

SAS GIC 2012

Liability-Driven Asset Strategy for General Insurers

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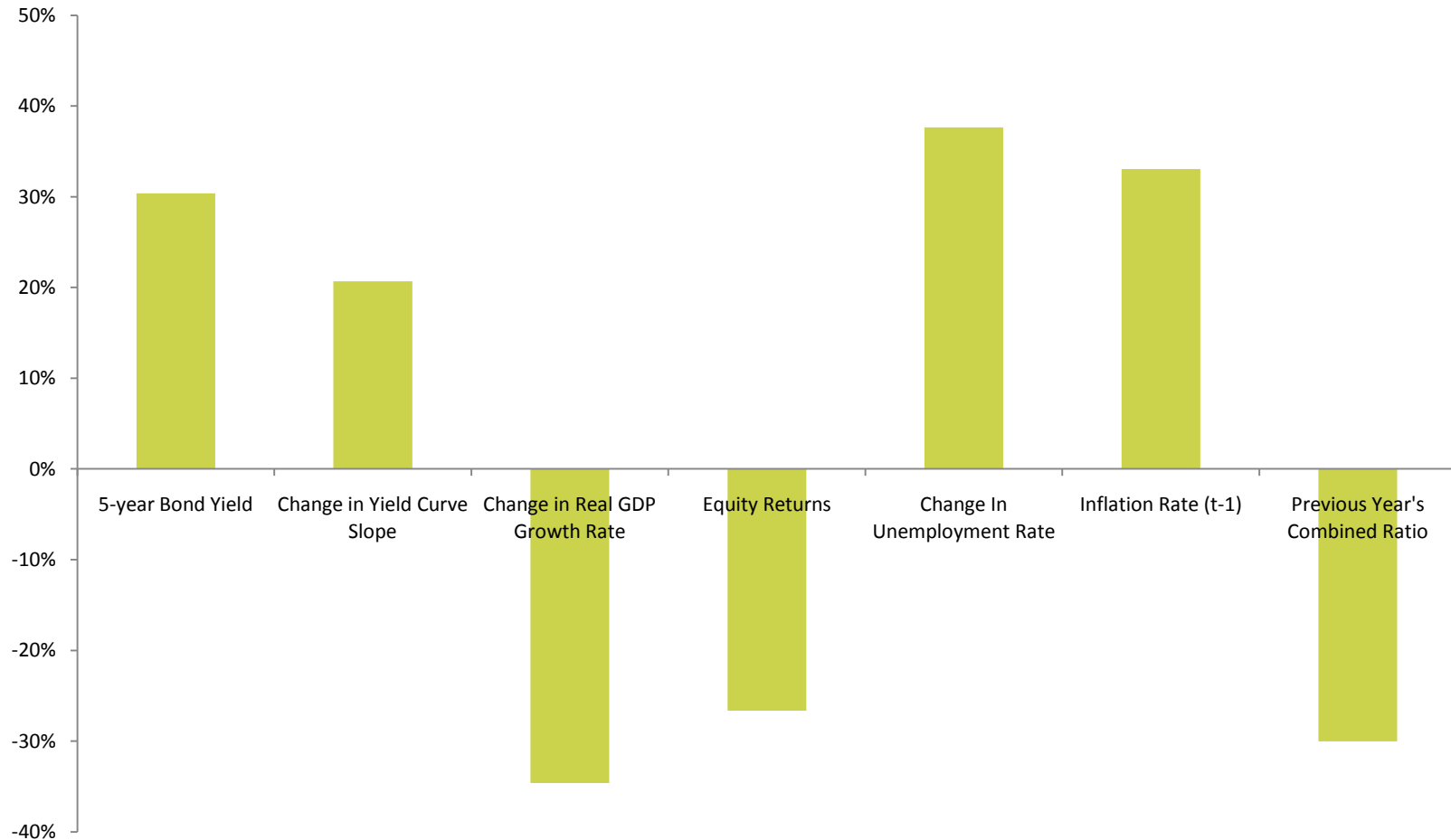
Overview

- + This presentation considers how strategic asset allocation can be analysed in the presence of general insurance liabilities
- + Two topics are discussed and developed using case studies:
 1. Analysing asset strategy in context of the **asset-liability relationships** that can be found in general insurance
 2. Analysing asset strategy in context of **investment objectives** that can be important to general insurance corporates

Analysing asset strategy in context of asset-liability relationships found in general insurance

General Insurance Industry Combined Ratio Correlations to Economic Variables

Correlation of Change In P&C Industry Non Cat Combined Ratio to:



+ Increase in combined ratio means decrease in insurance profit

Why do economic factors drive P&C underwriting?

