Multi-Factor Models / Fama-French
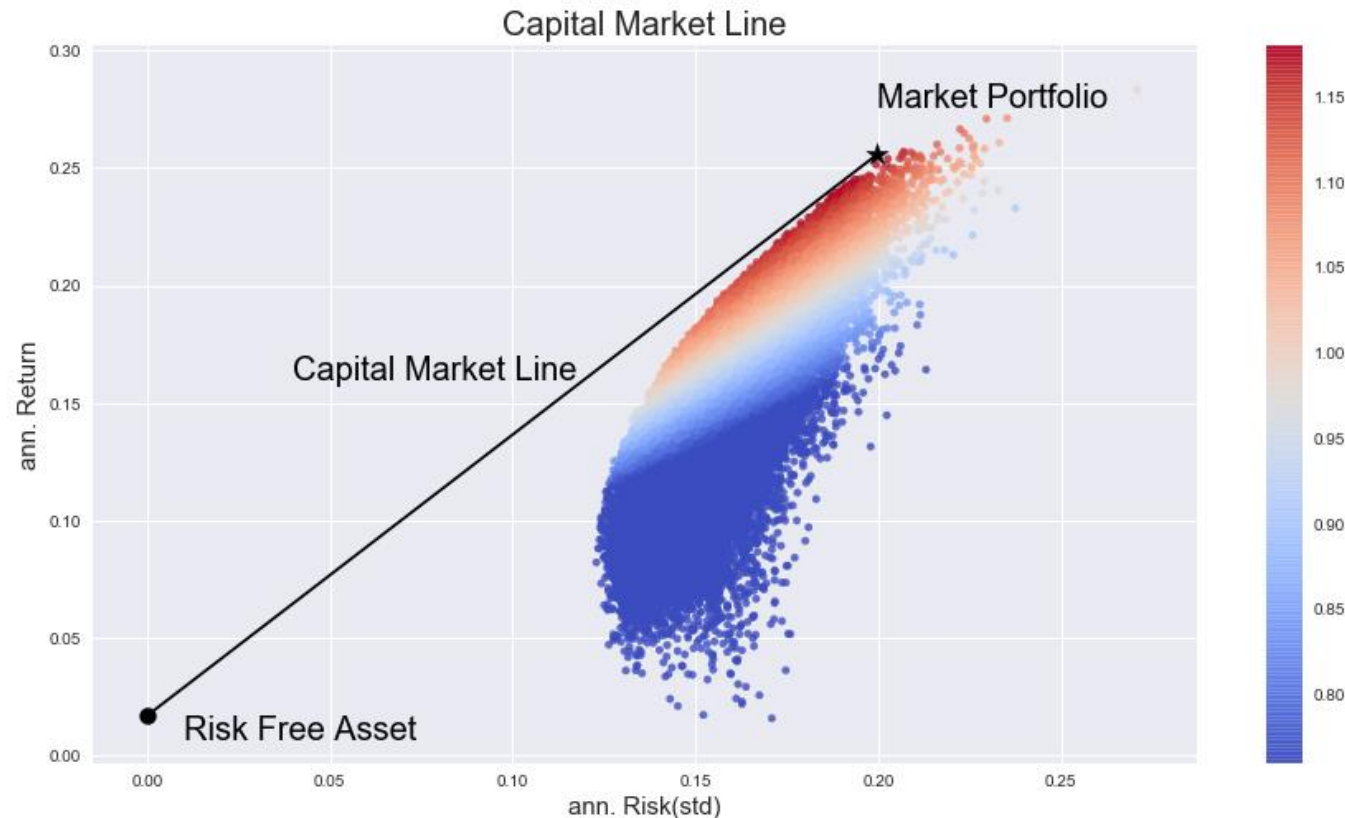

Which Factor(s) drive Stock/Portfolio Returns?

