How to Think About Risk Management

Thomas S. Coleman

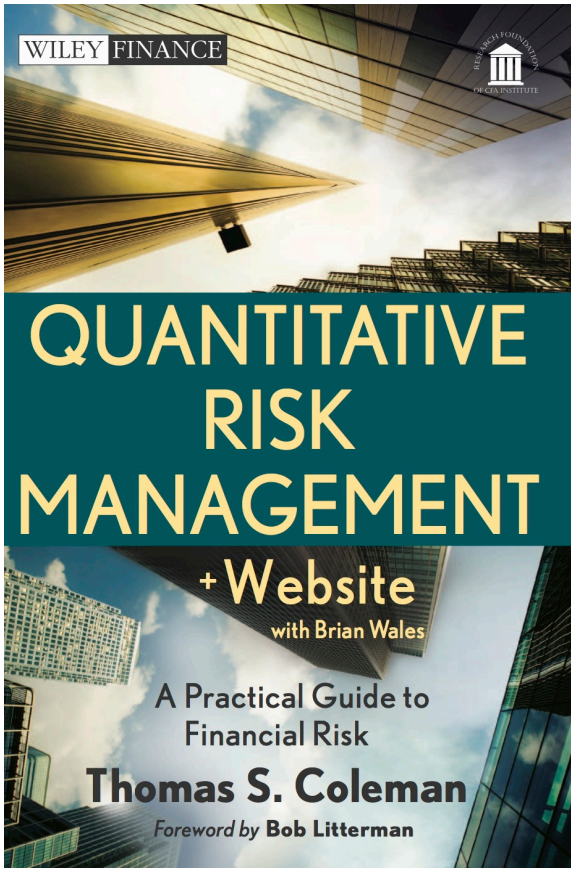
Greenwich Library / CFA Society Stamford

September 6th, 2012

Executive Director, Becker Friedman Institute for Research in Economics, University of Chicago

tscoleman@uchicago.edu

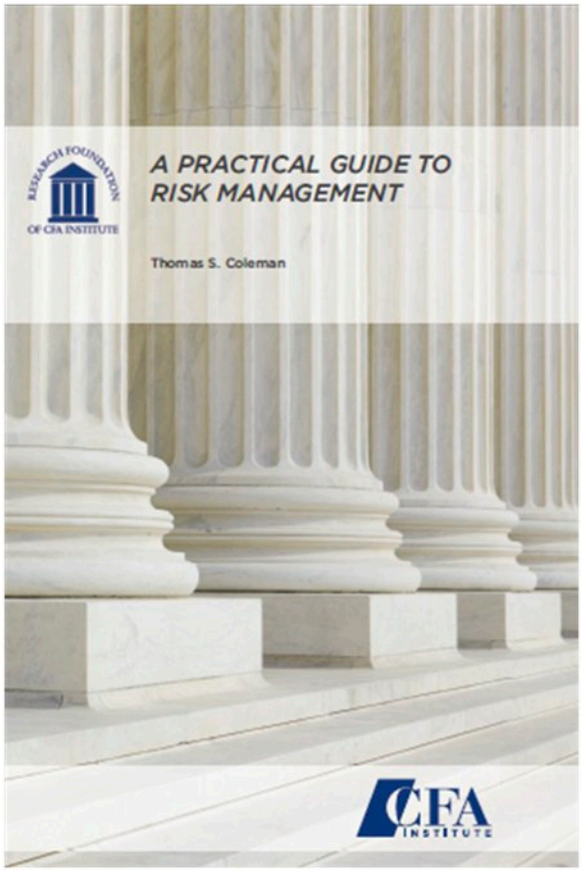
Research Foundation of CFA Institute



Quantitative Risk Management

complete 550-page book

http://www.wiley.com/buy/1118026586



A Practical Guide to Risk Management

First 5 chapters

http://www.cfapubs.org/toc/rf/2011/2011/3

Research Foundation of CFA Institute

Overview

- How to Think about Risk Management
  - Risk management as management
  - Thinking about risk and uncertainty
  - An overview of quantitative techniques – volatility and VaR, Marginal Contribution and Best Hedges
- Further Reading
  - ***A Practical Guide to Risk Management*** (first 5 chapters) - www.cfapubs.org/toc/rf/2011/2011/3
  - ***Quantitative Risk Management***, Wiley (complete book) - http://www.wiley.com/buy/1118026586
  - Slides - www.closemountain.com/papers/CFA_CT_120906.pdf

Research Foundation of CFA Institute

Who am I?

