

Basic Principles

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Outline

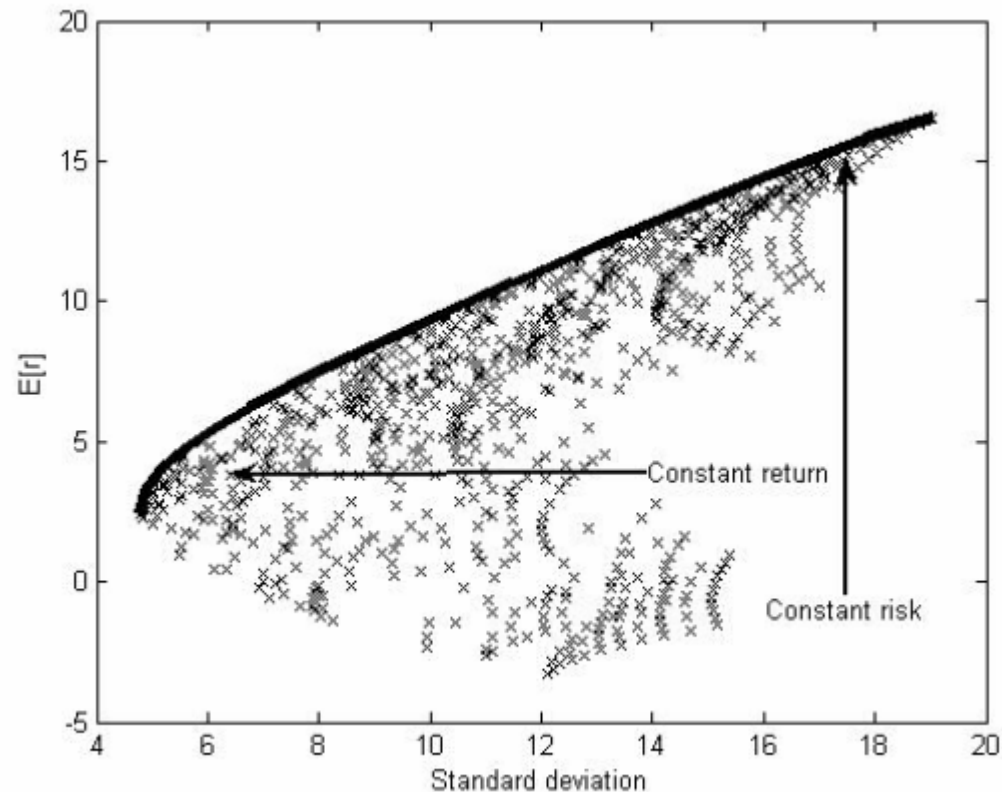
- Guiding principles in finance
- Strategic and tactical asset allocation
- An investment framework primer
 - Necessary tools
 - Financial and econometric techniques
 - How to combine the two
 - The difference between estimation of a model and using it to generate predictions

Guiding principles in finance

- Asset allocation is a central sub-element of finance concerned with:
 - Allocation of capital over time
 - Capital is a scarce resource
 - Optimal investor behaviour
 - Equilibrium in financial market
 - The well-functioning of financial market
 - Corporates' investment decisions

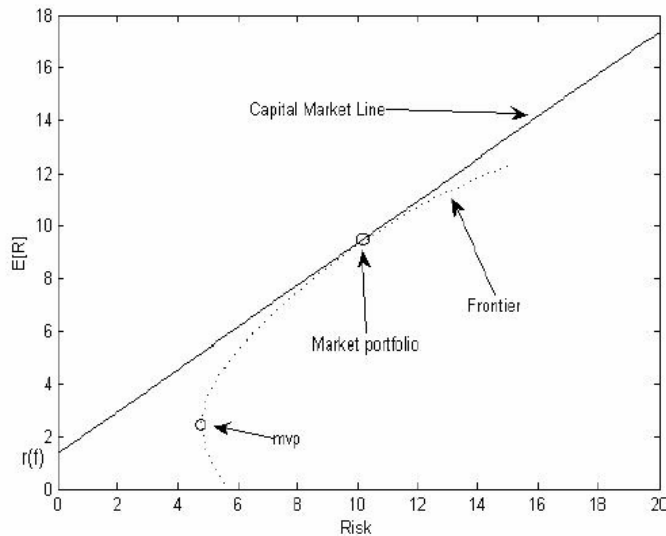
Guiding principles in finance

a) The positive relationship between return and risk



Guiding principles in finance

- This relationship is formalised through
 - The Capital Asset Pricing Model (CAPM)
 - The Arbitrage Pricing Theory (APT)



$$r_j = r_f + \beta_j * (r_M - r_f) + e_j.$$

$$\underbrace{\sigma_j^2}_{\text{total risk}} = \underbrace{\beta_j^2 * \sigma_M^2}_{\text{systematic risk}} + \underbrace{\sigma_{e_j}^2}_{\text{unsystematic risk}}.$$

Guiding principles in finance

b) The law of one price

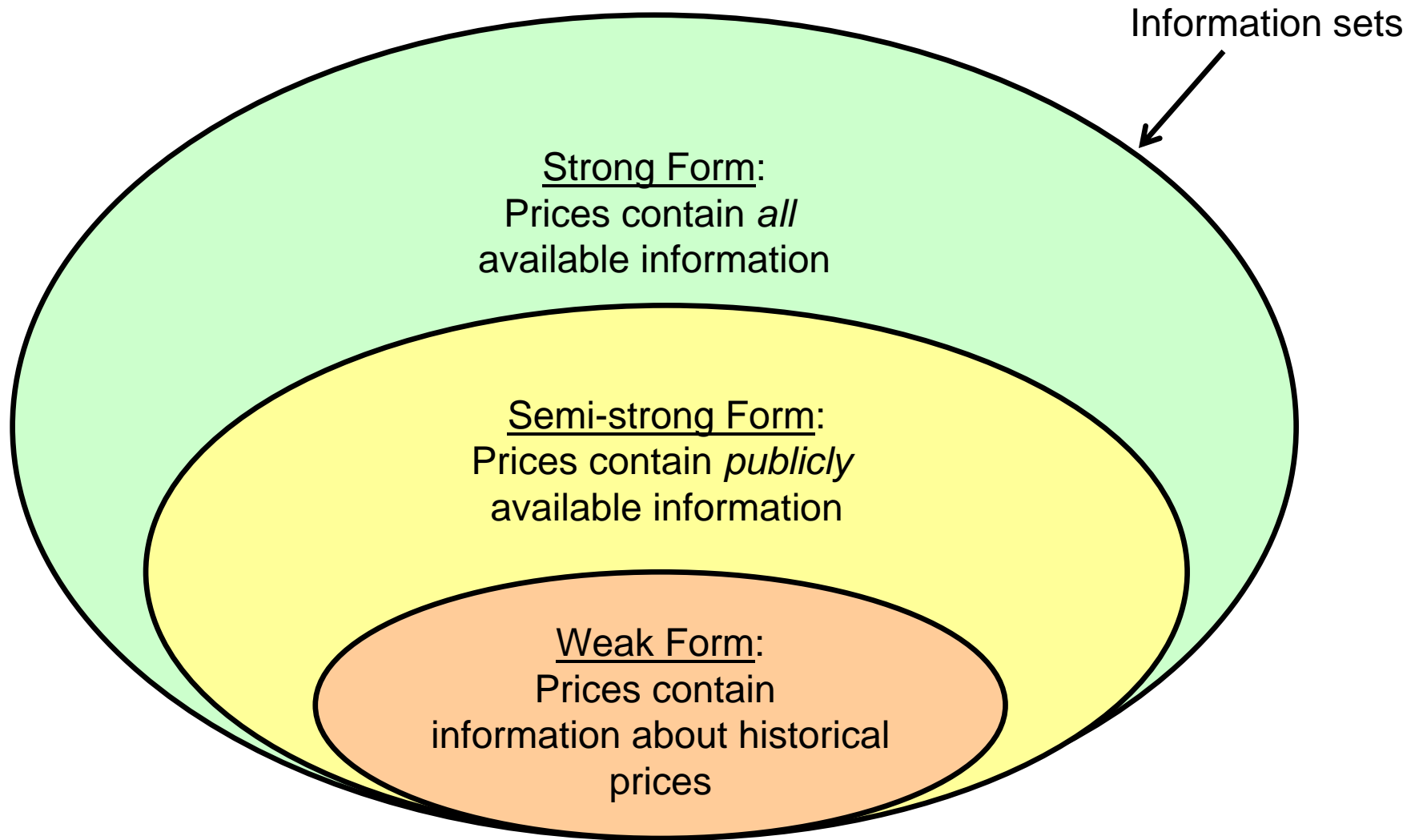
- Identical items (risk) should sell at the same prices
- Arbitrage
 - The process of generating profit without taking risk
 - Simultaneously buying and selling of assets
- Short selling is possible

Guiding principles in finance

c) **Market efficiency** (information transmission)

- Strong form
- Semi-strong form
- Weak form
- Prices in an efficient market reflect all available information
- Information is available and is cheap to all investors
- Prices react only to the flow of new information
- Prices in financial markets are therefore unpredictable

Ideas that shape financial thinking



Ideas that shape financial thinking

- Is it possible to empirically test market efficiency?
- Joint test of efficiency and an equilibrium model for asset prices
- Excess returns could reflect the costly process of gathering and processing information
- Relative efficiency perhaps easier to deal with than absolute efficiency

