

# Pricing, Risk, and Performance Measurement in Practice

The Building Block Approach to Modeling Instruments and Portfolios

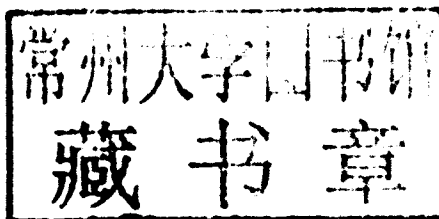
Wolfgang Schwerdt  
Marcelle von Wendland



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## ***Advance Praise for Pricing, Risk, and Performance Measurement in Practice***

“The book represents a fresh and innovative departure from ‘traditional’ approaches to modelling of securities data. Subsequently, it also presents much more flexible ways to analyze and process the data. Even if you are not involved with re-architecting an organization’s master data handling, there are numerous ideas, principles, and nuggets that make it a worthwhile read.”

–Dr. Matthias Autrata, Director, Deutsche Asset Management Global Technology Operations—Asset Management Platform Services

“The piece of work is a very nice, well-structured step-to-step guide on how to value securities. The authors have achieved in making a highly complex topic easy to understand, and offer a guide for valuating securities from the very beginning to the very end.”

–Alexandra Balloff, Executive Director, Global Head of Market Data Management, WestLB

“It is refreshing to see an approach to financial data modeling which adequately reflects the semantics of the instruments themselves. This book presents complex mathematical models for securities calculations, illustrated with easy to understand diagrams. This is combined with a mature and comprehensive method for developing systems and data models that should be followed by any financial institution that wishes to develop robust and maintainable systems for risk, valuation, and performance attribution.”

–Mike Bennett, Hypercube Limited, EDM Council Semantics Repository Architect

“By taking from the outset a technical and applied perspective, this book greatly complements the theoretical literature. Practitioners will obviously like it, but also all others interested in valuation and risk control should find the book stimulating as providing insights on the real issues one faces when implementing models.”

–Ulrich Bindseil, Head of Risk Management Division, European Central Bank

“I found the approach of the authors to be really interesting. The book combined with the available web support will provide anyone interested in the subject with a compendium of useful information and ideas that they will find invaluable.”

–Dennis Cox, CEO, Risk Reward Limited; Chairman, Risk Forum Securities and Investment Institute

“*Pricing, Risk, and Performance Measurement in Practice* is very ambitious in scope yet succeeds by moving step-by-step from the fundamentals of modelling to a comprehensive overview of valuation, risk, and performance management issues. By anchoring the discussion firmly in methodology and by mirroring theory chapters with sections on practical aspects of implementation, the authors offer a valuable ‘real life’ toolbox to anyone working in the financial services industry.”

–Martijn Groot, Director, Market Strategy, Asset Control, Luxembourg

“I endorse the publication of Wolfgang Schwerdt and Marcelle von Wendland’s *Pricing, Risk, and Performance Measurement in Practice*. This book gives interesting and valuable insights for the practitioner to model instruments and portfolios. Following the building block approach, the authors

demonstrate in a convincing manner that complex situations can be decomposed in an easy and flexible way. Concrete figures and a lot of examples help to explain the basic ideas and how to handle problems in practical situations.”

—Olaf Huebler, Professor of Econometrics in the Institute of Empirical Economics at the Leibniz University Hannover and Research Fellow of IZA (Bonn) and IAB (Nuremberg)

“The authors show that risk management needs to be based on the economic properties of financial instruments and that a vital link exists between data, data modeling, and risk management. To my knowledge this is the first time this link is explicitly demonstrated in the literature on valuation and risk management. Overall an interesting and demanding book for everybody who intends to build or improve risk management systems.”

—Martin Janssen, Banking Institute, University of Zurich; CEO ECOFIN Research and Consulting Ltd., Zurich, Switzerland

“The authors have achieved a perfect balance between theory and the practical implementation of financial information management and modeling tools. For anyone with a need to create or improve performance and risk management systems, this book offers a road map to get you there quickly and correctly.”

—Richard M. King, Managing Director, LeftBrain, Inc.

“The authors of *Pricing, Risk and Performance Measurement* are skillfully bridging the gap between risk management theory and its practical real life application. Whether you are developing and applying ad-hoc risk models or finding yourself faced with building an enterprise-wide performance analytics platform, their book will provide you with a robust and proven toolkit to do so.

Readers are equipped with a thoroughly researched best practice guide and will profit from step-by-step guidance through all stages of planning, composing, mapping, creating, calibrating, and refining a solid risk portfolio model. Whilst the vast number of tables, graphical illustrations, process diagrams, and sample calculations provide a great stand-alone desktop reference, the combination with the book’s software tools and templates on its companion website make this an invaluable aid.

The book is unique as it introduces and advocates a proven methodology which was developed together with and has been successfully applied by many banks to model over five million financial instruments—what better ‘seal of approval’ can you ask for?”