- Educational Background
  - Physics undergraduate at Harvard, PhD economics University of Chicago
  - Taught economics and finance for four years
- Practical Experience
  - Over 20 years ago moved from academics to finance
  - Trading and quantitative model-building on a derivatives desk
  - More recently founded and managed a macro-global hedge fund
  - Short stint as risk manager at a large hedge fund
  - Recently moved back to University of Chicago – helping to run the Becker Friedman Institute for Research in Economics
- Trading and Management
  - I want to emphasize – I come from a trading and management background – not from "risk management"

Research Foundation of CFA Institute

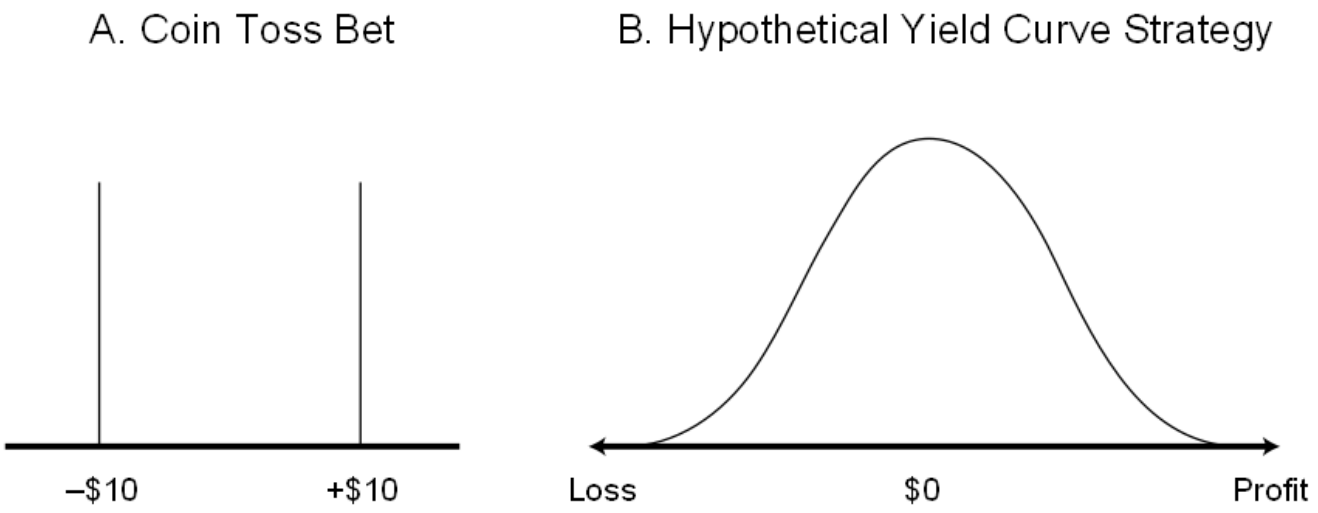
My View of Risk Management

- Challenging some conventional wisdoms
  - Good Risk Management is old-fashioned management, not fancy mathematics
  - Mathematics and numbers *are* important, but only part of the answer
- Managing People, Processes, Institutions
  - People most important – all problems, all successes, come from people
  - Incentives, compensation, principal-agent problems
- "Risk Management" Should Not be a Separate Department and Cannot be Delegated

Research Foundation of CFA Institute

Risk and Uncertainty

- What is Risk? – Start from Fundamentals
  - Possibility that P&L is different from what is expected
- P&L Distribution



