



Economic Scenario Generators



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The Good Old Days

Traditional Actuarial Focus has been on underwriting

- ◆ Mortality
- ◆ Lapses
- ◆ Adverse Selection

Investment Risk was secondary

- ◆ Hold to maturity
- ◆ Focus on yield vs. crediting strategy



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◀ World Changed in 2008

- ◆ Yields dropped below minimum crediting rates
- ◆ Most assets saw horrible performance
- ◆ Spike in risk charges made matters worse
- ◆ Increased use of OTTI just piled on

◀ Rules are Changing

- ◆ Going forward there is a large push to understand risks from **ALL** sources
 - ❖ Economic Capital
 - ❖ Solvency II
 - ❖ IFRS
 - ❖ FASB Changes

Rules are Changing

- ◆ Companies need to go beyond simple scenario testing
 - ❖ e.g. New York 7

- ◆ Relying on Economic Scenario Generators (ESGs)
 - ❖ Generate “unlimited” number of potential futures
 - ❖ Full range of economic variables

ESG Basics

- ◆ ESGs are, by design, very complicated
 - ❖ Makes understanding or evaluating them difficult

- ◆ Easier to think of three basic questions:
 - ❖ How big a movement?
 - ❖ How likely is that movement?
 - ❖ What else happens in the economy?

◀ Where should we start?

- ◆ Consider a Variable Annuity Company
 - ❖ Equity exposure
 - ❖ Impact of guarantees
 - ❖ Also concerned about secondary impacts (e.g. change in interest rates)

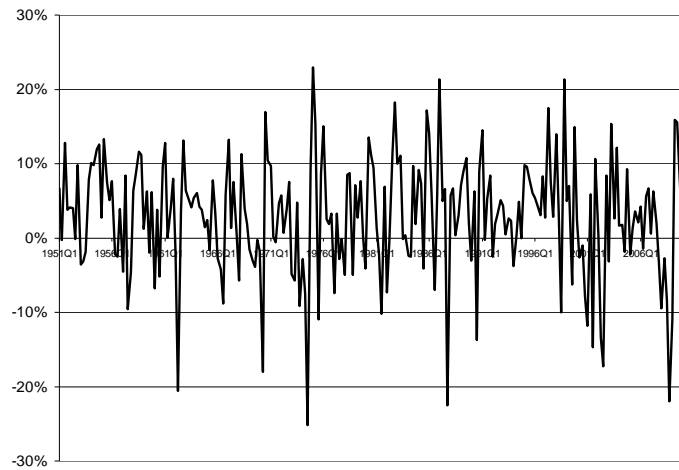
- ◆ Complex Risk Management Task
 - ❖ Start by looking at equity

◀ Modeling Basics

- ◆ All ESG Modeling starts by looking at history
 - ❖ What has happened is a good guide to what can happen

