

John B. Guerard Jr.
Anureet Saxena
Mustafa Gultekin

Quantitative Corporate Finance

Second Edition



Springer

Quantitative Corporate Finance

John B. Guerard Jr. • Anureet Saxena
Mustafa Gultekin

Quantitative Corporate Finance

Second Edition



Springer

John B. Guerard Jr.
McKinley Capital Management, LLC
Anchorage, AK, USA

Anureet Saxena
McKinley Capital Management, LLC
Stamford, CT, USA

Mustafa Gultekin
Kenan-Flagler Business School
University of North Carolina Chapel Hill
Chapel Hill, NC, USA

ISBN 978-3-030-43546-2 ISBN 978-3-030-43547-9 (eBook)
<https://doi.org/10.1007/978-3-030-43547-9>

© Springer Nature Switzerland AG 2007, 2021

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors, and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Why a Second Edition of *Quantitative Corporate Finance*?

Eli Schwartz and I were very pleased with our *Quantitative Corporate Finance* text, published by Kluwer Academic Publishers in 2007. Eli was an economist and elder statesman, a sage, of 86. Eli had written a great book, *Corporate Finance*, published by St. Martin's in 1962. We combined my *Handbook of Financial Modeling* (coauthored with H.T. Vaught, for Probus, in 1989) and updated all materials for the Kluwer text. Eli was fond of telling me that when undergraduate economics students at MIT asked Robert Solow, the famed Nobel Prize Laureate, about what they needed to know to get a job on Wall Street, Professor Solow handed them a copy of Eli's book and told them to read and know the text. Eli earned his Ph.D. from Brown University and taught at Lehigh for 38 years. Eli was a visiting professor at the University of Pennsylvania, New York University, the London School of Economics, and Tel Aviv University. Eli published over 50 articles, including papers in the *American Economic Review*, the *Journal of Finance* (five), *Journal of Business*, and the *National Tax Journal*.

In 2010, Lehigh honored Eli with a festschrift for his 85th birthday. The festschrift included works by two Nobel laureates, Harry Markowitz and Robert Solow; Murray Weidenbaum, President Reagan's Chairman of the Council of Economic Advisors; John Hilley; several Lehigh colleagues; and one practitioner, me.

<https://www2.lehigh.edu/news/schwartz-honored-with-festschrift>

Nick Philipson, our publisher, attended the Lehigh celebration and an academic version of the festschrift was published by Springer, who had purchased Kluwer, in 2010. Nick made a great call to publish the book.

Eli Schwartz, 89, of Allentown, passed away in his home on August 31, 2010. Born in New York City, he was the husband of Renee (Kartiganer) Schwartz and they celebrated 62 years of marriage on August 29.

Eli was brilliant, a great conversationalist, and a very wise man. He is greatly missed.

There are other reasons for a second edition. First, the papers of the Schwartz festschrift are integrated into the revised edition. Second, our book was 99% complete when I became Director of Quantitative Research at McKinley Capital

Management (MCM) in Anchorage, Alaska. The final ten pages of chapter “Multi-factor Risk Models and Portfolio Construction and Management” took me 18 months to complete. We successfully used the multifactor APT risk model featured in chapter “Multifactor Risk Models and Portfolio Construction and Management” for portfolio construction at McKinley for over 10 years (validated in the forthcoming *Wilmott Magazine* piece). Moreover, I taught in-house classes at McKinley Capital; 2-day, 15-hour seminars at Rutgers University, where I prepared the first edition of this book for my MBA classes; and the Georgia Institute of Technology Quantitative and Computational Finance (QCF) programs, where I recruited my MCM Quants. The Tech QCF Program is a top-ten Financial Engineering program. I grew up near Atlanta, earned my MSIM (Master’s in Industrial Management) degree from Tech, and I am completely biased in hiring exceptionally bright and hard-working Tech QCF Quants. You will see references to Sundaram Chettiappan, Eli Krauklis, Manish Kumar, and Elaine Wang, all Tech QCF graduates with whom I published MCM Horse Race studies, to validate APT and Axioma risk models. These references are in chapter “Multifactor Risk Models and Portfolio Construction and Management.” The extensions to chapters “Risk and Return of Equity and the Capital Asset Pricing Model” and “Multifactor Risk Models and Portfolio Construction and Management” reflect multifactor risk modeling at McKinley Capital, 2006–2019.