Research Foundation of CFA Institute

Risk and Uncertainty – cont'd

- Becoming Comfortable With Randomness And Uncertainty
  - Randomness not intuitive
    - Birthday problem
  - We humans not good thinking about randomness
- Should Not Throw Up Hands and Give Up
  - Physics not intuitive – yet we use it all the time
  - Mathematics and probability are tools to supplement intuition
- Learn to Embrace Uncertainty and Randomness

Research Foundation of CFA Institute

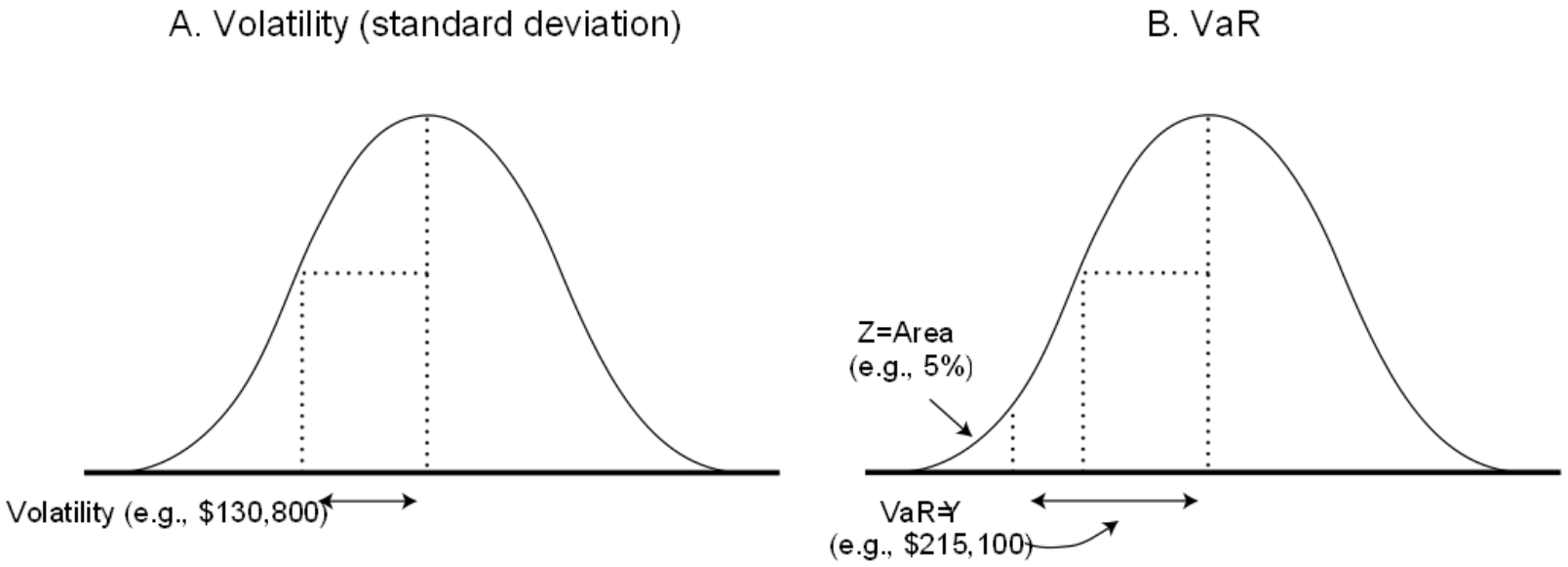
Risk Tools

- Focus on the *Intuition* Behind the Numbers
  - Fundamental tension – Mathematics vs. Management
- Volatility (σ, standard deviation) and VaR (Value at Risk)
- Portfolio Tools (Contribution to Risk, etc.)

