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BOOK REVIEW

Mark Kritzman, Senior Editor

FINANCIAL RISK MANAGEMENT—Models, History, and Institutions

Allan M. Malz, John Wiley & Sons, Inc., 2011
(*Reviewed by Bruce Grantier*)

Alan Maltz is Senior Analytical Advisor in the Markets Group at the Federal Reserve Bank of New York, where he worked on implementation of the Fed's emergency liquidity programs to address the financial crisis. Prior to that he was chief risk officer at several multi strategy hedge funds, plus head of research at RiskMetrics group. He holds a PhD in economics from Columbia University where he also teaches a graduate course in financial risk management.

On the cover, Emanuel Derman, of whom I am a fan, writes: *"…Allan Maltz wide experience on Wall Street and at the Fed provides him with the perfect background for writing this important and uniquely comprehensive book."*

In this review I propose to follow the chapter outline (with apologies for pursuing that simplistic approach), but this probably gives the reader the best insight into the extensive contents of this book.

Chapter 1, "Financial Risk in a Crises-Prone World", sets the background. It traces the evolution of the banking system of the 1960's from depository institutions through financial intermediaries to today's "shadow banking system". It discusses many financial innovations over that period, from mutual funds to the most exotic derivatives; including mortgage backed securities and collateralized mortgage obligations—the chief culprits in the sub-prime crisis. One chart summarizes the dramatic shifts over 1959–2008 in the shares of financial sectors—away from banks and insurance companies to mutual funds, agencies (government sponsored issuers), asset backed security issuers and speciality finance companies. Another table lists and describes 32 financial mishaps over 1970–2009. The chapter defines numerous types of financial risk under the classifications: market, credit, liquidity, model, operational, legal, reputational, and systematic.

Chapter 2, "Market Risk Basics", introduces the tools and the basic concepts of market risk. Given the enormous variety of assets and risk factors, no single model could possibly capture price movements, so this chapter sets the stage for discussing the basics of the modelling encountered throughout the rest of the book.

It begins with arithmetic, geometric, and logarithmic returns, moving to risk, security prices, and the standard asset pricing model. The chapter discusses random walks, Wiener processes and Brownian motion and concludes with portfolio risk, including beat, efficiency, and diversification.

Chapter 3, "Value-at-Risk", is the introduction of several chapters dealing with VaR. It begins with an excellent summary of the limitations and the criticisms of VaR, but equally, points out the importance of VaR as an analytical tool (continued in Chapter 11). It begins with a definition of the VaR model, including user defined parameters, steps in computing, and the estimation of volatility used in VaR. It discusses the exponentially weighted moving average (EWMA) model and GARCH model and their applications. Finally, it discusses parametric, Monte Carlo, and historic simulations—the alternative modes of computation of VaR.

Chapter 4, "Nonlinear Risks and the Treatment of Bonds and Options", discusses these two key examples of nonlinear risk—the prior chapter dealt with linear relationships only. Black-Scholes option pricing is reviewed, followed by nonlinear VaR and the use of Monte Carlo and historic simulations of nonlinear exposures. Bond nonlinearity is due to convexity, i.e., the sensitivity of duration to interest rates. The chapter reviews the bond math of duration and convexity, duration only VaR, and duration plus convexity VaR.

Chapter 5, "Portfolio VaR for Market Risk", extends asset VaR into portfolio VaR and, in doing so introduces the element of complexity and the dependence of returns on multiple risk factors. The chapter covers such topics as covariance and correlation matrices, mapping of bonds and options, delta-normal VaR, portfolio VaR using Monte Carlo simulation, and option vega risk.

Chapter 6, "Credit and Counterparty Risk", is the first of several chapters on credit risk. It covers the basics, including types of credit-risky securities (corporate and sovereign debt, credit derivatives and structured credit products). It provides a very interesting discussion of transaction cost problems (asymmetric information, principle-agency problems, risk shifting, moral hazard, adverse selection, externalities, and collective action problems). It discusses assessing creditworthiness, country party risk, the Merton Model, credit factor models, and credit risk measures.

Chapter 7, "Spread Risk and Default Intensity Models", continues the themes set out in Chapter 6. Types of credit spreads are defined, including: yield, asset swap, credit default, option adjusted, and discount margin spreads. Default curve analysis (modelling default analysis) is discussed, dealing with default timing functions and hazard rates.

