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Strategic Asset Allocation
Matching Assets to Liabilities

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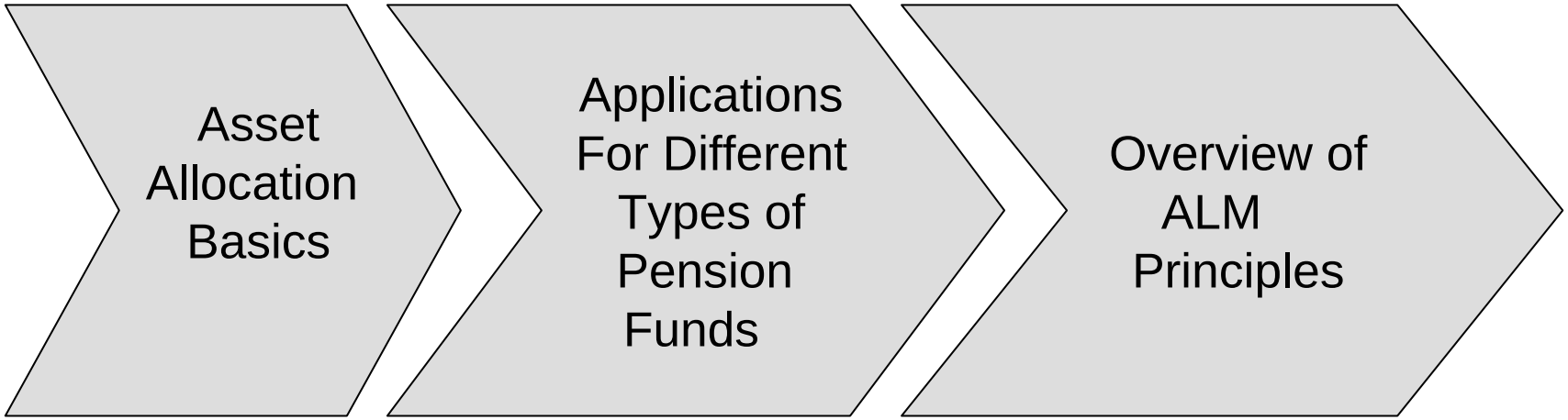
Structure of the presentation



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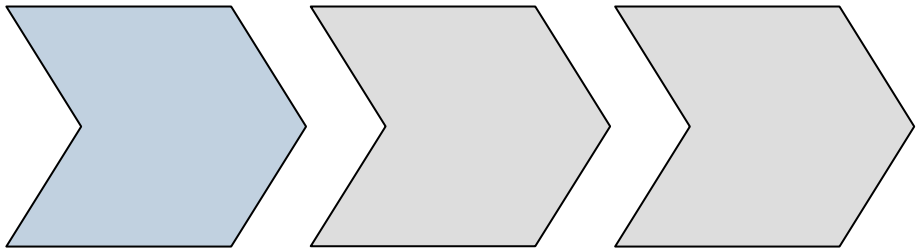
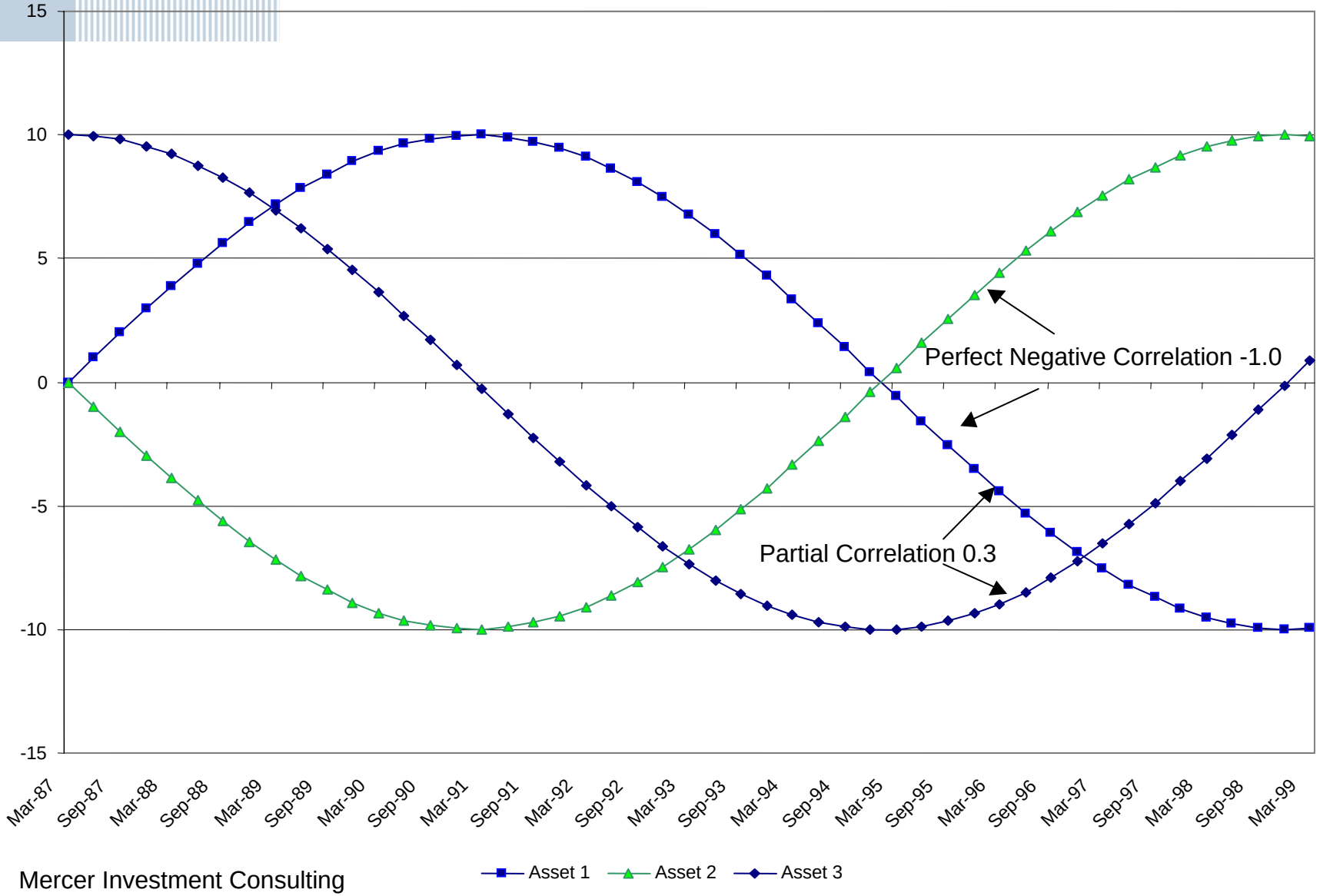
Asset Allocation Basics