Research Foundation of CFA Institute

Volatility and VaR

- Remember – We Care About P&L Distribution
  - Volatility and VaR tell us scale or dispersion – summary measures for the distribution
  - Very simple concepts – graphically



Research Foundation of CFA Institute

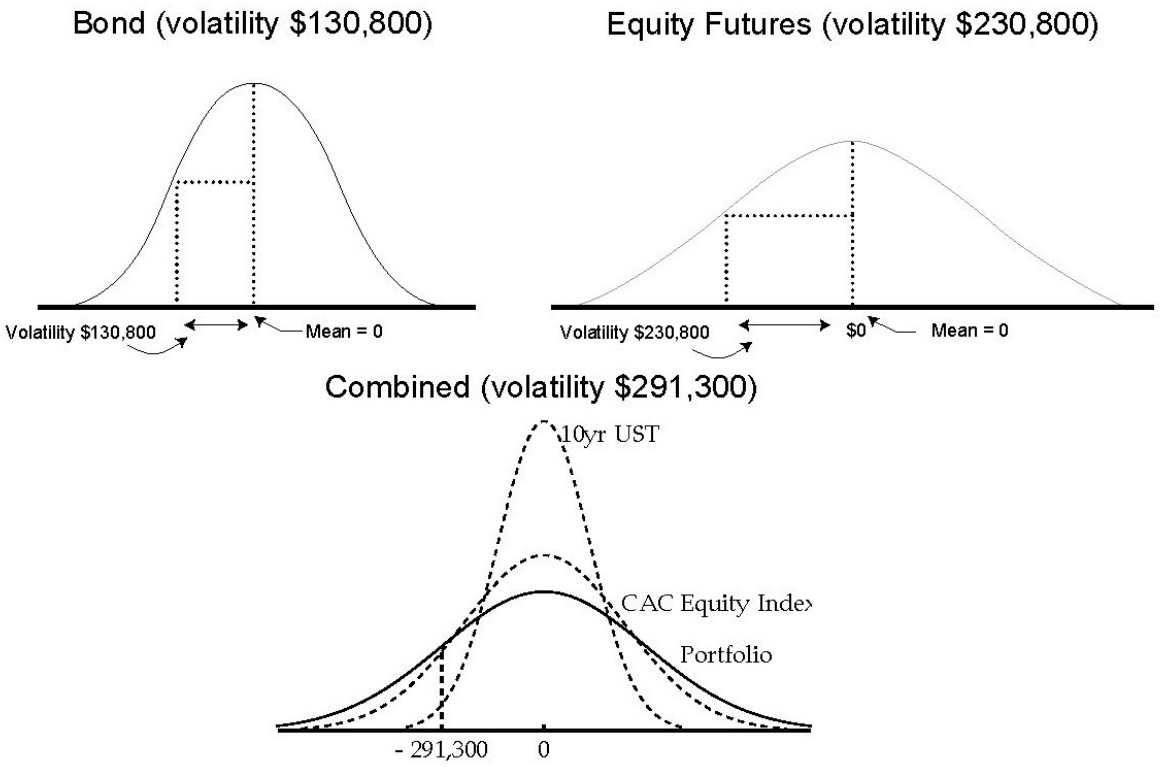
Using Volatility (or VaR)

- "Scale" for Standard Trading Conditions
  - Tells us how big P&L might be
  - P&L outside vol roughly 30% or 1 day out of 3
  - P&L less than 5% VaR roughly 5% or 1 day out of 20
- To Compare Different Assets
  - E.g. Bond and CAC equity index futures
  - P&L matters – money is still money
- To Combine Assets
  - P&L adds, but volatilities do not – diversification
- Extreme Events – more later

Research Foundation of CFA Institute

Volatility to Compare and Combine

- $20mn 10-year UST; €7mn ($9.1mn) CAC
  - Very different – how to compare? Use volatility (or VaR)



Research Foundation of CFA Institute

Volatility and VaR Tips

- Some "Tricks-of-the-Trade" for Volatility and VaR
- Calculating Volatility
  - Use history to calculate standard deviation of changes
  - On Bloomberg, **HVT**. How many days?
- Calculating VaR
  - Quick-and-dirty – gross-up volatility
  - For normal: 1.65x for 5%, 2.33x for 1%, 2.7x for once-per-year. BUT BEWARE NORMAL
- Time Scaling
  - $\sqrt{t}$ – from daily to annual (255 days) multiply by 15.97
- Measure Volatility or VaR as Percentage of Portfolio
  - UST vol is $130,800, or 0.65% daily, or 10.4% annually

