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Foreword

The arrival of *Macrofinancial Risk Analysis* with its new perspective on how investors, bankers, risk managers, economic overseers and policymakers can measure and analyze risk in both emerging market and developed economies could not have been better timed. We are amidst a perplexing financial crisis of banking and credit risk which is directly affecting the United States, United Kingdom and Europe. At the same moment, many emerging market countries, often the sources of financial crisis, appear remarkably strong, with large reserves and trade surpluses. How it will play out in the impending future, we do not know. But what we do know is that over the past five to ten years, the interconnected risks among emerging and developed market countries have become significantly greater, reactions in financial markets across geopolitical borders are considerably more rapid, and the complexity of the risk structures in every domain has increased dramatically. Happily, the collection of market-proven risk measurement and risk management techniques has also become proportionally richer. Dale Gray and Samuel Malone provide a prime exemplifying case by applying the financial engineering tools of contingent claims analysis (CCA) to create an innovative and substantial addition to the measurement, analysis, and management of the financial risks of a national economy. From its 1970s origins in measuring the risk and pricing of derivative securities, CCA has continuously found ever broader applications in the mainstream of finance and risk management. This book extends this type of analysis to help us better understand and evaluate risk flows among sectors and across economies and links this new approach to traditional macroeconomic analysis.

The core analytical tool employed is the CCA risk-adjusted balance sheet, which quantifies the risk sensitivity of a country or sector's assets and liabilities to external "shocks." At the national level, the corporate, financial and governmental sectors of an economy are viewed as interconnected portfolios of assets, liabilities, and guarantees – some explicit and others implicit. Traditional sovereign-risk models have difficulty in analyzing how risk exposures can be rather benign at a point in time and then without any apparent change in asset or liability holdings, those exposures increase rapidly and erupt into a full-blown crisis. Such behavior is however well-understood by risk managers of a derivatives book in which the non-linear nature of the derivative prices relative to the underlying fundamentals can cause rapid and radical changes in the risk characteristics of the book without any changes in the actual positions held. Both the assets and liabilities of the various macro-sectors exhibit non-linear derivative-like structures. The CCA approach is well-suited to capturing the impact of such non-linearity and quantifying the risk effects of asset-liability mismatches within and across institutions. Gray and Malone apply CCA at the level of the government sector to develop risk measures that help gauge the probability of systemic crises. Risk-adjusted CCA balance sheets are used to facilitate simulations and stress testing to evaluate the potential impact of policies to manage systemic risk. This approach to evaluating risk on the

01 balance sheets of the macroeconomic sectors represents an enhanced framework for macro
02 risk analysis distinct from, and complementary to, traditional macroeconomic analysis based
03 primarily on flow variables.

04 The approach also applies modern risk management and finance techniques to the macro-
05 economy to achieve a richer method of assessing country vulnerability, as well as the
06 valuation of sovereign debt, contingent liabilities, equity and other contingent claims on
07 sector assets. It can be used to help formulate relative-value investing and trading strategies,
08 including sovereign capital structure arbitrage and cross-sector and cross-country arbitrage.
09 In addition, the framework can enrich analysis and management of sovereign wealth funds
10 and to inform the design of new instruments and contracts to control or transfer risk between
11 economies.

12 Section I begins with two chapters that provide an overview of the evolution of selected
13 models from macroeconomics and finance, and make the case for why a new generation of
14 macrofinance models are needed that integrate the two types of models. Chapter 3 reviews a
15 few core macroeconomic models used for evaluating policy. Chapter 4 proceeds to explain
16 the basic analytical tools used in finance, including a primer on stochastic processes and
17 option pricing models. Chapters 5 and 6 describe contingent claims analysis and its extensions
18 that are used throughout the book.

19 Section II begins by laying out the basic macrofinance framework with contingent claims
20 balance sheets of interlinked sectors (sovereign, financial, corporate, and household) and
21 the risk transmission between sectors in Chapter 7. Chapter 8 discusses how sovereign
22 contingent claim balance sheets can be calibrated using current financial market prices and
23 used to calculate sovereign credit risk indicators. It describes how this new tool can be used
24 for policy analysis, including debt and reserves management as well as fiscal policy. Chapter
25 9 discusses the relationship between models of interest rates in macroeconomics, as in the
26 Taylor rule in macroeconomic policy models, and term structure of interest rates models in
27 finance, with a view towards reconciling these different approaches. In Chapter 10, financial
28 stability indicators are developed that are linked into macroeconomic models in the chapters
29 to follow. Chapter 11 discusses the adaptation of the macrofinance framework to fixed and
30 floating exchange rate regimes.

31 Section III begins with Chapter 12 on new applications of macrofinance to sovereign
32 reserve, debt, and sovereign wealth management, which is certainly a hot topic at the moment
33 and promises to continue to be so into the indefinite future. Chapter 13 shows how to relate
34 the risk-adjusted, contingent claims balance sheets of macrofinance to the standard flow-
35 of-funds and national accounting balance sheets used in macroeconomic analysis. Among
36 other things, it shows how traditional macroeconomic flow-of-funds can be derived as a
37 special case of contingent claims pricing relationships in the limit as uncertainty disappears.
38 Chapter 14 discusses several ways to link macrofinance outputs to monetary policy models,
39 Dynamic Stochastic General Equilibrium (DSGE) models, and macroeconomic Vector
40 Autoregression (VAR) models.

41 Section IV focuses on analyzing financial distress and crisis in economies, beginning
42 with an overview in Chapter 15 of the existing economics literature on financial crises.
43 Chapter 16 discusses four important “destabilization mechanisms”, or potentially danger-
44 ous interactions of nonlinear effects, that can cause crises to occur in the context of the
45 macrofinance model. These mechanisms rely on the valuation formulas of contingent claims
46 analysis applied to the macroeconomic sectors, and as such, are contributions to the the-
47 ory of financial crises. Chapters 17 and 18 are devoted to an empirical application of the

01 macrofinance model to study the Asian crisis of 1997–98 and the Brazilian crisis of 2002,
02 respectively.

03 Section V applies the insights of the macrofinance approach to selected topics relevant
04 to senior managers in international financial institutions, staffs of finance ministries, and
05 global investors. Chapter 19 uses the macrofinance model to focus on the new international
06 global environment and the potential impact of international shocks and risk transmission.
07 Chapter 20 looks at alternative policies, contracts, and tools that can be used to transfer
08 and mitigate risk on the sovereign balance sheet and the economy. It points out how the
09 modern techniques of Alternative Risk Transfer (ART) can be adapted and applied at the
10 sector, economy, and international level. Chapter 21 offers several ideas for investment
11 and trading strategies, including sovereign capital structure arbitrage using relative-value
12 techniques based on contingent claims and macrofinance model. Chapter 22 closes the book
13 with a summary look at the “bigger picture” surrounding macrofinance and lays out several
14 suggestions for future research ideas, which will surely be of interest to those working in
15 both macroeconomics and finance.

16 *Macrofinancial Risk Analysis* is a bold and largely self-contained offering of an integration
17 of finance and macroeconomic modeling to help us to better understand, measure and manage
18 risk in the evolving global economic system. Whether prime researcher, experienced public
19 policy maker, or seasoned private-sector practitioner, the reader is in for a treat: *Bon Appétit!*

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21 Robert C. Merton
22 Harvard Business School
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