

151 Trading Strategies

Zura Kakushadze^{§†1} and Juan Andrés Serur^{#2}

[§] *Quantigic® Solutions LLC*

*1127 High Ridge Road #135, Stamford, CT 06905*³

[†] *Free University of Tbilisi, Business School & School of Physics*
240, David Agmashenebeli Alley, Tbilisi, 0159, Georgia

[#] *Universidad del CEMA*

Av. Córdoba 374, C1054AAP, Ciudad de Buenos Aires, Argentina

(August 17, 2018)

ZK: To my mother Mila and my children Mirabelle and Maximilien

JAS: To my parents, Claudio and Andrea, and my brother Emiliano

Abstract

We provide detailed descriptions, including over 550 mathematical formulas, for over 150 trading strategies across a host of asset classes (and trading styles). This includes stocks, options, fixed income, futures, ETFs, indexes, commodities, foreign exchange, convertibles, structured assets, volatility (as an asset class), real estate, distressed assets, cash, cryptocurrencies, miscellany (such as weather, energy, inflation), global macro, infrastructure, and tax arbitrage. Some strategies are based on machine learning algorithms (such as artificial neural networks, Bayes, k-nearest neighbors). We also give: source code for illustrating out-of-sample backtesting with explanatory notes; around 2,000 bibliographic references; and over 900 glossary, acronym and math definitions. The presentation is intended to be descriptive and pedagogical.

This is a preview version containing parts of the following book:

Z. Kakushadze and J.A. Serur. *151 Trading Strategies*. Cham, Switzerland: Palgrave Macmillan, an imprint of Springer Nature, 1st Edition (2018), XX, 480 pp; ISBN 978-3-030-02791-9. Full version:

<https://www.springer.com/us/book/9783030027919>. Copyright © 2018 Zura Kakushadze and Juan Andrés Serur. All Rights Reserved.

¹ Zura Kakushadze, Ph.D., is the President and CEO of Quantigic® Solutions LLC, and a Full Professor at Free University of Tbilisi. Email: zura@quantigic.com

² Juan Andrés Serur, M.Fin., is an Assistant Professor at University of CEMA. Email: jaserur15@ucema.edu.ar

³ **DISCLAIMER:** This address is used by the corresponding author for no purpose other than to indicate his professional affiliation as is customary in publications. In particular, the contents of this paper are not intended as an investment, legal, tax or any other such advice, and in no way represent views of Quantigic® Solutions LLC, the website www.quantigic.com or any of their other affiliates.

Contents

| | |
|--|-----------|
| Praises of <i>151 Trading Strategies</i> | 7 |
| 1 Introduction and Summary | 9 |
| 2 Options | 11 |
| 2.1 Generalities | 11 |
| 2.2 Strategy: Covered call | 12 |
| 2.3 Strategy: Covered put | 12 |
| 2.4 Strategy: Protective put | 13 |
| 2.5 Strategy: Protective call | 13 |
| 2.6 Strategy: Bull call spread | 13 |
| 2.7 Strategy: Bull put spread | 14 |
| 2.8 Strategy: Bear call spread | 14 |
| 2.9 Strategy: Bear put spread | 14 |
| 2.10 Strategy: Long synthetic forward | 15 |
| 2.11 Strategy: Short synthetic forward | 15 |
| 2.12 Strategy: Long combo | 15 |
| 2.13 Strategy: Short combo | 16 |
| 2.14 Strategy: Bull call ladder | 16 |
| 2.15 Strategy: Bull put ladder | 17 |
| 2.16 Strategy: Bear call ladder | 17 |
| 2.17 Strategy: Bear put ladder | 17 |
| 2.18 Strategy: Calendar call spread | 18 |
| 2.19 Strategy: Calendar put spread | 18 |
| 2.20 Strategy: Diagonal call spread | 19 |
| 2.21 Strategy: Diagonal put spread | 19 |
| 2.22 Strategy: Long straddle | 20 |
| 2.23 Strategy: Long strangle | 20 |
| 2.24 Strategy: Long guts | 20 |
| 2.25 Strategy: Short straddle | 21 |
| 2.26 Strategy: Short strangle | 21 |
| 2.27 Strategy: Short guts | 21 |
| 2.28 Strategy: Long call synthetic straddle | 22 |
| 2.29 Strategy: Long put synthetic straddle | 22 |
| 2.30 Strategy: Short call synthetic straddle | 22 |
| 2.31 Strategy: Short put synthetic straddle | 23 |
| 2.32 Strategy: Covered short straddle | 23 |
| 2.33 Strategy: Covered short strangle | 23 |
| 2.34 Strategy: Strap | 24 |
| 2.35 Strategy: Strip | 24 |
| 2.36 Strategy: Call ratio backspread | 24 |

| | | |
|----------|---|-----------|
| 2.37 | Strategy: Put ratio backspread | 25 |
| 2.38 | Strategy: Ratio call spread | 25 |
| 2.39 | Strategy: Ratio put spread | 25 |
| 2.40 | Strategy: Long call butterfly | 26 |
| 2.40.1 | Strategy: Modified call butterfly | 26 |
| 2.41 | Strategy: Long put butterfly | 26 |
| 2.41.1 | Strategy: Modified put butterfly | 27 |
| 2.42 | Strategy: Short call butterfly | 27 |
| 2.43 | Strategy: Short put butterfly | 27 |
| 2.44 | Strategy: “Long” iron butterfly | 28 |
| 2.45 | Strategy: “Short” iron butterfly | 28 |
| 2.46 | Strategy: Long call condor | 28 |
| 2.47 | Strategy: Long put condor | 29 |
| 2.48 | Strategy: Short call condor | 29 |
| 2.49 | Strategy: Short put condor | 29 |
| 2.50 | Strategy: Long iron condor | 30 |
| 2.51 | Strategy: Short iron condor | 30 |
| 2.52 | Strategy: Long box | 31 |
| 2.53 | Strategy: Collar | 31 |
| 2.54 | Strategy: Bullish short seagull spread | 31 |
| 2.55 | Strategy: Bearish long seagull spread | 32 |
| 2.56 | Strategy: Bearish short seagull spread | 32 |
| 2.57 | Strategy: Bullish long seagull spread | 33 |
| 3 | Stocks | 34 |
| 3.1 | Strategy: Price-momentum | 34 |
| 3.2 | Strategy: Earnings-momentum | 35 |
| 3.3 | Strategy: Value | 36 |
| 3.4 | Strategy: Low-volatility anomaly | 36 |
| 3.5 | Strategy: Implied volatility | 37 |
| 3.6 | Strategy: Multifactor portfolio | 37 |
| 3.7 | Strategy: Residual momentum | 38 |
| 3.8 | Strategy: Pairs trading | 39 |
| 3.9 | Strategy: Mean-reversion – single cluster | 40 |
| 3.9.1 | Strategy: Mean-reversion – multiple clusters | 41 |
| 3.10 | Mean-reversion – weighted regression | 43 |
| 3.11 | Strategy: Single moving average | 43 |
| 3.12 | Strategy: Two moving averages | 44 |
| 3.13 | Strategy: Three moving averages | 45 |
| 3.14 | Strategy: Support and resistance | 45 |
| 3.15 | Strategy: Channel | 46 |
| 3.16 | Strategy: Event-driven – M&A | 46 |
| 3.17 | Strategy: Machine learning – single-stock KNN | 47 |

| | | |
|----------|--|-----------|
| 3.18 | Strategy: Statistical arbitrage – optimization | 49 |
| 3.18.1 | Dollar-neutrality | 50 |
| 3.19 | Strategy: Market-making | 52 |
| 3.20 | Strategy: Alpha combos | 53 |
| 3.21 | A few comments | 54 |
| 4 | Exchange-traded funds (ETFs) | 55 |
| 4.1 | Strategy: Sector momentum rotation | 55 |
| 4.1.1 | Strategy: Sector momentum rotation with MA filter | 56 |
| 4.1.2 | Strategy: Dual-momentum sector rotation | 56 |
| 4.2 | Strategy: Alpha rotation | 57 |
| 4.3 | Strategy: R-squared | 57 |
| 4.4 | Strategy: Mean-reversion | 58 |
| 4.5 | Strategy: Leveraged ETFs (LETFs) | 58 |
| 4.6 | Strategy: Multi-asset trend following | 59 |
| 5 | Fixed Income | 60 |
| 5.1 | Generalities | 60 |
| 5.1.1 | Zero-coupon bonds | 60 |
| 5.1.2 | Bonds with coupons | 60 |
| 5.1.3 | Floating rate bonds | 61 |
| 5.1.4 | Swaps | 61 |
| 5.1.5 | Duration and convexity | 62 |
| 5.2 | Strategy: Bullets | 63 |
| 5.3 | Strategy: Barbells | 63 |
| 5.4 | Strategy: Ladders | 64 |
| 5.5 | Strategy: Bond immunization | 64 |
| 5.6 | Strategy: Dollar-duration-neutral butterfly | 65 |
| 5.7 | Strategy: Fifty-fifty butterfly | 66 |
| 5.8 | Strategy: Regression-weighted butterfly | 66 |
| 5.8.1 | Strategy: Maturity-weighted butterfly | 67 |
| 5.9 | Strategy: Low-risk factor | 67 |
| 5.10 | Strategy: Value factor | 67 |
| 5.11 | Strategy: Carry factor | 68 |
| 5.12 | Strategy: Rolling down the yield curve | 68 |
| 5.13 | Strategy: Yield curve spread (flatteners & steepeners) | 69 |
| 5.14 | Strategy: CDS basis arbitrage | 69 |
| 5.15 | Strategy: Swap-spread arbitrage | 70 |
| 6 | Indexes | 70 |
| 6.1 | Generalities | 70 |
| 6.2 | Strategy: Cash-and-carry arbitrage | 71 |
| 6.3 | Strategy: Dispersion trading in equity indexes | 71 |

| | | |
|-----------|---|-----------|
| 6.3.1 | Strategy: Dispersion trading – subset portfolio | 72 |
| 6.4 | Strategy: Intraday arbitrage between index ETFs | 73 |
| 6.5 | Strategy: Index volatility targeting with risk-free asset | 74 |
| 7 | Volatility | 74 |
| 7.1 | Generalities | 74 |
| 7.2 | Strategy: VIX futures basis trading | 75 |
| 7.3 | Strategy: Volatility carry with two ETNs | 76 |
| 7.3.1 | Strategy: Hedging short VXX with VIX futures | 76 |
| 7.4 | Strategy: Volatility risk premium | 77 |
| 7.4.1 | Strategy: Volatility risk premium with Gamma hedging | 77 |
| 7.5 | Strategy: Volatility skew – long risk reversal | 78 |
| 7.6 | Strategy: Volatility trading with variance swaps | 78 |
| 8 | Foreign Exchange (FX) | 79 |
| 8.1 | Strategy: Moving averages with HP filter | 79 |
| 8.2 | Strategy: Carry trade | 80 |
| 8.2.1 | Strategy: High-minus-low carry | 81 |
| 8.3 | Strategy: Dollar carry trade | 82 |
| 8.4 | Strategy: Momentum & carry combo | 82 |
| 8.5 | Strategy: FX triangular arbitrage | 83 |
| 9 | Commodities | 83 |
| 9.1 | Strategy: Roll yields | 83 |
| 9.2 | Strategy: Trading based on hedging pressure | 84 |
| 9.3 | Strategy: Portfolio diversification with commodities | 84 |
| 9.4 | Strategy: Value | 84 |
| 9.5 | Strategy: Skewness premium | 85 |
| 9.6 | Strategy: Trading with pricing models | 85 |
| 10 | Futures | 86 |
| 10.1 | Strategy: Hedging risk with futures | 86 |
| 10.1.1 | Strategy: Cross-hedging | 87 |
| 10.1.2 | Strategy: Interest rate risk hedging | 87 |
| 10.2 | Strategy: Calendar spread | 88 |
| 10.3 | Strategy: Contrarian trading (mean-reversion) | 89 |
| 10.3.1 | Strategy: Contrarian trading – market activity | 89 |
| 10.4 | Strategy: Trend following (momentum) | 90 |
| 11 | Structured Assets | 91 |
| 11.1 | Generalities: Collateralized Debt Obligations (CDOs) | 91 |
| 11.2 | Strategy: Carry, equity tranche – index hedging | 93 |
| 11.3 | Strategy: Carry, senior/mezzanine – index hedging | 93 |
| 11.4 | Strategy: Carry – tranche hedging | 93 |

| | |
|---|------------|
| 11.5 Strategy: Carry – CDS hedging | 94 |
| 11.6 Strategy: CDOs – curve trades | 94 |
| 11.7 Strategy: Mortgage-backed security (MBS) trading | 94 |
| 12 Convertibles | 95 |
| 12.1 Strategy: Convertible arbitrage | 95 |
| 12.2 Strategy: Convertible option-adjusted spread | 96 |
| 13 Tax Arbitrage | 96 |
| 13.1 Strategy: Municipal bond tax arbitrage | 96 |
| 13.2 Strategy: Cross-border tax arbitrage | 97 |
| 13.2.1 Strategy: Cross-border tax arbitrage with options | 98 |
| 14 Miscellaneous Assets | 98 |
| 14.1 Strategy: Inflation hedging – inflation swaps | 98 |
| 14.2 Strategy: TIPS-Treasury arbitrage | 99 |
| 14.3 Strategy: Weather risk – demand hedging | 100 |
| 14.4 Strategy: Energy – spark spread | 102 |
| 15 Distressed Assets | 102 |
| 15.1 Strategy: Buying and holding distressed debt | 102 |
| 15.2 Strategy: Active distressed investing | 103 |
| 15.2.1 Strategy: Planning a reorganization | 103 |
| 15.2.2 Strategy: Buying outstanding debt | 103 |
| 15.2.3 Strategy: Loan-to-own | 104 |
| 15.3 Strategy: Distress risk puzzle | 104 |
| 15.3.1 Strategy: Distress risk puzzle – risk management | 104 |
| 16 Real Estate | 105 |
| 16.1 Generalities | 105 |
| 16.2 Strategy: Mixed-asset diversification with real estate | 105 |
| 16.3 Strategy: Intra-asset diversification within real estate | 106 |
| 16.3.1 Strategy: Property type diversification | 106 |
| 16.3.2 Strategy: Economic diversification | 106 |
| 16.3.3 Strategy: Property type and geographic diversification | 107 |
| 16.4 Strategy: Real estate momentum – regional approach | 107 |
| 16.5 Strategy: Inflation hedging with real estate | 107 |
| 16.6 Strategy: Fix-and-flip | 108 |
| 17 Cash | 108 |
| 17.1 Generalities | 108 |
| 17.2 Strategy: Money laundering – the dark side of cash | 108 |
| 17.3 Strategy: Liquidity management | 109 |
| 17.4 Strategy: Repurchase agreement (REPO) | 109 |

| | |
|---|------------|
| 17.5 Strategy: Pawnbroking | 109 |
| 17.6 Strategy: Loan sharking | 110 |
| 18 Cryptocurrencies | 110 |
| 18.1 Generalities | 110 |
| 18.2 Strategy: Artificial neural network (ANN) | 110 |
| 18.3 Strategy: Sentiment analysis – naïve Bayes Bernoulli | 114 |
| 19 Global Macro | 115 |
| 19.1 Generalities | 115 |
| 19.2 Strategy: Fundamental macro momentum | 116 |
| 19.3 Strategy: Global macro inflation hedge | 116 |
| 19.4 Strategy: Global fixed-income strategy | 117 |
| 19.5 Strategy: Trading on economic announcements | 117 |
| 20 Infrastructure | 117 |
| Acknowledgments | 118 |
| A R Source Code for Backtesting | 119 |
| B DISCLAIMERS | 126 |
| References | 128 |
| Glossary | 273 |
| Acronyms | 330 |
| Some Math Notations | 334 |
| Explanatory Comments for Index | 335 |
| Index | 336 |
| Front Cover | 355 |

Praises of *151 Trading Strategies*

“If you want to work as a trader or quant on Wall Street, you have to walk the walk and talk the talk. This unique book is a comprehensive introduction to a wide variety of tried and tested trading strategies. I highly recommend a 152nd trading strategy called buy this book!”

–**Peter Carr**, Professor and Chair of Finance and Risk Engineering Department, NYU’s Tandon School of Engineering; and 2010 Financial Engineer of the Year, International Association for Quantitative Finance & Sungard

“This book is an encyclopedic guided tour of “quant” investment strategies, from the simplest ones (like trend following) to much more exotic ones using sophisticated derivative contracts. No claim is made about the profitability of these strategies: one knows all too well how much implementation details and transaction costs matter. But no quant trader can afford ignoring what’s out there, as a source of inspiration or as a benchmark for new ideas.”

–**Jean-Philippe Bouchaud**, Chairman and Chief Scientist, Capital Fund Management; Professor, École Normale Supérieure; Member, French Academy of Sciences; and Co-Director, CFM-Imperial Institute of Quantitative Finance

“Zura Kakushadze and Juan Andrés Serur have created a masterful encyclopedia of quantitative trading strategies. The authors offer us a rigorous but accessible treatment of the mathematical foundations of these strategies. The coverage is comprehensive, starting with simple and well-known strategies such as covered call and then moving naturally to strategies involving cryptocurrencies. The supporting material such as a detailed glossary and an extensive list of references will make this book an essential reference for financial economists and investment professionals.”

–**Hossein Kazemi**, Michael & Cheryl Philipp Endowed Professor of Finance, University of Massachusetts at Amherst; and Editor-in-Chief, *The Journal of Alternative Investments*

“The successful trading of financial instruments is both a science and an art, just as the efforts of a chef reflect both gastronomic artistry and the underlying chemical and thermal processes of cooking. In *151 Trading Strategies* financial traders are provided with a compendium of sound recipes, spanning the broad range of methods that can be applied to modern investment practice. The exposition of both the mathematics and intuition of each described trade is clear and concise. Readers will appreciate the inclusion of extensive computer code so as to reduce effort needed to implement any required calculations.”

–**Dan diBartolomeo**, President, Northfield Information Systems; and Editor, *Journal of Asset Management*

“A real tour de force—*151 Trading Strategies* provides the most comprehensive un-

This is a preview version containing parts of the following book:
Z. Kakushadze and J.A. Serur. *151 Trading Strategies*. Cham, Switzerland:
Palgrave Macmillan, an imprint of Springer Nature, 1st Edition (2018), XX,
480 pp; ISBN 978-3-030-02791-9. Full version:
<https://www.springer.com/us/book/9783030027919>. Copyright © 2018
Zura Kakushadze and Juan Andrés Serur. All Rights Reserved.

covering of popular hedge fund strategies. By revealing all the hedge funds' secret sauce, Kakushadze and Serur have now rendered everything as beta-strategies. Time to lower 'em fees!"

–**Jim Kyung-Soo Liew**, Assistant Professor of Finance, Carey Business School, Johns Hopkins University; Advisory Board Member, *The Journal of Portfolio Management*; and Co-Founder, SoKat

"This book is an impressive concentration of strategies and formulas to expand knowledge in quantitative finance; it's a must-read for anyone who wants to drastically improve his or her expertise in financial markets dynamics."

–**Daniele Bernardi**, CEO, DIAMAN Capital; and Chairman of the Board, *INVESTORS' Magazine Italia*

1 Introduction and Summary

A trading strategy can be defined as a set of instructions to achieve certain asset holdings by some predefined times t_1, t_2, \dots , which holdings can (but need not) be null at one or more of these times. In many cases, the main objective of a trading strategy is to make a profit, i.e., to generate a positive return on its investment. However, some viable trading strategies are not always outright profitable as stand-alone strategies. E.g., a hedging strategy can be a part of a bigger plan, which itself can but need not be a trading strategy. Thus, an airline hedging against rising fuel costs with commodity futures is a trading strategy, which is a risk-management step in executing the airline’s business strategy of generating profits through its services.

In the case of trading strategies that are intended to be outright profitable as stand-alone strategies, one may argue that the phrase “buy low, sell high” captures their essence. However this viewpoint is somewhat superfluous and, while it applies to trading strategies that buy and sell a single asset (e.g., a single stock), it would exclude a whole host of viable strategies that do not work quite like that. E.g., a trading strategy that uses a hedging sub-strategy for risk management may not always “buy low, sell high” when it comes to a particular asset in its portfolio. This is because hedging risk – or, essentially, transferring some risk to other market participants – is not free, and often a trader will pay a premium for hedging some risks in a trading strategy to achieve its objectives. Another example would be the so-called statistical arbitrage, wherein the trading portfolio can consist of, e.g., thousands of stocks and profitability is typically not achieved by buying low and selling high each stock or even any discernable groups of stocks, but statistically, across all stocks, with some trades making money and some losing it. It gets complicated quickly.

The purpose of these notes is to collect a variety of trading strategies in the context of finance (as opposed to trading baseball cards, classic cars, etc.) across essentially all (or at least most frequently encountered) asset classes. Here we deliberately use the term “asset class” somewhat loosely and include what can be referred to as “asset sub-classes”. Thus, a narrower definition would include stocks, bonds, cash, currencies, real estate, commodities and infrastructure. However, this definition would be too narrow for our purposes here. We also consider: derivatives such as options and futures; exchange-traded funds (ETFs); indexes (which are usually traded through vehicles such as ETFs and futures); volatility, which can be treated as an asset class (and traded via, among other things, exchange-traded notes); structured assets (such as collateralized debt obligations and mortgage-backed securities); convertible bonds (which represent a hybrid between bonds and stocks); distressed assets (which are not a separate asset class per se, but the corresponding trading strategies are rather distinct); cryptocurrencies; miscellaneous assets such as weather and energy (derivatives); and also trading strategies such as tax arbitrage and global macro (which use some assets mentioned above as tradables). Some strategies are relatively simple and can be described in words, while many (in fact, most) require a much more detailed mathematical description, which we provide formulaically.

It is important to bear in mind that, unlike the laws of nature (physics), which (apparently) are set in stone and do not change in time, financial markets are man-made and change essentially continuously, and at times quite dramatically. One of the consequences of this transiency is that trading strategies that may have worked well for some time, may die, sometimes quite abruptly. E.g., when the New York Stock Exchange (NYSE) started switching away from its human-operated “specialist” system to electronic trading beginning late 2006,⁴ many statistical arbitrage strategies that were profitable for years prior to that, pretty much died overnight as volatility increased and what used to do the trick before no longer did. Eventually the market was flooded with high frequency trading (HFT)⁵ strategies further diminishing profit margins of many “good old” trading strategies and killing them.

However, technological advances gave rise to new types of trading, including ubiquitous trading strategies based on data mining and machine learning, which seek to identify – typically quite ephemeral – signals or trends by analyzing large volumes of diverse types of data. Many of these trading signals are so faint that they cannot be traded on their own, so one combines thousands, in fact, tens or even hundreds of thousands if not millions of such signals with nontrivial weights to amplify and enhance the overall signal such that it becomes tradable on its own and profitable after trading costs and slippage, including that inflicted by HFT.⁶

Considering the intrinsically ephemeral nature of the financial markets and trading strategies designed to make a profit therefrom, the purpose of these notes is *not* to convey to the reader how to make money using any trading strategy but simply to provide information on and give some flavor of what kind of trading strategies people have considered across a broad cross-section of asset classes and trading styles. In light of the foregoing, we make the following **DISCLAIMER**: *Any information or opinions provided herein are for informational purposes only and are not intended, and shall not be construed, as an investment, legal, tax or any other such advice, or an offer, solicitation, recommendation or endorsement of any trading strategy, security, product or service.* For further legal disclaimers, see Appendix B hereof.

We hope these notes will be useful to academics, practitioners, students and aspiring researchers/traders for years to come. These notes intentionally – not to duplicate prior literature and to avoid this manuscript spanning thousands of pages – do not contain any numeric simulations, backtests, empirical studies, etc. However, we do provide an eclectic cornucopia of references, including those with detailed empirical analyses. Our purpose here is to describe, in many cases in sizable detail, various trading strategies. Also, Appendix A provides source code for illustrating out-of-sample backtesting (see Appendix B for legalese).⁷ So, we hope you enjoy!

⁴ NYSE first started with its “Hybrid Market” (see, e.g., [Hendershott and Moulton, 2011]). However, the writing had been on the wall for the ultimate demise of the specialist system for quite some time. For a timeline, see, e.g., [Pisani, 2010].

⁵ See, e.g., [Aldridge, 2013], [Lewis, 2014].

⁶ See, e.g., [Kakushadze and Tulchinsky, 2016], [Kakushadze and Yu, 2017b].

⁷ The code in Appendix A is not written to be “fancy” or optimized for speed or otherwise.

2 Options

2.1 Generalities

An option is a form of a financial derivative. It is a contract sold by the option writer to the option holder. Typically, an option gives the option holder the right, but not the obligation, to buy or sell an underlying security or financial asset (e.g., a share of common stock) at an agreed-upon price (referred to as the strike price) during a certain period of time or on a specific date (referred to as the exercise date). A buyer pays a premium to the seller for the option. For option pricing, see, e.g., [Harrison and Pliska, 1981], [Baxter and Rennie, 1996], [Hull, 2012], [Kakushadze, 2015a].

A European call option is a right (but not an obligation) to buy a stock at the maturity time T for the strike price k agreed on at time $t = 0$. The claim for the call option $f^{call}(S_T, k) = (S_T - k)^+$. Here $(x)^+ = x$ if $x > 0$, and $(x)^+ = 0$ if $x \leq 0$. By the “claim” we mean how much the option is worth at maturity T . If the stock price at maturity $S_T > k$, then the option holder gains $S_T - k$ (excluding the cost paid for the option at $t = 0$). If the price at maturity $S_T \leq k$, then there is no profit to be made from the option as it makes no sense to exercise it if $S_T < k$ (as it is cheaper to buy the stock in the market) and it makes no difference if $S_T = k$ – all this is assuming no transaction costs. Similarly, a European put option is a right (but not an obligation) to sell a stock at the maturity time T for the strike price k agreed on at time $t = 0$. The claim for the put option is given by $f^{put}(S_T, k) = (k - S_T)^+$.

Options can be issued on a variety of underlying assets, e.g., equities (single-stock options), bonds, futures, indexes, commodities, currencies, etc. For the sake of terminological convenience and definiteness, in the following we will frequently refer to the underlying asset as “stock”, even though in many cases the discussion can be readily generalized to other assets. Furthermore, there is a variety of option styles (beyond European options – for European options, see, e.g., [Black and Scholes, 1973]), e.g., American options (that can be exercised on any trading day on or before expiration – see, e.g., [Kim, 1990]), Bermudan options (that can be exercised only on specified dates on or before expiration – see, e.g., [Andersen, 1999]), Canary options (that can be exercised, say, quarterly, but not before a determined time period, say, 1 year, has elapsed – see, e.g., [Henrard, 2006]), Asian options (whose payoff is determined by the average underlying price over some preset time period – see, e.g., [Rogers and Shi, 1995]), barrier options (which can be exercised only if the underlying security’s price passes a certain level or “barrier” – see, e.g., [Haug, 2001]), other exotic options (a broad category of options that typically are complexly structured – see, e.g., [Fabozzi, 2002]), etc. Let us also mention binary (a.k.a. all-or-nothing or digital) options (that pay a preset amount, say, \$1, if the underlying security meets a predefined condition on expiration, otherwise they simply expire without paying anything to the holder – see, e.g., [Breen and Litzenberger, 1978]).

Some trading strategies can be built using, e.g., combinations of options. Such trading strategies can be divided into two groups: directional and non-directional.

Directional strategies imply an expectation on the direction of the future stock price movements. Non-directional (a.k.a. neutral) strategies are not based on the future direction: the trader is oblivious to whether the stock price goes up or down.

Directional strategies can be divided into two subgroups: (i) bullish strategies, where the trader profits if the stock price goes up; and (ii) bearish strategies, where the trader profits if the stock price goes down. Non-directional strategies can be divided into two subgroups: (a) volatility strategies that profit if the stock has large price movements (high volatility environment); and (b) sideways strategies that profit if the stock price remains stable (low volatility environment). Also, one can distinguish income, capital gain, hedging strategies, etc. (see, e.g., [Cohen, 2005]).

In the remainder of this section, unless stated otherwise, all options are for the same stock and have the same time-to-maturity (TTM). The moneyness abbreviations are: ATM = at-the-money, ITM = in-the-money, OTM = out-of-the-money. Also: f_T is the payoff at maturity T ; S_0 is the stock price at the time $t = 0$ of entering the trade (i.e., establishing the initial position); S_T is the stock price at maturity; C is the net credit received at $t = 0$, and D is the net debit required at $t = 0$, as applicable; $H = D$ (for a net debit trade) or $H = -C$ (for a net credit trade);⁸ S_{*up} and S_{*down} are the higher and lower break-even (i.e., for which $f_T = 0$) stock prices at maturity; if there is only one break-even price, it is denoted by S_* ; P_{max} is the maximum profit at maturity; L_{max} is the maximum loss at maturity.

2.2 Strategy: Covered call

This strategy (a.k.a. “buy-write” strategy) amounts to buying stock and writing a call option with a strike price K against the stock position. The trader’s outlook on the stock price is neutral to bullish. The covered call strategy has the same payoff as writing a put option (short/naked put).⁹ While maintaining the long stock position, the trader can generate income by periodically selling OTM call options. We have:¹⁰

$$f_T = S_T - S_0 - (S_T - K)^+ + C = K - S_0 - (K - S_T)^+ + C \quad (1)$$

$$S_* = S_0 - C \quad (2)$$

$$P_{max} = K - S_0 + C \quad (3)$$

$$L_{max} = S_0 - C \quad (4)$$

2.3 Strategy: Covered put

This strategy (a.k.a. “sell-write” strategy) amounts to shorting stock and writing a put option with a strike price K against the stock position. The trader’s outlook is

⁸ H is the net debit for all bought option premia less the net credit for all sold option premia.

⁹ This is related to put-call parity (see, e.g., [Stoll, 1969], [Hull, 2012]).

¹⁰ For some literature on covered call strategies, see, e.g., [Pounds, 1978], [Whaley, 2002], [Feldman and Roy, 2004], [Hill *et al*, 2006], [Kapadia and Szado, 2007], [Che and Fung, 2011], [Mugwagwa *et al*, 2012], [Israelov and Nielsen, 2014], [Israelov and Nielsen, 2015a], [Hemler and Miller, 2015].

neutral to bearish. The covered put strategy has the same payoff as writing a call option (short/naked call). While maintaining the short stock position, the trader can generate income by periodically selling OTM put options. We have:¹¹

$$f_T = S_0 - S_T - (K - S_T)^+ + C = S_0 - K - (S_T - K)^+ + C \quad (5)$$

$$S_* = S_0 + C \quad (6)$$

$$P_{max} = S_0 - K + C \quad (7)$$

$$L_{max} = \text{unlimited} \quad (8)$$

2.4 Strategy: Protective put

This strategy (a.k.a. “married put” or “synthetic call”) amounts to buying stock and an ATM or OTM put option with a strike price $K \leq S_0$. The trader’s outlook is bullish. This is a hedging strategy: the put option hedges the risk of the stock price falling. We have:¹²

$$f_T = S_T - S_0 + (K - S_T)^+ - D = K - S_0 + (S_T - K)^+ - D \quad (9)$$

$$S_* = S_0 + D \quad (10)$$

$$P_{max} = \text{unlimited} \quad (11)$$

$$L_{max} = S_0 - K + D \quad (12)$$

2.5 Strategy: Protective call

This strategy (a.k.a. “married call” or “synthetic put”) amounts to shorting stock and buying an ATM or OTM call option with a strike price $K \geq S_0$. The trader’s outlook is bearish. This is a hedging strategy: the call option hedges the risk of the stock price rising. We have:¹³

$$f_T = S_0 - S_T + (S_T - K)^+ - D = S_0 - K + (K - S_T)^+ - D \quad (13)$$

$$S_* = S_0 - D \quad (14)$$

$$P_{max} = S_0 - D \quad (15)$$

$$L_{max} = K - S_0 + D \quad (16)$$

2.6 Strategy: Bull call spread

This is a vertical spread consisting of a long position in a close to ATM call option with a strike price K_1 , and a short position in an OTM call option with a higher

¹¹ The covered put option strategy is symmetrical to the covered call option strategy. Academic literature on the covered put option strategy appears to be scarce. See, e.g., [Che, 2016].

¹² For some literature on protective put strategies, see, e.g., [Figlewski, Chidambaram and Kaplan, 1993], [Israelov and Nielsen, 2015b], [Israelov, Nielsen and Villalon, 2017], [Israelov, 2017].

¹³ The protective call option strategy is symmetrical to the protective put option strategy. Academic literature on the protective call option strategy appears to be scarce. See, e.g., [Jabbour and Budwick, 2010], [Tokic, 2013].

strike price K_2 . This is a net debit trade. The trader's outlook is bullish: the strategy profits if the stock price rises. This is a capital gain strategy. We have:¹⁴

$$f_T = (S_T - K_1)^+ - (S_T - K_2)^+ - D \quad (17)$$

$$S_* = K_1 + D \quad (18)$$

$$P_{max} = K_2 - K_1 - D \quad (19)$$

$$L_{max} = D \quad (20)$$

2.7 Strategy: Bull put spread

This is a vertical spread consisting of a long position in an OTM put option with a strike price K_1 , and a short position in another OTM put option with a higher strike price K_2 . This is a net credit trade. The trader's outlook is bullish. This is an income strategy. We have:

$$f_T = (K_1 - S_T)^+ - (K_2 - S_T)^+ + C \quad (21)$$

$$S_* = K_2 - C \quad (22)$$

$$P_{max} = C \quad (23)$$

$$L_{max} = K_2 - K_1 - C \quad (24)$$

2.8 Strategy: Bear call spread

This is a vertical spread consisting of a long position in an OTM call option with a strike price K_1 , and a short position in another OTM call option with a lower strike price K_2 . This is a net credit trade. The trader's outlook is bearish. This is an income strategy. We have:

$$f_T = (S_T - K_1)^+ - (S_T - K_2)^+ + C \quad (25)$$

$$S_* = K_2 + C \quad (26)$$

$$P_{max} = C \quad (27)$$

$$L_{max} = K_1 - K_2 - C \quad (28)$$

2.9 Strategy: Bear put spread

This is a vertical spread consisting of a long position in a close to ATM put option with a strike price K_1 , and a short position in an OTM put option with a lower

¹⁴ For some literature on bull/bear call/put vertical spreads, see, e.g., [Cartea and Pedraz, 2012], [Chaput and Ederington, 2003], [Chaput and Ederington, 2005], [Chen, Chen and Howell, 1999], [Cong, Tan and Weng, 2013], [Cong, Tan and Weng, 2014], [Matsypura and Timkovsky, 2010], [Shah, 2017], [Wong, Thompson and Teh, 2011], [Zhang, 2015]. Also see [Clarke, de Silva and Thorley, 2013], [Cohen, 2005], [Jabbour and Budwick, 2010], [McMillan, 2002], [The Options Institute, 1995].

strike price K_2 . This is a net debit trade. The trader's outlook is bearish: this strategy profits if the stock price falls. This is a capital gain strategy. We have:

$$f_T = (K_1 - S_T)^+ - (K_2 - S_T)^+ - D \quad (29)$$

$$S_* = K_1 - D \quad (30)$$

$$P_{max} = K_1 - K_2 - D \quad (31)$$

$$L_{max} = D \quad (32)$$

2.10 Strategy: Long synthetic forward

This strategy amounts to buying an ATM call option and selling an ATM put option with a strike price $K = S_0$. This can be a net debit or net credit trade. Typically, $|H| \ll S_0$. The trader's outlook is bullish: this strategy mimics a long stock or futures position; it replicates a long forward contract with the delivery price K and the same maturity as the options. This is a capital gain strategy. We have:¹⁵

$$f_T = (S_T - K)^+ - (K - S_T)^+ - H = S_T - K - H \quad (33)$$

$$S_* = K + H \quad (34)$$

$$P_{max} = \text{unlimited} \quad (35)$$

$$L_{max} = K + H \quad (36)$$

2.11 Strategy: Short synthetic forward

This strategy amounts to buying an ATM put option and selling an ATM call option with a strike price $K = S_0$. This can be a net debit or net credit trade. Typically, $|H| \ll S_0$. The trader's outlook is bearish: this strategy mimics a short stock or futures position; it replicates a short forward contract with the delivery price K and the same maturity as the options. This is a capital gain strategy. We have:

$$f_T = (K - S_T)^+ - (S_T - K)^+ - H = K - S_T - H \quad (37)$$

$$S_* = K - H \quad (38)$$

$$P_{max} = K - H \quad (39)$$

$$L_{max} = \text{unlimited} \quad (40)$$

2.12 Strategy: Long combo

This strategy (a.k.a. “long risk reversal”) amounts to buying an OTM call option with a strike price K_1 and selling an OTM put option with a strike price K_2 . The

¹⁵ For some literature on long/short synthetic forward contracts (a.k.a. synthetic futures), see, e.g., [Benavides, 2009], [Bozic and Fortenbery, 2012], [DeMaskey, 1995], [Ebrahim and Rahman, 2005], [Nandy and Chattopadhyay, 2016].

trader's outlook is bullish. This is a capital gain strategy.¹⁶ We have ($K_1 > K_2$):

$$f_T = (S_T - K_1)^+ - (K_2 - S_T)^+ - H \quad (41)$$

$$S_* = K_1 + H, \quad H > 0 \quad (42)$$

$$S_* = K_2 + H, \quad H < 0 \quad (43)$$

$$K_2 \leq S_* \leq K_1, \quad H = 0 \quad (44)$$

$$P_{max} = \text{unlimited} \quad (45)$$

$$L_{max} = K_2 + H \quad (46)$$

2.13 Strategy: Short combo

This strategy (a.k.a. “short risk reversal”) amounts to buying an OTM put option with a strike price K_1 and selling an OTM call option with a strike price K_2 . The trader's outlook is bearish. This is a capital gain strategy. We have ($K_2 > K_1$):

$$f_T = (K_1 - S_T)^+ - (S_T - K_2)^+ - H \quad (47)$$

$$S_* = K_1 - H, \quad H > 0 \quad (48)$$

$$S_* = K_2 - H, \quad H < 0 \quad (49)$$

$$K_1 \leq S_* \leq K_2, \quad H = 0 \quad (50)$$

$$P_{max} = K_1 - H \quad (51)$$

$$L_{max} = \text{unlimited} \quad (52)$$

2.14 Strategy: Bull call ladder

This is a vertical spread consisting of a long position in (usually) a close to ATM call option with a strike price K_1 , a short position in an OTM call option with a strike price K_2 , and a short position in another OTM call option with a higher strike price K_3 . A bull call ladder is a bull call spread financed by selling another OTM call option (with the strike price K_3).¹⁷ This adjusts the trader's outlook from bullish (bull call spread) to conservatively bullish or even non-directional (with an expectation of low volatility). We have:

$$f_T = (S_T - K_1)^+ - (S_T - K_2)^+ - (S_T - K_3)^+ - H \quad (53)$$

$$S_{*down} = K_1 + H, \quad H > 0 \quad (54)$$

$$S_{*up} = K_3 + K_2 - K_1 - H \quad (55)$$

$$P_{max} = K_2 - K_1 - H \quad (56)$$

$$L_{max} = \text{unlimited} \quad (57)$$

¹⁶ For some literature on long/short combo strategies, see, e.g., [Rusnáková, Šoltés and Szabo, 2015], [Šoltés, 2011], [Šoltés and Rusnáková, 2012]. Also see, e.g., [Chaput and Ederington, 2003].

¹⁷ In this sense, this is an “income” strategy.

2.15 Strategy: Bull put ladder

This is a vertical spread consisting of a short position in (usually) a close to ATM put option with a strike price K_1 , a long position in an OTM put option with a strike price K_2 , and a long position in another OTM put option with a lower strike price K_3 . A bull put ladder typically arises when a bull put spread (a bullish strategy) goes wrong (the stock trades lower), so the trader buys another OTM put option (with the strike price K_3) to adjust the position to bearish. We have:¹⁸

$$f_T = (K_3 - S_T)^+ + (K_2 - S_T)^+ - (K_1 - S_T)^+ - H \quad (58)$$

$$S_{*up} = K_1 + H, \quad H < 0 \quad (59)$$

$$S_{*down} = K_3 + K_2 - K_1 - H \quad (60)$$

$$P_{max} = K_3 + K_2 - K_1 - H \quad (61)$$

$$L_{max} = K_1 - K_2 + H \quad (62)$$

2.16 Strategy: Bear call ladder

This is a vertical spread consisting of a short position in (usually) a close to ATM call option with a strike price K_1 , a long position in an OTM call option with a strike price K_2 , and a long position in another OTM call option with a higher strike price K_3 . A bear call ladder typically arises when a bear call spread (a bearish strategy) goes wrong (the stock trades higher), so the trader buys another OTM call option (with the strike price K_3) to adjust the position to bullish. We have:

$$f_T = (S_T - K_3)^+ + (S_T - K_2)^+ - (S_T - K_1)^+ - H \quad (63)$$

$$S_{*down} = K_1 - H, \quad H < 0 \quad (64)$$

$$S_{*up} = K_3 + K_2 - K_1 + H \quad (65)$$

$$P_{max} = \text{unlimited} \quad (66)$$

$$L_{max} = K_2 - K_1 + H \quad (67)$$

2.17 Strategy: Bear put ladder

This is a vertical spread consisting of a long position in (usually) a close to ATM put option with a strike price K_1 , a short position in an OTM put option with a strike price K_2 , and a short position in another OTM put option with a lower strike price K_3 . A bear put ladder is a bear put spread financed by selling another OTM put option (with the strike price K_3).¹⁹ This adjusts the trader's outlook from bearish (bear put spread) to conservatively bearish or even non-directional (with an

¹⁸ For some literature on ladder strategies, see, e.g., [Amaitiek, Bálint and Rešovský, 2010], [Harčariková and Šoltés, 2016], [He, Tang and Zhang, 2016], [Šoltés and Amaitiek, 2010a].

¹⁹ In this sense, as for the bull call ladder, this is an "income" strategy.

expectation of low volatility). We have (assuming $K_3 + K_2 - K_1 + H > \max(H, 0)$):

$$f_T = (K_1 - S_T)^+ - (K_2 - S_T)^+ - (K_3 - S_T)^+ - H \quad (68)$$

$$S_{*up} = K_1 - H, \quad H > 0 \quad (69)$$

$$S_{*down} = K_3 + K_2 - K_1 + H \quad (70)$$

$$P_{max} = K_1 - K_2 - H \quad (71)$$

$$L_{max} = K_3 + K_2 - K_1 + H \quad (72)$$

2.18 Strategy: Calendar call spread

This is a horizontal spread consisting of a long position in a close to ATM call option with TTM T' and a short position in another call option with the same strike price K but shorter TTM $T < T'$. This is a net debit trade. The trader's outlook is neutral to bullish. At the expiration of the short call option ($t = T$), the best case scenario is if the stock price is right at the strike price ($S_T = K$). At $t = T$ let V be the value of the long call option (expiring at $t = T'$) assuming $S_T = K$. We have:²⁰

$$P_{max} = V - D \quad (73)$$

$$L_{max} = D \quad (74)$$

If at the expiration of the short call option the stock price $S_{stop-loss} \leq S_T \leq K$, where $S_{stop-loss}$ is the stop-loss price below which the trader would unwind the entire position, then the trader can write another call option with the strike price K and TTM $T_1 < T'$. While maintaining the long position in the call option with TTM T' , the trader can generate income by periodically selling call options with shorter maturities. In this regard, this strategy resembles the covered call strategy.

2.19 Strategy: Calendar put spread

This is a horizontal spread consisting of a long position in a close to ATM put option with TTM T' and a short position in another put option with the same strike price K but shorter TTM $T < T'$. This is a net debit trade. The trader's outlook is neutral to bearish. At the expiration of the short put option ($t = T$), the best case scenario is if the stock price is right at the strike price ($S_T = K$). At $t = T$ let V be the value of the long put option (expiring at $t = T'$) assuming $S_T = K$. We have:

$$P_{max} = V - D \quad (75)$$

$$L_{max} = D \quad (76)$$

If at the expiration of the short put option the stock price $K \leq S_T \leq S_{stop-loss}$, where $S_{stop-loss}$ is the stop-loss price above which the trader would unwind the

²⁰ For some literature on calendar/diagonal call/put spreads, see, e.g., [Carmona and Durrleman, 2003], [Carr and Javaheri, 2005], [Dale and Currie, 2015], [Gatheral and Jacquier, 2014], [Kawaller, Koch and Ludan, 2002], [Liu and Tang, 2010], [Manoliu, 2004], [Pirrong, 2017], [Till, 2008].

entire position, then the trader can write another put option with the strike price K and TTM $T_1 < T'$. While maintaining the long position in the put option with TTM T' , the trader can generate income by periodically selling put options with shorter maturities. In this regard, this strategy resembles the covered put strategy.