Modeling Basics

Historical S&P 500 Quarterly Returns
1951 - 2010



Modeling Basics

- ◆ What does this tell us?
 - ❖ Fairly volatile
 - ❖ Little serial correlation

- ◆ Very different than the picture for Interest Rates



Modeling Basics

Historical 10-Year Treasury Yield
1951 - 2010



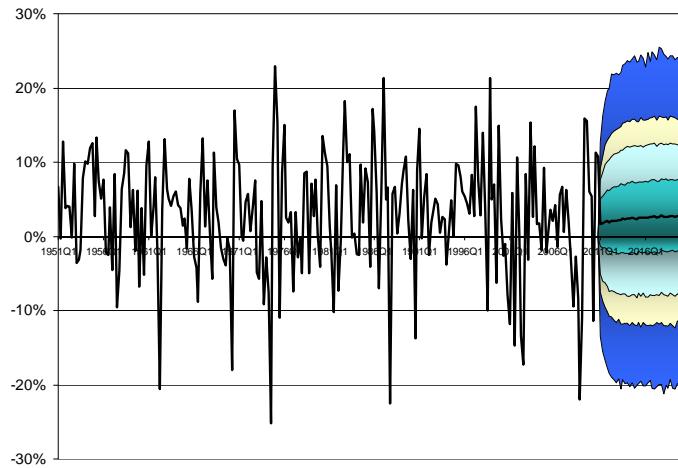
Modeling Basics

- ◆ A “good” ESG will
 - ❖ Produce a similar distribution of results



Modeling Basics

Projected S&P 500 Returns



Modeling Basics

Projected 10-Year Yields

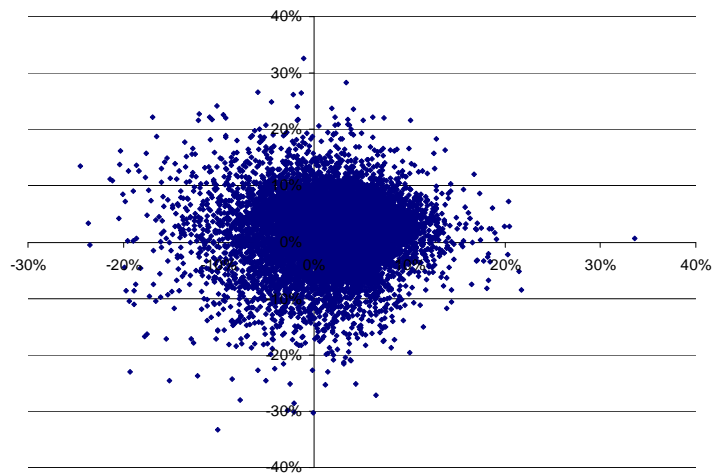


Modeling Basics

- ◆ A “good” ESG will
 - ❖ Produce a similar distribution of results
 - ❖ Maintain the desired relations
 - ❖ Produce scenarios that have never been seen before

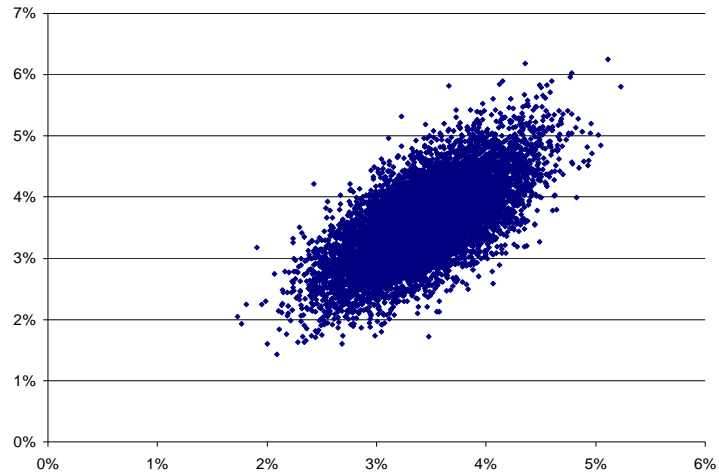
Modeling Basics

S&P 500 Projected Returns
1st and 2nd Quarters



Modeling Basics

10-Year Treasury Yields 1st and 2nd Quarters

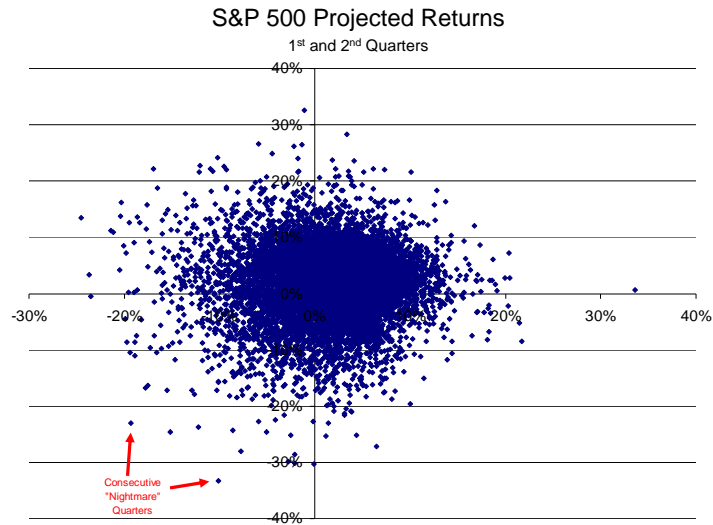


Modeling Basics

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Modeling Basics



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The Power of "AND"

"Good" ESG needs to go beyond these individual risks

- ◆ Relationships are key to Enterprise Risk Management (ERM)
- ◆ 2008 taught us the importance of "AND"
 - ❖ Equity Risk AND
 - ❖ Increased hedging costs AND
 - ❖ Dropping interest rates AND...