Ideas that shape financial thinking

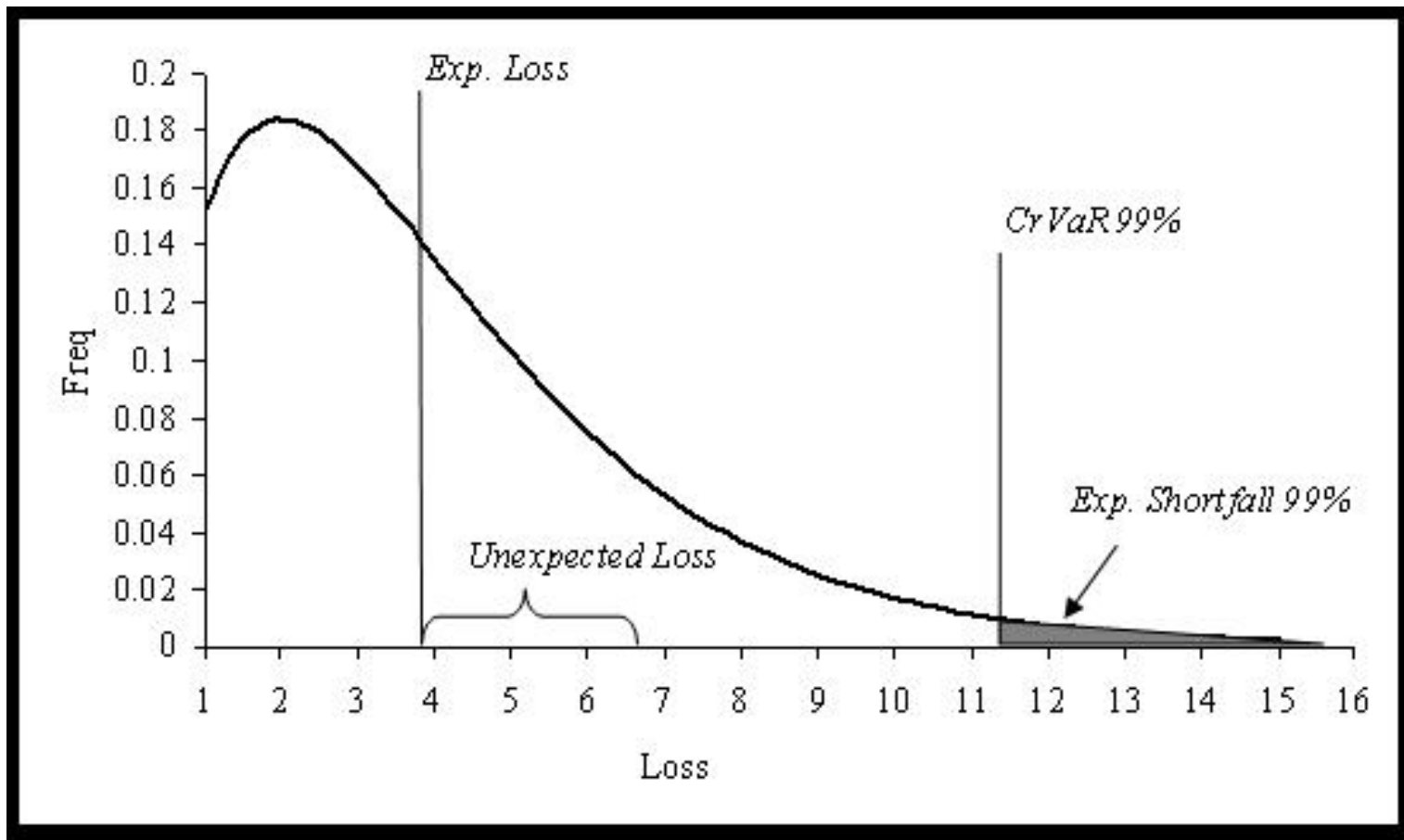
- Weak form tests
 - Can trading rules based on past price changes generate excess returns?
 - Correlation tests and sign tests
- Semi-strong form:
 - Event studies of information releases
- Strong-form:
 - Tests based on insider profits

Ideas that shape financial thinking

- Investor / financial agent behaviour
 - More wealth is desired to less
 - Aversion to risk
 - Homogenous expectations
 - Types of agents:
 - Liquidity traders
 - Informed traders
 - Preferences expressed in terms of expected risk and return

Ideas that shape financial thinking

d) Risk measures



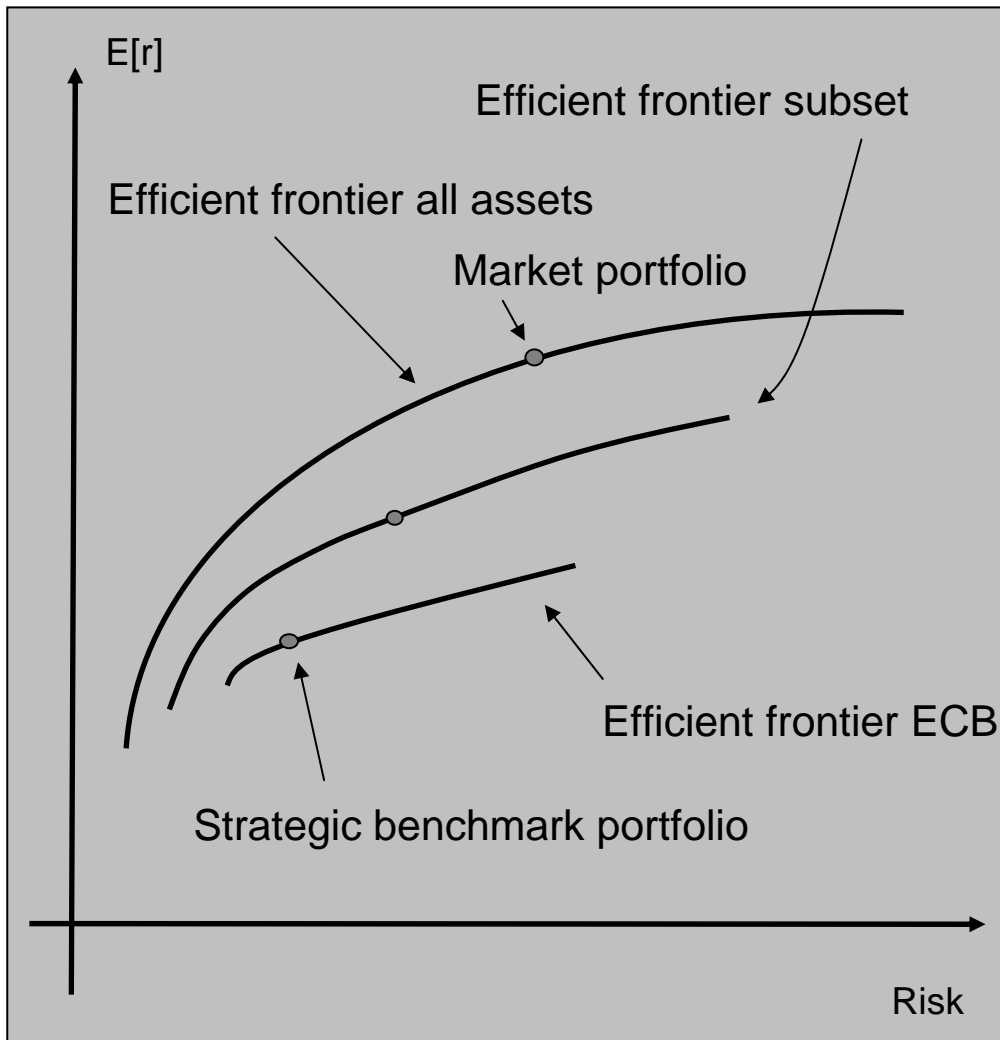
Strategic and tactical asset allocation

- Characteristics of strategic asset allocation:
 - Translation of the organisations long-term risk preferences into an actual allocation
 - Board decision
 - Investment horizon: substantially longer than the horizon for the tactical decision
 - The decision is typically done in terms of currencies and asset classes...
 - ... implementation however at asset level

Strategic and tactical asset allocation

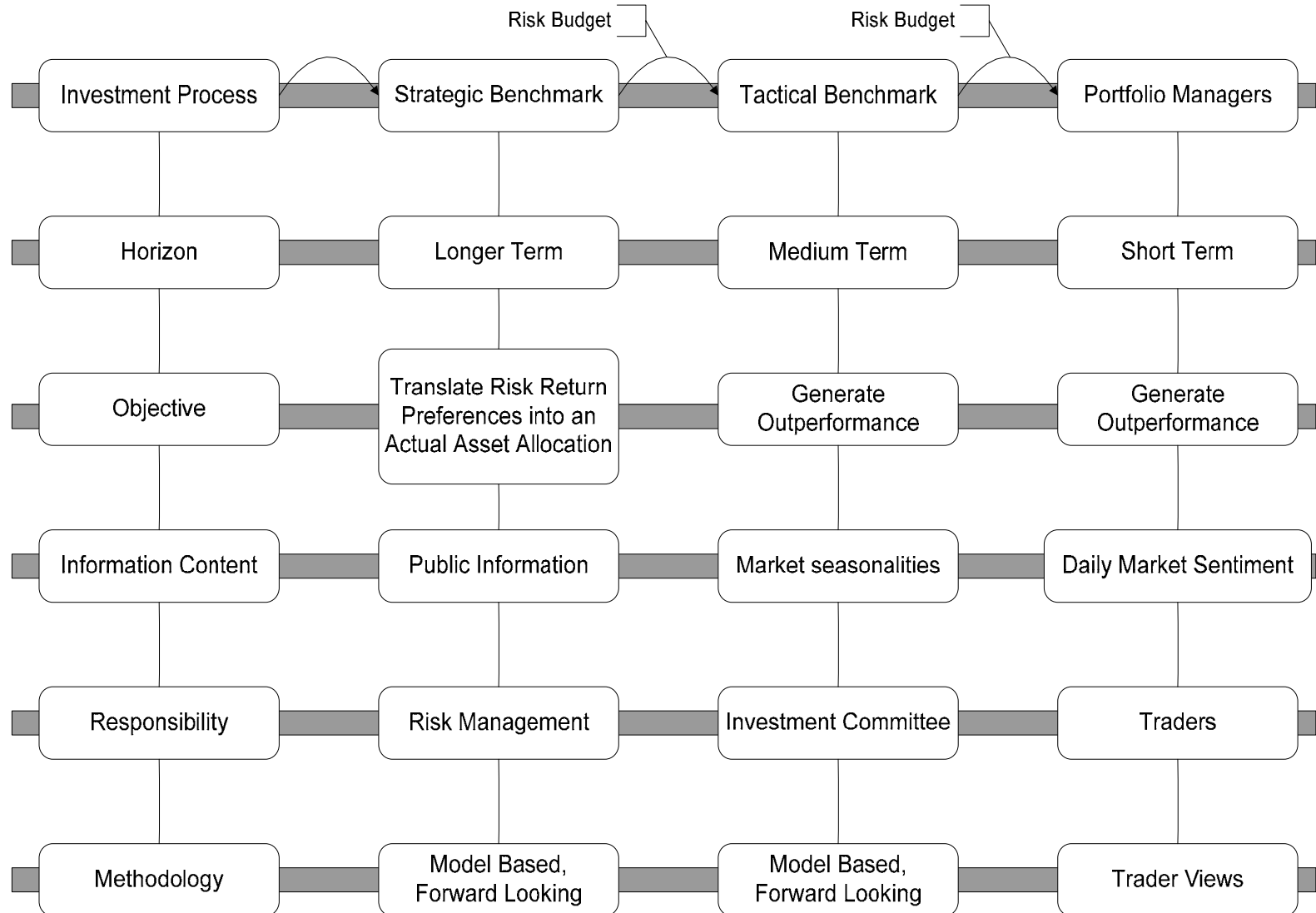
- Characteristics of strategic asset allocation:
 - Replicability is important for the tactical layers
 - Risk budgets are defined for each of the tactical layers against the strategic benchmark
 - The strategic benchmark serves as an anchor for the tactical levels
 - The tactical benchmark and investment managers are performance measured against the strategic benchmark
 - When the active layers have views they deviate from the strategic benchmark
 - When not, they assume a neutral position against the strategic benchmark