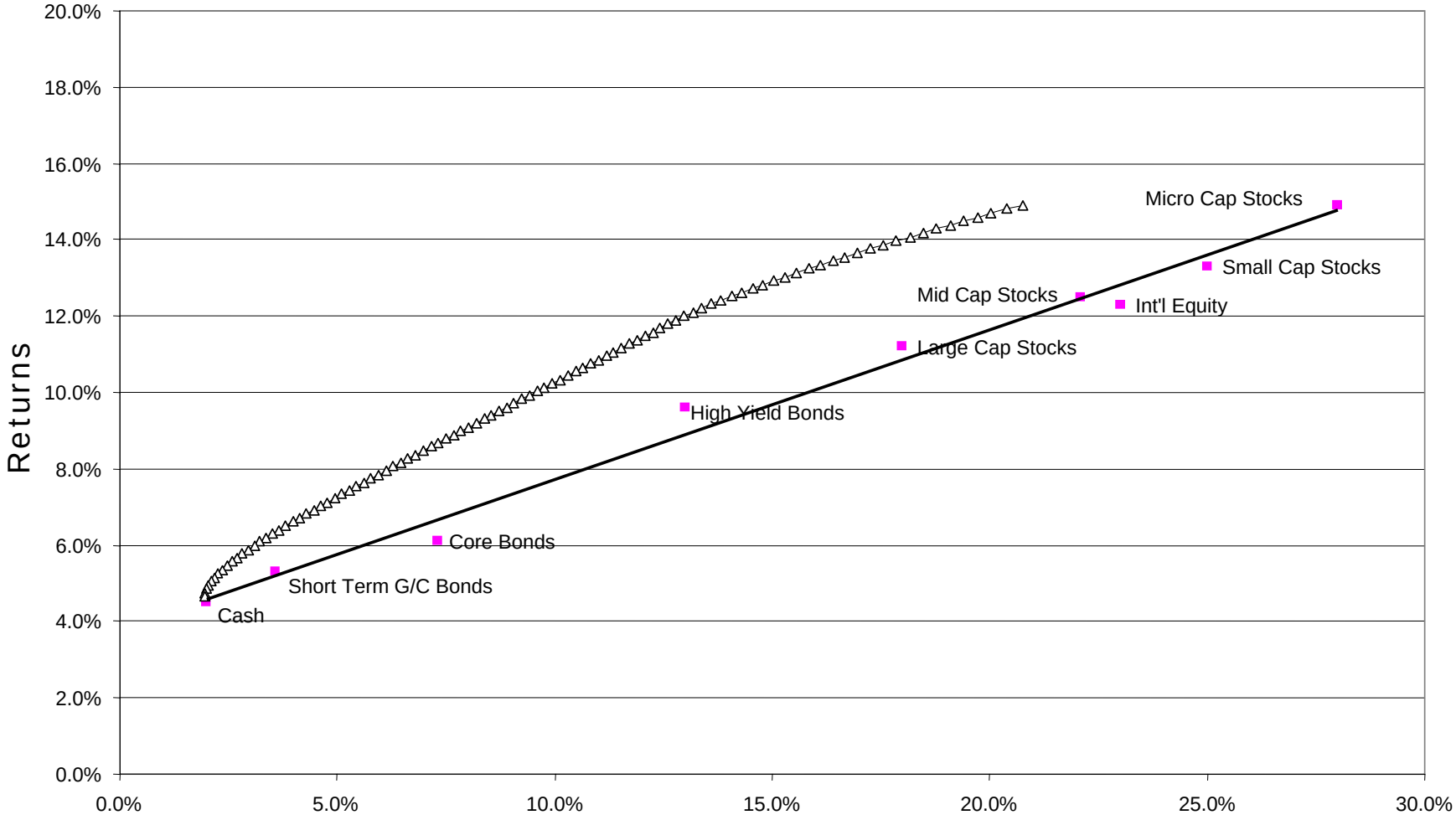
Return and Risk

Theoretical Capital Market Line

Correlation



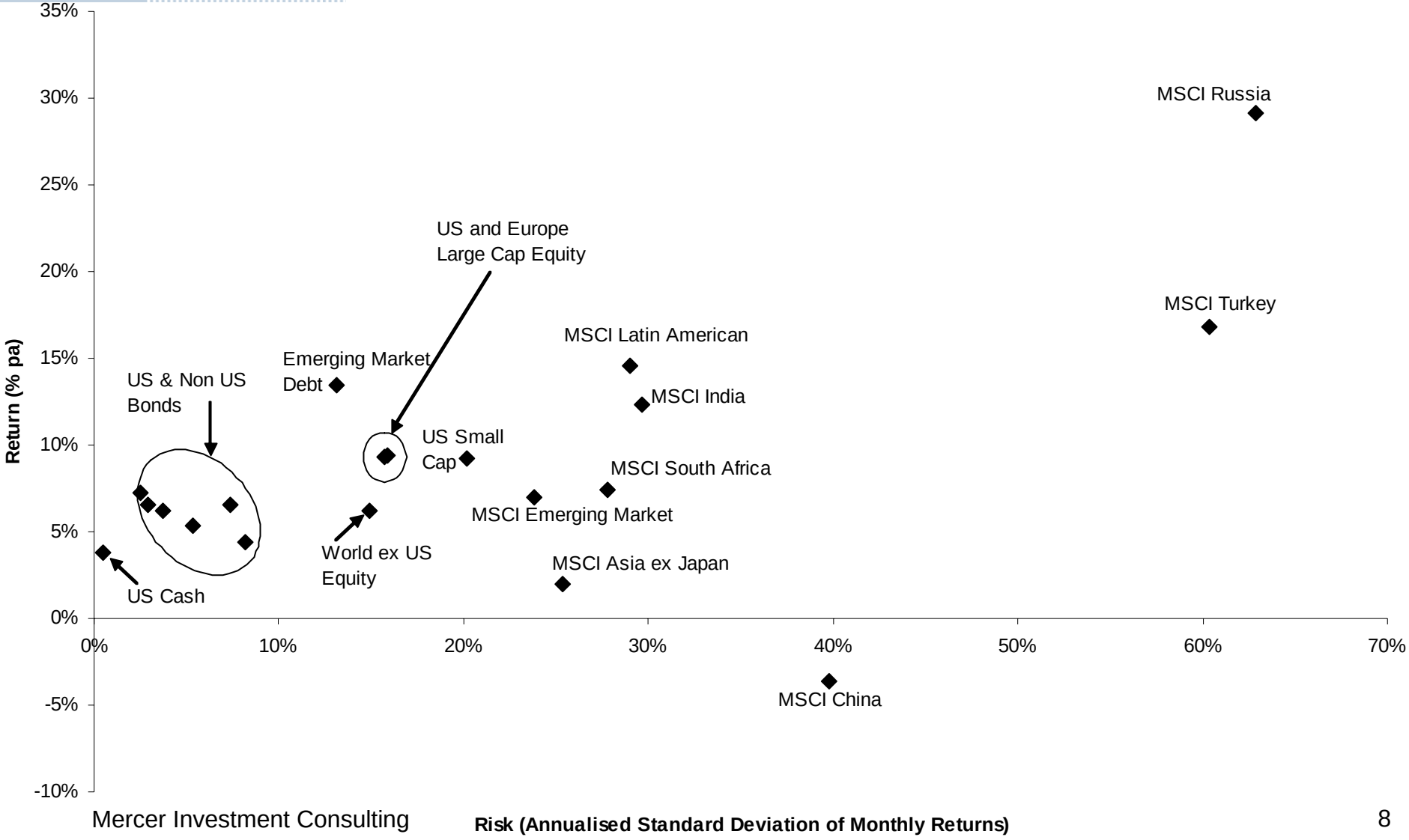
Efficient Frontier



Assumption Setting

- Asset classes to include
- Expected returns net of expenses and taxes (where applicable)
- Expected standard deviations of returns
- Expected correlation of asset class returns

Risks and Returns
Ten Year USD Returns to December 2005



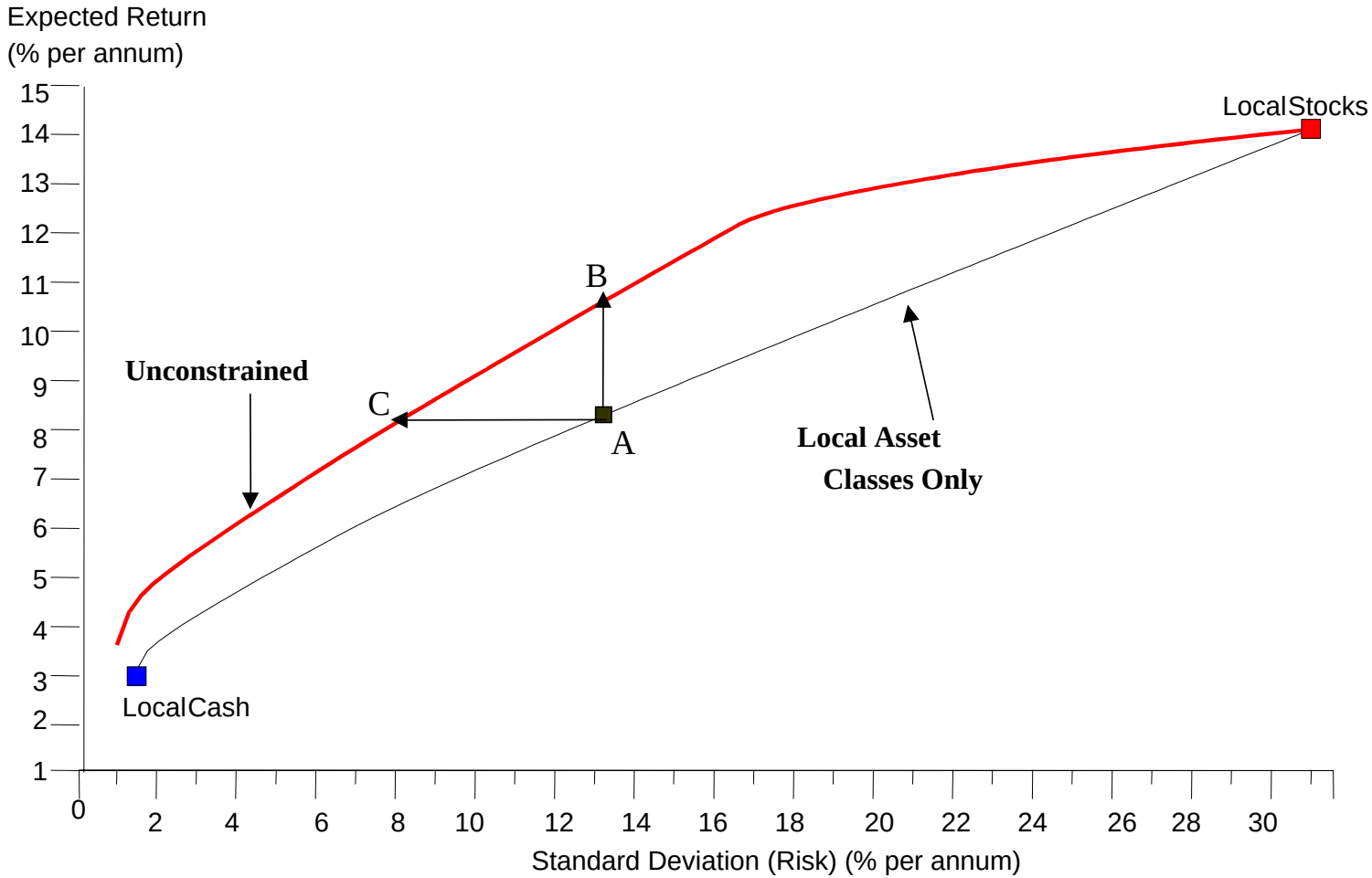
Some Thoughts On Assumptions

- **Mercer's approach to developing capital market assumptions is explicitly forward-looking rather than backward-looking**
- **Begin with modeling of inflation and economic growth (which are relatively easy to model), and build from that to model capital market returns**
  - This process provides more reasonable return patterns, that behave more similarly to what we see in the real world, than do approaches in which capital market returns are modeled directly based on reference to historical patterns
- **In absence of change in interest rate or exchange rate regime, long-term historical data is reasonable proxy for forward-looking risk expectations**
  - However, it needs to be recognized that volatility of fixed income and equity returns is generally lower in a low inflation, low interest rate environment
- **Although very long-term history is relevant for estimating risk premiums, recent past provides little useful information about future expected returns**
  - E.g., for Japan, with domestic government bond index yielding around 0.9%, we can't expect bond returns *in Yen terms* much higher than 0.9% over medium term, regardless of history

Purpose of Asset Allocation Studies

- Three asset allocation decisions depend on liabilities
  - Equity / fixed income split
  - Fixed income duration (nominal vs real, where applicable)
  - Foreign/domestic split
- These decisions should be main focus of asset allocation study be it ALM or asset only
- Further refining of broad asset classes based on asset structure analysis, such as:
  - Government versus non-government bonds
  - Domestic versus foreign bonds
  - Developed versus developing markets