2.20 Strategy: Diagonal call spread

This is a diagonal spread consisting of a long position in a deep ITM call option with a strike price K_1 and TTM T' , and a short position in an OTM call option with a strike price K_2 and shorter TTM $T < T'$. This is a net debit trade. The trader's outlook is bullish. At $t = T$ let V be the value of the long call option (expiring at $t = T'$) assuming $S_T = K$. We have:

$$P_{max} = V - D \quad (77)$$

$$L_{max} = D \quad (78)$$

If at the expiration of the short call option the stock price $S_{stop-loss} \leq S_T \leq K_2$, where $S_{stop-loss}$ is the stop-loss price below which the trader would unwind the entire position, then the trader can write another OTM call option with TTM $T_1 < T'$. While maintaining the long position in the call option with TTM T' , the trader can generate income by periodically selling OTM call options with shorter maturities. In this regard, this strategy is similar to the calendar call spread. The main difference is that, in the diagonal call spread the deep ITM call option (unlike the close to ATM call option in the calendar call spread) more closely mimics the underlying stock, so the position is more protected against a sharp rise in the stock price.

2.21 Strategy: Diagonal put spread

This is a diagonal spread consisting of a long position in a deep ITM put option with a strike price K_1 and TTM T' , and a short position in an OTM put option with a strike price K_2 and shorter TTM $T < T'$. This is a net debit trade. The trader's outlook is bearish. At $t = T$ let V be the value of the long put option (expiring at $t = T'$) assuming $S_T = K$. We have:

$$P_{max} = V - D \quad (79)$$

$$L_{max} = D \quad (80)$$

If at the expiration of the short put option the stock price $K_2 \leq S_T \leq S_{stop-loss}$, where $S_{stop-loss}$ is the stop-loss price above which the trader would unwind the entire position, then the trader can write another OTM put option with TTM $T_1 < T'$. While maintaining the long position in the put option with TTM T' , the trader can generate income by periodically selling OTM put options with shorter maturities. In this regard, this strategy is similar to the calendar put spread. The main difference is that, in the diagonal put spread the deep ITM put option (unlike the close to

ATM put option in the calendar put spread) more closely mimics the underlying stock, so the position is more protected against a sharp drop in the stock price.

2.22 Strategy: Long straddle

This is a volatility strategy consisting of a long position in an ATM call option, and a long position in an ATM put option with a strike price K . This is a net debit trade. The trader's outlook is neutral. This is a capital gain strategy. We have²¹:

$$f_T = (S_T - K)^+ + (K - S_T)^+ - D \quad (81)$$

$$S_{*up} = K + D \quad (82)$$

$$S_{*down} = K - D \quad (83)$$

$$P_{max} = \text{unlimited} \quad (84)$$

$$L_{max} = D \quad (85)$$

2.23 Strategy: Long strangle

This is a volatility strategy consisting of a long position in an OTM call option with a strike price K_1 , and a long position in an OTM put option with a strike price K_2 . This is a net debit trade. However, because both call and put options are OTM, this strategy is less costly to establish than a long straddle position. The flipside is that the movement in the stock price required to reach one of the break-even points is also more significant. The trader's outlook is neutral. This is a capital gain strategy. We have:

$$f_T = (S_T - K_1)^+ + (K_2 - S_T)^+ - D \quad (86)$$

$$S_{*up} = K_1 + D \quad (87)$$

$$S_{*down} = K_2 - D \quad (88)$$

$$P_{max} = \text{unlimited} \quad (89)$$

$$L_{max} = D \quad (90)$$

2.24 Strategy: Long guts

This is a volatility strategy consisting of a long position in an ITM call option with a strike price K_1 , and a long position in an ITM put option with a strike price K_2 . This is a net debit trade. Since both call and put options are ITM, this strategy

²¹ For some literature on straddle/strangle strategies, see, e.g., [Copeland and Galai, 1983], [Coval and Shumway, 2001], [Engle and Rosenberg, 2000], [Gao, Xing and Zhang, 2017], [Goltz and Lai, 2009], [Guo, 2000], [Hansch, Naik and Viswanathan, 1998], [Noh, Engle and Kane, 1994], [Rusnáková and Šoltés, 2012], [Suresh, 2015]. Academic literature specifically on long/short guts strategies (which can be thought of as variations on straddles) appears to be more scarce. For a book reference, see, e.g., [Cohen, 2005]. For covered straddles, see, e.g., [Johnson, 1979].

is more costly to establish than a long straddle position. The trader's outlook is neutral. This is a capital gain strategy. We have (assuming $D > K_2 - K_1$):²²

$$f_T = (S_T - K_1)^+ + (K_2 - S_T)^+ - D \quad (91)$$

$$S_{*up} = K_1 + D \quad (92)$$

$$S_{*down} = K_2 - D \quad (93)$$

$$P_{max} = \text{unlimited} \quad (94)$$

$$L_{max} = D - (K_2 - K_1) \quad (95)$$

2.25 Strategy: Short straddle

This is a sideways strategy consisting of a short position in an ATM call option, and a short position in an ATM put option with a strike price K . This is a net credit trade. The trader's outlook is neutral. This is an income strategy. We have:

$$f_T = -(S_T - K)^+ - (K - S_T)^+ + C \quad (96)$$

$$S_{*up} = K + C \quad (97)$$

$$S_{*down} = K - C \quad (98)$$

$$P_{max} = C \quad (99)$$

$$L_{max} = \text{unlimited} \quad (100)$$

2.26 Strategy: Short strangle

This is a sideways strategy consisting of a short position in an OTM call option with a strike price K_1 , and a short position in an OTM put option with a strike price K_2 . This is a net credit trade. Since both call and put options are OTM, this strategy is less risky than a short straddle position. The flipside is that the initial credit is also lower. The trader's outlook is neutral. This is an income strategy. We have:

$$f_T = -(S_T - K_1)^+ - (K_2 - S_T)^+ + C \quad (101)$$

$$S_{*up} = K_1 + C \quad (102)$$

$$S_{*down} = K_2 - C \quad (103)$$

$$P_{max} = C \quad (104)$$

$$L_{max} = \text{unlimited} \quad (105)$$

2.27 Strategy: Short guts

This is a sideways strategy consisting of a short position in an ITM call option with a strike price K_1 , and a short position in an ITM put option with a strike price K_2 . This is a net credit trade. Since both call and put options are ITM, the initial

²² Otherwise this strategy would generate risk-free profits.

credit is higher than in a short straddle position. The flipside is that the risk is also higher. The trader's outlook is neutral. This is an income strategy. We have:²³

$$f_T = -(S_T - K_1)^+ - (K_2 - S_T)^+ + C \quad (106)$$

$$S_{*up} = K_1 + C \quad (107)$$

$$S_{*down} = K_2 - C \quad (108)$$

$$P_{max} = C - (K_2 - K_1) \quad (109)$$

$$L_{max} = \text{unlimited} \quad (110)$$

2.28 Strategy: Long call synthetic straddle

This volatility strategy (which is the same as a long straddle with the put replaced by a synthetic put) amounts to shorting stock and buying *two* ATM (or the nearest ITM) call options with a strike price K . The trader's outlook is neutral. This is a capital gain strategy.²⁴ We have (assuming $S_0 \geq K$ and $D > S_0 - K$):

$$f_T = S_0 - S_T + 2 \times (S_T - K)^+ - D \quad (111)$$

$$S_{*up} = 2 \times K - S_0 + D \quad (112)$$

$$S_{*down} = S_0 - D \quad (113)$$

$$P_{max} = \text{unlimited} \quad (114)$$

$$L_{max} = D - (S_0 - K) \quad (115)$$

2.29 Strategy: Long put synthetic straddle

This volatility strategy (which is the same as a long straddle with the call replaced by a synthetic call) amounts to buying stock and buying *two* ATM (or the nearest ITM) put options with a strike price K . The trader's outlook is neutral. This is a capital gain strategy. We have (assuming $S_0 \leq K$ and $D > K - S_0$):

$$f_T = S_T - S_0 + 2 \times (K - S_T)^+ - D \quad (116)$$

$$S_{*up} = S_0 + D \quad (117)$$

$$S_{*down} = 2 \times K - S_0 - D \quad (118)$$

$$P_{max} = \text{unlimited} \quad (119)$$

$$L_{max} = D - (K - S_0) \quad (120)$$

2.30 Strategy: Short call synthetic straddle

This sideways strategy (which is the same as a short straddle with the put replaced by a synthetic put) amounts to buying stock and selling *two* ATM (or the nearest

²³ Similarly to long guts, here we assume that $C > K_2 - K_1$.

²⁴ Academic literature on synthetic straddles appears to be scarce. See, e.g., [Trifonov *et al*, 2011], [Trifonov *et al*, 2014].

OTM) call options with a strike price K . The trader's outlook is neutral. This is a capital gain strategy. We have (assuming $S_0 \leq K$):

$$f_T = S_T - S_0 - 2 \times (S_T - K)^+ + C \quad (121)$$

$$S_{*up} = 2 \times K - S_0 + C \quad (122)$$

$$S_{*down} = S_0 - C \quad (123)$$

$$P_{max} = K - S_0 + C \quad (124)$$

$$L_{max} = \text{unlimited} \quad (125)$$

2.31 Strategy: Short put synthetic straddle

This sideways strategy (which is the same as a short straddle with the call replaced by a synthetic call) amounts to shorting stock and selling *two* ATM (or the nearest OTM) put options with a strike price K . The trader's outlook is neutral. This is a capital gain strategy. We have (assuming $S_0 \geq K$):

$$f_T = S_0 - S_T - 2 \times (K - S_T)^+ + C \quad (126)$$

$$S_{*up} = S_0 + C \quad (127)$$

$$S_{*down} = 2 \times K - S_0 - C \quad (128)$$

$$P_{max} = S_0 - K + C \quad (129)$$

$$L_{max} = \text{unlimited} \quad (130)$$

2.32 Strategy: Covered short straddle

This strategy amounts to augmenting a covered call by writing a put option with the same strike price K and TTM as the sold call option and thereby increasing the income. The trader's outlook is bullish. We have:

$$f_T = S_T - S_0 - (S_T - K)^+ - (K - S_T)^+ + C \quad (131)$$

$$S_* = \frac{1}{2} (S_0 + K - C) \quad (132)$$

$$P_{max} = K - S_0 + C \quad (133)$$

$$L_{max} = S_0 + K - C \quad (134)$$

2.33 Strategy: Covered short strangle

This strategy amounts to augmenting a covered call by writing an OTM put option with a strike price K' and the same TTM as the sold call option (whose strike price is K) and thereby increasing the income. The trader's outlook is bullish. We have:

$$f_T = S_T - S_0 - (S_T - K)^+ - (K' - S_T)^+ + C \quad (135)$$

$$P_{max} = K - S_0 + C \quad (136)$$

$$L_{max} = S_0 + K' - C \quad (137)$$

2.34 Strategy: Strap

This is a volatility strategy consisting of a long position in *two* ATM call options, and a long position in an ATM put option with a strike price K . This is a net debit trade. The trader's outlook is bullish. This is a capital gain strategy. We have:²⁵

$$f_T = 2 \times (S_T - K)^+ + (K - S_T)^+ - D \quad (138)$$

$$S_{*up} = K + \frac{D}{2} \quad (139)$$

$$S_{*down} = K - D \quad (140)$$

$$P_{max} = \text{unlimited} \quad (141)$$

$$L_{max} = D \quad (142)$$

2.35 Strategy: Strip

This is a volatility strategy consisting of a long position in an ATM call option, and a long position in *two* ATM put options with a strike price K . This is a net debit trade. The trader's outlook is bearish. This is a capital gain strategy. We have:

$$f_T = (S_T - K)^+ + 2 \times (K - S_T)^+ - D \quad (143)$$

$$S_{*up} = K + D \quad (144)$$

$$S_{*down} = K - \frac{D}{2} \quad (145)$$

$$P_{max} = \text{unlimited} \quad (146)$$

$$L_{max} = D \quad (147)$$

2.36 Strategy: Call ratio backspread

This strategy consists of a short position in N_S close to ATM call options with a strike price K_1 , and a long position in N_L OTM call options with a strike price K_2 , where $N_L > N_S$. Typically, $N_L = 2$ and $N_S = 1$, or $N_L = 3$ and $N_S = 2$. The trader's outlook is strongly bullish. This is a capital gain strategy. We have:²⁶

$$f_T = N_L \times (S_T - K_2)^+ - N_S \times (S_T - K_1)^+ - H \quad (148)$$

$$S_{*down} = K_1 - H/N_S, \quad H < 0 \quad (149)$$

$$S_{*up} = (N_L \times K_2 - N_S \times K_1 + H)/(N_L - N_S) \quad (150)$$

$$P_{max} = \text{unlimited} \quad (151)$$

$$L_{max} = N_S \times (K_2 - K_1) + H \quad (152)$$

²⁵ For some literature on strip and strap strategies, see, e.g., [Jha and Kalimipal, 2010], [Topaloglou, Vladimirov and Zenios, 2011].

²⁶ For some literature on call/put ratio (back)spreads, see, e.g., [Augustin, Brenner and Subrahmanyam, 2015], [Chaput and Ederington, 2008], [Šoltés, 2010], [Šoltés and Amaitiek, 2010b], [Šoltés and Rusnáková, 2013].

2.37 Strategy: Put ratio backspread

This strategy consists of a short position in N_S close to ATM put options with a strike price K_1 , and a long position in N_L OTM put options with a strike price K_2 , where $N_L > N_S$. Typically, $N_L = 2$ and $N_S = 1$, or $N_L = 3$ and $N_S = 2$. The trader's outlook is strongly bearish. This is a capital gain strategy. We have:

$$f_T = N_L \times (K_2 - S_T)^+ - N_S \times (K_1 - S_T)^+ - H \quad (153)$$

$$S_{*up} = K_1 + H/N_S, \quad H < 0 \quad (154)$$

$$S_{*down} = (N_L \times K_2 - N_S \times K_1 - H)/(N_L - N_S) \quad (155)$$

$$P_{max} = N_L \times K_2 - N_S \times K_1 - H \quad (156)$$

$$L_{max} = N_S \times (K_1 - K_2) + H \quad (157)$$

2.38 Strategy: Ratio call spread

This strategy consists of a short position in N_S close to ATM call options with a strike price K_1 , and a long position in N_L ITM call options with a strike price K_2 , where $N_L < N_S$. Typically, $N_L = 1$ and $N_S = 2$, or $N_L = 2$ and $N_S = 3$. This is an income strategy if it is structured as a net credit trade. The trader's outlook is neutral to bearish. We have:²⁷

$$f_T = N_L \times (S_T - K_2)^+ - N_S \times (S_T - K_1)^+ - H \quad (158)$$

$$S_{*down} = K_2 + H/N_L, \quad H > 0 \quad (159)$$

$$S_{*up} = (N_S \times K_1 - N_L \times K_2 - H)/(N_S - N_L) \quad (160)$$

$$P_{max} = N_L \times (K_1 - K_2) - H \quad (161)$$

$$L_{max} = \text{unlimited} \quad (162)$$

2.39 Strategy: Ratio put spread

This strategy consists of a short position in N_S close to ATM put options with a strike price K_1 , and a long position in N_L ITM put options with a strike price K_2 , where $N_L < N_S$. Typically, $N_L = 1$ and $N_S = 2$, or $N_L = 2$ and $N_S = 3$. This is an income strategy if it is structured as a net credit trade. The trader's outlook is neutral to bullish. We have:

$$f_T = N_L \times (K_2 - S_T)^+ - N_S \times (K_1 - S_T)^+ - H \quad (163)$$

$$S_{*up} = K_2 - H/N_L, \quad H > 0 \quad (164)$$

$$S_{*down} = (N_S \times K_1 - N_L \times K_2 + H)/(N_S - N_L) \quad (165)$$

$$P_{max} = N_L \times (K_2 - K_1) - H \quad (166)$$

$$L_{max} = N_S \times K_1 - N_L \times K_2 + H \quad (167)$$

²⁷ So, the difference between call/put ratio backspreads and ratio call/put spreads is that in the former $N_L > N_S$, while in the latter $N_L < N_S$.

2.40 Strategy: Long call butterfly

This is a sideways strategy consisting of a long position in an OTM call option with a strike price K_1 , a short position in *two* ATM call options with a strike price K_2 , and a long position in an ITM call option with a strike price K_3 . The strikes are equidistant: $K_2 - K_3 = K_1 - K_2 = \kappa$. This is a relatively low cost net debit trade. The trader's outlook is neutral. This is a capital gain strategy. We have:²⁸

$$f_T = (S_T - K_1)^+ + (S_T - K_3)^+ - 2 \times (S_T - K_2)^+ - D \quad (168)$$

$$S_{*down} = K_3 + D \quad (169)$$

$$S_{*up} = K_1 - D \quad (170)$$

$$P_{max} = \kappa - D \quad (171)$$

$$L_{max} = D \quad (172)$$

2.40.1 Strategy: Modified call butterfly

This is a variation of the long call butterfly strategy where the strikes are no longer equidistant; instead we have $K_1 - K_2 < K_2 - K_3$. This results in a sideways strategy with a bullish bias. We have:

$$f_T = (S_T - K_1)^+ + (S_T - K_3)^+ - 2 \times (S_T - K_2)^+ - D \quad (173)$$

$$S_* = K_3 + D \quad (174)$$

$$P_{max} = K_2 - K_3 - D \quad (175)$$

$$L_{max} = D \quad (176)$$

2.41 Strategy: Long put butterfly

This is a sideways strategy consisting of a long position in an OTM put option with a strike price K_1 , a short position in *two* ATM put options with a strike price K_2 , and a long position in an ITM put option with a strike price K_3 . The strikes are equidistant: $K_3 - K_2 = K_2 - K_1 = \kappa$. This is a relatively low cost net debit trade. The trader's outlook is neutral. This is a capital gain strategy. We have:

$$f_T = (K_1 - S_T)^+ + (K_3 - S_T)^+ - 2 \times (K_2 - S_T)^+ - D \quad (177)$$

$$S_{*up} = K_3 - D \quad (178)$$

$$S_{*down} = K_1 + D \quad (179)$$

$$P_{max} = \kappa - D \quad (180)$$

$$L_{max} = D \quad (181)$$

²⁸ For some literature on butterfly spreads (including iron butterflies), see, e.g., [Balbás, Longarela and Lucia, 1999], [Howison, Reisinger and Witte, 2013], [Jongadsayakul, 2017], [Matsypura and Timkovsky, 2010], [Youbi, Pindza and Maré, 2017], [Wolf, 2014], [Wystup, 2017]. Academic literature on condor strategies (which can be thought of as variations on butterflies) appears to be more scarce. See, e.g., [Niblock, 2017].

2.41.1 Strategy: Modified put butterfly

This is a variation of the long put butterfly strategy where the strikes are no longer equidistant; instead we have $K_3 - K_2 < K_2 - K_1$. This results in a sideways strategy with a bullish bias. We have (for $H > 0$ there is also $S_{*up} = K_3 - H$):²⁹

$$f_T = (K_1 - S_T)^+ + (K_3 - S_T)^+ - 2 \times (K_2 - S_T)^+ - H \quad (182)$$

$$S_{*down} = 2 \times K_2 - K_3 + H \quad (183)$$

$$P_{max} = K_3 - K_2 - H \quad (184)$$

$$L_{max} = 2 \times K_2 - K_1 - K_3 + H \quad (185)$$

2.42 Strategy: Short call butterfly

This is a volatility strategy consisting of a short position in an ITM call option with a strike price K_1 , a long position in *two* ATM call options with a strike price K_2 , and a short position in an OTM call option with a strike price K_3 . The strikes are equidistant: $K_3 - K_2 = K_2 - K_1 = \kappa$. This is a net credit trade. In this sense, this is an income strategy. However, the potential reward is sizably smaller than with a short straddle or a short strangle (albeit with a lower risk). The trader's outlook is neutral. We have:

$$f_T = 2 \times (S_T - K_2)^+ - (S_T - K_1)^+ - (S_T - K_3)^+ + C \quad (186)$$

$$S_{*up} = K_3 - C \quad (187)$$

$$S_{*down} = K_1 + C \quad (188)$$

$$P_{max} = C \quad (189)$$

$$L_{max} = \kappa - C \quad (190)$$

2.43 Strategy: Short put butterfly

This is a volatility strategy consisting of a short position in an ITM put option with a strike price K_1 , a long position in *two* ATM put options with a strike price K_2 , and a short position in an OTM put option with a strike price K_3 . The strikes are equidistant: $K_2 - K_3 = K_1 - K_2 = \kappa$. This is a net credit trade. In this sense, this is an income strategy. However, the potential reward is sizably smaller than with a short straddle or a short strangle (albeit with a lower risk). The trader's outlook is neutral. We have:

$$f_T = 2 \times (K_2 - S_T)^+ - (K_1 - S_T)^+ - (K_3 - S_T)^+ + C \quad (191)$$

$$S_{*down} = K_3 + C \quad (192)$$

$$S_{*up} = K_1 - C \quad (193)$$

$$P_{max} = C \quad (194)$$

$$L_{max} = \kappa - C \quad (195)$$

²⁹ Ideally, this should be structured as a net credit trade, albeit this may not always be possible.

2.44 Strategy: “Long” iron butterfly

This sideways strategy is a combination of a bull put spread and a bear call spread and consists of a long position in an OTM put option with a strike price K_1 , a short position in an ATM put option and an ATM call option with a strike price K_2 , and a long position in an OTM call option with a strike price K_3 . The strikes are equidistant: $K_2 - K_1 = K_3 - K_2 = \kappa$. This is a net credit trade. The trader’s outlook is neutral. This is an income strategy. We have:

$$f_T = (K_1 - S_T)^+ - (K_2 - S_T)^+ - (S_T - K_2)^+ + (S_T - K_3)^+ + C \quad (196)$$

$$S_{*up} = K_2 + C \quad (197)$$

$$S_{*down} = K_2 - C \quad (198)$$

$$P_{max} = C \quad (199)$$

$$L_{max} = \kappa - C \quad (200)$$

2.45 Strategy: “Short” iron butterfly

This volatility strategy is a combination of a bear put spread and a bull call spread and consists of a short position in an OTM put option with a strike price K_1 , a long position in an ATM put option and an ATM call option with a strike price K_2 , and a short position in an OTM call option with a strike price K_3 . The strikes are equidistant: $K_2 - K_1 = K_3 - K_2 = \kappa$. This is a net debit trade. The trader’s outlook is neutral. This is a capital gain strategy. We have:

$$f_T = (K_2 - S_T)^+ + (S_T - K_2)^+ - (K_1 - S_T)^+ - (S_T - K_3)^+ - D \quad (201)$$

$$S_{*up} = K_2 + D \quad (202)$$

$$S_{*down} = K_2 - D \quad (203)$$

$$P_{max} = \kappa - D \quad (204)$$

$$L_{max} = D \quad (205)$$

2.46 Strategy: Long call condor

This is a sideways strategy consisting of a long position in an ITM call option with a strike price K_1 , a short position in an ITM call option with a higher strike price K_2 , a short position in an OTM call option with a strike price K_3 , and a long position in an OTM call option with a higher strike price K_4 . All strikes are equidistant: $K_4 - K_3 = K_3 - K_2 = K_2 - K_1 = \kappa$. This is a relatively low cost net debit trade. The trader’s outlook is neutral. This is a capital gain strategy. We have:

$$f_T = (S_T - K_1)^+ - (S_T - K_2)^+ - (S_T - K_3)^+ + (S_T - K_4)^+ - D \quad (206)$$

$$S_{*up} = K_4 - D \quad (207)$$

$$S_{*down} = K_1 + D \quad (208)$$

$$P_{max} = \kappa - D \quad (209)$$

$$L_{max} = D \quad (210)$$

2.47 Strategy: Long put condor

This is a sideways strategy consisting of a long position in an OTM put option with a strike price K_1 , a short position in an OTM put option with a higher strike price K_2 , a short position in an ITM put option with a strike price K_3 , and a long position in an ITM put option with a higher strike price K_4 . All strikes are equidistant: $K_4 - K_3 = K_3 - K_2 = K_2 - K_1 = \kappa$. This is a relatively low cost net debit trade. The trader's outlook is neutral. This is a capital gain strategy. We have:

$$f_T = (K_1 - S_T)^+ - (K_2 - S_T)^+ - (K_3 - S_T)^+ + (K_4 - S_T)^+ - D \quad (211)$$

$$S_{*up} = K_4 - D \quad (212)$$

$$S_{*down} = K_1 + D \quad (213)$$

$$P_{max} = \kappa - D \quad (214)$$

$$L_{max} = D \quad (215)$$

2.48 Strategy: Short call condor

This is a volatility strategy consisting of a short position in an ITM call option with a strike price K_1 , a long position in an ITM call option with a higher strike price K_2 , a long position in an OTM call option with a strike price K_3 , and a short position in an OTM call option with a higher strike price K_4 . All strikes are equidistant: $K_4 - K_3 = K_3 - K_2 = K_2 - K_1 = \kappa$. This is a relatively low net credit trade. As with a short call butterfly, the potential reward is sizably smaller than with a short straddle or a short strangle (albeit with a lower risk). So, this is a capital gain (rather than an income) strategy. The trader's outlook is neutral. We have:

$$f_T = (S_T - K_2)^+ + (S_T - K_3)^+ - (S_T - K_1)^+ - (S_T - K_4)^+ + C \quad (216)$$

$$S_{*up} = K_4 - C \quad (217)$$

$$S_{*down} = K_1 + C \quad (218)$$

$$P_{max} = C \quad (219)$$

$$L_{max} = \kappa - C \quad (220)$$

2.49 Strategy: Short put condor

This is a volatility strategy consisting of a short position in an OTM put option with a strike price K_1 , a long position in an OTM put option with a higher strike price K_2 , a long position in an ITM put option with a strike price K_3 , and a short position in an ITM put option with a higher strike price K_4 . All strikes are equidistant: $K_4 - K_3 = K_3 - K_2 = K_2 - K_1 = \kappa$. This is a relatively low net credit trade.

As with a short put butterfly, the potential reward is sizably smaller than with a short straddle or a short strangle (albeit with a lower risk). So, this is a capital gain (rather than an income) strategy. The trader's outlook is neutral. We have:

$$f_T = (K_2 - S_T)^+ + (K_3 - S_T)^+ - (K_1 - S_T)^+ - (K_4 - S_T)^+ + C \quad (221)$$

$$S_{*up} = K_4 - C \quad (222)$$

$$S_{*down} = K_1 + C \quad (223)$$

$$P_{max} = C \quad (224)$$

$$L_{max} = \kappa - C \quad (225)$$

2.50 Strategy: Long iron condor

This sideways strategy is a combination of a bull put spread and a bear call spread and consists of a long position in an OTM put option with a strike price K_1 , a short position in an OTM put option with a higher strike price K_2 , a short position in an OTM call option with a strike price K_3 , and a long position in an OTM call option with a higher strike price K_4 . The strikes are equidistant: $K_4 - K_3 = K_3 - K_2 = K_2 - K_1 = \kappa$. This is a net credit trade. The trader's outlook is neutral. This is an income strategy. We have:

$$f_T = (K_1 - S_T)^+ + (S_T - K_4)^+ - (K_2 - S_T)^+ - (S_T - K_3)^+ + C \quad (226)$$

$$S_{*up} = K_3 + C \quad (227)$$

$$S_{*down} = K_2 - C \quad (228)$$

$$P_{max} = C \quad (229)$$

$$L_{max} = \kappa - C \quad (230)$$

2.51 Strategy: Short iron condor

This volatility strategy is a combination of a bear put spread and a bull call spread and consists of a short position in an OTM put option with a strike price K_1 , a long position in an OTM put option with a higher strike price K_2 , a long position in an OTM call option with a strike price K_3 , and a short position in an OTM call option with a higher strike price K_4 . The strikes are equidistant: $K_4 - K_3 = K_3 - K_2 = K_2 - K_1 = \kappa$. This is a net debit trade. The trader's outlook is neutral. This is a capital gain strategy. We have:

$$f_T = (K_2 - S_T)^+ + (S_T - K_3)^+ - (K_1 - S_T)^+ - (S_T - K_4)^+ - D \quad (231)$$

$$S_{*up} = K_3 + D \quad (232)$$

$$S_{*down} = K_2 - D \quad (233)$$

$$P_{max} = \kappa - D \quad (234)$$

$$L_{max} = D \quad (235)$$

2.52 Strategy: Long box

This volatility strategy can be viewed as a combination of a long synthetic forward and a short synthetic forward, or as a combination of a bull call spread and a bear put spread, and consists of a long position in an ITM put option with a strike price K_1 , a short position in an OTM put option with a lower strike price K_2 , a long position in an ITM call option with the strike price K_2 , and a short position in an OTM call option with the strike price K_1 . The trader's outlook is neutral. This is a capital gain strategy.³⁰ We have (assuming $K_1 \geq K_2 + D$):

$$\begin{aligned} f_T &= (K_1 - S_T)^+ - (K_2 - S_T)^+ + (S_T - K_2)^+ - (S_T - K_1)^+ - D \\ &= K_1 - K_2 - D \end{aligned} \quad (236)$$

$$P_{max} = (K_1 - K_2) - D \quad (237)$$

2.53 Strategy: Collar

This strategy (a.k.a. “fence”) is a covered call augmented by a long put option as insurance against the stock price falling.³¹ It amounts to buying stock, buying an OTM put option with a strike price K_1 , and selling an OTM call option with a higher strike price K_2 . The trader's outlook is moderately bullish. This is a capital gain strategy. We have:³²

$$f_T = S_T - S_0 + (K_1 - S_T)^+ - (S_T - K_2)^+ - H \quad (238)$$

$$S_* = S_0 + H \quad (239)$$

$$P_{max} = K_2 - S_0 - H \quad (240)$$

$$L_{max} = S_0 - K_1 + H \quad (241)$$

2.54 Strategy: Bullish short seagull spread

This option trading strategy is a bull call spread financed with a sale of an OTM put option. It amounts to a short position in an OTM put option with a strike price K_1 , a long position in an ATM call option with a strike price K_2 , and a short position in an OTM call option with a strike price K_3 . Ideally, the trade should be structured to have zero cost. The trader's outlook is bullish. This is a capital gain

³⁰ In some cases it can be used as a tax strategy – see, e.g., [Cohen, 2005]. For some literature on box option strategies, see, e.g., [BenZion, Anan and Yagil, 2005], [Bharadwaj and Wiggins, 2001], [Billingsley and Chance, 1985], [Clarke, de Silva and Thorley, 2013], [Fung, Mok and Wong, 2004], [Hemler and Miller, 1997], [Jongadsayakul, 2016], [Ronn and Ronn, 1989], [Vipul, 2009].

³¹ Similarly, a short collar is a covered put augmented by a long call option.

³² For some literature on collar strategies, see, e.g., [Bartonová, 2012], [Burnside *et al*, 2011], [D'Antonio, 2008], [Israelov and Klein, 2016], [Li and Yang, 2017], [Officer, 2004], [Officer, 2006], [Shan, Garvin and Kumar, 2010], [Szado and Schneeweis, 2010], [Szado and Schneeweis, 2011], [Timmermans, Schumacher and Ponds, 2017], [Yim *et al*, 2011].

strategy. We have:³³

$$f_T = -(K_1 - S_T)^+ + (S_T - K_2)^+ - (S_T - K_3)^+ - H \quad (242)$$

$$S_* = K_2 + H, \quad H > 0 \quad (243)$$

$$S_* = K_1 + H, \quad H < 0 \quad (244)$$

$$K_1 \leq S_* \leq K_2, \quad H = 0 \quad (245)$$

$$P_{max} = K_3 - K_2 - H \quad (246)$$

$$L_{max} = K_1 + H \quad (247)$$

2.55 Strategy: Bearish long seagull spread

This option trading strategy is a short combo (short risk reversal) hedged against the stock price rising by buying an OTM call option. It amounts to a long position in an OTM put option with a strike price K_1 , a short position in an ATM call option with a strike price K_2 , and a long position in an OTM call option with a strike price K_3 . Ideally, the trade should be structured to have zero cost. The trader's outlook is bearish. This is a capital gain strategy. We have:

$$f_T = (K_1 - S_T)^+ - (S_T - K_2)^+ + (S_T - K_3)^+ - H \quad (248)$$

$$S_* = K_1 - H, \quad H > 0 \quad (249)$$

$$S_* = K_2 - H, \quad H < 0 \quad (250)$$

$$K_1 \leq S_* \leq K_2, \quad H = 0 \quad (251)$$

$$P_{max} = K_1 - H \quad (252)$$

$$L_{max} = K_3 - K_2 + H \quad (253)$$

2.56 Strategy: Bearish short seagull spread

This option trading strategy is a bear put spread financed with a sale of an OTM call option. It amounts to a short position in an OTM put option with a strike price K_1 , a long position in an ATM put option with a strike price K_2 , and a short position in an OTM call option with a strike price K_3 . Ideally, the trade should be structured to have zero cost. The trader's outlook is bearish. This is a capital gain strategy. We have:

$$f_T = -(K_1 - S_T)^+ + (K_2 - S_T)^+ - (S_T - K_3)^+ - H \quad (254)$$

$$S_* = K_2 - H, \quad H > 0 \quad (255)$$

$$S_* = K_3 - H, \quad H < 0 \quad (256)$$

$$K_2 \leq S_* \leq K_3, \quad H = 0 \quad (257)$$

$$P_{max} = K_2 - K_1 - H \quad (258)$$

$$L_{max} = \text{unlimited} \quad (259)$$

³³ Academic literature on seagull spreads appears to be scarce. For a book reference, see, e.g., [Wystup, 2017].

2.57 Strategy: Bullish long seagull spread

This option trading strategy is a long combo (long risk reversal) hedged against the stock price falling by buying an OTM put option. It amounts to a long position in an OTM put option with a strike price K_1 , a short position in an ATM put option with a strike price K_2 , and a long position in an OTM call option with a strike price K_3 . Ideally, the trade should be structured to have zero cost. The trader's outlook is bullish. This is a capital gain strategy. We have:

$$f_T = (K_1 - S_T)^+ - (K_2 - S_T)^+ + (S_T - K_3)^+ - H \quad (260)$$

$$S_* = K_3 + H, \quad H > 0 \quad (261)$$

$$S_* = K_2 + H, \quad H < 0 \quad (262)$$

$$K_2 \leq S_* \leq K_3, \quad H = 0 \quad (263)$$

$$P_{max} = \text{unlimited} \quad (264)$$

$$L_{max} = K_2 - K_1 + H \quad (265)$$

A R Source Code for Backtesting

In this appendix we give the R (R Package for Statistical Computing, <http://www.r-project.org>) source code for backtesting intraday strategies, where the position is established at the open and liquidated at the close of the same day. The sole purpose of this code is to illustrate some simple tricks for doing out-of-sample backtesting. In particular, this code does not deal with the survivorship bias in any way,²⁴⁵ albeit for this kind of strategies – precisely because these are intraday strategies – the survivorship bias is not detrimental (see, e.g., [Kakushadze, 2015b]).²⁴⁶

The main function (which internally calls some subfunctions) is `qrm.backtest()` with the following inputs: (i) `days` is the lookback; (ii) `d.r` is used for computing risk, both as the length of the moving standard deviation `tr` (computed internally over `d.r`-day moving windows) as well as the lookback for computing the risk model (and, if applicable, a statistical industry classification) – see below; (iii) `d.addv` is used as the lookback for the average daily dollar volume `addv`, which is computed internally; (iv) `n.addv` is the number of top tickers by `addv` used as the trading universe, which is recomputed every `d.r` days; (v) `inv.lvl` is the total investment level (long plus short, and the strategy is dollar-neutral); (vi) `bnds` controls the position bounds (which are the same in this strategy as the trading bounds), i.e., the dollar holdings H_i for each stock are bounded via (B_i are the `bnds` elements, which can be uniform)

$$|H_i| \leq B_i A_i \quad (548)$$

where $i = 1, \dots, N$ labels the stocks in the trading universe, and A_i are the corresponding elements of `addv`; (vii) `incl.cost` is a Boolean for including linear trading costs, which are modeled as follows.²⁴⁷ For the stock labeled by i , let E_i be its expected return, and w_i be its weight in the portfolio. The source code below determines w_i via (mean-variance) optimization (with bounds). For the stock labeled by i , let the linear trading cost per *dollar* traded be τ_i . Including such costs in portfolio optimization amounts to replacing the expected return of the portfolio

$$E_{port} = \sum_{i=1}^N E_i w_i \quad (549)$$

by

$$E_{port} = \sum_{i=1}^N [E_i w_i - \tau_i |w_i|] \quad (550)$$

²⁴⁵ I.e., simply put, it does not account for the fact that in the past there were tickers that are no longer there at present, be it due to bankruptcies, mergers, acquisitions, etc. Instead, the input data is taken for the tickers that exist on a given day by looking back, say, some number of years.

²⁴⁶ For some literature related to the survivorship bias, which is important for longer-horizon strategies, see, e.g., [Amin and Kat, 2003], [Brown *et al.*, 1992], [Bu and Lacey, 2007], [Carhart *et al.*, 2002], [Davis, 1996], [Elton, Gruber and Blake, 1996b], [Garcia and Gould, 1993].

²⁴⁷ Here we closely follow the discussion in Subsection 3.1 of [Kakushadze and Yu, 2018b].

A complete algorithm for including linear trading costs in mean-variance optimization is given in, e.g., [Kakushadze, 2015b]. However, for our purposes here the following simple “hack” suffices. We can define the effective return

$$E_i^{eff} = \text{sign}(E_i) \max(|E_i| - \tau_i, 0) \quad (551)$$

and simply set

$$E_{port} = \sum_{i=1}^N E_i^{eff} w_i \quad (552)$$

I.e., if the magnitude for the expected return for a given stock is less than the expected cost to be incurred, we set the expected return to zero, otherwise we reduce said magnitude by said cost. This way we can avoid a nontrivial iterative procedure (see, e.g., [Kakushadze, 2015b]), albeit this is only an approximation.

So, what should we use as τ_i in (551)? The model of [Almgren *et al*, 2005] is reasonable for our purposes here. Let H_i be the *dollar* amount traded for the stock labeled by i . Then for the linear trading costs we have

$$T_i = \zeta \sigma_i \frac{|H_i|}{A_i} \quad (553)$$

where σ_i is the historical volatility, A_i is the average daily dollar volume (ADDV), and ζ is an overall normalization constant we need to fix. However, above we work with weights w_i , not traded dollar amounts H_i . In our case of a purely intraday trading strategy discussed above, they are related simply via $H_i = I w_i$, where I is the total investment level (i.e., the total absolute dollar holdings of the portfolio after establishing it). Therefore, we have (note that $T_i = \tau_i |H_i| = \tau_i I |w_i|$)

$$\tau_i = \zeta \frac{\sigma_i}{A_i} \quad (554)$$

We will fix the overall normalization ζ via the following heuristic. We will (conservatively) assume that the average linear trading cost per dollar traded is 10 bps (1 bps = 1 basis point = 1/100 of 1%),²⁴⁸ i.e., $\text{mean}(\tau_i) = 10^{-3}$ and $\zeta = 10^{-3}/\text{mean}(\sigma_i/A_i)$.

Next, internally the code sources price and volume data by reading it from tab-delimited files²⁴⁹ `nrm.ret.txt` (overnight return internally referred to as `ret` – see below), `nrm.open.txt` (daily raw, unadjusted open price, internally referred to as `open`), `nrm.close.txt` (daily raw, unadjusted close price, internally referred to as `close`), `nrm.vol.txt` (daily raw, unadjusted volume, internally referred to as `vol`), `nrm.prc.txt` (daily close price fully adjusted for all splits and dividends, internally referred to as `prc`). The rows of `ret`, `open`, `close`, `vol` and `prc` correspond to the N tickers (index i). Let trading days be labeled by $t = 0, 1, 2, \dots, T$, where $t = 0$ is the

²⁴⁸ This amounts to assuming that, to establish an equally-weighted portfolio, it costs 10 bps.

²⁴⁹ This specific code does not use high, low, VWAP (volume-weighted average price), intraday (e.g., minute-by-minute) prices, etc. However, it is straightforward to modify it such that it does.

most recent day. Then the columns of **open**, **close**, **vol** and **prc** correspond to the trading days $t = 1, 2, \dots, T$, i.e., the value of t is the same as the value of the column index. On the other hand, the columns of **ret** correspond to the overnight close-to-open returns from the trading day t to the trading day $t - 1$. I.e., the first column of **ret** corresponds to the overnight close-to-open return from the trading day $t = 1$ to the trading day $t = 0$. Furthermore, **ret**, call it $R_i(t)$, where $t = 1, 2, \dots, T$ labels the columns of **ret**, is computed as follows:

$$R_i(t) = \ln \left(\frac{P_i^{AO}(t-1)}{P_i^{AC}(t)} \right) \quad (555)$$

$$P_i^{AO}(t) = \gamma_i^{adj}(t) P_i^O(t) \quad (556)$$

$$\gamma_i^{adj}(t) = \frac{P_i^{AC}(t)}{P_i^C(t)} \quad (557)$$

Here: $P_i^O(t)$ is the raw open price (which is the corresponding element of **open** for $t = 1, 2, \dots, T$); $P_i^C(t)$ is the raw close price (which is the corresponding element of **close** for $t = 1, 2, \dots, T$); $P_i^{AC}(t)$ is the fully adjusted close price (which is the corresponding element of **prc** for $t = 1, 2, \dots, T$); $\gamma_i^{adj}(t)$ is the adjustment factor, which is used for computing the fully adjusted open price $P_i^{AO}(t)$; so $R_i(t)$ is the overnight, close-to-open return based on fully adjusted prices. Note that the $t = 0$ prices required for computing $R_i(1)$ are *not* part of the matrices **open**, **close** and **prc**. Also, the code internally assumes that the matrices **ret**, **open**, **close**, **vol** and **prc** are all aligned, i.e., all tickers and dates are the same and in the same order in each of the 5 files **nrm.ret.txt** (note the labeling of the returns described above), **nrm.open.txt**, **nrm.close.txt**, **nrm.vol.txt** and **nrm.prc.txt**. The ordering of the tickers in these files is immaterial, so long as it is the same in all 5 files as the code is oblivious to this ordering. However, the dates must be ordered in the descending order, i.e., the first column corresponds to the most recent date, the second column corresponds to the date before it, etc. (here “date” corresponds to a trading day). Finally, note that the internal function **read.x()** reads these files with the parameter value **as.is = T**. This means that these files are in the “R-ready” tab-delimited format, with $N + 1$ tab-delimited lines. The lines 2 through $N + 1$ have $T + 1$ elements each, the first element being a ticker symbol (so the N ticker symbols comprise **dimnames(.)[[1]]** of the corresponding matrix, e.g., **open** for the open prices), and the other T elements being the T values (e.g., $P_i^O(t)$, $t = 1, \dots, T$, for the open prices). However, the first line has only T elements, which are the labels of the trading days (so these comprise **dimnames(.)[[2]]** of the corresponding matrix, e.g., **open** for the open prices). Internal functions that use this input data, such as **calc.mv.avg()** (which computes simple moving averages) and **calc.mv.sd()** (which computes simple moving standard deviations) are simple and self-explanatory.