Strategic and tactical asset allocation



- In-house benchmark construction vs externally defined alternatives
- Selection of the eligible investment universe
- Must take into account:
 - Investment constraints
 - Investment universe
- Subject to performance checks
 - Tactical benchmark
 - Active portfolios

Strategic and tactical asset allocation

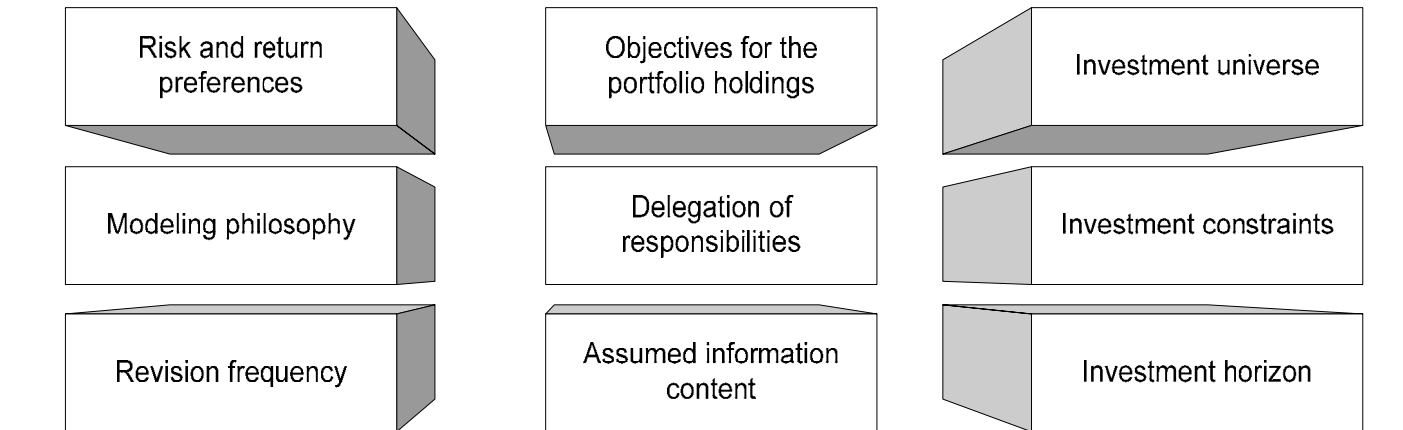


Strategic and tactical asset allocation

- Strategic asset allocation should:
 - Reflect the institution’s “long” term risk-return preferences
 - Mathematical formulation of the long term risk-return preferences
 - Be forward looking i.e. take into account the current and uncertain future economic environment
 - Simulation based forward looking methodology for yields/returns and integration of macro economic variables
 - Be based on a transparent, accountable and flexible decision support framework with consistent treatment of different risk sources
 - Quantitative, using a well documented and flexible modelling framework which can be easily adapted to handle changing requirements i.e. additional asset classes and risk types

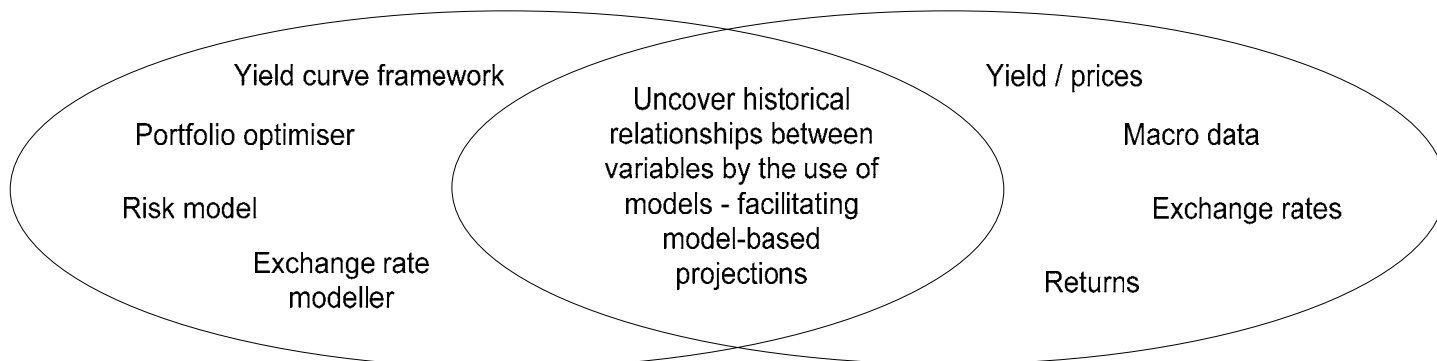
Strategic and tactical asset allocation

Policy Requirements and Objectives



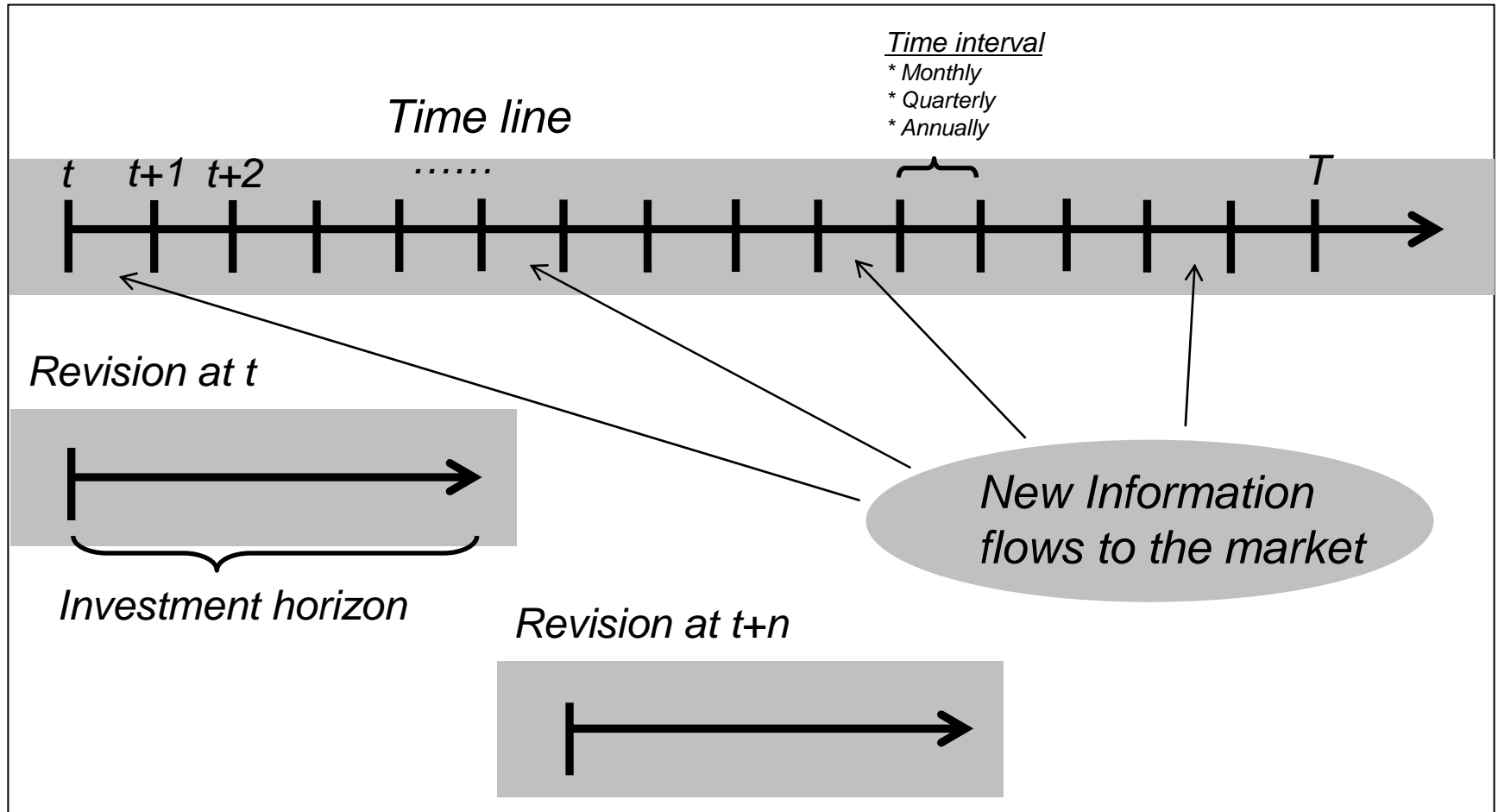
Investment Process Tools

Data



Strategic and tactical asset allocation

- Revision frequency and investment horizon



Strategic and tactical asset allocation

- Decisions regarding the Strategic asset allocation set-up depends hugely on the organisation in question:
 - Investment bank
 - Central bank
 - Pension fund
- Design variables:
 - Eligible investment universe
 - Investment horizon for SAA and TAA