Third, Harry Markowitz and I are presenting an extension to our financial anomalies, stock selection, and equity modeling work of 1993 referenced in chapters “Risk and Return of Equity and the Capital Asset Pricing Model” and “Multifactor Risk Models and Portfolio Construction and Management” in October 2019, at the Q-Group meeting. The models we showcased in the first edition continue to be statistically significant. I will bet that there is a 65–75% chance that these stock selection models will continue to be statistically significant, passing the Markowitz-Xu (1994) Data Mining Corrections test, during the 2020–2029 time period, and will be reported in the third edition of the text. Fourth, a new edition allows me to use a more current text in my Tech and Rutgers 1 and 2-day classes. We have had 56,140 PDF downloads of our text, as reported by the Springer website, putting our book in the top 20%. My Springer book to honor Harry Markowitz, with 94,086 downloads, is my personal best. Finally, and most importantly, several major texts and associated papers have been published that compel our second edition. These texts are:

- Castle, J., & Shepard, N. (2009). *The methodology and practice of econometrics*. Oxford, UK: Oxford University Press.
- Castle, J., Doornik, J. A., & Hendry, D. F. (2013). Model selection in equations with many ‘small’ effects. *Oxford Bulletin of Economics and Statistics*, 75, 6–22.
- Castle, J., Clements, M. P., & Hendry, D.F. (2015). ‘Robust approaches to forecasting’, *International Journal of Forecasting*, 31, 99–112.
- Clements, M. P., & Hendry, D. F. (1998). *Forecasting economic time series*. Cambridge, UK: Cambridge University Press.
- Connor, G., Goldberg, L., & Korajczyk, R. A. (2010). *Portfolio risk analysis*. Princeton: Princeton University Press.

- Elton, E. J., Gruber, M. J. Brown, S. J., & Goetzman, W. N. (2007). *Modern portfolio theory and investment analysis* (7th ed.). Hoboken, NJ: John Wiley & Sons, Inc..
- Dhrymes, P. J. (2017). *Introductory econometrics* (Revised ed.). New York: Springer.
- Hendry, D. F., & Doornik, J. A. (2014). *Empirical model discovery and theory evaluation*. Cambridge, MA: MIT Press.
- Levy, H. (2012). *The capital asset pricing model in the 21st century*. Cambridge: Cambridge University Press.
- Lo, A. W., Mamaysky, H., & Wang, J. (2000). Foundations of technical analysis: Computational algorithms, statistical inference, and empirical implementation. *Journal of Finance*, 60, 1705–1764.
- Lo, A. (2017). *Adaptive markets*. Princeton: Princeton University Press.
- Markowitz, H. M. (2013). *Risk-return analysis*. New York: McGraw-Hill. The first volume of a four-volume set on the risk-return trade-off.
- Liu, L. M. (2006). *Time series forecasting and time series analysis*. Chicago: Scientific Computing Associates Corp.
- Maronna, R. A., Martin, R. D., Yohai, V. J., & Salibian-Barrera, M. (2019). *Robust statistics: Theory and methods (with R)*. New York: Wiley.
- Nikolopoulos, K. I., & Thomakos, D. D. (2019). *Forecasting with the theta method*. New York: Wiley.
- Tsay, R. S. (2010). *Analysis of financial time series* (3rd ed.). New York: Wiley.
- Tsay, R. S., & Chen, R. (2019). *Nonlinear time series analysis*. New York: Wiley.

In the years post our first edition, several good friends and coauthors passed. Eli Schwartz and Phoebus Dhrymes were over 80. Phoebus Dhrymes was a great Springer author of four major econometric texts. Eli and Phoebus were magnificent, highly independent thinkers, who left very high standards for us to try to reach. Bob Gillam, the founder of McKinley Capital, passed away last year at far too young an age, 72, and is missed. Bob taught me and others one of the greatest lessons an individual can teach young Americans: what it means to be an entrepreneur and keep the lights on in industry! Rob Gillam, our CEO/CIO, has big shoes to fill and big innovative ideas for McKinley.

