Session 14: ERM/Capital Implications for Investments

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Presenters:
Tobias Gummersbach
Hal Warren Pedersen ASA

ERM/Capital Implications for Investments

Hal Pedersen, Conning

Society of Actuaries ERM Symposium 2018
Miami
Session 14, 14:00-15:15
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The Investment and ERM Processes

- What do we mean by Enterprise Risk Management (ERM)?
- ERM is an all-encompassing approach that integrates every aspect of a company's business in order to identify and manage both internal and external risks to the organization.
- At this level of generality there are a lot of models, assumptions, risk metrics and potential levers for managing the enterprise.
- In practice, a focus on specific areas of the enterprise is given by various members of senior management.
- Our focus today is on the strategic considerations faced by the team of the Chief Investment Officer within an ERM program.
- Actuaries were early pioneers in blending investment and risk management, going back to basic interest rate immunization.
- More sophisticated cash flow matching techniques came into vogue in the 1980s.
- Economic scenario generators started to play a significant role in the 1990s.

The Investment and ERM Processes

- Ongoing developments in finance, breakthroughs in actuarial modeling techniques, and major advances in computing power have combined to create opportunities for insurers to implement very informative ERM programs with investment programs that are carefully optimized to their business.
- Today, a wide range of very sophisticated and informative stochastic modeling and optimization techniques are available for managing the investment process within and ERM framework.
- Financial risk modeling is the basis for internal company models for regulatory economic capital calculations. It has proved to be an effective and insightful method for performing insurance company investment analysis.
- Strategic Asset Allocation (SAA) is one example of a very useful process for managing the investment process within and ERM framework.
- SAA involves the exploration of the risk and reward tradeoffs associated with different asset allocation alternatives.

Spectrum of Modeling Capabilities (Classical to Stochastic/SAA)

- Simple
- Understandable
- Focused on interest rate risk
- Risks not quantified

- Quantifiable interest rate risk
- Only considers one type of risk
- Focus only on interest rate risk
- Theoretical analysis

- Reflects correlation between assets
- Incorporates constraints
- Emphasis on total returns
- Does not reflect interplay of assets and liabilities

- Models Assets & Liabilities
- Leverages economic scenarios
- Optimizes present value of distributed earnings (PVDE)
- Utilizes actuarial models and ESG and investment optimization tools

The Investment and ERM Processes

- The goal of an SAA is to maximize the reward potential of the selected investment strategy while minimizing exposure of the company to unacceptable or unanticipated risks.
- The basic process requires:
  - establishing the trading rules that will govern the implementation of the investment strategy,
  - setting the environment under which the alternative investment strategies are evaluated, and
  - identifying a company's objectives, constraints, and risk tolerance.
- Constant Mix Strategies are allocation strategies that are constant over time.
- Many other strategies can be considered (Dynamic Trading Strategies, Tactical Asset Allocation etc.)
- Constant mix strategies with rebalancing lend themselves to benchmarks and performance measurement and thus are commonly used within the insurance industry.

Use of Economic Scenario Generators for Setting Economic and Capital Market Assumptions

- An economic scenario generator (ESG) is a software tool that simulates future economic scenarios and the risks embedded in them. It is integral to an ERM approach and a critical component of the suite of models that analyze the external risks to an organization.

- ESGs can be used for Market-Consistent applications. Also referred to as Risk Neutral. Market-consistent valuation applications require ESGs to be capable of generating scenarios that can reproduce the observable prices of traded derivative instruments. Complicated insurance liabilities may be priced in this mode.

- Most risk management applications require ESGs to be capable of producing dynamics (e.g., volatility, correlations) that are representative of the possible future paths of economic variables. Commonly referred to as “real world” calibrations, they enable the “what if” questions by management as it tries to gauge the likelihood of future events and the impact on its business.

- The investment risk management aspects of an SAA depends on real world ESG parameterization.

Use of Economic Scenario Generators for Setting Economic and Capital Market Assumptions

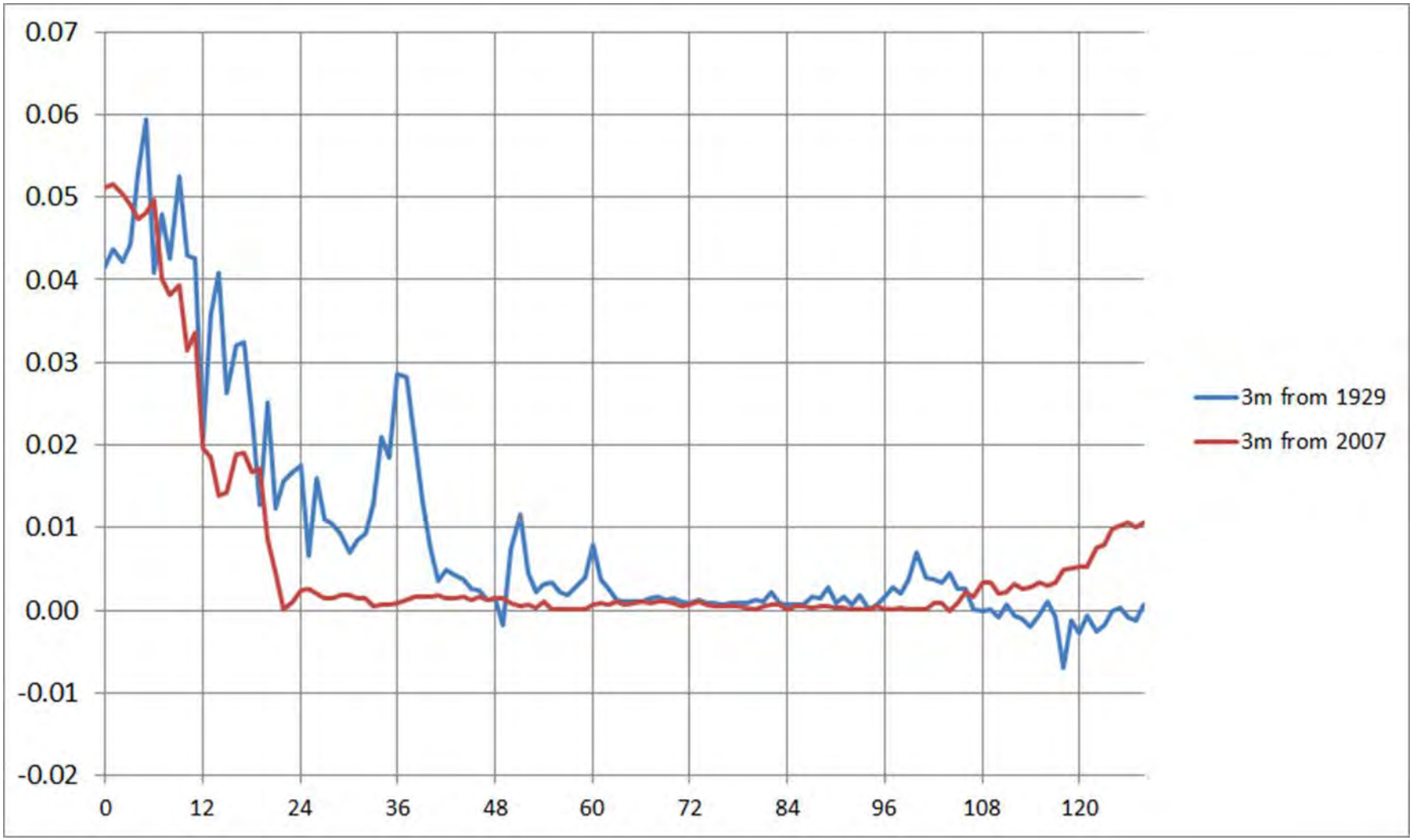
- Parameterizations of real world ESG models require the user to make choices about the future economic environment that they want to reflect in their risk analysis work.

- Some of the key decision points when parameterizing a real world model include:
  - selecting the appropriate steady state levels,
  - determining the appropriate values for the initial conditions,
  - identifying the key parameterization targets or “stylized facts” that are necessary for the application, and
  - controlling the expected reversionary paths of economic variables

- Setting assumptions about steady state interest rate levels is a complex issue, particularly in today’s environment.

- Expected risk and reward assumptions should be informed by historical relationships among asset classes and for SAA work they should be free from judgments that involve short-term value assessments on particular asset classes, sectors, and individual securities.

US 3m Treasury Yield – Months into Great Depression/Recession



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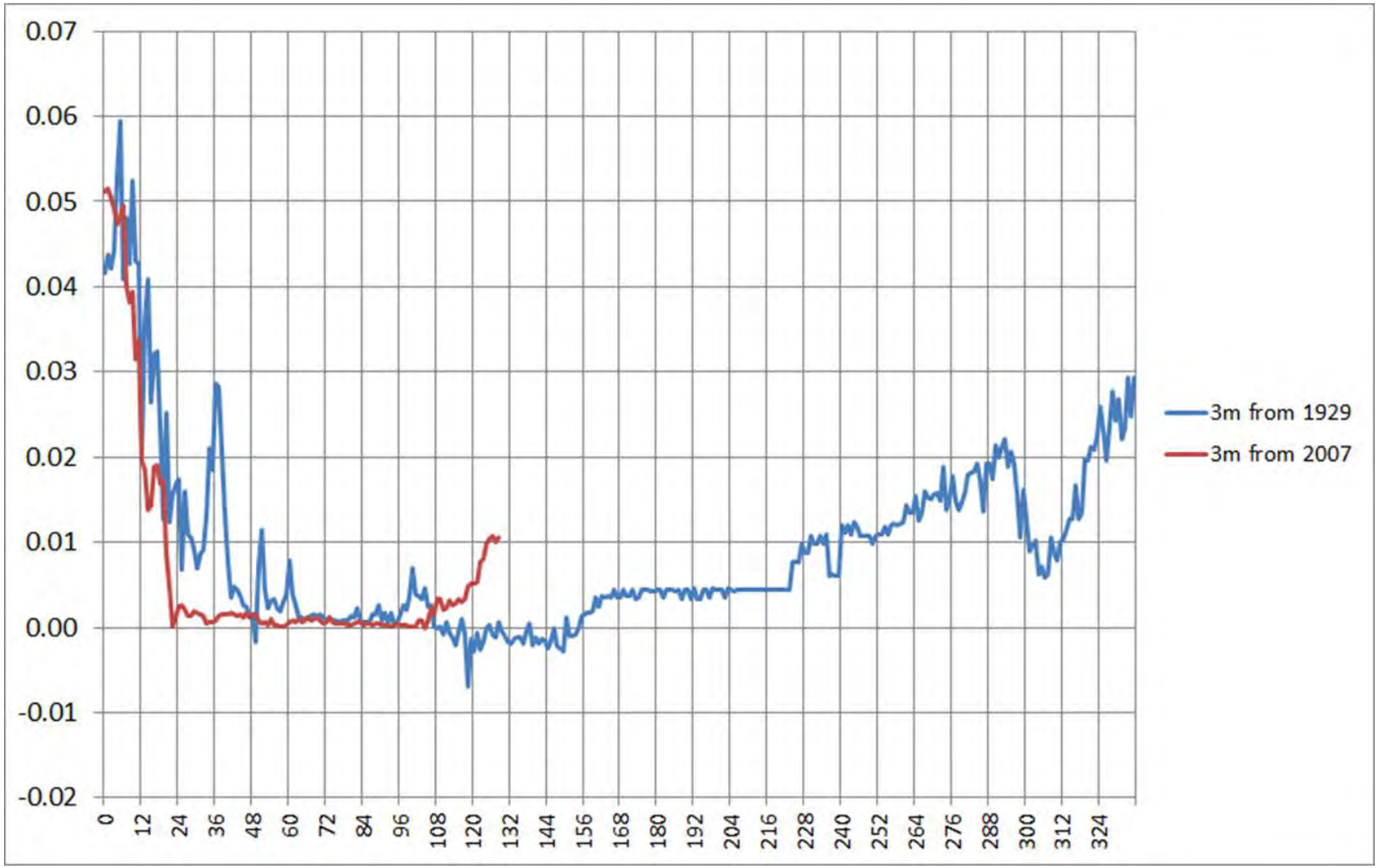

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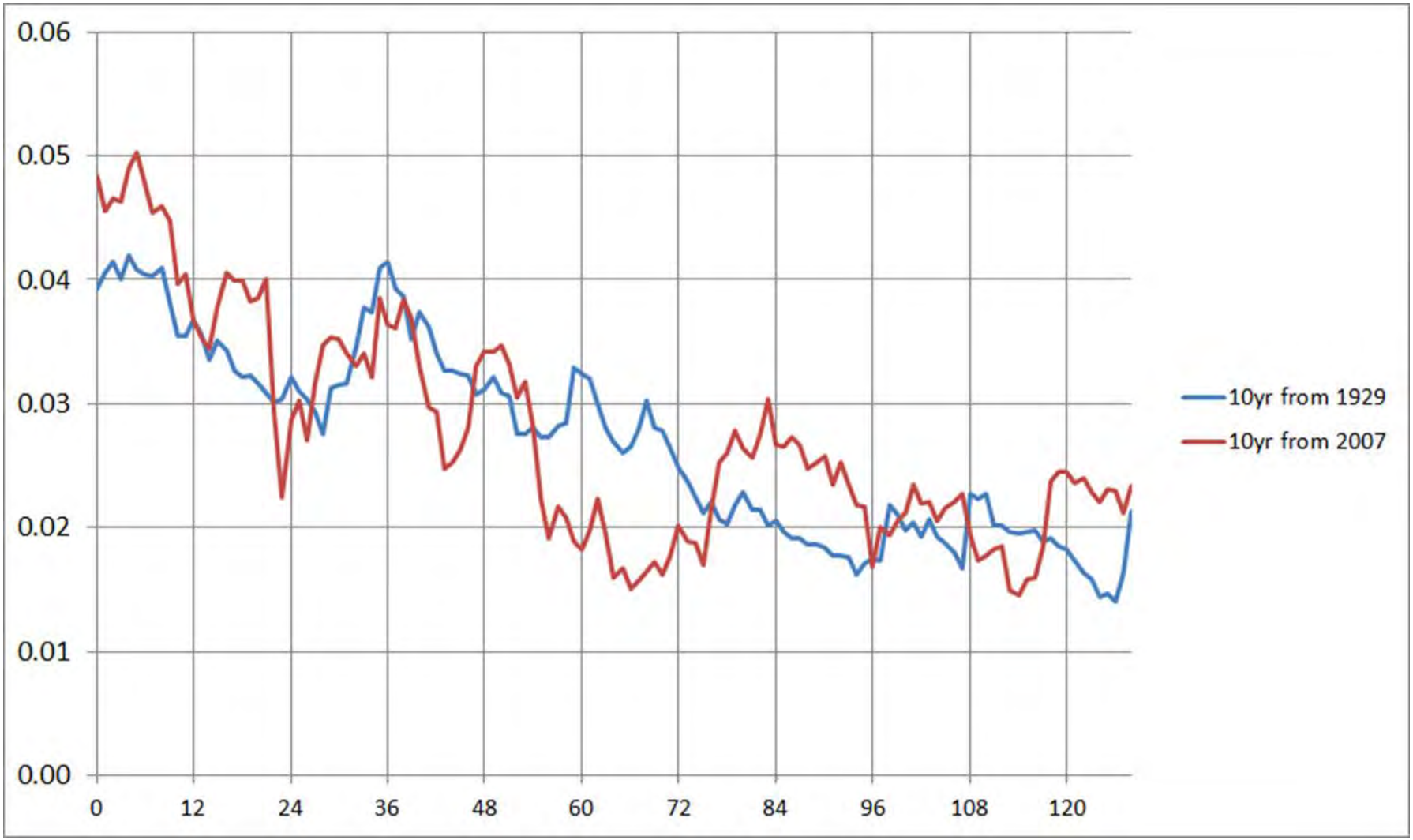
US 10yr Treasury Yield – Months into Great Depression/Recession