Strategic and tactical asset allocation

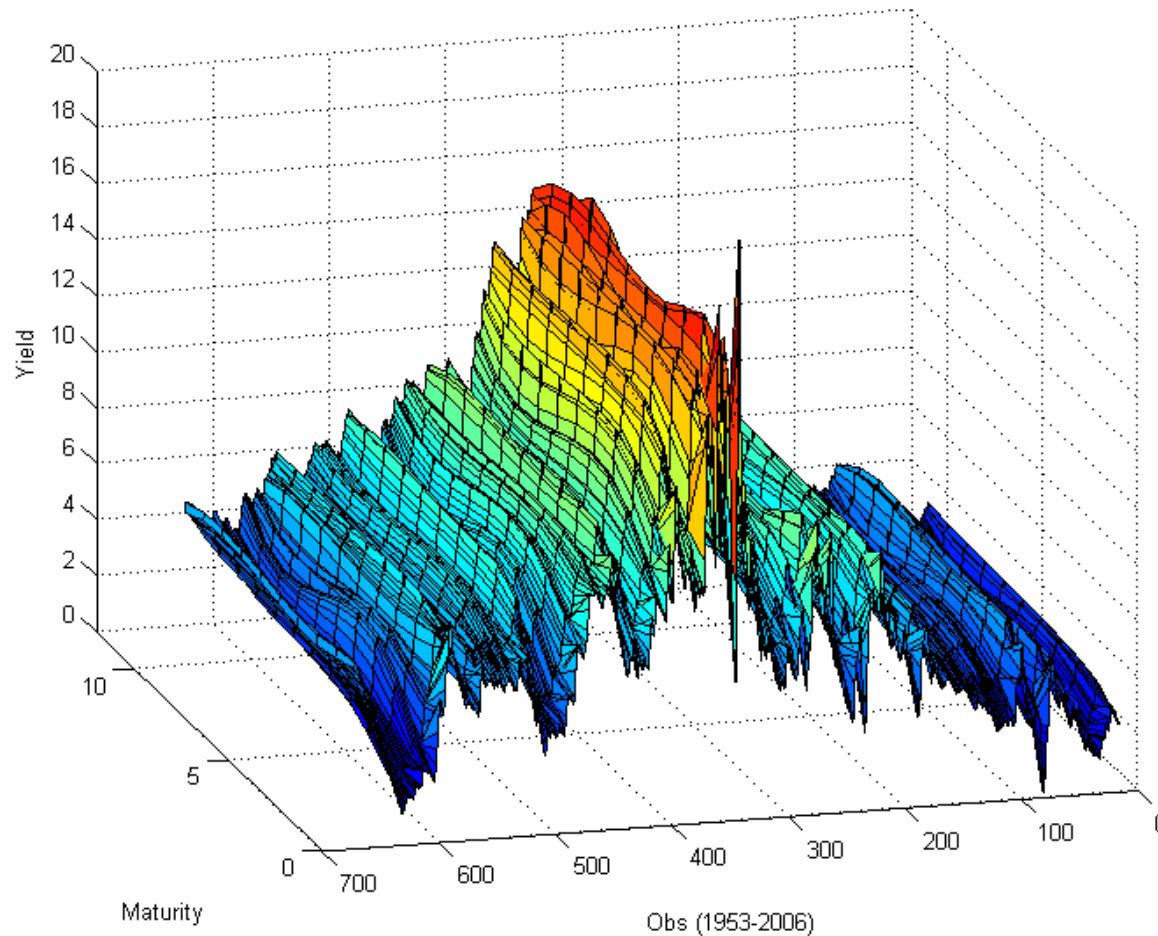
- Design variables (cont):
 - Revision frequency
 - Risk budgets
 - Asset class constraints
 - Instrument constraints
 - Issuer constraints
 - Investment objectives for SAA and TAA
 - Who has the responsibility

Strategic and tactical asset allocation

- An example of a risk averse institution could be:
 - Investment universe: Government bonds, Agencies, BIS instruments, Supranationals, Deposits
 - Quantification of risk appetite: No negative returns at a given confidence level at a given horizon, e.g. 5 years @99% VaR level
 - Maximum exposure to specific instrument classes based on liquidity risk considerations
 - Minimum holding in highly liquid assets
 - Risk budget allocation to active management in terms of VaR or Modified duration limits