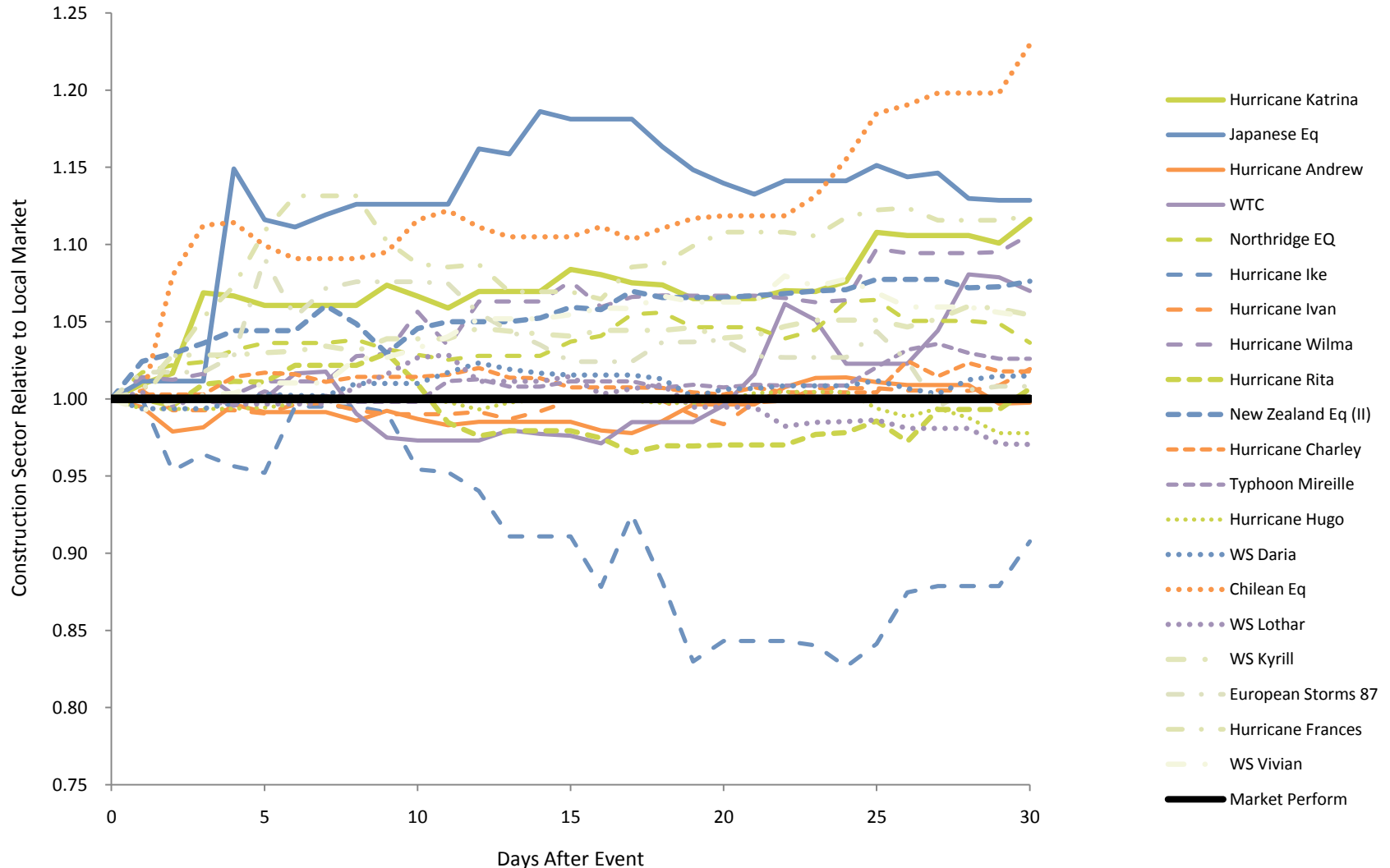
- + Inflation impacts claims cost
 - Both realised and anticipated
- + Negative shocks to economic growth lead to increases in combined ratio
 - Affects demand for insurance
 - + Downwards effect on exposure, premium rates
 - Increases in claims cost
 - + Fraud, theft, increased propensity to claim
- + Numerous other factors
 - Stock market falls linked to D&O claims
 - Credit insurance...
 - Cost/availability of capital, competition
 - Impacts of natural catastrophes on financial markets

Impact of Natural Catastrophes On Financial Markets

- + Natural catastrophes typically P&C insurer's and reinsurer's "peak risks"
- + What impact do catastrophes have on financial markets?
 - Yang *et al** investigate impact of catastrophes on markets in Japan
- + Investigations indicate slightly negative (but not statistically significant) impact on overall equity markets
- + At a granular level, disasters can impact specific industry sectors, both negatively and positively
- + Construction industry equity *tends* to outperform market post-disaster
 - Increased demand for construction services following major catastrophe
- + P&C insurance sector tends to underperform
- + Which other industry sectors have +ve or -ve "catastrophe beta"?