As mentioned above, the input parameter **d.r** is used for recomputing the trading universe every **d.r** trading days and also recomputing the risk models (see below) every **d.r** trading days. These computations are done 100% out-of-sample, i.e., the

data used in these computations is 100% in the past w.r.t. to the trading day on which the resultant quantities are used for (simulated) trading. This is accomplished in part by using the internal function `calc.ix()`. Note that the input data described above is structured and further used in such a way that the backtests are 100% out-of-sample. Here two conceptually different aspects must be distinguished. Thus, we have the expected returns and “the rest”, the latter – which can be loosely referred to as “risk management” – being the universe selection, the risk model computation, etc., i.e., the machinery that gets us from the expected returns to the desired holdings (that is, the strategy positions). The risk management part must be 100% out-of-sample. In real life the expected returns are also 100% out-of-sample. However, in backtesting, while the expected returns cannot under any circumstances look into the future, they can sometimes be “borderline in-sample”. Thus, consider a strategy that today trades on the overnight yesterday’s-close-to-today’s-open return. If we assume that the positions are established based on this return sometime after the open, then the backtest is out-of-sample by the “delay” time between the open and when the position is established. However, if we assume that the position is established at the open, then this is the so-called “delay-0” strategy, and the backtest is “borderline in-sample” in the sense that in real life the orders would have to be sent with some, albeit possibly small, delay, but could never be executed exactly at the open. In this sense it still makes sense to backtest such a strategy to measure the strength of the signal. What would make no sense and should never be done is to run an outright in-sample backtest that looks into the future. E.g., using today’s closing prices for computing expected returns for trading at today’s open would be grossly in-sample. On the other hand, using yesterday’s prices to trade at today’s open is the so-called “delay-1” strategy, which is basically 1 day out-of-sample (and, not surprisingly, is expected to backtest much worse than a delay-0 strategy). The code gives examples of both delay-0 (mean-reversion) and delay-1 (momentum) strategies (see the comments `DELAY-0` and `DELAY-1` in the code).

The code internally computes the desired holdings via optimization. The optimizer function (which incorporates bounds and linear constraints such as dollar-neutrality) `bopt.calc.opt()` is given in [Kakushadze, 2015e]. One of its inputs is the inverse model covariance matrix for the stocks. This matrix is computed internally via functions such as `qrm.cov.pc()` and `qrm.erank.pc()`, which are given in and utilize the statistical risk model construction of [Kakushadze and Yu, 2017a], or `qrm.gen.het()`, which is given in and utilizes the heterotic risk model construction of [Kakushadze and Yu, 2016a]. The latter requires a multilevel binary industry classification. The code below builds such a classification via the function `qrm.stat.ind.class.all()`, which is given in and utilizes the statistical industry classification construction of [Kakushadze and Yu, 2016b]. However, the code can be straightforwardly modified to utilize a fundamental industry classification, such as GICS (Global Industry Classification Standard), BICS (Bloomberg Industry Classification System), SIC (Standard Industrial Classification), etc. One issue with this is that practically it is difficult to do this 100% out-of-sample. However, “in-

sampleness” of a fundamental industry classification – which is relatively stable – typically does not pose a serious issue in such backtests as stocks rarely jump industries. Furthermore, note that the aforesaid “external” functions have various other parameters (which are set to their implicit default values in the code below), which can be modified (see the references above that provide the aforesaid functions).

Finally, the code internally computes the desired holdings and various performance characteristics such as the total P&L over the backtesting period, annualized return, annualized Sharpe ratio, and cents-per-share. These and other quantities computed internally can be returned (e.g., via environments or lists), dumped into files, printed on-screen, etc. The code is straightforward and can be tweaked depending on the user’s specific needs/strategies. Its purpose is illustrative/pedagogical.

```
qrm.backtest <- function(days = 252 * 5, d.r = 21, d.addv = 21,
  n.addv = 2000, inv.lvl = 2e+07, bnds = .01, incl.cost = F)
{
  calc.ix <- function(i, d, d.r)
  {
    k1 <- d - i
    k1 <- trunc(k1 / d.r)
    ix <- d - k1 * d.r
    return(ix)
  }

  calc.mv.avg <- function(x, days, d.r)
  {
    y <- matrix(0, nrow(x), days)
    for(i in 1:days)
      y[, i] <- rowMeans(x[, i:(i + d.r - 1)])

    return(y)
  }

  calc.mv.sd <- function(x, days, d.r)
  {
    y <- matrix(0, nrow(x), days)
    for(i in 1:days)
      y[, i] <- apply(x[, i:(i + d.r - 1)], 1, sd)

    return(y)
  }

  read.x <- function(file)
  {
```

```

    x <- read.delim(file, as.is = T)
    x <- as.matrix(x)
    mode(x) <- "numeric"
    return(x)
}

calc.sharpe <- function (pnl, inv.lvl)
{
  print(sum(pnl, na.rm = T))
  print(mean(pnl, na.rm = T) * 252 / inv.lvl * 100)
  print(mean(pnl, na.rm = T) / sd(pnl, na.rm = T) * sqrt(252))
}

ret <- read.x("nrm.ret.txt")
open <- read.x("nrm.open.txt")
close <- read.x("nrm.close.txt")
vol <- read.x("nrm.vol.txt")
prc <- read.x("nrm.prc.txt")

addv <- calc.mv.avg(vol * close, days, d.addv)
ret.close <- log(prc[, -ncol(prc)]/prc[, -1])
tr <- calc.mv.sd(ret.close, days, d.r)

ret <- ret[, 1:days]
prc <- prc[, 1:days]
close <- close[, 1:days]
open <- open[, 1:days]
close1 <- cbind(close[, 1], close[, -ncol(close)])
open1 <- cbind(close[, 1], open[, -ncol(open)])

pnl <- matrix(0, nrow(ret), ncol(ret))
des.hold <- matrix(0, nrow(ret), ncol(ret))

for(i in 1:ncol(ret))
{
  ix <- calc.ix(i, ncol(ret), d.r)
  if(i == 1)
    prev.ix <- 0

  if(ix != prev.ix)
  {
    liq <- addv[, ix]
    x <- sort(liq)
  }
}

```

```

x <- x[length(x):1]
take <- liq >= x[n.addv]

r1 <- ret.close[take, (ix:(ix + d.r - 1))]

### ind.list <- qrm.stat.ind.class.all(r1,
###   c(100, 30, 10), iter.max = 100)

### rr <- qrm.gen.het(r1, ind.list)

rr <- qrm.cov.pc(r1)
### rr <- qrm.erank.pc(r1)

cov.mat <- rr$inv.cov
prev.ix <- ix
}

w.int <- rep(1, sum(take))
ret.opt <- ret ### DELAY-0 MEAN-REVERSION
### ret.opt <- -log(close/open) ### DELAY-1 MOMENTUM

if(incl.cost)
{
  lin.cost <- tr[take, i] / addv[take, i]
  lin.cost <- 1e-3 * lin.cost / mean(lin.cost)
}
else
  lin.cost <- 0

ret.lin.cost <- ret.opt[take, i]
ret.lin.cost <- sign(ret.lin.cost) *
  pmax(abs(ret.lin.cost) - lin.cost, 0)

des.hold[take, i] <- as.vector(bopt.calc.opt(ret.lin.cost, w.int,
  cov.mat, bnds * liq[take]/inv.lvl, -bnds * liq[take]/inv.lvl))

des.hold[take, i] <- -des.hold[take, i] *
  inv.lvl / sum(abs(des.hold[take, i]))

pnl[take, i] <- des.hold[take, i] *
  (close1[take, i]/open1[take, i] - 1)

pnl[take, i] <- pnl[take, i] - abs(des.hold[take, i]) * lin.cost

```

```

}

des.hold <- des.hold[, -1]
pnl <- pnl[, -1]
pnl <- colSums(pnl)
calc.sharpe(pnl, inv.lvl)

trd.vol <- 2 * sum(abs(des.hold/open1[, -1]))
cps <- 100 * sum(pnl) / trd.vol
print(cps)
}

```

B DISCLAIMERS

Wherever the context so requires, the masculine gender includes the feminine and/or neuter, and the singular form includes the plural and *vice versa*. The author of this paper (“Author”) and his affiliates including without limitation Quantigic® Solutions LLC (“Author’s Affiliates” or “his Affiliates”) make no implied or express warranties or any other representations whatsoever, including without limitation implied warranties of merchantability and fitness for a particular purpose, in connection with or with regard to the content of this paper including without limitation any code or algorithms contained herein (“Content”).

The reader may use the Content solely at his/her/its own risk and the reader shall have no claims whatsoever against the Author or his Affiliates and the Author and his Affiliates shall have no liability whatsoever to the reader or any third party whatsoever for any loss, expense, opportunity cost, damages or any other adverse effects whatsoever relating to or arising from the use of the Content by the reader including without any limitation whatsoever: any direct, indirect, incidental, special, consequential or any other damages incurred by the reader, however caused and under any theory of liability; any loss of profit (whether incurred directly or indirectly), any loss of goodwill or reputation, any loss of data suffered, cost of procurement of substitute goods or services, or any other tangible or intangible loss; any reliance placed by the reader on the completeness, accuracy or existence of the Content or any other effect of using the Content; and any and all other adversities or negative effects the reader might encounter in using the Content irrespective of whether the Author or his Affiliates is or are or should have been aware of such adversities or negative effects.

Any information or opinions provided herein are for informational purposes only and are not intended, and shall not be construed, as an investment, legal, tax or any other such advice, or an offer, solicitation, recommendation or endorsement of any trading strategy, security, product or service, or any article, book or any other publication referenced herein or any of the content contained therein.

This is a preview version containing parts of the following book:
Z. Kakushadze and J.A. Serur. *151 Trading Strategies*. Cham, Switzerland:
Palgrave Macmillan, an imprint of Springer Nature, 1st Edition (2018), XX,
480 pp; ISBN 978-3-030-02791-9. Full version:
<https://www.springer.com/us/book/9783030027919>. Copyright © 2018
Zura Kakushadze and Juan Andrés Serur. All Rights Reserved.

The R code included in Appendix A hereof is part of the copyrighted R code of Quantigic® Solutions LLC and is provided herein with the express permission of Quantigic® Solutions LLC. The copyright owner retains all rights, title and interest in and to its copyrighted source code included in Appendix A hereof and any and all copyrights therefor.

References

- Abken, P.A. (1989) An analysis of intra-market spreads in heating oil futures. *Journal of Futures Markets* 9(1): 77-86.
- Abken, P.A. and Nandi, S. (1996) Options and Volatility. *Federal Reserve Bank of Atlanta, Economic Review* 81(3): 21-35.
- Abraham, J.M. and Hendershott, P.H. (1993) Patterns and Determinants of Metropolitan House Prices, 1977 to 1991. In: Browne, L.E. and Rosengren, E.S. (eds.) *Real Estate and the Credit Crunch*. Boston, MA: Federal Reserve Bank of Boston, pp. 18-42.
- Abraham, J.M. and Hendershott, P.H. (1996) Bubbles in Metropolitan Housing Markets. *Journal of Housing Research* 7(2): 191-207.
- Abreu, D. and Brunnermeier, M.K. (2002) Synchronization risk and delayed arbitrage. *Journal of Financial Economics* 66(2-3): 341-360.
- Accominotti, O. and Chambers, D. (2014) Out-of-Sample Evidence on the Returns to Currency Trading. *Working Paper*. Available online: <https://ssrn.com/abstract=2293684>.
- Acharya, V.V., Almeida, H. and Campello, M. (2007) Is cash negative debt? A hedging perspective on corporate financial policies. *Journal of Financial Intermediation* 16(4): 515-554.
- Ackert, L.F. and Tian, Y.S. (2000) Arbitrage and valuation in the market for Standard and Poor's Depositary Receipts. *Financial Management* 29(3): 71-87.
- Adam, F. and Lin, L.H. (2001) An Analysis of the Applications of Neural Networks in Finance. *Interfaces* 31(4): 112-122.
- Adams, Z. and Glück, T. (2015) Financialization in commodity markets: A passing trend or the new normal? *Journal of Banking & Finance* 60: 93-111.
- Adrangi, B., Chatrath, A., Song, F. and Szidarovszky, F. (2006) Petroleum spreads and the term structure of futures prices. *Applied Economics* 38(16): 1917-1929.
- Adrian, T., Begalle, B., Copeland, A. and Martin, A. (2013) Repo and Securities Lending. *Federal Reserve Bank of New York Staff Reports*, No. 529. Available online: https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr529.pdf.

Adrian, T. and Wu, H. (2010) The Term Structure of Inflation Expectations. *Federal Reserve Bank of New York Staff Reports*, No. 362. Available online: https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr362.pdf.

Agapova, A. (2011a) Conventional mutual funds versus exchange-traded funds. *Journal of Financial Markets* 14(2): 323-343.

Agapova, A. (2011b) The Role of Money Market Mutual Funds in Mutual Fund Families. *Journal of Applied Finance* 21(1): 87-102.

Agarwal, V., Fung, W.H., Loon, Y.C. and Naik, N.Y. (2011) Risk and return in convertible arbitrage: Evidence from the convertible bond market. *Journal of Empirical Finance* 18(2): 175-194.

Ahmadi, H.Z., Sharp, P.A. and Walther, C.H. (1986) The effectiveness of futures and options in hedging currency risk. In: Fabozzi, F. (ed.) *Advances in Futures and Options Research*, Vol. 1, Part B. Greenwich, CT: JAI Press, Inc., pp. 171-191.

Ahmerkamp, J.D. and Grant, J. (2013) The Returns to Carry and Momentum Strategies. *Working Paper*. Available online: <https://ssrn.com/abstract=2227387>.

Ahn, D.-H., Boudoukh, J., Richardson, M. and Whitelaw, R.F. (2002) Partial adjustment or stale prices? Implications from stock index and futures return autocorrelations. *Review of Financial Studies* 15(2): 655-689.

Ahn, D.-H., Conrad, J. and Dittmar, R. (2003) Risk Adjustment and Trading Strategies. *Review of Financial Studies* 16(2): 459-485.

Ai, H. and Bansal, R. (2016) Risk Preferences and the Macro Announcement Premium. *Working Paper*. Available online: <https://ssrn.com/abstract=2827445>.

Aiba, Y. and Hatano, N. (2006) A microscopic model of triangular arbitrage. *Physica A: Statistical Mechanics and its Applications* 371(2): 572-584.

Aiba, Y., Hatano, N., Takayasu, H., Marumo, K. and Shimizu, T. (2002) Triangular arbitrage as an interaction among foreign exchange rates. *Physica A: Statistical Mechanics and its Applications* 310(3-4): 467-479.

Aiba, Y., Hatano, N., Takayasu, H., Marumo, K. and Shimizu, T. (2003) Triangular arbitrage and negative auto-correlation of foreign exchange rates. *Physica A: Statistical Mechanics and its Applications* 324(1-2): 253-257.

- Äijö, J. (2008) Implied volatility term structure linkages between VDAX, VSMI and VSTOXX volatility indices. *Global Finance Journal* 18(3): 290-302.
- Aït-Sahalia, Y. and Duarte, J. (2003) Nonparametric option pricing under shape restrictions. *Journal of Econometrics* 116(1-2): 9-47.
- Aït-Sahalia, Y., Karaman, M. and Mancini, L. (2015) The Term Structure of Variance Swaps and Risk Premia. *Working Paper*. Available online: <https://ssrn.com/abstract=2136820>.
- Akram, Q.F., Rime, D. and Sarno, L. (2008) Arbitrage in the foreign exchange market: Turning on the microscope. *Journal of International Economics* 76(2): 237-253.
- Alaminos, D., del Castillo, A. and Fernández, M.Á. (2016) A Global Model for Bankruptcy Prediction. *PLoS ONE* 11(11): e0166693.
- Alaton, P., Djehiche, B. and Stillberger, D. (2010) On modelling and pricing weather derivatives. *Applied Mathematical Finance* 9(1): 1-20.
- Albeverio, S., Steblovskaya, V. and Wallbaum, K. (2013) Investment instruments with volatility target mechanism. *Quantitative Finance* 13(10): 1519-1528.
- Albrecht, P. (1985) A note on immunization under a general stochastic equilibrium model of the term structure. *Insurance: Mathematics and Economics* 4(4): 239-244.
- Aldohni, A.K. (2013) Loan Sharks v. Short-term Lenders: How Do the Law and Regulators Draw the Line? *Journal of Law and Society* 40(3): 420-449.
- Aldridge, I. (2013) *High-Frequency Trading: A Practical Guide to Algorithmic Strategies and Trading Systems*. (2nd ed.) Hoboken, NJ: John Wiley & Sons, Inc.
- Aldridge, I. (2016) ETFs, High-Frequency Trading, and Flash Crashes. *Journal of Portfolio Management* 43(1): 17-28.
- Alessandretti, L., ElBahrawy, A., Aiello, L.M. and Baronchelli, A. (2018) Machine Learning the Cryptocurrency Market. *Working Paper*. Available online: <https://arxiv.org/pdf/1805.08550.pdf>.
- Alexander, C. and Korovilas, D. (2012) Understanding ETNs on VIX Futures. *Working Paper*. Available online: <https://ssrn.com/abstract=2043061>.
- Alexander, G.J. and Resnick, B.G. (1985) Using linear and goal programming to immunize bond portfolios. *Journal of Banking & Finance* 9(1): 35-54.

Allen, F. and Michaely, R. (1995) Dividend Policy. In: Jarrow, R.A., Maksimovic, V. and Ziemba, W.T. (eds.) *Handbooks in Operations Research and Management Science*, Vol 9. Amsterdam, The Netherlands: Elsevier, Chapter 25, pp. 793-837.

Almeida, H., Campello, M. and Weisbach, M.S. (2005) The Cash Flow Sensitivity of Cash. *Journal of Finance* 59(4): 1777-1804.

Almgren, R., Thum, C., Hauptmann, E. and Li, H. (2005) Equity market impact. *Risk Magazine* 18(7): 57-62.

Altman, E.I. (1968) Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy. *Journal of Finance* 23(4): 589-609.

Altman, E. (1993) *Corporate financial distress and bankruptcy*. (2nd ed.) Hoboken, NJ: John Wiley & Sons, Inc.

Altman, E.I. (1998) Market Dynamics and Investment Performance of Distressed and Defaulted Debt Securities. *Working Paper*. Available online: <https://ssrn.com/abstract=164502>.

Altman, N.S. (1992) An introduction to kernel and nearest-neighbor nonparametric regression. *American Statistician* 46(3): 175-185.

Altman, E.I., Brady, B., Resti, A. and Sironi, A. (2005) The link between default and recovery rates: theory, empirical evidence and implications. *Journal of Business* 78(6): 2203-2228.

Altman, E.I. and Hotchkiss, E. (2006) *Corporate Financial Distress and Bankruptcy: Predict and Avoid Bankruptcy, Analyze and Invest in Distressed Debt*. Hoboken, NJ: John Wiley & Sons, Inc.

Amaitiek, O.F.S., Bálint, T. and Rešovský, M. (2010) The Short Call Ladder strategy and its application in trading and hedging. *Acta Montanistica Slovaca* 15(3): 171-182.

Amato, J.D. and Gyntelberg, J. (2005) CDS Index Tranches and the Pricing of Credit Risk Correlations. *BIS Quarterly Review*, December 2005, pp. 73-87. Available online: https://www.bis.org/publ/qtrpdf/r_qt0503g.pdf.

Amato, J.D. and Remolona, E.M. (2003) The credit spread puzzle. *BIS Quarterly Review*, December 2003, pp. 51-63. Available online: https://www.bis.org/publ/qtrpdf/r_qt0312e.pdf.

Ambrose, B., LaCour-Little, M. and Sanders, A. (2004) The Effect of Confirming Loan Status on Mortgage Yield Spreads: A Loan Level Analysis. *Real Estate Economics* 32(4): 541-569.

Amenc, N., Ducoulombier, F., Goltz, F. and Ulahel, J. (2016) Ten Misconceptions about Smart Beta. *Working Paper*. Available online: <https://www.edhec.edu/sites/www.edhec-portail.pprod.net/files/publications/pdf/edhec-position-paper-ten-misconceptions-about-smart-beta%5F1468395239135-pdf.jpg>.

Amenc, N., Goltz, F., Sivasubramanian, S. and Lodh, A. (2015) Robustness of Smart Beta Strategies. *Journal of Index Investing* 6(1): 17-38.

Amenc, N., Martellini, L. and Ziemann, V. (2009) Inflation-Hedging Properties of Real Assets and Implications for Asset-Liability Management Decisions. *Journal of Portfolio Management* 35(4): 94-110.

Amihud, Y. (2002) Illiquidity and stock returns: cross-section and time-series effects. *Journal of Financial Markets* 5(1): 31-56.

Amihud, Y. and Goyenko, R. (2013) Mutual Fund's R^2 as Predictor of Performance. *Review of Financial Studies* 26(3): 667-694.

Amihud, Y. and Murgia, M. (1997) Dividends, Taxes, and Signaling: Evidence from Germany. *Journal of Finance* 52(1): 397-408.

Amin, G.S. and Kat, H.M. (2003) Welcome to the Dark Side: Hedge Fund Attrition and Survivorship Bias over the Period 1994-2001. *Journal of Alternative Investments* 6(1): 57-73.

Amiri, M., Zandieh, M., Vahdani, B., Soltani, R. and Roshanaei, V. (2010) An integrated eigenvector-DEA-TOPSIS methodology for portfolio risk evaluation in the FOREX spot market. *Expert Systems with Applications* 37(1): 509-516.

Amjad, M.J. and Shah, D. (2017) Trading Bitcoin and Online Time Series Prediction. *Working Paper*. Available online: <http://proceedings.mlr.press/v55/amjad16.pdf>.

Ammann, M., Kind, A. and Seiz, R. (2010) What drives the performance of convertible-bond funds? *Journal of Banking & Finance* 34(11): 2600-2613.

Ammann, M., Kind, A. and Wilde, C. (2003) Are convertible bonds underpriced? An analysis of the French market. *Journal of Banking & Finance* 27(4): 635-653.

An, B.-J., Ang, A., Bali, T.G. and Cakici, N. (2014) The Joint Cross Section of Stocks and Options. *Journal of Finance* 69(5): 2279-2337.

Anacker, K.B. (2009) Big flipping schemes in small cities? The case of Mansfield, Ohio. *Housing and Society* 36(1): 5-28.

- Anacker, K.B. and Schintler, L.A. (2015) Flip that house: visualising and analysing potential real estate property flipping transactions in a cold local housing market in the United States. *International Journal of Housing Policy* 15(3): 285-303.
- Anand, A. and Venkataraman, K. (2016) Market Conditions, Fragility, and the Economics of Market Making. *Journal of Financial Economics* 121(2): 327-349.
- Andersen, L. (1999) A Simple Approach to the Pricing of Bermudan Swaptions in the Multi-factor Libor Market Model. *Journal of Computational Finance* 3(2): 5-32.
- Andersen, L.B.G. (2010) Markov models for commodity futures: theory and practice. *Quantitative Finance* 10(8): 831-854.
- Andersen, L. and Sidenius, J. (2005) Extensions to the Gaussian Copula: Random Recovery and Random Factor Loadings. *Journal of Credit Risk* 1(1): 29-70.
- Andersen, L., Sidenius, J. and Basu, S. (2003) All your hedges in one basket. *Risk*, November 2003, pp. 67-72.
- Anderson, R.M., Bianchi, S.W. and Goldberg, L.R. (2014) Determinants of Levered Portfolio Performance. *Financial Analysts Journal* 70(5): 53-72.
- Anderson, R.W. and Danthine, J.P. (1981) Cross Hedging. *Journal of Political Economy* 89(6): 1182-1196.
- Andrade, G., Mitchell, M. and Stafford, E. (2001) New evidence and perspectives on mergers. *Journal of Economic Perspectives* 15(2): 103-120.
- Andrieș, A.M. and Virlan, C.A. (2017) Risk arbitrage in emerging Europe: are cross-border mergers and acquisition deals more risky? *Economic Research – Ekonomska Istraživanja* 30(1): 1367-1389.
- Ané, T. and Labidi, C. (2001) Implied volatility surfaces and market activity over time. *Journal of Economics and Finance* 25(3): 259-275.
- Ang, S., Alles, L. and Allen, D. (1998) Riding the Yield Curve: An Analysis of International Evidence. *Journal of Fixed Income* 8(3): 57-74.
- Ang, A., Bekaert, G. and Wei, M. (2008) The Term Structure of Real Rates and Expected Inflation. *Journal of Finance* 63(2): 797-849.
- Ang, A., Green, R.C., Longstaff, F.A. and Xing, Y. (2017) Advance Refundings of Municipal Bonds. *Journal of Finance* 72(4): 1645-1682.

- Ang, A., Hodrick, R., Xing, Y. and Zhang, X. (2006) The Cross-Section of Volatility and Expected Returns. *Journal of Finance* 61(1): 259-299.
- Ang, A., Hodrick, R., Xing, Y. and Zhang, X. (2009) High Idiosyncratic Volatility and Low Returns: International and Further U.S. Evidence. *Journal of Financial Economics* 91(1): 1-23.
- Ang, K.K. and Quek, C. (2006) Stock trading using RSPOP: A novel rough set-based neuro-fuzzy approach. *IEEE Transactions on Neural Networks* 17(5): 1301-1315.
- Anglin, P.M., Rutherford, R. and Springer, T. (2003) The Trade-off Between the Selling Price of Residential Properties and Time-on-the-Market: The Impact of Price Setting. *Journal of Real Estate Finance and Economics* 26(1): 95-111.
- Anker, P. (1999) Uncovered interest parity, monetary policy and time-varying risk premia. *Journal of International Money and Finance* 18(6): 835-851.
- Ankirchner, S., Dimitroff, G., Heyne, G. and Pigorsch, C. (2012) Futures Cross-Hedging with a Stationary Basis. *Journal of Financial and Quantitative Analysis* 47(6): 1361-1395.
- Ankirchner, S. and Heyne, G. (2012) Cross Hedging with Stochastic Correlation. *Finance and Stochastics* 16(1): 17-43.
- Ansar, A., Flyvbjerg, B., Budzier, A. and Lunn, D. (2016) Does infrastructure investment lead to economic growth or economic fragility? Evidence from China. *Oxford Review of Economic Policy* 32(3): 360-390.
- Anson, M.J.P (1998) Spot Returns, Roll Yield, and Diversification with Commodity Futures. *Journal of Alternative Investments* 1(3): 16-32.
- Anson, M. (2013) Performance Measurement in Private Equity: The Impact of FAS 157 on the Lagged Beta Effect. *Journal of Private Equity* 17(1): 29-44.
- Antonacci, G. (2014) *Dual Momentum Investing: An Innovative Strategy for Higher Returns with Lower Risk*. New York, NY: McGraw-Hill, Inc.
- Antonacci, G. (2017) Risk Premia Harvesting Through Dual Momentum. *Journal of Management & Entrepreneurship* 11(1): 27-55.
- Antoniou, A. and Holmes, P. (1995) Futures Trading, Information and Spot Price Volatility: Evidence from the FTSE 100 Stock Index Futures Contract using GARCH. *Journal of Banking & Finance* 19(1): 117-129.

Aragon, G.O., Ergun, A.T., Getmansky, M. and Girardi, G. (2017) Hedge Fund Liquidity Management. *Working Paper*. Available online: <https://ssrn.com/abstract=3033930>.

Ardizzi, G., Petraglia, C., Piacenza, M., Schneider, F. and Turati, G. (2014) Money Laundering as a Crime in the Financial Sector: A New Approach to Quantitative Assessment, with an Application to Italy. *Journal of Money, Credit and Banking* 46(8): 1555-1590.

Aretz, K. and Pope, P.F. (2013) Common factors in default risk across countries and industries. *European Financial Management* 19(1): 108-152.

Arezki, R. and Sy, A. (2016) Financing Africa's Infrastructure Deficit: From Development Banking to Long-term Investing. *Journal of African Economies* 25(S2): 59-73.

Armann, V. and Weisdorf, M. (2008) Hedging Inflation with Infrastructure Assets. In: Benaben, B. and Goldenberg, S. (eds.) *Inflation Risk and Products: The Complete Guide*. London, UK: Risk Books, pp. 111-126.

Arnott, R., Chaves, D., Gunzberg, J., Hsu, J. and Tsui, P. (2014) Getting Smarter about Commodities: An index to counter the possible pitfalls. *Journal of Indexes*, November/December 2014, pp. 52-60.

Arnott, R.D., Hsu, J., Kalesnik, V. and Tindall, P. (2013) The Surprising Alpha from Malkiel's Monkey and Upside-Down Strategies. *Journal of Portfolio Management* 39(4): 91-105.

Arnsdorf, M. and Halperin, I. (2007) BSLP: Markovian bivariate spread-loss model for portfolio credit derivatives. *Working Paper*. Available online: <https://arxiv.org/pdf/0901.3398>.

Asem, E. and Tian, G. (2010) Market Dynamics and Momentum Profits. *Journal of Financial and Quantitative Analysis* 45(6): 1549-1562.

Asgharian, M., Diz, F., Gregoriou, G.N. and Rouah, F. (2004) The Global Macro Hedge Fund Cemetery. *Journal of Derivatives Accounting* 1(2): 187-194.

Asgharian, H. and Karlsson, S. (2008) An Empirical Analysis of Factors Driving the Swap Spread. *Journal of Fixed Income* 18(2): 41-56.

Asness, C.S. (1994) *Variables that Explain Stock Returns* (Ph.D. Thesis). Chicago, IL: University of Chicago.

Asness, C.S. (1995) The Power of Past Stock Returns to Explain Future Stock Returns. *Working Paper* (unpublished). New York, NY: Goldman Sachs Asset Management.

Asness, C. (1997) The Interaction of Value and Momentum Strategies. *Financial Analysts Journal* 53(2): 29-36.

Asness, C., Frazzini, A., Israel, R. and Moskowitz, T. (2014) Fact, Fiction, and Momentum Investing. *Journal of Portfolio Management* 40(5): 75-92.

Asness, C., Krail, R.J. and Liew, J.M. (2001) Do Hedge Funds Hedge? *Journal of Portfolio Management* 28(1): 6-19.

Asness, C., Moskowitz, T. and Pedersen, L.H. (2013) Value and Momentum Everywhere. *Journal of Finance* 68(3): 929-985.

Asness, C.S., Porter, R.B. and Stevens, R.L. (2000) Predicting Stock Returns Using Industry-Relative Firm Characteristics. *Working Paper*. Available online: <https://ssrn.com/abstract=213872>.

Augustin, P., Brenner, B. and Subrahmanyam, M.G. (2015) Informed Options Trading prior to M&A Announcements: Insider Trading? *Working Paper*. Available online: <https://ssrn.com/abstract=2441606>.

Aussenegg, W., Götz, L. and Jelic, R. (2014) European asset swap spreads and the credit crisis. *European Journal of Finance* 22(7): 572-600.

Avdjiev, S., Du, W., Koch, C. and Shin, H.S. (2016) The Dollar, Bank Leverage and the Deviation from Covered Interest Parity. *Working Paper*. Available online: <https://ssrn.com/abstract=2870057>.

Avellaneda, M. and Lee, J.H. (2010) Statistical arbitrage in the U.S. equity market. *Quantitative Finance* 10(7): 761-782.

Avellaneda, M. and Papanicolaou, A. (2018) Statistics of VIX Futures and Applications to Trading Volatility Exchange-Traded Products. *Journal of Investment Strategies* 7(2): 1-33.

Avellaneda, M. and Stoikov, S. (2008) High frequency trading in a limit order book. *Quantitative Finance* 8(3): 217-224.

Avellaneda, M. and Zhang, S. (2010) Path-Dependence of Leveraged ETF Returns. *Journal on Financial Mathematics* 1(1): 586-603.

Ayache, E., Forsyth, P.A. and Vetzal, K.R. (2003) Valuation of Convertible Bonds With Credit Risk. *Journal of Derivatives* 11(1): 9-29.

Ayuso, J. and Restoy, F. (1996) Interest Rate Parity and Foreign Exchange Risk Premia in the ERM. *Journal of International Money and Finance* 15(3): 369-382.

Azmat, Q. and Iqbal, A.M. (2017) The role of financial constraints on precautionary cash holdings: evidence from Pakistan. *Economic Research – Ekonomska Istraživanja* 30(1): 596-610.

Baba, N. and Packer, F. (2009) Interpreting deviations from covered interest parity during the financial market turmoil of 2007-08. *Journal of Banking & Finance* 33(11): 1953-1962.

Babbs, S.H. and Nowman, B.K. (1999) Kalman filtering of generalized Vasicek term structure models. *Journal of Financial and Quantitative Analysis* 34(1): 115-130.

Bacchetta, P. and van Wincoop, E. (2006) Incomplete Information Processing: A Solution to the Forward Discount Puzzle. *American Economic Review* 96(3): 552-576.

Bacchetta, P. and van Wincoop, E. (2010) Infrequent Portfolio Decisions: A Solution to the Forward Discount Puzzle. *American Economic Review* 100(3): 870-904.

Baek, C. and Elbeck, M. (2014) Bitcoins as an Investment or Speculative Vehicle? A First Look. *Applied Economics Letters* 22(1): 30-34.

Bai, Q., Bond, S.A. and Hatch, B.C. (2015) The Impact of Leveraged and Inverse ETFs on Underlying Real Estate Returns. *Real Estate Economics* 43(1): 37-66.

Bai, J. and Collin-Dufresne, P. (2013) The CDS-Bond Basis. *Working Paper*. Available online: <https://ssrn.com/abstract=2024531>.

Baillie, R.T. and Myers, R.J. (1991) Bivariate GARCH estimation of the optimal commodity futures hedge. *Journal of Applied Econometrics* 6(2): 109-124.

Baillie, R.T. and Osterberg, W.P. (2000) Deviations from daily uncovered interest rate parity and the role of intervention. *Journal of International Financial Markets, Institutions and Money* 10(4): 363-379.

Baker, M., Bradley, B. and Wurgler, J. (2011) Benchmarks as Limits to Arbitrage: Understanding the Low-Volatility Anomaly. *Financial Analysts Journal* 67(1): 40-54.

Baker, M., Pan, A. and Wurgler, J. (2012) The effect of reference point prices on mergers and acquisitions. *Journal of Financial Economics* 106(1): 49-71.

Baker, M. and Savaşoglu, S. (2002) Limited arbitrage in mergers and acquisitions. *Journal of Financial Economics* 64(1): 91-115.

- Bakshi, G. and Kapadia, N. (2003a) Delta-Hedged Gains and the Negative Market Volatility Risk Premium. *Review of Financial Studies* 16(2): 527-566.
- Bakshi, G. and Kapadia, N. (2003b) Volatility Risk Premiums Embedded in Individual Equity Options. *Journal of Derivatives* 11(1): 45-54.
- Bakshi, G., Kapadia, N. and Madan, D. (2003) Stock Return Characteristics, Skew Laws, and the Differential Pricing of Individual Equity Options. *Review of Financial Studies* 16(1): 101-143.
- Bakshi, G. and Panayotov, G. (2013) Predictability of currency carry trades and asset pricing implications. *Journal of Financial Economics* 110(1): 139-163.
- Balbás, A., Longarela, I.R. and Lucia, J.J. (1999) How Financial Theory Applies to Catastrophe-Linked Derivatives – An Empirical Test of Several Pricing Models. *Journal of Risk and Insurance* 66(4): 551-582.
- Bali, T.G. and Demirtas, K.O. (2008) Testing mean reversion in financial market volatility: Evidence from S&P 500 index futures. *Journal of Futures Markets* 28(1): 1-33.
- Bali, T.G. and Hovakimian, A. (2009) Volatility Spreads and Expected Stock Returns. *Management Science* 55(11): 1797-1812.
- Ballings, M., Van den Poel, D., Hespeels, N. and Gryp, R. (2015) Evaluating multiple classifiers for stock price direction prediction. *Expert Systems with Applications* 42(20): 7046-7056.
- Balta, A.-N. and Kosowski, R. (2013) Momentum Strategies in Futures Markets and Trend-Following Funds. *Working Paper*. Available online: https://www.edhec.edu/sites/www.edhec-portail.pprod.net/files/publications/pdf/edhec-working-paper-momentum-strategies-in-futures_1410350911195-pdf.jpg.
- Bandarchuk, P. and Hilscher, J. (2013) Sources of Momentum Profits: Evidence on the Irrelevance of Characteristics. *Review of Finance* 17(2): 809-845.
- Banz, R. (1981) The relationship between return and market value of common stocks. *Journal of Financial Economics* 9(1): 3-18.
- Barber, J., Bennett, S. and Gvozdeva, E. (2015) How to Choose a Strategic Multifactor Equity Portfolio? *Journal of Index Investing* 6(2): 34-45.
- Barberis, N. (2000) Investing for the Long Run when Returns Are Predictable. *Journal of Finance* 55(1): 225-264.

- Barberis, N. and Huang, M. (2008) Stocks as Lotteries: The Implications of Probability Weighting for Security Prices. *American Economic Review* 98(5): 2066-2100.
- Bardong, F. and Lehnert, T. (2004) TIPS, Break-Even Inflation, and Inflation Forecasts. *Journal of Fixed Income* 14(3): 15-35.
- Bariviera, A.F., Basgall, M.J., Hasperu , W. and Naiouf, M. (2017) Some stylized facts of the Bitcoin market. *Physica A: Statistical Mechanics and its Applications* 484: 82-90.
- Barnes, M.L., Bodie, Z., Triest, R.K. and Wang, J.C. (2010) A TIPS Scorecard: Are They Accomplishing Their Objectives? *Financial Analysts Journal* 66(5): 68-84.
- Baron, M., Brogaard, J., Hagstr mer, B. and Kirilenko, A. (2014) Risk and Return in High-Frequency Trading. *Journal of Financial and Quantitative Analysis* (forthcoming). Available online: <https://ssrn.com/abstract=2433118>.
- Barr, D.G. and Campbell, J.Y. (1997) Inflation, real interest rates, and the bond market: A study of UK nominal and index-linked government bond prices. *Journal of Monetary Economics* 39(3): 361-383.
- Barrett, W.B. and Kolb, R.W. (1995) Analysis of spreads in agricultural futures. *Journal of Futures Markets* 15(1): 69-86.
- Barrieu, P. and El Karoui, N. (2002) Optimal design of weather derivatives. *ALGO Research* 5(1): 79-92.
- Barrieu, P. and Scaillet, O. (2010) A Primer on Weather Derivatives. In: Filar, J.A. and Haurie, A. (eds.) *Uncertainty and Environmental Decision Making: A Handbook of Research and Best Practice*. International Series in Operations Research & Management Science, Vol. 138. New York, NY: Springer U.S.
- Barroso, P. and Santa-Clara, P. (2014) Momentum Has Its Moments. *Journal of Financial Economics* 116(1): 111-120.
- Bartonov , M. (2012) Hedging of Sales by Zero-cost Collar and its Financial Impact. *Journal of Competitiveness* 4(2): 111-127.
- Bartov, E., Radhakrishnan, S. and Krinsky, I. (2005) Investor Sophistication and Patterns in Stock Returns after Earnings Announcements. *Accounting Review* 75(1): 289-319.
- Basu, S. (1977) The investment performance of common stocks in relation to their price to earnings ratios: A test of the efficient market hypothesis. *Journal of Finance* 32(3): 663-682.

Basu, D. and Miffre, J. (2013) Capturing the risk premium of commodity futures: The role of hedging pressure. *Journal of Banking & Finance* 37(7): 2652-2664.

Batta, G., Chacko, G. and Dharan, B. (2010) A Liquidity-Based Explanation of Convertible Arbitrage Alphas. *Journal of Fixed Income* 20(1): 28-43.

Battalio, R. and Mendenhall, R. (2007) Post-Earnings Announcement Drift: Intra-Day Timing and Liquidity Costs. *Working Paper*. Available online: <https://ssrn.com/abstract=937257>.

Batten, J. and Ellis, C. (1996) Technical trading system performance in the Australian share market: Some empirical evidence. *Asia Pacific Journal of Management* 13(1): 87-99.

Batten, J.A., Khaw, K. and Young, M.R. (2014) Convertible Bond Pricing Models. *Journal of Economic Surveys* 28(5): 775-803.

Baxter, M. and King, R. (1999) Measuring business cycles: Approximate band-pass filters for economic time-series. *Review of Economics and Statistics* 81(4): 575-593.

Baxter, M. and Rennie, A. (1996) *Financial Calculus: An Introduction to Derivative Pricing*. Cambridge, UK: Cambridge University Press.

Bayer, P.J., Geissler, C., Mangum, K. and Roberts, J.W. (2015) Speculators and Middlemen: The Strategy and Performance of Investors in the Housing Market. *Working Paper*. Available online: <https://ssrn.com/abstract=1754003>.

Beaver, W.H. (1966) Financial ratios as predictors of failure. *Journal of Accounting Research* 4: 71-111.

Beaver, W.H., McNichols, M.F. and Rhie, J.-W. (2005) Have financial statements become less informative? Evidence from the ability of financial ratios to predict bankruptcy. *Review of Accounting Studies* 10(1): 93-122.

Bedendo, M., Cathcart, L. and El-Jahel, L. (2007) The Slope of the Term Structure of Credit Spreads: An Empirical Investigation. *Journal of Financial Research* 30(2): 237-257.

Beekhuizen, P., Duyvesteyn, J., Martens, M. and Zomerdijs, C. (2016) Carry Investing on the Yield Curve. *Working Paper*. Available online: <http://ssrn.com/abstract=2808327>.

Bekaert, G. and Wang, X. (2010) Inflation Risk and the Inflation Risk Premium. *Economic Policy* 25(64): 755-806.

Bekaert, G., Wei, M. and Xing, Y. (2007) Uncovered interest rate parity and the term structure. *Journal of International Money and Finance* 26(6): 1038-1069.

Bekkers, N., Doeswijk, R.Q. and Lam, T.W. (2009) Strategic Asset Allocation: Determining the Optimal Portfolio with Ten Asset Classes. *Journal of Wealth Management* 12(3): 61-77.

Belgrade, N. and Benhamou, E. (2004) Reconciling Year on Year and Zero Coupon Inflation Swap: A Market Model Approach. *Working Paper*. Available online: <https://ssrn.com/abstract=583641>.

Belgrade, N., Benhamou, E. and Koehler, E. (2004) A Market Model for Inflation. *Working Paper*. Available online: <https://ssrn.com/abstract=576081>.

Belkin, B., Suchover, S. and Forest, L. (1998) A one-parameter representation of credit risk and transition matrices. *Credit Metrics Monitor* 1(3): 46-56.

Bellamy, D.E. (1994) Evidence of imputation clienteles in the Australian equity market. *Asia Pacific Journal of Management* 11(2): 275-287.

Bellovary, J.L., Giacomino, D.E. and Akers, M.D. (2007) A review of bankruptcy prediction studies: 1930 to present. *Journal of Financial Education* 33(4): 3-41.

Benavides, G. (2009) Predictive Accuracy of Futures Options Implied Volatility: The Case of the Exchange Rate Futures Mexican Peso-US Dollar. *Panorama Económico* 5(9): 55-95.

Ben-David, I., Franzoni, F.A. and Moussawi, R. (2012) ETFs, Arbitrage, and Contagion. *Working Paper*. Available online: http://www.nccr-finrisk.uzh.ch/media/pdf/wp/WP793_B1.pdf.

Ben-David, I., Franzoni, F.A. and Moussawi, R. (2017) Do ETFs Increase Volatility? *Journal of Finance* (forthcoming). Available online: <https://ssrn.com/abstract=1967599>.

Beneish, M.D. and Whaley, R.E. (1996) An Anatomy of the “S&P Game”: The Effects of Changing the Rules. *Journal of Finance* 51(5): 1909-1930.

Benet, B.A. (1990) Commodity futures cross hedging of foreign exchange exposure. *Journal of Futures Markets* 10(3): 287-306.

Bengio, Y. (2009) Learning Deep Architectures for AI. *Foundations and Trends in Machine Learning* 2(1): 1-127.