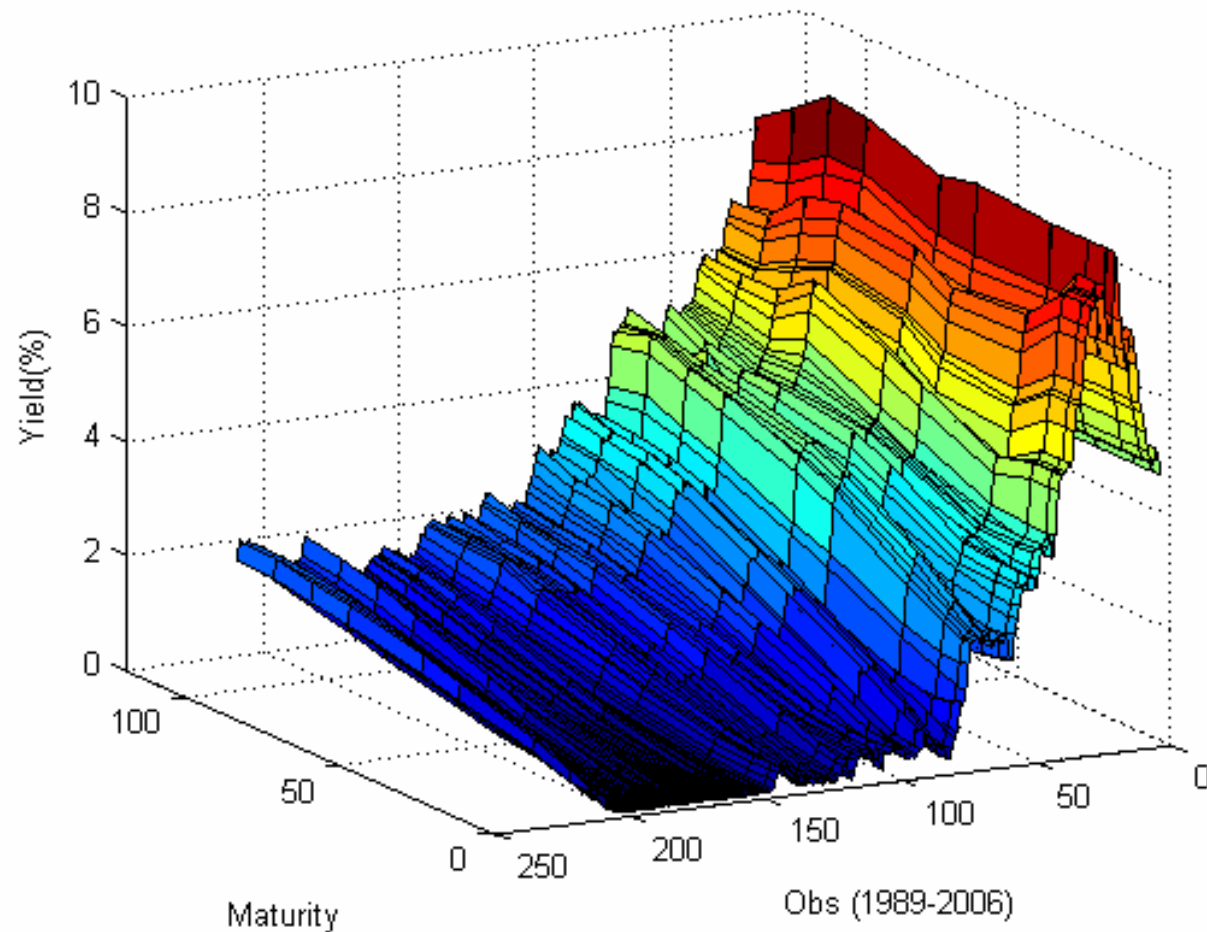
An investment framework primer

- Historical yield curve evolution in US

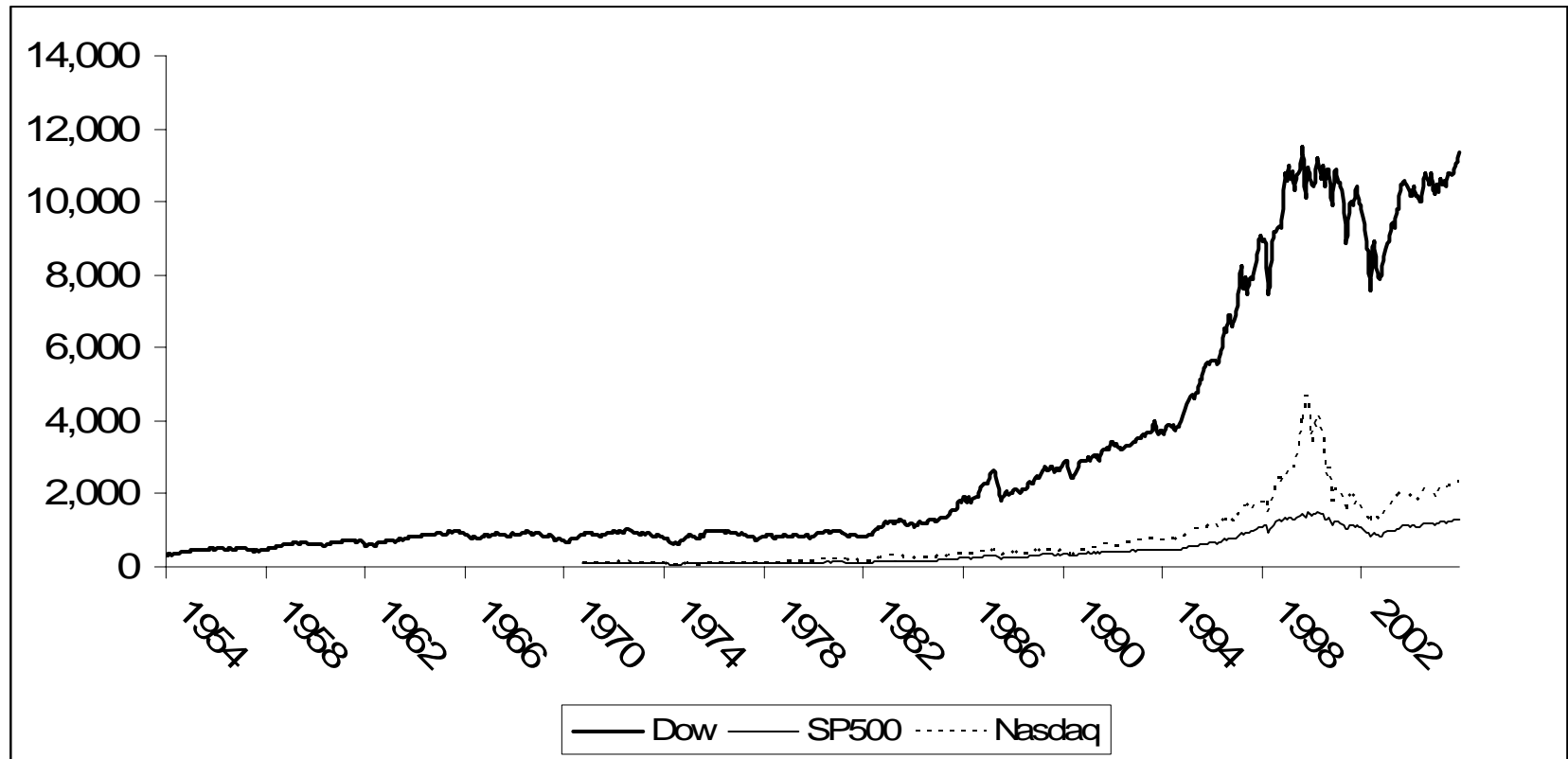


An investment framework primer

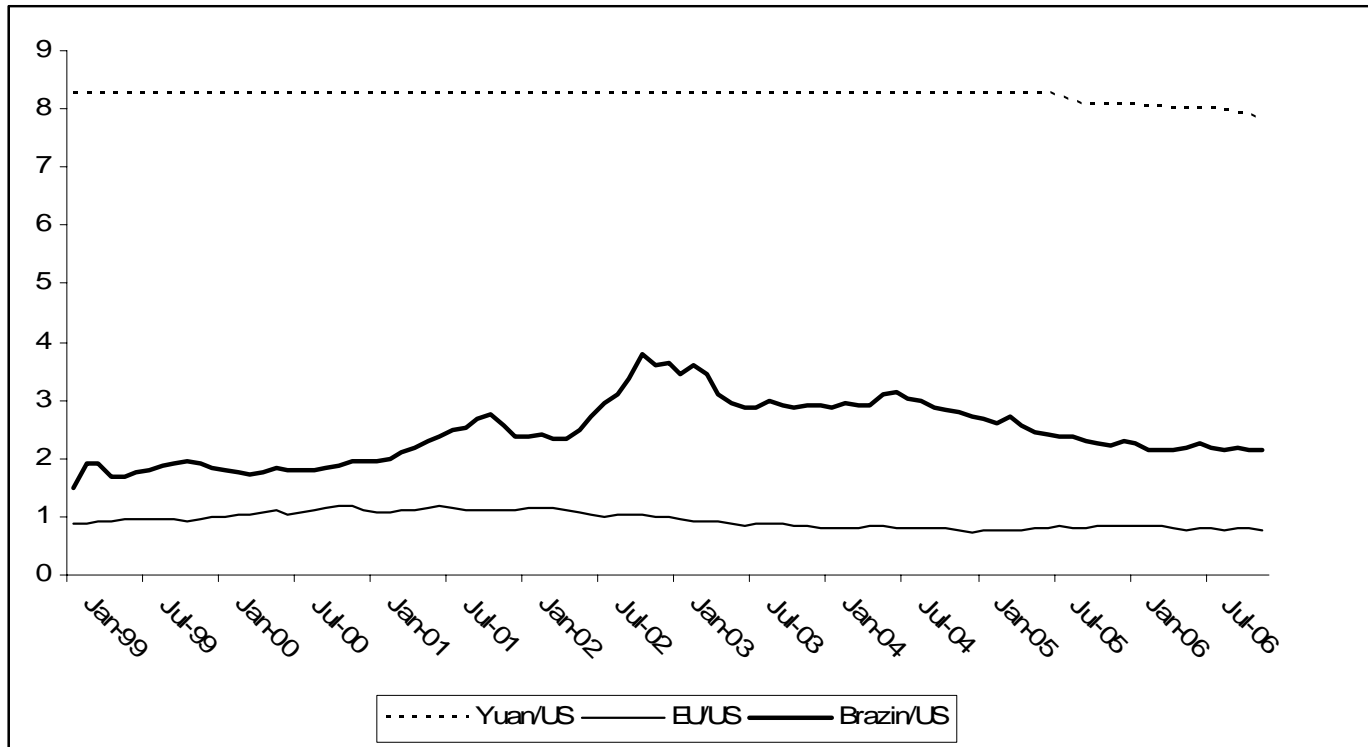
- Historical yield evolution in Japan



An investment framework primer



An investment framework primer



An investment framework primer

- Expected return distributions are at the core of Strategic Asset Allocation methodologies
 - Most relevant are the expected return and volatility but also other moments can be relevant if the distributions are non-normal
- What are the alternatives for generating expected returns?
 - Forward/backward looking, ALM, Risk neutral, non parametric techniques
- Strategic asset allocation decisions
 - Allocations for the longer time-horizon
 - Empirical return distributions are necessary
 - Forward looking methodology for yields/returns
 - Simulation based approach
 - Integration of macro economic variables
 - “No-view” and conditional optimisation

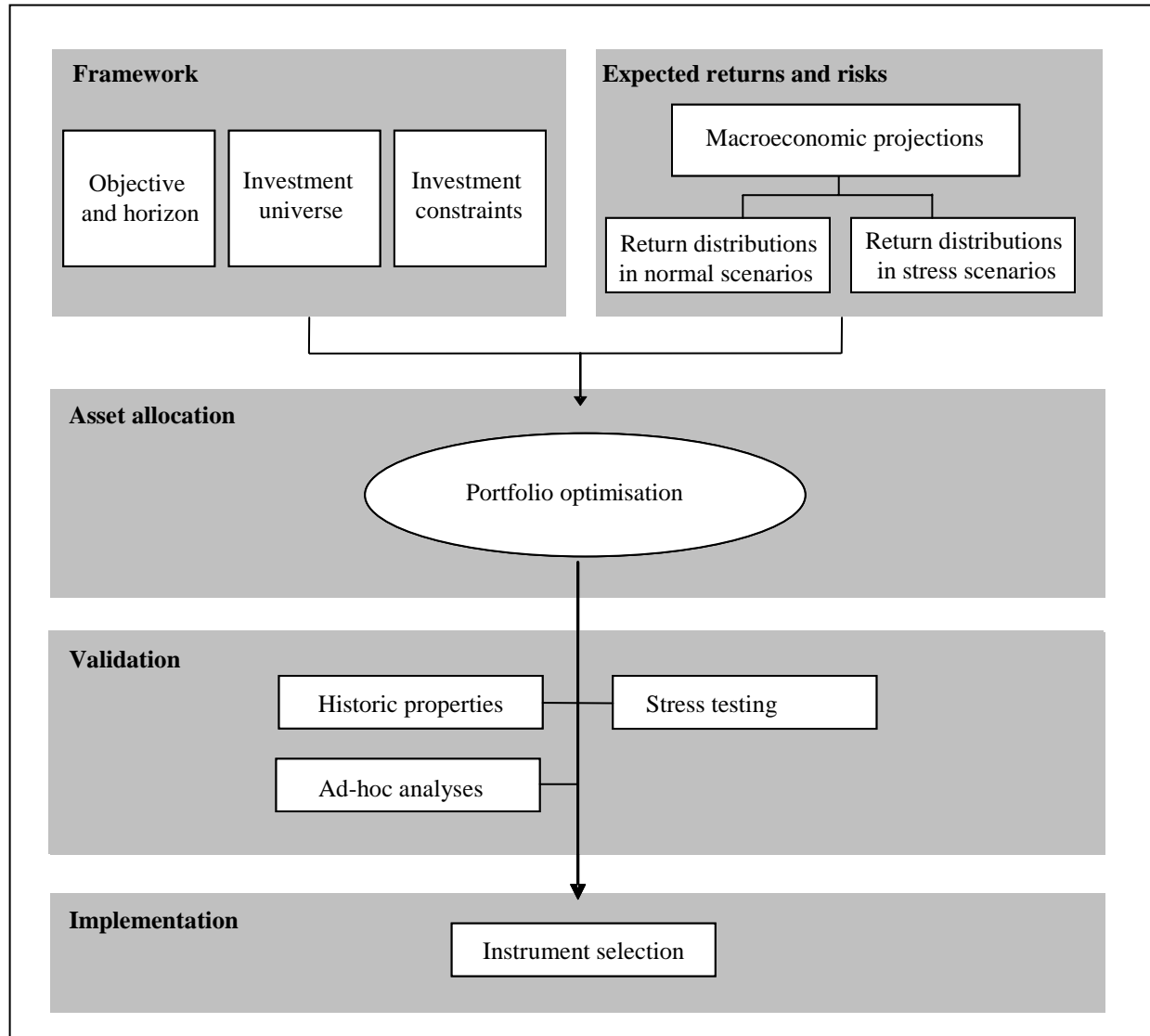
An investment framework primer

- Basic modeling building blocks:
 - Yield curve model
 - Model for equity risk premia
 - Model for currency pairs
 - Portfolio optimiser
 - Forecasting/prediction model
- Definition of the investment universe
- Quantification of risk appetite
- Maximum exposure to specific instrument classes based on liquidity risk considerations
- Investment horizon
- Revision frequency

An investment framework primer

- Suggestions on underlying principles:
 - Forward looking methodology
 - Scenario based
 - Conditional vs. unconditional predictions
 - Modelling Philosophy:
 - Not to beat the market but to reflect market expectations
 - Long-term view
 - Be objective i.e. as quantitative as possible
 - Provide a stable, transparent, and flexible decision support framework

An investment framework primer

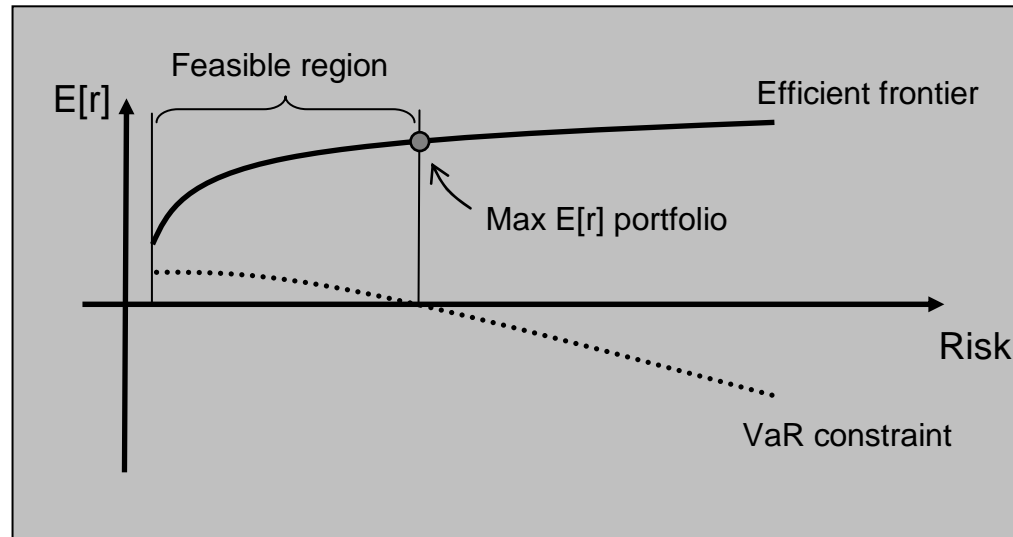


An example

- Intuition of the yield curve module could be:
 - Underlying factors drive yield curves
 - These factors are related to the macro economy
 - Different future macro economic scenarios leads to different yield curve evolutions...
 - and, thus to different expected returns
- How to obtain yield curve factors?
 - For example, the Nelson-Siegel model / parametric model
- How to create a link to the macro economy?
 - For example, regime switches