Importance of Establishing Asset Classes
Foreign Investment: An Example



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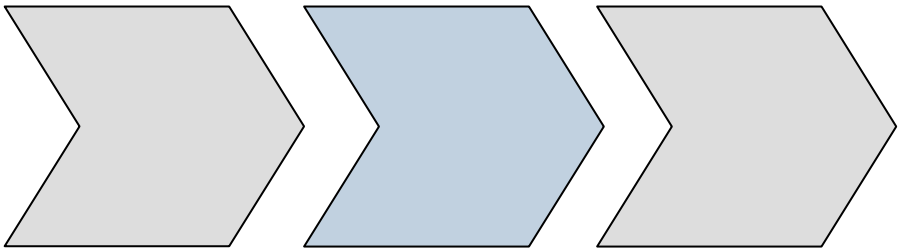
Applications for Different Types of Pension Funds



Defined Benefit vs Defined Contribution

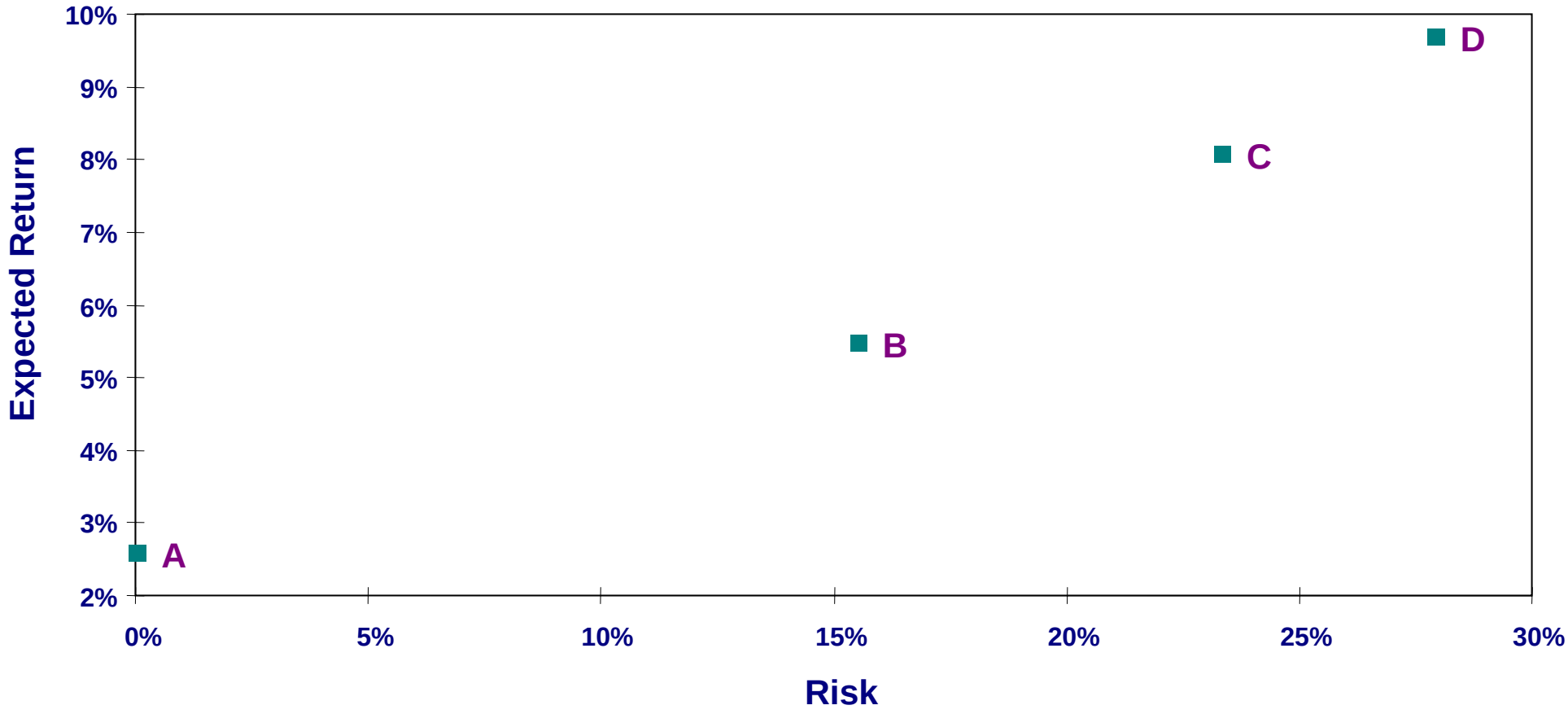
- Key difference is nature of liabilities
- Defined benefit liabilities
  - Typically vary with salary inflation
  - Value of liabilities may vary with changes in bond yields
  - Liabilities not directly affected by investment returns achieved, although overall financial position of fund will be
- Defined contribution liabilities
  - Vary with line with investment returns declared
  - Declared return could vary from achieved return in which case reserves need to be managed

Risk for Defined Contribution Funds
Importance of Investment Objectives

- Consider 2 definitions of risk:
  - Probability of negative return in any year
  - Probability of not achieving 7% pa over 10 years
- Consider 4 portfolios:
  - Portfolio A (100% cash)
  - Portfolio B (30% equity, 70% fixed income/cash)
  - Portfolio C (70% equity, 30% fixed income)
  - Portfolio D (100% equity)