- Benhamou, E. (2016) Trend Without Hiccups – A Kalman Filter Approach. *Working Paper*. Available online: <https://ssrn.com/abstract=2747102>.
- Benos, E., Brugler, J., Hjalmarsson, E. and Zikes, F. (2017) Interactions among High-Frequency Traders. *Journal of Financial and Quantitative Analysis* 52(4): 1375-1402.
- Benos, E. and Sagade, S. (2016) Price Discovery and the Cross-Section of High-Frequency Trading. *Journal of Financial Markets* 30: 54-77.
- Benth, F. (2003) On arbitrage-free pricing of weather derivatives based on fractional Brownian motion. *Applied Mathematical Finance* 10(4): 303-324.
- Benth, F.E. and Kettler, P.C. (2010) Dynamic copula models for the spark spread. *Quantitative Finance* 11(3): 407-421.
- Benth, F.E., Kholodnyi, V.A. and Laurence, P. (eds.) (2014) *Quantitative Energy Finance: Modeling, Pricing, and Hedging in Energy and Commodity Markets*. New York, NY: Springer-Verlag.
- Benth, F.E. and Saltyte-Benth, J. (2005) Stochastic modelling of temperature variations with a view towards weather derivatives. *Applied Mathematical Finance* 12(1): 53-85.
- Benth, F.E. and Saltyte-Benth, J. (2007) The volatility of temperature and pricing of weather derivatives. *Quantitative Finance* 7(5): 553-561.
- Benth, F., Saltyte-Benth, J. and Koekebakker, S. (2007) Putting a price on temperature. *Scandinavian Journal of Statistics* 34(4): 746-767.
- BenZion, U., Anan, S.D. and Yagil, J. (2005) Box Spread Strategies and Arbitrage Opportunities. *Journal of Derivatives* 12(3): 47-62.
- BenZion, U., Klein, P., Shachmurove, Y. and Yagil, J. (2003) Efficiency differences between the S&P 500 and the Tel-Aviv 25 indices: a moving average comparison. *International Journal of Business* 8(3): 267-284.
- Beracha, E. and Downs, D.H. (2015) Value and Momentum in Commercial Real Estate: A Market-Level Analysis. *Journal of Portfolio Management* 41(6): 48-61.
- Beracha, E. and Skiba, H. (2011) Momentum in Residential Real Estate. *Journal of Real Estate Finance and Economics* 43(3): 229-320.
- Berk, J., Green, R. and Naik, V. (1999) Optimal Investment, Growth Options and Security Returns. *Journal of Finance* 54(5): 1153-1608.

Bernadell, C., Coche, J. and Nyholm, K. (2005) Yield curve prediction for the strategic investor. *Working Paper Series*, No. 472. Frankfurt am Main, Germany: European Central Bank. Available online: <https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp472.pdf?1dc8846d9df4642959c54aa73cee81ad>.

Bernanke, B.S. and Kuttner, K.N. (2005) What Explains the Stock Market's Reaction to Federal Reserve Policy? *Journal of Finance* 60(3): 1221-1257.

Bernard, C., Cui, Z. and Mcleish, D. (2014) Convergence of the discrete variance swap in time-homogeneous diffusion models. *Quantitative Finance Letters* 2(1): 1-6.

Bernard, V.L. and Thomas, J.K. (1989) Post-Earnings-Announcement Drift: Delayed Price Response or Risk Premium? *Journal of Accounting Research* 27: 1-36.

Bernard, V.L. and Thomas, J.K. (1990) Evidence That Stock Prices Do Not Fully Reflect the Implications of Current Earnings for Future Earnings. *Journal of Accounting and Economics* 13(4): 305-340.

Bernardi, S., Leippold, M. and Lohre, H. (2018) Maximum Diversification Strategies along Commodity Risk Factors. *European Financial Management* 24(1): 53-78.

Bernstein, J. (1990) *Jake Bernstein's seasonal futures spreads: high-probability seasonal spreads for futures traders*. Hoboken, NJ: John Wiley & Sons, Inc.

Bessembinder, H. (1992) Systematic risk, hedging pressure, and risk premiums in futures markets. *Review of Financial Studies* 5(4): 637-667.

Bessembinder, H. (1993) An empirical analysis of risk premia in futures markets. *Journal of Futures Markets* 13(6): 611-630.

Bessembinder, H. and Chan, K. (1992) Time-varying risk premia and forecastable returns in futures markets. *Journal of Financial Economics* 32(2): 169-193.

Bessembinder, H., Coughenour, J.F., Seguin, P.J. and Smoller, M.M. (1995) Mean reversion in equilibrium asset prices: evidence from the futures term structure. *Journal of Finance* 50(1): 361-375.

Bessembinder, H. and Maxwell, W. (2008) Markets: Transparency and the Corporate Bond Market. *Journal of Economic Perspectives* 22(2): 217-234.

Bessembinder, H. and Seguin, P.J. (1993) Price volatility, trading volume, and market depth: Evidence from futures markets. *Journal of Financial and Quantitative Analysis* 28(1): 21-39.

- Bester, A., Martinez, V.H. and Rosu, I. (2017) Cash Mergers and the Volatility Smile. *Working Paper*. Available online: <https://ssrn.com/abstract=1364491>.
- Beyaert, A., García-Solanes, J. and Pérez-Castejón, J.J. (2007) Uncovered interest parity with switching regimes. *Economic Modelling* 24(2): 189-202.
- Bharadwaj, A. and Wiggins, J.B. (2001) Box Spread and Put-Call Parity Tests for the S&P 500 Index LEAPS Market. *Journal of Derivatives* 8(4): 62-71.
- Bhattacharya, U., Loos, B., Meyer, S. and Hackethal, A. (2017) Abusing ETFs. *Review of Finance* 21(3): 1217-1250.
- Bhojraj, S. and Swaminathan, B. (2006) Macromomentum: Returns Predictability in International Equity Indices. *Journal of Business* 79(1): 429-451.
- Bhushan, R. (1994) An Informational Efficiency Perspective on the Post-Earnings Announcement Drift. *Journal of Accounting and Economics* 18(1): 45-65.
- Biais, B. and Foucault, T. (2014) HFT and market quality. *Bankers, Markets & Investors* 128: 5-19.
- Biais, B., Foucault, T. and Moinas, S. (2014) Equilibrium Fast Trading. *Working Paper*. Available online: <https://ssrn.com/abstract=2024360>.
- Bianchi, R.J., Drew, M. and Fan, J. (2015) Combining momentum with reversal in commodity futures. *Journal of Banking & Finance* 59: 423-444.
- Biby, J.D., Modukuri, S. and Hargrave, B. (2001) Collateralized Borrowing via Dollar Rolls. In: Fabozzi, F.J. (ed.) *The Handbook of Mortgage-Backed Securities*. (5th ed.) New York, NY: McGraw-Hill, Inc.
- Bielecki, T.R., Brigo, D. and Patras, F. (2011) *Credit Risk Frontiers: Subprime Crisis, Pricing and Hedging, CVA, MBS, Ratings, and Liquidity*. Hoboken, NJ: John Wiley & Sons, Inc.
- Bielecki, T., Jeanblanc, M. and Rutkowski, M. (2007) Hedging of basket credit derivatives in the Credit Default Swap market. *Journal of Credit Risk* 3(1): 91-132.
- Bielecki, T., Vidozzi, A. and Vidozzi, L. (2008) A Markov copulae approach to pricing and hedging of credit index derivatives and ratings triggered step-up bonds. *Journal of Credit Risk* 4(1): 47-76.
- Bieri, D.S. and Chincarini, L.B. (2004) Riding the Yield Curve: Diversification of Strategies. *Working Paper*. Available online: <https://ssrn.com/abstract=547682>.

- Bieri, D.S. and Chincarini, L.B. (2005) Riding the Yield Curve: A Variety of Strategies. *Journal of Fixed Income* 15(2): 6-35.
- Bierwag, G.O. (1979) Dynamic portfolio immunization policies. *Journal of Banking & Finance* 3(1): 23-41.
- Bierwag, G.O. and Kaufman, G. (1978) Bond Portfolio Strategy Simulations: A Critique. *Journal of Financial and Quantitative Analysis* 13(3): 519-525.
- Billingsley, R.S. and Chance, D.M. (1985) Options Market Efficiency and the Box Spread Strategy. *Financial Review* 20(4): 287-301.
- Billingsley, R.S. and Chance, D.M. (1988) The pricing and performance of stock index futures spreads. *Journal of Futures Markets* 8(3): 303-318.
- Bilson, J.F.O. (1981) The “Speculative Efficiency” Hypothesis. *Journal of Business* 54(3): 435-451.
- Birari, A. and Rode, M. (2014) Edge Ratio of Nifty for Last 15 Years on Donchian Channel. *SIJ Transactions on Industrial, Financial & Business Management (IFBM)* 2(5): 247-254.
- Bird, R., Liem, H. and Thorp, S. (2014) Infrastructure: Real Assets and Real Returns. *European Financial Management* 20(4): 802-824.
- Bitsch, F., Buchner, A. and Kaserer, C. (2010) Risk, Return and Cash Flow Characteristics of Infrastructure Fund Investments. *EIB Papers* 15(1): 106-136.
- Bjornson, B. and Carter, C.A. (1997) New Evidence on Agricultural Commodity Return Performance under Time-Varying Risk. *American Journal of Agricultural Economics* 79(3): 918-930.
- Black, F. (1972) Capital Market Equilibrium with Restricted Borrowing. *Journal of Business* 45(3): 444-455.
- Black, F. and Litterman, R. (1991) Asset allocation: Combining investors’ views with market equilibrium. *Journal of Fixed Income* 1(2): 7-18.
- Black, F. and Litterman, R. (1992) Global portfolio optimization. *Financial Analysts Journal* 48(5): 28-43.
- Black, F. and Scholes, M. (1973) The pricing of options and corporate liabilities. *Journal of Political Economy* 81(3): 637-659.
- Blake, M.L. and Catlett, L. (1984) Cross Hedging Hay Using Corn Futures: An Empirical Test. *Western Journal of Agricultural Economics* 9(1): 127-134.

Blanc-Brude, F., Hasan, M. and Whittaker, T. (2016) Benchmarking infrastructure project finance: Objectives, roadmap, and recent progress. *Journal of Alternative Investments* 19(2): 7-18.

Blanc-Brude, F., Whittaker, T. and Wilde, S. (2017) Searching for a listed infrastructure asset class using mean-variance spanning. *Financial Markets and Portfolio Management* 31(2): 137-179.

Blanchard, O.J. and Gali, J. (2007) The Macroeconomic Effects of Oil Shocks: Why are the 2000s So Different from the 1970s? *Working Paper*. Available online: <http://www.nber.org/papers/w13368.pdf>.

Blanchard, O.J. and Riggi, M. (2013) Why are the 2000s so different from the 1970s? A structural interpretation of changes in the macroeconomic effects of oil prices. *Journal of the European Economic Association* 11(5): 1032-1052.

Blank, S.C. (1984) Cross Hedging Australian Cattle. *Australian Journal of Agricultural Economics* 28(2-3): 153-162.

Blitz, D., Huij, J., Lansdorp, S. and Verbeek, M. (2013) Short-term residual reversal. *Journal of Financial Markets* 16(3): 477-504.

Blitz, D., Huij, J. and Martens, M. (2011) Residual Momentum. *Journal of Empirical Finance* 18(3): 506-521.

Blitz, D.C. and van Vliet, P. (2007) The Volatility Effect: Lower Risk without Lower Return. *Journal of Portfolio Management* 34(1): 102-113.

Blitz, D. and Van Vliet, P. (2008) Global Tactical Cross Asset Allocation: Applying Value and Momentum Across Asset Classes. *Journal of Portfolio Management* 35(1): 23-28.

Block, R.L. (2011) *Investing in REITs: Real Estate Investment Trusts*. New York, NY: Bloomberg Press.

Bloesch, J. and Gourio, F. (2015) The effect of winter weather on U.S. economic activity. *Federal Reserve Bank of Chicago, Economic Perspectives* 39(1): 1-20.

Bloom, L., Easley, D. and O'Hara, M. (1994) Market Statistics and Technical Analysis: The Role of Volume. *Journal of Finance* 49(1): 153-181.

Blundell, L. (2006) Infrastructure investment: On the up. *Property Australia* 20(9): 20-22.

Bobey, B. (2010) The Effects of Default Correlation on Corporate Bond Credit Spreads. *Working Paper*. Available online: <https://ssrn.com/abstract=1510170>.

- Bodie, Z. (1983) Commodity Futures as a Hedge against Inflation. *Journal of Portfolio Management* 9(3): 12-17.
- Bodie, Z., Kane, A. and Marcus, A.J. (1996) *Investments*. New York, NY: McGraw-Hill, Inc.
- Bodie, Z. and Rosansky, V.I. (1980) Risk and Return in Commodity Futures. *Financial Analysts Journal* 36(3): 27-39.
- Bogomolov, T. (2013) Pairs trading based on statistical variability of the spread process. *Quantitative Finance* 13(9): 1411-1430.
- Bohlin, S. and Strickland, G. (2004) Climbing the Ladder: How to Manage Risk in Your Bond Portfolio. *American Association of Individual Investors Journal*, July 2004, pp. 5-8.
- Bol, G., Rachev, S.T. and Würth, R. (eds.) (2009) *Risk Assessment: Decisions in Banking and Finance*. Heidelberg, Germany: Physica-Verlag.
- Bollen, N.P.B. and Busse, J.A. (2005) Short-Term Persistence in Mutual Fund Performance. *Review of Financial Studies* 18(2): 569-597.
- Bollen, J. and Mao, H. (2011) Twitter mood as a stock market predictor. *Computer* 44(10): 91-94.
- Bollen, J., Mao, H. and Zeng, X. (2011) Twitter mood predicts the stock market. *Journal of Computational Science* 2(1): 1-8.
- Bollen, N.P.B. and Whaley, R. (2004) Does Net Buying Pressure Affect the Shape of Implied Volatility Functions? *Journal of Finance* 59(2): 711-754.
- Bollerslev, T., Gibson, M. and Zhou, H. (2011) Dynamic estimation of volatility risk premia and investor risk aversion from option-implied and realized volatilities. *Journal of Econometrics* 160(1): 235-245.
- Bologna, P. and Cavallo, L. (2002) Does the Introduction of Index Futures Effectively Reduce Stock Market Volatility? Is the Futures Effect Immediate? Evidence from the Italian Stock Exchange Using GARCH. *Applied Financial Economics* 12(3): 183-192.
- Bond, M.T. and Seiler, M.J. (1998) Real Estate Returns and Inflation: An Added Variable Approach. *Journal of Real Estate Research* 15(3): 327-338.
- Bondarenko, O. (2014) Why Are Put Options So Expensive? *Quarterly Journal of Finance* 4(3): 1450015.
- Booth, L.D. (1987) The dividend tax credit and Canadian ownership objectives. *Canadian Journal of Economics* 20(2): 321-339.

Booth, L.D. and Johnston, D.J. (1984) The ex-dividend day behavior of Canadian stock prices: Tax changes and clientele effects. *Journal of Finance* 39(2): 457-476.

Booth, J.R., Smith, R.L. and Stolz, R.W. (1984) The Use of Interest Rate Futures by Financial Institutions. *Journal of Bank Research* 15(1): 15-20.

Borovkova, S. and Geman, H. (2006) Seasonal and stochastic effects in commodity forward curves. *Review of Derivatives Research* 9(2): 167-186.

Bos, R. (2000) *Index Calculation Primer*. New York, NY: Standard and Poor's Quantitative Services.

Bos, M., Carter, S. and Skiba, P.M. (2012) The Pawn Industry and Its Customers: The United States and Europe. *Working Paper*. Available online: <https://ssrn.com/abstract=2149575>.

Boscher, H. and Ward, I. (2002) Long or short in CDOs. *Risk*, June 2002, pp. 125-129.

Bossu, S. (2006) Introduction to Variance Swaps. *Wilmott Magazine*, March 2006, pp. 50-55.

Boudoukh, J., Richardson, M. and Whitelaw, R.F. (1994) Industry Returns and the Fisher Effect. *Journal of Finance* 49(5): 1595-1615.

Boudoukh, J., Whitelaw, R., Richardson, M. and Stanton, R. (1997) Pricing Mortgage-Backed Securities in a Multifactor Interest Rate Environment: A Multivariate Density Estimation Approach. *Review of Financial Studies* 10(2): 405-446.

Boulos, N. and Swanson, P.E. (1994) Interest Rate Parity in Times of Turbulence: The Issue Revisited. *Journal of Financial and Strategic Decisions* 7(2): 43-52.

Bouman, F.J.A. and Houtman, R. (1988) Pawnbroking as an Instrument of Rural Banking in the Third World. *Economic Development and Cultural Change* 37(1): 69-89.

Bouoiyour, J., Selmi, R. and Tiwari, A.K. (2015) Is Bitcoin business income or speculative foolery? New ideas through an improved frequency domain analysis. *Annals of Financial Economics* 10(1): 1-23.

Bouoiyour, J., Selmi, R., Tiwari, A.K. and Olayeni, O.R. (2016) What drives Bitcoin price? *Economics Bulletin* 36(2): 843-850.

- Bouri, E., Gupta, R., Tiwari, A.K. and Roubaud, D. (2017a) Does Bitcoin hedge global uncertainty? Evidence from wavelet-based quantile-in-quantile regressions. *Finance Research Letters* 23: 87-95.
- Bouri, E., Molnár, P., Azzi, G., Roubaud, D. and Hagfors, L.I. (2017b) On the hedge and safe haven properties of Bitcoin: Is it really more than a diversifier? *Finance Research Letters* 20: 192-198.
- Bouzoubaa, M. and Osseiran, A. (2010) *Exotic options and hybrids: a Guide to Structuring, Pricing and Trading*. Chichester, UK: John Wiley & Sons, Ltd.
- Bowen, D.A. and Hutchinson, M.C. (2016) Pairs trading in the UK equity market: Risk and return. *European Journal of Finance* 22(14): 1363-1387.
- Bowen, D., Hutchinson, M.C. and O'Sullivan, N. (2010) High frequency equity pairs trading: Transaction costs, speed of execution and patterns in returns. *Journal of Trading* 5(3): 31-38.
- Bowsher, N. (1979) Repurchase Agreements. *Federal Reserve Bank of St. Louis Review* 61(9): 17-22.
- Boyarchenko, N., Fuster, A. and Lucca, D.O. (2014) Understanding Mortgage Spreads. *Federal Reserve Bank of New York Staff Reports*, No. 674. Available online:
https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr674.pdf.
- Boyd, J.H., Hu, J. and Jagannathan, R. (2005) The Stock Market's Reaction to Unemployment News: Why Bad News Is Usually Good for Stocks. *Journal of Finance* 60(2): 649-672.
- Boyd, N.E. and Mercer, J.M. (2010) Gains from Active Bond Portfolio Management Strategies. *Journal of Fixed Income* 19(4): 73-83.
- Boyle, P.P. (1978) Immunization under stochastic models of the term structure. *Journal of the Institute of Actuaries* 105(2): 177-187.
- Bozdog, D., Florescu, I., Khashanah, K. and Wang, J. (2011) Rare Events Analysis of High-Frequency Equity Data. *Wilmott Magazine* 2011(54): 74-81.
- Bozic, M. and Fortenbery, T.R. (2012) Creating Synthetic Cheese Futures: A Method for Matching Cash and Futures Prices in Dairy. *Journal of Agribusiness* 30(2): 87-102.
- Brandvold, M., Molnár, P., Vagstad, K. and Valstad, O.C.A. (2015) Price discovery on Bitcoin exchanges. *Journal of International Financial Markets, Institutions and Money* 36: 18-35.

Branger, N. and Schlag, C. (2004) Why is the Index Smile So Steep? *Review of Finance* 8(1): 109-127.

Brazil, A.J. (1988) Citicorp's mortgage valuation model: Option-adjusted spreads and option-based durations. *Journal of Real Estate Finance and Economics* 1(2): 151-162.

Breedon, D.T. and Litzenberger, R.H. (1978) Prices of state-contingent claims implicit in option prices. *Journal of Business* 51(4): 621-651.

Brennan, M.J. and Schwartz, E.S. (1977) Convertible Bonds: Valuation and Optimal Strategies for Call and Conversion. *Journal of Finance* 32(5): 1699-1715.

Brennan, M.J. and Schwartz, E.S. (1985) Determinants of GNMA Mortgage Prices. *Real Estate Economics* 13(3): 209-228.

Brennan, M.J. and Schwartz, E.S. (1988) The case for convertibles. *Journal of Applied Corporate Finance* 1(2): 55-64.

Brenner, M., Subrahmanyam, M.G. and Uno, J. (1989) Stock index futures arbitrage in the Japanese markets. *Japan and the World Economy* 1(3): 303-330.

Brezigar-Masten, A. and Masten, P. (2012) CART-based selection of bankruptcy predictors for the logit model. *Expert Systems with Applications* 39(11): 10153-10159.

Brière, M., Oosterlinck, K. and Szafarz, A. (2015) Virtual currency, tangible return: Portfolio diversification with bitcoin. *Journal of Asset Management* 16(6): 365-373.

Briys, E. and Solnik, B. (1992) Optimal currency hedge ratios and interest rate risk. *Journal of International Money and Finance* 11(5): 431-445.

Broadie, M. and Jain, A. (2008) The effect of jumps and discrete sampling on volatility and variance swaps. *International Journal of Theoretical and Applied Finance* 11(8): 761-797.

Brock, W., Lakonishock, J. and LeBaron, B. (1992) Simple technical trading rules and the stochastic properties of stock returns. *Journal of Finance* 47(5): 1731-1764.

Brockett, P., Golden, L.L., Wen, M. and Yang, C. (2010) Pricing weather derivatives using the indifference pricing approach. *North American Actuarial Journal* 13(3): 303-315.

Brockett, P.L., Wang, M. and Yang, C. (2005) Weather Derivatives And Weather Risk Management. *Risk Management and Insurance Review* 8(1): 127-140.

Brody, D., Syroka, J. and Zervos, M. (2002) Dynamical pricing of weather derivatives. *Quantitative Finance* 2(3): 189-198.

Brogaard, J. and Garriott, C. (2018) High-Frequency Trading Competition. *Working Paper*. Available online: <https://ssrn.com/abstract=2435999>.

Brogaard, J., Hagströmer, B., Nordén, L. and Riordan, R. (2015) Trading Fast and Slow: Colocation and Liquidity. *Review of Financial Studies* 28(12): 3407-3443.

Brogaard, J., Hendershott, T. and Riordan, R. (2014) High-Frequency Trading and Price Discovery. *Review of Financial Studies* 27(8): 2267-2306.

Brooks, J. (2017) A Half Century of Macro Momentum. *Working Paper*. Available online: <https://www.aqr.com/-/media/AQR/Documents/Insights/White-Papers/A-Half-Century-of-Macro-Momentum.pdf>.

Brooks, C. and Chong, J. (2001) The Cross-Currency Hedging Performance of Implied Versus Statistical Forecasting Models. *Journal of Futures Markets* 21(11): 1043-1069.

Brooks, C., Davies, R.J. and Kim, S.S. (2007) Cross Hedging with Single Stock Futures. *Assurances et Gestion des Risques* 74(4): 473-504.

Brooks, C., Henry, O.T. and Persaud, G. (2002) The Effect of Asymmetries on Optimal Hedge Ratios. *Journal of Business* 75(2): 333-352.

Brooks, J. and Moskowitz, T.J. (2017) Yield Curve Premia. *Working Paper*. Available online: <https://ssrn.com/abstract=2956411>.

Brown, D. (1999) The Determinants of Expected Returns on Mortgage-backed Securities: An Empirical Analysis of Option-adjusted Spreads. *Journal of Fixed Income* 9(2): 8-18.

Brown, P. and Clarke, A. (1993) The Ex-Dividend Day Behaviour of Australian Share Prices Before and After Dividend Imputation. *Australian Journal of Management* 18(1): 1-40.

Brown, D.C., Davies, S. and Ringgenberg, M. (2018) ETF Arbitrage and Return Predictability. *Working Paper*. Available online: <https://ssrn.com/abstract=2872414>.

- Brown, S.J., Goetzmann, W., Ibbotson, R.G. and Ross, S.A. (1992) Survivorship Bias in Performance Studies. *Review of Financial Studies* 5(4): 553-580.
- Brown, S.J., Grundy, B.D., Lewis, C.M. and Verwijmeren, P. (2012) Convertibles and hedge funds as distributors of equity exposure. *Review of Financial Studies* 25(10): 3077-3112.
- Brown, K.C. and Raymond, M.V. (1986) Risk arbitrage and the prediction of successful corporate takeovers. *Financial Management* 15(3): 54-63.
- Browne, S. (2000) Risk-constrained dynamic active portfolio management. *Management Science* 46(9): 1188-1199.
- Brück, E. and Fan, Y. (2017) Smart Beta In Global Government Bonds And Its Risk Exposure. *Working Paper*. Available online: https://www.cfasociety.org/France/Documents/QuantAwards2017_Etienne%20BRUECK%20and%20Yuanting%20FAN_EDHEC.pdf.
- Bruder, B., Dao, T.-L., Richard, R.-J. and Roncalli, T. (2013) Trend Filtering Methods for Momentum Strategies. *Working Paper*. Available online: <https://ssrn.com/abstract=2289097>.
- Brunnermeier, M.K., Nagel, S. and Pedersen, L.H. (2008) Carry Trades and Currency Crashes. *NBER Macroeconomics Annual* 23(1): 313-347.
- Bu, Q. and Lacey, N. (2007) Exposing Survivorship Bias in Mutual Fund Data. *Journal of Business and Economics Studies* 13(1): 22-37.
- Budish, E., Cramton, P. and Shim, J. (2015) The High-Frequency Trading Arms Race: Frequent Batch Auctions as a Market Design Response. *Quarterly Journal of Economics* 130(4): 1547-1621.
- Buetow, G.W. and Henderson, B.J. (2012) An empirical analysis of exchange-traded funds. *Journal of Portfolio Management* 38(4): 112-127.
- Buetow, G.W. and Henderson, B.J. (2016) The VIX Futures Basis: Determinants and Implications. *Journal of Portfolio Management* 42(2): 119-130.
- Bühler, W. and Kempf, A. (1995) DAX index futures: Mispricing and arbitrage in German markets. *Journal of Futures Markets* 15(7): 833-859.
- Bundgaard, J. (2013) Coordination Rules as a Weapon in the War against Cross-Border Tax Arbitrage – The Case of Hybrid Entities and Hybrid Financial Instruments. *Bulletin for International Taxation*, April/May 2013, pp. 200-204.
- Buraschi, A. and Jiltsov, A. (2005) Inflation Risk Premia and the Expectations Hypothesis. *Journal of Financial Economics* 75(2): 429-490.

Burnside, C., Eichenbaum, M., Kleshchelski, I. and Rebelo, S. (2011) Do peso problems explain the returns to the carry trade? *Review of Financial Studies* 24(3): 853-891.

Burnside, C., Eichenbaum, M. and Rebelo, S. (2007) The Returns to Currency Speculation in Emerging Markets. *American Economic Review* 97(2): 333-338.

Burnside, C., Eichenbaum, M. and Rebelo, S. (2008) Carry Trade: The Gains of Diversification. *Journal of the European Economic Association* 6(2/3): 581-588.

Burnside, C., Eichenbaum, M. and Rebelo, S. (2011) Carry trade and momentum in currency markets. *Annual Review of Financial Economics* 3: 511-535.

Burtshell, X., Gregory, J. and Laurent, J.-P. (2009) A comparative analysis of CDO pricing models under the factor copula framework. *Journal of Derivatives* 16(4): 9-37.

Busch, T., Christensen, B.J. and Nielsen, M.Ø. (2011) The Role of Implied Volatility in Forecasting Future Realized Volatility and Jumps in Foreign Exchange, Stock, and Bond Markets. *Journal of Econometrics* 160(1): 48-57.

Buser, S.A. and Hess, P.J. (1986) Empirical determinants of the relative yields on taxable and tax-exempt securities. *Journal of Financial Economics* 17(2): 335-355.

Butterworth, D. and Holmes, P. (2010) Mispricing in stock index futures contracts: evidence for the FTSE 100 and FTSE mid 250 contracts. *Applied Economics Letters* 7(12): 795-801.

Buttimer, R.J., Hyland, D.C. and Sanders, A.B. (2005) REITs, IPO Waves, and Long-Run Performance. *Real Estate Economics* 33(1): 51-87.

Caginalp, G., DeSantis, M. and Sayrak, A. (2014) The nonlinear price dynamics of US equity ETFs. *Journal of Econometrics* 183(2): 193-201.

Calamos, N.P. (2003) *Convertible Arbitrage: Insights and Techniques for Successful Hedging*. Hoboken, NJ: John Wiley & Sons, Inc.

Caldeira, J. and Moura, G.V. (2013) Selection of a portfolio of pairs based on cointegration: A statistical arbitrage strategy. *Working Paper*. Available online: <https://ssrn.com/abstract=2196391>.

Callaghan, S.R. and Barry, C.B. (2003) Tax-induced trading of equity securities: Evidence from the ADR market. *Journal of Finance* 58(4): 1583-1611.

Callejón, A.M., Casado, A.M., Fernández, M.A. and Peláez, J.I. (2013) A System of Insolvency Prediction for industrial companies using a financial alternative model with neural networks. *International Journal of Computational Intelligence Systems* 6(1): 29-37.

Campbell, J.Y. (1991) A Variance Decomposition for Stock Returns. *Economic Journal* 101(405): 157-179.

Campbell, J.Y., Chan, Y.L. and Viceira, L.M. (2003) A multivariate model of strategic asset allocation. *Journal of Financial Economics* 67(1): 41-80.

Campbell, S.D. and Diebold, F.X. (2005) Weather forecasting for weather derivatives. *Journal of the American Statistical Association* 100(469): 6-16.

Campbell, J.Y., Hilscher, J. and Szilagyi, J. (2008) In Search of Distress Risk. *Journal of Finance* 63(6): 2899-2939.

Campbell, J.Y., Shiller, R.J. and Viceira, L.M. (2009) Understanding Inflation-Indexed Bond Markets. In: Romer, D. and Wolfers, J. (eds.) *Brookings Papers on Economic Activity*. Washington, DC: Brookings Institution Press, pp. 79-120.

Campbell, J.Y., Sunderam, A. and Viceira, L.M. (2017) Inflation Bets or Deflation Hedges? The Changing Risks of Nominal Bonds. *Critical Finance Review* 6(2): 263-301.

Campbell, J.Y. and Viceira, L.M. (2004) Long-Horizon Mean-Variance Analysis: A User Guide. *Working Paper*. Available online: http://www.people.hbs.edu/lviceira/faj_cv_userguide.pdf.

Campbell, J.Y. and Viceira, L.M. (2005) The Term Structure of the Risk: Return Trade-Off. *Financial Analysts Journal* 61(1): 34-44.

Canina, L. and Figlewski, S. (1993) The Informational Content of Implied Volatility. *Review of Financial Studies* 6(3): 659-681.

Cao, C., Chen, Y., Liang, B. and Lo, A.W. (2013) Can hedge funds time market liquidity? *Journal of Financial Economics* 109(2): 493-516.

Cao, C., Goldie, B., Liang, B. and Petrasek, L. (2016) What Is the Nature of Hedge Fund Manager Skills? Evidence from the Risk-Arbitrage Strategy. *Journal of Financial and Quantitative Analysis* 51(3): 929-957.

Cao, M. and Wei, J. (2000) Pricing the weather. *Risk*, May 2000, pp. 67-70.

Cao, M. and Wei, J. (2004) Weather derivatives valuation and market price of weather risk. *Journal of Futures Markets* 24(11): 1065-1089.

- Caplin, A. and Leahy, J. (2011) Trading Frictions and House Price Dynamics. *Journal of Money, Credit and Banking* 43(7): 283-303.
- Capozza, D.R., Hendershott, P.H. and Mack, C. (2004) An Anatomy of Price Dynamics in Illiquid Markets: Analysis and Evidence from Local Housing Markets. *Real Estate Economics* 32(1): 1-32.
- Carhart, M.M. (1997) Persistence in mutual fund performance. *Journal of Finance* 52(1): 57-82.
- Carhart, M.M., Carpenter, J.N., Lynch, A.W. and Musto, D.K. (2002) Mutual Fund Survivorship. *Review of Financial Studies* 15(5): 1439-1463.
- Carmona, R. and Crépey, S. (2010) Particle methods for the estimation of credit portfolio loss distributions. *International Journal of Theoretical and Applied Finance* 13(4): 577-602.
- Carmona, R. and Durrleman, V. (2003) Pricing and Hedging Spread Options. *SIAM Review* 45(4): 627-685.
- Carr, P. and Javaheri, A. (2005) The forward PDE for European options on stocks with fixed fractional jumps. *International Journal of Theoretical and Applied Finance* 8(2): 239-253.
- Carr, P. and Lee, R. (2007) Realized volatility and variance: Options via swaps. *Risk* 20(5): 76-83.
- Carr, P. and Lee, R. (2009) Volatility Derivatives. *Annual Review of Financial Economics* 1: 319-339.
- Carr, P., Lee, R. and Wu, L. (2012) Variance swaps on time-changed Lévy processes. *Finance and Stochastics* 16(2): 335-355.
- Carr, P. and Wu, L. (2009) Variance risk premiums. *Review of Financial Studies* 22(3): 1311-1341.
- Carr, P. and Wu, L. (2016) Analyzing volatility risk and risk premium in option contracts: A new theory. *Journal of Financial Economics* 120(1): 1-20.
- Carrasco, C.G. (2007) Studying the properties of the correlation trades. *Working Paper*. Available online: https://mpira.ub.uni-muenchen.de/22318/1/MPRA_paper_22318.pdf.
- Carrion, A. (2013) Very fast money: High-frequency trading on the NASDAQ. *Journal of Financial Markets* 16(4): 680-711.
- Carrion, A. and Kolay, M. (2017) Trade Signing in Fast Markets. *Working Paper*. Available online: <https://ssrn.com/abstract=2489868>.

- Carron, A.S. and Hogan, M. (1988) The option valuation approach to mortgage pricing. *Journal of Real Estate Finance and Economics* 1(2): 131-149.
- Cartea, A. and Figueroa, M. (2005) Pricing in electricity markets: a mean reverting jump diffusion model with seasonality. *Applied Mathematical Finance* 12(4): 313-335.
- Cartea, A. and Pedraz, C.G. (2012) How Much Should We Pay for Interconnecting Electricity Markets? A Real Options Approach. *Energy Economics* 34(1): 14-30.
- Carter, C., Rausser, G. and Schmitz, A. (1983) Efficient asset portfolios and the theory of normal backwardation. *Journal of Political Economy* 91(2): 319-331.
- Casassus, J. and Collin-Dufresne, P. (2005) Stochastic convenience yield implied from commodity futures and interest rates. *Journal of Finance* 60(5): 2283-2331.
- Case, K.E. and Shiller, R.J. (1987) Prices of Single Family Homes since 1970: New Indexes for Four Cities. *Federal Reserve Bank of Boston, New England Economic Review*, September-October 1987, pp. 45-56.
- Case, K.E. and Shiller, R.J. (1989) The Efficiency of the Market for Single-Family Homes. *American Economic Review* 79(1): 125-137.
- Case, K.E. and Shiller, R.J. (1990) Forecasting Prices and Excess Returns in the Housing Market. *Real Estate Economics* 18(3): 253-273.
- Caskey, J.P. (1991) Pawnbroking in America: the Economics of a Forgotten Credit Market. *Journal of Money, Credit and Banking* 23(1): 85-99.
- Cassano, M. and Sick, G. (2013) Valuation of a spark spread: an LM6000 power plant. *European Journal of Finance* 18(7-8): 689-714.
- Castelino, M.G and Vora, A. (1984) Spread volatility in commodity futures: The length effect. *Journal of Futures Markets* 4(1): 39-46.
- Cavaglia, S. and Vadim, M. (2002) Cross-Industry, Cross Country Allocation. *Financial Analysts Journal* 58(6): 78-97.
- Cecchetti, S.G., Cumby, R.E. and Figlewski, S. (1988) Estimation of the Optimal Futures Hedge. *Review of Economics and Statistics* 70(4): 623-630.
- Čerović, S. and Pepić, M. (2011) Interest rate derivatives in developing countries in Europe. *Perspectives of Innovation in Economics and Business* 9(3): 38-42.

- Čerović, S., Pepić, M., Čerović, S. and Čerović, N. (2014) Duration and convexity of bonds. *Singidunum Journal of Applied Sciences* 11(1): 53-66.
- Cerrato, M. and Djennad, A. (2008) Dynamic Option Adjusted Spread and the Value of Mortgage Backed Securities. *Working Paper*. Available online: https://www.gla.ac.uk/media/media_71226_en.pdf.
- Chaboud, A.P. and Wright, J.H. (2005) Uncovered interest parity: it works, but not for long. *Journal of International Economics* 66(2): 349-362.
- Chaiyapo, N. and Phewchean, N. (2017) An application of Ornstein-Uhlenbeck process to commodity pricing in Thailand. *Advances in Difference Equations* 2017: 179.
- Chakravarty, S., Gulen, H. and Mayhew, S. (2004) Informed Trading in Stock and Option Markets. *Journal of Finance* 59(3): 1235-1257.
- Chalmers, J.M.R. (1998) Default Risk Cannot Explain the Muni Puzzle: Evidence from Municipal Bonds that are Secured by U.S. Treasury Obligations. *Review of Financial Studies* 11(2): 281-308.
- Chambers, D.R., Foy, M., Liebner, J. and Lu, Q. (2014) Index Option Returns: Still Puzzling. *Review of Financial Studies* 27(6): 1915-1928.
- Chan, E.P. (2013) *Algorithmic Trading: Winning Strategies and Their Rationale*. Hoboken, NJ: John Wiley & Sons, Inc.
- Chan, A.W.H. and Chen, N.-F. (2007) Convertible bond underpricing: Renegotiable covenants, seasoning, and convergence. *Management Science* 53(11): 1793-1814.
- Chan, K.C. and Chen, N.-F. (1991) Structural and Return Characteristics of Small and Large Firms. *Journal of Finance* 46(4): 1467-1484.
- Chan, K. and Chung, Y.P. (1993) Intraday relationships among index arbitrage, spot and futures price volatility, and spot market volume: A transactions data test. *Journal of Banking & Finance* 17(4): 663-687.
- Chan, K.C., Hendershott, P.H. and Sanders, A.B. (1990) Risk and Return on Real Estate: Evidence from Equity REITs. *AREUEA Journal* 18(4): 431-452.
- Chan, K.C., Jegadeesh, N. and Lakonishok, J. (1996) Momentum Strategies. *Journal of Finance* 51(5): 1681-1713.
- Chan, S.H., Leung, W.K. and Wang, K. (1998) Institutional Investment in REITs: Evidence and Implications. *Journal of Real Estate Research* 16(3): 357-374.

- Chan, K.F., Treepongkaruna, S., Brooks, R. and Gray, S. (2011) Asset market linkages: Evidence from financial, commodity and real estate assets. *Journal of Banking & Finance* 35(6): 1415-1426.
- Chance, D. (1994) *Managed Futures and Their Role in Investment Portfolios*. Charlottesville, VA: The Research Foundation of the Institute of Chartered Financial Analysts.
- Chance, D.M. and Jordan, J.V. (1996) Duration, Convexity, and Time as Components of Bond Returns. *Journal of Fixed Income* 6(2): 88-96.
- Chandra, P. (2003) Sigmoidal Function Classes for Feedforward Artificial Neural Networks. *Neural Processing Letters* 18(3): 205-215.
- Chang, E.C., Cheng, J.W. and Pinegar, J.M. (1999) Does Futures Trading Increase Stock Market Volatility? The Case of the Nikkei Stock Index Futures Exchange. *Journal of Banking & Finance* 23(5): 727-753.
- Chang, J.S. and Fang, H. (1990) An intertemporal measure of hedging effectiveness. *Journal of Futures Markets* 10(3): 307-321.
- Chang, R.P., Ko, K.-C., Nakano, S. and Rhee, S.G. (2016) Residual Momentum and Investor Underreaction in Japan. *Working Paper*. Available online: <http://sfm.finance.nsysu.edu.tw/php/Papers/CompletePaper/134-1136665035.pdf>.
- Chaput, J.S. and Ederington, L.H. (2003) Option Spread and Combination Trading. *Journal of Derivatives* 10(4): 70-88.
- Chaput, J.S. and Ederington, L.H. (2005) Vertical Spread Design. *Journal of Derivatives* 12(3): 28-46.
- Chaput, J.S. and Ederington, L.H. (2008) Ratio Spreads. *Journal of Derivatives* 15(3): 41-57.
- Charupat, N. and Miu, P. (2011) The Pricing and Performance of Leveraged Exchange-Traded Funds. *Journal of Banking & Finance* 35(4): 966-977.
- Chatterjee, S., Dhillon, U.S. and Ramírez, G.G. (1996) Resolution of Financial Distress: Debt Restructurings via Chapter 11, Prepackaged Bankruptcies, and Workouts. *Financial Management* 25(1): 5-18.
- Chaudhuri, A. and De, K. (2011) Fuzzy support vector machine for bankruptcy prediction. *Applied Soft Computing* 11(2): 2472-2486.
- Chaumont, S., Imkeller, P. and Müller, M. (2006) Equilibrium Trading of Climate and Weather Risk and Numerical Simulation in a Markovian Framework. *Stochastic Environment Research and Risk Assessment* 20(3): 184-205.

Chava, S. and Jarrow, R.A. (2004) Bankruptcy Prediction with Industry Effects. *Review of Finance* 8(4): 537-569.

Chaves, D.B. (2012) Eureka! A Momentum Strategy that Also Works in Japan. *Working Paper*. Available online:
<https://ssrn.com/abstract=1982100>.

Chaves, D.B. and Viswanathan, V. (2016) Momentum and mean-reversion in commodity spot and futures markets. *Journal of Commodity Markets* 3(1): 39-53.

Che, Y.S. (2016) *A study on the risk and return of option writing strategies* (Ph.D. Thesis). *HKBU Institutional Repository. Open Access Theses and Dissertations*. 187. Hong Kong, China: Hong Kong Baptist University. Available online: https://repository.hkbu.edu.hk/etd_oa/187/.

Che, S.Y.S. and Fung, J.K.W. (2011) The performance of alternative futures buy-write strategies. *Journal of Futures Markets* 31(12): 1202-1227.

Cheah, E.T. and Fry, J. (2015) Speculative Bubbles in Bitcoin markets? An Empirical Investigation into the Fundamental Value of Bitcoin. *Economics Letters* 130: 32-36.

Chen, M.Y. (2014) A high-order fuzzy time series forecasting model for internet stock trading. *Future Generation Computer Systems* 37: 461-467.

Chen, H.J., Chen, S.J., Chen, Z. and Li, F. (2017) Empirical Investigation of an Equity Pairs Trading Strategy. *Management Science* (forthcoming). DOI: <https://doi.org/10.1287/mnsc.2017.2825>.

Chen, A.H.Y., Chen, K.C. and Howell, S. (1999) An analysis of dividend enhanced convertible stocks. *International Review of Economics and Finance* 8(3): 327-338.

Chen, T.F., Chung, S.L. and Tsai, W.C. (2016) Option-Implied Equity Risk and the Cross-Section of Stock Returns. *Financial Analysts Journal* 72(6): 42-55.

Chen, S.-J., Hsieh, C., Vines, T.W. and Chiou, S. (1998) Macroeconomic Variables, Firm-Specific Variables and Returns to REITs. *Journal of Real Estate Research* 16(3): 269-278.

Chen, A.H., Kang, J. and Yang, B. (2005) A Model for Convexity-Based Cross-Hedges with Treasury Futures. *Journal of Fixed Income* 15(3): 68-79.

Chen, L., Lesmond, D.A. and Wei, J. (2007) Corporate Yield Spreads and Bond Liquidity. *Journal of Finance* 62(1): 119-149.

- Chen, A.S., Leung, M.T. and Daouk, H. (2003) Application of neural networks to an emerging financial market: Forecasting and trading the Taiwan Stock Index. *Computers & Operations Research* 30(6): 901-923.
- Chen, R.-R., Liu, B. and Cheng, X. (2010) Pricing the Term Structure of Inflation Risk Premia: Theory and Evidence from TIPS. *Journal of Empirical Finance* 17(4): 702-721.
- Chen, Z., Mao, C.X. and Wang, Y. (2010) Why firms issue callable bonds: Hedging investment uncertainty. *Journal of Corporate Finance* 16(4): 588-607.
- Chen, G., Roberts, M.C. and Thraen, C.S. (2006) Managing dairy profit risk using weather derivatives. *Journal of Agricultural and Resource Economics* 31(3): 653-666.
- Chen, A.H. and Selender, A.K. (1994) Determination of Swap Spreads: An Empirical Analysis. *Cox School of Business Historical Working Papers*, No. 170. Dallas, TX: Southern Methodist University. Available online: http://scholar.smu.edu/business_workingpapers/170.
- Chen, F. and Sutcliffe, C. (2007) Better Cross Hedges With Composite Hedging? Hedging Equity Portfolios Using Financial and Commodity Futures. *European Journal of Finance* 18(6): 575-595.
- Chen, H.-L., Yang, B., Wang, G., Liu, J., Xu, X., Wang, S.-J. and Liu D.-Y. (2011) A novel bankruptcy prediction model based on an adaptive fuzzy k-nearest neighbor method. *Knowledge-Based Systems* 24(8): 1348-1359.
- Cheng, M. and Madhavan, A. (2010) The Dynamics of Leveraged and Inverse Exchange-Traded Funds. *Journal of Investment Management* 7(4): 43-62.
- Cheng, I.-H. and Xiong, W. (2013) Why Do Hedgers Trade so Much? *Working Paper*. Available online: <https://ssrn.com/abstract=2358762>.
- Chernenko, S. and Sunderam, A. (2016) Liquidity Transformation in Asset Management: Evidence from the Cash Holdings of Mutual Funds. *Working Paper*. Available online: <http://www.nber.org/papers/w22391>.
- Chernov, M. and Mueller, P. (2012) The Term Structure of Inflation Expectations. *Journal of Financial Economics* 106(2): 367-394.
- Cherry, J. (2004) The Limits of Arbitrage: Evidence from Exchange Traded Funds. *Working Paper*. Available online: <https://ssrn.com/abstract=628061>.