* Charles C. Yang, Mulong Wang, Xiaoying Chen, (2008) "Catastrophe effects on stock markets and catastrophe risk securitization", Journal of Risk Finance, The, Vol. 9 Iss: 3, pp.232 - 243

Construction sector equity returns in excess of local broad equity market after the 20 largest insured losses since 1970



Source: Datastream and B+H own calculations

Example: Simple P&C insurance company

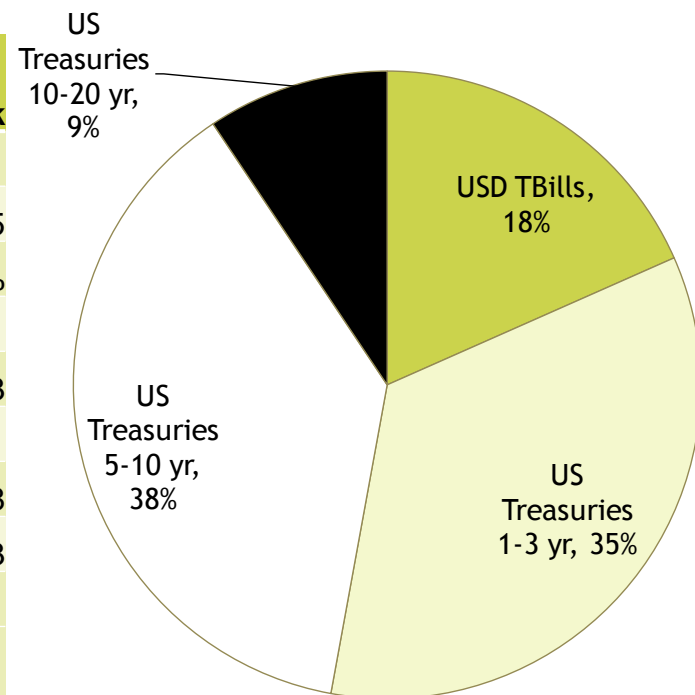
- + 10 lines of business (long-tailed liability and short-tailed catastrophe)
- + Aggregate distributions for insurance risk variables
 - Normal for exposure levels & premium rates
 - Gamma for non-cat burning cost
 - Normal for reserve risk
 - Catastrophes pre-simulated
- + Exposure, Premium Rates, Burning Cost all allowed to be sensitive to economic factors (using a GLM approach)
 - Interest Rates
 - Equity Returns
 - Unemployment
 - GDP
- + Claims payments sensitive to mixture of inflation rates (some lines also assumed insensitive to inflation)
 - Price
 - Wage
 - Medical
- + One year of new business, one-year balance-sheet to balance-sheet view, discounted reserves
- + **Just an example!**

Internal Model - Base Results

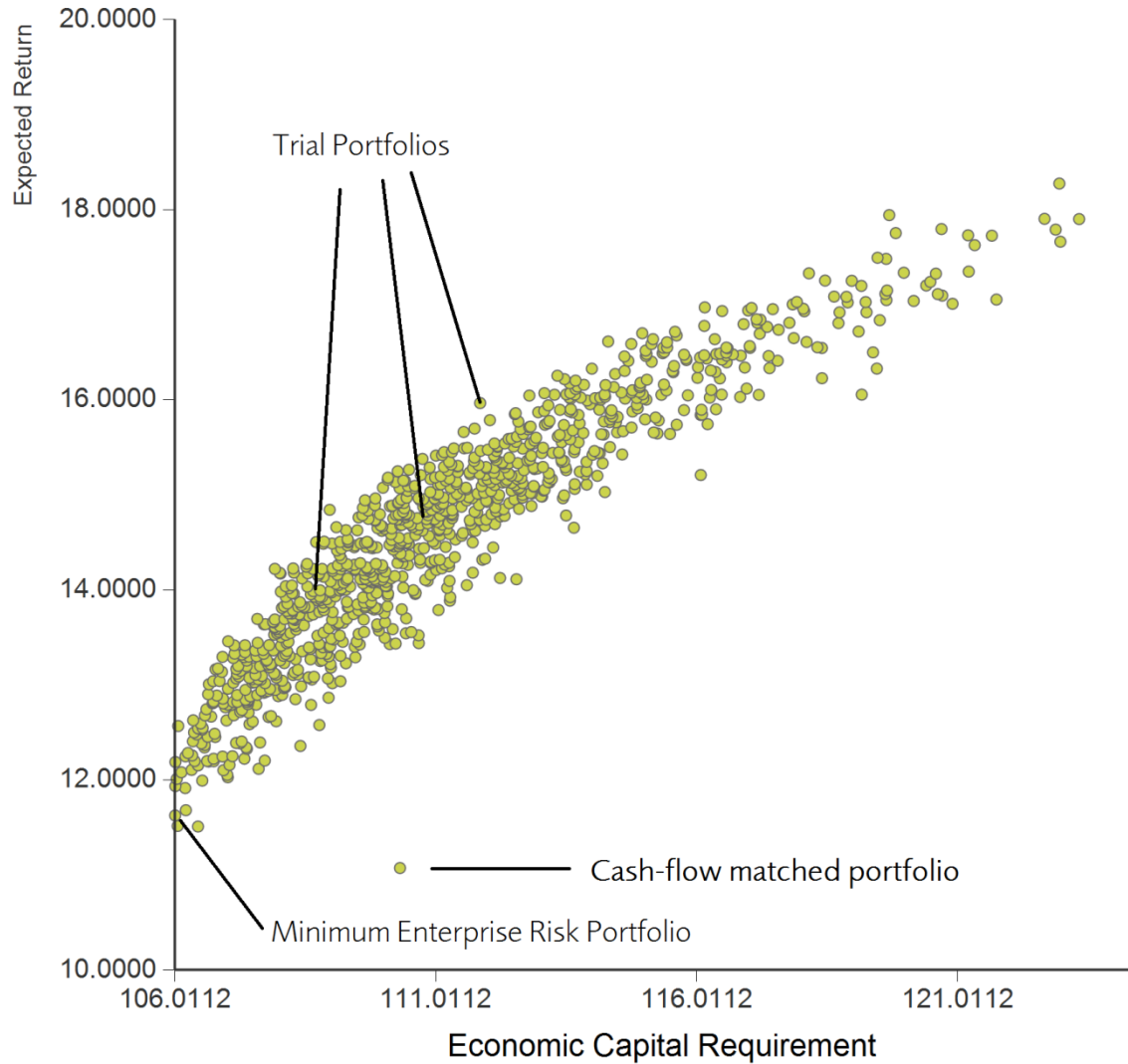
- + \$115m Net Premium Income
- + \$273m Economic Liabilities
- + \$400m Investment Assets
- + \$127m Economic Net Assets
- + ~5 year duration of liabilities
- + 97% expected combined ratio
- + Economic Capital Requirement TVaR 99%