Multi-Factor Models
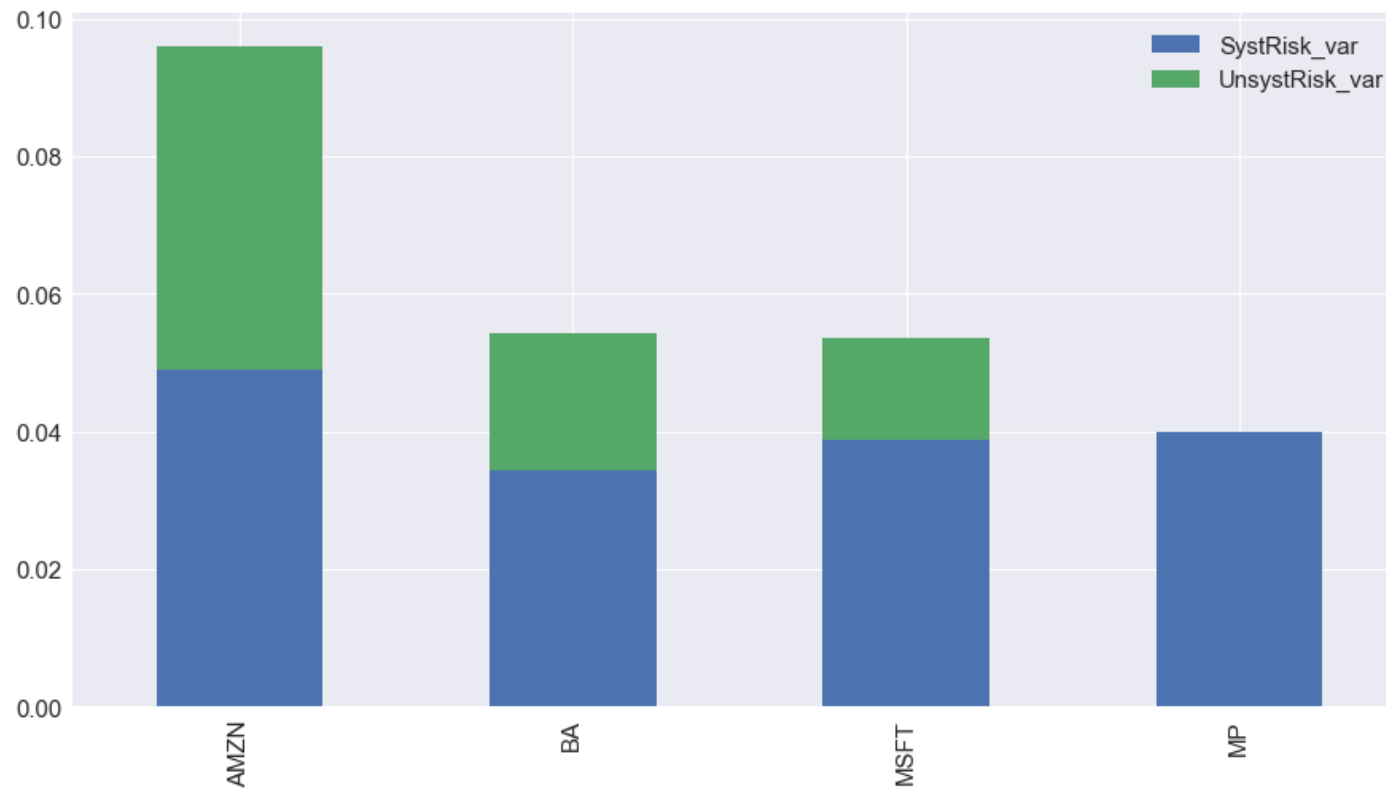
Recap: Portfolio Theory & CAPM