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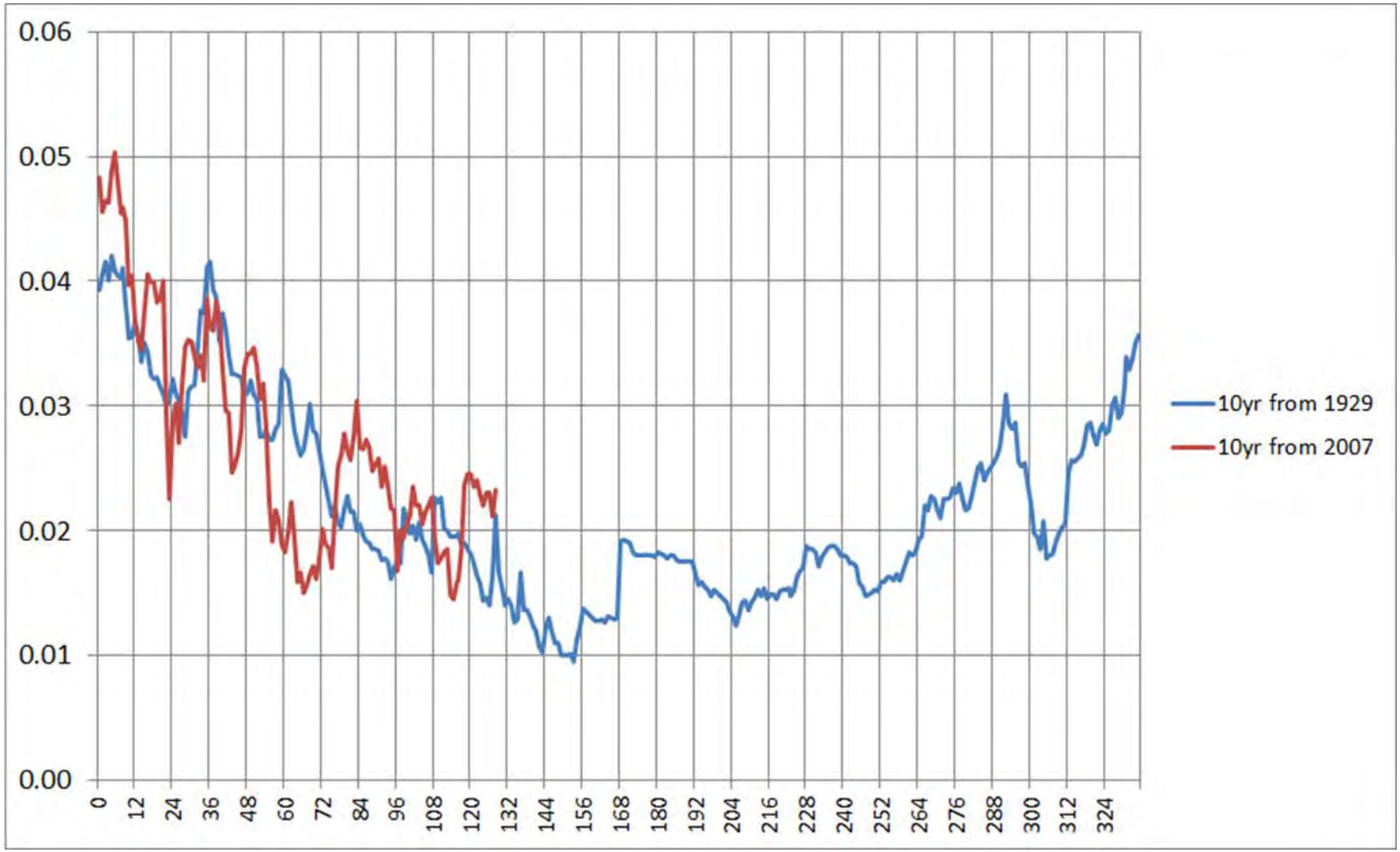

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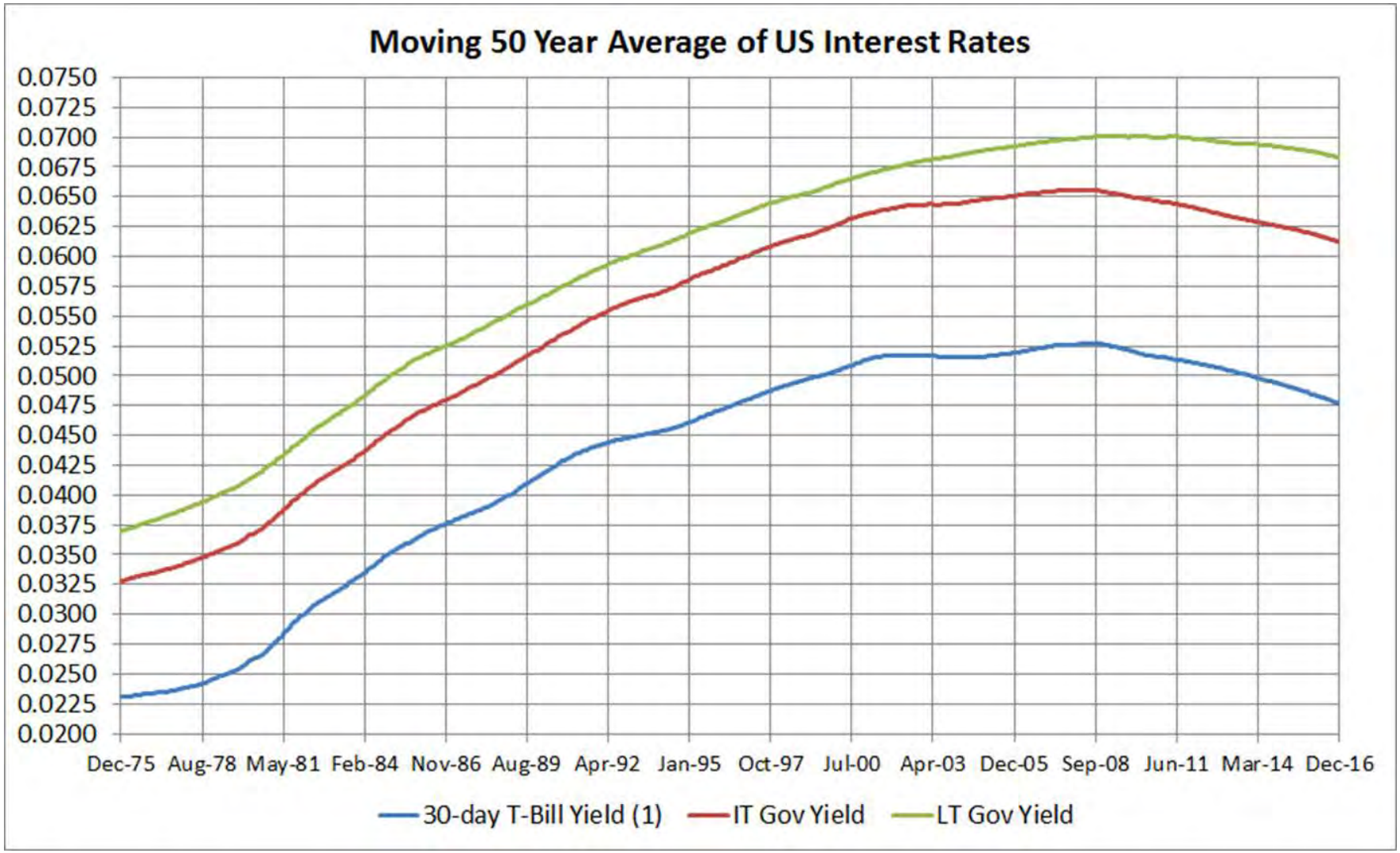
Steady State US Treasury (Long Term Calibration Targets)



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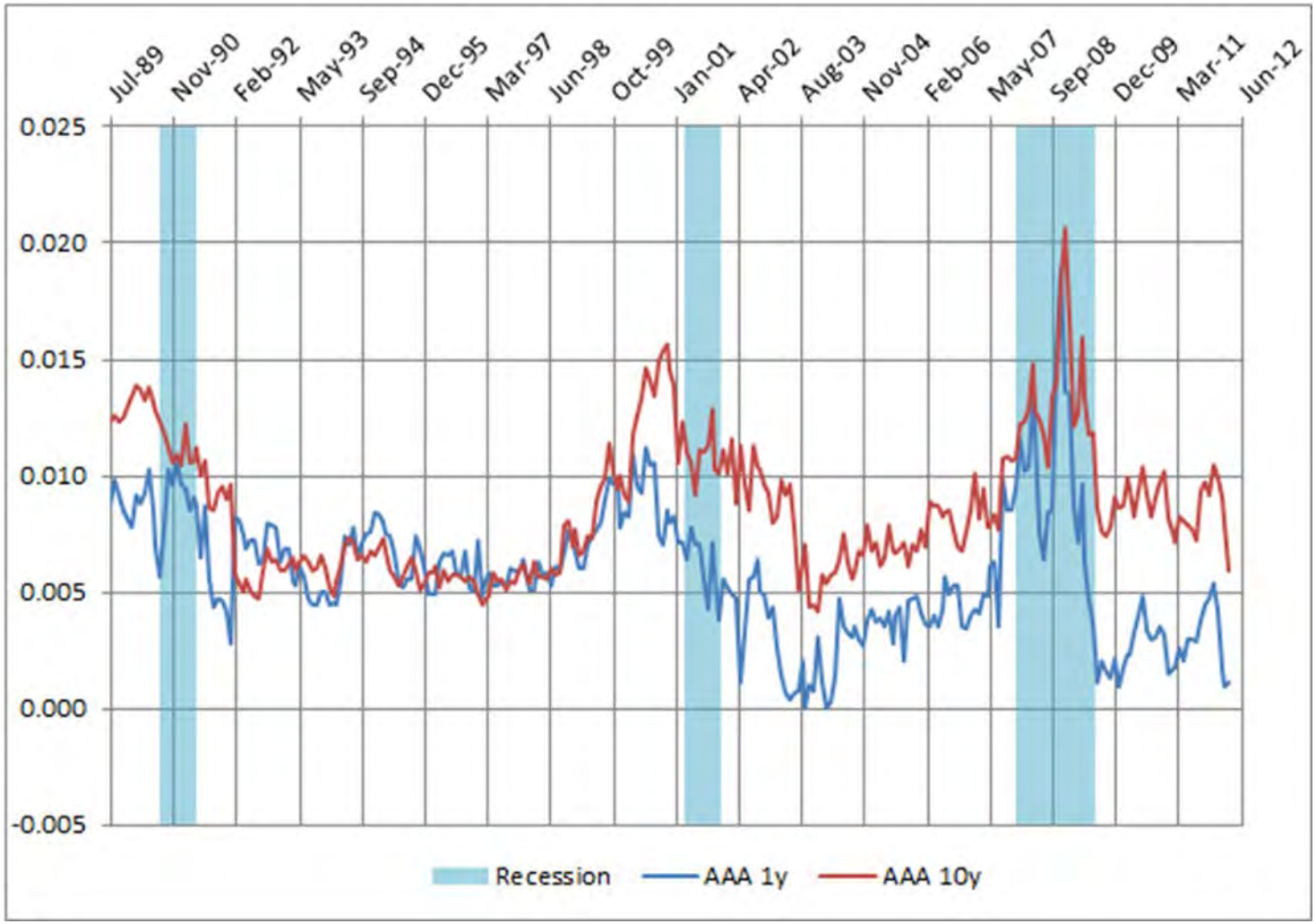
Stylized Facts



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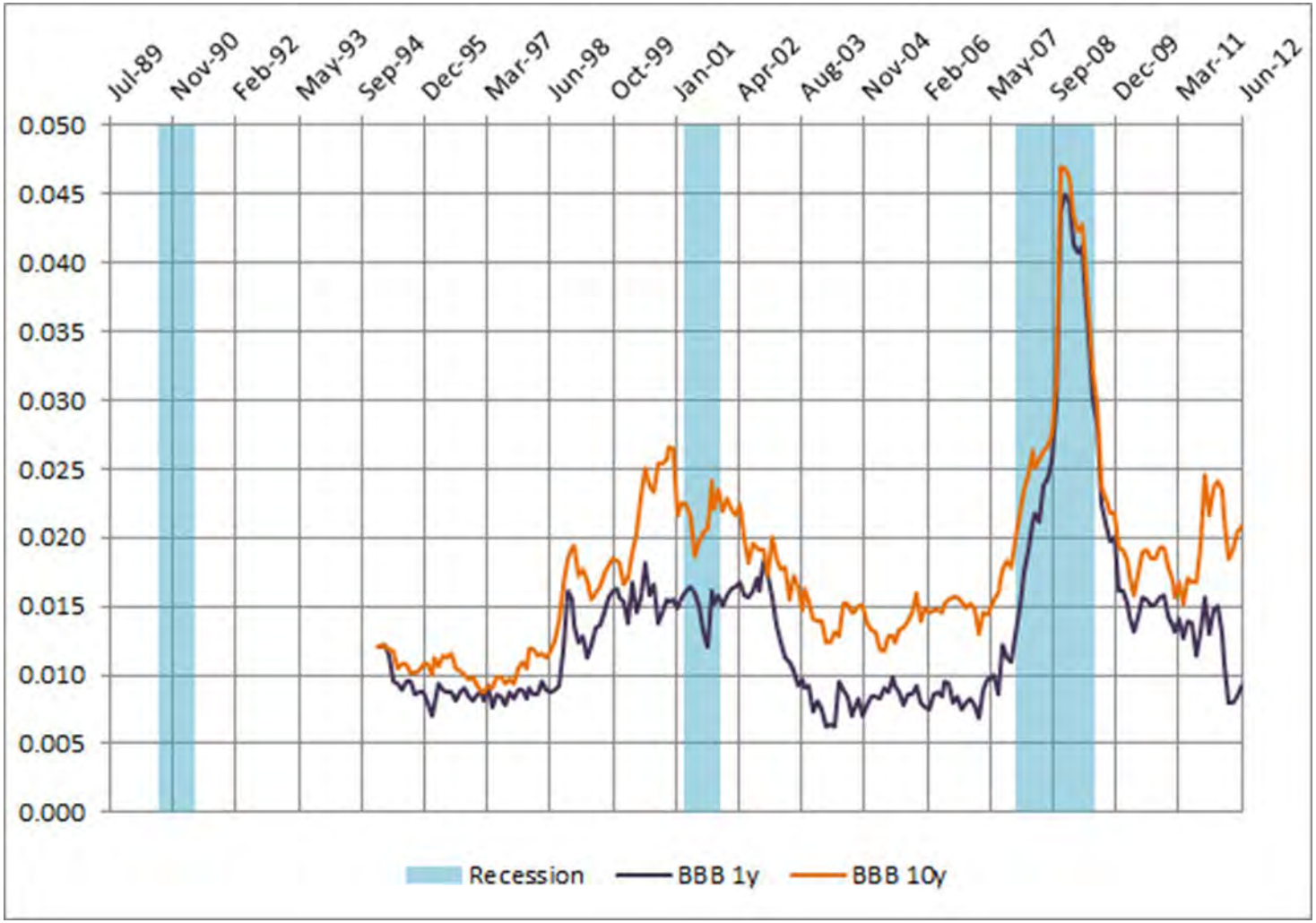

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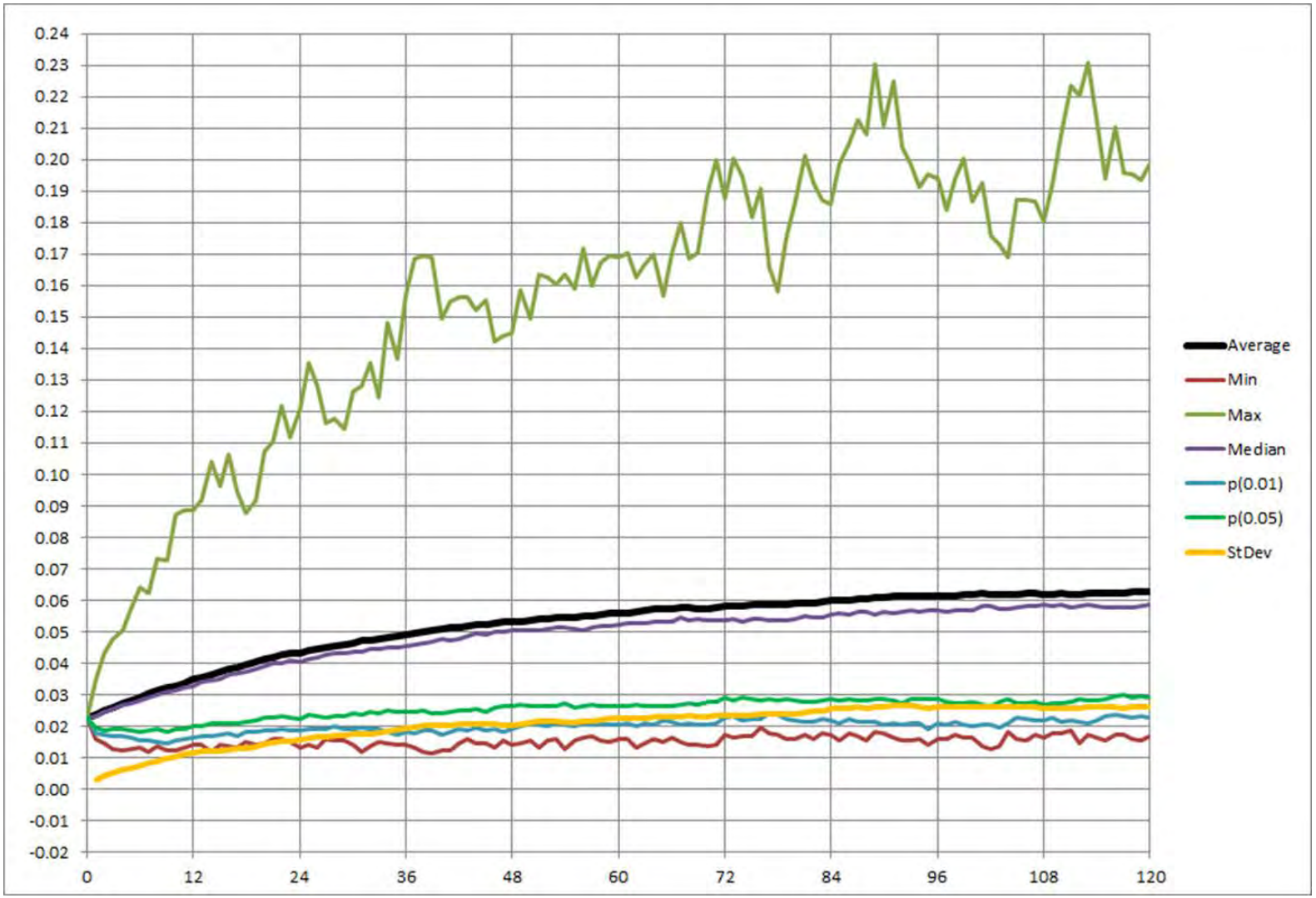
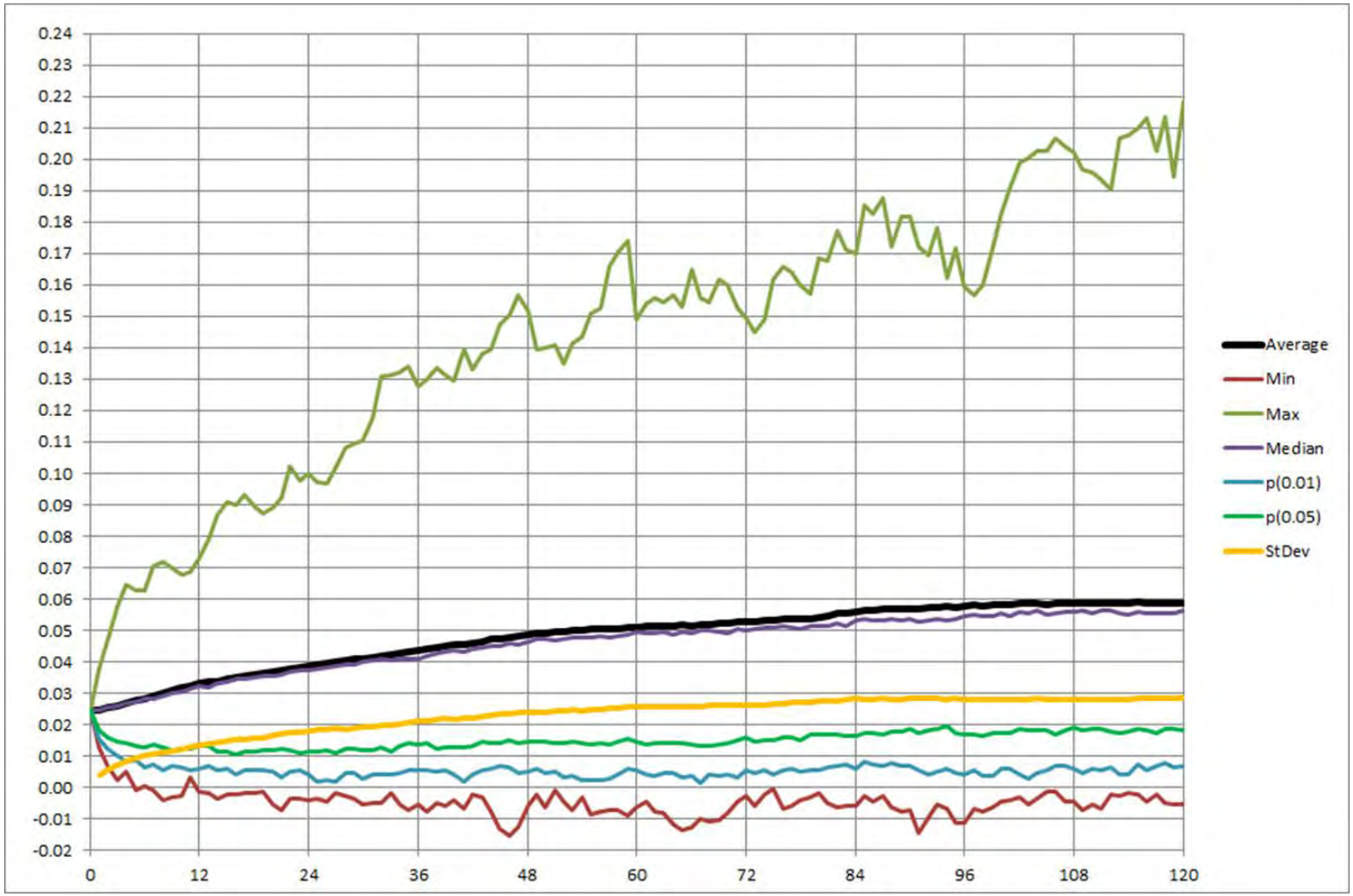
Base Reversion Rate Calibration



