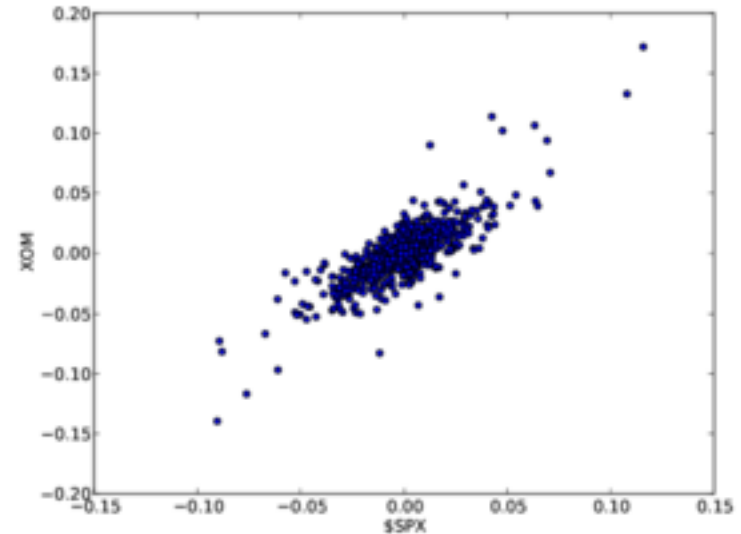
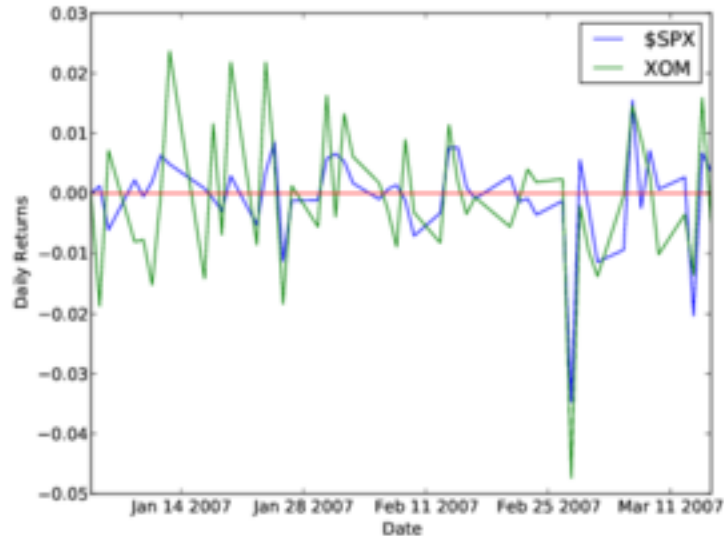
The Market Portfolio

- Usually broad market-cap weighted index
 - US: S&P 500
 - UK: FTA
 - Japan: TOPIX
- Remember our company that printed \$1 bills?
- Island analogy.

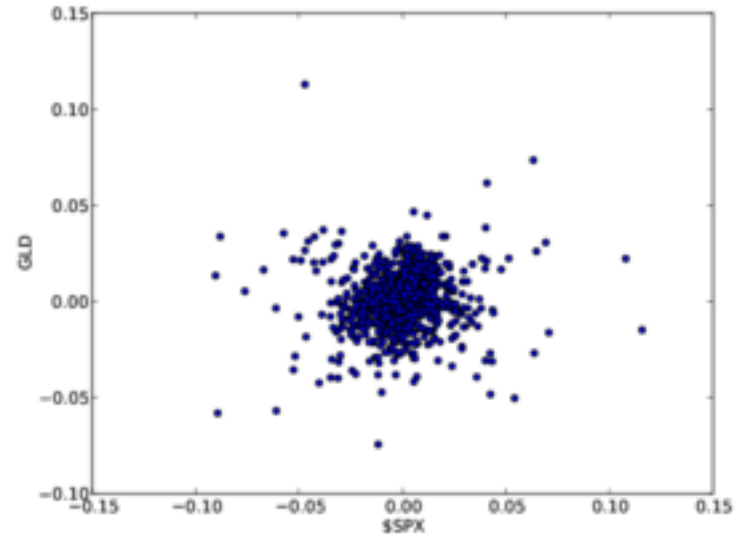
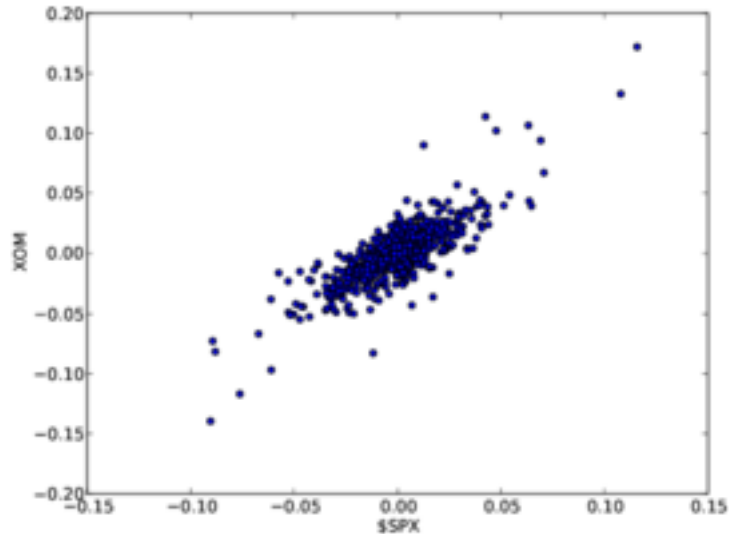
Next Time

More formalities

Beta & Correlation with the Market



Beta & Correlation with Market



CAPM: Definition of Beta

- ⊙ Assume:

- $r_p(t) = \text{beta}_p * r_m(t) + \text{alpha}_p$

- ⊙ Use linear regression (line fitting) to find beta and alpha.

CAPM: Residual = 0

- $r_p(t) = \text{beta}_p * r_m(t) + \text{alpha}_p$
- $r_p(t) = \text{beta}_p * r_m(t)$

CAPM: Implications

- Expected excess returns are proportional to beta.
- beta of a portfolio = weighted sum of betas of components.