To maximize Portfolio Performance (Sharpe Ratio) all (rational) Investors should hold a combination of the Risk-Free Asset and the Market Portfolio.
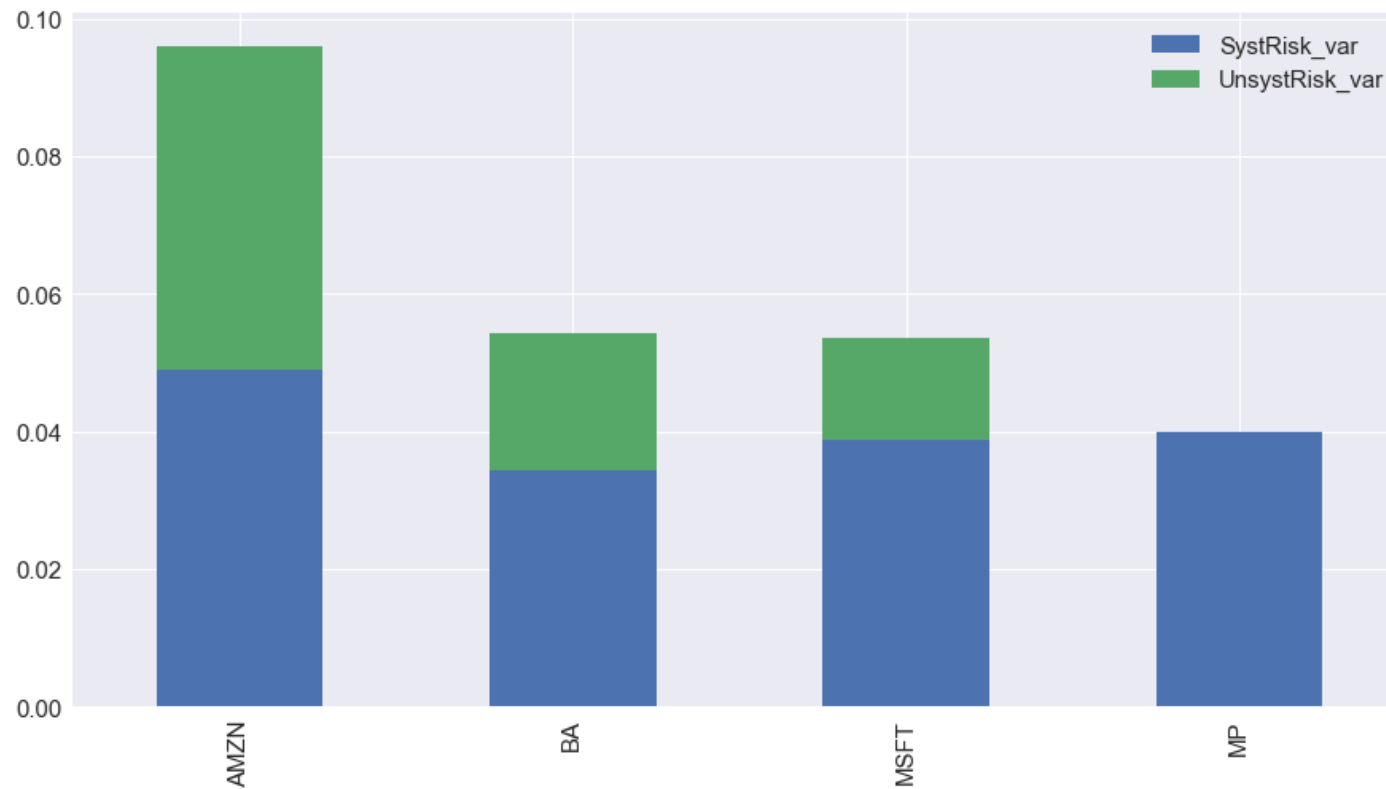
Recap: Portfolio Theory & CAPM

Unsystematic (company-specific) Risk can be fully diversified/eliminated in the Market Portfolio.

Recap: Portfolio Theory & CAPM

> Stock Returns should solely depend / be explained by the Market Risk (Systematic Risk). Market Risk is measured by the Beta-Factor.
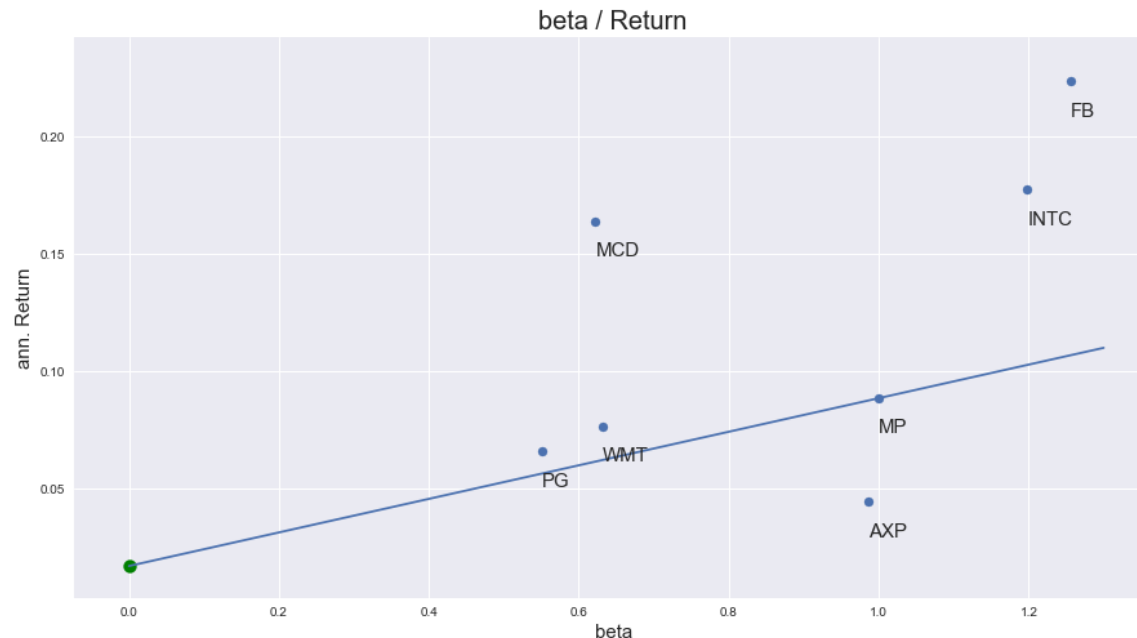
Recap: Portfolio Theory & CAPM

- All Stocks should be located on the Security Market Line (SML).

$$\text{CAPM: } StockReturn = r_f + \left(MarketReturn - r_f\right) * beta$$

- The Distance of actual Returns to SML is the Stock´s Alpha (Excess / Abnormal Return).