Prepared by Conning, Inc. Source: GEMS® Economic Scenario Generator scenario.

Adjusted Reversion Rate Calibration



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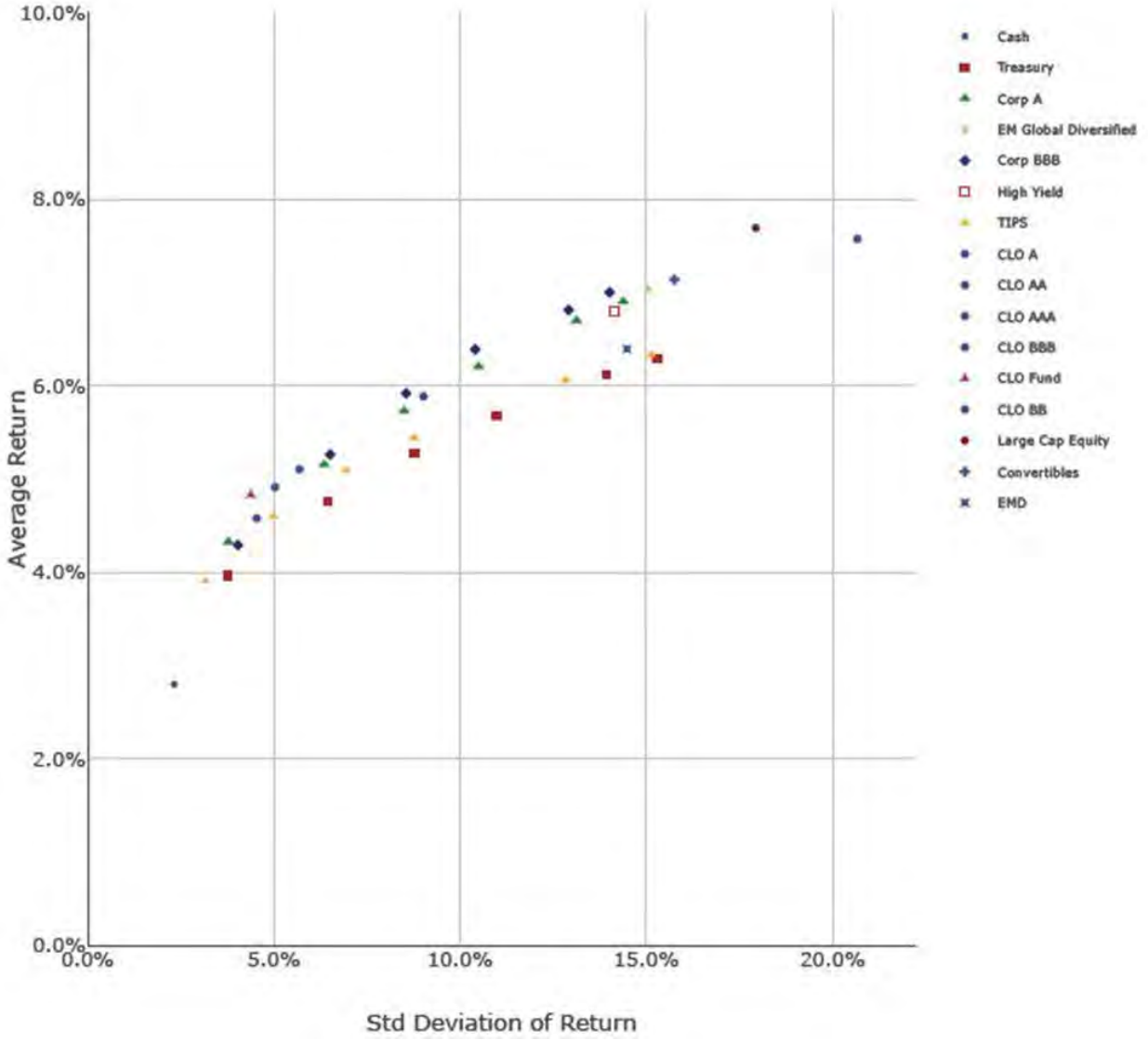
Steady State – Putting It Together



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Use of Economic Scenario Generators for Setting Economic and Capital Market Assumptions

- Robust collection of asset classes that accurately captures the insurer's investment options.
- Realistic correlation structures.
- Relative positioning of risk-return profile across asset classes is important.
- A robust recalibration tool is an important part of getting the economic scenarios properly set-up for the SAA. The same can be said for other investment management approaches in an ERM framework.
- Models must have correct relationships between key economic variables. Allows one to understand where things are going wrong under extreme events.
- Correlation is not the same as the dynamical comovements underlying the model.

Simulation Modeling Approach

Economic Scenario Generator (ESG)

Models Future States of the Economy & Financial Markets

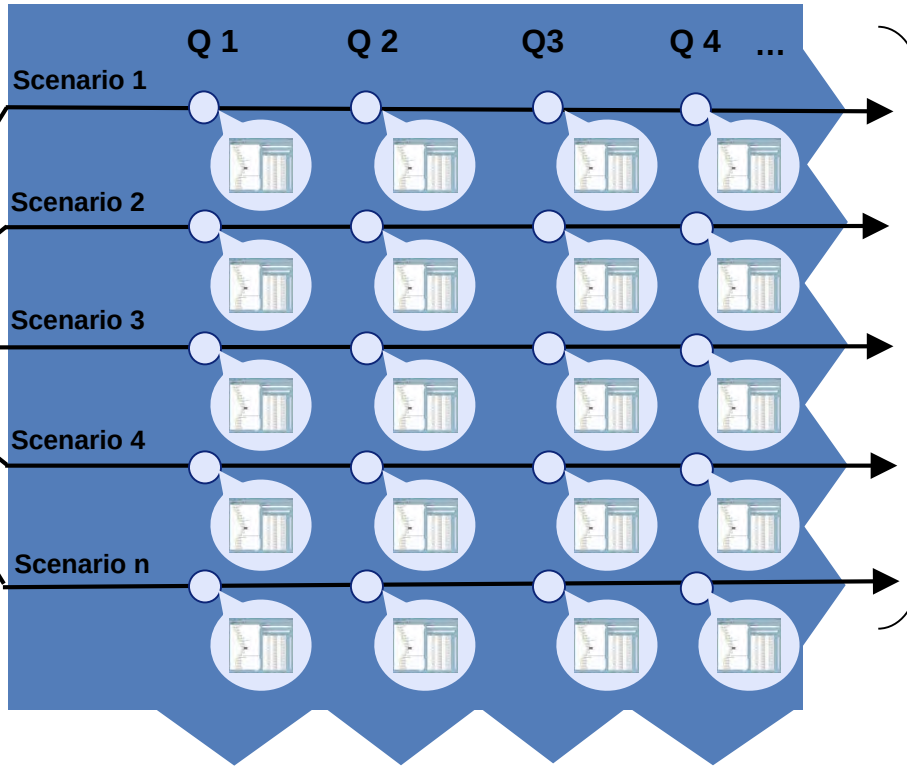
Company Data Input

Current Business State

- Current Financials
- Business Plans
- Actuarial Models
- Input from ERM

Start of Simulation

Company Model – Projects Future States of the Company



Whole-Company Outputs

Accounting

Regulatory

Financials

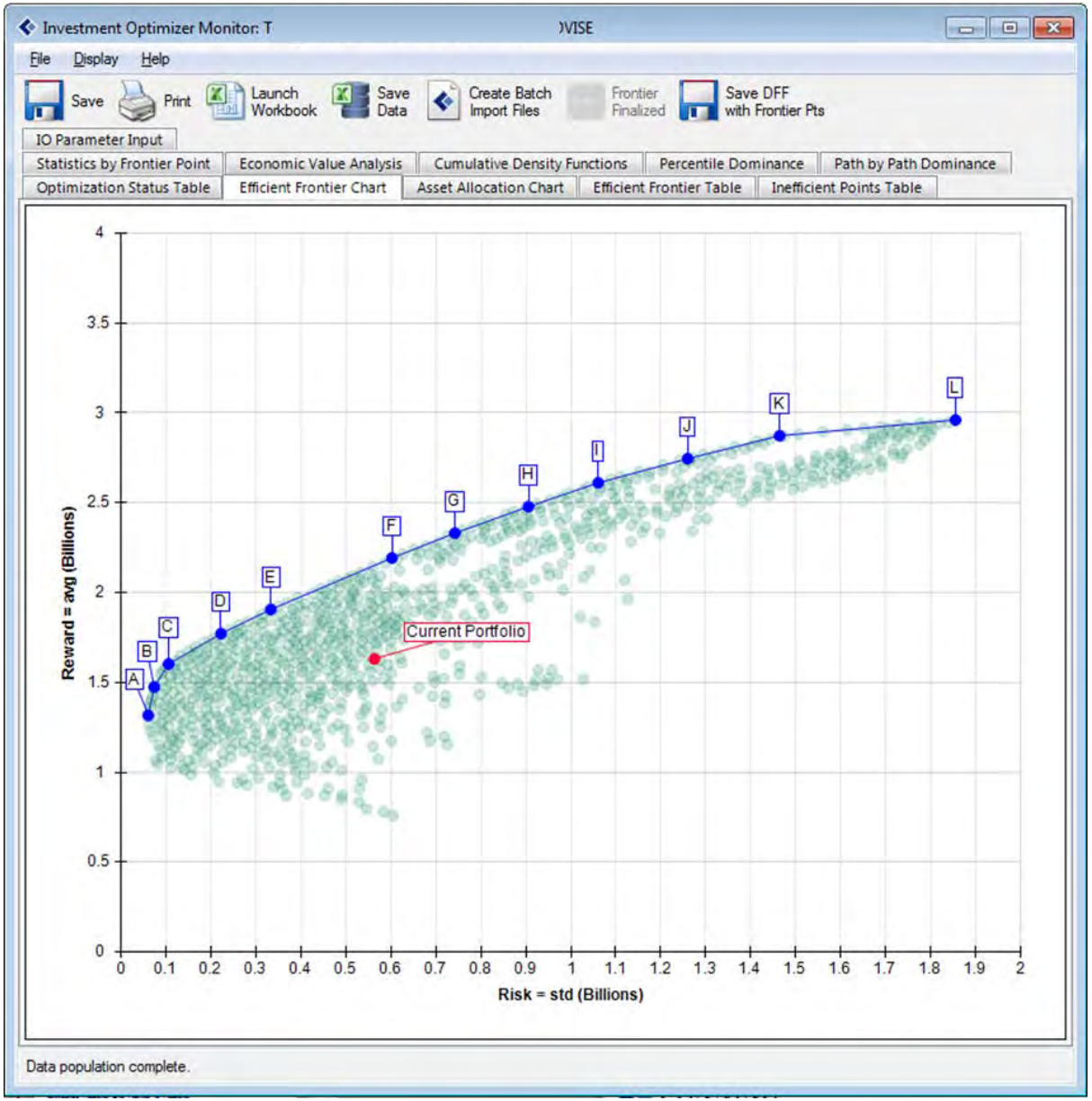
Tax

High-performance Business Computing

Economic Value (EV) Efficient Frontier

Integrated ALM

- Identify investment strategy to meet specific risk/reward profile
- Maximize economic value — not just investment returns — for various levels of risk
- Provides a platform for aggregating enterprise risks



Prepared by Conning, Inc. Source: ADVISE® Enterprise Risk Modeler model using hypothetical company data.

