The Men Behind Capital Asset Pricing Model

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School of Mathematical Sciences

18th March 2017

Outline

Capital Asset Pricing Model

Formula

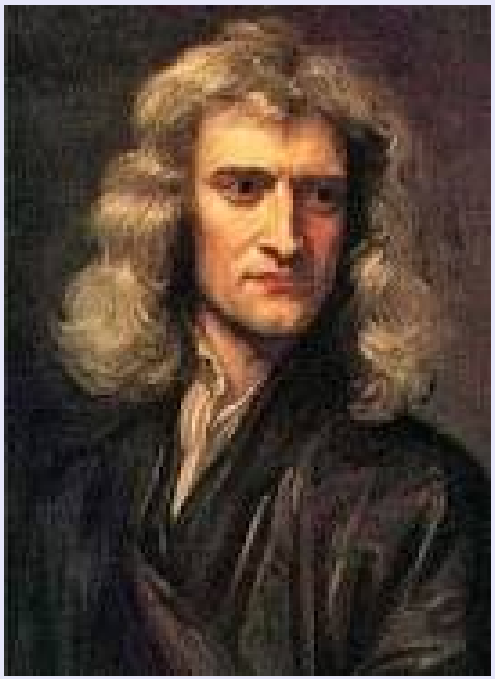
$$E[\tilde{r_q}] - r_f = \beta_{qm}(E[\tilde{r_m}] - r_f)$$

where

$E[\tilde{r_q}]$	the expected return on the capital asset
$E[\tilde{r_m}]$	the expected return of the market
r_f	the risk-free rate of interest
β_{qm}	$\frac{Cov[\tilde{r_q}, \tilde{r_m}]}{Var[\tilde{r_m}]}$

Coincidence in Scientific Thought

In the 17th century...



Isaac Newton

Gottfried Leibniz

Coincidence in Scientific Thought

In the 20th century...

Jack Treynor(1962)

William F.Sharpe(1964)

John Lintner(1965)

Jan Mossin(1966)

Coincidence in Scientific Thought

1990 Nobel Memorial Prize in Economics

William F.Sharpe

Markowitz

Merton Miller

Coincidence in Scientific Thought

why?

Markowitz's work

Portfolio Selection(1952)