—Markus Krebsz, Capital Markets Consultant, SME Panel member for Credit Risk & Structured Products, 4Most

“This book is the first to point out the fundamental link between data, data modeling, and risk management. It contains a huge number of very valuable details and concepts. A must read for anyone setting out to build risk management systems.”

—Didier Maman, Managing Director, Vidatis s.a.r.l.

“In times of financial turmoil survival depends on knowing where your risks are and having the right tools to lead you to where you want to be going. This great book is just about that—a must read.”

—Mark Michel, Wincor Nixdorf Banking Solutions

“Are you always thinking that everything except plain vanilla is too complicated? Try this book and you realize that even the most complex systems are built piece by piece from simple building blocks. This book is a magnificent tool for financial instrument expert and IT-expert to understand each other. *Pricing, Risk, and Performance Measurement* creates value-added to design new systems from practical and user-friendlier perspective.”

–Marko Myller, Economist, Oversight of Market Infrastructure, Financial Markets and Statistics, Bank of Finland

“The book reveals the authors’ profound exposure to securities database projects and distinctively considers risk concepts in an integrated manner. The presented building block approach supports flexibility in data models—an important prerequisite in times of change. A must read for all those who would want to cross the border from pure theory to practice, and like to know more about the more practical aspects of statistics compilation, thus including the latest state-of-knowledge in international securities database projects.”

–Robert Obrzut, Economist-Statistician, Banque centrale du Luxembourg

“The book by Wolfgang Schwerdt and Marcelle von Wendland describes very clearly the Building Block approach to financial instrument portfolio modelling. This innovative method provides for flexibility in modelling of large portfolios containing instruments of different characteristics, and is open, unlike standard database approach, to adoption of new features or parameters that may be necessary in the future. The authors are among the most experienced persons in the field of theory and practical use of Building Block approach, their book shows a new direction and is full of practical solutions for all persons dealing with portfolio and risk management. A valuable position.”

–Marcin Sienicki, Portfolio Investment Statistics Division, Statistics Department, National Bank of Poland

“Recent events have shown how financial information is key. This book is a guide to manage it. Useful both for new traders entering the business and for big organisations, who want to check if their system is up-to-date.”

–Fabio Salvatore Piamonte, Reference data on entities and financial instrument division, Banca d’Italia

“This is the book the data management community has been waiting for! The Building Block approach introduced by Wolfgang and Marcelle de-mystifies the process of market risk modelling; they rightly consider the operational and business risk associated with the more complex financial instruments and the need to source a broader spectrum of high quality reference data to meet the needs of the entire organisation. I would recommend this highly.”

–Lisa Sully, Global Head of Data Management, Aberdeen Asset Management PLC

“This book is the most comprehensive I have come about in terms of linking business and business requirements to IT implementation. And on top you get ready-to-use components and advice—should be a must read for anyone embarking on risk management.”

–Rainer Zahradnik, Head of Software Development at RTC, Switzerland

## The Elsevier and Mondo Visione World Capital Markets Series



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**Series Editor Herbie Skeete** is a well-known figure in the financial information industry having spent twenty-six years at Reuters. During his many senior positions with Reuters—most recently as Head of Equities Content and Head of Exchange Strategy—Mr. Skeete has become recognized globally as an expert on exchanges and content issues. He is frequently asked to address conferences and to contribute to roundtable discussions. Mr. Skeete runs the exchange information publisher Mondo Visione Ltd; edits the industry-standard *Handbook of World Stock, Commodity, and Derivatives Exchanges*, which celebrates its seventeenth edition in 2007; and operates the exchange information website [www.exchange-handbook.com](http://www.exchange-handbook.com).

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# *Preface*

If you are reading this you are probably either considering buying this book or have already done so.

If you have already purchased this book we would like to say thank you, and congratulate you for deciding to join us on our journey toward better, faster, more resilient, and more flexible pricing, risk modelling, and performance measurement solutions.

If you are also fairly new to or just getting acquainted with pricing, risk modelling, and performance measurement we hope that this book will help you hit the ground running when you implement your first models. You will benefit regardless of whether your first model implementations are part of your studies or you have been dropped in at the deep and your models are for real-life decision making at an investment management firm or bank.

If you have not yet purchased this book you are probably grappling with the tough choice of picking the right book for yourself from the many great books on modelling financial instruments and portfolios that fill the shelves in front of you at the bookshop. Now let's make your choice a bit easier: If you are looking for a book on the theoretical foundations of modern finance or something similar you can now safely put this book away and try your luck by reaching for another book on the shelf. If, however, you need or want to build practical pricing, risk, or performance measurement models that stand up to the harsh demands of real life in the investment, risk management, or banking world, then hold on tight to the book in your hands!

This book is intensely practical and has come from the authors' many years of experience with financial instrument and portfolio models. That experience spans from small ad hoc research applications to very large enterprise-level models that are able to deal with hundreds of thousands or even millions of instruments and investment positions, tight processing schedules, often less than perfect input data, and high demands on accuracy and robustness.