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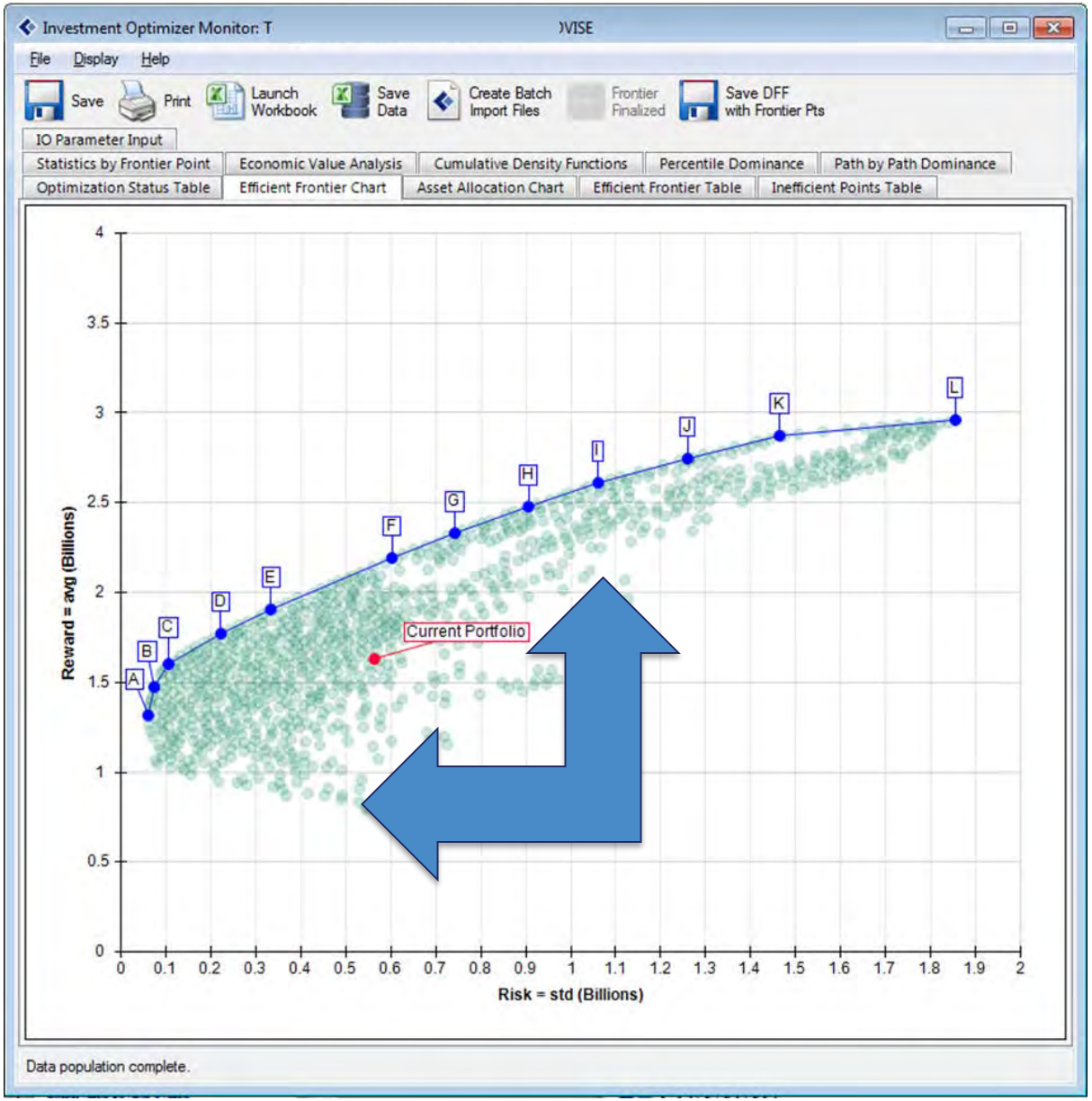

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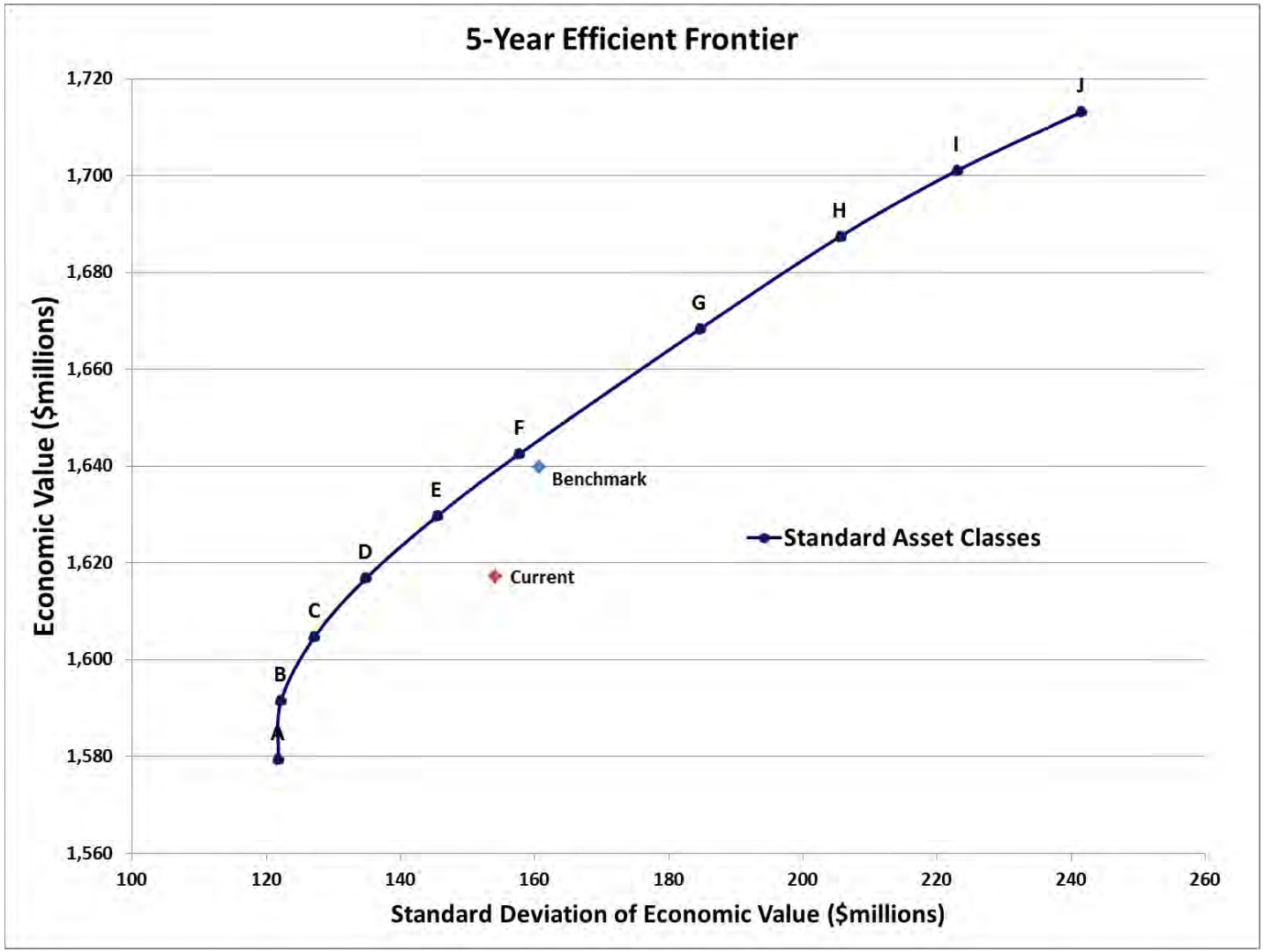

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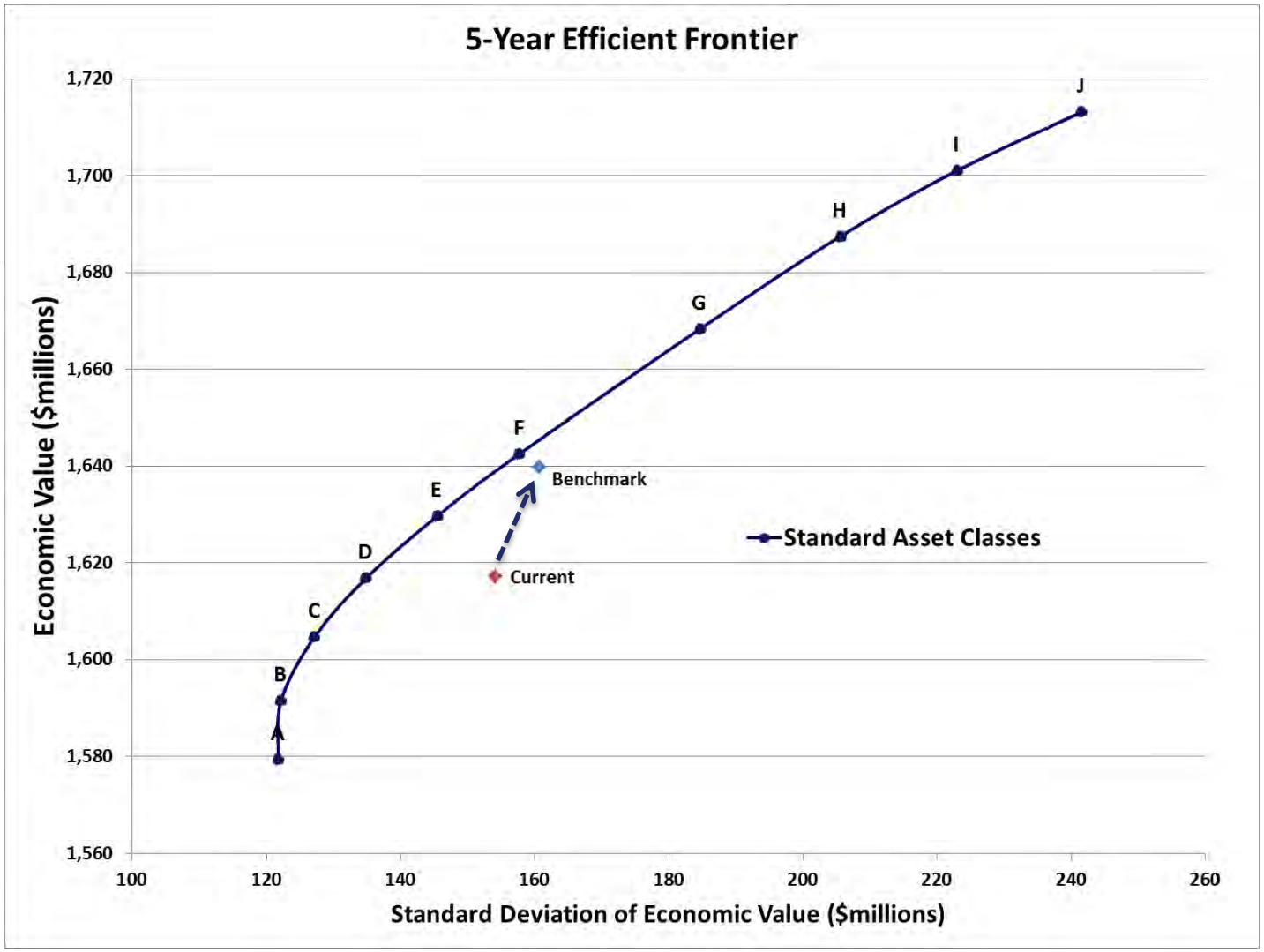

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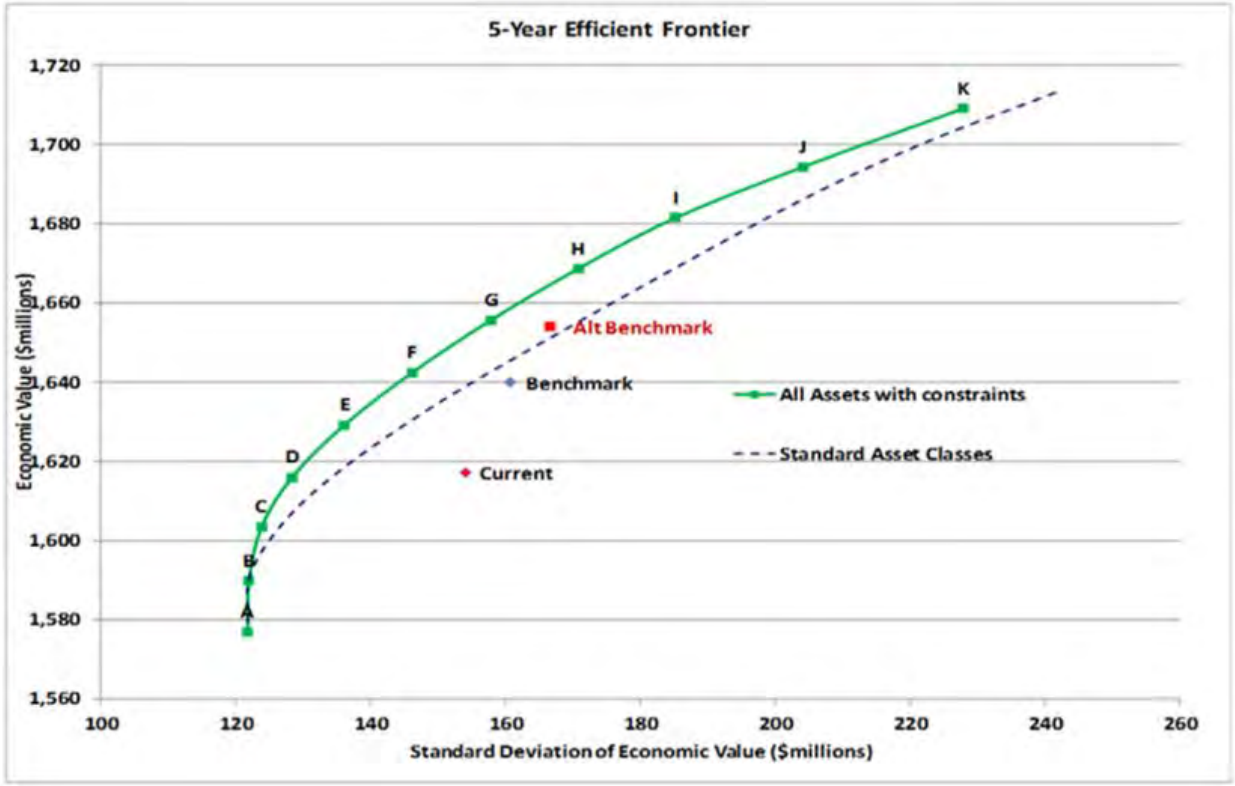

	Current	Benchmark	A	B	C	D	E	F	G	H	I	J	K
Cash and Gov't	5%	4%	36%	16%	8%	6%	1%	-	-	-	-	-	-
Corporate	65%	40%	21%	40%	32%	31%	54%	52%	41%	35%	39%	50%	59%
Structured	16%	29%	43%	43%	44%	33%	14%	17%	26%	32%	28%	20%	19%
CML/Private Placement	11%	20%	-	1%	15%	29%	30%	30%	30%	30%	30%	26%	15%
High Yield	3%	3%	-	-	-	-	-	-	-	-	-	-	-
US Equity	-	1%	-	-	-	-	-	-	-	-	-	1%	4%
Alternative Assets	-	3%	-	-	1%	1%	1%	1%	3%	3%	3%	3%	3%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Overall Duration	7.1	8.1	6.7	6.8	6.5	6.6	6.8	7.4	7.7	8.5	9.7	11.0	12.2
Economic Value ($MM)	1,617	1,654	1,577	1,590	1,603	1,616	1,629	1,642	1,656	1,669	1,681	1,694	1,709
Risk ($MM)	154	167	122	122	124	128	136	146	158	171	185	204	228

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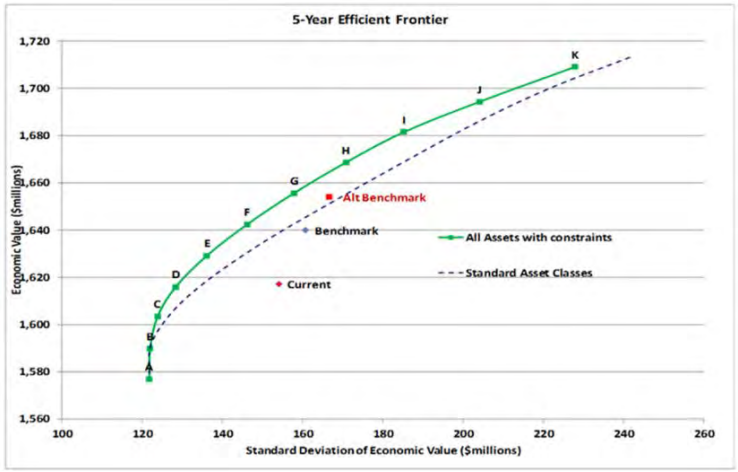
Economic Value (EV) Asset Allocation



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High Yield	3%	3%	-	-	-	-	-	-	-	-	-	-	-
US Equity	-	1%	-	-	-	-	-	-	-	-	-	1%	4%
Alternative Assets	-	3%	-	-	1%	1%	1%	1%	3%	3%	3%	3%	3%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
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- Credit Risk
- Illiquidity Exposure
- Alternative Assets
- Prepayment Risk
- Diversification
- Duration Targeting

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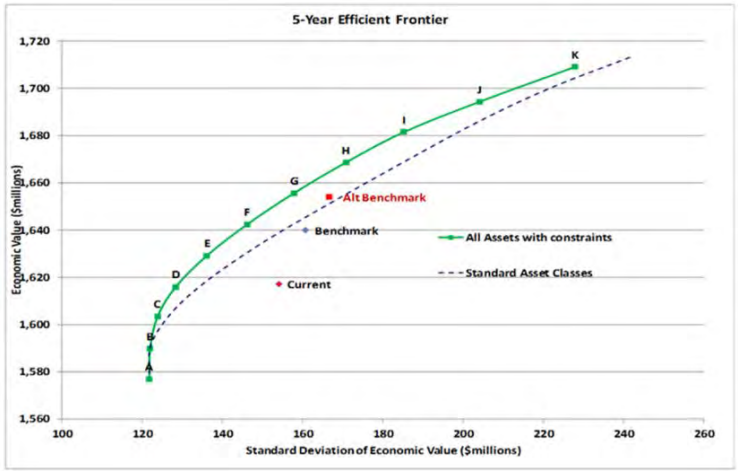

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High Yield	3%	3%	-	-	-	-	-	-	-	-	-	-	-
US Equity	-	1%	-	-	-	-	-	-	-	-	-	1%	4%
Alternative Assets	-	3%	-	-	1%	1%	1%	1%	3%	3%	3%	3%	3%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
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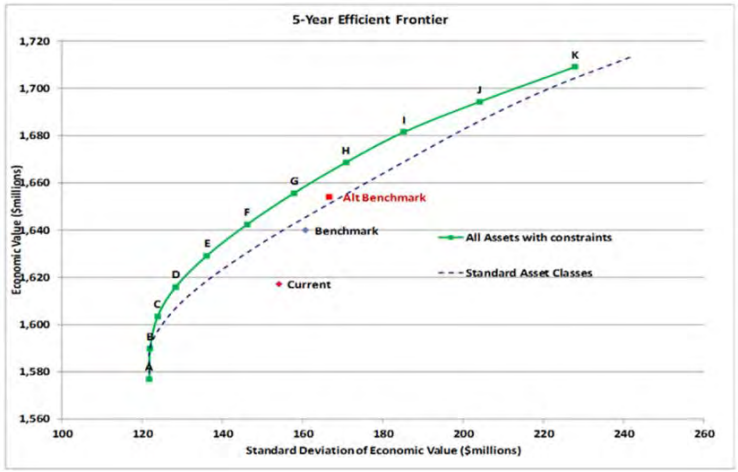