- Cheung, W. (2010) The Black-Litterman model explained. *Journal of Asset Management* 11(4): 229-243.
- Cheung, C.S., Kwan, C.C.Y. and Sarkar, S. (2010) Bond Portfolio Laddering: A Mean-Variance Perspective. *Journal of Applied Finance* 20(1): 103-109.
- Cheung, C.W., Kwan, C.C. and Yip, P.C. (1990) The hedging effectiveness of options and futures: a mean-gini approach. *Journal of Futures Markets* 10(1): 61-73.
- Cheung, A., Roca, E. and Su, J.-J. (2015) Crypto-currency Bubbles: an Application of the Phillips-Shi-Yu (2013) Methodology on Mt. Gox Bitcoin Prices. *Applied Economics* 47(23): 2348-2358.
- Chiang, T.C. and Jiang, C.X. (1995) Foreign exchange returns over short and long horizons. *International Review of Economics & Finance* 4(3): 267-282.
- Chiang, M.H. and Wang, C.Y. (2002) The Impact of Futures Trading on Spot Index Volatility: Evidence from Taiwan Index Futures. *Applied Economics Letters* 9(6): 381-385.
- Chidambaran, N.K., Fernando, C.S. and Spindt, P.A. (2001) Credit enhancement through financial engineering: Freeport McMoRan's gold-denominated depositary shares. *Journal of Financial Economics* 60(2-3): 487-528.
- Chin, J.Y.F., Prevost, A.K. and Gottesman, A.A. (2002) Contrarian investing in a small capitalization market: Evidence from New Zealand. *Financial Review* 37(3): 421-446.
- Chinco, A. and Mayer, C. (2012) Distant speculators and asset bubbles in the housing market. *Working Paper*. Available online: http://www.econ.yale.edu/~shiller/behfin/2012-04-11/Chinco_Mayer.pdf.
- Chinloy, P. (1989) The Probability of Prepayment. *Journal of Real Estate Finance and Economics* 2(4): 267-283.
- Cho, M. (1996) House Price Dynamics: A Survey of Theoretical and Empirical Issues. *Journal of Housing Research* 7(2): 145-172.
- Choi, M.S. (2011) Momentary exchange rate locked in a triangular mechanism of international currency. *Applied Economics* 43(16): 2079-2087.
- Choi, D., Getmansky, M., Henderson, B. and Tookes, H. (2010) Convertible bond arbitrageurs as suppliers of capital. *Review of Financial Studies* 23(6): 2492-2522.

- Choi, D., Getmansky, M. and Tookes, H. (2009) Convertible bond arbitrage, liquidity externalities, and stock prices. *Journal of Financial Economics* 91(2): 227-251.
- Choi, H.I., Kwon, S.-H., Kim, J.Y. and Jung, D.-S. (2014) Commodity Futures Term Structure Model. *Bulletin of the Korean Mathematical Society* 51(6): 1791-1804.
- Chong, E., Han, C. and Park, F.C. (2017) Deep learning networks for stock market analysis and prediction: Methodology, data representations, and case studies. *Expert Systems with Applications* 83: 187-205.
- Chong, J. and Miffre, J. (2010) Conditional Correlation and Volatility in Commodity Futures and Traditional Asset Markets. *Journal of Alternative Investments* 12(3): 61-75.
- Chordia, T., Goyal, A., Sadka, G., Sadka, R. and Shivakumar, L. (2009) Liquidity and the Post-Earnings-Announcement Drift. *Financial Analysts Journal* 65(4): 18-32.
- Chordia, T. and Shivakumar, L. (2002) Momentum, Business Cycle, and Time-Varying Expected Returns. *Journal of Finance* 57(2): 985-1019.
- Chordia, T. and Shivakumar, L. (2006) Earnings and price momentum. *Journal of Financial Economics* 80(3): 627-656.
- Choroś-Tomczyk, B., Härdle, W.K. and Okhrin, O. (2016) A semiparametric factor model for CDO surfaces dynamics. *Journal of Multivariate Analysis* 146: 151-163.
- Choudhry, M. (2004) The credit default swap basis: analysing the relationship between cash and synthetic credit markets. *Journal of Derivatives Use, Trading and Regulation* 10(1): 8-26.
- Choudhry, M. (2006) Revisiting the Credit Default Swap Basis: Further Analysis of the Cash and Synthetic Credit Market Differential. *Journal of Structured Finance* 11(4): 21-32.
- Choudhry, M. (2007) Trading the CDS Basis: Illustrating Positive and Negative Basis Arbitrage Trades. *Journal of Trading* 2(1): 79-94.
- Christensen, M. (1999) Duration and Convexity for Bond Portfolios. *Finanzmarkt und Portfolio Management* 13(1): 66-72.
- Christensen, P.E. and Fabozzi, F.J. (1985) Bond Immunization: An Asset Liability Optimization Strategy. In: Fabozzi, F.J. and Pollack, I.M. (eds.) *The Handbook of Fixed Income Securities*. (2nd ed.) Homewood, IL: Dow Jones-Irwin, pp. 676-703.

Christensen, J.H.E. and Gillan, J.M. (2012) Could the U.S. Treasury Benefit from Issuing More TIPS? *Federal Reserve Bank of San Francisco, Working Papers Series*, No. 2011-16. Available online: <https://www.frbsf.org/economic-research/files/wp11-16bk.pdf>.

Christensen, J.H.E., Lopez, J.A. and Rudebusch, G.D. (2010) Inflation Expectations and Risk Premiums in an Arbitrage-Free Model of Nominal and Real Bond Yields. *Journal of Money, Credit, and Banking* 42(6): 143-178.

Christensen, B.J. and Prabhala, N.R. (1998) The relation between implied and realized volatility. *Journal of Financial Economics* 50(2): 125-150.

Christiansen, C. and Lund, J. (2005) Revisiting the Shape of the Yield Curve: The Effect of Interest Rate Volatility. *Working Paper*. Available online: <https://ssrn.com/abstract=264139>.

Christie-David, R. and Chaudry, M. (2001) Coskewness and cokurtosis in futures markets. *Journal of Empirical Finance* 8(1): 55-81.

Christoffersen, S.E.K., Géczy, C.C., Musto, D.K. and Reed, A.V. (2005) Cross-border Dividend Taxation and the Preferences of Taxable and Nontaxable Investors: Evidence From Canada. *Journal of Financial Economics* 78(1): 121-144.

Christoffersen, S.E.K., Reed, A.V., Géczy, C.C. and Musto, D.K. (2003) The Limits to Dividend Arbitrage: Implications for Cross Border Investment. *Working Paper*. Available online: <https://ssrn.com/abstract=413867>.

Chua, C.T., Koh, W.T.H. and Ramaswamy, K. (2006) Profiting from Mean-Reverting Yield Curve Trading Strategies. *Journal of Fixed Income* 15(4): 20-33.

Chuang, H. (2015) Time Series Residual Momentum. *Working Paper*. Available online: <http://www.econ.tohoku.ac.jp/econ/datascience/DDSR-DP/no38.pdf>.

Chuang, H. and Ho, H.-C. (2014) Implied Price Risk and Momentum Strategy. *Review of Finance* 18(2): 591-622.

Chui, A.C.W., Titman, S. and Wei, K.C.J. (2003a) The Cross-Section of Expected REIT Returns. *Real Estate Economics* 31(3): 451-479.

Chui, A.C.W., Titman, S. and Wei, K.C.J. (2003b) Intra-industry momentum: the case of REITs. *Journal of Financial Markets* 6(3): 363-387.

Chung, S.Y. (2000) Review of Macro Trading and Investment Strategies: Macroeconomic Arbitrage in Global Markets. *Journal of Alternative Investments* 3(1): 84-85.

- Ciaian, P., Rajcaniova, M. and Kancs, D. (2015) The economics of BitCoin price formation. *Applied Economics* 48(19): 1799-1815.
- Cirelli, S., Vitali, S., Ortobelli Lozza, S. and Moriggia, V. (2017) A conservative discontinuous target volatility strategy. *Investment Management and Financial Innovations* 14(2-1): 176-190.
- Clare, A.D., Ioannides, M. and Skinner, F.S. (2000) Hedging Corporate Bonds with Stock Index Futures: A Word of Caution. *Journal of Fixed Income* 10(2): 25-34.
- Clarida, R.H., Davis, J.M. and Pedersen, N. (2009) Currency carry trade regimes: Beyond the Fama regression. *Journal of International Money and Finance* 28(8): 1375-1389.
- Clarida, R. and Waldman, D. (2007) Is Bad News About Inflation Good News for the Exchange Rate? *Working Paper*. Available online: <http://www.nber.org/papers/w13010.pdf>.
- Clark, G.L. (2017) Financial intermediation, infrastructure investment and regional growth. *Area Development and Policy* 2(3): 217-236.
- Clark, G.L., Monk, A.H.B., Orr, R. and Scott, W. (2012) The new Era of infrastructure investing. *Pensions: An International Journal* 17(2): 103-111.
- Clark, T.E. and Terry, S.J. (2010) Time Variation in the Inflation Passthrough of Energy Prices. *Journal of Finance* 42(7): 1419-1433.
- Clark, T.A. and Weinstein, M.I. (1983) The behavior of the common stock of bankrupt firms. *Journal of Finance* 38(2): 489-504.
- Clarke, R.G., de Silva, H. and Thorley, S. (2006) Minimum-Variance Portfolios in the U.S. Equity Market. *Journal of Portfolio Management* 33(1): 10-24.
- Clarke, R.G., de Silva, H. and Thorley, S. (2010) Know Your VMS Exposure. *Journal of Portfolio Management* 36(2): 52-59.
- Clarke, R.G., de Silva, H. and Thorley, S. (2013) *Fundamentals of Futures and Options*. New York, NY: The Research Foundation of CFA Institute.
- Clifford, C.P., Fulkerson, J.A. and Jordan, B.D. (2014) What Drives ETF Flows? *Financial Review* 49(3): 619-642.
- Clinton, K. (1988) Transactions costs and covered interest arbitrage: Theory and evidence. *Journal of Political Economy* 96(2): 358-370.
- Cochrane, J.H. (1999) Portfolio Advice for a Multifactor World. *Federal Reserve Bank of Chicago, Economic Perspectives* 23(3): 59-78.

Cochrane, J.H. and Piazzesi, M. (2005) Bond Risk Premia. *American Economic Review* 95(1): 138-160.

Coffey, N., Hrungr, W.B. and Sarkar, A. (2009) Capital constraints, counterparty risk, and deviations from covered interest rate parity. *Federal Reserve Bank of New York Staff Reports*, No. 393. Available online: https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr393.pdf.

Cohen, G. (2005) *The bible of options strategies: the definitive guide for practical trading strategies*. Upper Saddle River, NJ: Financial Times Prentice Hall.

Cole, C.A., Kastens, T.L., Hampel, F.A. and Gow, L.R. (1999) A calendar spread trading simulation of seasonal processing spreads. In: *Proceedings of the NCCC-134 Conference on Applied Commodity Price Analysis, Forecasting, and Market Risk Management*. Available online: http://www.farmland.illinois.edu/nccc134/conf_1999/pdf/confp14-99.pdf.

Cole, C.S. and Young, P.J. (1995) Modified duration and convexity with semi-annual compounding. *Journal of Economics and Finance* 19(1): 1-15.

Colianni, S., Rosales, S. and Signorotti, M. (2015) Algorithmic Trading of Cryptocurrency Based on Twitter Sentiment Analysis. *Working Paper*. Available online: http://cs229.stanford.edu/proj2015/029_report.pdf.

Collin-Dufresne, P. and Solnik, B. (2001) On the Term Structure of Default Premia in the Swap and LIBOR Markets. *Journal of Finance* 56(3): 1095-1115.

Cong, J., Tan, K.S. and Weng, C. (2013) VAR-Based Optimal Partial Hedging. *ASTIN Bulletin: The Journal of the IAA* 43(3): 271-299.

Cong, J., Tan, K.S. and Weng, C. (2014) CVaR-Based Optimal Partial Hedging. *Journal of Risk* 16(3): 49-83.

Connor, G. and Leland, H. (1995) Cash Management for Index Tracking. *Financial Analysts Journal* 51(6): 75-80.

Connor, G. and Woo, M. (2004) An Introduction to hedge funds. *Working Paper*. Available online: <http://eprints.lse.ac.uk/24675/1/dp477.pdf>.

Conover, C.M., Jensen, G., Johnson, R. and Mercer, M. (2008) Sector Rotation and Monetary Conditions. *Journal of Investing* 28(1): 34-46.

Conover, C.M., Jensen, G.R., Johnson, R.R. and Mercer, J.M. (2010) Is Now the Time to Add Commodities to Your Portfolio? *Journal of Investing* 19(3): 10-19.

- Conrad, J., Dittmar, R.F. and Ghysels, E. (2013) Ex Ante Skewness and Expected Stock Returns. *Journal of Finance* 68(1): 85-124.
- Conrad, J.S., Hameed, A. and Niden, C. (1994) Volume and autocovariances in short-horizon individual security returns. *Journal of Finance* 49(4): 1305-1329.
- Conrad, J. and Kaul, G. (1998) An Anatomy of Trading Strategies. *Review of Financial Studies* 11(3): 489-519.
- Cont, R. and Minca, A. (2013) Recovering Portfolio Default Intensities Implied by CDO Quotes. *Mathematical Finance* 23(1): 94-121.
- Cook, T.Q. and LaRoche, R.B. (eds.) (1993) *Instruments of the money market*. (7th ed.) Richmond, Virginia: Federal Reserve Bank of Richmond.
- Cook, T.Q. and Rowe, T.D. (eds.) (1986) *Instruments of the money market*. (6th ed.) Richmond, Virginia: Federal Reserve Bank of Richmond.
- Cooper, T. (2010) Alpha Generation and Risk Smoothing Using Managed Volatility. *Working Paper*. Available online: <https://ssrn.com/abstract=1664823>.
- Cooper, M., Downs, D.H. and Patterson, G.A. (1999) Real Estate Securities and a Filter-based, Short-term Trading Strategy. *Journal of Real Estate Research* 18(2): 313-334.
- Cooper, M.J., Gutierrez, R.C., Jr. and Hameed, A. (2004) Market States and Momentum. *Journal of Finance* 59(3): 1345-1365.
- Cooper, I. and Priestley, R. (2008) Time-Varying Risk Premiums and the Output Gap. *Review of Financial Studies* 22(7): 2801-2833.
- Copeland, T.E. and Galai, D. (1983) Information Effects on the bid-ask spread. *Journal of Finance* 38(5): 1457-1469.
- Corbally, M. and Dang, P. (2002) Underlying Markets and Indexes. In: Banks, E. (ed.) *Weather Risk Management: Market, Products and Applications*. London, UK: Palgrave Macmillan.
- Corbett, M. (2006) *Find it, fix it, flip it! Make millions in real estate – one house at a time*. New York, NY: Plume.
- Cornell, B. and French, K.R. (1983) The pricing of stock index futures. *Journal of Futures Markets* 3(1): 1-14.
- Cornelli, F. and Li, D.D. (2002) Risk Arbitrage in Takeovers. *Review of Financial Studies* 15(3): 837-868.

- Corrado, C.J. and Miller, T.W., Jr. (2005) The forecast quality of CBOE implied volatility indexes. *Journal of Futures Markets* 25(4): 339-373.
- Corrado, C.J. and Su, T. (1997) Implied volatility skews and stock return skewness and kurtosis implied by stock option prices. *European Journal of Finance* 3(1): 73-85.
- Correia, M.M., Richardson, S.A. and Tuna, A.I. (2012) Value Investing in Credit Markets. *Review of Accounting Studies* 17(3): 572-609.
- Cosandier, P.-A. and Lang, B.R. (1981) Interest rate parity tests: Switzerland and some major western countries. *Journal of Banking & Finance* 5(2): 187-200.
- Cousin, A. and Laurent, J. (2012) Dynamic Hedging of Synthetic CDO Tranches: Bridging the Gap between Theory and Practice. In: Bielecki, T.R., Brigo, D. and Patras, F. (eds.) *Credit Risk Frontiers*. Hoboken, NJ: John Wiley & Sons, Inc., Chapter 6.
- Coval, J.D. and Shumway, T. (2001) Expected options returns. *Journal of Finance* 56(3): 983-1009.
- Cover, T.M. (1984) An algorithm for maximizing expected log investment return. *IEEE Transactions on Information Theory* 30(2): 369-373.
- Cox, D. (2015) *Handbook of Anti Money Laundering*. Chichester, UK: John Wiley & Sons, Ltd.
- Crabbe, L.E. and Fabozzi, F.J. (2002) *Corporate Bond Portfolio Management*. Hoboken, NJ: John Wiley & Sons, Inc.
- Creamer, G.G. and Freund, Y. (2007) A Boosting Approach for Automated Trading. *Journal of Trading* 2(3): 84-96.
- Creamer, G.G. and Freund, Y. (2010) Automated Trading with Boosting and Expert Weighting. *Quantitative Finance* 10(4): 401-420.
- Cremers, M. and Weinbaum, D. (2010) Deviations from Put-Call Parity and Stock Return Predictability. *Journal of Financial and Quantitative Analysis* 45(2): 335-367.
- Creti, A., Joëts, M. and Mignon, V. (2013) On the links between stock and commodity markets' volatility. *Energy Economics* 37: 16-28.
- Cross, R. and Kozyakin, V. (2015) Fact and fictions in FX arbitrage processes. *Journal of Physics: Conference Series* 585: 012015.

- Cultrera, L. and Brédart, X. (2015) Bankruptcy prediction: the case of Belgian SMEs. *Review of Accounting and Finance* 15(1): 101-119.
- Czaja, M.-G., Kaufmann, P. and Scholz, H. (2013) Enhancing the profitability of earnings momentum strategies: The role of price momentum, information diffusion and earnings uncertainty. *Journal of Investment Strategies* 2(4): 3-57.
- Dahlgran, R.A. (2000) Cross-hedging the cottonseed crush: A case study. *Agribusiness* 16(2): 141-158.
- Daigler, R.T. (2007) Spread volume for currency futures. *Journal of Economics and Finance* 31(1): 12-19.
- Daigler, R.T. and Copper, M. (1998) A Futures Duration-Convexity Hedging Method. *Financial Review* 33(4): 61-80.
- Dale, A. and Currie, E. (2015) An alternative funding model for agribusiness research in Canada. *Agricultural Sciences* 6(9): 961-969.
- Damghani, B.M. and Kos, A. (2013) De-arbitraging With a Weak Smile: Application to Skew Risk. *Wilmott Magazine* 2013(64): 40-49.
- Damiani, D. (2012) The Case for Cash. *CFA Institute Magazine* 23(4): 8-9.
- D'Amico, S., Kim, D. and Wei, M. (2018) Tips from TIPS: The Informational Content of Treasury Inflation-Protected Security Prices. *Journal of Financial and Quantitative Analysis* 53(1): 395-436.
- Daniel, K. (2001) The Power and Size of Mean Reversion Tests. *Journal of Empirical Finance* 8(5): 493-535.
- Daniel, K. and Moskowitz, T.J. (2016) Momentum crashes. *Journal of Financial Economics* 122(2): 221-247.
- D'Antonio, L. (2008) Equity Collars as Alternative to Asset Allocation. *Journal of Financial Service Professionals* 62(1): 67-76.
- Dao, T.-L. (2014) Momentum strategies with the L1 filter. *Journal of Investment Strategies* 3(4): 57-82.
- Das, S. (2005) *Credit Derivatives: Trading & Management of Credit & Default Risk*. (3rd ed.) Hoboken, NJ: John Wiley & Sons, Inc.
- da S. Gomes, G.S., Ludermir, T.B. and Lima, L.M.M.R. (2011) Comparison of new activation functions in neural network for forecasting financial time series. *Neural Computing and Applications* 20(3): 417-439.

Dash, R. and Dash, P.K. (2016) A hybrid stock trading framework integrating technical analysis with machine learning techniques. *Journal of Finance and Data Science* 2(1): 42-57.

Da Silva, A.S., Lee, W. and Pornrojngkool, B. (2009) The Black-Litterman model for active portfolio management. *Journal of Portfolio Management* 35(2): 61-70.

Daumas, L.D. (2017) Hedging stocks through commodity indexes: a DCC-GARCH approach. *Working Paper*. Available online: https://impa.br/wp-content/uploads/2017/11/Ri02017-PP_FAiube.pdf.

Davidson, A.S., Herskovitz, M.D. and Van Drunen, L.D. (1988) The refinancing threshold pricing model: An economic approach to valuing MBS. *Journal of Real Estate Finance and Economics* 1(2): 117-130.

Davis, J.L. (1996) The cross-section of stock returns and survivorship bias: Evidence from delisted stocks. *Quarterly Review of Economics and Finance* 36(3): 365-375.

Davis, M. (2001) Pricing Weather Derivatives by Marginal Value. *Quantitative Finance* 1(3): 305-308.

Davis, M.H.A. (2006) Optimal Hedging with Basis Risk. In: Kabanov, Y., Liptser, R. and Stoyanov, J. (eds.) *From Stochastic Calculus to Mathematical Finance*. Berlin, Germany: Springer.

Davis, M. and Lleo, S. (2012) Fractional Kelly strategies in continuous time: Recent developments. In: MacLean, L.C. and Ziemba, W. (eds.) *Handbook of the Fundamentals of Financial Decision Making*. Singapore: World Scientific Publishing.

Davis, M. and Lo, V. (2001) Infectious defaults. *Quantitative Finance* 1(4): 382-387.

Deacon, M., Derry, A. and Mirfendereski, D. (2004) *Inflation-indexed Securities: Bonds, Swaps and other Derivatives*. Chichester, UK: John Wiley & Sons, Ltd.

Deardorff, A.V. (1979) One-Way Arbitrage and Its Implications for the Foreign Exchange Markets. *Journal of Political Economy* 87(2): 351-364.

de Boer, P.-T., Kroese, D.P., Mannor, S. and Rubinstein, R.Y. (2005) A Tutorial on the Cross-Entropy Method. *Annals of Operations Research* 134(1): 19-67.

DeBondt, W.F.M. and Thaler, R.H. (1985) Does stock market overreact? *Journal of Finance* 40(3): 793-807.

De Carvalho, R.L., Dugnolle, P., Lu, X. and Moulin, P. (2014) Low-Risk Anomalies in Global Fixed Income: Evidence from Major Broad Markets. *Journal of Fixed Income* 23(4): 51-70.

Dechant, T. and Finkenzeller, K. (2013) How much into infrastructure? Evidence from dynamic asset allocation. *Journal of Property Research* 30(2): 103-127.

Dechario, T., Mosser, P., Tracy, J., Vickery, J. and Wright, J. (2010) A Private Lender Cooperative Model for Residential Mortgage Finance. *Federal Reserve Bank of New York Staff Reports*, No. 466. Available online: https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr466.pdf.

De Jong, A., Dutordoir, M. and Verwijmeren, P. (2011) Why do convertible issuers simultaneously repurchase stock? An arbitrage-based explanation. *Journal of Financial Economics* 100(1): 113-129.

De La Peña, J.I., Garayeta, A. and Iturricastillo, I. (2017) Dynamic immunisation does not imply cash flow matching: a hard application to Spain. *Economic Research – Ekonomska Istraživanja* 30(1): 238-255.

DeLisle, J., Doran, J. and Krieger, K. (2014) Volatility as an Asset Class: Holding VIX in a Portfolio. *Working Paper*. Available online: <https://ssrn.com/abstract=2534081>.

DeMaskey, A.L. (1995) A Comparison of the Effectiveness of Currency Futures and Currency Options in the Context of Foreign Exchange Risk Management. *Managerial Finance* 21(4): 40-51.

DeMaskey, A.L. (1997) Single and Multiple Portfolio Cross-Hedging with Currency Futures. *Multinational Finance Journal* 1(1): 23-46.

DeMaskey, A.L. and Pearce, J.A. (1998) Commodity and Currency Futures Cross-Hedging of ASEAN Currency Exposures. *Journal of Transnational Management Development* 4(1): 5-24.

Demeterfi, K., Derman, E., Kamal, M. and Zou, J. (1999) A guide to volatility and variance swaps. *Journal of Derivatives* 6(4): 9-32.

DeMiguel, V., Plyakha, Y., Uppal, R. and Vilkov, G. (2013) Improving Portfolio Selection Using Option-Implied Volatility and Skewness. *Journal of Financial and Quantitative Analysis* 48(6): 1813-1845.

DeMoura, C.E., Pizzinga, A. and Zubelli, J. (2016) A pairs trading strategy based on linear state space models and the Kalman filter. *Quantitative Finance* 16(10): 1559-1573.

Dempster, M.A.H. and Jones, C.M. (2002) Can channel pattern trading be profitably automated? *European Journal of Finance* 8(3): 275-301.

Deng, Q. (2008) Volatility Dispersion Trading. *Working Paper*. Available online: <https://ssrn.com/abstract=1156620>.

Deng, S.-J., Johnson, B. and Sogomonian, A. (2001) Exotic electricity options and the valuation of electricity generation and transmission assets. *Decision Support Systems* 30(3): 383-392.

Deng, G., McCann, C. and Wang, O. (2012) Are VIX Futures ETPs Effective Hedges? *Journal of Index Investing* 3(3): 35-48.

Dennis, P. and Mayhew, S. (2002) Risk-Neutral Skewness: Evidence from Stock Options. *Journal of Financial and Quantitative Analysis* 37(3): 471-493.

Dennis, P., Mayhew, S. and Stivers, C. (2006) Stock Returns, Implied Volatility Innovations, and the Asymmetric Volatility Phenomenon. *Journal of Financial and Quantitative Analysis* 41(2): 381-406.

Denton, J.W. and Hung, M.S. (1996) A comparison of nonlinear optimization methods for supervised learning in multilayer feedforward neural networks. *European Journal of Operational Research* 93(2): 358-368.

de Oliveira, F.A., Nobre, C.N. and Zárate, L.E. (2013) Applying Artificial Neural Networks to prediction of stock price and improvement of the directional prediction index – Case study of PETR4, Petrobras, Brazil. *Expert Systems with Applications* 40(18): 7596-7606.

Depken, C.A., Hollans, H. and Swidler, S. (2009) An empirical analysis of residential property flipping. *Journal of Real Estate Finance and Economics* 39(3): 248-263.

Depken, C.A., Hollans, H. and Swidler, S. (2011) Flips, flops and foreclosures: Anatomy of a real estate bubble. *Journal of Financial Economic Policy* 3(1): 49-65.

Derman, E. and Kani, I. (1994) Riding on a Smile. *Risk* 7(2): 139-145.

de Roon, F.A., Nijman, T.E. and Veld, C. (1998) Pricing Term Structure Risk in Futures Markets. *Journal of Financial and Quantitative Analysis* 33(1): 139-157.

de Roon, F.A., Nijman, T.E. and Veld, C. (2000) Hedging pressure effects in futures markets. *Journal of Finance* 55(3): 1437-1456.

Derwall, J., Huij, J., Brounen, D. and Marquering, W. (2009) REIT Momentum and the Performance of Real Estate Mutual Funds. *Financial Analysts Journal* 65(5): 24-34.

Derwall, J., Huij, J. and De Zwart, G.B. (2009) The Short-Term Corporate Bond Anomaly. *Working Paper*. Available online: <https://ssrn.com/abstract=1101070>.

D'Este, R. (2014) The Effect of Stolen Goods Markets on Crime: Evidence from a Quasi-Natural Experiment. *Working Paper*. Available online: https://warwick.ac.uk/fac/soc/economics/research/workingpapers/2014/twerp_1040b_deste.pdf.

Detemple, J. and Rindisbacher, M. (2010) Dynamic Asset Allocation: Portfolio Decomposition Formula and Applications. *Review of Financial Studies* 23(1): 25-100.

Detlefsen, K. and Härdle, W.K. (2013) Variance swap dynamics. *Quantitative Finance* 13(5): 675-685.

Dewally, M., Ederington, L.H. and Fernando, C.S. (2013) Determinants of Trader Profits in Commodity Futures Markets. *Review of Financial Studies* 26(10): 2648-2683.

De Wit, I. (2010) International Diversification Strategies for Direct Real Estate. *Journal of Real Estate Finance and Economics* 41(4): 433-457.

De Wit, J. (2006) Exploring the CDS-Bond Basis. *Working Paper*. Available online: <https://ssrn.com/abstract=1687659>.

de Wit, E.R. and van der Klaauw, B. (2013) Asymmetric Information and List-Price Reductions in the Housing Market. *Regional Science and Urban Economics* 43(3): 507-520.

De Zwart, G., Markwat, T., Swinkels, L. and van Dijk, D. (2009) The economic value of fundamental and technical information in emerging currency markets. *Journal of International Money and Finance* 28(4): 581-604.

Dichev, I. (1998) Is the risk of bankruptcy a systematic risk? *Journal of Finance* 53(3): 1131-1147.

Diebold, F.X. and Li, C. (2002) Forecasting the term structure of government bond yields. *Journal of Econometrics* 130(2): 337-364.

- Diebold, F.X., Rudebusch, G.D. and Aruoba, S.B. (2006) The macroeconomy and the yield curve: a dynamic latent factor approach. *Journal of Econometrics* 131(1-2): 309-338.
- Ding, J.J. and Sherris, M. (2011) Comparison of market models for measuring and hedging synthetic CDO tranche spread risks. *European Actuarial Journal* 1(S2): 261-281.
- Disatnik, D., Duchin, R. and Schmidt, B. (2014) Cash Flow Hedging and Liquidity Choices. *Review of Finance* 18(2): 715-748.
- Dischel, B. (1998a) At last: A model for weather risk. *Energy and Power Risk Management* 11(3): 20-21.
- Dischel, B. (1998b) Black-Scholes won't do. *Energy and Power Risk Management* 11(10): 8-9.
- Dischel, B. (1999) Shaping history for weather risk management. *Energy and Power Risk Management* 12(8): 13-15.
- Do, B. and Faff, R. (2010) Does simple pairs trading still work? *Financial Analysts Journal* 66(4): 83-95.
- Do, B. and Faff, R. (2012) Are pairs trading profits robust to trading costs? *Journal of Financial Research* 35(2): 261-287.
- Doan, M.P., Alexeev, V. and Brooks, R. (2014) Concurrent momentum and contrarian strategies in the Australian stock market. *Australian Journal of Management* 41(1): 77-106.
- Dobson, M.W.R. (1984) Global Investment Portfolios: The United Kingdom and Scandinavia. *ICFA Continuing Education Series* 1984(4): 56-60.
- Doeswijk, R., Lam, T. and Swinkels, L. (2014) The Global Multi-Asset Market Portfolio, 1959-2012. *Financial Analysts Journal* 70(2): 26-41.
- Doeswijk, R. and van Vliet, P. (2011) Global tactical sector allocation: a quantitative approach. *Journal of Portfolio Management* 28(1): 29-47.
- Dolan, C.P. (1999) Forecasting the Yield Curve Shape. *Journal of Fixed Income* 9(1): 92-99.
- Dolvin, S.D. (2009) ETFs: Arbitrage opportunities and market forecasting. *Journal of Index Investing* 1(1): 107-116.
- Dolvin, S. and Kirby, J. (2011) Momentum Trading in Sector ETFs. *Journal of Index Investing* 2(3): 50-57.

Donchian, R.D. (1960) High finance in copper. *Financial Analysts Journal* 16(6): 133-142.

Dong, J.-C., Liu, J.-X., Wang, C.-H., Yuan, H. and Wang, W.-J. (2009) Pricing Mortgage-Backed Security: An Empirical Analysis. *Systems Engineering – Theory & Practice* 29(12): 46-52.

Dong, Z. and Zhou, D.-X. (2008) Learning gradients by a gradient descent algorithm. *Journal of Mathematical Analysis and Applications* 341(2): 1018-1027.

Donier, J. and Bouchaud, J.-P. (2015) Why Do Markets Crash? Bitcoin Data Offers Unprecedented Insights. *PLoS ONE* 10(10): e0139356.

Donninger, C. (2014) VIX Futures Basis Trading: The Calvados-Strategy 2.0. *Working Paper*. Available online: <https://ssrn.com/abstract=2379985>.

Donninger, C. (2015) Trading the Patience of Mrs. Yellen. A Short Vix-Futures Strategy for FOMC Announcement Days. *Working Paper*. Available online: <https://ssrn.com/abstract=2544445>.

Doran, J.S. and Krieger, K. (2010) Implications for Asset Returns in the Implied Volatility Skew. *Financial Analysts Journal* 66(1): 65-76.

Doran, J.S., Peterson, D.R. and Tarrant, B.C. (2007) Is there information in the volatility skew? *Journal of Futures Markets* 27(10): 921-959.

Dorflleitner, G. and Wimmer, M. (2010) The pricing of temperature futures at the Chicago Mercantile Exchange. *Journal of Banking & Finance* 34(6): 1360-1370.

Dornier, F. and Queruel, M. (2000) Caution to the wind. *Energy and Power Risk Management* 13(8): 30-32.

Doskov, N. and Swinkels, L. (2015) Empirical evidence on the currency carry trade, 1900-2012. *Journal of International Money and Finance* 51: 370-389.

Douglas, R. (ed.) (2007) *Credit Derivative Strategies: New Thinking on Managing Risk and Return*. New York, NY: Bloomberg Press.

Dowd, K. and Hutchinson, M. (2015) Bitcoin Will Bite the Dust. *Cato Journal* 35(2): 357-382.

Downing, C., Jaffee, D. and Wallace, N. (2009) Is the Market for Mortgage-Backed Securities a Market for Lemons? *Review of Financial Studies* 22(7): 2457-2494.

Doyle, J.T., Lundholm, R.J. and Soliman, M.T. (2006) The extreme future stock returns following I/B/E/S earnings surprises. *Journal of Accounting Research* 44(5): 849-887.

Draper, P., Faff, R.W. and Hillier, D. (2006) Do Precious Metals Shine? An Investment Perspective. *Financial Analysts Journal* 62(2): 98-106.

Dreyfus, S.E. (1990) Artificial neural networks, back propagation, and the Kelley-Bryson gradient procedure. *Journal of Guidance, Control, and Dynamics* 13(5): 926-928.

Driessen, J., Maenhout, P.J. and Vilkov, G. (2009) The Price of Correlation Risk: Evidence from Equity Options. *Journal of Finance* 64(3): 1377-1406.

Driessen, J., Nijman, T. and Simon, Z. (2017) The Missing Piece of the Puzzle: Liquidity Premiums in Inflation-Indexed Markets. *Working Paper*. Available online: <https://ssrn.com/abstract=3042506>.

Drobetz, W. (2001) How to Avoid the Pitfalls in Portfolio Optimization? Putting the Black-Litterman Approach at Work. *Financial Markets and Portfolio Management* 15(1): 59-75.

Drobny, S. (2006) *Inside the House of Money: Top Hedge Fund Traders on Profiting in the Global Markets*. Hoboken, NJ: John Wiley & Sons, Inc.

Droms, W.G. and Walker, D.A. (2001) Performance persistence of international mutual funds. *Global Finance Journal* 12(2): 237-248.

Du, W., Tepper, A. and Verdelhan, A. (2018) Deviations from Covered Interest Rate Parity. *Journal of Finance* (forthcoming). DOI: <https://doi.org/10.1111/jofi.12620>. Available online: <https://ssrn.com/abstract=2768207>.

Duarte, J., Longstaff, F.A. and Yu, F. (2006) Risk and Return in Fixed-Income Arbitrage: Nickels in Front of a Steamroller? *Review of Financial Studies* 20(3): 769-811.

Dubil, R. (2011) Hedge Funds: Alpha, Beta and Replication Strategies. *Journal of Financial Planning* 24(10): 68-77.

Duca, E., Dutordoir, M., Veld, C. and Verwijmeren, P. (2012) Why are convertible bond announcements associated with increasingly negative issuer stock returns? An arbitrage based explanation. *Journal of Banking & Finance* 36(11): 2884-2899.

Duchin, R. (2010) Cash Holdings and Corporate Diversification. *Journal of Finance* 65(3): 955-992.

- Dudley, W., Roush, J.E. and Steinberg, M. (2009) The Case for Tips: An Examination of the Costs and Benefits. *Federal Reserve Bank of New York, Economic Policy Review* 15(1): 1-17.
- Duffie, D. (1996) Special repo rates. *Journal of Finance* 51(2): 493-526.
- Duffie, D. (2004) Time to adapt copula methods for modelling credit risk correlation. *Risk*, April 2004, p. 77.
- Duffie, D. (2017) The covered interest parity conundrum. *Risk*, May 2017. Available online: <https://www.risk.net/4353726>.
- Duffie, D. and Gârleanu, N. (2001) Risk and Valuation of Collateralized Debt Obligations. *Financial Analysts Journal* 57(1): 41-59.
- Duffie, D. and Huang, M. (1996) Swap Rates and Credit Quality. *Journal of Finance* 51(2): 921-949.
- Duffie, D., Saita, L. and Wang, K. (2007) Multi-period corporate default prediction with stochastic covariates. *Journal of Financial Economics* 83(3): 635-665.
- Duffie, D. and Singleton, K.J. (1997a) Modeling term structures of defaultable bonds. *Review of Financial Studies* 12(4): 687-720.
- Duffie, D. and Singleton, K.J. (1997b) An Econometric Model of the Term Structure of Interest Rate Swap Yields. *Journal of Finance* 52(4): 1287-1321.
- DuJardin, P. (2015) Bankruptcy prediction using terminal failure processes. *European Journal of Operational Research* 242(1): 286-303.
- Dukes, W.P., Frolich, C.J. and Ma, C.K. (1992) Risk arbitrage in tender offers. *Journal of Portfolio Management* 18(4): 47-55.
- Dumas, B., Fleming, J. and Whaley, R. (1998) Implied Volatility Functions: Empirical Tests. *Journal of Finance* 53(6): 2059-2106.
- Dunis, C., Laws, J. and Evans, B. (2006) Trading futures spreads. *Applied Financial Economics* 16(12): 903-914.
- Dunis, C., Laws, J. and Evans, B. (2010) Trading and filtering futures spread portfolios. *Journal of Derivatives & Hedge Funds* 15(4): 274-287.
- Dunis, C., Laws, J. and Rudy, J. (2013) Mean Reversion Based on Autocorrelation: A Comparison Using the S&P 100 Constituent Stocks and the 100 Most Liquid ETFs. *ETF Risk*, October 2013, pp. 36-41.

Dunn, K.B. and McConnell, J.J. (1981a) A Comparison of Alternative Models for Pricing GNMA Mortgage-Backed Securities. *Journal of Finance* 36(2): 471-484.

Dunn, K.B. and McConnell, J.J. (1981b) Valuation of GNMA Mortgage-Backed Securities. *Journal of Finance* 36(3): 599-616.

Dupire, B. (1994) Pricing with a smile. *Risk* 7(1): 18-20.

Dusak, K. (1973) Futures Trading and Investor Returns: An Investigation of Commodity Market Risk Premiums. *Journal of Political Economy* 81(6): 1387-1406.

Dutordoir, M., Lewis, C.M., Seward, J. and Veld, C. (2014) What we do and do not know about convertible bond financing. *Journal of Corporate Finance* 24: 3-20.

Dutt, H.R., Fenton, J., Smith, J.D. and Wang, G.H.K. (1997) Crop year influences and variability of the agricultural futures spreads. *Journal of Futures Markets* 17(3): 341-367.

Dwyer, G.P., Jr., Locke, P. and Yu, W. (1996) Index Arbitrage and Nonlinear dynamics Between the S&P 500 Futures and Cash. *Review of Financial Studies* 9(1): 301-332.

Dyhrberg, A.H. (2015) Bitcoin, gold and the dollar – a GARCH volatility analysis. *Finance Research Letters* 16: 85-92.

Dyhrberg, A.H. (2016) Hedging capabilities of bitcoin. Is it the virtual gold? *Finance Research Letters* 16: 139-144.

Dyl, E.A. and Joehnk, M.D. (1981) Riding the Yield Curve: Does it Work? *Journal of Portfolio Management* 7(3): 13-17.

Dyl, E.A. and Martin, S.A. (1986) Another Look at Barbells Versus Ladders. *Journal of Portfolio Management* 12(3): 54-59.

Dynkin, L., Hyman, J., Konstantinovsky, V. and Roth, N. (2001) Building an MBS Index: Conventions and Calculations. In: Fabozzi, F.J. (ed.) *The Handbook of Mortgage-Backed Securities*. (5th ed.) New York, NY: McGraw-Hill, Inc.

Dzikevičius, A. and Šanranda, S. (2010) EMA versus SMA: Usage to forecast Stock Markets: The Case of S&P 500 and OMX Baltic Benchmark. *Verslas: teorija ir praktika – Business: theory and practice* 11(3): 248-255.

- Easley, D., López de Prado, M.M. and O'Hara, M. (2011) The microstructure of the 'flash crash': flow toxicity, liquidity crashes and the probability of informed trading. *Journal of Portfolio Management* 37(2): 118-128.
- Easley, D., López de Prado, M.M. and O'Hara, M. (2012) The volume clock: Insights into the high frequency paradigm. *Journal of Portfolio Management* 39(1): 19-29.
- Eastman, A.M. and Lucey, B.M. (2008) Skewness and asymmetry in futures returns and volumes. *Applied Financial Economics* 18(10): 777-800.
- Eberhart, A., Altman, E. and Aggarwal, R. (1999) The Equity Performance of Firms Emerging from Bankruptcy. *Journal of Finance* 54(5): 1855-1868.
- Eberhart, A.C. and Sweeney, R.J. (1992) Does the Bond Market Predict Bankruptcy Settlements? *Journal of Finance* 47(3): 943-980.
- Ebrahim, S. and Rahman, S. (2005) On the pareto-optimality of futures contracts over Islamic forward contracts: Implications for the emerging Muslim economies. *Journal of Economic Behavior & Organization* 56(2): 273-295.
- Ederington, L.H. (1979) The hedging performance of the new futures markets. *Journal of Finance* 34(1): 157-170.
- Edwards, D.W. (2009) *Energy Trading & Investing: Trading, Risk Management and Structuring Deals in the Energy Market*. New York, NY: McGraw-Hill, Inc.
- Edwards, F.R. (1988) Futures Trading and Cash Market Volatility: Stock Index and Interest Rate Futures. *Journal of Futures Markets* 8(4): 421-439.
- Edwards, R. and Magee, J. (1992) *Technical Analysis of Stock Trends*. New York, NY: New York Institute of Finance.
- Edwards, F.R. and Park, J.M. (1996) Do Managed Futures Make Good Investments? *Journal of Futures Markets* 16(5): 475-517.
- Edwards, S. and Susmel, R. (2003) Interest-Rate Volatility in Emerging Markets. *Review of Economics and Statistics* 85(2): 328-348.
- Egginton, J.F., Van Ness, B.F. and Van Ness, R.A. (2016) Quote Stuffing. *Financial Management* 45(3): 583-608.
- Ehlgén, J. (1998) Distortionary effects of the optimal Hodrick-Prescott filter. *Economics Letters* 61(3): 345-349.