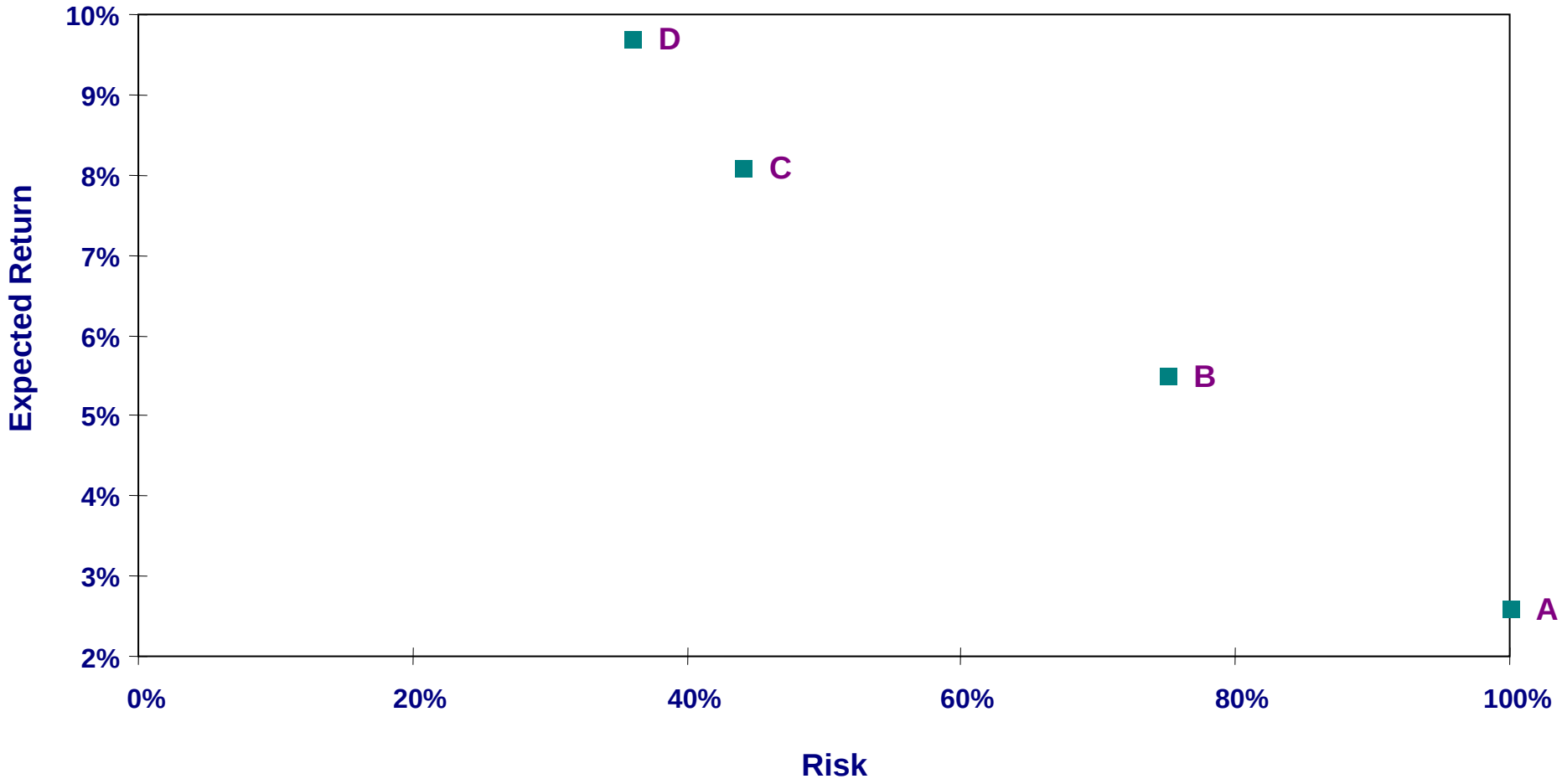
Short-Term Risk

Risk As Probability Of Achieving A Negative Absolute Return In Any One Year Period

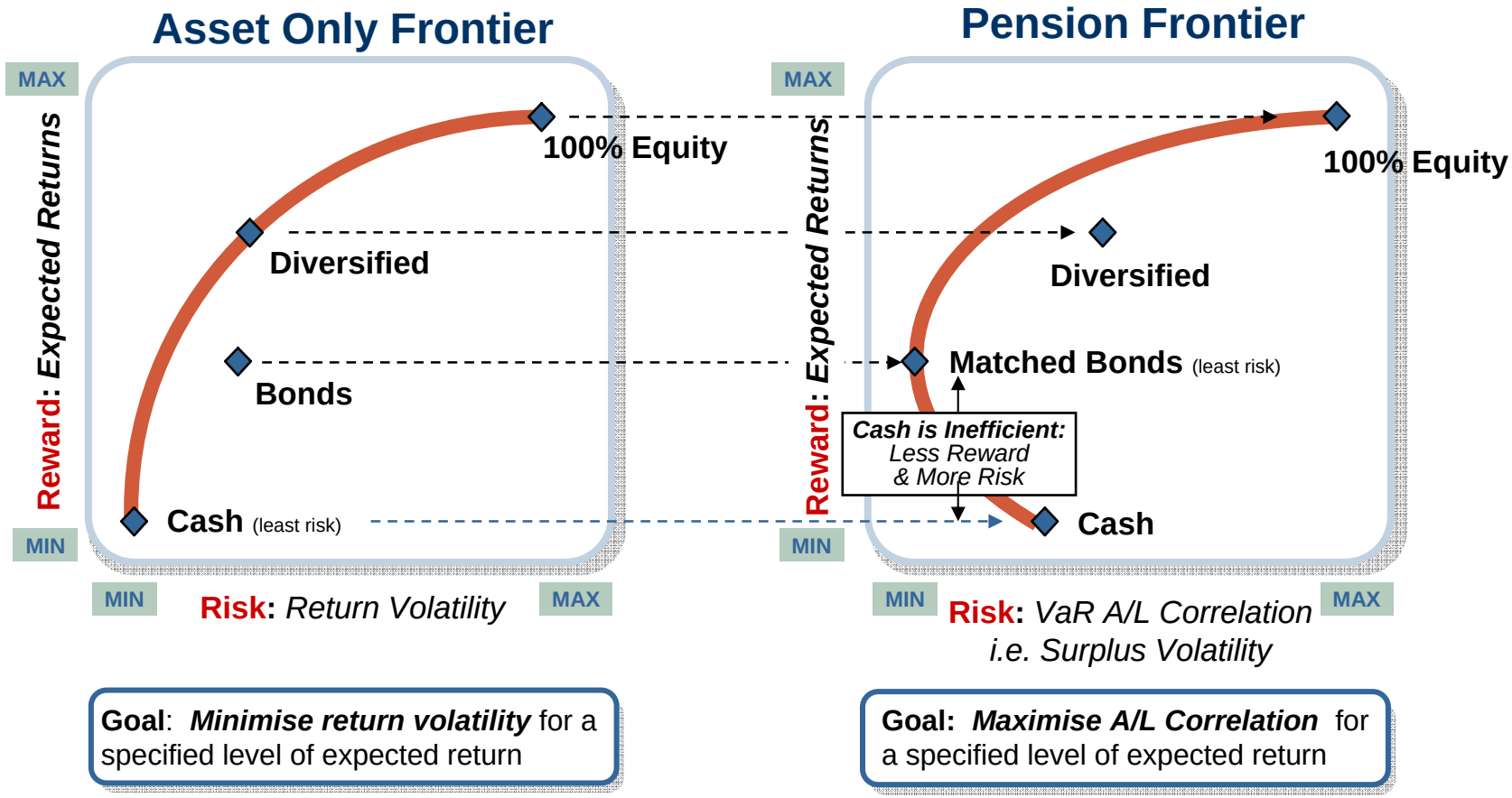


Longer-Term Risk

Risk As Probability of Not Achieving Objective of 7% pa Return Over 10 Years



Portfolio Efficiency When Liabilities Are Considered



When liabilities are considered, the efficient mixes are not the same as those that are efficient in an asset-only framework… simply due to the change in the definition of "risk".