- Alpha should be random and should not persist over longer time periods (non-significant).

Recap: Portfolio Theory & CAPM

Another Interpretation of the Beta-Factor: Slope of Regression Line between Stock Returns and Market Portfolio Returns (Market Model)

$$MSFT_i = intercept + beta * MarketReturn_i + \varepsilon_i$$
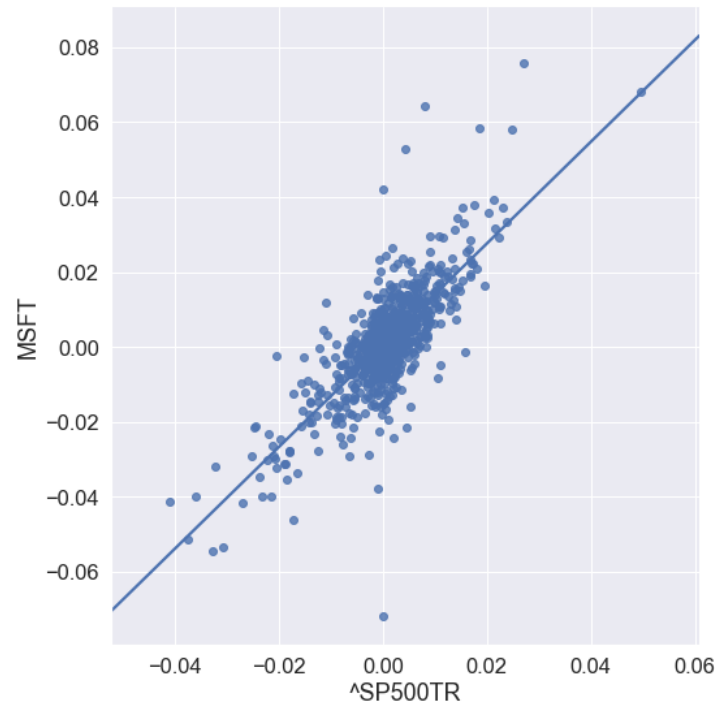
Market Model vs. CAPM

Market Model

- No underlying Theory

- Linear Regression between Stock Returns and Market Returns

$$StockReturn_i = intercept + beta * MarketReturn_i + \varepsilon_i$$

- Slope coefficient: A Stock´s Beta-Factor

- Intercept coefficient: Expected Stock Return if Market Return == 0

- Pro: Does not require risk-free return of risk-free Asset (e.g. US Treasury) to calculate a Stock´s Beta

Market Model vs. CAPM

CAPM

- Based on Portfolio & Asset Pricing Theories/Models

- CAPM-Formula (SML):

$$StockReturn = r_f + (MarketReturn - r_f) * beta \ (+alpha)$$

- Rearranged CAPM:

$$(StockReturn - r_f) = (MarketReturn - r_f) * beta \ (+alpha)$$

$$StockPremium = MarketPremium * beta \ (+alpha)$$

- Linear Regression Model:

$$StockPremium_i = alpha + beta * MarketPremium_i + \varepsilon_i$$

- Slope coefficient: A Stock´s Beta-Factor

- Intercept coefficient: A Stock´s Alpha (Excess / Abnormal Return)

But: CAPM is incomplete

Fama-French
Multi-Factor Models

The Evidence:

Positive / negative Alphas can persist over longer time periods (significant).

(Potential) Reasons:

- Markets are not efficient (stock prices do not reflect all publicly available information)

- Investors are not rational

- Expectations of Investors differ

- Hard to determine the "Market Portfolio"

- Portfolio Theory / CAPM (falsely) assume normality of Returns (Fat Tails not reflected)

- There are multiple (less theoretically grounded) factors that determine/drive Stock Returns.

Fama-French Multi-Factor Models

- Created by American economist & researchers Eugene Fama and Kenneth French

- Two of the most influential economists (academic contributions to Asset Pricing, Market Efficiency)

- Nobel Memorial Prize in Economic Sciences for Fama in 2013

- Fama-French Three-Factor Model (1992)

- Fama-French Five-Factor Model (2015)

- Large Database on Website

  http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/index.html