Metric (\$m)	Standalone Asset Risk	Standalone Insurance Risk	Total Risk
Expected Economic Profit	3.5	7.6	11.1
Standard Deviation	13.9	34.9	35.5
Probability of Loss	35%	36%	33%
VaR @ 90%	14.6	39.6	37.1
VaR @ 95%	22.1	57.5	55.3
VaR @ 99%	38.9	93.6	92.1
VaR @ 99.5%	44.7	108.9	106.8
TVaR @ 99%	48.0	111.7	110.3
Economic Capital Requirement	48.0	111.7	110.3

Cash-flow matched Asset Allocation



Beyond Mean-Variance - Economic Capital

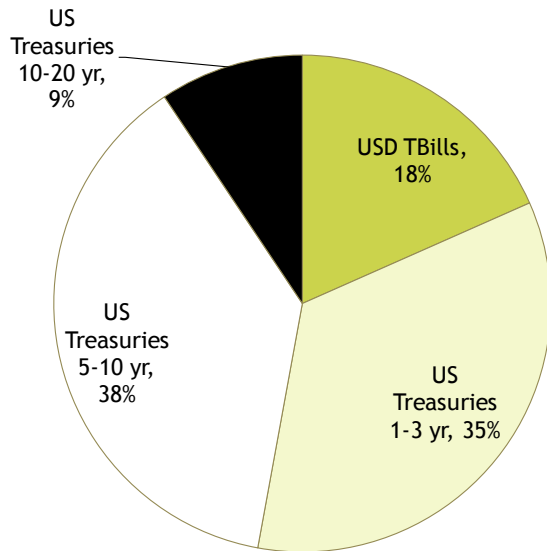


Beyond Mean Variance - Economic Capital

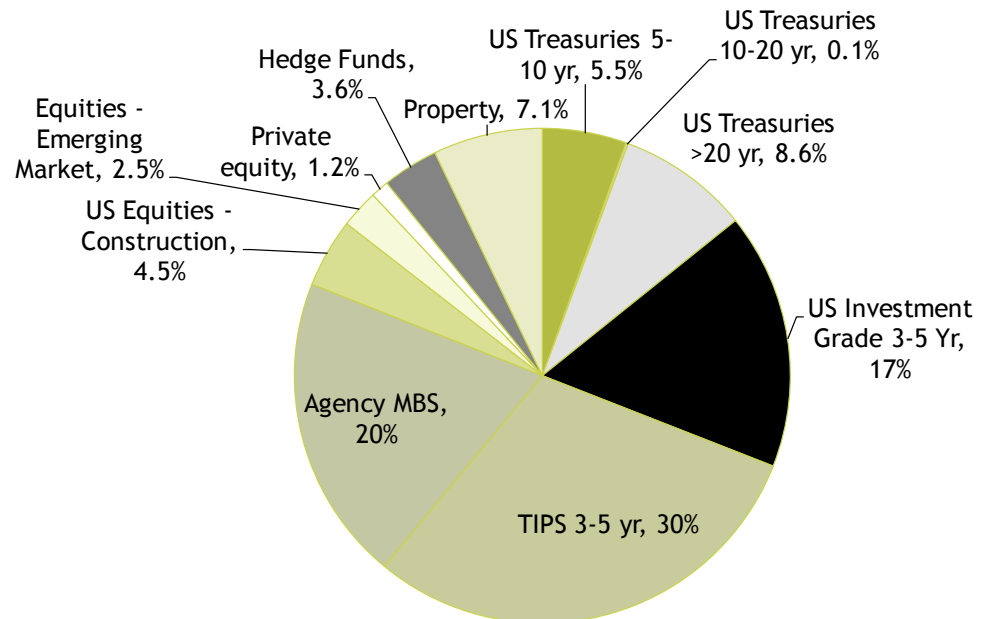
\$m unless stated

Metric	Base Allocation	New Allocation
Expected Economic Profit	11.1	14.7
Standard Deviation	35.5	37.3
Probability of Loss	33%	31%
VaR @ 90%	37.1	34.4
VaR @ 95%	55.3	53.6
VaR @ 99%	92.1	89.6
VaR @ 99.5%	106.8	106.6
TVaR @ 99%	110.3	110.3

Original Allocation



New Allocation



Enterprise Level Asset Allocation - Internal Model Results Summary

- + Taking an appropriate level of market risk can reduce capital requirements/risk and/or increase expected profit
- + Diversification with insurance risks, risk premia on assets, economic impacts on liabilities create enterprise level risks, and opportunities to reduce risk as well as increase expected return
