Methods and Challenges in Portfolio Construction at SINOPIA

GT Portfolio Optimization
CMAP, Ecole Polytechnique
Portfolio Construction
Adapting our market anticipations to the clients’ requests

Investment strategy characteristics

Return estimates  Portfolio optimisation  Risk estimates

Target portfolio
Tactical Asset Allocation Strategies

From investment signals to tactical positions

Expected Excess return at 3 months for bond markets

<table>
<thead>
<tr>
<th>Currency</th>
<th>Excess Return</th>
</tr>
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<tbody>
<tr>
<td>AUD</td>
<td>3.3%</td>
</tr>
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Source: SINOPIA

Global Fixed Income Allocation

Duration 6.43

Source: SINOPIA
Tactical Asset Allocation Strategies

From investment signals to tactical positions

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Source: SINOPIA
Tactical Asset Allocation Strategies

3 key elements for TAA strategies

- Investment signals expressing market anticipations
  - Forecasting models are in line with SINOPIA Investment philosophy:
    
    \[ \text{Markets are rational and efficient on average} \]

- A robust risk model dedicated to portfolio optimisation
  - A few systematic factors driving the common behavior of the assets
  - One specific source of risk for each asset

- A transparent optimisation process that can easily be adapted to any strategy
  - Each step is simple and intuitive
  - Each strategy is represented by a set of parameters (benchmark composition, level of active risk…) and constraints (e.g. limit on weights)
TAA Investment Signals
An econometric model based on a fundamental approach

- Consensus forecasts on fundamentals
- Valuation model
  - long-term relationship
- Equilibrium Rate
- Expected tactical return
- Market Rate

- Market Price

Non contractual document
TAA Investment Signals

The equilibrium value of the US 10-year rate

Source: SINOPIA
Risk Models for TAA

Risk parameters are critical for optimizing active positions

- The impact of volatility is straightforward

- The impact of correlation is less obvious
Risk Models for TAA

Risk parameters are not stable

- The volatility of the volatility is well-known

- The correlation is also changing

Volatility of the JPM World Index

Correlation between JPM Indexes

Source: Bloomberg, SINOPIA

Non contractual document
Risk Models for TAA

Example: risk model for developed bond markets

Systematic risk:
- Factor betas
- Factor volatility: 4.2%

Specific risk

Specific volatility

Source: SINOPIA

Non contractual document
TAA Optimisation Process

Decomposing the investment signals I

<table>
<thead>
<tr>
<th>Currency</th>
<th>Expected premium</th>
<th>Long term premium</th>
<th>TAA premium</th>
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<tbody>
<tr>
<td>AUD</td>
<td>3.3%</td>
<td>AUD 0.9%</td>
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<tr>
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Source: SINOPIA
# TAA Optimisation Process

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TAA Optimisation Process

Determining the exposure for each source of performance

\[
\text{Exposure} = \frac{\text{Forecast Quality} \times \text{Premium}}{\text{Risk Aversion} \times \text{Risk level}}
\]

!! The sources of performance must be uncorrelated !!
TAA Optimisation Process
Mixing the sources of performance according to the strategy

- Single asset vs multi asset
- Absolute return vs benchmarked strategies
- Market neutral vs tactical position on the asset class
- Long only vs long short
- Adding up particular constraints?
Challenges for TAA Strategies
Relaxing some assumptions of the optimization process

- Calibration of the optimizers: aligning investment signals distribution and risk models
- Performance of the models during crisis: handling short term discrepancies
- Robustness of the models: the dimension puzzle
- Mean Variance framework: considering more general optimization criterions
- Investing for longer horizons / non myopic investors: multiperiod investment rules
Dynamic Risk Management Strategies

Managing risk in the short term for longer time horizons

- Investors may have specific medium to long term objectives and constraints

- Risk budget changes over time depending on:
  - Past performance of the strategy
  - Current market risk environment

- Investment strategies must manage risk at short term and provide optimal return profiles during the whole lifecycle of the products
Dynamic Risk Management Strategies

How to manage risk in a multi period framework?

What next?

Current market level

Required minimal level
Dynamic Risk Management Strategies

Anticipate, don’t just react

- Short-term allocation decisions alters the return profile at maturity
  - Set a management rule at the outset in case of unexpected adverse events

- Define the risk budget
  - Analyze the constraints: guarantee, VaR, expected shortfall
  - Value them to determine the risk budget and the hedge

- Define the investment policy of the risk budget
  - What type of performance engine? beta or alpha?
  - Investor risk tolerance
  - Investment horizon(s)
  - Structured product or open-ended fund
Define the risk budget

Example of liability valuation in a LDI context

Value of liabilities: € 56.1 m

Source: SINOPIA
Invest the risk budget

A 3 steps process

- Choose the risky asset
- Measure and follow short term risk indicators
- Adapt the exposure to the risk budget according to the management rule defined at the outset
Short term risk indicators

Volatility dynamic

- Market volatility is not constant over time:
  - low volatility periods
  - high volatility periods

- Strong market movements are followed by other strong movements
  - volatility persistence effect

Source: Bloomberg, SINOPIA
Short term risk indicators

Volatility skew

Eurostoxx Implied Volatility - June 2008

Source: SINOPIA
Short term risk indicators

Extreme events

- Model lower tail distribution
- Extrapolate the distribution tail to lower quantiles: stress calculation

Source: SINOPIA
Adapt the exposure to the risk budget

CPPI vs OBPI

Cushion

Floor Value

multiplier

Risky Asset (exposure)

T-bills

Option

Replication of a Zero Coupon

Final payoff of the predefined formula

At maturity the replication of the zero coupon returns 100% of initial investment
Adapt the exposure to the risk budget

Managing short term volatility

- Volatility adjustment rule: an example
  - Target volatility = 20%
  - Expected volatility = 40%
  - Adjusted index = 50% of the raw index

- Strategy results
  - Success in approaching constant volatility
  - Extreme risk remains close to original index extreme risk

Source: SINOPIA
Adapt the exposure to the risk budget

Which tools?

- Simulation tool for open ended funds
  - Analyzing the behavior of an investment strategy on a lot of scenarios generated by Monte Carlo

- Exotic options pricers for structured products
Challenges for DRM strategies

Modeling the objectives and measuring the short term risk

- Finding realistic criterions representing risk aversion to compare DRM strategies
  - Transparency of the optimal management rules
  - Relevance of the performance and risk indicators

- Short term risk indicators (volatility and extreme values) for actively managed portfolios

- Adding short term options for managing the exposure

- Hedging policy of the liabilities
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Postal address: 75419 Paris cedex 08
Offices: Immeuble Ile de France - 4 place de la Pyramide - La Défense 9 - 92800 Puteaux - France
www.assetmanagement.hsbc.com/fr
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