An example

- Intuition of the portfolio optimiser
- Simulated return distributions are core input
- The optimiser searches over different strategies to find the one that maximises return while still fulfilling the annual loss constraint
- Illustration of a one period problem:

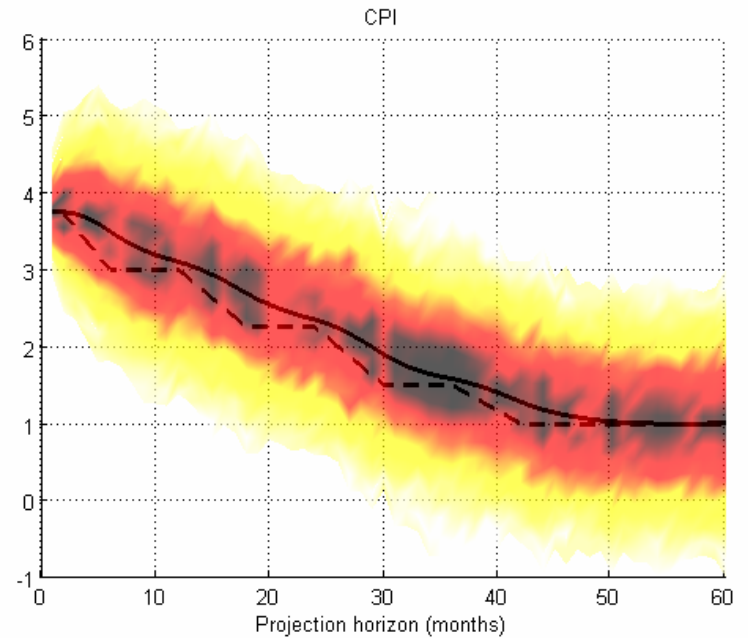
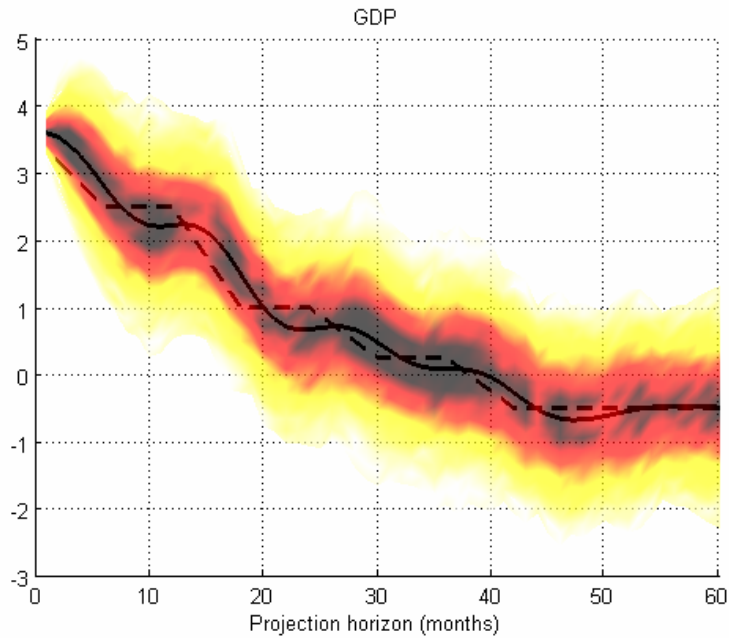


An example

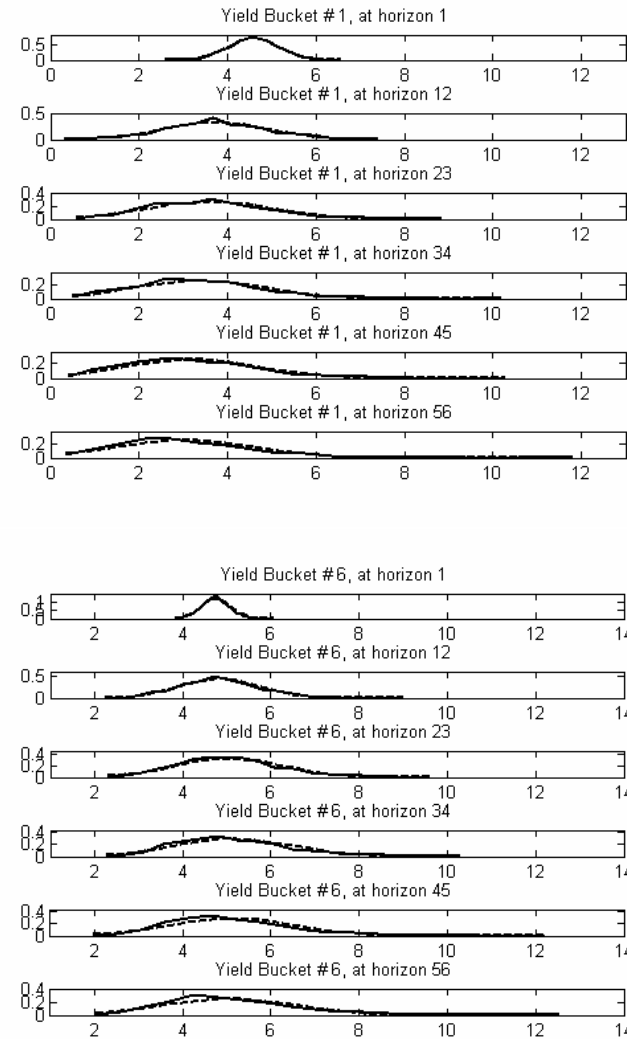
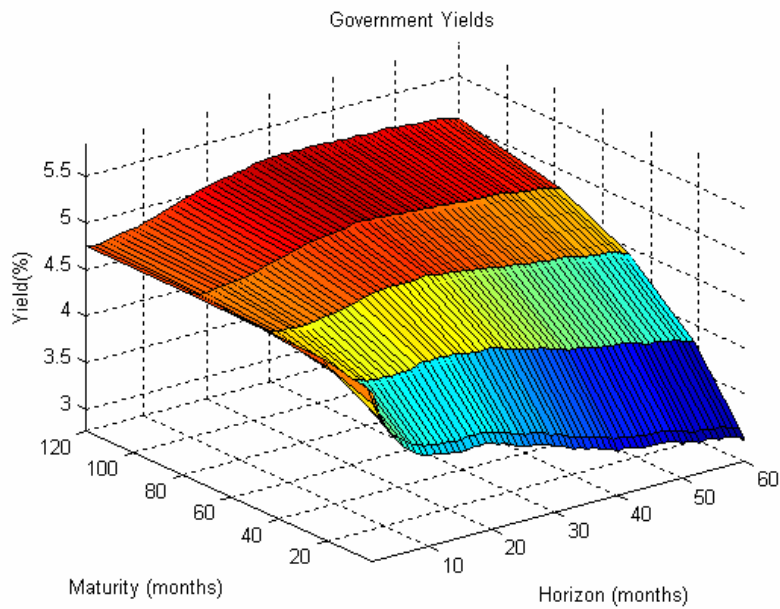
- For long-term asset allocation it is necessary to rely on simulation methodologies to generate necessary inputs
- The process could be something like:
 - Estimate a relevant model e.g. a VAR(p) for the variables of interest
 - Look at the estimated parameters
 - Change them to fit with economic intuition and what is expected for the future
 - It could be that other drift rates are expected going forward
 - Or, that the board wants to see how the asset allocation performs in a given stress scenario
 - Or, that the head of division wants to know what the sensitivity in the found asset weights are to changes in the return expectations
 - Or,
 - Perform the predictions and complete the analysis
- So there is a big difference between historical estimation and forward looking decisions based on the estimated models!