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Alternative Assets	-	3%	-	-	1%	1%	1%	1%	3%	3%	3%	3%	3%
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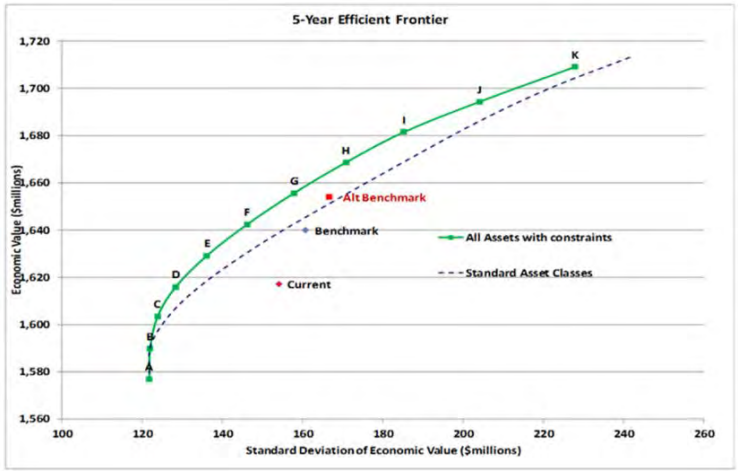

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US Equity	-	1%	-	-	-	-	-	-	-	-	-	1%	4%
Alternative Assets	-	3%	-	-	1%	1%	1%	1%	3%	3%	3%	3%	3%
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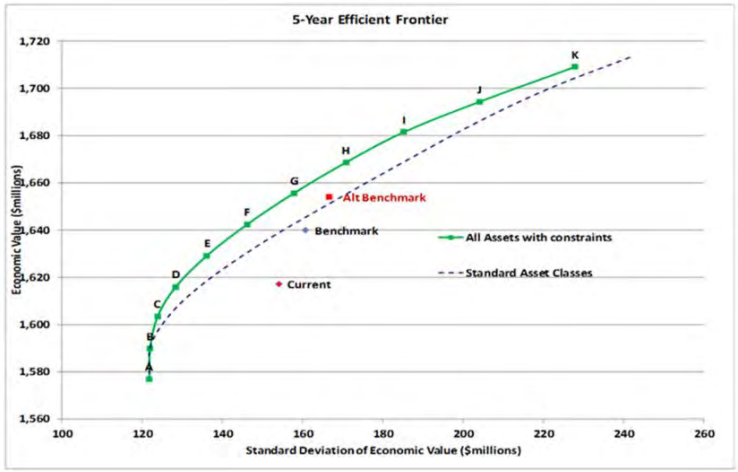

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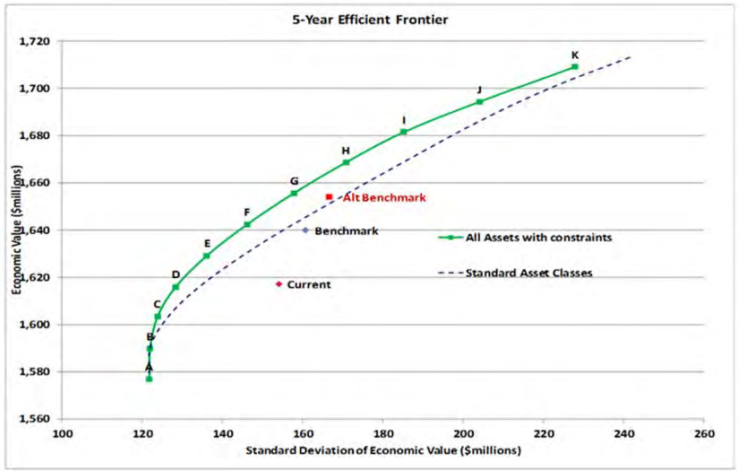
- Alternative Assets
- Prepayment Risk
- Diversification
- Duration Targeting

Prepared by Conning, Inc. Source: ADVISE® Enterprise Risk Modeler model using hypothetical company data.

Economic Value (EV) Asset Allocation



	Current	Benchmark	A	B	C	D	E	F	G	H	I	J	K
Cash and Gov't	5%	4%	36%	16%	8%	6%	1%	-	-	-	-	-	-
Corporate	65%	40%	21%	40%	32%	31%	54%	52%	41%	35%	39%	50%	59%
Structured	16%	29%	43%	43%	44%	33%	14%	17%	26%	32%	28%	20%	19%
CML/Private Placement	11%	20%	-	1%	15%	29%	30%	30%	30%	30%	30%	26%	15%
High Yield	3%	3%	-	-	-	-	-	-	-	-	-	-	-
US Equity	-	1%	-	-	-	-	-	-	-	-	-	1%	4%
Alternative Assets	-	3%	-	-	1%	1%	1%	1%	3%	3%	3%	3%	3%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Overall Duration	7.1	8.1	6.7	6.8	6.5	6.6	6.8	7.4	7.7	8.5	9.7	11.0	12.2
Economic Value ($MM)	1,617	1,654	1,577	1,590	1,603	1,616	1,629	1,642	1,656	1,669	1,681	1,694	1,709
Risk ($MM)	154	167	122	122	124	128	136	146	158	171	185	204	228

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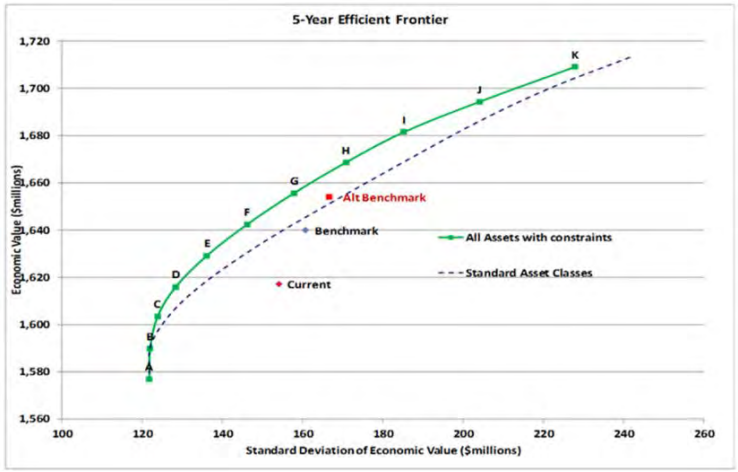

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High Yield	3%	3%	-	-	-	-	-	-	-	-	-	-	-
US Equity	-	1%	-	-	-	-	-	-	-	-	-	1%	4%
Alternative Assets	-	3%	-	-	1%	1%	1%	1%	3%	3%	3%	3%	3%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Overall Duration	7.1	8.1	6.7	6.8	6.5	6.6	6.8	7.4	7.7	8.5	9.7	11.0	12.2
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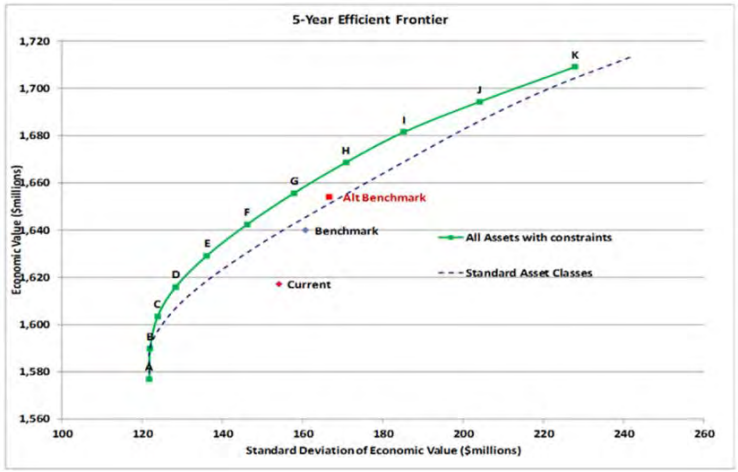

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High Yield	3%	3%	-	-	-	-	-	-	-	-	-	-	-
US Equity	-	1%	-	-	-	-	-	-	-	-	-	1%	4%
Alternative Assets	-	3%	-	-	1%	1%	1%	1%	3%	3%	3%	3%	3%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Overall Duration	7.1	8.1	6.7	6.8	6.5	6.6	6.8	7.4	7.7	8.5	9.7	11.0	12.2
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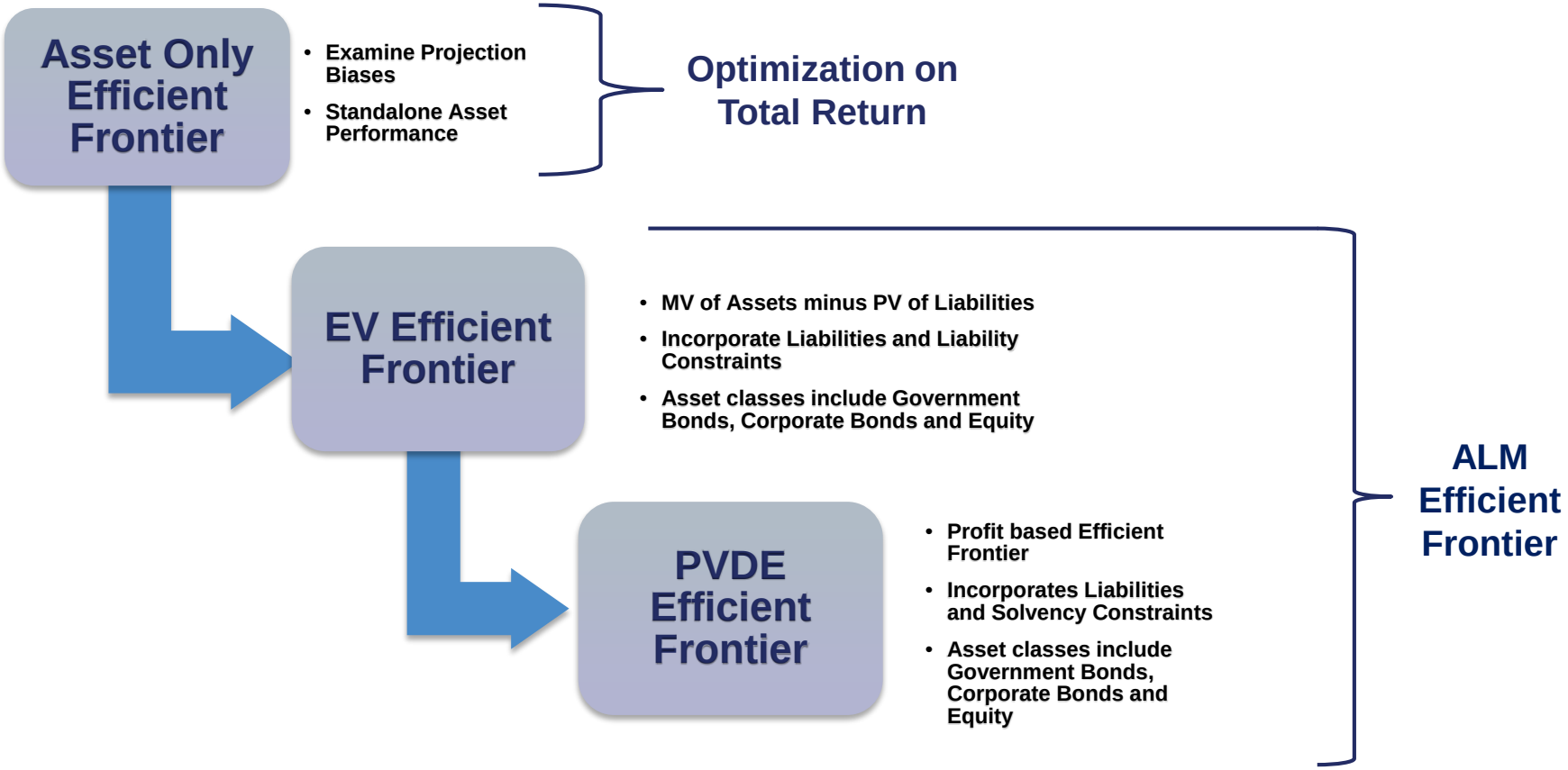
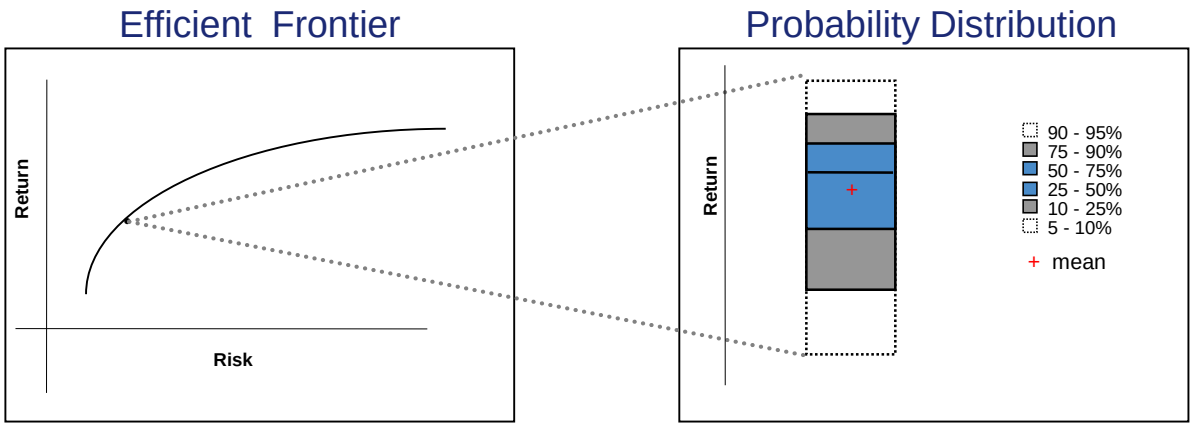
The Efficient Frontier — Progressive Analysis



Expected Results and Range of Results

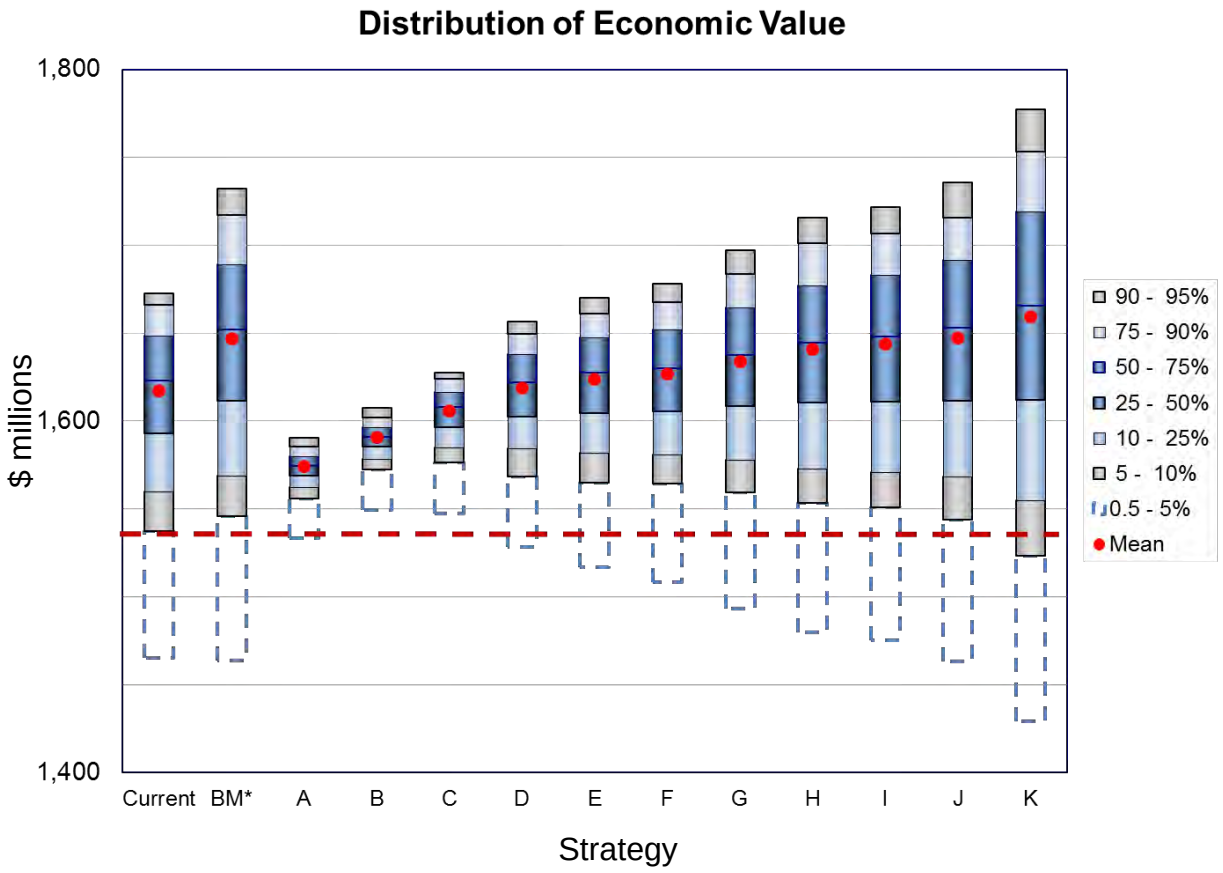


- Each point on the efficient frontier, defined by a single risk and a single reward measure, is based on the results of 1,000s of scenarios
- We usually want the investment strategy that on average gives the "best" reward for a given level of risk
- However, we also want to know the downside risk — how bad could results be?
- We evaluate this risk by looking at the range of potential results; for example, how bad is the 5% probability level (1 year in twenty), and can we accept that much risk?

