An Energy Portfolio for Massachusetts

Energy Policy Review Commission

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Objectives

- Job creation
- Economic growth
- Energy security
- Reliability
- Low cost
- Reduced carbon emissions

Does the Market Need Help?

- No information
- Externalities
- Poor Decisions

Modern Portfolio Theory

Modern portfolio theory (**MPT**) is a theory of finance that attempts to *maximize portfolio expected return* for a given amount of *portfolio risk*, or equivalently minimize risk for a given level of expected return, by carefully *choosing the proportions of various assets*.

Diversification

A collection of investment assets that has collectively lower risk than any individual asset. This is possible, intuitively speaking, because different types of assets often change in value in opposite ways

How To Choose

Assets in an investment portfolio should not be selected individually, each on their own merits. Rather, it is important to consider how each asset changes in price relative to how every other asset in the portfolio changes in price.

What to Include?

An asset will be purchased only if it improves the risk-expected return characteristics of the market portfolio, the relevant measure of the risk of a security is the risk it adds to the market portfolio, and not its risk in isolation. In this context, the volatility of the asset, and its correlation with the market portfolio.

Risk and Expected Return

MPT assumes that investors are risk averse, meaning that given two portfolios that offer the same expected return, investors will prefer the less risky one. Thus, an investor will take on increased risk only if compensated by higher expected returns. Conversely, an investor who wants higher expected returns must accept more risk.

Returns

The proportion weighted combination of the constituent assets' returns.

- Cost of electricity generated by competing fuels
- Quantity of carbon released by competing fuels
- Number of jobs created
- Alternative subsidies/tax breaks
- Worker safety
- Water consumption

Risk

- The standard deviation of return
- Specific risk associated with individual assets
  - Fuel prices
  - Carbon policy
  - Transportation
  - Generation
  - Drought

Volatility

Portfolio volatility is a function of the correlation of the component assets, for all asset pairs.

- How does oil price risk co-vary?
- How does reliability co-vary?

Examples of Information to Collect

- Relation between fossil fuel prices and the prices of electricity
- Reliability rates
- Transportation infrastructure & risk
- Droughts and water supply
- How carbon policies will affect price