- Eichenbaum, M. and Evans, C.L. (1995) Some Empirical Evidence on the Effects of Shocks to Monetary Policy on Exchange Rates. *Quarterly Journal of Economics* 110(4): 975-1009.
- Eichholtz, P.M.A., Hoesli, M., MacGregor, B.D. and Nanthakumaran, N. (1995) Real estate portfolio diversification by property type and region. *Journal of Property Finance* 6(3): 39-59.
- Eisdorfer, A. and Misirli, E. (2015) Distressed Stocks in Distressed Times. *Working Paper*. Available online: <https://ssrn.com/abstract=2697771>.
- Eisl, A., Gasser, S. and Weinmayer, K. (2015) Caveat Emptor: Does Bitcoin Improve Portfolio Diversification? *Working Paper*. Available online: <https://ssrn.com/abstract=2408997>.
- Elder, A. (2014) *The New Trading for a Living*. Hoboken, NJ: John Wiley & Sons, Inc.
- Eldred, G.W. (2004) *The Beginner's Guide to Real Estate Investing*. Hoboken, NJ: John Wiley & Sons, Inc.
- Elias, R.S., Wahab, M.I.M. and Fang, L. (2016) The spark spread and clean spark spread option based valuation of a power plant with multiple turbines. *Energy Economics* 59: 314-327.
- El Kalak, I. and Hudson, R. (2016) The effect of size on the failure probabilities of SMEs: An empirical study on the US market using discrete hazard model. *International Review of Financial Analysis* 43: 135-145.
- Elliott, R., Siu, T. and Chan, L. (2007) Pricing volatility swaps under Heston's stochastic volatility model with regime switching. *Applied Mathematical Finance* 14(1): 41-62.
- Elliott, R.J., van der Hoek, J. and Malcolm, W.P. (2005) Pairs trading. *Quantitative Finance* 5(3): 271-276.
- Elton, E.J., Gruber, M.J. and Blake, C.R. (1996a) The Persistence of Risk-Adjusted Mutual Fund Performance. *Journal of Business* 69(2): 133-157.
- Elton, E.J., Gruber, M.J. and Blake, C.R. (1996b) Survivor Bias and Mutual Fund Performance. *Review of Financial Studies* 9(4): 1097-1120.
- Elton, E.J., Gruber, M.J. and Rentzler, J.C. (1987) Professionally Managed, Publicly Traded Commodity Funds. *Journal of Business* 60(2): 175-199.
- Emery, G.W. and Liu, Q. (2002) An analysis of the relationship between electricity and natural gas futures prices. *Journal of Futures Markets* 22(2): 95-122.

- Engel, C. (1996) The Forward Discount Anomaly and the Risk Premium: A Survey of Recent Evidence. *Journal of Empirical Finance* 3(2): 123-192.
- Engle, R.F. and Granger, C.W.J. (1987) Co-integration and error correction: Representation, estimation and testing. *Econometrica* 55(2): 251-276.
- Engle, R. and Rosenberg, J. (2000) Testing the volatility term structure using option hedging criteria. *Journal of Derivatives* 8(1): 10-28.
- Engle, R.F. and Watson, M.W. (1987) The Kalman Filter: applications to forecasting and rational-expectation models. In: Bewley, T.F. (ed.) *Fifth World Conference: Advances in Econometrics*, Vol. 1. Cambridge, UK: Cambridge University Press.
- Eraker, B. (2009) The Volatility Premium. *Working Paper*. Available online: http://www.nccr-finrisk.uzh.ch/media/pdf/Eraker_23-10.pdf.
- Eraker, B. and Wu, Y. (2014) Explaining the Negative Returns to VIX Futures and ETNs: An Equilibrium Approach. *Working Paper*. Available online: <https://ssrn.com/abstract=2340070>.
- Erb, C. and Harvey, C. (2006) The Strategic and Tactical Value of Commodity Futures. *Financial Analysts Journal* 62(2): 69-97.
- Erickson, M., Goolsbee, A. and Maydew, E. (2003) How Prevalent is Tax Arbitrage? Evidence from the Market for Municipal Bonds. *National Tax Journal* 56(1): 259-270.
- Ertugrul, M. and Giambona, E. (2011) Property Segment and REIT Capital Structure. *Journal of Real Estate Finance and Economics* 43(4): 505-526.
- Espinoza, R.D. and Luccioni, L. (2002) Proper Risk Management: The Key To Successful Brownfield Development. *WIT Transactions on Ecology and the Environment* 55: 297-306.
- Eun, C.S. and Sabherwal, S. (2003) Cross-border listings and price discovery: Evidence from U.S. listed Canadian stocks. *Journal of Finance* 58(2): 549-575.
- Evans, M.D.D. (1998) Real Rates, Expected Inflation, and Inflation Risk Premia. *Journal of Finance* 53(1): 187-218.
- Evans, C.L. and Marshall, D.A. (2007) Economic determinants of the nominal treasury yield curve. *Journal of Monetary Economics* 54(7): 1986-2003.
- Faber, M. (2007) A Quantitative Approach to Tactical Asset Allocation. *Journal of Wealth Management* 9(4): 69-79.

Faber, M. (2015) Learning to Play Offense and Defense: Combining Value and Momentum from the Bottom Up, and the Top Down. *Working Paper*. Available online: <https://ssrn.com/abstract=2669202>.

Faber, M. (2016) The Trinity Portfolio: A Long-Term Investing Framework Engineered for Simplicity, Safety, and Outperformance. *Working Paper*. Available online: <https://ssrn.com/abstract=2801856>.

Fabozzi, F.J. (ed.) (2002) *The Handbook of Financial Instruments*. Hoboken, NJ: John Wiley & Sons, Inc.

Fabozzi, F.J. (2006a) *Fixed Income Mathematics: Analytical & Statistical Techniques*. New York, NY: McGraw-Hill, Inc.

Fabozzi, F.J. (ed.) (2006b) *The Handbook of Mortgage-Backed Securities*. New York, NY: McGraw-Hill, Inc.

Fabozzi, F.J. (2012a) *Bond markets, analysis, and strategies*. Upper Saddle River, NJ: Prentice Hall.

Fabozzi, F.J. (2012b) *Institutional Investment Management: Equity and Bond Portfolio Strategies and Applications*. Hoboken, NJ: John Wiley & Sons, Inc.

Fabozzi, F.J., Focardi, S.M. and Jonas, C. (2010) *Investment Management after the Global Financial Crisis*. Charlottesville, VA: The Research Foundation of CFA Institute.

Fabozzi, F.J. and Mann, S.V. (2010) *Introduction to Fixed Income Analytics: Relative Value Analysis, Risk Measures, and Valuation*. Hoboken, NJ: John Wiley & Sons, Inc.

Fabozzi, F.J., Martellini, L. and Priaulet, P. (2006) *Advanced Bond Portfolio Management. Best Practices in Modeling and Strategies*. Hoboken, NJ: John Wiley & Sons, Inc.

Falkenstein, E. and Hanweck, J. (1996) Minimizing Basis Risk from Non-Parallel Shifts in the Yield Curve. *Journal of Fixed Income* 6(1): 60-68.

Fama, E.F. (1984) Forward and spot exchange rates. *Journal of Monetary Economics* 14(3): 319-338.

Fama, E.F. (1996) Multifactor Portfolio Efficiency and Multifactor Asset Pricing. *Journal of Financial and Quantitative Analysis* 31(4): 441-465.

Fama, E.F. and French, K.R. (1987) Commodity futures prices: some evidence on forecast power, premiums, and the theory of storage. *Journal of Business* 60(1): 55-73.

- Fama, E.F. and French, K.R. (1988) Business Cycles and the Behavior of Metals Prices. *Journal of Finance* 43(5): 1075-1093.
- Fama, E.F. and French, K.R. (1992) The Cross-Section of Expected Stock Returns. *Journal of Finance* 47(2): 427-465.
- Fama, E.F. and French, K.R. (1993) Common Risk Factors in the Returns on Stocks and Bonds. *Journal of Financial Economics* 33(1): 3-56.
- Fama, E.F. and French, K.R. (1996) Multifactor Explanations of Asset Pricing Anomalies. *Journal of Finance* 51(1): 55-84.
- Fama, E.F. and French, K.R. (1998) Value versus Growth: The International Evidence. *Journal of Finance* 53(6): 1975-1999.
- Fama, E.F. and French, K.R. (2008) Dissecting Anomalies. *Journal of Finance* 63(4): 1653-1678.
- Fama, E.F. and French, K.R. (2012) Size, Value and Momentum in International Stock Returns. *Journal of Financial Economics* 105(3): 457-472.
- Fama, E.F. and Schwert, G.W. (1977) Asset returns and inflation. *Journal of Financial Economics* 5(2): 115-146.
- Fass, S.M. and Francis, J. (2004) Where have all the hot goods gone? The role of pawnshops. *Journal of Research in Crime and Delinquency* 41(2): 156-179.
- Fassas, A.P. (2011) Mispricing in stock index futures markets – the case of Greece. *Investment Management and Financial Innovations* 8(2): 101-107.
- Fedorova, E., Gilenko, E. and Dovzhenko, S. (2013) Bankruptcy prediction for Russian companies: Application of combined classifiers. *Expert Systems with Applications* 40(18): 7285-7293.
- Feldhütter, P. and Lando, D. (2008) Decomposing swap spreads. *Journal of Financial Economics* 88(2): 375-405.
- Feldman, B.E. (2003) Investment Policy for Securitized and Direct Real Estate. *Journal of Portfolio Management* 29(5): 112-121.
- Feldman, B. and Roy, D. (2004) Passive Options-based Investment Strategies: The Case of the CBOE S&P 500 BuyWrite Index. *ETF and Indexing* 38(1): 72-89.
- Feldman, B. and Till, H. (2006) Backwardation and Commodity Futures Performance: Evidence from Evolving Agricultural Markets. *Journal of Alternative Investments* 9(3): 24-39.

- Félix, J.A. and Rodríguez, F.F. (2008) Improving moving average trading rules with boosting and statistical learning methods. *Journal of Forecasting* 27(5): 433-449.
- Fengler, M.R., Herwartz, H. and Werner, C. (2012) A Dynamic Copula Approach to Recovering the Index Implied Volatility Skew. *Journal of Financial Econometrics* 10(3): 457-493.
- Fenn, D.J., Howison, S.D., McDonald, M., Williams, S. and Johnson, N.F. (2009) The mirage of triangular arbitrage in the spot foreign exchange market. *International Journal of Theoretical and Applied Finance* 12(8): 1105-1123.
- Fernandez-Perez, A., Frijns, B., Fuertes, A.M. and Miffre, J. (2018) The skewness of commodity futures returns. *Journal of Banking & Finance* 86: 143-158.
- Fernandez-Perez, A., Fuertes, A.M. and Miffre, J. (2016) Is idiosyncratic volatility priced in commodity futures markets? *International Review of Financial Analysis* 46: 219-226.
- Ferreira, S., Grammatikos, T. and Michala, D. (2016) Forecasting distress in Europe SME portfolios. *Journal of Banking & Finance* 64: 112-135.
- Person, W. and Mo, H. (2016) Performance measurement with selectivity, market and volatility timing. *Journal of Financial Economics* 121(1): 93-110.
- Fifield, S.G.M., Power, D.M. and Knipe, D.G.S. (2008) The performance of moving average rules in emerging stock markets. *Applied Financial Economics* 18(19): 1515-1532.
- Figlewski, S., Chidambaran, N.K. and Kaplan, S. (1993) Evaluating the Performance of the Protective Put Strategy. *Financial Analysts Journal* 49(4): 46-56, 69.
- Filipović, D., Gourié, E. and Mancini, L. (2016) Quadratic variance swap models. *Journal of Financial Economics* 119(1): 44-68.
- Finger, C.C. (1999) Conditional approaches for credit metrics portfolio distributions. *Credit Metrics Monitor* 2(1): 14-33.
- Finkenzeller, K., Dechant, T. and Schäfers, W. (2010) Infrastructure: a new dimension of real estate? An asset allocation analysis. *Journal of Property Investment & Finance* 28(4): 263-274.
- Finnerty, J.D. and Tu, M. (2017) Valuing Convertible Bonds: A New Approach. *Business Valuation Review* 36(3): 85-102.

Fiorenzani, S. (2006) *Quantitative Methods for Electricity Trading and Risk Management: Advanced Mathematical and Statistical Methods for Energy Finance*. London, UK: Palgrave Macmillan.

Firstenberg, P.M., Ross, S.A. and Zisler, R.C. (1988) Real estate: The whole story. *Journal of Portfolio Management* 14(3): 22-34.

Fishe, R.P.H., Janzen, J.P. and Smith, A. (2014) Hedging and Speculative Trading in Agricultural Futures Markets. *American Journal of Agricultural Economics* 96(2): 542-556.

Fisher, M. (2002) Special Repo Rates: An Introduction. *Federal Reserve Bank of Atlanta, Economic Review* 87(2): 27-43.

Fisher, G., Shah, R. and Titman, S. (2016) Combining Value and Momentum. *Journal of Investment Management* 14(2): 33-48.

Fisher, L. and Weil, R.L. (1971) Coping with the Risk of Interest-Rate Fluctuations: Returns to Bondholders from Naïve and Optimal Strategies. *Journal of Business* 44(4): 408-431.

Fleckenstein, M. (2012) The Inflation-Indexed Bond Puzzle. *Working Paper*. Available online: <https://ssrn.com/abstract=2180251>.

Fleckenstein, M., Longstaff, F.A. and Lustig, H.N. (2013) Why Does the Treasury Issue TIPS? The TIPS-Treasury Bond Puzzle. *Journal of Finance* 69(5): 2151-2197.

Fleckenstein, M., Longstaff, F.A. and Lustig, H.N. (2017) Deflation Risk. *Review of Financial Studies* 30(8): 2719-2760.

Fleming, M.J. and Krishnan, N. (2012) The Microstructure of the TIPS Market. *Federal Reserve Bank of New York, Economic Policy Review* 18(1): 27-45.

Fleming, J., Ostdiek, B. and Whaley, R.E. (1995) Predicting stock market volatility: A new measure. *Journal of Futures Markets* 15(3): 265-302.

Fleming, M.J. and Sporn, J.R. (2013) Trading Activity and Price Transparency in the Inflation Swap Market. *Federal Reserve Bank of New York, Economic Policy Review* 19(1): 45-58.

Flint, E. and Maré, E. (2017) Fractional Black-Scholes option pricing, volatility calibration and implied Hurst exponents in South African context. *South African Journal of Economic and Management Sciences* 20(1): a1532.

Fong, H.G. and Vasicek, O.A. (1983). The tradeoff between return and risk in immunized portfolios. *Financial Analysts Journal* 39(5): 73-78.

- Fong, H.G. and Vasicek, O.A. (1984) A Risk Minimizing Strategy for Portfolio Immunization. *Journal of Finance* 39(5): 1541-1546.
- Fong, W.M. and Yong, L.H.M. (2005) Chasing trends: recursive moving average trading rules and internet stocks. *Journal of Empirical Finance* 12(1): 43-76.
- Fontaine, J.-F. and Nolin, G. (2017) Measuring Limits of Arbitrage in Fixed-Income Markets. *Staff Working Paper*, No. 2017-44. Ottawa, Canada: Bank of Canada.
- Fontana, A. (2010) The Persistent Negative CDS-Bond Basis during the 2007/08 Financial Crisis. *Working Paper*. Available online: http://www.unive.it/media/allegato/DIP/Economia/Working_papers/Working_papers_2010/WP_DSE_fontana_13_10.pdf.
- Fontana, A. and Scheicher, M. (2016) An analysis of euro area sovereign CDS and their relation with government bonds. *Journal of Banking & Finance* 62: 126-140.
- Fortin, M. and Khoury, N. (1984) Hedging Interest Rate Risks with Financial Futures. *Canadian Journal of Administrative Sciences* 1(2): 367-382.
- Foster, G., Olsen, C. and Shevlin, T. (1984) Earnings releases, anomalies, and the behavior of security returns. *Accounting Review* 59(4): 574-603.
- Foster, F.D. and Whiteman, C.H. (2002) Bayesian Cross Hedging: An Example from the Soybean Market. *Australian Journal of Management* 27(2): 95-122.
- Frachot, A. (1996) A reexamination of the uncovered interest rate parity hypothesis. *Journal of International Money and Finance* 15(3): 419-437.
- Frankel, J.A. (2006) The Effect of Monetary Policy on Real Commodity Prices. In: Campbell, J. (ed.) *Asset Prices and Monetary Policy*. Chicago, IL: University of Chicago Press, pp. 291-333.
- Franken, J.R.V. and Parcell, J.L. (2003) Cash Ethanol Cross-Hedging Opportunities. *Journal of Agricultural and Applied Economics* 35(3): 509-516.
- Frazzini, A. and Pedersen, L.H. (2014) Betting against Beta. *Journal of Financial Economics* 111(1): 1-25.
- Frenkel, J.A. and Levich, R.M. (1975) Covered interest arbitrage: Unexploited profits? *Journal of Political Economy* 83(2): 325-338.
- Frenkel, J.A. and Levich, R.M. (1981) Covered interest arbitrage in the 1970's. *Economics Letters* 8(3): 267-274.

Frey, R. and Backhaus, J. (2008) Pricing and Hedging of Portfolio Credit Derivatives with Interacting Default Intensities. *International Journal of Theoretical and Applied Finance* 11(6): 611-634.

Frey, R. and Backhaus, J. (2010) Dynamic hedging of synthetic CDO tranches with spread risk and default contagion. *Journal of Economic Dynamics and Control* 34(4): 710-724.

Frey, R., McNeil, A. and Nyfeler, N. (2001) Copulas and Credit Models. *Risk*, October 2001, pp. 111-114.

Fridson, M.S. and Xu, X. (2014) Duration Targeting: No Magic for High-Yield Investors. *Financial Analysts Journal* 70(3): 28-33.

Friewald, N., Jankowitsch, R. and Subrahmanyam, M. (2012) Illiquidity, or Credit Deterioration: A Study of Liquidity in the U.S. Bond Market during Financial Crises. *Journal of Financial Economics* 105(1): 18-36.

Frino, A., Gallagher, D.R., Neubert, A.S. and Oetomo, T.N. (2004) Index Design and Implications for Index Tracking. *Journal of Portfolio Management* 30(2): 89-95.

Frino, A. and McKenzie, M. (2002) The pricing of stock index futures spreads at contract expiration. *Journal of Futures Markets* 22(5): 451-469.

Froot, K.A., Scharfstein, D.S. and Stein, J.C. (1993) Risk Management: Coordinating Corporate Investment and Financing Policies. *Journal of Finance* 48(5): 1629-1658.

Froot, K.A. and Thaler, R.H. (1990) Anomalies: Foreign Exchange. *Journal of Economic Perspectives* 4(3): 179-192.

Fry, J. and Cheah, E.T. (2016) Negative bubbles and shocks in cryptocurrency markets. *International Review of Financial Analysis* 47: 343-352.

Fu, F. (2009) Idiosyncratic Risk and the Cross-Section of Expected Stock Returns. *Journal of Financial Economics* 91(1): 24-37.

Fu, Y. and Qian, W. (2014) Speculators and Price Overreaction in the Housing Market. *Real Estate Economics* 42(4): 977-1007.

Fu, X., Sandri, M. and Shackleton, M.B. (2016) Asymmetric Effects of Volatility Risk on Stock Returns: Evidence from VIX and VIX Futures. *Journal of Futures Markets* 36(11): 1029-1056.

Fuertes, A., Miffre, J. and Fernandez-Perez, A. (2015) Commodity Strategies Based on Momentum, Term Structure, and Idiosyncratic Volatility. *Journal of Futures Markets* 35(3): 274-297.

Fuertes, A., Miffre, J. and Rallis, G. (2010) Tactical allocation in commodity futures markets: Combining momentum and term structure signals. *Journal of Banking & Finance* 34(10): 2530-2548.

Fugazza, C., Guidolin, M. and Nicodano, G. (2007) Investing for the Long-run in European Real Estate. *Journal of Real Estate Finance and Economics* 34(1): 35-80.

Fulli-Lemaire, N. (2013) An Inflation Hedging Strategy with Commodities: A Core Driven Global Macro. *Journal of Investment Strategies* 2(3): 23-50.

Fung, W. and Hsieh, D.A. (1999) A Primer on Hedge Funds. *Journal of Empirical Finance* 6(3): 309-331.

Fung, J.K.W., Mok, H.M.K. and Wong, K.C.K. (2004) Pricing Efficiency in a Thin Market with Competitive Market Makers: Box Spread Strategies in the Hang Seng Index Options Market. *Financial Review* 39(3): 435-454.

Fusaro, P.C. and James, T. (2005) *Energy Hedging in Asia: Market Structure and Trading Opportunities*. London, UK: Palgrave Macmillan.

Füss, R. and Nikitina, O. (2011) Explaining Yield Curve Dynamics. *Journal of Fixed Income* 21(2): 68-87.

Gabaix, X., Krishnamurthy, A. and Vigneron, O. (2007) Limits of arbitrage: theory and evidence from the mortgage-backed securities market. *Journal of Finance* 62(2): 557-595.

Gajardo, G., Kristjanpoller, W.D. and Minutolo, M. (2018) Does Bitcoin exhibit the same asymmetric multifractal cross-correlations with crude oil, gold and DJIA as the Euro, Great British Pound and Yen? *Chaos, Solitons & Fractals* 109: 195-205.

Gande, A., Altman, E. and Saunders, A. (2010) Bank Debt vs. Bond Debt: Evidence from Secondary Market Prices. *Journal of Money, Credit and Banking* 42(4): 755-767.

Gao, B. and Ren, R.-E. (2015) A New Sector Rotation Strategy and its Performance Evaluation: Based on a Principal Component Regression Model. *Working Paper*. Available online: <https://ssrn.com/abstract=2628058>.

Gao, C., Xing, Y. and Zhang, X. (2017) Anticipating Uncertainty: Straddles Around Earnings Announcements. *Working Paper*. Available online: <https://ssrn.com/abstract=2204549>.

Garbade, K.D. (2004) Origins of the Federal Reserve Book-Entry System. *Federal Reserve Bank of New York, Economic Policy Review* 10(3): 33-50.

- Garcia, C.B. and Gould, F.J. (1993) Survivorship Bias. *Journal of Portfolio Management* 19(3): 52-56.
- Garcia, D. and Schweitzer, F. (2015) Social signals and algorithmic trading of Bitcoin. *Royal Society Open Science* 2(9): 150288.
- Garcia, D., Tessone, C.J., Mavrodiev, P. and Perony, N. (2014) The digital traces of bubbles: feedback cycles between socioeconomic signals in the Bitcoin economy. *Journal of The Royal Society Interface* 11(99): 0623.
- Garcia-Feijóo, L., Kochard, L., Sullivan, R.N. and Wang, P. (2015) Low-Volatility Cycles: The Influence of Valuation and Momentum on Low-Volatility Portfolios. *Financial Analysts Journal* 71(3): 47-60.
- Garlappi, L. and Yan, H. (2011) Financial Distress and the Cross-section of Equity Returns. *Journal of Finance* 66(3): 789-822.
- Gârleanu, N., Pedersen, L.H. and Poteshman, A.M. (2009) Demand-Based Option Pricing. *Review of Financial Studies* 22(10): 4259-4299.
- Garvey, R. and Wu, F. (2009) Intraday time and order execution quality dimensions. *Journal of Financial Markets* 12(2): 203-228.
- Garyn-Tal, S. (2014a) An Investment Strategy in Active ETFs. *Journal of Index Investing* 4(1): 12-22.
- Garyn-Tal, S. (2014b) Explaining and Predicting ETFs Alphas: The R^2 Methodology. *Journal of Index Investing* 4(4): 19-32.
- Garzarelli, F., Cristelli, M., Pompa, G., Zaccaria, A. and Pietronero, L. (2014) Memory effects in stock price dynamics: evidences of technical trading. *Scientific Reports* 4: 4487.
- Gatev, E., Goetzmann, W.N. and Rouwenhorst, K.G. (2006) Pairs Trading: Performance of a Relative-Value Arbitrage Rule. *Review of Financial Studies* 19(3): 797-827.
- Gatheral, J. and Jacquier, A. (2014) Arbitrage-free SVI volatility surfaces. *Quantitative Finance* 14(1): 59-71.
- Gatzlaff, D.H. and Tirtiroglu, D. (1995) Real Estate Market Efficiency: Issues and Evidence. *Journal of Real Estate Literature* 3(2): 157-189.
- Gay, G.D. and Kolb, R.W. (1983) The Management of Interest Rate Risk. *Journal of Portfolio Management* 9(2): 65-70.

Gay, G.D., Kolb, R.W. and Chiang, R. (1983) Interest Rate Hedging: An Empirical Test Of Alternative Strategies. *Journal of Financial Research* 6(3): 187-197.

Ge, W. (2016) A Survey of Three Derivative-Based Methods to Harvest the Volatility Premium in Equity Markets. *Journal of Investing* 25(3): 48-58.

Géczy, C., Minton, B.A. and Schrand, C. (1997) Why Firms Use Currency Derivatives. *Journal of Finance* 52(4): 1323-1354.

Géczy, C.C. and Samonov, M. (2016) Two Centuries of Price-Return Momentum. *Financial Analysts Journal* 72(5): 32-56.

Gehricke, S.A. and Zhang, J.E. (2018) Modeling VXX. *Journal of Futures Markets* 38(8): 958-976.

Geltner, D.M., Miller, N.G., Clayton, J. and Eichholtz, P. (2006) *Commercial Real Estate Analysis and Investments*. (2nd ed.) Atlanta, GA: OnCourse Learning Publishing.

Geltner, D.M., Rodriguez, J.V. and O'Connor, D. (1995) The Similar Genetics of Public and Private Real Estate and the Optimal Long-Horizon Portfolio Mix. *Real Estate Finance* 12(3): 13-25.

Geman, H. (1998) *Insurance and Weather Derivatives: From Exotic Options to Exotic Underlyings*. London, UK: Risk Books.

Geman, H. and Leonardi, M.-P. (2005) Alternative approaches to weather derivatives pricing. *Managerial Finance* 31(6): 46-72.

Geman, H. and Roncoroni, A. (2006) Understanding the fine structure of electricity prices. *Journal of Business* 79(3): 1225-1261.

Gençay, R. (1996) Nonlinear prediction of security returns with moving average rules. *Journal of Forecasting* 15(3): 165-174.

Gençay, R. (1998) The Predictability of securities returns with simple technical rules. *Journal of Empirical Finance* 5(4): 347-359.

Gençay, R. and Stengos, T. (1998) Moving average rules, volume and the predictability of security returns with feedforward networks. *Journal of Forecasting* 17(5-6): 401-414.

Genesove, D. and Han, L. (2012) Search and Matching in the Housing Market. *Journal of Urban Economics* 72(1): 31-35.

Genesove, D. and Mayer, C. (1997) Equity and Time to Sale in the Real Estate Market. *American Economic Review* 87(3): 255-269.

- Genesove, D. and Mayer, C. (2001) Loss Aversion and Seller Behavior: Evidence From the Housing Market. *Quarterly Journal of Economics* 116(4): 1233-1260.
- George, T.J. and Hwang, C.-Y. (2010) A resolution of the distress risk and leverage puzzles in the cross section of stock returns. *Journal of Financial Economics* 96(1): 56-79.
- Georgoula, I., Pournarakis, D., Bilanakos, C., Sotiropoulos, D. and Giallis, G.M. (2015) Using Time-Series and Sentiment Analysis to Detect the Determinants of Bitcoin Prices. *Working Paper*. Available online: <https://ssrn.com/abstract=2607167>.
- Gerakos, J. and Linnainmaa, J. (2012) Decomposing Value. *Working Paper*. Available online: <https://ssrn.com/abstract=2083166>.
- Gervais, S. and Odean, T. (2001) Learning to Be Overconfident. *Review of Financial Studies* 14(1): 1-27.
- Geske, R.L. and Pieptea, D.R. (1987) Controlling Interest Rate Risk and Return with Futures. *Review of Futures Markets* 6(1): 64-86.
- Gestel, T., Suykens, J.A.K., Baestaend, D.E., Lambrechts, A., Lanckriet, G., Vandaele, B., Moor, B. and Vandewalle, J. (2001) Financial time series prediction using least squares support vector machines within the evidence framework. *IEEE Transactions on Neural Networks* 12(4): 809-821.
- Ghiulnara, A. and Viegas, C. (2010) Introduction of weather-derivative concepts: perspectives for Portugal. *Journal of Risk Finance* 11(1): 9-19.
- Ghosh, A. (1993) Hedging with stock index futures: Estimation and forecasting with error correction model. *Journal of Futures Markets* 13(7): 743-752.
- Ghosh, A. (2012) Comparative study of Financial Time Series Prediction by Artificial Neural Network with Gradient Descent Learning. *International Journal of Scientific & Engineering Research* 3(1): 41-49.
- Gibson, M.S. (2004) Understanding the Risk of Synthetic CDOs. *Finance and Economics Discussion Series (FEDS)*, Paper No. 2004-36. Washington, DC: Board of Governors of the Federal Reserve System. Available online: <https://www.federalreserve.gov/pubs/feds/2004/200436/200436pap.pdf>.
- Gibson, M.S. and Pritsker, M. (2000) Improving Grid-based Methods for Estimating Value at Risk of Fixed-Income Portfolios. *Journal of Risk* 3(2): 65-89.
- Gibson, R. and Schwartz, E.S. (1990) Stochastic convenience yield and the pricing of oil contingent claims. *Journal of Finance* 15(3): 959-967.

- Giese, P. (2012) Optimal design of volatility-driven algo-alpha trading strategies. *Risk* 25(5): 68-73.
- Giesecke, K. and Weber, S. (2006) Credit contagion and aggregate losses. *Journal of Economic Dynamics and Control* 30(5): 741-767.
- Gilbert, S., Jones, S.K. and Morris, G.H. (2006) The impact of skewness in the hedging decision. *Journal of Futures Markets* 26(5): 503-520.
- Gilmour, N. and Ridley, N. (2015) Everyday vulnerabilities – money laundering through cash intensive businesses. *Journal of Money Laundering Control* 18(3): 293-303.
- Gilson, S.C. (1995) Investing in Distressed Situations: A Market Survey. *Financial Analysts Journal* 51(6): 8-27.
- Gilson, S.C. (2010) *Creating Value Through Corporate Restructuring: Case Studies in Bankruptcies, Buyouts, and Breakups*. Hoboken, NJ: John Wiley & Sons, Inc.
- Gilson, S. (2012) Preserving Value by Restructuring Debt. *Journal of Applied Corporate Finance* 24(4): 22-35.
- Gilson, S.C., John, K. and Lang, L.H.P. (1990) Troubled debt restructurings: An empirical study of private reorganization of firms in default. *Journal of Financial Economics* 27(2): 315-353.
- Girma, P.B. and Paulson, A.S. (1998) Seasonality in petroleum futures spreads. *Journal of Futures Markets* 18(5): 581-598.
- Glabadanidis, P. (2015) Market Timing With Moving Averages. *International Review of Finance* 15(3): 387-425.
- Glaeser, E.L. and Kallal, H.D. (1997) Thin Markets, Asymmetric Information, and Mortgage-Backed Securities. *Journal of Financial Intermediation* 6(1): 64-86.
- Glasserman, P. and Wu, Q. (2010) Forward and future implied volatility. *International Journal of Theoretical and Applied Finance* 14(3): 407-432.
- Gliner, G. (2014) *Global Macro Trading: Profiting in a New World Economy*. Hoboken, NJ: John Wiley & Sons, Inc.
- Glorot, X., Bordes, A. and Bengio, Y. (2011) Deep Sparse Rectifier Neural Networks. *Proceedings of Machine Learning Research* 15: 315-323.

Godfrey, C. and Brooks, C. (2015) The Negative Credit Risk Premium Puzzle: A Limits to Arbitrage Story. *Working Paper*. Available online: <https://ssrn.com/abstract=2661232>.

Goebel, P.R., Harrison, D.M., Mercer, J.M. and Whitby, R.J. (2013) REIT Momentum and Characteristic-Related REIT Returns. *Journal of Real Estate Finance and Economics* 47(3): 564-581.

Goetzmann, W.N. and Ibbotson, R.G. (1990) The Performance of Real Estate as an Asset Class. *Journal of Applied Corporate Finance* 3(1): 65-76.

Goetzmann, W.N. and Ibbotson, R.G. (1994) Do Winners Repeat? *Journal of Portfolio Management* 20(2): 9-18.

Golden, L.L., Wang, M. and Yang, C. (2007) Handling Weather Related Risks through the Financial Markets: Considerations of Credit Risk, Basis Risk, and Hedging. *Journal of Risk and Insurance* 74(2): 319-346.

Goldstein, H.N. (1964) The Implications of Triangular Arbitrage for Forward Exchange Policy. *Journal of Finance* 19(3): 544-551.

Goltz, F. and Lai, W.N. (2009) Empirical properties of straddle returns. *Journal of Derivatives* 17(1): 38-48.

Göncü, A. (2012) Pricing temperature-based weather derivatives in China. *Journal of Risk Finance* 13(1): 32-44.

Goodfellow, I., Warde-Farley, D., Mirza, M., Courville, A. and Bengio, Y. (2013) Maxout Networks. *Proceedings of Machine Learning Research* 28(3): 1319-1327.

Goodfriend, M. (2011) Money Markets. *Annual Review of Financial Economics* 3: 119-1137.

Goodman, L.S. (2002) Synthetic CDOs: An Introduction. *Journal of Derivatives* 9(3): 60-72.

Goodman, L.S. and Lucas, D.J. (2002) And When CDOs PIK? *Journal of Fixed Income* 12(1): 96-102.

Gordini, N. (2014) A genetic algorithm approach for SMEs bankruptcy prediction: Empirical evidence from Italy. *Expert Systems with Applications* 41(14): 6433-6455.

Gorton, G.B., Hayashi, F. and Rouwenhorst, K.G. (2013) The Fundamentals of Commodity Futures Returns. *Review of Finance* 17(1): 35-105.

- Gorton, G. and Metrick, A. (2012) Securitized banking and the run on repo. *Journal of Financial Economics* 104(3): 425-451.
- Gorton, G.B. and Rouwenhorst, K.G. (2006) Facts and Fantasies about Commodity Futures. *Financial Analysts Journal* 62(2): 47-68.
- Gradojevic, N., Gençay, R. and Erdemlioglu, D. (2017) Robust Prediction of Triangular Currency Arbitrage with Liquidity and Realized Risk Measures: A New Wavelet-Based Ultra-High-Frequency Analysis. *Working Paper*. Available online: <https://ssrn.com/abstract=3018815>.
- Graff, R., Harrington, A. and Young, M. (1999) Serial Persistence in Disaggregated Australian Real Estate Returns. *Journal of Real Estate Portfolio Management* 5(2): 113-128.
- Graff, R.A. and Young, M.S. (1997) Serial Persistence in Equity REIT Returns. *Journal of Real Estate Research* 14(3): 183-214.
- Graham, M., Nikkinen, J. and Sahlström, P. (2003) Relative importance of scheduled macroeconomic news for stock market investors. *Journal of Economics and Finance* 27(2): 153-165.
- Graham, S. and Pirie, W. (1994) Index Fund Rebalancing and Market Efficiency. *Journal of Economics and Finance* 18(2): 219-229.
- Grant, J. (2016) *Trading Strategies in Futures Markets* (Ph.D. Thesis). London, UK: Imperial College. Available online: <https://spiral.imperial.ac.uk/bitstream/10044/1/32011/1/Grant-J-2016-PhD-Thesis.PDFA.pdf>.
- Grantier, B.J. (1988) Convexity and Bond Performance: The Benter the Better. *Financial Analysts Journal* 44(6): 79-81.
- Grasselli, M. and Wagalath, L. (2018) VIX vs VXX: A Joint Analytical Framework. *Working Paper*. Available online: <https://ssrn.com/abstract=3144526>.
- Green, R.C. and Rydqvist, K. (1999) Ex-day behavior with dividend preference and limitations to short-term arbitrage: the case of Swedish lottery bonds. *Journal of Financial Economics* 53(2): 145-187.
- Greenhaus, S.F. (1991) Approaches to Investing in Distressed Securities: Passive Approaches. In: Bowman, T.A. (ed.) *Analyzing Investment Opportunities in Distressed and Bankrupt Companies*. (AIMR Conference Proceedings, Vol. 1991, Iss. 1.) Chicago, IL: AIMR, pp. 47-52.
- Greer, R.J. (1978) Conservative Commodities: A Key Inflation Hedge. *Journal of Portfolio Management* 4(4): 26-29.

- Greer, R.J. (2000) The Nature of Commodity Index Returns. *Journal of Alternative Investments* 3(1): 45-52.
- Greer, R.J. (2007) The Role of Commodities in Investment Portfolios. *CFA Institute Conference Proceedings Quarterly* 24(4): 35-44.
- Grieves, R. (1999) Butterfly Trades. *Journal of Portfolio Management* 26(1): 87-95.
- Grieves, R. and Mann, S.V. (2004) An Overlooked Coupon Effect in Treasury Futures Contracts. *Journal of Derivatives* 12(2): 56-61.
- Grieves, R., Mann, S.V., Marcus, A.J. and Ramanlal, P. (1999) Riding the Bill Curve. *Journal of Portfolio Management* 25(3): 74-82.
- Grieves, R. and Marcus, A.J. (1992) Riding the Yield Curve: Reprise. *Journal of Portfolio Management* 18(4): 67-76.
- Grieves, R. and Marcus, A.J. (2005) Delivery Options and Treasury-Bond Futures Hedge Ratios. *Journal of Derivatives* 13(2): 70-76.
- Griffin, J.M., Ji, X. and Martin, J.S. (2003) Momentum Investing and Business Cycle Risks: Evidence from Pole to Pole. *Journal of Finance* 58(6): 2515-2547.
- Griffin, J.M. and Lemmon, M.L. (2002) Book-to-Market Equity, Distress Risk, and Stock Returns. *Journal of Finance* 57(5): 2317-2336.
- Grigg, N.S. (2010) *Infrastructure Finance: The Business of Infrastructure for a Sustainable Future*. Hoboken, NJ: John Wiley & Sons, Inc.
- Grimsey, D. and Lewis, M.K. (2002) Evaluating the risks of public private partnerships for infrastructure projects. *International Journal of Project Management* 20(2): 107-118.
- Grinblatt, M. and Moskowitz, T.J. (2004) Predicting Stock Price Movements from Past Returns: The Role of Consistency and Tax-Loss Selling. *Journal of Financial Economics* 71(3): 541-579.
- Grinblatt, M. and Titman, S. (1992) The Persistence of Mutual Fund Performance. *Journal of Finance* 47(5): 1977-1984.
- Grinold, R.C. and Kahn, R.N. (2000) *Active Portfolio Management*. New York, NY: McGraw-Hill, Inc.
- Grishchenko, O.V. and Huang, J.-Z. (2013) Inflation Risk Premium: Evidence from the TIPS Market. *Journal of Fixed Income* 22(4): 5-30.

- Grishchenko, O.V., Vanden, J.M. and Zhang, J. (2016) The Informational Content of the Embedded Deflation Option in TIPS. *Journal of Banking & Finance* 65: 1-26.
- Grissom, T.V., Kuhle, J.L. and Walther, C.H. (1987) Diversification works in real estate, too. *Journal of Portfolio Management* 13(2): 66-71.
- Grobys, K., Heinonen, J.-P. and Kolari, J.W. (2016) Is Currency Momentum a Hedge for Global Economic Risk? *Working Paper*. Available online: <https://ssrn.com/abstract=2619146>.
- Grudnitski, G. and Osborn, L. (1993) Forecasting S&P and Gold Futures Prices: An Application of Neural Networks. *Journal of Futures Markets* 13(6): 631-643.
- Grundy, B.D. and Martin, J.S. (2001) Understanding the Nature of the Risks and the Source of the Rewards to Momentum Investing. *Review of Financial Studies* 14(1): 29-78.
- Grundy, B.D. and Verwijmeren, P. (2016) Disappearing call delay and dividend-protected convertible bonds. *Journal of Finance* 71(1): 195-224.
- Gunasekarage, A. and Power, D.M. (2001) The profitability of moving average trading rules in South Asian stock markets. *Emerging Markets Review* 2(1): 17-33.
- Gunasekarage, A., Power, D.M. and Ting Zhou, T.T. (2008) The long-term inflation hedging effectiveness of real estate and financial assets: A New Zealand investigation. *Studies in Economics and Finance* 25(4): 267-278.
- Guo, D. (2000) Dynamic Volatility Trading Strategies in the Currency Option Market. *Review of Derivatives Research* 4(2): 133-154.
- Gupta, R. and Miller, S.M. (2012) “Ripple effects” and forecasting home prices in Los Angeles, Las Vegas, and Phoenix. *Annals of Regional Science* 48(3): 763-782.
- Guren, A.M. (2014) The Causes and Consequences of House Price Momentum. *Working Paper*. Available online: <http://scholar.harvard.edu/files/guren/files/gurenjmp.pdf>.
- Gürkaynak, R.S., Sack, B. and Wright, J.H. (2010) The TIPS Yield Curve and Inflation Compensation. *American Economic Journal: Macroeconomics* 2(1): 70-92.
- Gutierrez, R.C. and Prinsky, C.A. (2007) Momentum, Reversal, and the Trading Behaviors of Institutions. *Journal of Financial Markets* 10(1): 48-75.

- Hafner, R. and Wallmeier, M. (2007) Volatility as an Asset Class: European Evidence. *European Journal of Finance* 13(7): 621-644.
- Hagenstein, F., Mertz, A. and Seifert, J. (2004) *Investing in Corporate Bonds and Credit Risk*. London, UK: Palgrave Macmillan.
- Hagopian, G.C. (1999) Property-flipping and fraudulent appraisals: The phenomenon and the crackdown. *Assessment Journal* 6(6): 33-39.
- Hagströmer, B. and Nordén, L. (2013) The Diversity of High-Frequency Traders. *Journal of Financial Markets* 16(4): 741-770.
- Hagströmer, B., Nordén, L. and Zhang, D. (2014) The Aggressiveness of High-Frequency Traders. *Financial Review* 49(2): 395-419.
- Hall, P., Park, B.U. and Samworth, R.J. (2008) Choice of neighbor order in nearest-neighbor classification. *Annals of Statistics* 36(5): 2135-2152.
- Hall, J., Pinnuck, M. and Thorne, M. (2013) Market risk exposure of merger arbitrage in Australia. *Accounting & Finance* 53(1): 185-215.
- Hamelink, F. and Hoesli, M. (1996) Swiss real estate as a hedge against inflation: New evidence using hedonic and autoregressive models. *Journal of Property Finance* 7(1): 33-49.
- Hamerle, A., Igl, A. and Plank, K. (2012) Correlation smile, volatility skew, and systematic risk sensitivity of tranches. *Journal of Derivatives* 19(3): 8-27.
- Hamilton, J. (2003) What is an oil shock? *Journal of Econometrics* 113(2): 363-398.
- Hamisultane, H. (2009) Utility-based pricing of weather derivatives. *European Journal of Finance* 16(6): 503-525.
- Han, S. and Qiu, J. (2007) Corporate precautionary cash holdings. *Journal of Corporate Finance* 13(1): 43-57.
- Hancock, G.D. (2013) VIX Futures ETNs: Three Dimensional Losers. *Accounting and Finance Research* 2(3): 53-64.
- Hanley, M. (1999) Hedging the Force of Nature. *Risk Professional* 5(4): 21-25.
- Hanly, J., Morales, L. and Cassells, D. (2018) The efficacy of financial futures as a hedging tool in electricity markets. *International Journal of Financial Economics* 23(1): 29-40.
- Hansch, O., Naik, N.Y. and Viswanathan, S. (1998) Do inventories matter in dealership markets? Evidence from the London stock exchange. *Journal of Finance* 53(5): 1623-1656.