Economic Efficient Frontier

Observations

- Benchmark economic value is improved over the Current allocation at nearly every percentile
- Extreme tail events are similar between the Benchmark and Current allocations
- Benchmark changes from the Current portfolio:
  - Longer Duration
  - More BBB credit risk
  - More Equities
  - More Alternative Assets



*Benchmark Strategy

Prepared by Conning, Inc. Source: ADVISE® Enterprise Risk Modeler model using hypothetical company data.

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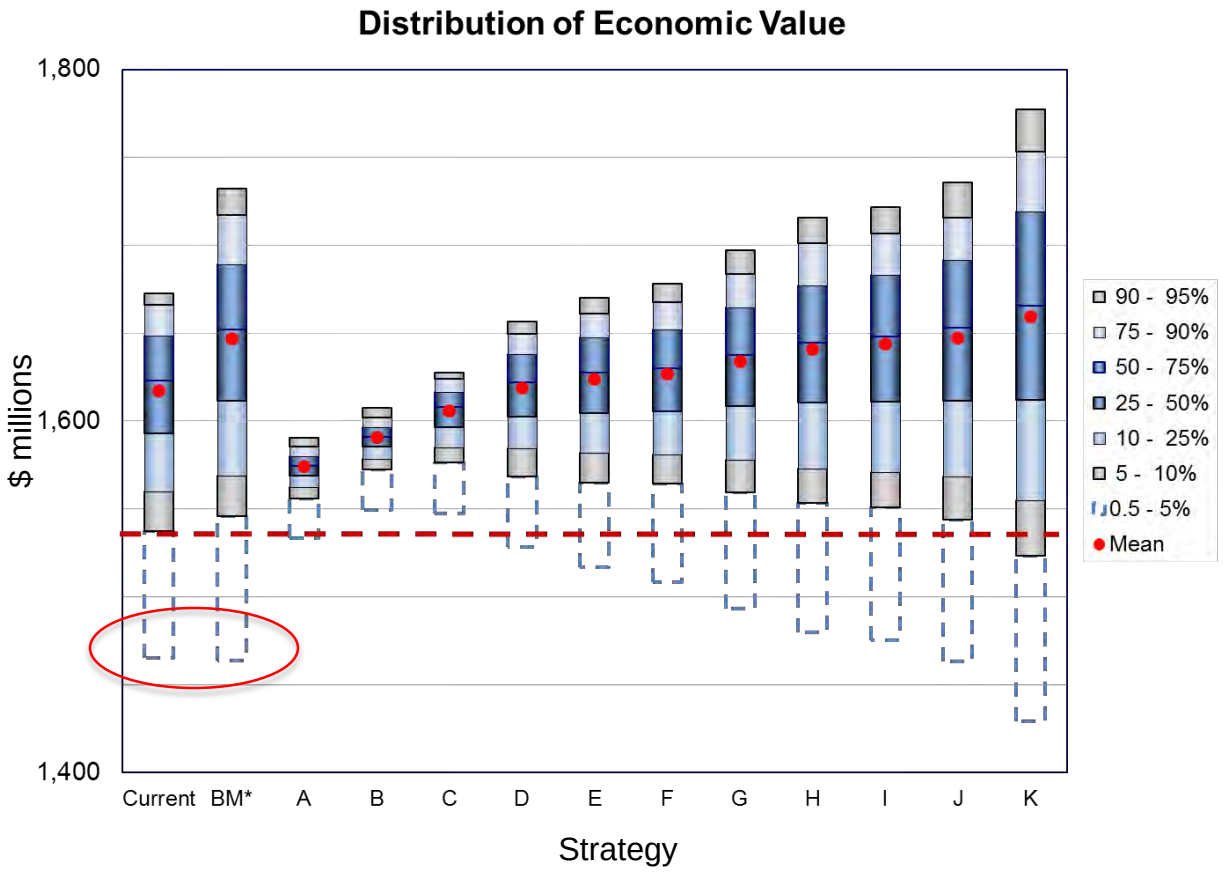
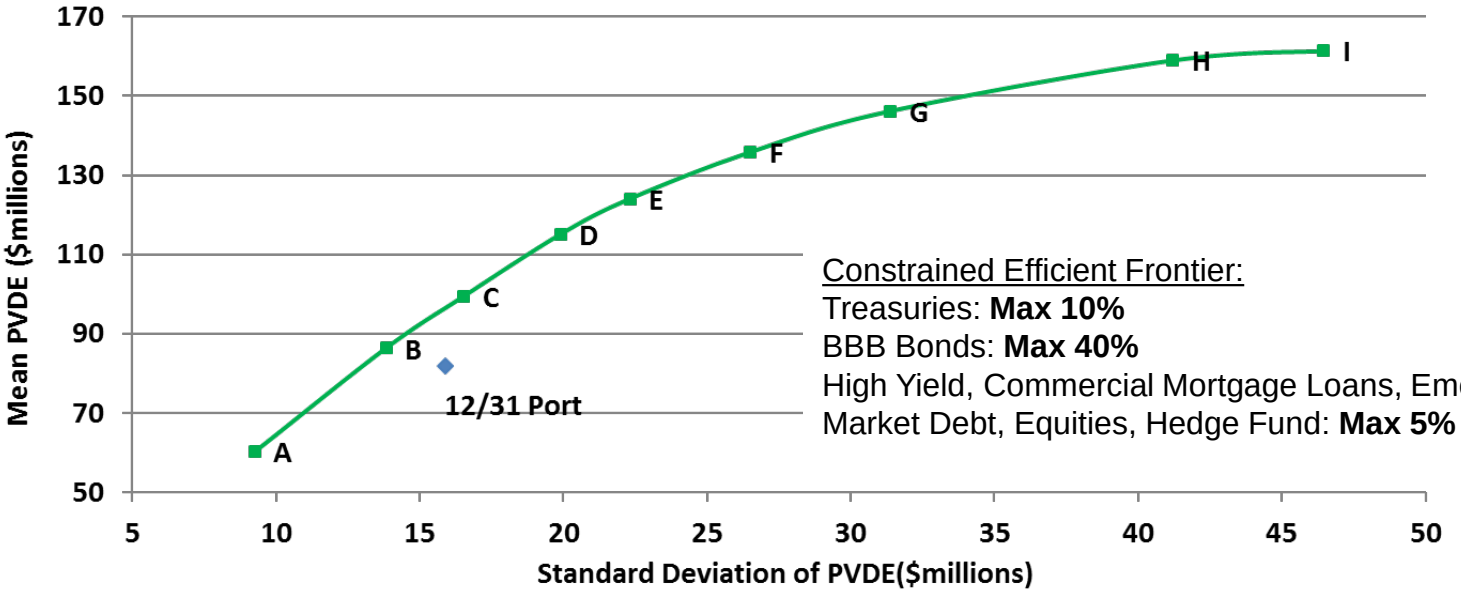


*Benchmark Strategy

Prepared by Conning, Inc. Source: ADVISE® Enterprise Risk Modeler model using hypothetical company data.

Strategic Asset Allocation

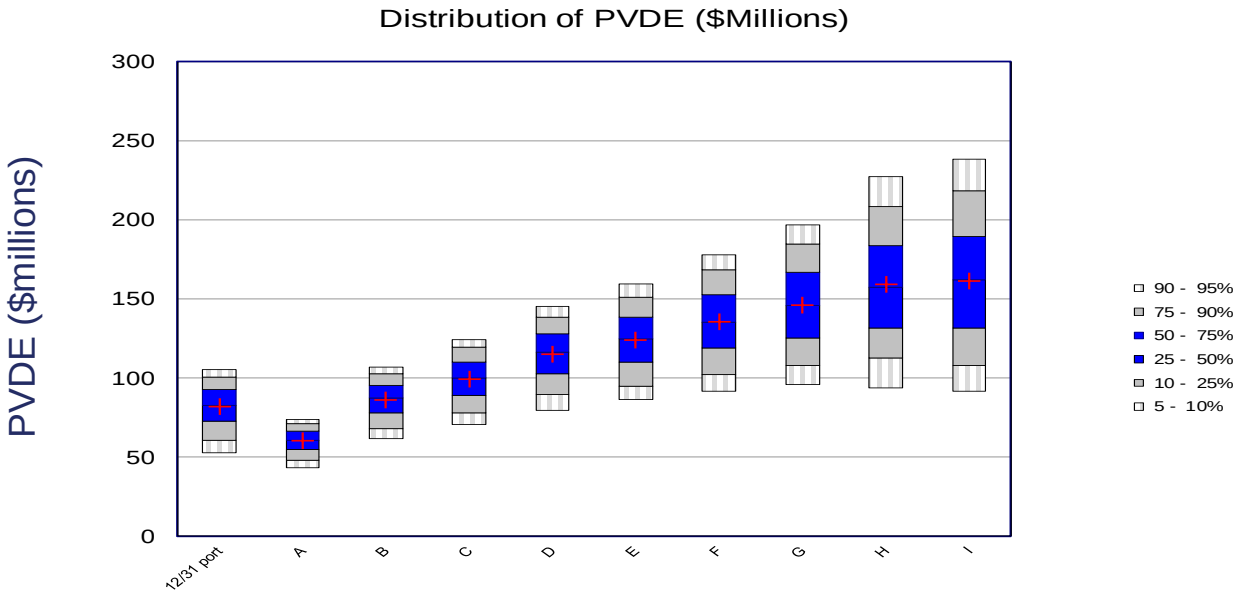


Constrained Efficient Frontier:
Treasuries: **Max 10%**
BBB Bonds: **Max 40%**
High Yield, Commercial Mortgage Loans, Emerging Market Debt, Equities, Hedge Fund: **Max 5%**

	12/31 Port	A	B	C	D	E	F	G	H	I
Duration	**9.1**	**8.4**	**9.2**	**9.2**	**9.8**	**9.9**	**10.1**	**10.4**	**12.1**	**13.2**
Cash	2%	1%	2%	1%	1%	-	-	-	-	-
Treasury	0%	10%	7%	1%	-	-	-	-	-	-
Corporate A	54%	42%	60%	65%	52%	49%	46%	45%	39%	43%
Corporate BBB	21%	19%	26%	27%	40%	40%	40%	40%	40%	40%
Structured	19%	25%	1%	1%	1%	-	-	-	-	-
Mortgage-Backed Securities (MBS)	1%	-	-	-	-	3%	4%	3%	5%	-
High Yield	3%	2%	3%	4%	5%	5%	5%	5%	5%	5%
Emerging Market Debt	-	1%	1%	1%	1%	3%	4%	5%	5%	5%
Equities	0%	-	-	-	-	-	1%	2%	6%	7%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Prepared by Conning, Inc. Source: ADVISE® Enterprise Risk Modeler model using hypothetical company data.

ALM Efficient Frontier PVDE Distributions

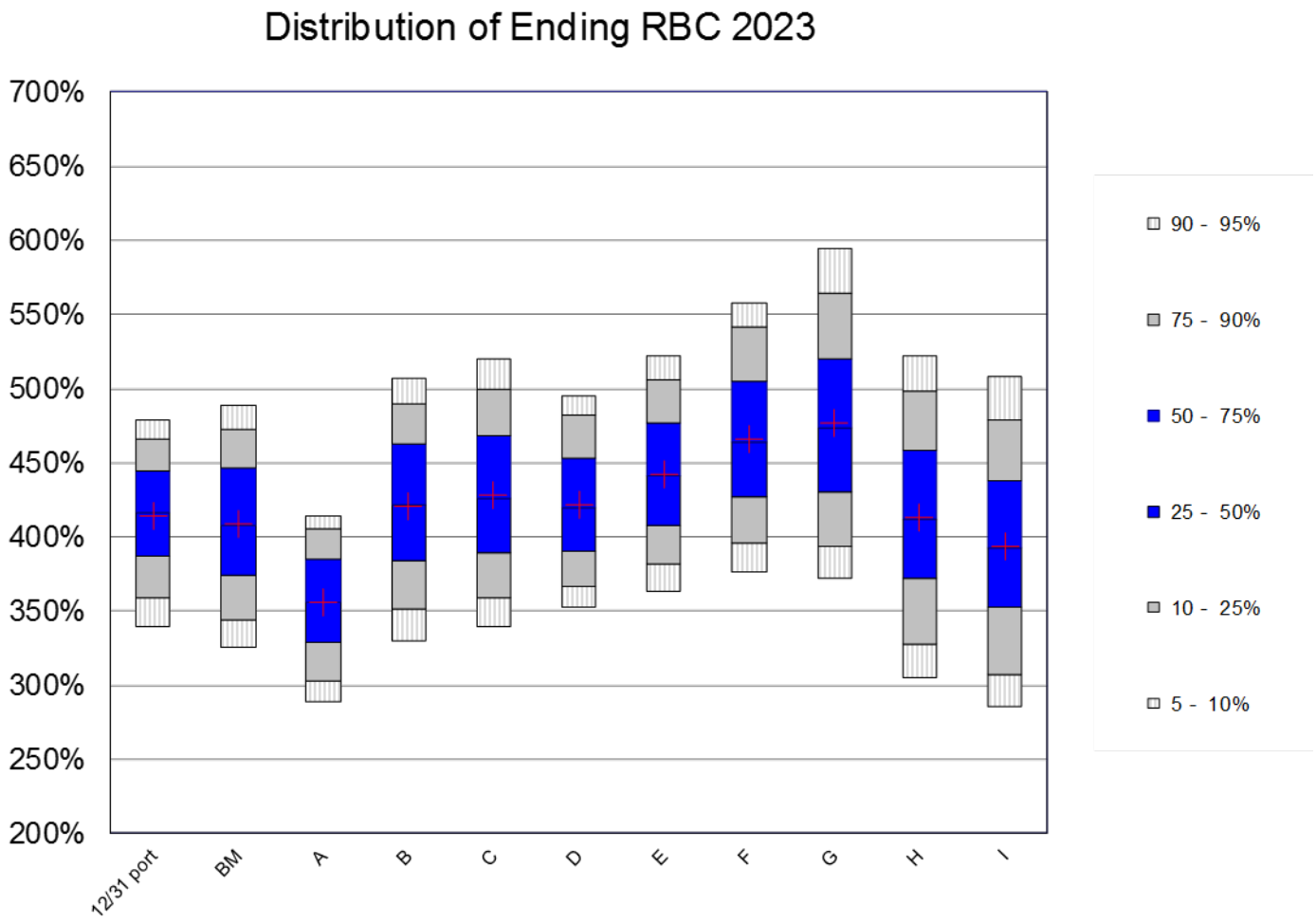


	12/31 Port	A	B	C	D	E	F	G	H	I
Duration	**9.1**	**8.4**	**9.2**	**9.2**	**9.8**	**9.9**	**10.1**	**10.4**	**12.1**	**13.2**
Cash	2%	1%	2%	1%	1%	-	-	-	-	-
Treasury	0%	10%	7%	1%	-	-	-	-	-	-
Corporate A	54%	42%	60%	65%	52%	49%	46%	45%	39%	43%
Corporate BBB	21%	19%	26%	27%	40%	40%	40%	40%	40%	40%
Structured	19%	25%	1%	1%	1%	-	-	-	-	-
Mortgages	1%	-	-	-	-	3%	4%	3%	5%	-
High Yield	3%	2%	3%	4%	5%	5%	5%	5%	5%	5%
EMD	-	1%	1%	1%	1%	3%	4%	5%	5%	5%
Equity	0%	-	-	-	-	-	1%	2%	6%	7%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

When looking at risk in terms of the worst 5th percentile company value, Strategy G, with a duration of 10.4, is the low risk efficient strategy.

Prepared by Conning, Inc. Source: ADVISE® Enterprise Risk Modeler model using hypothetical company data.