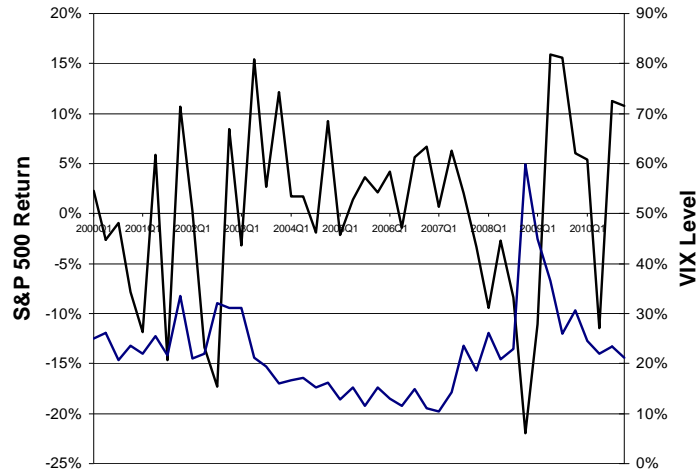


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◀ The Power of “AND”

S&P 500 Return vs. VIX Level
2000 - 2010



◀ Next Steps

- ◆ Now comes the hard part:
 - ❖ What do we do with this model?



◀ Next Steps

Start by incorporating into existing models

- ◆ Cash flow testing
- ◆ Strategic planning systems

Often need to revisit the setup due to wider range of scenarios

- ◆ What if IMR goes negative?
- ◆ What if interest rates drop to 0%? Go up to 20%?

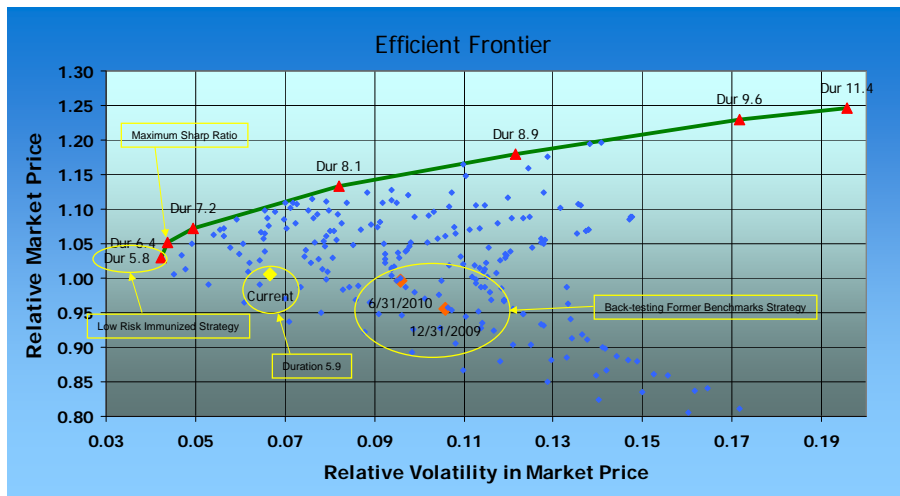
◀ Next Steps

- ◆ Even this simple extension can be quite powerful
 - ❖ More realistic view of profitability
 - ❖ Begin to assess probabilities
 - Hitting budget
 - Losing money

Going Beyond

- ◆ These types of results will naturally give rise to certain questions
 - ❖ Why is the probability of loss so high?
 - ❖ What can we do to better manage this risk?
 - ❖ What can we do to make more money?
- ◆ Naturally leads to evaluating alternative strategic alternatives
 - ❖ Asset allocation
 - ❖ Hedging programs
 - ❖ Product design

ALM Efficient Frontier



Getting carried away

- ◆ At first, these ESGs look incredibly complex
- ◆ Once you start better understand them, you start to see their inner beauty
 - ❖ Still VERY complex
 - ❖ The complexity is because they're trying to model the ENTIRE economy
 - ❖ The balance is they key to making them useful
- ◆ People get in a lot of trouble when they forget that these models aren't perfect
 - ❖ Consider what happened in 2008



Getting carried away

OTTI pre-2008

- ◆ GAAP-only requirement to write down certain bonds
- ◆ Often avoided by asserting a "willingness and ability" to hold until recovery
- ◆ Initially, not much of a concern for companies

OTTI 2008 and beyond

- ◆ Credit spreads reached unprecedented levels, leading to huge unrealized losses
- ◆ Auditors became aggressive in assessing OTTI, questioning whether assets would ever recover
- ◆ Also began forcing companies to take same write downs for Stat accounting





Getting carried away

Remember famous quote by George Box:

“All models are wrong, some models are useful.”



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