- Hansen, L.P. and Hodrick, R.J. (1980) Forward Exchange Rates as Optimal Predictors of Future Spot Rates: An Econometric Analysis. *Journal of Political Economy* 88(5): 829-853.
- Happ, S. (1986) The Behavior of Rates on Federal Funds and Repurchase Agreements. *American Economist* 30(2): 22-32.
- Haran, M., Newell, G., Adair, A., McGreal, S. and Berry, J. (2011) The performance of UK regeneration property within a mixed asset portfolio. *Journal of Property Research* 28(1): 75-95.
- Harčariková, M. and Šoltés, M. (2016) Risk Management in Energy Sector Using Short Call Ladder Strategy. *Montenegrin Journal of Economics* 12(3): 39-54.
- Härdle, W.K. and López Cabrera, B. (2011) The Implied Market Price of Weather Risk. *Applied Mathematical Finance* 19(1): 59-95.
- Härdle, W. and Silyakova, E. (2010) Volatility Investing with Variance Swaps. *Working Paper*. Available online: <https://ssrn.com/abstract=2894245>.
- Hardy, C.C. (1978) *The Investor's Guide to Technical Analysis*. New York, NY: McGraw-Hill, Inc.
- Harford, J. (2005) What drives merger waves? *Journal of Financial Economics* 77(3): 529-560.
- Harner, M.M. (2008) The Corporate Governance and Public Policy Implications of Activist Distressed Debt Investing. *Fordham Law Review* 77(2): 703-773.
- Harner, M.M. (2011) Activist Distressed Debtholders: The New Barbarians at the Gate? *Washington University Law Review* 89(1): 155-206.
- Harris, T.S., Hubbard, R.G. and Kemsley, D. (2001) The Share Price Effects Of Dividend Taxes And Tax Imputation Credits. *Journal of Public Economics* 79(3): 569-596.
- Harris, L.E. and Namvar, E. (2016) The Economics of Flash Orders and Trading. *Journal of Investment Management* 14(4): 74-86.
- Harris, R.D.F. and Yilmaz, F. (2009) A momentum trading strategy based on the low frequency component of the exchange rate. *Journal of Banking & Finance* 33(9): 1575-1585.
- Harrison, J.M. and Pliska, S.R. (1981) Martingales and stochastic integrals in the theory of continuous trading. *Stochastic Processes and Their Applications* 11(3): 215-260.

Hartigan, L.R., Prasad, R. and De Francesco, A.J. (2011) Constructing an investment return series for the UK unlisted infrastructure market: estimation and application. *Journal of Property Research* 28(1): 35-58.

Hartzell, D.J., Eichholtz, P. and Selender, A. (2007) Economic diversification in European real estate portfolios. *Journal of Property Research* 10(1): 5-25.

Hartzell, D., Hekman, J. and Miles, M. (1986) Diversification Categories in Investment Real Estate. *Real Estate Economics* 14(2): 230-254.

Hartzell, D., Hekman, J.S. and Miles, M.E. (1987) Real Estate Returns and Inflation. *Real Estate Economics* 15(1): 617-637.

Hartzell, D.J., Shulman, D.G. and Wurtzebach, C.H. (1987) Refining the Analysis of Regional Diversification for Income-Producing Real Estate. *Journal of Real Estate Research* 2(2): 85-95.

Hartzog, J. (1982) Controlling Profit Volatility: Hedging with GNMA Options. *Federal Home Loan Bank Board Journal* 15(2): 10-14.

Harvey, A.C. (1984) A unified view of statistical forecasting procedures. *Journal of Forecasting* 3(3): 245-275.

Harvey, A.C. (1990) *Forecasting, Structural Time Series Models and the Kalman Filter*. Cambridge, UK: Cambridge University Press.

Harvey, C.R. (2014) Bitcoin Myths and Facts. *Working Paper*. Available online: <https://ssrn.com/abstract=2479670>.

Harvey, C.R. (2016) Cryptofinance. *Working Paper*. Available online: <https://ssrn.com/abstract=2438299>.

Harvey, J.T. (2015) Deviations from uncovered interest rate parity: a Post Keynesian explanation. *Journal of Post Keynesian Economics* 27(1): 19-35.

Harvey, A. and Trimbur, T. (2008) Trend Estimation and the Hodrick-Prescott Filter. *Journal of the Japan Statistical Society* 38(1): 41-49.

Hasbrouck, J. and Saar, G. (2013) Low-latency Trading. *Journal of Financial Markets* 16(4): 646-679.

Hastings, A. and Nordby, H. (2007) Benefits of Global Diversification on a Real Estate Portfolio. *Journal of Portfolio Management* 33(5): 53-62.

Hatemi-J, A. and Roca, E. (2006) Calculating the optimal hedge ratio: constant, time varying and the Kalman Filter approach. *Applied Economics Letters* 13(5): 293-299.

- Hau, H. (2014) The exchange rate effect of multi-currency risk arbitrage. *Journal of International Money and Finance* 47: 304-331.
- Haubrich, J., Pennacchi, G. and Ritchken, P. (2012) Inflation Expectations, Real Rates, and Risk Premia: Evidence from Inflation Swaps. *Review of Financial Studies* 25(5): 1588-1629.
- Haug, E.G. (2001) Closed form Valuation of American Barrier Options. *International Journal of Theoretical and Applied Finance* 4(2): 355-359.
- Haugen, R.A. (1995) *The New Finance: The Case Against Efficient Markets*. Upper Saddle River, NJ: Prentice Hall.
- Haurin, D.R. and Gill, H.L. (2002) The Impact of Transaction Costs and the Expected Length of Stay on Homeownership. *Journal of Urban Economics* 51(3): 563-584.
- Haurin, D.R., Haurin, J.L., Nadauld, T. and Sanders, A. (2010) List Prices, Sale Prices and Marketing Time: An Application to U.S. Housing Markets. *Real Estate Economics* 38(4): 659-685.
- Hautcoeur, P.C. (2006) Why and how to measure stock market fluctuations? The early history of stock market indices, with special reference to the French case. *Working Paper*. Available online: <https://halshs.archives-ouvertes.fr/halshs-00590522/PDF/wp200610.pdf>.
- Hayes, B. (2011) Multiple time scale attribution for commodity trading advisor (CTA) funds. *Journal of Investment Management* 9(2): 35-72.
- Hayre, L.S. (1990) Understanding option-adjusted spreads and their use. *Journal of Portfolio Management* 16(4): 68-69.
- He, D.X., Hsu, J.C. and Rue, N. (2015) Option-Writing Strategies in a Low-Volatility Framework. *Journal of Investing* 24(3): 116-128.
- He, J., Tang, Q. and Zhang, H. (2016) Risk reducers in convex order. *Insurance: Mathematics and Economics* 70: 80-88.
- Head, A., Lloyd-Ellis, H. and Sun, H. (2014) Search, Liquidity, and the Dynamics of House Prices and Construction. *American Economic Review* 104(4): 1172-1210.
- Heaton, H. (1988) On the possible tax-driven arbitrage opportunities in the new municipal bond futures contract. *Journal of Futures Markets* 8(3): 291-302.

Hegde, S.P. (1982) The Impact of Interest Rate Level and Volatility on the Performance of Interest Rate Hedges. *Journal of Futures Markets* 2(4): 341-356.

Heidari, M. and Wu, L. (2003) Are Interest Rate Derivatives Spanned by the Term Structure of Interest Rates? *Journal of Fixed Income* 13(1): 75-86.

Helm, D. (2009) Infrastructure Investment, the Cost of Capital, and Regulation: an Assessment. *Oxford Review of Economic Policy* 25(3): 307-326.

Helm, D. and Tindall, T. (2009) The Evolution of Infrastructure and Utility Ownership and its Implications. *Oxford Review of Economic Policy* 25(3): 411-434.

Hemler, M.L. and Miller, T.W., Jr. (1997) Box spread arbitrage profits following the 1987 market crash. *Journal of Financial and Quantitative Analysis* 32(1): 71-90.

Hemler, M.L. and Miller, T.W., Jr. (2015) The Performance of Options-Based Investment Strategies: Evidence for Individual Stocks During 2003-2013. *Working Paper*. Available online:
<http://www.optionseducation.org/content/dam/oic/documents/literature/files/perf-options-strategies.pdf>.

Hendershott, T., Jones, C. and Menkveld, A. (2011) Does Algorithmic Trading Improve Liquidity? *Journal of Finance* 66(1): 1-33.

Hendershott, T., Jones, C. and Menkveld, A. (2013) Implementation Shortfall with Transitory Price Effects. In: Easley, D., López de Prado, M. and O'Hara, M. (eds.) *High Frequency Trading: New Realities for Traders, Markets and Regulators*. London, UK: Risk Books, Chapter 9.

Hendershott, T. and Moulton, P.C. (2011) Automation, speed, and stock market quality: The NYSE's Hybrid. *Journal of Financial Markets* 14(4): 568-604.

Hendershott, T. and Riordan, R. (2013) Algorithmic Trading and the Market for Liquidity. *Journal of Financial and Quantitative Analysis* 48(4): 1001-1024.

Henderson, B. (2005) *Convertible Bonds: New Issue Performance and Arbitrage Opportunities* (Ph.D. Thesis). Urbana-Champaign IL: University of Illinois.

Henderson, R. (1924) A new method of graduation. *Transactions of the Actuarial Society of America* 25: 29-40.

Henderson, R. (1925) Further remarks on graduation. *Transactions of the Actuarial Society of America* 26: 52-57.

Henderson, R. (1938) *Mathematical Theory of Graduation*. New York, NY: Actuarial Society of America.

Henderson, T.M. (2003) *Fixed Income Strategy: The Practitioner's Guide to Riding the Curve*. Chichester, UK: John Wiley & Sons, Ltd.

Henderson, B.J. and Tookes, H. (2012) Do investment banks' relationships with investors impact pricing? The case of convertible bond issues. *Management Science* 58(2): 2272-2291.

Henrard, M.P.A. (2006) A Semi-Explicit Approach to Canary Swaptions in HJM One-Factor Model. *Applied Mathematical Finance* 13(1): 1-18.

Hensher, D. and Jones, S. (2007) Forecasting corporate bankruptcy: Optimizing the performance of the mixed logit model. *Abacus* 43(3): 241-364.

Herbertsson, A. (2008) Pricing synthetic CDO tranches in a model with default contagion using the matrix-analytic approach. *Journal of Credit Risk* 4(4): 3-35.

Herranz-Loncán, A. (2007) Infrastructure investment and Spanish economic growth, 1850-1935. *Explorations in Economic History* 44(3): 452-468.

Hess, D., Huang, H. and Niessen, A. (2008) How Do Commodity Futures Respond to Macroeconomic News? *Financial Markets and Portfolio Management* 22(2): 127-146.

Hew, D., Skerratt, L., Strong, N. and Walker, M. (1996) Post-earnings-announcement drift: Some preliminary evidence for the UK. *Accounting & Business Research* 26(4): 283-293.

Hill, J.M., Balasubramanian, V., Gregory, K. and Tierens, I. (2006) Finding Alpha via Covered Call Writing. *Financial Analysts Journal* 62(5): 29-46.

Hill, J.M., Nadig, D. and Hougan, M. (2015) A Comprehensive Guide to Exchange-Traded Funds (ETFs). *Research Foundation Publications* 2015(3): 1-181.

Hillegeist, S.A., Keating, E., Cram, D.P. and Lunsford, K.G. (2004) Assessing the probability of bankruptcy. *Review of Accounting Studies* 9(1): 5-34.

Hilliard, J.E. (1984) Hedging Interest Rate Risk with Futures Portfolios under Term Structure Effects. *Journal of Finance* 39(5): 1547-1569.

Hilliard, J. and Jordan, S. (1989) Hedging Interest Rate Risk with Futures Portfolios under Full-Rank Assumptions. *Journal of Financial and Quantitative Analysis* 24(2): 217-240.

Hilliard, J. and Reis, J. (1998) Valuation of commodity futures and options under stochastic convenience yields, interest rates, and jump diffusions on the spot. *Journal of Financial and Quantitative Analysis* 33(1): 61-86.

Hinnerich, M. (2008) Inflation-indexed swaps and swaptions. *Journal of Banking & Finance* 32(11): 2293-2306.

Hirschey, N. (2018) Do High-Frequency Traders Anticipate Buying and Selling Pressure? *Working Paper*. Available online: <https://ssrn.com/abstract=2238516>.

Hirshleifer, D. (1990) Hedging Pressure and Futures Price Movements in a General Equilibrium Model. *Econometrica* 58(2): 411-428.

Hirshleifer, D., Lim, S.S. and Teoh, S.H. (2009) Driven to distraction: Extraneous events and underreaction to earnings news. *Journal of Finance* 64(5): 2289-2325.

Ho, T. and Saunders, A. (1983) Fixed Rate Loan Commitments, Take-Down Risk, and the Dynamics of Hedging with Futures. *Journal of Financial and Quantitative Analysis* 18(4): 499-516.

Hodges, S. and Carverhill, A. (1993) Quasi mean reversion in an efficient stock market: the characterization of economic equilibria which support Black-Scholes option pricing. *Economic Journal* 103(417): 395-405.

Hodrick, R.J. (1987) *The Empirical Evidence on the Efficiency of Forward and Futures Foreign Exchange Markets*. New York, NY: Harwood Academic.

Hodrick, R.J. and Prescott, E.C. (1997) Postwar U.S. Business Cycles: An Empirical Investigation. *Journal of Money, Credit and Banking* 29(1): 1-16.

Hoesli, M. and Lekander, J. (2008) Real estate portfolio strategy and product innovation in Europe. *Journal of Property Investment & Finance* 26(2): 162-176.

Hoevenaars, R.P.M.M., Molenaar, R.D.J., Schotman, P.C. and Steenkamp, T.B.M. (2008) Strategic asset allocation with liabilities: Beyond stocks and bonds. *Journal of Economic Dynamics and Control* 32(9): 2939-2970.

Holden, C.W. and Jacobsen, S. (2014) Liquidity Measurement Problems in Fast Competitive Markets: Expensive and Cheap Solutions. *Journal of Finance* 69(4): 1747-1885.

Holmes, P. (1996) Stock index futures hedging: hedge ratio estimation, duration effects, expiration effects and hedge ratio stability. *Journal of Business Finance & Accounting* 23(1): 63-77.

Hong, H., Torous, W. and Valkanov, R. (2007) Do Industries Lead Stock Markets? *Journal of Financial Economics* 83(2): 367-396.

Hopton, D. (1999) Prevention of Money Laundering: The Practical Day-to-Day Problems and Some Solutions. *Journal of Money Laundering Control* 2(3): 249-252.

Hördahl, P. and Tristani, O. (2012) Inflation Risk Premia in the Term Structure of Interest Rates. *Journal of the European Economic Association* 10(3): 634-657.

Hördahl, P. and Tristani, O. (2014) Inflation Risk Premia in the Euro Area and the United States. *International Journal of Central Banking* 10(3): 1-47.

Horvath, P.A. (1998) A Measurement of the Errors in Intra-Period Compounding and Bond Valuation: A Short Extension. *Financial Review* 23(3): 359-363.

Hotchkiss, E.S. and Mooradian, R.M. (1997) Vulture Investors and the Market for Control of Distressed Firms. *Journal of Financial Economics* 43(3): 401-432.

Hotchkiss, E.S. and Ronen, R. (2002) The Informational Efficiency of the Corporate Bond Market: An Intraday Analysis. *Review of Financial Studies* 15(5): 1325-1354.

Hou, A.J. and Nordén, L.L. (2018) VIX futures calendar spreads. *Journal of Futures Markets* 38(7): 822-838.

Houdain, J.P. and Guegan, D. (2006) Hedging tranches index products: illustration of model dependency. *ICFAI Journal of Derivatives Markets* 4: 39-61.

Houweling, P. and van Vundert, J. (2017) Factor Investing in the Corporate Bond Market. *Financial Analysts Journal* 73(2): 100-115.

Howison, S.D., Reisinger, C. and Witte, J.H. (2013) The Effect of Nonsmooth Payoffs on the Penalty Approximation of American Options. *SIAM Journal on Financial Mathematics* 4(1): 539-574.

Hsieh, C.H. and Barmish, B.R. (2015) On Kelly betting: Some limitations. In: *Proceeding of the 53rd Annual Allerton Conference on Communication, Control, and Computing*. Washington, DC: IEEE, pp. 165-172.

Hsieh, C.H., Barmish, B.R. and Gubner, J.A. (2016) Kelly betting can be too conservative. In: *Proceedings of the 2016 Conference on Decision and Control (CDC)*. Washington, DC: IEEE, pp. 3695-3701.

Hsieh, J. and Walkling, R.A. (2005) Determinants and Implications of Arbitrage Holdings in Acquisitions. *Journal of Financial Economics* 77(3): 605-648.

Hsu, M. (1998) Spark Spread Options Are Hot! *Electricity Journal* 11(2): 28-39.

Hsu, Y.-C., Lin, H.-W. and Vincent, K. (2018) Analyzing the Performance of Multi-Factor Investment Strategies under Multiple Testing Framework. *Working Paper*. Available online:
[http://www.econ.sinica.edu.tw/UpFiles/2013092817175327692/Seminar_PDF2013093010102890633/17-A0001\(all\).pdf](http://www.econ.sinica.edu.tw/UpFiles/2013092817175327692/Seminar_PDF2013093010102890633/17-A0001(all).pdf).

Hu, J. (2001) *Basics of Mortgage-Backed Securities*. (2nd ed.) Hoboken, NJ: John Wiley & Sons, Inc.

Huang, J.-Z. and Kong, W. (2003) Explaining Credit Spread Changes: New Evidence From Option-Adjusted Bond Indexes. *Journal of Derivatives* 11(1): 30-44.

Huang, W., Nakamori, Y. and Wang, S.-Y. (2005) Forecasting stock market movement direction with support vector machine. *Computers & Operation Research* 32(10): 2513-2522.

Huang, H., Shiu, Y. and Lin, P. (2008) HDD and CDD option pricing with market price of weather risk for Taiwan. *Journal of Futures Markets* 28(8): 790-814.

Huang, C.L. and Tsai, C.Y. (2009) A hybrid SOFM-SVR with a filter-based feature selection for stock market forecasting. *Expert Systems with Applications* 36(2): 1529-1539.

Huault, I. and Rainelli-Weis, H. (2011) A Market for Weather Risk? Conflicting Metrics, Attempts at compromise, and Limits to Commensuration. *Organization Studies* 32(10): 1395-1419.

Huck, N. (2009) Pairs selection and outranking: An application to the S&P 100 index. *European Journal of Operational Research* 196(2): 819-825.

Huck, N. (2015) Pairs trading: Does volatility timing matter? *Applied Economics* 47(57): 6239-6256.

- Huck, N. and Afawubo, K. (2014) Pairs trading and selection methods: is cointegration superior? *Applied Economics* 47(6): 599-613.
- Hudson-Wilson, S. (1990) New Trends in Portfolio Theory. *Journal of Property Management* 55(3): 57-58.
- Hudson-Wilson, S., Gordon, J.N., Fabozzi, F.J., Anson, M.J.P. and Giliberto, M. (2005) Why Real Estate? *Journal of Portfolio Management* 31(5): 12-21.
- Huerta, R., Elkan, C. and Corbacho, F. (2013) Nonlinear Support Vector Machines Can Systematically Identify Stocks with High and Low Future Returns. *Algorithmic Finance* 2(1): 45-58.
- Hühn, H. and Scholz, H. (2017) Alpha Momentum and Price Momentum. *Working Paper*. Available online: <https://ssrn.com/abstract=2287848>.
- Huij, J. and Lansdorp, S. (2017) Residual Momentum and Reversal Strategies Revisited. *Working Paper*. Available online: <https://ssrn.com/abstract=2929306>.
- Hull, D.A. (1996) Stemming algorithms: A case study for detailed evaluation. *Journal of the American Society for Information Science and Technology* 47(1): 70-84.
- Hull, J.C. (2012) *Options, Futures and Other Derivatives*. Upper Saddle River, NJ: Prentice Hall.
- Hull, J.C. and White, A.D. (2004) Valuation of a CDO and an n^{th} to Default CDS without Monte Carlo Simulation. *Journal of Derivatives* 12(2): 8-23.
- Hull, J.C. and White, A.D. (2006) Valuing Credit Derivatives Using an Implied Copula Approach. *Journal of Derivatives* 14(2): 8-28.
- Hull, J.C. and White, A.D. (2010) An Improved Implied Copula Model and its Application to the Valuation of Bespoke CDO Tranches. *Journal of Investment Management* 8(3): 11-31.
- Hull, J., Predescu, M. and White, A. (2005) Bond Prices, Default Probabilities and Risk Premiums. *Journal of Credit Risk* 1(2): 53-60.
- Hung, N.H. (2016) Various moving average convergence divergence trading strategies: a comparison. *Investment Management and Financial Innovations* 13(2): 363-369.
- Hunter, R. (1999) Managing Mother Nature. *Derivatives Strategy* 4(2): 15-19.

Hunter, D.M. and Simon, D.P. (2005) Are TIPS the “real” deal?: A conditional assessment of their role in a nominal portfolio. *Journal of Banking & Finance* 29(2): 347-368.

Hürlimann, W. (2002) On immunization, stop-loss order and the maximum Shiu measure. *Insurance: Mathematics and Economics* 31(3): 315-325.

Hürlimann, W. (2012) On directional immunization and exact matching. *Communications in Mathematical Finance* 1(1): 1-12

Hurst, B., Ooi, Y.H. and Pedersen, L.H. (2017) A Century of Evidence on Trend-Following Investing. *Journal of Portfolio Management* 44(1): 15-29.

Husson, T. and McCann, C.J. (2011) The VXX ETN and Volatility Exposure. *PIABA Bar Journal* 18(2): 235-252.

Hutson, E. (2000) Takeover targets and the probability of bid success: Evidence from the Australian market. *International Review of Financial Analysis* 9(1): 45-65.

Hwang, C.-Y. and George, T.J. (2004) The 52-Week High and Momentum Investing. *Journal of Finance* 59(5): 2145-2176.

Idzorek, T. (2007) A Step-by-Step Guide to the Black-Litterman Model. In: Satchell, S. (ed.) *Forecasting Expected Returns in the Financial Markets*. Waltham, MA: Academic Press.

Illueca, M. and Lafuente, J.A. (2003) The Effect of Spot and Futures Trading on Stock Index Volatility: A Non-parametric Approach. *Journal of Futures Markets* 23(9): 841-858.

Ilmanen, A. (2011) *Expected Returns: An Investor's Guide to Harvesting Market Rewards*. Hoboken, NJ: John Wiley & Sons, Inc.

Ilmanen, A., Byrne, R., Gunasekera, H. and Minikin, R. (2004) Which Risks Have Been Best Rewarded? *Journal of Portfolio Management* 30(2): 53-57.

Ilut, C. (2012) Ambiguity Aversion: Implications for the Uncovered Interest Rate Parity Puzzle. *American Economic Journal: Macroeconomics* 4(3): 33-65.

Inderst, G. (2010a) Infrastructure as an Asset Class. *EIB Papers* 15(1): 70-105.

Inderst, G. (2010b) Pension fund investment in infrastructure: What have we learnt? *Pensions: An International Journal* 15(2): 89-99.

- Ingersoll, J. (1977) A contingent-claims valuation of convertible securities. *Journal of Financial Economics* 4(3): 289-322.
- Irwin, S.H., Zulauf, C.R. and Jackson, T.E. (1996) Monte Carlo analysis of mean reversion in commodity futures prices. *American Journal of Agricultural Economics* 78(2): 387-399.
- Israelov, R. (2017) Pathetic Protection: The Elusive Benefits of Protective Puts. *Working Paper*. Available online: <https://ssrn.com/abstract=2934538>.
- Israelov, R. and Klein, M. (2016) Risk and Return of Equity Index Collar Strategies. *Journal of Alternative Investments* 19(1): 41-54.
- Israelov, R. and Nielsen, L.N. (2014) Covered Call Strategies: One Fact and Eight Myths. *Financial Analysts Journal* 70(6): 23-31.
- Israelov, R. and Nielsen, L.N. (2015a) Covered Calls Uncovered. *Financial Analysts Journal* 71(6): 44-57.
- Israelov, R. and Nielsen, L.N. (2015b) Still Not Cheap: Portfolio Protection in Calm Markets. *Journal of Portfolio Management* 41(4): 108-120.
- Israelov, R., Nielsen L.N. and Villalon, D. (2017) Embracing Downside Risk. *Journal of Alternative Investments* 19(3): 59-67.
- Ito, T., Yamada, K., Takayasu, M. and Takayasu, H. (2012) Free Lunch! Arbitrage Opportunities in the Foreign Exchange Markets. *Working Paper*. Available online: <http://www.nber.org/papers/w18541>.
- Iturricastillo, I. and De La Peña, J.I. (2010) Absolute Immunization Risk as general measure of immunization risk. *Análisis Financiero* 114(3): 42-59.
- Ivanov, I.T. and Lenkey, S.L. (2014) Are Concerns About Leveraged ETFs Overblown? *Finance and Economics Discussion Series (FEDS)*, Paper No. 2014-106. Washington, DC: Board of Governors of the Federal Reserve System. Available online: <https://www.federalreserve.gov/econresdata/feds/2014/files/2014106pap.pdf>.
- Jabbour, G. and Budwick, P. (2010) *The option trader handbook: strategies and trade adjustments*. (2nd ed.) Hoboken, NJ: John Wiley & Sons, Inc.
- Jackwerth, J.C. (2000) Recovering Risk Aversion from Option Prices and Realized Returns. *Review of Financial Studies* 13(2): 433-451.
- Jacobs, H. and Weber, M. (2015) On the determinants of pairs trading profitability. *Journal of Financial Markets* 23: 75-97.

- Jacoby, G. and Shiller, I. (2008) Duration and Pricing of TIPS. *Journal of Fixed Income* 18(2): 71-84.
- Jain, G. and Baile, C. (2000) Managing weather risks. *Strategic Risk*, September 2000, pp. 28-31.
- James, F.E., Jr. (1968) Monthly moving averages – An effective investment tool? *Journal of Financial and Quantitative Analysis* 3(3): 315-326.
- James, T. (2003) *Energy Price Risk: Trading and Price Risk Management*. London, UK: Palgrave Macmillan.
- Jan, T.C. and Hung, M.W. (2004) Short-Run and Long-Run Persistence in Mutual Funds. *Journal of Investing* 13(1): 67-71.
- Jankowitsch, R. and Nettekoven, M. (2008) Trading strategies based on term structure model residuals. *European Journal of Finance* 14(4): 281-298.
- Jansen, I.P. and Nikiforov, A.L. (2016) Fear and Greed: A Returns-Based Trading Strategy around Earnings Announcements. *Journal of Portfolio Management* 42(4): 88-95.
- Jarrow, R.A. (2010) Understanding the risk of leveraged ETFs. *Finance Research Letters* 7(3): 135-139.
- Jarrow, R., Kchia, Y., Larsson, M. and Protter, P. (2013) Discretely sampled variance and volatility swaps versus their continuous approximations. *Finance and Stochastics* 17(2): 305-324.
- Jarrow, R., Lando, D. and Turnbull, S. (1997) A Markov model for the term structure of credit spreads. *Review of Financial Studies* 10(2): 481-523.
- Jarrow, R.A. and Protter, P. (2012) A Dysfunctional Role of High Frequency Trading in Electronic Markets. *International Journal of Theoretical and Applied Finance* 15(3): 1250022.
- Jarrow, R.A. and Turnbull, S.M. (1995) Pricing Derivatives on Financial Securities Subject to Credit Risk. *Journal of Finance* 50(1): 53-85.
- Jarrow, R. and Yildirim, Y. (2003) Pricing treasury inflation protected securities and related derivatives using an HJM model. *Journal of Financial and Quantitative Analysis* 38(2): 409-430.
- Jasemi, M. and Kimiagari, A.M. (2012) An investigation of model selection criteria for technical analysis of moving average. *Journal of Industrial Engineering International* 8: 5.

- Jegadeesh, N. (1990) Evidence of Predictable Behavior of Security Returns. *Journal of Finance* 45(3): 881-898.
- Jegadeesh, N. and Titman, S. (1993) Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency. *Journal of Finance* 48(1): 65-91.
- Jegadeesh, N. and Titman, S. (1995) Overreaction, delayed reaction, and contrarian profits. *Review of Financial Studies* 8(4): 973-993.
- Jegadeesh, N. and Titman, S. (2001) Profitability of Momentum Strategies: An Evaluation of Alternative Explanations. *Journal of Finance* 56(2): 699-720.
- Jensen, M.C. (1968) The Performance of Mutual Funds in the Period 1945-1964. *Journal of Finance* 23(2): 389-416.
- Jensen, G.R., Johnson, R.R. and Mercer, J.M. (2000) Efficient use of commodity futures in diversified portfolios. *Journal of Futures Markets* 20(5): 489-506.
- Jensen, G.R., Johnson, R.R. and Mercer, J.M. (2002) Tactical Asset Allocation and Commodity Futures. *Journal of Portfolio Management* 28(4): 100-111.
- Jermann, U.J. (2016) Negative Swap Spreads and Limited Arbitrage. *Working Paper*. Available online: <https://ssrn.com/abstract=2737408>.
- Jetley, G. and Ji, X. (2010) The shrinking merger arbitrage spread: Reasons and implications. *Financial Analysts Journal* 66(2): 54-68.
- Jewson, S. (2004a) Weather Derivative Pricing and the Distributions of Standard Weather Indices on US Temperatures. *Working Paper*. Available online: <https://ssrn.com/abstract=535982>.
- Jewson, S. (2004b) Introduction to Weather Derivative Pricing. *Working Paper*. Available online: <https://ssrn.com/abstract=557831>.
- Jewson, S., Brix, A. and Ziehmann, C. (2005) *Weather Derivative Valuation: The Meteorological, Statistical, Financial and Mathematical Foundations*. Cambridge, UK: Cambridge University Press.
- Jewson, S. and Caballero, R. (2003) Seasonality in the statistics of surface air temperature and the pricing of weather derivatives. *Meteorological Applications* 10(4): 367-376.
- Jha, R. and Kalimipal, M. (2010) The economic significance of conditional skewness in index option markets. *Journal of Futures Markets* 30(4): 378-406.

Jiang, H., Li, D. and Wang, A. (2017) Dynamic Liquidity Management by Corporate Bond Mutual Funds. *Working Paper*. Available online: <https://ssrn.com/abstract=2776829>.

Jiang, W., Li, K. and Wang, W. (2012) Hedge Funds and Chapter 11. *Journal of Finance* 67(2): 513-560.

Jiang, Z. and Liang, J. (2017) Cryptocurrency Portfolio Management with Deep Reinforcement Learning. *Working Paper*. Available online: <https://arxiv.org/pdf/1612.01277.pdf>.

Jiang, X. and Peterburgsky, S. (2017) Investment performance of shorted leveraged ETF pairs. *Applied Economics* 49(44): 4410-4427.

Jo, H., Han, I. and Lee, H. (1997) Bankruptcy prediction using case-based reasoning, neural networks, and discriminant analysis. *Expert Systems with Applications* 13(2): 97-108.

Jobst, A. (2005) Tranche Pricing in Subordinated Loan Securitization. *Journal of Structured Finance* 11(2): 64-96.

Jobst, A. (2006a) European Securitization: A GARCH Model of Secondary Market Spreads. *Journal of Structured Finance* 12(1): 55-80.

Jobst, A. (2006b) Sovereign Securitization in Emerging Markets. *Journal of Structured Finance* 12(3): 2-13.

Jobst, A. (2006c) Correlation, Price Discovery and Co-movement of ABS and Equity. *Derivatives Use, Trading & Regulation* 12(1-2): 60-101.

Jobst, A. (2007) A Primer on Structured Finance. *Journal of Derivatives & Hedge Funds* 13(3): 199-213.

John, W. and Brigitte, U. (2009) Measuring Global Money Laundering: “The Walker Gravity Model”. *Review of Law & Economics* 5(2): 821-853.

Johnson, H.F. (1979) Is It Better to Go Naked on the Street? A Primer on the Options Market. *Notre Dame Lawyer (Notre Dame Law Review)* 55(1): 7-32.

Johnson, T.C. (2002) Rational Momentum Effects. *Journal of Finance* 57(2): 585-608.

Johnson, T.C. (2008) Volume, liquidity, and liquidity risk. *Journal of Financial Economics* 87(2): 388-417.

Jones, F.J. (1991) Yield Curve Strategies. *Journal of Fixed Income* 1(2): 43-48.

- Jones, C.M., Lamont, O. and Lumsdaine, R.L. (1998) Macroeconomic news and bond market volatility. *Journal of Financial Economics* 47(3): 315-337.
- Jongadsayakul, W. (2016) A Box Spread Test of the SET50 Index Options Market Efficiency: Evidence from the Thailand Futures Exchange. *International Journal of Economics and Financial Issues* 6(4): 1744-1749.
- Jongadsayakul, W. (2017) Arbitrage Opportunity In Thailand Futures Exchange: An Empirical Study of SET50 Index Options. In: *2017 IACB, ICE & ISEC Proceedings*, Paper No. 381. Littleton, CO: Clute Institute.
- Jonsson, J. and Fridson, M. (1996) Forecasting Default Rates on High Yield Bonds. *Journal of Fixed Income* 6(1): 69-77.
- Jordan, B.D. and Jordan, S. (1997) Special repo rates: An empirical analysis. *Journal of Finance* 52(5): 2051-2072.
- Joseph, A. (1952) The Whittaker-Henderson Method of Graduation. *Journal of the Institute of Actuaries* 78(1): 99-114.
- Joshi, N.N. and Lambert, J.H. (2011) Diversification of infrastructure projects for emergent and unknown non-systematic risks. *Journal of Risk Research* 14(6): 717-733.
- Joslin, S. and Konchitchki, Y. (2018) Interest rate volatility, the yield curve, and the macroeconomy. *Journal of Financial Economics* 128(2): 344-362.
- Joslin, S., Pribsch, M. and Singleton, K.J. (2014) Risk Premiums in Dynamic Term Structure Models with Unspanned Macro Risks. *Journal of Finance* 69(3): 1197-1233.
- Jostarndt, P. and Sautner, Z. (2010) Out-of-Court Restructuring versus Formal Bankruptcy in a Non-Interventionist Bankruptcy Setting. *Review of Finance* 14(4): 623-668.
- Jostova, G., Nikolova, S., Philipov, A. and Stahel, C.W. (2013) Momentum in Corporate Bond Returns. *Review of Financial Studies* 26(7): 1649-1693.
- Joyce, M., Lildholdt, P. and Sorensen, S. (2010) Extracting Inflation Expectations and Inflation Risk Premia from the Term Structure: A Joint Model of the UK Nominal and Real Yield Curves. *Journal of Banking & Finance* 34(2): 281-294.
- Judd, K.L., Kubler, F. and Schmedders, K. (2011) Bond Ladders and Optimal Portfolios. *Review of Financial Studies* 24(12): 4123-4166.
- Julio, I.F., Hassan, M.K. and Ngene, G.M. (2013) Trading Strategies in Futures Markets. *Global Journal of Finance and Economics* 10(1): 1-12.

- Junkus, J.C. (1991) Systematic skewness in futures contracts. *Journal of Futures Markets* 11(1): 9-24.
- Jurek, J.W. (2014) Crash-neutral currency carry trades. *Journal of Financial Economics* 113(3): 325-347.
- Kablan, A. (2009) Adaptive Neuro-Fuzzy Inference System for Financial Trading using Intraday Seasonality Observation Model. *International Journal of Economics and Management Engineering* 3(10): 1909-1918.
- Kahn, R.N. and Lemmon, M. (2015) Smart Beta: The Owner's Manual. *Journal of Portfolio Management* 41(2): 76-83.
- Kahn, R.N. and Lemmon, M. (2016) The Asset Manager's Dilemma: How Smart Beta Is Disrupting the Investment Management Industry. *Financial Analysts Journal* 72(1): 15-20.
- Kahneman, D. and Tversky, A. (1979) Prospect theory: an analysis of decision under risk. *Econometrica* 47(2): 263-292.
- Kakodkar, A., Galiani, S., Jónsson, J.G. and Gallo, A. (2006) *Credit Derivatives Handbook 2006 – Vol. 2: A Guide to the Exotics Credit Derivatives Market*. New York, NY: Credit Derivatives Strategy, Merrill Lynch.
- Kakushadze, Z. (2015a) Phynance. *Universal Journal of Physics and Application* 9(2): 64-133. Available online: <https://ssrn.com/abstract=2433826>.
- Kakushadze, Z. (2015b) Mean-Reversion and Optimization. *Journal of Asset Management* 16(1): 14-40. Available online: <https://ssrn.com/abstract=2478345>.
- Kakushadze, Z. (2015c) 4-Factor Model for Overnight Returns. *Wilmott Magazine* 2015(79): 56-62. Available online: <https://ssrn.com/abstract=2511874>.
- Kakushadze, Z. (2015d) On Origins of Alpha. *Hedge Fund Journal* 108: 47-50. Available online: <https://ssrn.com/abstract=2575007>.
- Kakushadze, Z. (2015e) Heterotic Risk Models. *Wilmott Magazine* 2015(80): 40-55. Available online: <https://ssrn.com/abstract=2600798>.
- Kakushadze, Z. (2016) 101 Formulaic Alphas. *Wilmott Magazine* 2016(84): 72-80. Available online: <https://ssrn.com/abstract=2701346>.
- Kakushadze, Z. and Tulchinsky, I. (2016) Performance v. Turnover: A Story by 4,000 Alphas. *Journal of Investment Strategies* 5(2): 75-89. Available online: <http://ssrn.com/abstract=2657603>.

Kakushadze, Z. and Yu, W. (2016a) Multifactor Risk Models and Heterotic CAPM. *Journal of Investment Strategies* 5(4): 1-49. Available online: <https://ssrn.com/abstract=2722093>.

Kakushadze, Z. and Yu, W. (2016b) Statistical Industry Classification. *Journal of Risk & Control* 3(1): 17-65. Available online: <https://ssrn.com/abstract=2802753>.

Kakushadze, Z. and Yu, W. (2017a) Statistical Risk Models. *Journal of Investment Strategies* 6(2): 1-40. Available online: <https://ssrn.com/abstract=2732453>.

Kakushadze, Z. and Yu, W. (2017b) How to Combine a Billion Alphas. *Journal of Asset Management* 18(1): 64-80. Available online: <https://ssrn.com/abstract=2739219>.

Kakushadze, Z. and Yu, W. (2017c) *K-Means and Cluster Models for Cancer Signatures. *Biomolecular Detection and Quantification* 13: 7-31. Available online: <https://ssrn.com/abstract=2908286>.

Kakushadze, Z. and Yu, W. (2018a) Decoding Stock Market with Quant Alphas. *Journal of Asset Management* 19(1): 38-48. Available online: <https://ssrn.com/abstract=2965224>.

Kakushadze, Z. and Yu, W. (2018b) Notes on Fano Ratio and Portfolio Optimization. *Journal of Risk & Control* 5(1): 1-33. Available online: <https://ssrn.com/abstract=3050140>.

Kalev, P.S. and Inder, B.A. (2006) The information content of the term structure of interest rates. *Applied Economics* 38(1): 33-45.

Kallberg, J.G., Liu, C.L. and Trzcinka, C. (2000) The Value Added from Investment Managers: An Examination of Funds of REITs. *Journal of Financial and Quantitative Analysis* 35(3): 387-408.

Kalman, P.E. (1960) A New Approach to Linear Filtering and Prediction Problems. *Journal of Basic Engineering* 82(1): 35-45.

Kambhu, J. (2006) Trading Risk, Market Liquidity, and Convergence Trading in the Interest Rate Swap Spread. *Federal Reserve Bank of New York, Economic Policy Review* 12(1): 1-13.

Kaminski, V. (2004) *Managing Energy Price Risk: The New Challenges and Solutions*. London, UK: Risk Books.

Kandel, S., Ofer, A.R. and Sarig, O. (1996) Real Interest Rates and Inflation: An Ex-Ante Empirical Analysis. *Journal of Finance* 51(1): 205-225.

Kandel, S. and Stambaugh, R.F. (1987) Long-horizon Returns and Short-horizon Models. *CRSP Working Paper No. 222*. Chicago, IL: University of Chicago.

Kang, H.B. and Gardner, J. (1989) Selling Price and Marketing Time in the Residential Real Estate Market. *Journal of Real Estate Research* 4(1): 21-35.

Kang, J.K. and Lee, Y.W. (1996) The pricing of convertible debt offerings. *Journal of Financial Economics* 41(2): 231-248.

Kang, J., Liu, M.H. and Ni, S.X. (2002) Contrarian and momentum strategies in the China stock market: 1993-2000. *Pacific-Basin Finance Journal* 10(3): 243-265.

Kapadia, N. and Szado, E. (2007) The Risk Return Characteristics of the Buy-Write Strategy on the Russell 2000 Index. *Journal of Alternative Investments* 9(4): 39-56.

Kaplan, P. and Lummer, S.L. (1998) Update: GSCI Collateralized Futures as a Hedging Diversification Tool for Institutional Portfolios. *Journal of Investing* 7(4): 11-18.

Kara, Y., Boyacioglu, M.A. and Baykan, O.K. (2011) Predicting direction of stock price index movement using artificial neural networks and support vector machines: The sample of the Istanbul Stock Exchange. *Expert Systems with Applications* 38(5): 5311-5319.

Karlik, B. and Vehbi, A. (2011) Performance Analysis of Various Activation Functions in Generalized MLP Architectures of Neural Networks. *International Journal of Artificial Intelligence and Expert Systems* 1(4): 111-122.

Karolyi, G.A. and Kho, B.C. (2004) Momentum strategies: Some bootstrap tests. *Journal of Empirical Finance* 11(4): 509-536.

Karolyi, G.A. and Sanders, A.B. (1998) The Variation of Economic Risk Premiums in Real Estate Returns. *Journal of Real Estate Finance and Economics* 17(3): 245-262.

Karolyi, G.A. and Shannon, J. (1999) Where's the Risk in Risk Arbitrage? *Canadian Investment Review* 12(2): 12-18.

Kau, J.B., Keenan, D.C., Muller, W.J., III and Epperson, J.F. (1995) The valuation at origination of fixed-rate mortgages with default and prepayment. *Journal of Real Estate Finance and Economics* 11(1): 5-36.

Kawaller, I.G., Koch, P.D. and Ludan, L. (2002) Calendar spreads, outright futures positions and risk. *Journal of Alternative Investments* 5(3): 59-74.

- Kazemi, H. and Li, Y. (2009) Market timing of CTAs: An examination of systematic CTAs vs. discretionary CTAs. *Journal of Futures Markets* 29(11): 1067-1099.
- Keane, F. (1996) Repo rate patterns for new Treasury notes. *Federal Reserve Bank of New York, Current Issues in Economics and Finance* 2(10): 1-6.
- Kelly, J.L. (1956) A New Interpretation of Information Rate. *Bell System Technical Journal* 35(4): 917-926.
- Kemp, K. (2007) *Flipping confidential: The secrets of renovating property for profit in any market*. Hoboken, NJ: John Wiley & Sons, Inc.
- Kenett, D.Y., Ben-Jacob, E., Stanley, H.E. and Gur-Gershgoren, G. (2013) How High Frequency Trading Affects a Market Index. *Scientific Reports* 3: 2110.
- Kenyon, C. (2008) Inflation is normal. *Risk*, July 2008, pp. 76-82.
- Khan, S.A. (2002) Merger Arbitrage: A Long-Term Investment Strategy. *Journal of Wealth Management* 4(4): 76-81.
- Khandani, A. and Lo, A.W. (2011) What Happened to the Quants in August 2007? Evidence from Factors and Transactions Data. *Journal of Financial Markets* 14(1): 1-46.
- Khang, C.H. (1983) A dynamic global portfolio immunization strategy in the world of multiple interest rate changes: A dynamic immunization and minimax theorem. *Journal of Financial and Quantitative Analysis* 18(3): 355-363.
- Khuzwayo, B. and Maré, E. (2014) Aspects of volatility targeting for South African equity investors. *South African Journal of Economic and Management Sciences* 17(5): 691-699.
- Kidd, D. (2014) Global Tactical Asset Allocation: One Strategy Fits All? In: *Investment Risk and Performance*. Charlottesville, VA: CFA Institute.
- Kilgallen, T. (2012) Testing the Simple Moving Average across Commodities, Global Stock Indices, and Currencies. *Journal of Wealth Management* 15(1): 82-100.
- Kim, I.J. (1990) The analytic valuation of American options. *Review of Financial Studies* 3(4): 547-572.
- Kim, K. (2011) Performance Analysis of Pairs Trading Strategy Utilizing High Frequency Data with an Application to KOSPI 100 Equities. *Working Paper*. Available online: <https://ssrn.com/abstract=1913707>.