 - Matching best-estimate cash flows doesn't lead to minimum risk
 - allocations with inflation protection provided a lower level of risk and capital than their deterministic cash flow matched portfolio.
 - Also able to achieve a higher expected return using this extra capital by allocating some assets to riskier securities
- + **It's just an example!**
- + Lots of other constraints and considerations
 - Considerations: value, market, liquidity, model uncertainty
 - Other constraints e.g. Accounting profit volatility, allocation "too different to peers'" etc.

Analysing asset strategy in context of investment objectives that can be important to general insurance corporates

Investment objectives of P&C firms

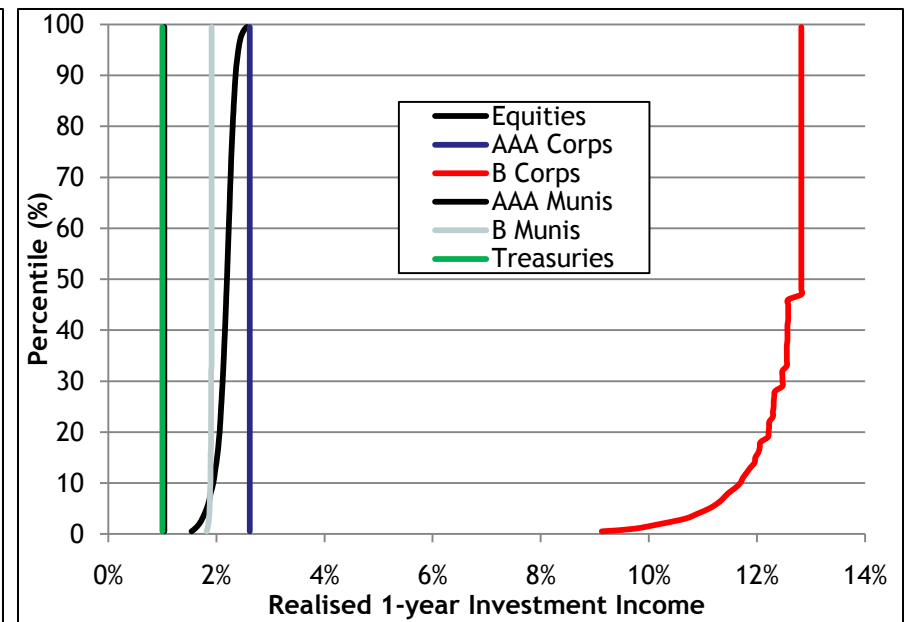
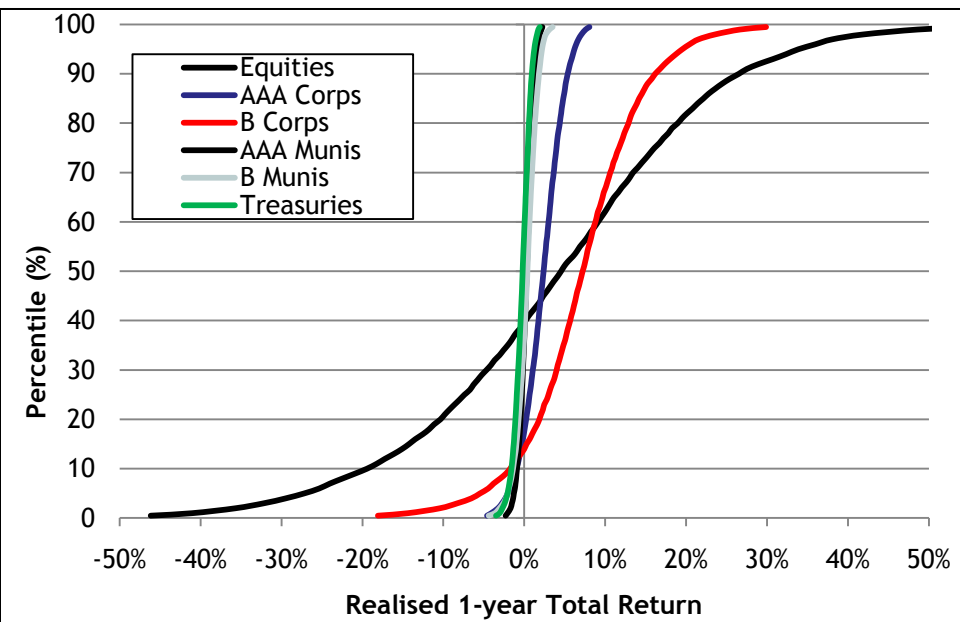
- + P&C firms will often have strategic investment objectives that are focused on investment income rather than total asset return
 - Mainly driven by accounting treatment and impact on corporate earnings
- + However, total asset return may still be an important downside risk constraint
 - Regulator and rating agency may be interested in state of mark-to-market balance sheet
- + Assets will also need to reflect the duration and liquidity profile of the liabilities