An example

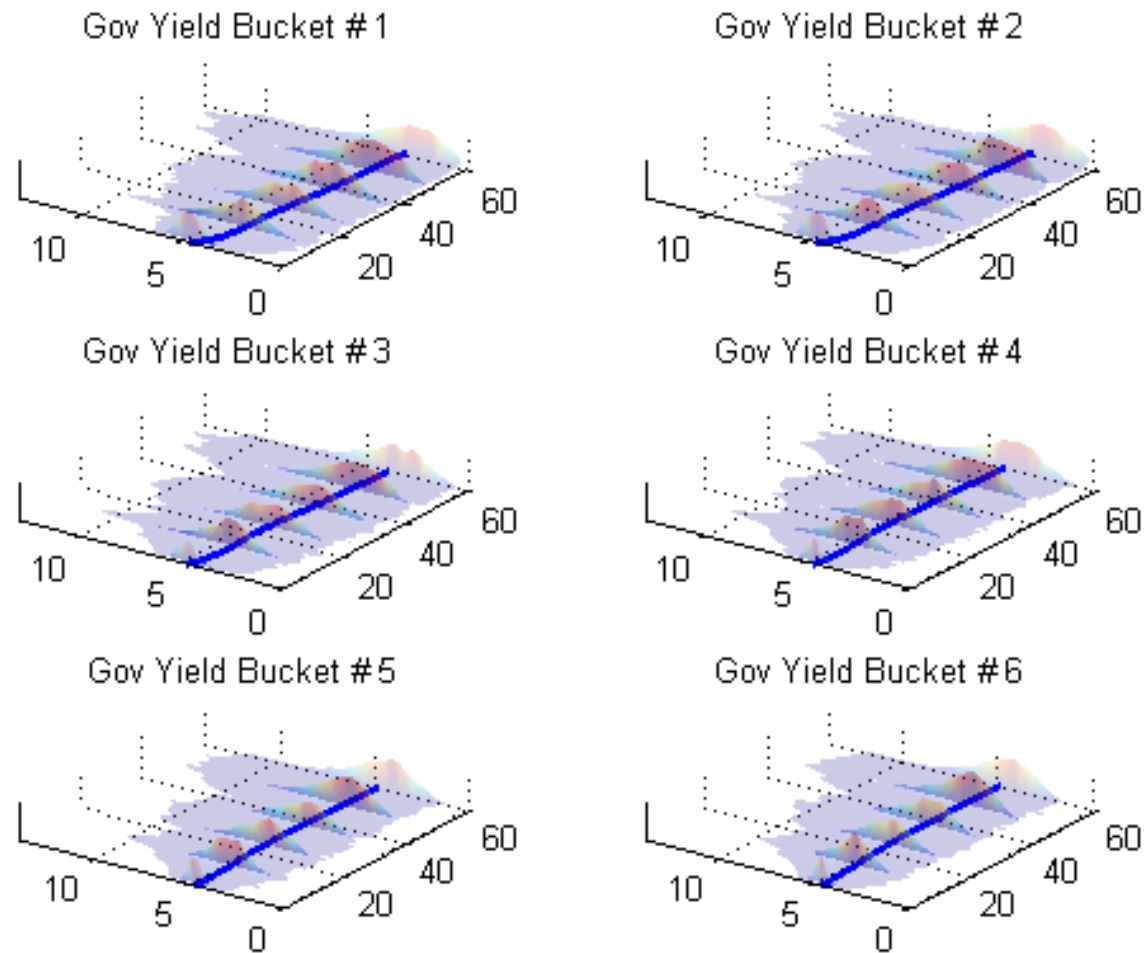
- A simulated recession scenario



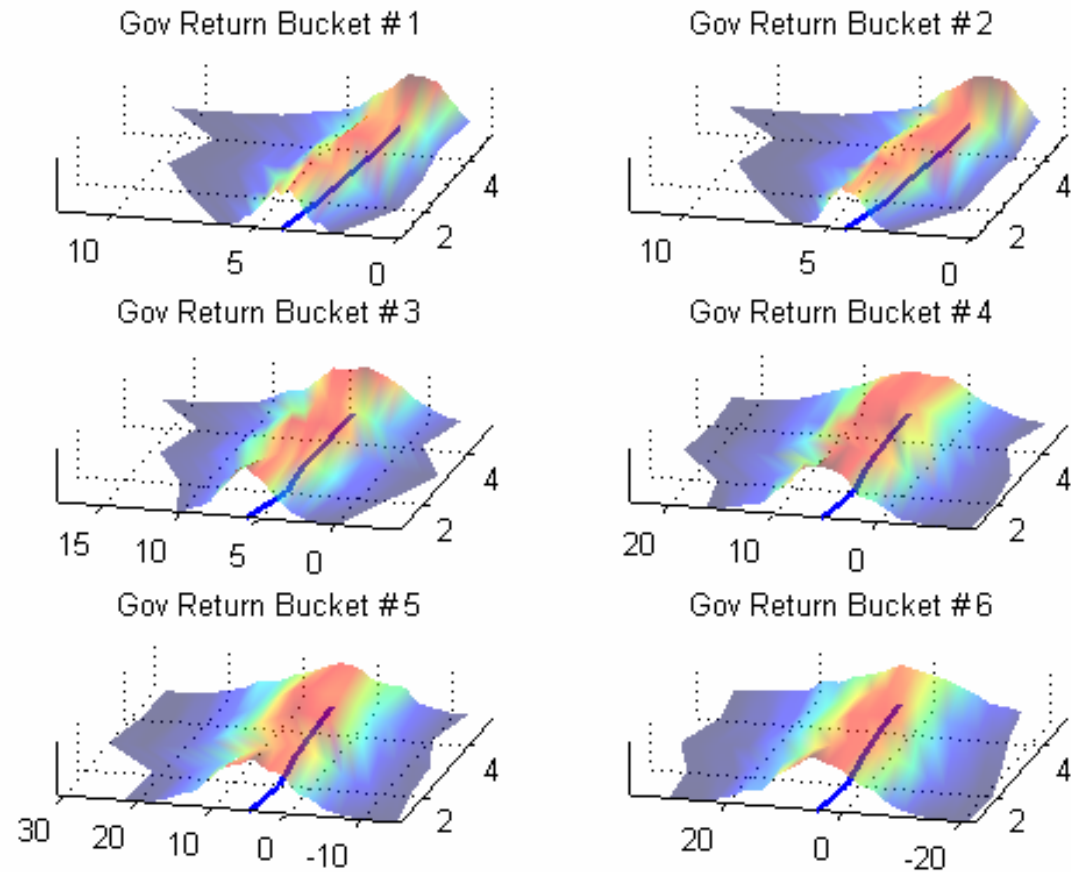
An example



An example

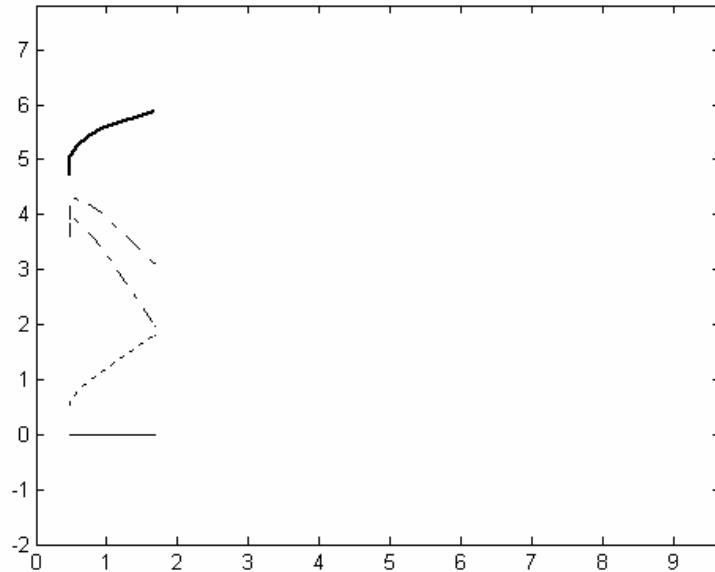


An example

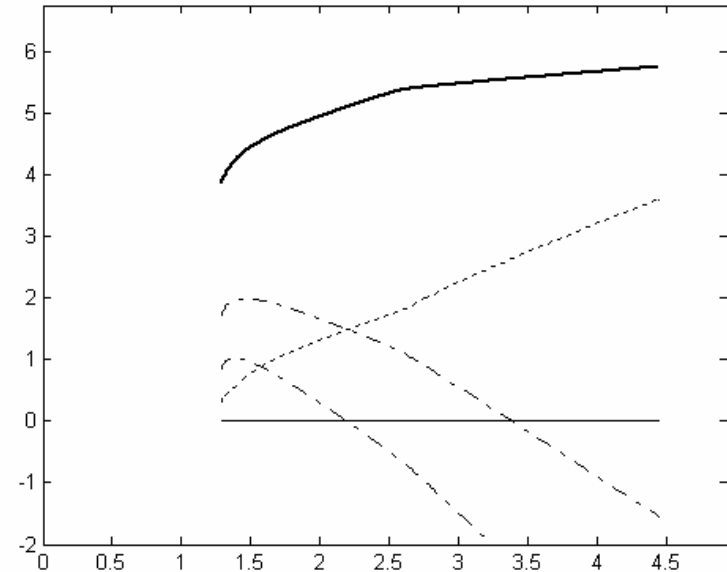


An example

Efficient Frontier year 1

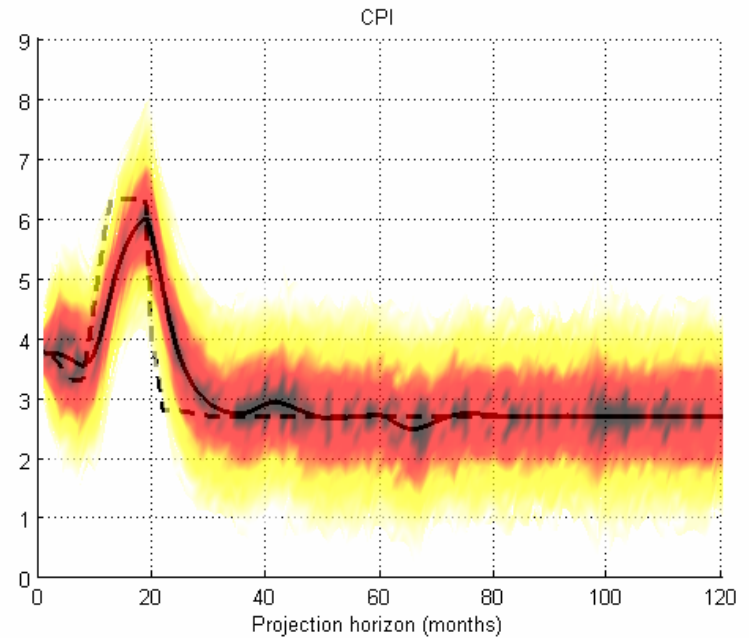
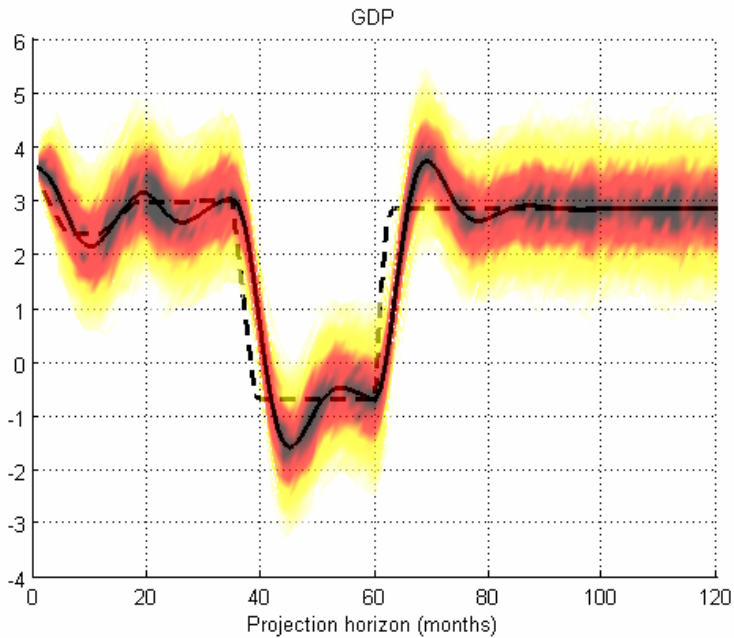