As with the first edition, this text has been written, 95% of my own time, on Saturday and Sunday afternoons. To Julie, my wife of 38 years, I say thank you. Richard, Katherine, and Stephanie, my children in the first edition, are now real-world working millennials who give me great pride and hope for the future. To my coauthors of papers used in the second edition, Dimitrios Thomakos, Harry Markowitz, Ganlin Xu, Anureet Saxena, Shijie Deng, Andrew Mark, Rob Gillam, Sundaram Chettiappan, Eli Krauklis, Manish Kumar, and Elaine Wang, I say thank you. To my professors of Finance and Economics, Jim Vander Weide, Steve Maier, Bernell Stone, Henry Latane (deceased), and Jan Mossin (deceased) in Finance, and Ed Tower, Larry Moss, Rick Ashley, and Thomas Havrilesky (deceased) in Economics, I say thank you. Any errors remaining in this text are not their fault!

We gratefully acknowledge the typing and editorial assistance of Allison Capps.

Please enjoy the second edition. Eli is not with us, but I bet he would be very pleased!

As I send this book to press in January 2020, I am very pleased to acknowledge my two coauthors who joined me on the revised text, Anureet Saxena and Mustafa Gultekin. Anureet is brilliant, a Carnegie Mellon Ph.D. in Operations Research, with publications in *Mathematical Programming*, the *Journal of Portfolio Management*, *Journal of Investing*, and *Frontiers in Applied Mathematical and Statistics*. Mustafa, a Ph.D. in Finance, New York University, has published in the *Journal of Finance*, *Journal of Financial Economics*, the *Journal of Financial and Quantitative Analysis*, *Management Science*, and *Research in Finance*. Allison Capps helped us with editorial assistance and manuscript preparation. Thank you very much.

The goal of this book is the same goal as the first edition. We seek to introduce the reader to the world of Harry Markowitz, Bill Sharpe, Marty Gruber, and Jack Treynor. Quantitative financial economics should be fun, and properly educated (young) bright Quants can make a very good living. My Tech QCF graduates, 3 years post-graduation, should be earning in the top 10% of the income distributions before they are 30; in the top 5% within 5–10 years. Have you any Grey Poupon? But of course. My goal is that my Quants will be the victors of income-inequalities. As they say downhome, “to the victors go the spoils.” Why eat yellow mustard on a hot dog when you can have Grey Poupon on a steak sandwich or Reuben? The fact that the models of chapters 8, 13, 14, 15, 21, and 22 of the first edition have been statistically significant, post-publication, was expected but nevertheless celebrated. I have similar expectations for these chapters for 2020–2029. Factor and model statistical significance and ensuring proper portfolio implementation are the only meaningful professional life measures for Quants.

As we are making revisions in our text, March 28, 2020, the business and political worlds are at odds on corporate stock buybacks, which we discuss in chapters “The Equity of the Corporation: Common and Preferred Stock” and “Multifactor Risk Models and Portfolio Construction and Management.” Buybacks, a component, of corporate exports enhanced domestic and global portfolios during the 1997–2015 time periods. Whether buybacks have retarded corporate investment is a great question, one that requires a far greater effort and longer time period of analysis that afforded by our revised edition contract. Perhaps we will answer this question in a third edition.

Anchorage, AK, USA
Labor Day, 9/2/2019

John Guerard

Contents

Introduction: Capital Formation, Risk, and the Corporation	1
Financial Mathematics and Theory	2
Growth and Survival of the Firm	2
Risk and Uncertainty Inherent in Finance	3
Types of Business Risk	3
Financial Risk	5
Division of Risk, Income, and Control	5
Profitability and Risk	8
Areas Covered in This Book	9
References	10
The Corporation and Other Forms of Business Organization	11
The Sole or Single Proprietorship	13
The Partnership	14
The Limited Partnership	16
The Corporation, Its Basic Characteristics	17
Chartering the Corporation	19
Administrative Organization	22
Major Rights of the Shareholders	24
The Advantages of the Corporate Form	26
References	27
The Corporation Balance Sheet	29
The Balance Sheet	29
Assets	30
Liabilities and Stockholder Equity	35
Book Value of Common Stock	40
Summary and Conclusions	47
References	52