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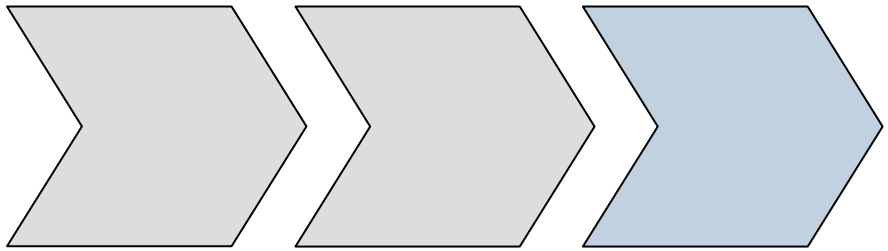
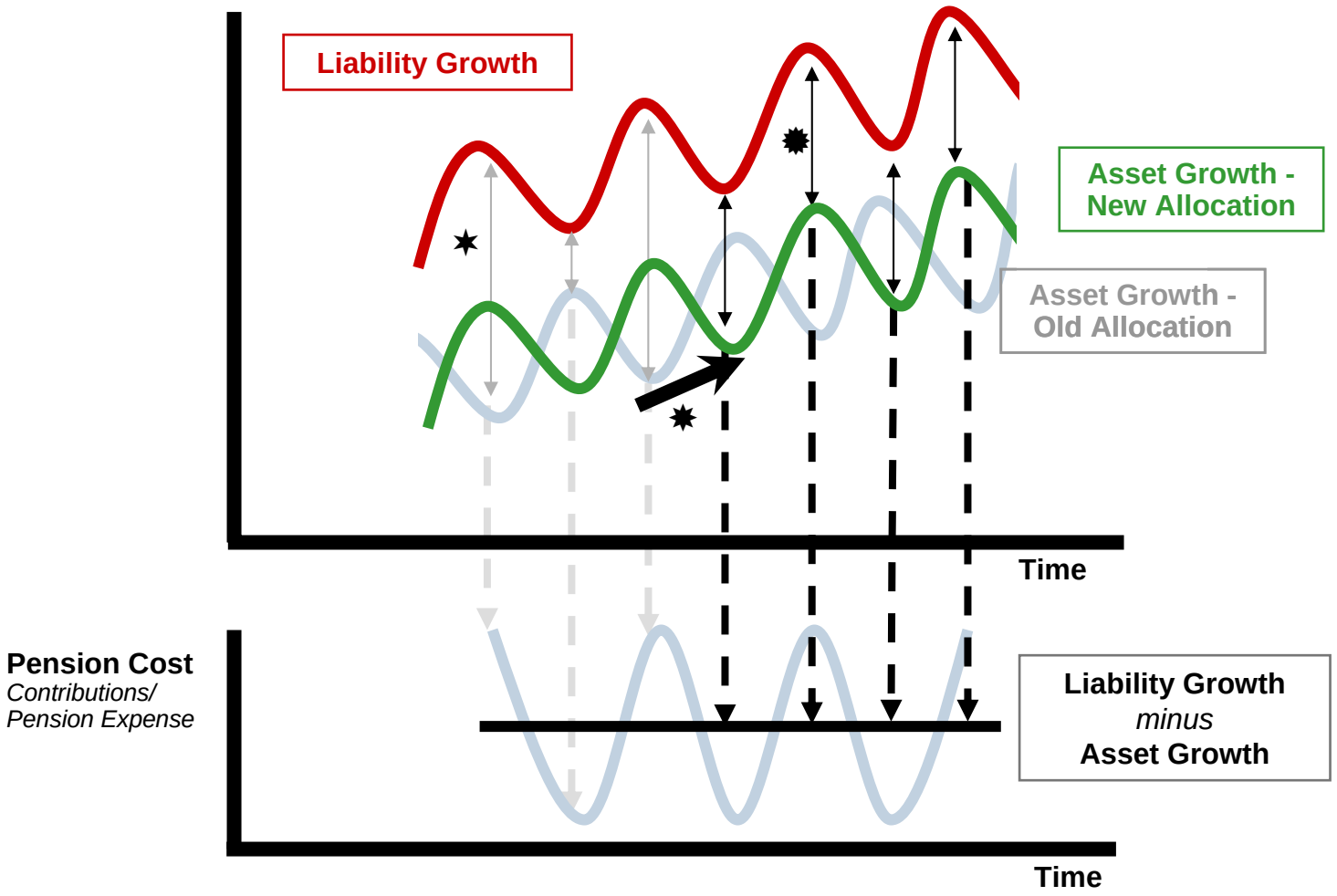
Overview of ALM Principles



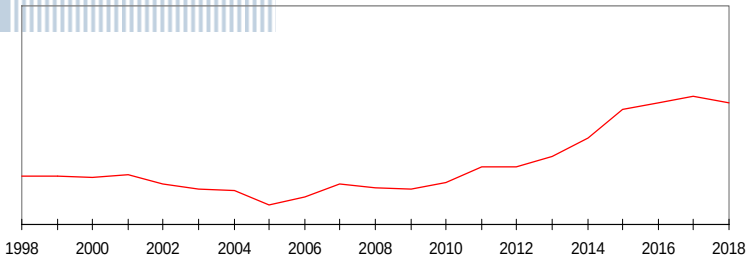
How Asset Allocation Influences Financial Outcomes

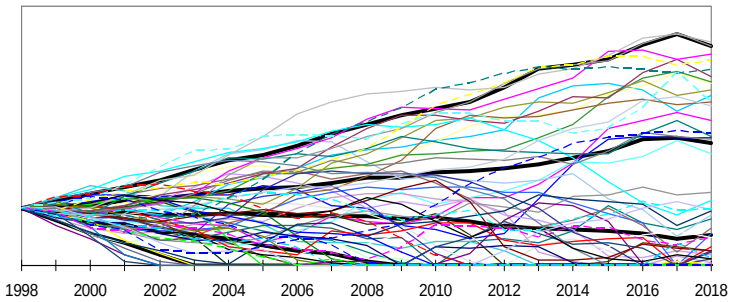


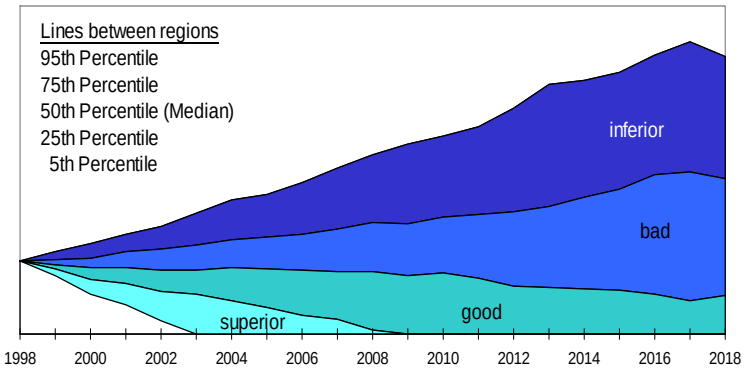
Why ALM?