Case Study

- + Use stochastic model of joint behaviour of total return and investment income of a range of asset types
- + In this initial analysis we focus on a single time horizon of 1-year
 - This analysis could be directly extended by creating portfolios per liability cashflow-year, and running the optimisation for each portfolio
- + The case study considers a total of 6 asset classes:
 - Treasury portfolio
 - + Duration of 5 years
 - Corporate bond indices
 - + 2 diversified portfolios:
 - Credit quality AAA and B;
 - Duration of 5 years
 - Municipal bond indices
 - + 2 diversified portfolios:
 - Credit quality AAA and B;
 - Duration of 5 years
 - S&P 500 equity index

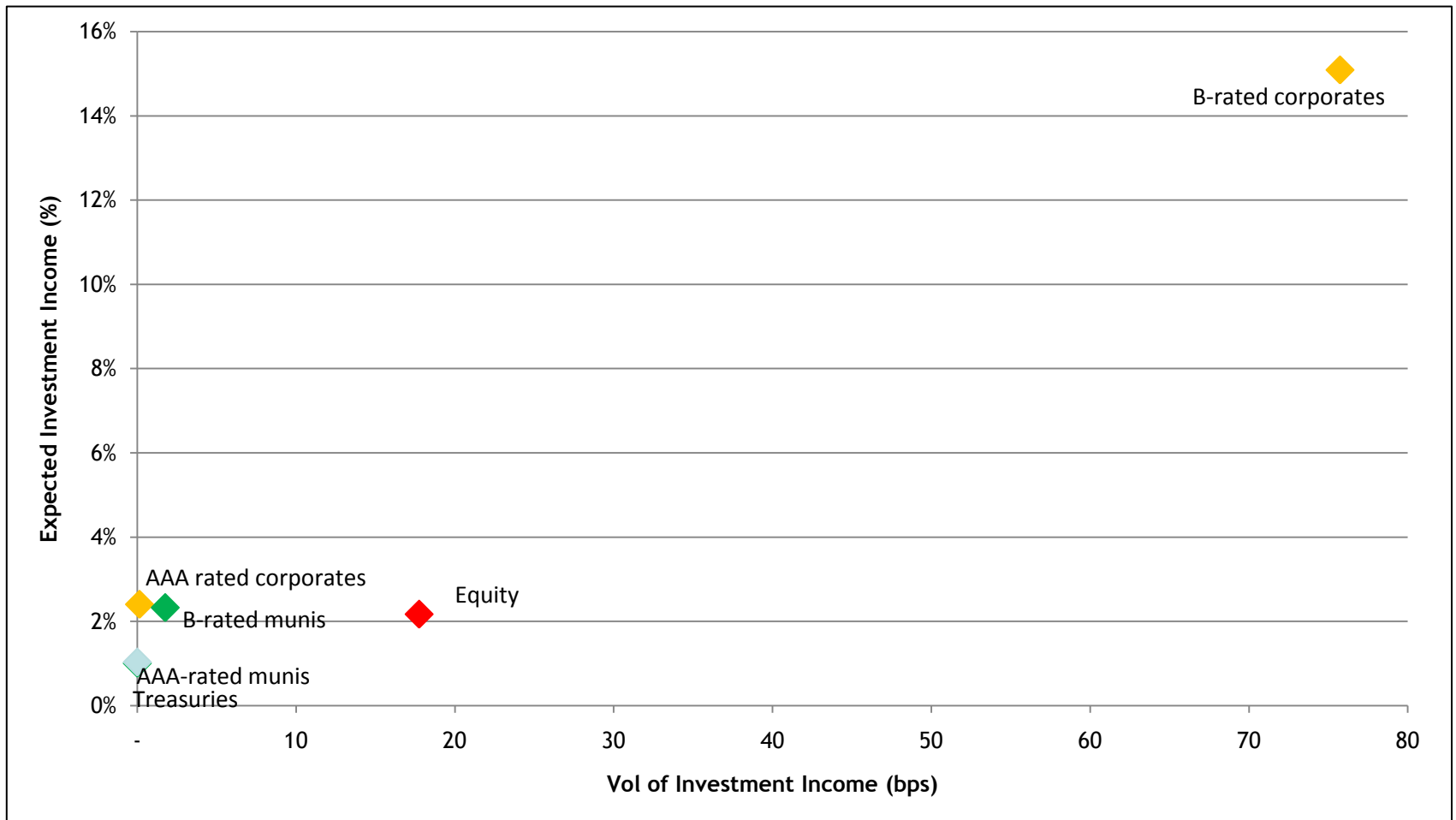
Investment Income and Total Returns

- ✦ (Joint) full probability distributions for investment income and total return of each modeled asset class:

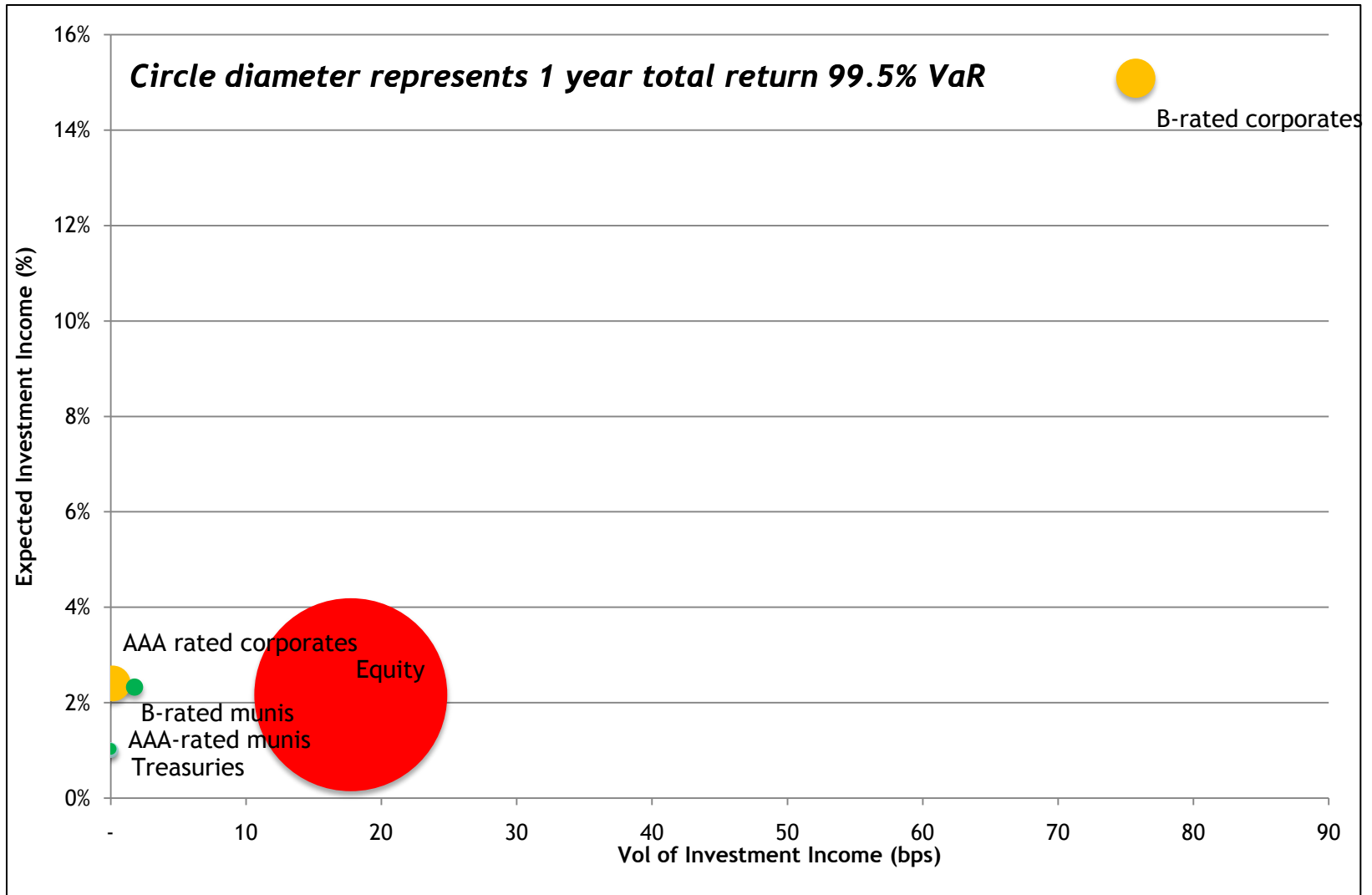


Asset Class Results:

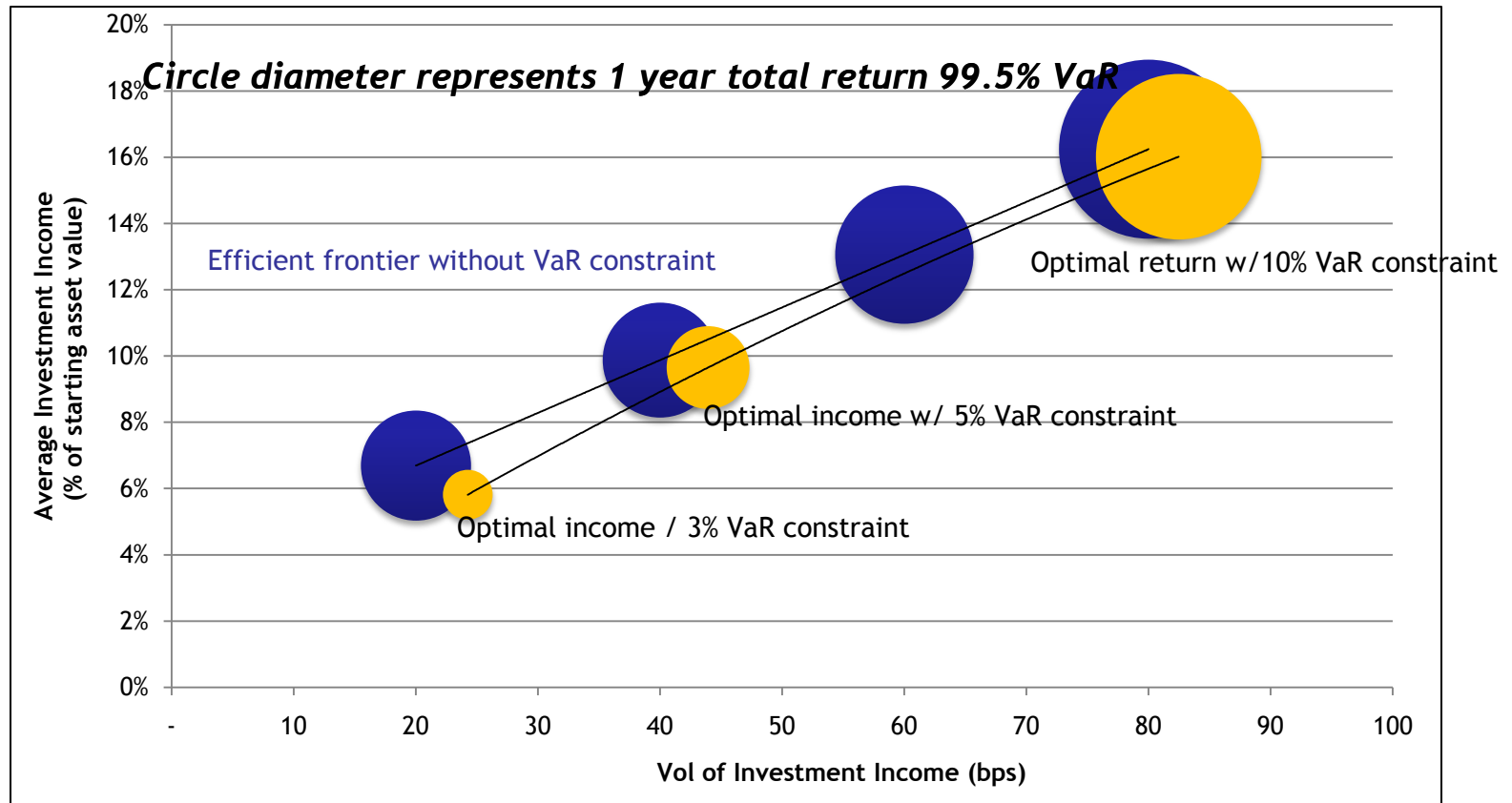
Expected Investment Income v Investment Income Vol



Asset Class Results



Optimised portfolios



- + Introducing total return downside constraints results in a reduced expected investment income for a given investment income volatility
- + At lower levels of investment income vol, a significant reduction in total return downside VaR risk can be obtained for a limited impact on expected investment income

Summary

- + Stochastic simulation model can be used to analyse portfolio construction and the likely range of investment income and total return outcomes for different portfolios
- + This can be used to optimise asset allocation against multiple risk constraints
 - Investment income uncertainty
 - Total return downside risk

Sources

- + “Economic Considerations for P&C Insurers”, James Norman, Barrie & Hibbert Insight Paper

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