Efficient Frontier over all years

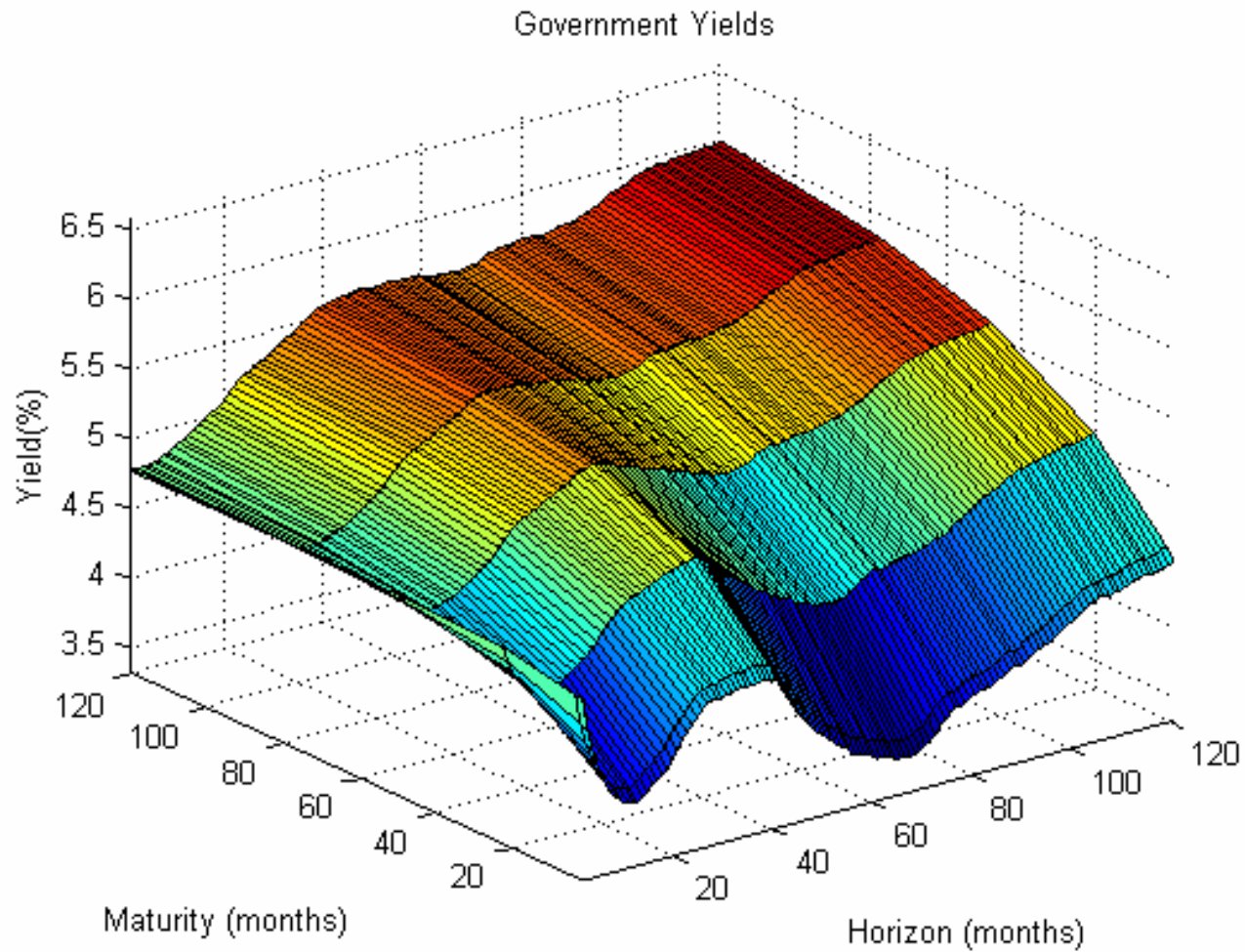


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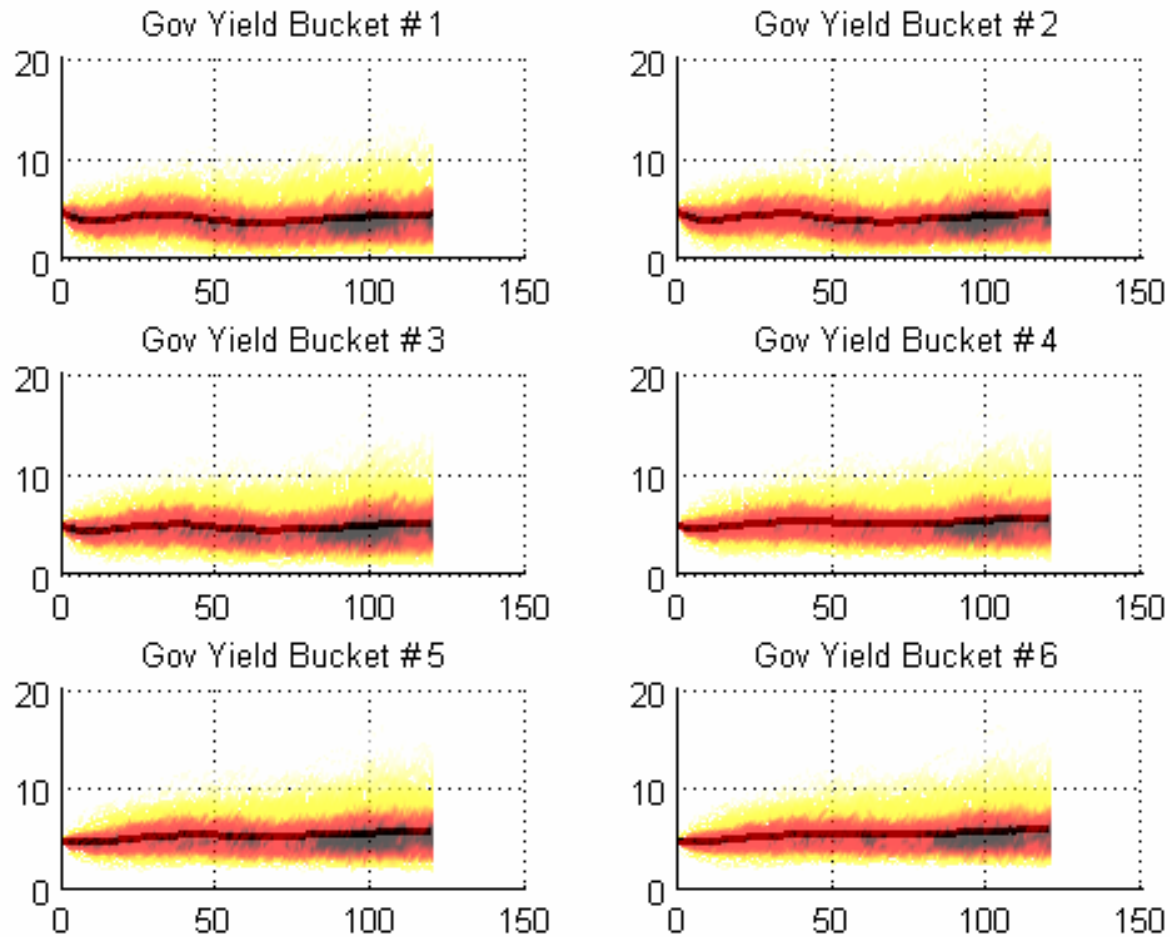
- A long term scenario with inflationary and recessionary periods



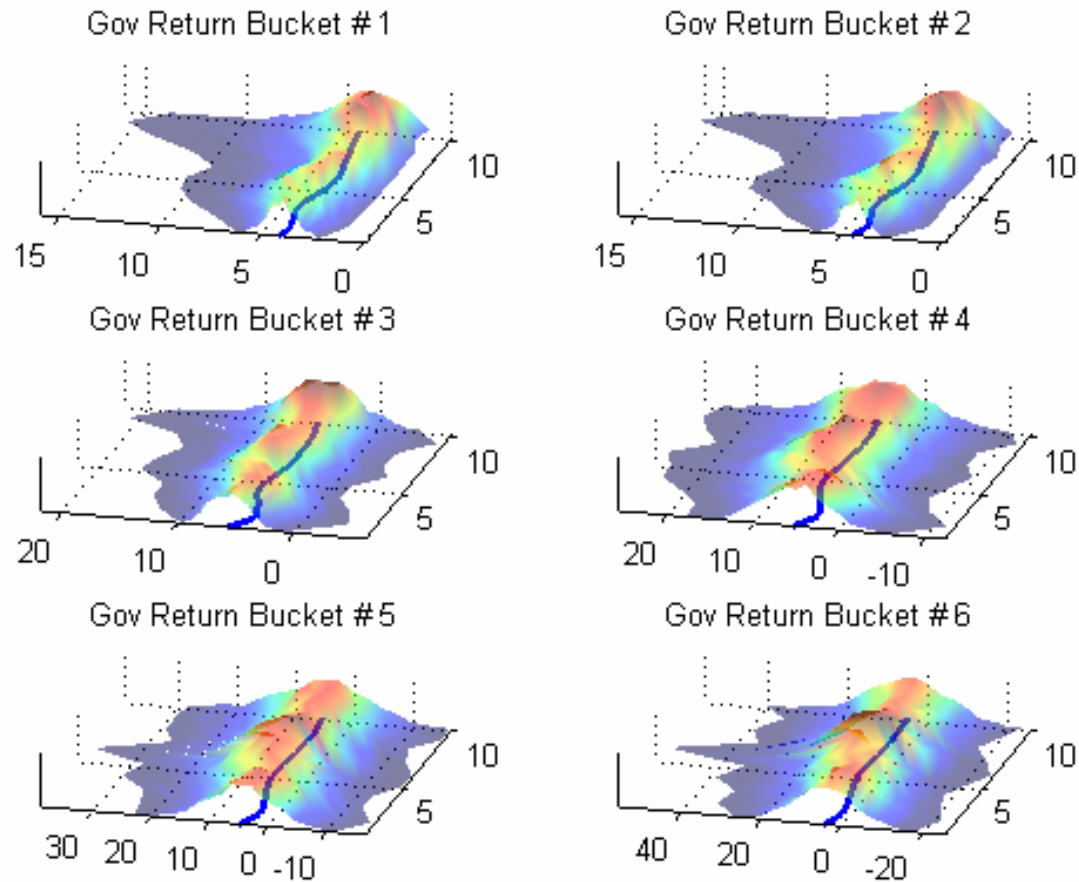
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