The building block method explained in this book was developed for the financial software solutions vendor Fincore Financial. It is the culmination of many years of practical research in the field of financial information technology. The approach is supported by leading-edge

commercial software such as Fincore Financial's Investment Information Central and provides unique support for the needs of buy side, hedge fund, and risk management requirements.

The building block approach is also at the very heart of Fincore Financial's commercial off-the-shelf solutions for investment management and banking. The data models and model mappings in this book have been made available by Fincore Financial. Although we have simplified them and renamed some of the attributes and classes to better highlight the key aspects of interest in this book, they are a true subset of Fincore Financial's successful commercial software products.

Numerous worked examples in this book and an extensive collection of downloadable example programs and ready-to-run source code makes this book the ideal companion for anyone who needs to implement pricing, risk, or performance measurement software solutions.

The book provides you with many practical examples of how to represent financial instruments, portfolios, valuation, risk- and performance model inputs and outputs, always using the building-block approach-based data model set out in the book. It shows many practical examples of how to wire up common, valuation, risk- and performance models with data in the data mode.

Fincore Financial is also sponsoring the companion web site for this book, which is another very valuable practical tool that is part of this book. It contains a wealth of practical examples and updated information, and will help you get the most out of this book. The companion web site provides a rich source of tools, test and sample data, tips, tricks, and further updated information.

## **How to Use the Companion Web Site**

The companion web site is an essential and valuable part of this book and you should access and use it to get the most from reading. The companion web site is exclusive for the readers of this book and entirely free to use.

The companion web site can be found at <http://modelbook.fincorefinancial.com/>. It contains:

- The data, code, and tutorial notes for all Lab Exercises mentioned in this book
- A lot of ready-to-use example code in ORACLE PL/SQL, R and AMPL
- Up-to-date information on where to get the free companion tools for running the code examples: R and AMPL modelling environments and Personal ORACLE Database

- Other useful and updated information on modelling and model implementation
- Information on contacting the authors directly if you have any further questions or comments
- Other useful information and additional useful tools

## Free Companion Software: R Language

Many of the examples in this book are written in **R**, which is an open source modelling software solution and language for statistics and mathematical modelling similar to the well known S-Plus language. **R** is very widely used by professional statisticians as well as risk and quantitative modelling professionals in the investment and banking industry. Although it is a free and open source, it is at least as capable as S-Plus or similar enterprise strength solutions and supported by a large and growing library of reusable models useful for modelling financial instruments and portfolios.

To get your own free copy of **R** go to the companion web site <http://modelbook.fincorefinancial.com/>, where you will find up-to-date links and instructions to download and install **R** on your computer.

## Free Companion Software: Personal ORACLE

All database examples (SQL and PL/SQL) in this book are written for use with ORACLE. ORACLE is the world's leading commercial database software. ORACLE provides a full industrial-strength free version of its software that you can download from their web site and install on your computer without charge. This free version is also optimised for use on your PC and is thus ideal for exploring all the SQL and database related code.

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## Free Companion Software: AMPL

Some of the modelling examples in this book are written for use with AMPL. AMPL is one of the leading languages for mathematical modelling involving linear and nonlinear programming and constrained optimisation. If you want to run those examples in the book that use AMPL, or you want to write your own portfolio optimisation programs you should download and install AMPL on your computer.

To get your own free copy of AMPL go to the companion web site <http://modelbook.fincorefinancial.com/>, where you will find up-to-date links and instructions to download and install AMPL on your computer.

## **Build Instruments by Drag-and-Drop in Graphical Wizard**

One of the best ways to explore the building block approach is by creating new instruments using a variety of building blocks from a rich palette of component blocks. The Fincore Investment Portal lets you create new financial instruments and templates for financial instrument types using an easy-to-use graphical wizard. With the trial version of the wizard you can create a very wide range of financial instruments using common and less common building blocks from coupon streams and bullet redemptions to exotic options.

To get a free trial use of the Fincore Investment Portal and the Fincore Instrument Builder Wizard go to the companion web site <http://modelbook.fincorefinancial.com/>, where you will get details for registering for a free trial account.

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Writing this book was a great and fascinating challenge. It nevertheless required a lot of understanding and support from both my private and professional entourage.

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My first and last thoughts are always with my wife Susanne and our two children, Yule and Luka, who so marvellously supported me throughout the past year while writing this book. Thank you so much for everything!

**Wolfgang Schwerdt**  
**Versoix, April 2009**

Writing a book is a monumental task not possible without the help and support of many people. I am therefore very grateful to all those who have given their help and support to Wolfgang Schwerdt and myself, thus helping to bring this book into the world.

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Finally, last but certainly not least, I would like to thank my family for all their support, not just while writing the book but throughout my whole life. My mum

Franziska von Wendland and my dad Georg Kress have no small part in helping me become the person I am today and thus deserve special credit. I would also like to thank my brother Felix von Wendland and his partner Ana Abati for feeding and watering me and making me smile on more than one occasion while I was burning the midnight oil writing parts of the book.

**Marcelle von Wendland  
London, April 2009**

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