Research Foundation of CFA Institute

Portfolio Tools

- Volatility and VaR Are Only A Start. Need:
  - Sources of risk
  - How trades alter risk
  - Simple representations for complex portfolios
- Marginal Contribution and Best Hedge
  - Marginal Contribution – risk decomposition
    - Beware name confusion (RiskMetrics)
  - Best Hedge – what size trade provides “best hedge” and how risk changes

Research Foundation of CFA Institute

Portfolio Tools – Example

- Continue with $20mn 10-year UST; €7mn ($9.1mn) CAC Futures
  - Portfolio vol $291,300
  - Contribution: 30% bond, 70% CAC futures
  - Best hedge with CAC is short €950k

	Positio'n (stand-alone) Volatility	Marginal Contribution	Best Hedge Pos'n	Volatility at Best Hedge	% Volatility Reduction	All-or-Nothing Cont'n
$20.0mn 10yr UST	$130,800	28.7%	-8.47	$224,100	23.1%	$60,490
€7.0mn CAC Equity	$230,800	71.3%	-0.95	$126,900	56.4%	$160,600
Portfolio Volatility	$291,300	100.0%				

Research Foundation of CFA Institute

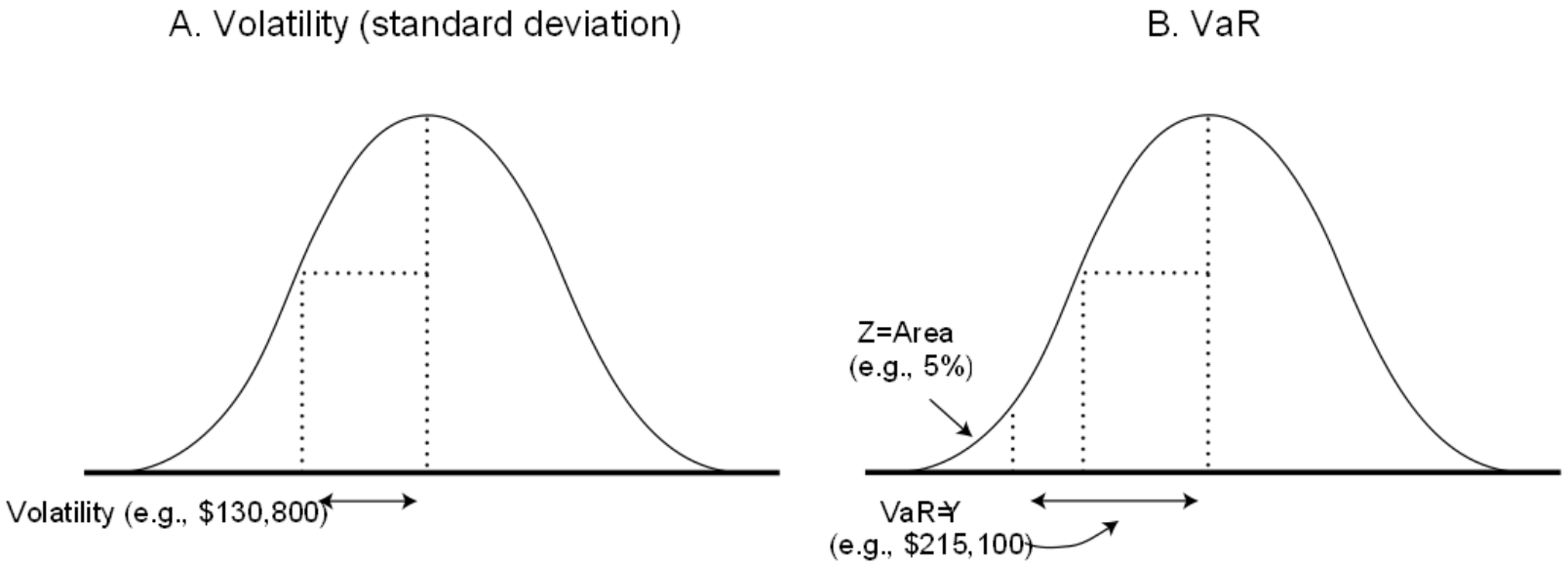
VaR and Extreme Events

- Extreme Events – VaR usually used for this
  - 5% VaR – P&L worse 5% or roughly 1-out-of-20 days
  - Could also look at 0.4% VaR – roughly once-per-year
- Be Careful with Extreme Events
  - Really hard to measure extreme events
  - Often larger than we expect
  - Maybe use simple rule-of-thumb: once-per-year = 4σ
    - Normal says once-per-year = 2.7σ
- Thinking of VaR
  - "Statistically worst-case loss" – really misleading
  - Much better: "a regularly occurring event with which we should be comfortable" (Litterman)