Probability Distribution of Ending Surplus



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C#:7048935

NEAM New England Asset Management

SOCIETY OF ACTUARIES

2018 SOA ERM Symposium

Session 14

ERM/Capital Implications for Investments

Tobias Gummersbach

Agenda

- Recap A.M. Best's recent BCAR asset capital charges update
- Introduce the concept of an "Enterprise" Efficient Frontier to evaluate and measure the impact of regulatory / rating agency considerations: Do BCAR capital charges impact asset allocation?
- Case study: BCAR impact on asset allocation optimization using year end 2016 P&C Industry holdings
- Reference to a similar study on NAIC's proposed RBC C1 capital charges

A.M. Best's BCAR (B1) and (B2) Charges Updates

A.M. Best BCAR for U.S. P&C Industry:

Required Capital

- (B1) Fixed Income Securities
- (B2) Equity Securities
- (B3) Interest Rate
- (B4) Credit
- (B5) Net Loss and LAE Reserves
- (B6) Net Premiums Written
- (B7) Business Risk
- (B8) Potential Catastrophe Losses

Net Required Capital =

$$\sqrt{(B1)^2 + (B2)^2 + (B3)^2 + (.5 * B4)^2 + [(.5 * B4) + (B5)]^2 + (B6)^2 + (B8)^2} + (B7)$$

(B1), (B2) Charges Overview:

- BCAR Net Required Capital consistent with a Value-at-Risk approach calculated at different confidence levels. 95%, 99%, 99.5%, 99.6% VAR calculations ascribe progressively increasing asset capital charges
- Rating categories (formerly NAIC 1 - 6) increase granularity
- Introduction of maturity considerations
- Baseline capital charges reflect multi-year default considerations and equity valuation changes generated by an Economic Scenario Generator (ESG)

- Total investment risk captured by three main components: (B1), (B2) and (B3)

Source: A.M. Best, NEAM Analytics

Old versus new 95% VAR (B1), (B2) Capital Charges

	95% Value-at-Risk										Old BCAR
Rating	**1 Year**	**2 Year**	**3 Year**	**4 Year**	**5 Year**	**6 Year**	**7 Year**	**8 Year**	**9 Year**	**10 Year**	
aaa	0.00%	0.00%	0.00%	0.00%	0.01%	0.02%	0.03%	0.04%	0.05%	0.05%	1%
aa+	0.00%	0.05%	0.09%	0.14%	0.18%	0.21%	0.24%	0.26%	0.28%	0.30%	
aa	0.00%	0.10%	0.18%	0.27%	0.34%	0.41%	0.45%	0.48%	0.52%	0.54%	
aa-	0.08%	0.24%	0.37%	0.52%	0.62%	0.71%	0.78%	0.82%	0.86%	0.91%	
a+	0.25%	0.53%	0.78%	1.01%	1.19%	1.33%	1.43%	1.48%	1.55%	1.62%	
a	0.33%	0.67%	0.99%	1.25%	1.47%	1.63%	1.74%	1.81%	1.89%	1.96%	
a-	0.42%	0.86%	1.24%	1.56%	1.82%	2.02%	2.13%	2.21%	2.30%	2.38%	
bbb+	0.75%	1.52%	2.16%	2.70%	3.13%	3.46%	3.69%	3.83%	3.99%	4.13%	2%
bbb	0.88%	1.75%	2.47%	3.09%	3.56%	3.93%	4.18%	4.33%	4.48%	4.65%	
bbb-	1.16%	2.29%	3.20%	3.95%	4.53%	4.97%	5.25%	5.41%	5.58%	5.78%	
bb+	1.89%	3.65%	5.15%	6.43%	7.48%	8.35%	9.03%	9.49%	9.93%	10.34%	4%
bb	2.21%	4.24%	5.94%	7.36%	8.54%	9.49%	10.22%	10.71%	11.18%	11.61%	
bb-	4.35%	8.14%	11.12%	13.47%	15.24%	16.55%	17.46%	18.00%	18.46%	18.82%	
b+ to b-	6.52%	11.91%	16.32%	19.90%	22.67%	24.85%	26.48%	27.66%	28.45%	28.92%	4.5%
ccc+ to ccc-	24.38%	37.13%	43.41%	46.09%	46.77%	46.77%	46.77%	46.77%	46.77%	46.77%	10%
cc to c	28.45%	43.32%	50.64%	53.77%	54.56%	54.56%	54.56%	54.56%	54.56%	54.56%	30%
d	32.51%	49.51%	57.87%	61.45%	62.36%	62.36%	62.36%	62.36%	62.36%	62.36%	
Equity	25.00%										15%

Source: A.M. Best, NEAM Analytics

- Capital charges increase non-linearly with longer maturity and weakening credit quality
- Green highlighted cells indicate “cheaper” rating / maturity combinations compared to old model

Old versus new 99.6% VAR (B1), (B2) Capital Charges

	99.6% Value-at-Risk										Old BCAR
Rating	**1 Year**	**2 Year**	**3 Year**	**4 Year**	**5 Year**	**6 Year**	**7 Year**	**8 Year**	**9 Year**	**10 Year**	
aaa	0.00%	0.05%	0.10%	0.14%	0.19%	0.23%	0.27%	0.30%	0.32%	0.38%	1%
aa+	0.09%	0.21%	0.35%	0.45%	0.54%	0.61%	0.68%	0.71%	0.77%	0.82%	
aa	0.18%	0.40%	0.61%	0.77%	0.90%	1.00%	1.10%	1.15%	1.21%	1.27%	
aa-	0.28%	0.59%	0.87%	1.11%	1.29%	1.40%	1.53%	1.58%	1.64%	1.72%	
a+	0.48%	0.99%	1.42%	1.77%	2.02%	2.21%	2.37%	2.42%	2.50%	2.61%	
a	0.58%	1.18%	1.70%	2.09%	2.39%	2.60%	2.78%	2.83%	2.93%	3.03%	
a-	0.71%	1.42%	2.01%	2.48%	2.85%	3.07%	3.25%	3.32%	3.41%	3.52%	
bbb+	1.17%	2.31%	3.26%	4.00%	4.57%	5.00%	5.31%	5.42%	5.60%	5.79%	2%
bbb	1.32%	2.61%	3.64%	4.48%	5.10%	5.58%	5.91%	6.02%	6.19%	6.39%	
bbb-	1.62%	3.19%	4.42%	5.40%	6.13%	6.67%	7.02%	7.17%	7.33%	7.54%	
bb+	2.47%	4.76%	6.67%	8.26%	9.51%	10.53%	11.23%	11.78%	12.24%	12.67%	4%
bb	2.82%	5.40%	7.52%	9.28%	10.65%	11.73%	12.50%	13.02%	13.51%	13.96%	
bb-	5.10%	9.48%	12.89%	15.50%	17.51%	18.82%	19.66%	20.16%	20.56%	20.89%	
b+ to b-	7.43%	13.44%	18.29%	22.13%	25.09%	27.25%	28.79%	29.93%	30.61%	30.95%	4.5%
ccc+ to ccc-	25.46%	38.31%	44.42%	46.84%	47.30%	47.30%	47.30%	47.30%	47.30%	47.30%	10%
cc to c	29.70%	44.69%	51.82%	54.64%	55.18%	55.18%	55.18%	55.18%	55.18%	55.18%	30%
d	33.94%	51.08%	59.23%	62.45%	63.06%	63.06%	63.06%	63.06%	63.06%	63.06%	
Equity	44.00%										15%

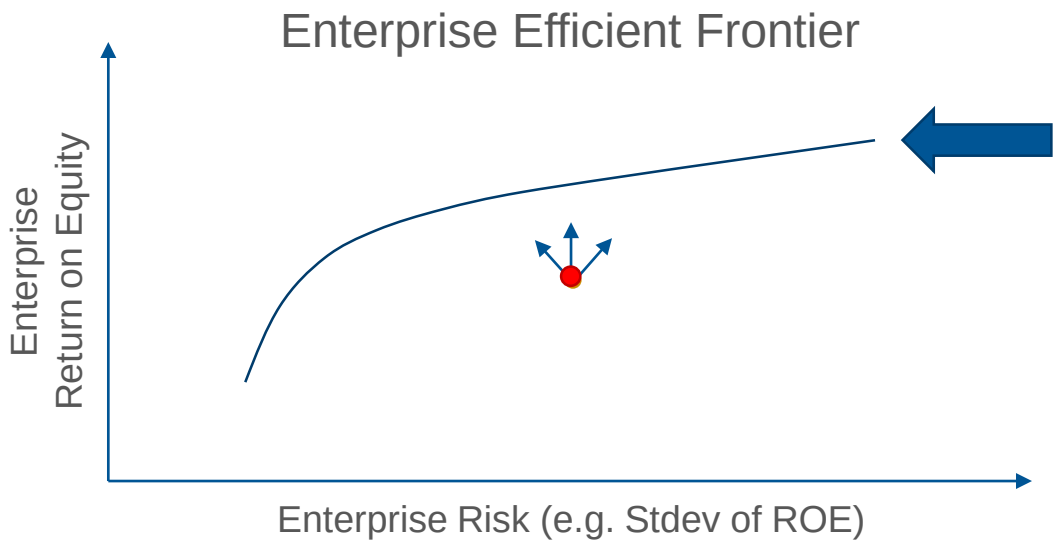
Source: A.M. Best, NEAM Analytics

- 99.6% VAR is A.M. Best's most conservative (tail-centric) regime
- Fixed income capital charges increase marginally compared to the 95% VAR regime
- Equity capital charges increase significantly

Evaluate the BCAR Impact on Asset Allocation in an Enterprise Optimization Context using a "DuPont" Marked-to-Market Framework

$$\text{Return on Equity} = \frac{\text{Earnings}}{\text{Equity}} =$$

$$= \left(\frac{\text{Assets}}{\text{Equity}} \times \boxed{\text{Return on Assets}} \right) + \left(\frac{\text{Liabilities}}{\text{Equity}} \times \text{Return on Liabilities} \right)$$



Measuring BCAR Impact

- Investment portfolio decision making addressed in an Enterprise framework reflecting liabilities
- Efficient frontiers indicate portfolios that provide highest risk-adjusted after-tax returns on equity under meaningful provided constraints
- Evaluate how efficient frontiers change under the new BCAR regime: "Cost of Constraints" Analysis

Source: NEAM Analytics

Case Study: P&C Industry's BCAR Asset Allocation Optimization Impact: Assumptions and Themes

- Model the U.S. year end 2016 P&C Industry as one organization
- Focus on Enterprise Return on Equity and Earnings Risk (initially)
- Optimize the investment portfolio in an "Enterprise" context reflecting liabilities with reasonable asset sector / credit / duration constraints
- Limit analysis to bonds, stocks, cash and short term holdings, excl. Schedule BA assets
- Assume A.M. Best's most conservative (B1) and (B2) baseline 99.6 Value-at-Risk capital charges to highlight impacts

Case Study: P&C Industry Year End 2016 Details

Sector	Allocation
ST/Gov't/Agcy	15.2%
Corp	25.4%
ABS/CMBS	7.0%
MBS/CMO	6.3%
Municipals	24.5%
Equities	21.7%
Total	**100.0%**
Duration	**5.18**

Rating	Allocation
Average	**AA-**
AAA/AA	55.0%
A	10.9%
BBB	10.4%
<BBB	3.0%
NR	20.7%
Total	**100.0%**

Underwriting LOB	Combined Ratio
Consolidated	99.0

(B1, B2) BCAR**	Charge ($BB)
Old BCAR	51.4
New 95 VAR	85.6
New 99 VAR	128.4
New 99.5 VAR	144.9
New 99.6 VAR	148.3

Enterprise Statistics *	
Return on Equity (after-tax)	7.53
Earnings Risk (Std Dev)	12.97
Total Return on Assets	3.11
Investment Leverage	2.23
Product Leverage	0.75
Product Margin	1.00

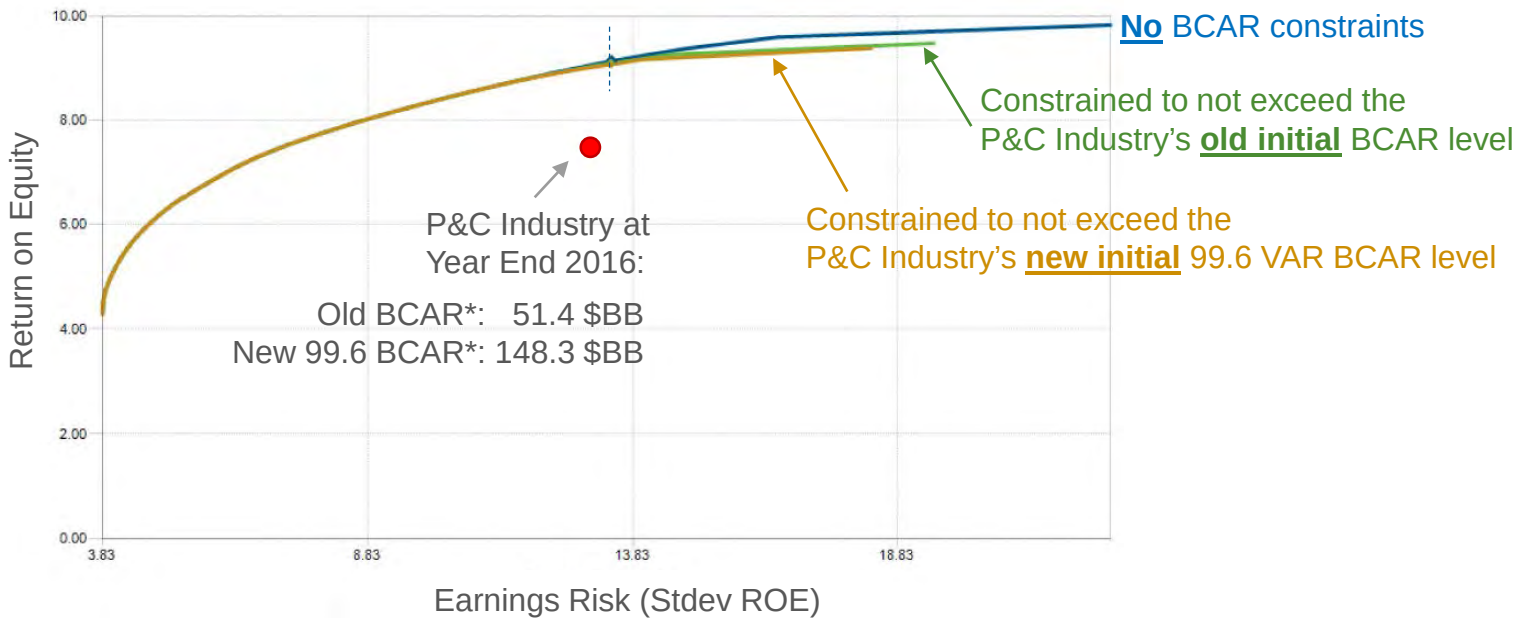
** Estimate using baseline BCAR charges after diversification

* The year-end 2016 P&C Industry is treated as one consolidated organization; Estimate

Source: SNL Financial, NEAM Analytics

Return on Equity and Earnings Risk Efficient Portfolios

- Efficient Frontier: Optimal asset allocations that provide the highest after-tax return on equity for different levels of earnings risk

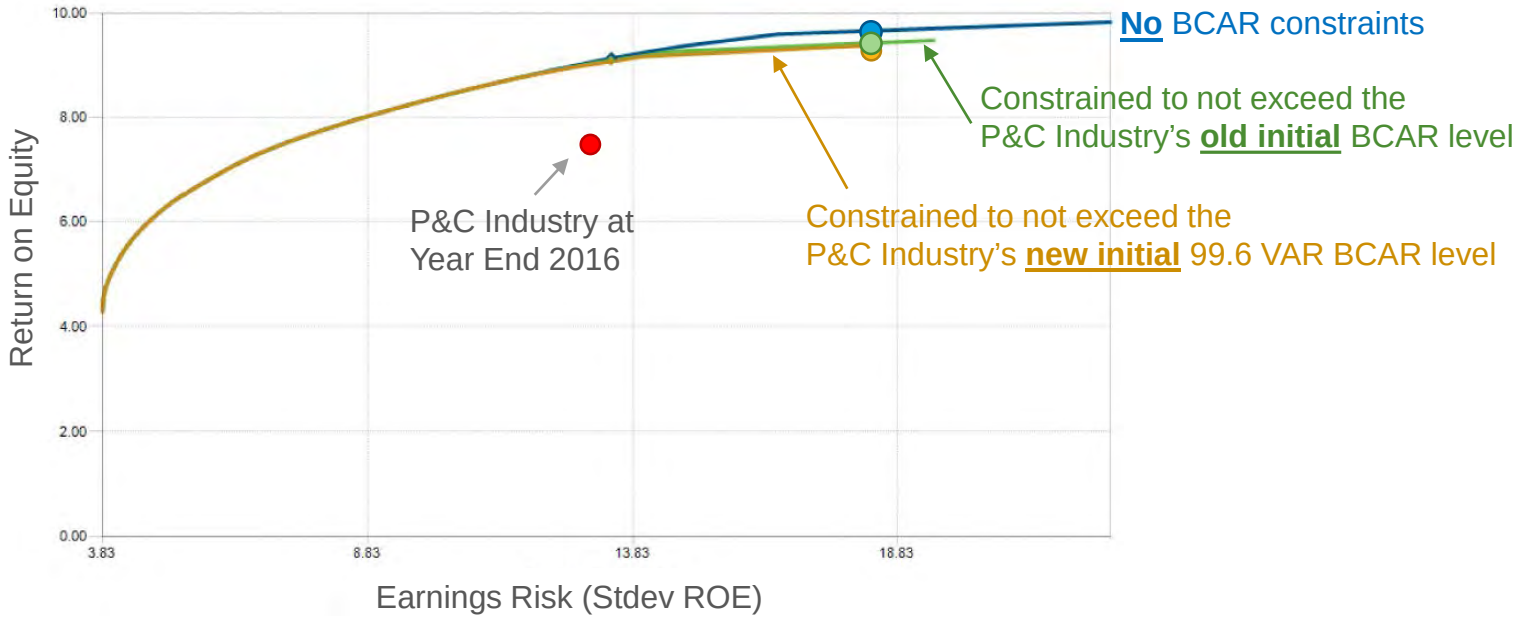


- New BCAR model not considerably more "restrictive" than the old model (The new 99.6 VAR BCAR does not yield significantly lower return portfolios than the old BCAR model given any level of risk)
- BCAR impact most "pronounced" for higher risk – higher return investment portfolio profiles

* The year-end 2016 P&C Industry is treated as one consolidated organization; Estimate