Chapter 8, "Portfolio Credit Risk", covers portfolio default risk, with correlation being the key concept. Risks are complicated by depending on both security issuer and type of security. The chapter reviews two approaches—the factor model (developed more in Chapter 6) and the Credit Metrics model. The Credit Metrics model has some advantages, such as being able to relate to real-world factors, such as equity prices.

Chapter 9, "Structured Credit Risk", discusses securitizations and structured credit products, which played a major role in the sub-prime crisis. Different types of securitizations are described: covered bonds, mortgage pass-throughs, collateralized mortgage obligations, and structured credit products. Tranches, seniority, the waterfall priority, and issuance process are discussed.

Credit scenario analysis is discussed along with measurement of risk using simulation. Credit VaR by tranche is discussed, along with a summary of tranche risks. The chapter concludes with an overall view of issuer and investor motivations for structured credit—a good perspective to have in light of the sub-prime crisis.

Chapter 10, "Alternatives to the Standard Market Risk Model", continues the analysis of Chapters 2–5 into non-normal distributions, starting with descriptions of kurtosis, skewness, and time variation. It plots daily returns of the S&P 500 over 1929–2011, showing the 99, 99.8, and 99.98% confidence level "exceedences". Needless to say there are more exceedences than should be expected—at the 99.999% confidence level maybe one in a few centuries vs. 211 in the 83 years actually observed—all contributing to failures in normal VaR. The chapter then sets out two approaches (out of a wide variety) to better account for asset behaviour: jump diffusion models and extreme value theory. The chapter concludes with a discussion of evidence of non-normality on derivative prices with emphasis on option process.

Chapter 11, "Assessing the Quality of Risk Measures", is a very good chapter and deals with criticisms of VaR as a risk model. It sets forth three main viewpoints of the criticisms of VaR: 1/model risk, 2/back testing, and 3/coherence. Model risk deals with the accuracy of inputs including the assumption of normal distribution. The chapter give the example during the sub-prime crisis of the residential mortgage backed security (RMBS) rating agencies assuming the house prices would at worst level off, but never go down—the chapter shows a graph of AAA RBMS tranche prices over 2007 going from 100 to 20. Back testing of VaR (not done sufficiently) deals with how often actual portfolio returns fall below VaR (excessions). VaR has also been criticized as a risk measure as not being a "coherent" risk measure. The VaR of a portfolio can be greater than the sum of the individual VaRs within the portfolio.

Chapter 12, "Liquidity and Leverage", deals with these two important aspects of the sub-prime crisis. It discusses transactions and funding liquidity, covering forms of collateral, markets for collateral, and different forms of leverage, concluding with a discussion of liquidity and systematic risk.

Chapter 13, "Risk Control and Mitigation", moves from risk measurement to risk management. It discusses the various risk management objectives participants might have, defines risk capital and contributions to risk, gives several good examples of approaches to stress testing, and comments on risk reporting.

Chapter 14, "Financial Crises", (by far, the longest chapter in the book), provides a very incisive and well-illustrated discussion of panics, runs, and crashes. These are typically characterized by sharp changes in some or all of: asset prices, return moments, aggregate credit availability, market liquidity, normal payment functioning, systematic risk, contagion, normal market functioning, normal economic activity, and the normal duration of any of these. The chapter discusses and gives examples of self-reinforcing mechanisms, behaviour of asset prices, causes of financial crises, and anticipation of financial crises. In the last topic, much work has been done on searching for macroeconomic predictors of financial crises, finding only weak evidence of good predictors. More successful as leading indicators of financial crises are three categories of asset prices: liquidity spreads, foreign exchange forward markets, and option implied volatilities.

Chapter 15, "Financial Regulation", is a wide-ranging and very informative chapter covering: the scope and structure of regulation, methods of regulation, public policy toward financial crises (including a very good discussion on lenders of last resort—rationale, scope and issues), and pitfalls in regulation. In reading this chapter, it struck me—what better author than a person such as Allan Matz to given his perspectives on this topic.

Overall, I would highly recommend this book to any and all students of the topic of risk. As Emanuel Derman says, and I hope my review has substantiated, "it is uniquely comprehensive". But it is also very practical and presents a good balance of not just the quantitative aspects of financial risk but the qualitative aspects as well. Having read some six or more books recently on the financial crisis and, over my career, at least that many on risk and related topics, I would say I probably learned more from this book than all of these.