PORTFOLIO SELECTION*

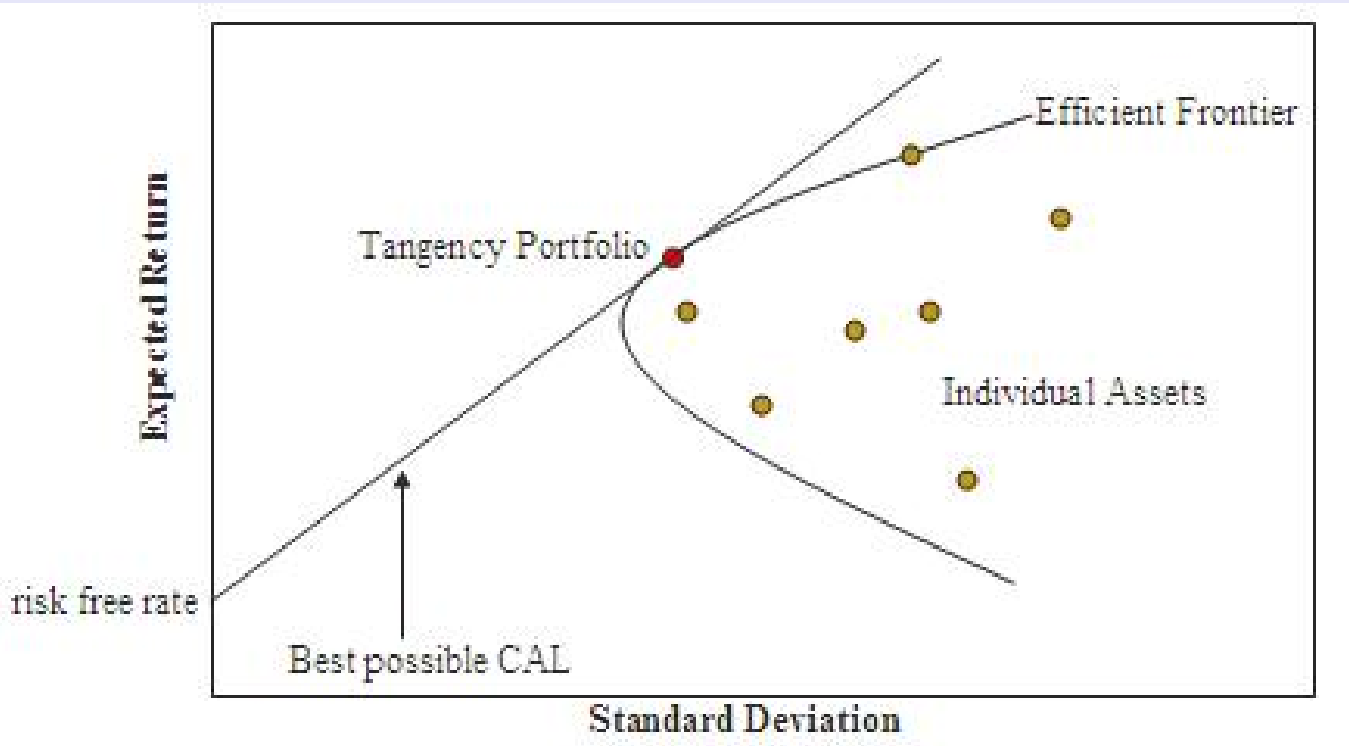
HARRY MARKOWITZ
The Rand Corporation

THE PROCESS OF SELECTING a portfolio may be divided into two stages. The first stage starts with observation and experience and ends with beliefs about the future performances of available securities. The second stage starts with the relevant beliefs about future performances and ends with the choice of portfolio. This paper is concerned with the second stage. We first consider the rule that the investor does (or should) maximize discounted expected, or anticipated, returns. This rule is rejected both as a hypothesis to explain, and as a maximum to guide investment behavior. We next consider the rule that the investor does (or should) consider expected return a desirable thing *and* variance of return an undesirable thing. This rule has many sound points, both as a

Markowitz's work

Modern portfolio theory(mean-variance analysis)

assembling a portfolio of assets such that the expected return is maximized for a given level of risk, defined as variance.



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- "The Cost of Capital, Corporation Finance, and the Theory of Investment."
- the connections between a firm's capital structure and its cost of capital or discount rate.
- need to determine the correct discount rate

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5. exchange papers with Sharpe
6. "I thought that if Sharpe was going to publish, what's the point of my publishing my paper?"

William Sharpe(1964)

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3. asked Markowitz for a dissertation topic
4. the final chapter of the dissertation(CAPM)
5. "Although Harry was not on my committee, he filled a role similar to that of dissertation advisor. My debt to him is truly enormous."

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5. the most mathematically impressive

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2. when he began work on CAPM?
3. did he know about the other three men’s work?

Comparison

- Treynor: capital budgeting, cost-of-capital issues
- Sharpe: optimum portfolio selection
- Linter: the concern of a firm issuing equities.
- Mossin: specifying equilibrium conditions in the asset market.

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- If Jack Treynor published his work in 1962

What's more

Black CAPM(zero-beta CAPM)

Fischer Black

- NOT assume the existence of a riskless asset
- more robust!

Black CAPM(zero-beta CAPM)

Formula

$$E[\tilde{r_q}] - E[\tilde{r}_{zc(m)}] = \beta_{qm}(E[\tilde{r_m}] - E[\tilde{r}_{zc(m)}])$$

where

$E[\tilde{r_{zc(m)}}]$	the expected return on the zero-covariance asset
$E[\tilde{r_q}]$	the expected return on the capital asset
$E[\tilde{r_m}]$	the expected return of the market
β_{qm}	$\frac{Cov[\tilde{r_q}, \tilde{r_m}]}{Var[\tilde{r_m}]}$

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Thank you!