Source: NEAM Analytics

Comparing BCAR Driven Portfolio Profile Differences



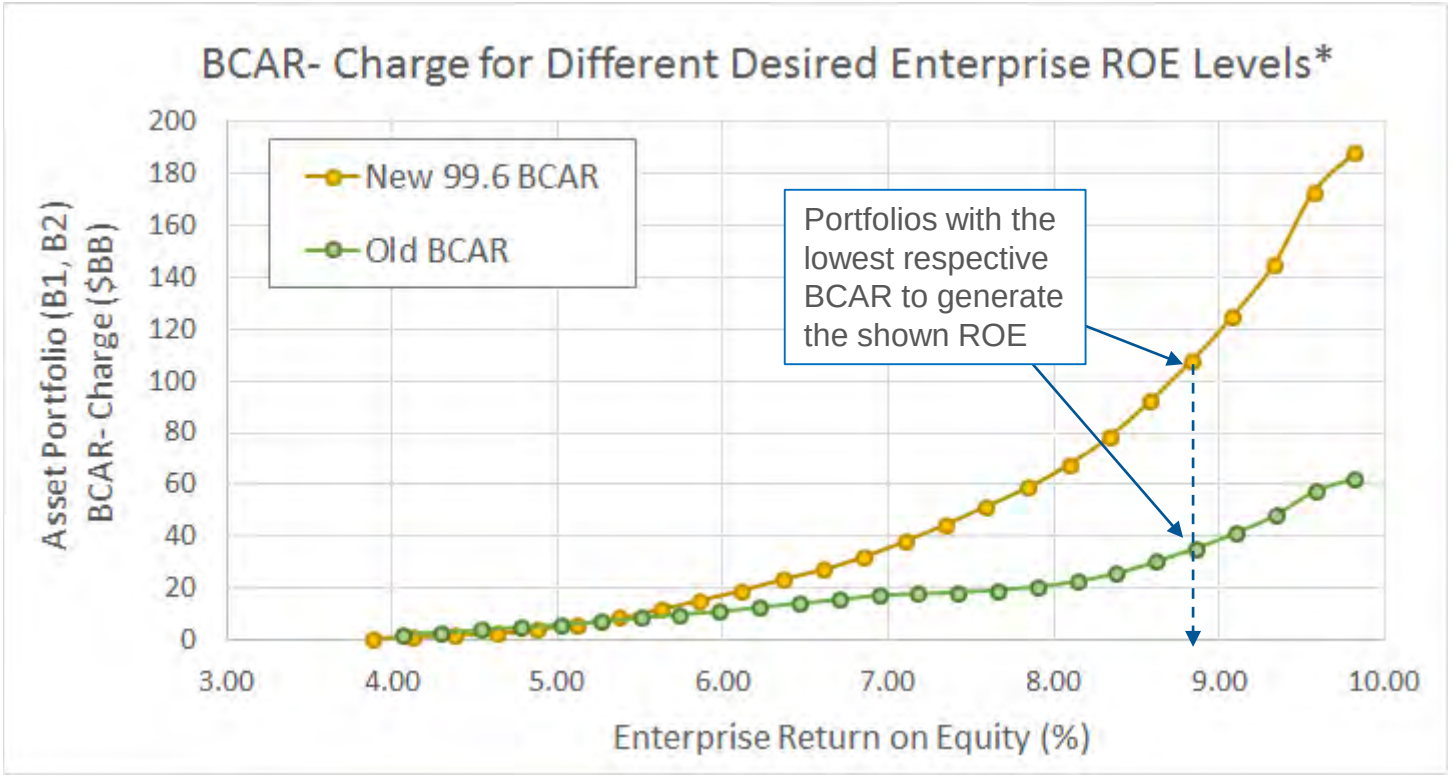
Key Portfolio Differences:

- New 99.6 BCAR ● versus unconstraint BCAR ●
  - Shorter Duration (6.7 vs 6.8)
  - Fewer equities (-7.0 %pts)
  - Higher BBB and below investment grade allocation (+2.8 %pts)
- New 99.6 BCAR ● versus old BCAR ●
  - Similar Duration (6.7)
  - Slightly fewer equities
  - Slightly higher credit quality

Source: NEAM Analytics

Different Objective: "BCAR" Efficient Portfolios

- Identify BCAR efficient portfolios as the investment portfolio construct that delivers the lowest BCAR charge for any given level of Enterprise ROE:



- 99.6 VAR BCAR capital charges increase non-linearly as higher yielding investment portfolio returns are targeted
- How do portfolio profiles that generate identical Enterprise ROEs compare under the old and new 99.6 BCAR?

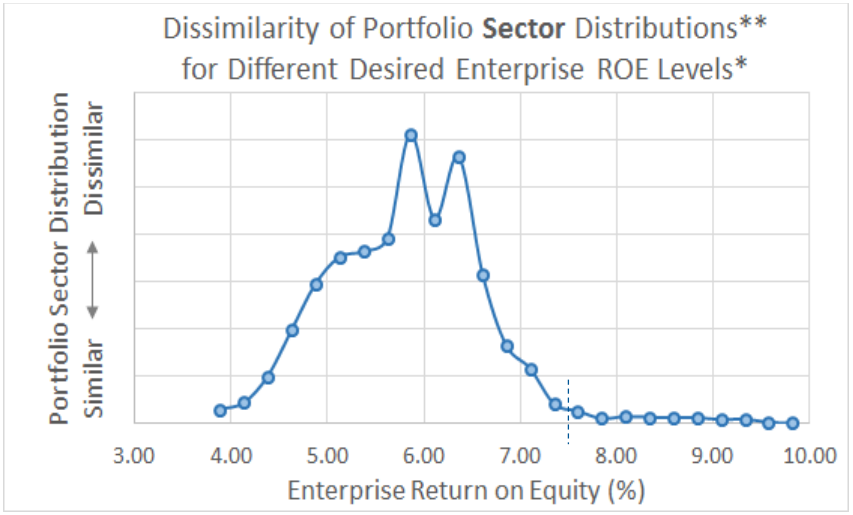
* The year-end 2016 P&C Industry is treated as one consolidated organization

Partnership at Work®

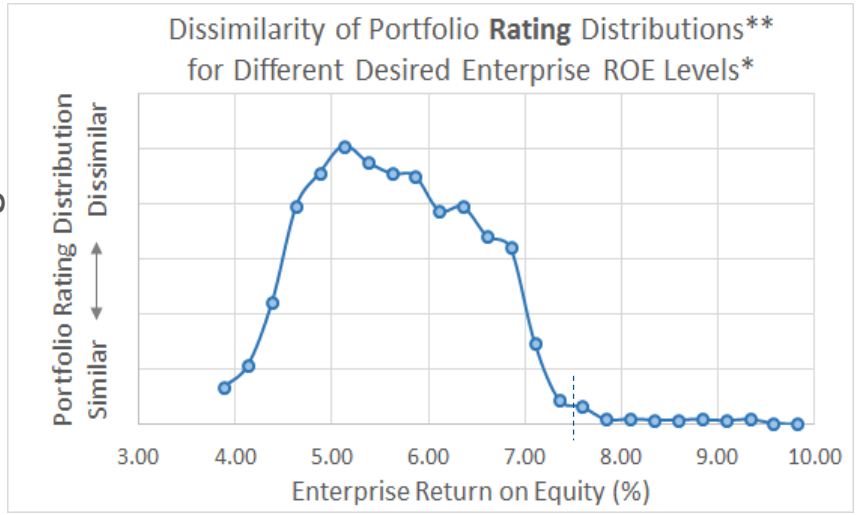
Source: NEAM Analytics

Comparing BCAR-Efficient Portfolios of Old versus New 99.6 VaR BCAR Regime: Sector, Credit, Duration

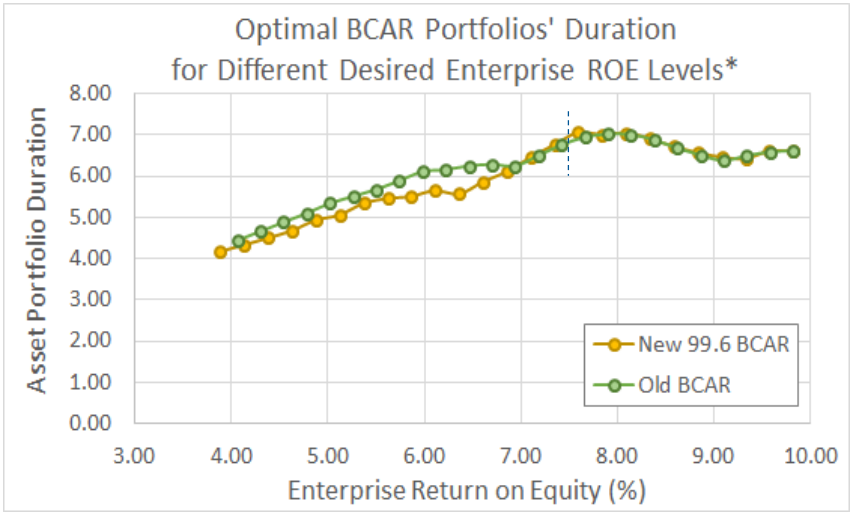
Sector



Rating



Duration

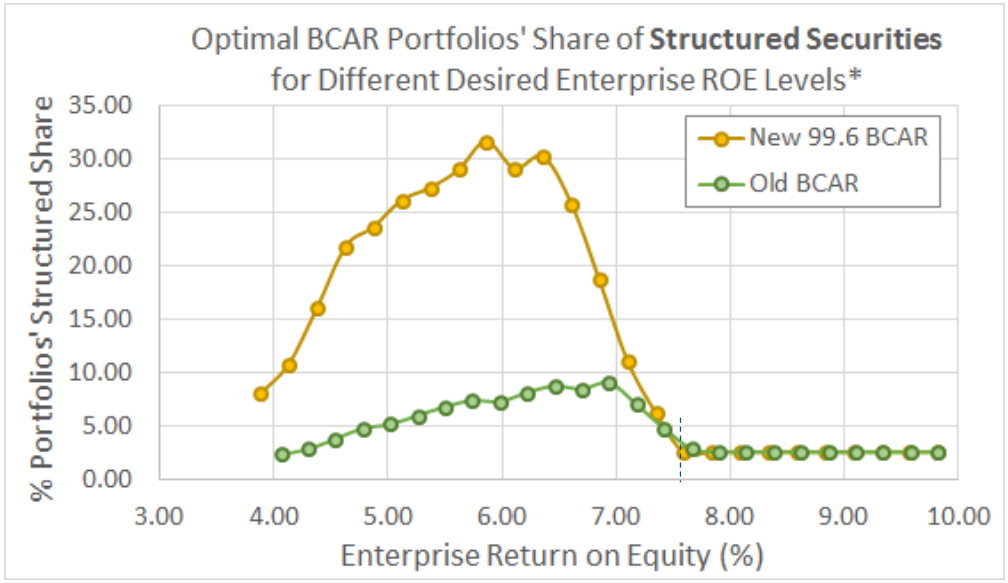


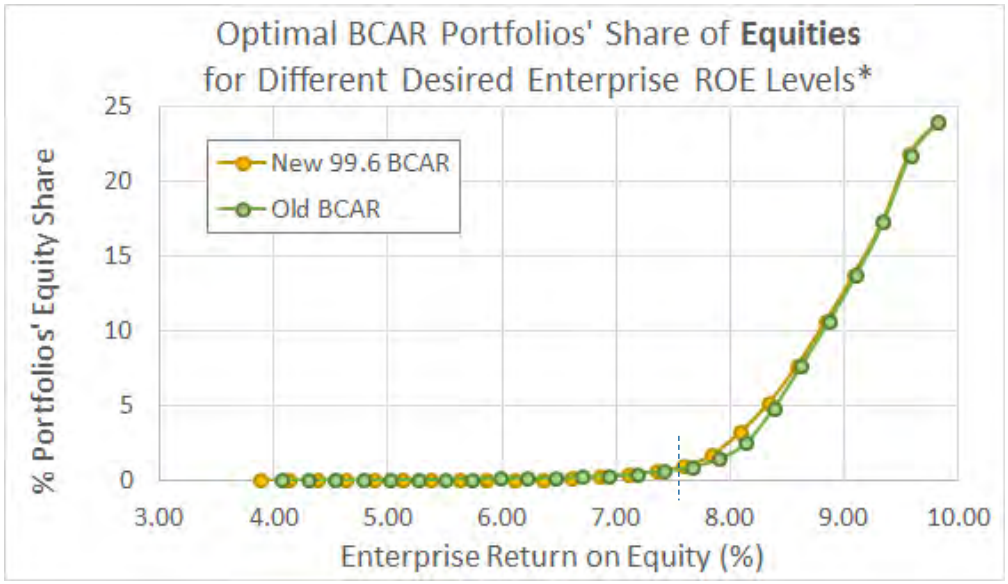
- BCAR efficient portfolios that generate identical expected Enterprise ROEs show different portfolio profiles under the old vs. new 99.6 BCAR regime in terms of duration, sector and rating distributions.
- Investment portfolio profiles become increasingly more similar for higher targeted Enterprise ROEs: The impact from optimizing under the old vs. new BCAR regime fades

** Defined as sum of squared % holding differences by sector or rating
* The year-end 2016 P&C Industry is treated as one consolidated organization

Source: NEAM Analytics

Comparing BCAR-Efficient Portfolios of Old versus New 99.6 VaR BCAR Regime: Highlighting Sector Differences





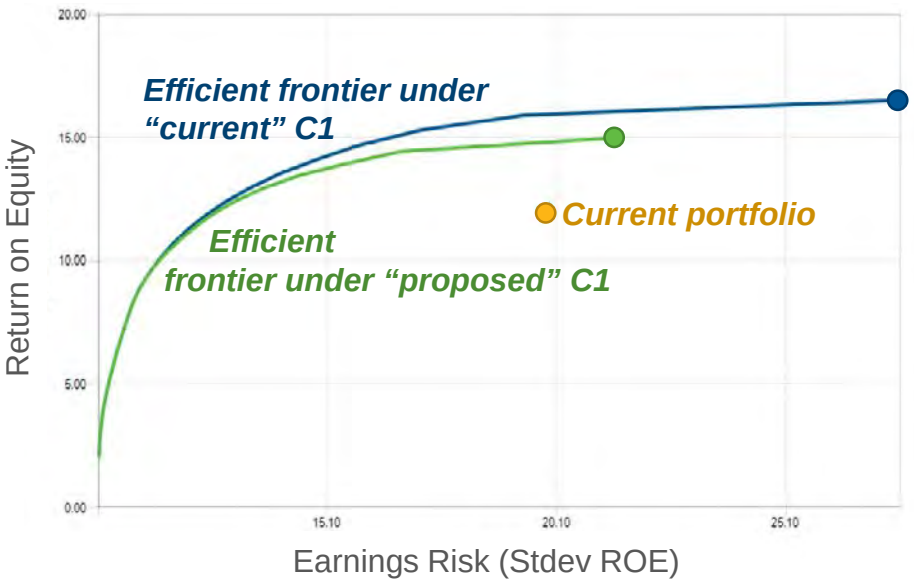
- New 99.6 BCAR favors shorter duration, higher credit quality structured securities in lower yielding investment portfolio profiles
- Higher return (and higher risk) portfolio allocations increasingly utilize equities regardless of their capital charges. The allocation to equities is similar in all BCAR regimes

Source: NEAM Analytics

Five Things To Remember

- A.M. Best introduced tail-risk focused stochastic (B1) and (B2) BCAR charges for different Value-at-Risk (VAR) confidence levels, maturity cohorts and a more granular rating scheme
- Fixed income capital charges increase non-linearly as credit weakens and maturity extends, reflecting greater likelihoods of default; Equity capital charges increase significantly
- The year end 2016 P&C industry's consolidated investment portfolio baseline BCAR charge triples under the new 99.6 VAR BCAR regime
- The new BCAR model does not significantly limit achieving higher risk adjusted investment returns
- Optimal risk adjusted return portfolios might have slightly different portfolio profiles with the new BCAR model often favoring higher credit quality, shorter maturity structured securities

NAIC RBC Proposed C1 Capital Charges Impact on Life Industry's Asset Allocation



- Proposed RBC C1 capital charges alter the Enterprise Efficient Frontier considerably, limiting investment opportunities when constrained to not exceed the respective old and new asset portfolio capital charge
- The introduction of proposed RBC C1 charges might incentivize Life insurers to reconfigure their investment portfolios, potentially favoring higher credit and shorter duration structured securities

Refer to results in
SOA "Risk & Rewards" Issue 70, August 2017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Risks & Rewards

SOCIETY OF ACTUARIES
INVESTMENT SECTION

Proposed NAIC RBC C1 Factors for Life Insurers: Impact on Portfolio Optimization?

By Mark Yu and Tobias Gummersbach

This article first appeared in the April 2017 issue of Perspectives. *It is reprinted here with permission.*

This issue of *Perspectives* highlights the differences between the current and proposed C1 factors.

The National Association of Insurance Commissioners (NAIC) presented a proposal of new risk-based capital (RBC) charges for C1 investment risk in 2015. This proposal also introduced additional granularity of fixed income credit rating reporting, from six to twenty categories. Although the current proposal focuses on life insurers, NAIC has stated that the proposed structure of twenty rating categories would also apply to health, and property and casualty insurers. The numeric values of the respective C1 factors might vary by industry segments.

These proposed capital charges are developed based on the historical default probability and loss recovery experiences of corporate bonds; however, they will apply to other fixed income securities including municipal bonds, structured securities[1] and private placements. In addition to these base C1 factors, there will be portfolio adjustments to reflect company-specific portfolio characteristics to help ensure that the statistical safety level (i.e., confidence level) for the C1 component is met. Our case study focuses on the base C1 factor without applying company-specific portfolio adjustments.

This issue of *Perspectives* highlights the differences between the current and proposed C1 factors. The portfolio optimization case study then utilizes the U.S. life industry data to illustrate key differences between optimized portfolios under current and proposed C1 factors.

CONTINUED ON PAGE 4

Source: NEAM Analytics

Q&A

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