Research Foundation of CFA Institute

Volatility and VaR – Slide 9 Again

- Remember – We Care About P&L Distribution
  - Volatility and VaR tell us scale or dispersion – summary measures for the distribution
  - Very simple concepts – graphically



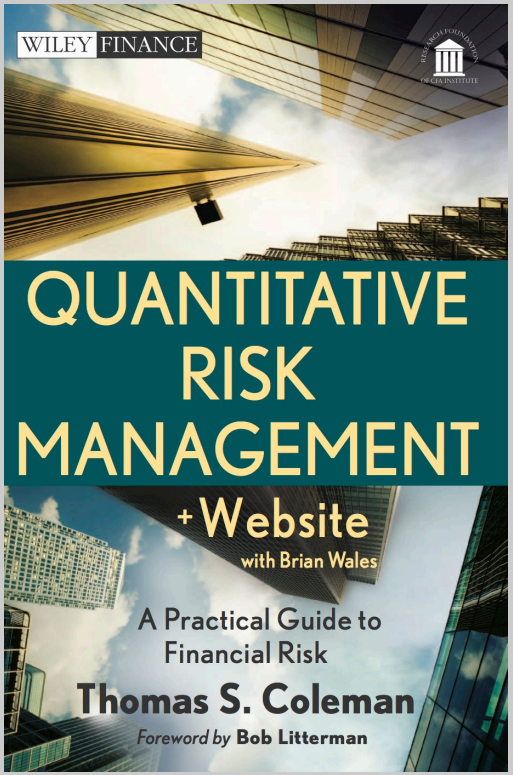
Research Foundation of CFA Institute

Risk Management is Management

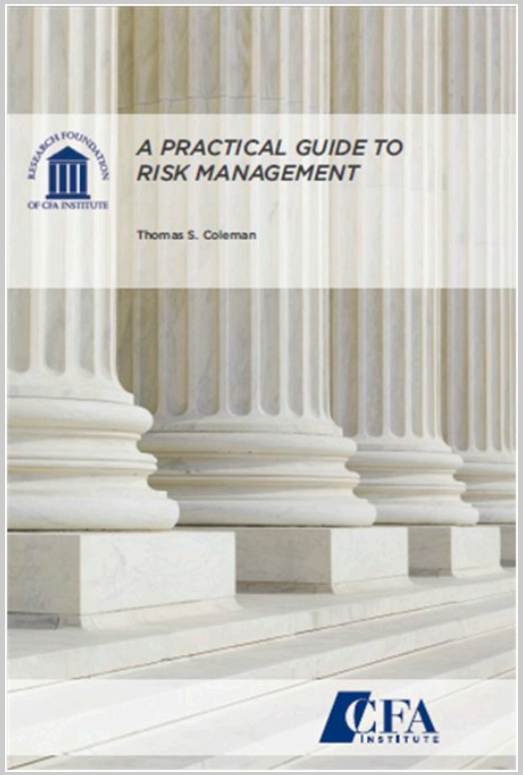
- Return to Risk Management as Management
- Remember Randomness and Uncertainty
  - Numbers don't give us certainty – just the scale of our uncertainty
- Delicate Balance – Practice old-fashioned judgment, take advantage of quantitative tools
- Extreme Events particularly difficult

Research Foundation of CFA Institute

Questions



Quantitative Risk Management
complete 550-page book
http://www.wiley.com/buy/1118026586



A Practical Guide to Risk Management
Monograph
http://www.cfapubs.org/toc/rf/2011/2011/3

Research Foundation of CFA Institute