- An asset only analysis assumes volatility of returns is proper definition of risk
- Since cash has lowest volatility of returns, implicitly cash assumed to be low risk asset
- ALM attempts to explicitly define risk as volatility of mismatch between investor's assets and liabilities
- ALM attempts to reflect that low risk asset for a liability-based investor is portfolio of investments that has same interest rate sensitivity (and currency exposure, etc, etc) as liabilities

Simulation Results
An Example

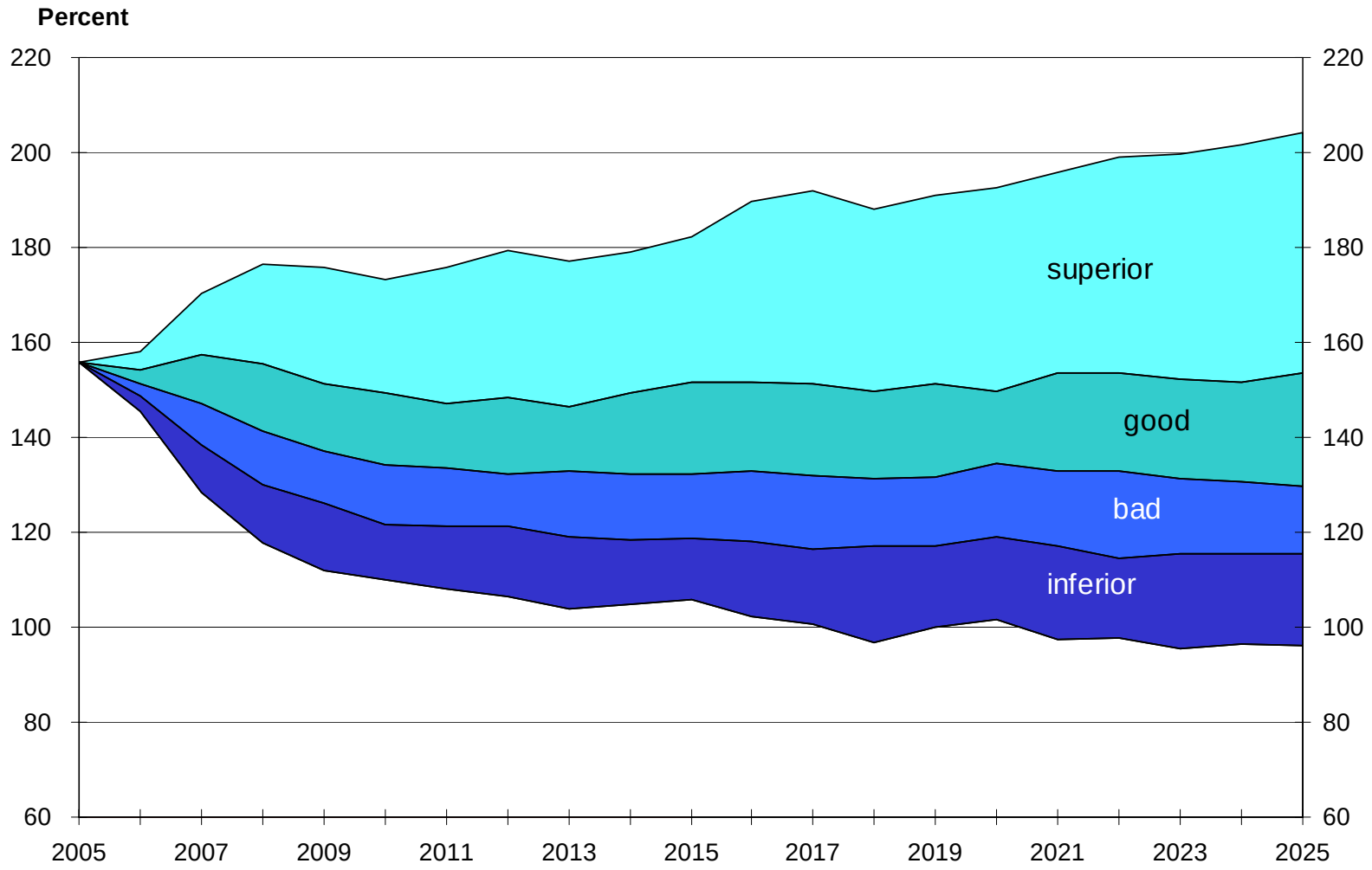




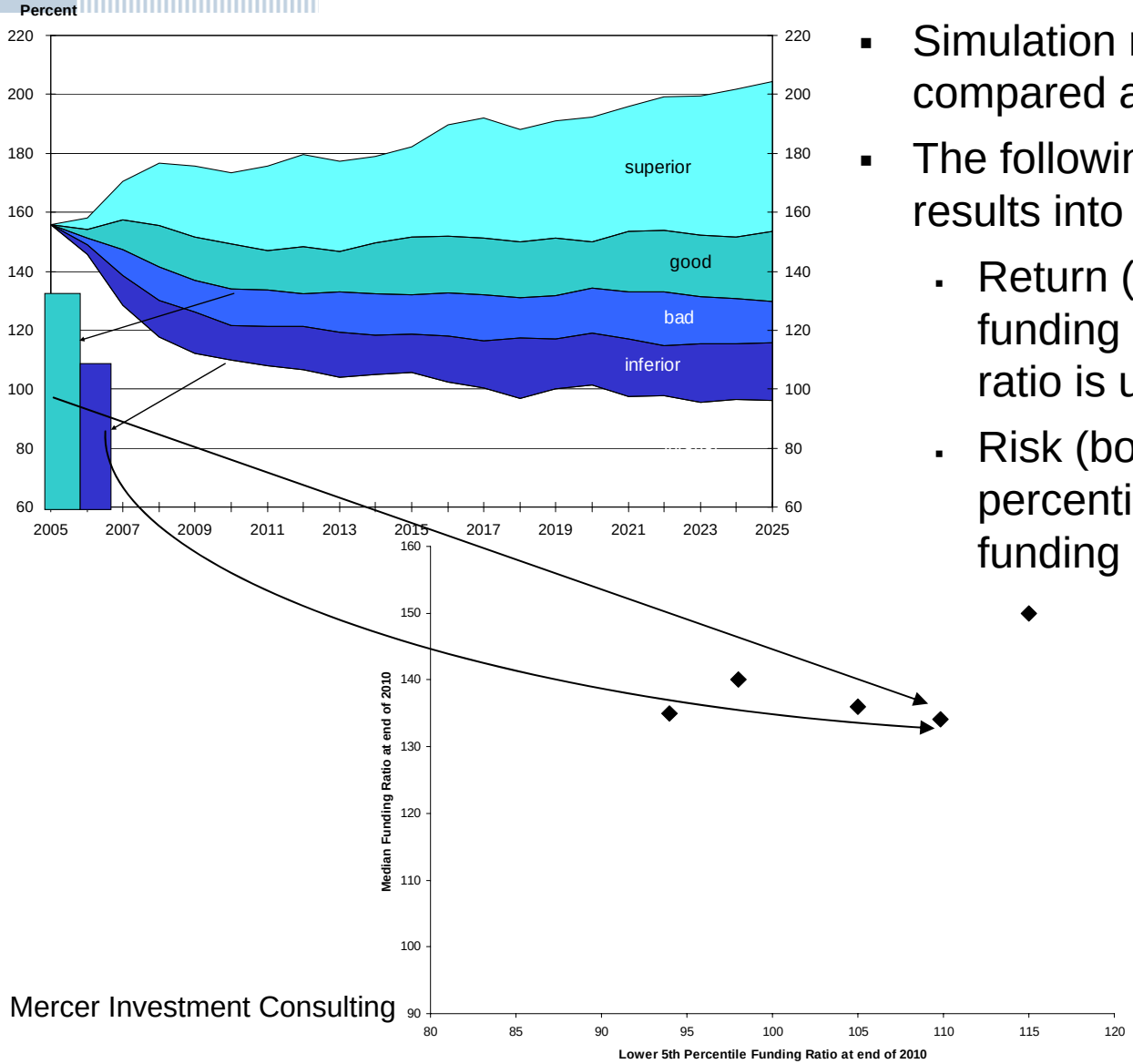


- Results are calculated for one path of the stochastic model
- This is repeated 500 times
- Each year is percentiled
- The percentiles group each years' results into regions
- The good and bad regions represent 25% variance from median results, or together what would be expected half of the time
- The superior and inferior regions add another 20% of upside and downside variance
- All the regions combined show 90% of simulated results

Simulation Results - Target Allocation
Funded Status

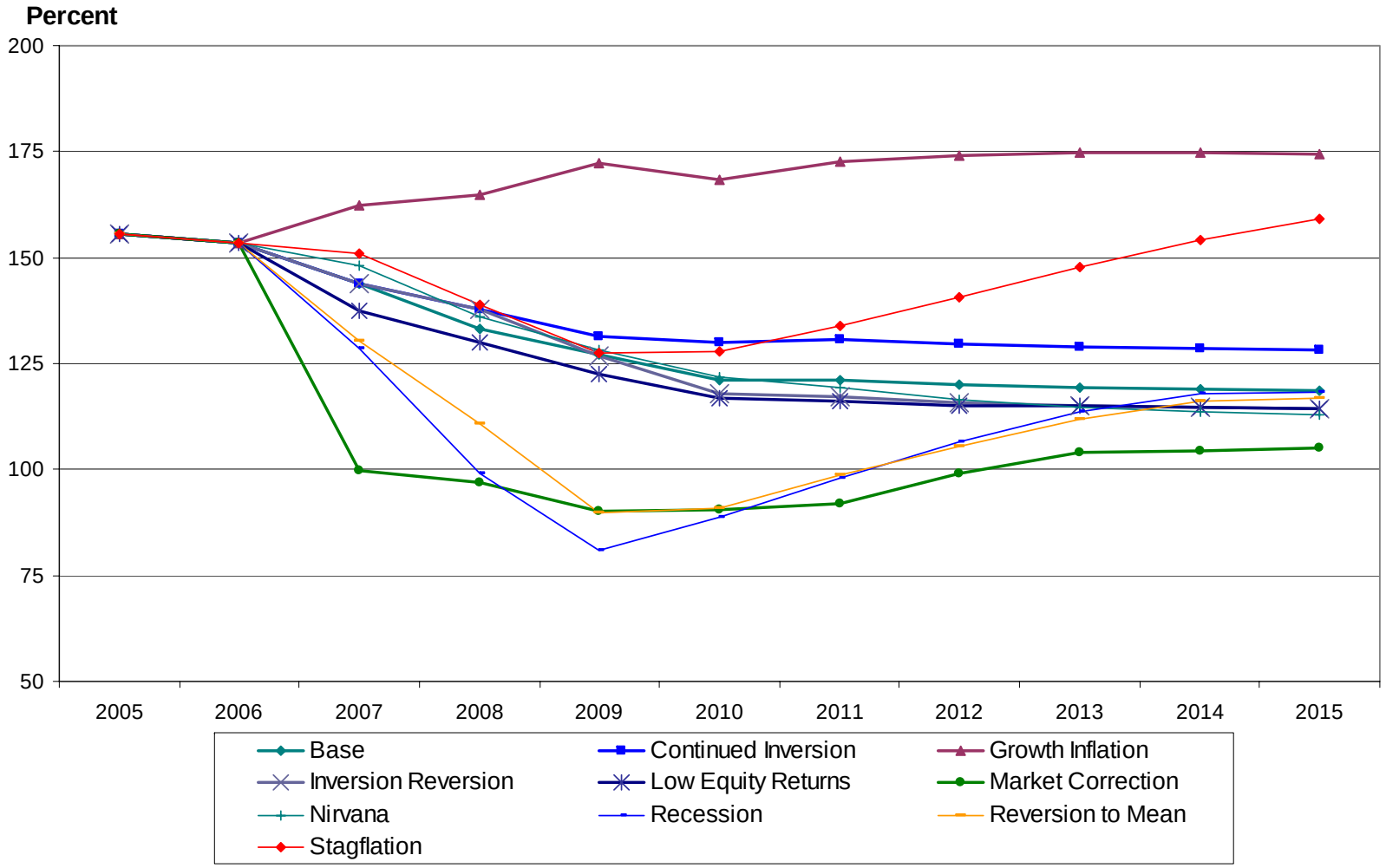


Analysis of Objectives



- Simulation results are not easily compared across alternative policies
- The following method translates results into a risk/reward framework:
  - Return (left axis) looks at median funding ratios. Higher funding ratio is up or "north"
  - Risk (bottom axis) looks at 95th percentile funding ratios. Lower funding ratio is left or "west"

Scenario Results - Target Allocation
Funded Ratio



Applications for Defined Contribution Plans

- Asset only study usually sufficient for DC plans
- However, if return credited differs from return actually achieved (on market value) basis, then effectively reserves exist and above principles can be used
- Risk measures will differ
  - Likelihood of return in any year falling below specified level
  - Likelihood of reserves exceeding (or falling below) specified level

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Final Observations

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- Principles behind understanding your liabilities is important
  - primary risk is not necessarily volatility of returns alone, but volatility of mismatch between assets and liabilities
  - ALM enables you to tailor “risk” measures
- For all investors, principles underlying strategic asset allocation enable you to determine “least risk” portfolio
  - Understanding this portfolio, and deciding how much additional investment risk to take against this, have become critical determinants of both short-term success and long-term survival
- ALM most valuable, not in terms of modeling “the long term”, but in:
  - helping investors decide how much financial risk can realistically be taken
  - how this financial risk should most effectively be taken