- Kim, K.J. (2003) Financial time series forecasting using support vector machines. *Neurocomputing* 55(1-2): 307-319.
- Kim, K.J. (2006) Artificial neural networks with evolutionary instance selection for financial forecasting. *Expert Systems with Applications* 30(3): 519-526.
- Kim, Y. and Enke, D. (2016) Using neural networks to forecast volatility for an asset allocation strategy based on the target volatility. *Procedia Computer Science* 95: 281-286.
- Kim, K. and Han, I. (2000) Genetic algorithms approach to feature discretization in artificial neural networks for the prediction of stock price index. *Expert Systems with Applications* 19(2): 125-132.
- Kim, M.-K. and Leuthold, R.M. (1997) The Distributional Behavior of Futures Price Spread Changes: Parametric and Nonparametric Tests for Gold, T-Bonds, Corn, and Live Cattle. *Working Paper*. Available online: <https://ageconsearch.umn.edu/bitstream/14767/1/aceo9703.pdf>.
- Kim, G.H., Li, H. and Zhang, W. (2016) CDS-Bond Basis and Bond Return Predictability. *Journal of Empirical Finance* 38: 307-337.
- Kim, G.H., Li, H. and Zhang, W. (2017) The CDS-Bond Basis Arbitrage and the Cross Section of Corporate Bond Returns. *Journal of Futures Markets* 37(8): 836-861.
- Kim, Y.B., Kim, J.G., Kim, W., Im, J.H., Kim, T.H., Kang, S.J. and Kim, C.H. (2016) Predicting Fluctuations in Cryptocurrency Transactions Based on User Comments and Replies. *PLoS ONE* 11(8): e0161197.
- King, R. (1986) Convertible Bond Valuation: An Empirical Test. *Journal of Financial Research* 9(1): 53-69.
- King, T.H.D. and Mauer, D.C. (2014) Determinants of corporate call policy for convertible bonds. *Journal of Corporate Finance* 24: 112-134.
- Kingma, D.P. and Ba, J. (2014) Adam: A Method for Stochastic Optimization. *Working Paper*. Available online: <https://arxiv.org/pdf/1412.6980>.
- Kirby, C. and Ostdiek, B. (2012) It's All in the Timing: Simple Active Portfolio Strategies that Outperform Naïve Diversification. *Journal of Financial and Quantitative Analysis* 47(2): 437-467.
- Kirilenko, A., Kyle, A., Samadi, M. and Tuzun, T. (2017) The Flash Crash: High-Frequency Trading in an Electronic Market. *Journal of Finance* 72(3): 967-998.

Kishore, V. (2012) Optimizing Pairs Trading of US Equities in a High Frequency Setting. *Working Paper*. Available online:
https://repository.upenn.edu/cgi/viewcontent.cgi?article=1095&context=wharton_research_scholars.

Kitsul, Y. and Wright, J.H. (2013) The Economics of Options-Implied Inflation Probability Density Functions. *Journal of Financial Economics* 110(3): 696-711.

Klingler, S. and Sundaresan, S.M. (2016) An Explanation of Negative Swap Spreads: Demand for Duration from Underfunded Pension Plans. *Working Paper*. Available online: <https://ssrn.com/abstract=2814975>.

Knight, J.R. (2002) Listing Price, Time on Market, and Ultimate Selling Price: Causes and Effects of Listing Price Changes. *Real Estate Economics* 30(2): 213-237.

Kobor, A., Shi, L. and Zelenko, I. (2005) What Determines U.S. Swap Spreads? *World Bank Working Paper No. 62*. Washington, DC: World Bank.

Kocherlakota, R., Rosenbloom, E. and Shiu, E. (1988) Algorithms for cash-flow matching. *Transactions of Society of Actuaries* 40: 477-484.

Kocherlakota, R., Rosenbloom, E. and Shiu, E. (1990) Cash-flow matching and linear programming duality. *Transactions of Society of Actuaries* 42: 281-293.

Kochin, L. and Parks, R. (1988) Was the tax-exempt bond market inefficient or were future expected tax rates negative? *Journal of Finance* 43(4): 913-931.

Koijen, R.S.J., Moskowitz, T.J., Pedersen, L.H. and Vrugt, E.B. (2018) Carry. *Journal of Financial Economics* 127(2): 197-225.

Kolb, R.W. and Chiang, R. (1981) Improving Hedging Performance Using Interest Rate Futures. *Financial Management* 10(3): 72-79.

Kolb, R.W. and Chiang, R. (1982) Duration, Immunization, and Hedging with Interest Rate Futures. *Journal of Financial Research* 5(2): 161-170.

Konstantinidi, E. and Skiadopoulos, G. (2016) How does the market variance risk premium vary over time? Evidence from S&P 500 variance swap investment returns. *Journal of Banking & Finance* 62: 62-75.

Koopman, S.J., Lucas, A. and Schwaab, B. (2012) Dynamic factor models with macro, frailty, and industry effects for U.S. default counts: The credit crisis of 2008. *Econometric Reviews* 30(4): 521-532.

Korajczyk, R.A. and Murphy, D. (2017) High Frequency Market Making to Large Institutional Trades. *Working Paper*. Available online: <https://ssrn.com/abstract=2567016>.

Korajczyk, R.A. and Sadka, R. (2004) Are momentum profits robust to trading costs? *Journal of Finance* 59(3): 1039-1082.

Kordonis, J., Symeonidis, A. and Arampatzis, A. (2016) Stock Price Forecasting via Sentiment Analysis on Twitter. In: *Proceedings of the 20th Pan-Hellenic Conference on Informatics (PCI'16)*. New York, NY: ACM, Article No. 36.

Kordos, M. and Cwiok, A. (2011) A new approach to neural network based stock trading strategy. In: Yin, H., Wang, W. and Rayward-Smith, V. (eds.) *Intelligent Data Engineering and Automated Learning-IDEAL*. Berlin, Germany: Springer, pp. 429-436.

Korkeamaki, T. and Michael, T.B. (2013) Where are they now? An analysis of the life cycle of convertible bonds. *Financial Review* 48(3): 489-509.

Korol, T. (2013) Early warning models against bankruptcy risk for Central European and Latin American enterprises. *Economic Modelling* 31: 22-30.

Kozhan, R., Neuberger, A. and Schneider, P. (2013) The Skew Risk Premium in the Equity Index Market. *Review of Financial Studies* 26(9): 2174-2203.

Kozhan, R. and Tham, W.W. (2012) Execution Risk in High-Frequency Arbitrage. *Management Science* 58(11): 2131-2149.

Kozhemiakin, A.V. (2007) The Risk Premium of Corporate Bonds. *Journal of Portfolio Management* 33(2): 101-109.

Kozicki, S. and Tinsley, P.A. (2012) Effective Use of Survey Information in Estimating the Evolution of Expected Inflation. *Journal of Money, Credit and Banking* 44(1): 145-169.

Kozlov, M. and Petajisto, A. (2013) Global Return Premiums on Earnings Quality, Value, and Size. *Working Paper*. Available online: <https://ssrn.com/abstract=2179247>.

Kraenzlin, S. (2007) The characteristics and development of the Swiss franc repurchase agreement market. *Financial Markets and Portfolio Management* 21(2): 241-261.

Krainer, J. (2001) A Theory of Liquidity in Residential Real Estate Markets. *Journal of Urban Economics* 49(1): 32-53.

- Krause, T., Ehsani, S. and Lien, D. (2014) Exchange-traded funds, liquidity and volatility. *Applied Financial Economics* 24(24): 1617-1630.
- Krauss, C. (2017) Statistical arbitrage pairs trading strategies: Review and outlook. *Journal of Economic Surveys* 31(2): 513-545.
- Krauss, C. and Stübinger, J. (2017) Non-linear dependence modelling with bivariate copulas: Statistical arbitrage pairs trading on the S&P 100. *Applied Economics* 23(1): 1-18.
- Krishnamurthy, A. (2002) The Bond/Old-Bond Spread. *Journal of Financial Economics* 66(2): 463-506.
- Kristoufek, L. (2015) What Are the Main Drivers of the Bitcoin Price? Evidence from Wavelet Coherence Analysis. *PLoS ONE* 10(4): e0123923.
- Kroner, K.F. and Sultan, J. (1993) Time-Varying Distributions and Dynamic Hedging with Foreign Currency Futures. *Journal of Financial and Quantitative Analysis* 28(4): 535-551.
- Kruttli, M., Monin, P. and Watugala, S.W. (2018) Investor Concentration, Flows, and Cash Holdings: Evidence from Hedge Funds. *Working Paper*. Available online: <https://ssrn.com/abstract=3031663>.
- Kryzanowski, L., Galler, M. and Wright, D. (1993) Using Artificial Neural Networks to Pick Stocks. *Financial Analysts Journal* 49(4): 21-27.
- Kuberek, R.C. and Pefley, N.G. (1983) Hedging Corporate Debt with U.S. Treasury Bond Futures. *Journal of Futures Markets* 3(4): 345-353.
- Kudryavtsev, A. (2012) Overnight stock price reversals. *Journal of Advanced Studies in Finance* 3(2): 162-170.
- Kuhle, J. and Alvaay, J. (2000) The Efficiency of Equity REIT Prices. *Journal of Real Estate Portfolio Management* 6(4): 349-354.
- Kumar, A. (2009) Who Gambles in the Stock Market? *Journal of Finance* 64(4): 1889-1933.
- Kumar, V.A. (2012) Money Laundering: Concept, Significance and its Impact. *European Journal of Business and Management* 4(2): 113-119.
- Kumar, M. and Thenmozhi, M. (2001) Forecasting Stock Index Movement: A Comparison of Support Vector Machines and Random Forest. *Working Paper*. Available online: <https://ssrn.com/abstract=876544>.
- Kwok, Y.K. (2014) Game option models of convertible bonds: Determinants of call policies. *Journal of Financial Engineering* 1(4): 1450029.

Lafuente, J.A. (2013) Optimal cross-hedging under futures mispricing: A note. *Journal of Derivatives & Hedge Funds* 19(3): 181-188.

Lahmiri, S. (2014) Wavelet low- and high-frequency components as features for predicting stock prices with backpropagation neural networks. *Journal of King Saud University – Computer and Information Sciences* 26(2): 218-227.

Lai, H.-C., Tseng, T.-C. and Huang, S.-C. (2016) Combining value averaging and Bollinger Band for an ETF trading strategy. *Applied Economics* 48(37): 3550-3557.

Laitinen, E.K. and Laitinen, T. (2000) Bankruptcy prediction application of the Taylor's expansion in logistic regression. *International Review of Financial Analysis* 9(4): 327-349.

Lakonishok, J., Lee, I., Pearson, N.D. and Poteshman, A.M. (2007) Option market activity. *Review of Financial Studies* 20(3): 813-857.

Lakonishok, J., Shleifer, A. and Vishny, R.W. (1994) Contrarian investment, extrapolation, and risk. *Journal of Finance* 49(5): 1541-1578.

Lakonishok, J. and Vermaelen, T. (1986) Tax-Induced Trading Around the Ex-Day. *Journal of Financial Economics* 16(3): 287-319.

Lambert, M., Papageorgiou, N. and Platania, F. (2006) Market Efficiency and Hedge Fund Trading Strategies. *Working Paper*. Available online: https://www.edhec.edu/sites/www.edhec-portail.pprod.net/files/edhec_working_paper_market_efficiency_and_hedge_fund_trading_strategies_f.compressed.pdf.

Lamoureux, C.G. and Lastrapes, W. (1993) Forecasting stock return variance: towards understanding stochastic implied volatility. *Review of Financial Studies* 6(2): 293-326.

Lamoureux, C. and Wansley, J. (1987) Market Effects of Changes in the S&P 500 Index. *Financial Review* 22(1): 53-69.

Landes, W.J., Stoffels, J.D. and Seifert, J.A. (1985) An Empirical Test of a Duration-Based Hedge: The Case of Corporate Bonds. *Journal of Futures Markets* 5(2): 173-182.

Lang, L.H.P., Litzenberger, R.H. and Liu, A.L. (1998) Determinants of Interest Rate Swap Spreads. *Journal of Banking & Finance* 22(12): 1507-1532.

Langetieg, T.C., Leibowitz, L. and Kogelman, S. (1990) Duration Targeting and the Management of Multiperiod Returns. *Financial Analysts Journal* 46(5): 35-45.

- Larker, D. and Lys, T. (1987) An empirical analysis of the incentives to engage in costly information acquisition: The case of risk arbitrage. *Journal of Financial Economics* 18(1): 111-126.
- Larkin, D.E., Babin, M.L. and Rose, C.A. (2004) Structuring European real estate private equity funds. *Briefings in Real Estate Finance* 3(3): 229-235.
- Larsen, G. and Resnick, B. (1998) Empirical Insights on Indexing. *Journal of Portfolio Management* 25(1): 51-60.
- Larsson, P. and Flohr, L. (2011) Optimal proxy-hedging of options on illiquid baskets. *Working Paper*. Available online: <https://www.math.kth.se/matstat/seminarier/reports/M-exjobb11/110131a.pdf>.
- Lasfer, M.A. (1995) Ex-Day Behavior: Tax or Short-Term Trading Effects. *Journal of Finance* 50(3): 875-897.
- Laurent, J.-P. and Gregory, J. (2005) Basket Default Swaps, CDOs and Factor Copulas. *Journal of Risk* 7(4): 8-23.
- Laurent, J.-P., Cousin, A. and Fermanian, J.D. (2011) Hedging default risks of CDOs in Markovian contagion models. *Quantitative Finance* 11(12): 1773-1791.
- Laureti, P., Medo, M. and Zhang, Y.-C. (2010) Analysis of Kelly-optimal portfolios. *Quantitative Finance* 10(7): 689-697.
- Lautier, D. and Galli, A. (2004) Simple and extended Kalman filters: an application to term structures of commodity prices. *Applied Financial Economics* 14(13): 963-973.
- Lazo, J.K., Lawson, M., Larsen, P.H. and Waldman, D.M. (2011) U.S. Economic Sensitivity to Weather Variability. *Bulletin of the American Meteorological Society* 92(6): 709-720.
- Lebeck, W.W. (1978) Futures trading and hedging. *Food Policy* 3(1): 29-35.
- Lee, S. (2010) The Changing Benefit of REITs to the Multi-Asset Portfolio. *Journal of Real Estate Portfolio Management* 16(3): 201-215.
- Lee, D.K.C., Guo, L. and Wang, Y. (2018) Cryptocurrency: A New Investment Opportunity? *Journal of Alternative Investments* 20(3): 16-40.
- Lee, H., Liao, T. and Tung, P. (2017) Investors' Heterogeneity in Beliefs, the VIX Futures Basis, and S&P 500 Index Futures Returns. *Journal of Futures Markets* 37(9): 939-960.

- Lee, S.B. and Oh, S.H. (1993) Managing non-parallel shift risk of yield curve with interest rate futures. *Journal of Futures Markets* 13(5): 515-526.
- Lee, Y. and Oren, S. (2009) An equilibrium pricing model for weather derivatives in a multi-commodity setting. *Energy Economics* 31(5): 702-713.
- Lee, S. and Stevenson, S. (2005) The Case for REITs in the Mixed-Asset Portfolio in the Short and Long Run. *Journal of Real Estate Portfolio Management* 11(1): 55-80.
- Leggio, K. and Lien, D. (2002) Hedging gas bills with weather derivatives. *Journal of Economics and Finance* 26(1): 88-100.
- Lehecka, G.V. (2013) Hedging and Speculative Pressures: An Investigation of the Relationships among Trading Positions and Prices in Commodity Futures Markets. In: *Proceedings of the NCCC-134 Conference on Applied Commodity Price Analysis, Forecasting, and Market Risk Management*. Available online: http://www.farmdoc.illinois.edu/nccc134/conf_2013/pdf/Lehecka_NCCC-134_2013.pdf.
- Lehmann, B.N. (1990) Fads, Martingales, and Market Efficiency. *Quarterly Journal of Economics* 105(1): 1-28.
- Leibowitz, M.L. and Bova, A. (2013) Duration Targeting and Index Convergence. *Morgan Stanley Investment Management Journal* 3(1): 73-80.
- Leibowitz, M.L., Bova, A. and Kogelman, S. (2014) Long-Term Bond Returns under Duration Targeting. *Financial Analysts Journal* 70(1): 31-51.
- Leibowitz, M.L., Bova, A. and Kogelman, S. (2015) Bond Ladders and Rolling Yield Convergence. *Financial Analysts Journal* 71(2): 32-46.
- Leigland, J. (2018) Changing Perceptions of PPP Risk and Return: The Case of Brownfield Concessions. *Journal of Structured Finance* 23(4): 47-56.
- Leland, H. and Connor, G. (1995) Optimal Cash Management for Investment Funds. *Research Program in Finance Working Papers*, No. RPF-244. Berkeley, CA: University of California at Berkeley.
- Leland, E.C. and Panos, N. (1997) The Puttable Bond Market: Structure, Historical Experience, and Strategies. *Journal of Fixed Income* 7(3): 47-60.
- Le Moigne, C. and Viveiros, É. (2008) Private Real Estate as an Inflation Hedge: An Updated Look with a Global Perspective. *Journal of Real Estate Portfolio Management* 14(4): 263-286.
- Leontsinis, S. and Alexander, C. (2016) Arithmetic variance swaps. *Quantitative Finance* 17(4): 551-569.

- Lessambo, F.I. (2016) *International Aspects of the US Taxation System*. New York, NY: Palgrave Macmillan.
- Leung, T., Li, J., Li, X. and Wang, Z. (2016) Speculative Futures Trading under Mean Reversion. *Asia-Pacific Financial Markets* 23(4): 281-304.
- Leung, C.K.Y. and Tse, C.-Y. (2013) Flippers in housing market search. *Working Paper*. Available online: <https://hub.hku.hk/bitstream/10722/190689/1/Content.pdf>.
- Levi, M. and Reuter, P. (2006) Money Laundering. *Crime and Justice* 34(1): 289-375.
- Levin, A. and Davidson, A. (2005) Prepayment Risk-and Option-Adjusted Valuation of MBS. *Journal of Portfolio Management* 31(4): 73-85.
- Levine, A. and Pedersen, L.H. (2016) Which Trend Is Your Friend? *Financial Analysts Journal* 72(3): 51-66.
- Levis, M. and Liodakis, M. (1999) The Profitability of Style Rotation Strategies in the United Kingdom. *Journal of Portfolio Management* 26(1): 73-86.
- Levitt, S.D. and Syverson, C. (2008) Market Distortions When Agents Are Better Informed: The Value of Information in Real Estate Transactions. *Review of Economics and Statistics* 90(4): 599-611.
- Levy, P.S. (1991) Approaches to Investing in Distressed Securities: Active Approaches. In: Bowman, T.A. (ed.) *Analyzing Investment Opportunities in Distressed and Bankrupt Companies*. (AIMR Conference Proceedings, Vol. 1991, Iss. 1.) Chicago, IL: AIMR, pp. 44-46.
- Levy, A. and Lieberman, O. (2013) Overreaction of country ETFs to US market returns: Intraday vs. daily horizons and the role of synchronized trading. *Journal of Banking & Finance* 37(5): 1412-1421.
- Lewis, K. (1995) Puzzles in International Financial Markets. In: Grossman G.M. and Rogoff, K. (eds.) *Handbook of International Economics*, Vol. 3. Amsterdam, The Netherlands: North-Holland, Chapter 37.
- Lewis, M. (2014) *Flash Boys: A Wall Street Revolt*. New York, NY: W.W. Norton & Company, Inc.
- Lewis, C.M., Rogalski, R.J. and Seward, J.K. (1999) Is convertible debt a substitute for straight debt or for common equity? *Financial Management* 28(3): 5-27.
- Lewis, C.M. and Verwijmeren, P. (2011) Convertible security design and contract innovation. *Journal of Corporate Finance* 17(4): 809-831.

- Lhabitant, F.-S. (2002) *Hedge Funds: Myths and Limits*. Chichester, UK: John Wiley & Sons, Ltd.
- L'Hoir, M. and Boulhabel, M. (2010) A Bond-Picking Model for Corporate Bond Allocation. *Journal of Portfolio Management* 36(3): 131-139.
- Li, D.X. (2000) On default correlation: a copula function approach. *Journal of Fixed Income* 9(4): 43-54.
- Li, T.R., Chamrajnagar, A.S., Fong, X.R., Rizik, N.R. and Fu, F. (2018) Sentiment-Based Prediction of Alternative Cryptocurrency Price Fluctuations Using Gradient Boosting Tree Model. *Working Paper*. Available online: <https://arxiv.org/pdf/1805.00558.pdf>.
- Li, X., Deng, X., Zhu, S., Wang, F. and Xie, H. (2014) An intelligent market making strategy in algorithmic trading. *Frontiers of Computer Science* 8(4): 596-608.
- Li, B., Hoi, S.C.H., Sahoo, D. and Liu, Z.-Y. (2015) Moving average reversion strategy for on-line portfolio selection. *Artificial Intelligence* 222: 104-123.
- Li, L. and Kleindorfer, P.R. (2009) On hedging spark spread options in electricity markets. *Risk and Decision Analysis* 1(4): 211-220.
- Li, X., Sullivan, R.N. and Garcia-Feijóo, L. (2014) The Limits to Arbitrage and the Low-Volatility Anomaly. *Financial Analysts Journal* 70(1): 52-63.
- Li, X., Sullivan, R.N. and Garcia-Feijóo, L. (2016) The Low-Volatility Anomaly: Market Evidence on Systematic Risk vs. Mispricing. *Financial Analysts Journal* 72(1): 36-47.
- Li, Y. and Wang, K. (1995) The Predictability of REIT Returns and Market Segmentation. *Journal of Real Estate Research* 10(5): 471-482.
- Li, P. and Yang, J. (2017) Pricing Collar Options with Stochastic Volatility. *Discrete Dynamics in Nature and Society* 2017: 9673630.
- Li, B., Zhao, P., Hoi, S.C.H. and Gopalkrishnan, V. (2012) PAMR: Passive aggressive mean reversion strategy for portfolio selection. *Machine Learning* 87(2): 221-258.
- Liao, G.Y. (2016) Credit migration and covered interest rate parity. *Working Paper*. Available online: <http://scholar.harvard.edu/files/gliao/files/creditcip.pdf>.
- Lien, D. (1992) Optimal Hedging and Spreading in Cointegrated Markets. *Economics Letters* 40(1): 91-95.

- Lien, D. (2004) Cointegration and the Optimal Hedge Ratio: The General Case. *Quarterly Review of Economics and Finance* 44(5): 654-658.
- Lien, D. (2010) The effects of skewness on optimal production and hedging decisions: An application of the skew-normal distribution. *Journal of Futures Markets* 30(3): 278-289.
- Lien, D. and Luo, X. (1993) Estimating Multiperiod Hedge Ratios in Cointegrated Markets. *Journal of Futures Markets* 13(8): 909-920.
- Lien, D. and Tse, Y.K. (2000) Hedging downside risk with futures contracts. *Applied Financial Economics* 10(2): 163-170.
- Lien, D. and Wang, Y. (2015) Effects of skewness and kurtosis on production and hedging decisions: A skewed t distribution approach. *European Journal of Finance* 21(13-14): 1132-1143.
- Liew, J.K.-S. and Budavári, T. (2016) Do Tweet Sentiments Still Predict the Stock Market? *Working Paper*. Available online: <https://ssrn.com/abstract=2820269>.
- Liew, J.K.-S., Li, R.Z. and Budavári, T. (2018) Crypto-Currency Investing Examined. *Working Paper*. Available online: <https://ssrn.com/abstract=3157926>.
- Liew, J.K.-S. and Mayster, B. (2018) Forecasting ETFs with Machine Learning Algorithms. *Journal of Alternative Investments* 20(3): 58-78.
- Liew, J. and Roberts, R. (2013) U.S. Equity Mean-Reversion Examined. *Risks* 1(3): 162-175.
- Liew, J. and Vassalou, M. (2000) Can Book-to-Market, Size and Momentum be Risk Factors that Predict Economic Growth? *Journal of Financial Economics* 57(2): 221-245.
- Liew, R. and Wu, Y. (2013) Pairs trading: A copula approach. *Journal of Derivatives & Hedge Funds* 19(1): 12-30.
- Lin, L., Lan, L.-H. and Chuang, S.-s. (2013) An Option-Based Approach to Risk Arbitrage in Emerging Markets: Evidence from Taiwan Takeover Attempts. *Journal of Forecasting* 32(6): 512-521.
- Lin, Y.-X., McCrae, M. and Gulati, C. (2006) Loss protection in pairs trading through minimum profit bounds: A cointegration approach. *Journal of Applied Mathematics and Decision Sciences* 2006(4): 1-14.

Lin, S.-Y. and Shyy, G. (2008) Credit Spreads, Default Correlations and CDO Tranching: New Evidence from CDS Quotes. *Working Paper*. Available online: <https://ssrn.com/abstract=496225>.

Lin, C.Y. and Yung, K. (2004) Real Estate Mutual Funds: Performance and Persistence. *Journal of Real Estate Research* 26(1): 69-93.

Lindahl, M. (1992) Minimum variance hedge ratios for stock index futures: duration and expiration effects. *Journal of Futures Markets* 12(1): 33-53.

Lioui, A. and Poncet, P. (2005) General equilibrium pricing of CPI derivatives. *Journal of Banking & Finance* 29(5): 1265-1294.

Litterman, R.B. and Scheinkman, J. (1991) Common Factors Affecting Bond Returns. *Journal of Fixed Income* 1(1): 54-61.

Litzenberger, R.H. and Rabinowitz, N. (1995) Backwardation in oil futures markets: Theory and empirical evidence. *Journal of Finance* 50(3): 1517-1545.

Liu, B., Chang, L.B. and Geman, H. (2017) Intraday pairs trading strategies on high frequency data: The case of oil companies. *Quantitative Finance* 17(1): 87-100.

Liu, B. and Dash, S. (2012) Volatility ETFs and ETNs. *Journal of Trading* 7(1): 43-48.

Liu, J., Longstaff, F.A. and Mandell, R.E. (2006) The Market Price of Risk in Interest Rate Swaps: The Roles of Default and Liquidity Risks. *Journal of Business* 79(5): 2337-2360.

Liu, C.H. and Mei, J. (1992) The Predictability of Returns on Equity REITs and their Co-Movement with Other Assets. *Journal of Real Estate Finance and Economics* 5(4): 401-418.

Liu, F., Pantelous, A.A. and von Mettenheim, H.-J. (2018) Forecasting and trading high frequency volatility on large indices. *Quantitative Finance* 18(5): 737-748.

Liu, P. and Tang, K. (2010) No-arbitrage conditions for storable commodities and the models of futures term structures. *Journal of Banking & Finance* 34(7): 1675-1687.

Liu, P. and Tang, K. (2011) The stochastic behavior of commodity prices with heteroscedasticity in the convenience yield. *Journal of Empirical Finance* 18(2): 211-224.

Liu, Z.F. and van der Heijden, T. (2016) Model-Free Risk-Neutral Moments and Proxies. *Working Paper*. Available online: <https://ssrn.com/abstract=2641559>.

Liu, J.-G. and Xu, E. (1998) Pricing of mortgage-backed securities with option-adjusted spread. *Managerial Finance* 24(9-10): 94-109.

Liu, L.X. and Zhang, L. (2008) Momentum Profits, Factor Pricing, and Macroeconomic Risk. *Review of Financial Studies* 21(6): 2417-2448.

Liverance, E. (2010) Variance Swap. In: Cont, R. (ed.) *Encyclopedia of Quantitative Finance*. Hoboken, NJ: John Wiley & Sons, Inc.

Livnat, J. and Mendenhall, R.R. (2006) Comparing the post-earnings announcement drift for surprises calculated from analyst and time series forecasts. *Journal of Accounting Research* 44(1): 177-205.

Lo, A. (2008) Where Do Alphas Come From?: A New Measure of the Value of Active Investment Management. *Journal of Investment Management* 6(2): 1-29.

Lo, A. (2016) What Is an Index? *Journal of Portfolio Management* 42(2): 21-36.

Lo, A.W. and MacKinlay, A.C. (1990) When Are Contrarian Profits Due to Stock Market Overreaction? *Review of Financial Studies* 3(3): 175-205.

Lo, A., Mamaysky, H. and Wang, J. (2000) Foundations of Technical Analysis: Computational Algorithms, Statistical Inference, and Empirical Implementation. *Journal of Finance* 55(4): 1705-1765.

Lo, A.W., Orr, A. and Zhang, R. (2017) The Growth of Relative Wealth and the Kelly Criterion. *Working Paper*. Available online: <https://ssrn.com/abstract=2900509>.

Loh, R.K. and Warachka, M. (2012) Streaks in earnings surprises and the cross-section of stock returns. *Management Science* 58(7): 1305-1321.

Loncarski, I., ter Horst, J.R. and Veld, C.H. (2006) The Convertible Arbitrage Strategy Analyzed. *Working Paper*. Available online: <https://pure.uvt.nl/ws/files/779871/98.pdf>.

Loncarski, I., ter Horst, J. and Veld, C. (2009) The Rise and Demise of the Convertible Arbitrage Strategy. *Financial Analysts Journal* 65(5): 35-50.

Longstaff, F. (2005) Borrower Credit and the Valuation of Mortgage-Backed Securities. *Real Estate Economics* 33(4): 619-661.

- Longstaff, F.A. (2011) Municipal Debt and Marginal Tax Rates: Is There a Tax Premium in Asset Prices? *Journal of Finance* 66(3): 721-751.
- Low, A., Muthuswamy, J., Sakar, S. and Terry, E. (2002) Multiperiod hedging with futures contracts. *Journal of Futures Markets* 22(12): 1179-1203.
- Lozovaia, T. and Hizhniakova, H. (2005) How to Extend Modern Portfolio Theory to Make Money from Trading Equity Options. *Working Paper*. Available online:
http://www.ivolatility.com/doc/Dispersion_Article.pdf.
- Lu, C.J., Lee, T.S. and Chiu, C. (2009) Financial time series forecasting using independent component analysis and support vector regression. *Decision Support Systems* 47(2): 115-125.
- Lu, L., Wang, J. and Zhang, G. (2012) Long term performance of leveraged ETFs. *Financial Services Review* 21(1): 63-80.
- Lucas, D.J., Goodman, L.S. and Fabozzi, F.J. (eds.) (2006) *Collateralized Debt Obligations: Structures and Analysis*. Hoboken, NJ: John Wiley & Sons, Inc.
- Lucca, D.O. and Moench, E. (2012) The Pre-FOMC Announcement Drift. *Journal of Finance* 70(1): 329-371.
- Lummer, S.L. and Siegel, L.B. (1993) GSCI Collateralized Futures: A Hedging and Diversification Tool for Institutional Portfolio. *Journal of Investing* 2(2): 75-82.
- Lumpkin, S.A. (1987) Repurchase and Reverse Repurchase Agreements. *Federal Reserve Bank of Richmond, Economic Review* 73(1): 15-23.
- Lustig, H., Roussanov, N. and Verdelhan, A. (2011) Common Risk Factors in Currency Markets. *Review of Financial Studies* 24(11): 3731-3777.
- Lustig, H., Roussanov, N. and Verdelhan, A. (2014) Countercyclical currency risk premia. *Journal of Financial Economics* 111(3): 527-553.
- Lustig, H. and Verdelhan, A. (2007) The Cross-Section of Foreign Currency Risk Premia and US Consumption Growth Risk. *American Economic Review* 97(1): 89-117.
- Ma, K., Mercer, M. and Walker, M. (1992) Rolling over futures contracts: A note. *Journal of Futures Markets* 12(2): 203-217.
- Maaravi, Y. and Levy, A. (2017) When your anchor sinks your boat: Information asymmetry in distributive negotiations and the disadvantage of making the first offer. *Judgment and Decision Making* 12(5): 420-429.

Macaulay, F.R. (1938) *Some theoretical problems suggested by the movements of interest rates, bond yields and stock prices in the United States since 1856*. New York, NY: NBER, Inc.

MacKinnon, G.H. and Al Zaman, A. (2009) Real estate for the long term: the effect of return predictability on long-horizon allocations. *Real Estate Economics* 37(1): 117-153.

Mackintosh, P. (2017) It's all about active ETFs. *Journal of Index Investing* 7(4): 6-15.

Madhavan, A. (2012) Exchange-Traded Funds, Market Structure, and the Flash Crash. *Financial Analysts Journal* 68(4): 20-35.

Madhavan, A.N. (2016) *Exchange-Traded Funds and the New Dynamics of Investing*. Oxford, UK: Oxford University Press.

Madura, J. and Ngo, T. (2008) Impact of ETF inception on the valuation and trading of component stocks. *Applied Financial Economics* 18(12): 995-1007.

Maghrebi, N., Kim, M. and Nishina, K. (2007) The KOSPI200 Implied Volatility Index: Evidence of Regime Shifts in Expected Volatility. *Asia-Pacific Journal of Financial Studies* 36(2): 163-187.

Maheswaran, K. and Yeoh, S.C. (2005) The Profitability of Merger Arbitrage: Some Australian Evidence. *Australian Journal of Management* 30(1): 111-126.

Malizia, E.E. and Simons, R.A. (1991) Comparing Regional Classifications for Real Estate Portfolio Diversification. *Journal of Real Estate Research* 6(1): 53-77.

Malkiel, B.G. (2014) Is Smart Beta Really Smart? *Journal of Portfolio Management* 40(5): 127-134.

Malpezzi, S. (1999) A Simple Error Correction Model of House Prices. *Journal of Housing Economics* 8(1): 27-62.

Maluf, Y.S. and Albuquerque, P.H.M. (2013) Empirical evidence: arbitrage with Exchange-traded Funds (ETFs) on the Brazilian market. *Revista Contabilidade & Finanças* 24(61): 64-74.

Mancini-Griffoli, T. and Rinaldo, A. (2011) Limits to Arbitrage During the Crisis: Funding Liquidity Constraints and Covered Interest Parity. *Working Paper*. Available online: <https://ssrn.com/abstract=1549668>.

Mankiw, N.G. and Summers, L.H. (1984) Do Long-Term Interest Rates Overreact to Short-Term Interest Rates? *Brookings Papers on Economic Activity*, No. 1, pp. 223-242.

Mann, S.V. and Ramanlal, P. (1997) The relative performance of yield curve strategies. *Journal of Portfolio Management* 23(4): 64-70.

Manoliu, M. (2004) Storage options valuation using multilevel trees and calendar spreads. *International Journal of Theoretical and Applied Finance* 7(4): 425-464.

Maribu, K.M., Galli, A. and Armstrong, M. (2007) Valuation of spark-spread options with mean reversion and stochastic volatility. *International Journal of Electronic Business Management* 5(3): 173-181.

Mark, N.C. and Wu, Y. (2001) Rethinking Deviations From Uncovered Interest Parity: the Role of Covariance Risk and Noise. *Economic Journal* 108(451): 1686-1706.

Markowitz, H. (1952) Portfolio Selection. *Journal of Finance* 7(1): 77-91.

Markwardt, D., Lopez, C. and DeVol, R. (2016) The Economic Impact of Chapter 11 Bankruptcy versus Out-of-Court Restructuring. *Journal of Applied Corporate Finance* 28(4): 124-128.

Marques, C.R., Neves, P.D. and Sarmento, L.M. (2003) Evaluating core inflation indicators. *Economic Modelling* 20(4): 765-775.

Marshall, C.M. (2008) *Volatility trading: Hedge funds and the search for alpha (new challenges to the efficient markets hypothesis)* (Ph.D. Thesis). New York, NY: Fordham University. Available online: <https://fordham.bepress.com/dissertations/AAI3353774/>.

Marshall, C.M. (2009) Dispersion trading: Empirical evidence from U.S. options markets. *Global Finance Journal* 20(3): 289-301.

Marshall, B.R., Cahan, R.H. and Cahan, J.M. (2008) Can commodity futures be profitably traded with quantitative market timing strategies? *Journal of Banking & Finance* 32(9): 1810-1819.

Marshall, B.R., Nguyen, N.H. and Visaltanachoti, N. (2013) ETF arbitrage: Intraday evidence. *Journal of Banking & Finance* 37(9): 3486-3498.

Martellini, L., Milhau, V. and Tarelli, A. (2015) Hedging Inflation-Linked Liabilities without Inflation-Linked Instruments through Long/Short Investments in Nominal Bonds. *Journal of Fixed Income* 24(3): 5-29.

Martellini, L., Priaulet, P. and Priaulet, S. (2002) Understanding the butterfly strategy. *Journal of Bond Trading and Management* 1(1): 9-19.

- Martellini, L., Priaulet, P. and Priaulet, S. (2003) *Fixed Income Securities: Valuation, Risk Management and Portfolio Strategies*. Hoboken, NJ: John Wiley & Sons, Inc.
- Martin, G. (2010) The Long-Horizon Benefits of Traditional and New Real Assets in the Institutional Portfolio. *Journal of Alternative Investments* 13(1): 6-29.
- Martin, I. (2011) Simple Variance Swaps. *Working Paper*. Available online: <http://www.nber.org/papers/w16884>.
- Martinelli, R. and Rhoads, N. (2010) Predicting Market Data Using The Kalman Filter, Part 1 and Part 2. *Technical Analysis of Stocks & Commodities* 28(1): 44-47; *ibid.* 28(2): 46-51.
- Martínez, B. and Torró, H. (2018) Hedging spark spread risk with futures. *Energy Policy* 113: 731-746.
- Maslov, S. and Zhang, Y.-C. (1998) Optimal investment strategy for risky assets. *International Journal of Theoretical and Applied Finance* 1(3): 377-387.
- Matsypura, D. and Timkovsky, V.G. (2010) Combinatorics of Option Spreads: The Margining Aspect. *Working Paper*. Available online: https://ses.library.usyd.edu.au/bitstream/2123/8172/1/OMWP_2010_04.pdf.
- Mauer, R. and Sebastian, S. (2002) Inflation Risk Analysis of European Real Estate Securities. *Journal of Real Estate Research* 24(1): 47-78.
- Mayers, D. (1998) Why firms issue convertible bonds: The matching of financial and real investment options. *Journal of Financial Economics* 47(1): 83-102.
- Mayhew, S. (1995) Implied Volatility. *Financial Analysts Journal* 51(4): 8-20.
- Maze, S. (2012) Dispersion Trading in South Africa: An Analysis of Profitability and a Strategy Comparison. *Working Paper*. Available online: <https://ssrn.com/abstract=2398223>.
- Mazurczak, A. (2011) Development of Real Estate Investment Trust (REIT) regimes in Europe. *Journal of International Studies* 4(1): 115-123.
- McCants, A. (2007) Goods at Pawn: The Overlapping Worlds of Material Possessions and Family Finance in Early Modern Amsterdam. *Social Science History* 31(2): 213-238.

- McComas, A. (2003) Getting technical with spreads. *Futures Magazine*, July 2013, pp. 52-55.
- McConnell, J.J. and Buser, S.A. (2011) The Origins and Evolution of the Market for Mortgage-Backed Securities. *Annual Review of Financial Economics* 3: 173-192.
- McConnell, J.J. and Schwartz, E.S. (1986) LYON Taming. *Journal of Finance* 41(3): 561-577.
- McDevitt, D. and Kirwan, J. (2008) Corporate and Infrastructure-backed Inflation-linked Bonds. In: Benaben, B. and Goldenberg, S. (eds.) *Inflation Risk and Products: The Complete Guide*. London, UK: Risk Books, pp. 621-641.
- McDonald, R.L. (2001) Cross-Border Investing with Tax Arbitrage: The Case of German Dividend Tax Credits. *Review of Financial Studies* 14(3): 617-657.
- Mcelroy, T. (2008) Exact formulas for the Hodrick-Prescott Filter. *Econometrics Journal* 11(1): 208-217.
- McEnally, R.W. and Rice, M.L. (1979) Hedging Possibilities in the Flotation of Debt Securities. *Financial Management* 8(4): 12-18.
- McKee, T.E. and Lensberg, T. (2002) Genetic programming and rough sets: A hybrid approach to bankruptcy classification. *European Journal of Operational Research* 138(2): 436-451.
- McKenzie, J.A. (2002) A Reconsideration of the Jumbo/Non-Jumbo Mortgage Rate Differential. *Journal of Real Estate Finance and Economics* 25(2-3): 197-213.
- McMillan, L.G. (2002) *Options as a Strategic Investment*. (4th ed.) New York, NY: New York Institute of Finance.
- Meen, G. (2002) The Time-Series Behavior of House Prices: A Transatlantic Divide? *Journal of Housing Economics* 11(1): 1-23.
- Mehra, Y.P. (2002) Survey Measures of Expected Inflation: Revisiting the Issues of Predictive Content and Rationality. *Federal Reserve Bank of Richmond, Economic Quarterly* 88(3): 17-36.
- Mei, J. and Gao, B. (1995) Price Reversals, Transaction costs and Arbitrage Profits in the Real Estate Securities Market. *Journal of Real Estate Finance and Economics* 11(2): 153-165.

- Mei, J. and Liao, H.H. (1998) Risk Characteristics of Real Estate Related Securities: An Extension of Liu and Mei (1992). *Journal of Real Estate Research* 16(3): 279-290.
- Meissner, G. (ed.) (2008) *The Definitive Guide to CDOs*. London, UK: Incisive Media.
- Meissner, G. (2016) Correlation Trading Strategies: Opportunities and Limitations. *Journal of Trading* 11(4): 14-32.
- Mendenhall, R. (2004) Arbitrage Risk and the Post-Earnings-Announcement Drift. *Journal of Business* 77(6): 875-894.
- Menkhoff, L., Sarno, L., Schmeling, M. and Schrimpf, A. (2012) Currency momentum strategies. *Journal of Financial Economics* 106(3): 660-684.
- Menkveld, A.J. (2013) High Frequency Trading and the New Market Makers. *Journal of Financial Markets* 16(4): 712-740.
- Menkveld, A.J. (2016) The Economics of High-Frequency Trading: Taking Stock. *Annual Review of Financial Economics* 8: 1-24.
- Mercurio, F. (2005) Pricing inflation-indexed derivatives. *Quantitative Finance* 5(3): 289-302.
- Mercurio, F. and Moreni, N. (2006) Inflation with a smile. *Risk* 19(3): 70-75.
- Mercurio, F. and Moreni, N. (2009) Inflation modelling with SABR dynamics. *Risk*, June 2009, pp. 106-111.
- Mercurio, F. and Yildirim, Y. (2008) Modelling Inflation. In: Benaben, B. and Goldenberg, S. (eds.) *Inflation Risks and Products: The Complete Guide*. London, UK: Risk Books.
- Merton, R.C. (1987) A Simple Model of Capital Market Equilibrium with Incomplete Information. *Journal of Finance* 42(3): 483-510.
- Metghalchi, M., Marcucci, J. and Chang, Y.-H. (2012) Are moving average trading rules profitable? Evidence from the European stock markets. *Applied Economics* 44(12): 1539-1559.
- Meziani, A.S. (2015) Active exchange-traded funds: Are we there yet? *Journal of Index Investing* 6(2): 86-98.
- Mhaskar, H.N. and Micchelli, C.A. (1993) How to choose an activation function. In: *Proceedings of the 6th International Conference on Neural Information Processing Systems (NIPS'93)*. San Francisco, CA: Morgan Kaufmann Publishers, Inc., pp. 319-326.

- Miao, G.J. (2014) High frequency and dynamic pairs trading based on statistical arbitrage using a two-stage correlation and cointegration approach. *International Journal of Economics and Finance* 6(3): 96-110.
- Miao, G.J., Wei, B. and Zhou, H. (2012) Ambiguity Aversion and Variance Premium. *Working Paper*. Available online: <https://ssrn.com/abstract=2023765>.
- Miffre, J. (2012) Hedging pressure-based long/short commodity strategy used for third generation commodity index. *Risk*, January 2012. Available online: <https://www.risk.net/2247251>.
- Miffre, J. and Rallis, G. (2007) Momentum strategies in commodity futures markets. *Journal of Banking & Finance* 31(6): 1863-1886.
- Milanov, K., Kounchev, O., Fabozzi, F.J., Kim, Y.S. and Rachev, S.T. (2013) A Binomial-Tree Model for Convertible Bond Pricing. *Journal of Fixed Income* 22(3): 79-94.
- Miles, M. and Mahoney, J. (1997) Is commercial real estate an inflation hedge? *Real Estate Finance* 13(4): 31-45.
- Miles, M. and McCue, T. (1984) Commercial Real Estate Returns. *Real Estate Economics* 12(3): 355-377.
- Miller, M.H. (1977) Debt and taxes. *Journal of Finance* 32(2): 261-275.
- Milonas, N.T. (1991) Measuring seasonalities in commodity markets and the half-month effect. *Journal of Futures Markets* 11(3): 331-346.
- Milosevic, N. (2016) Equity Forecast: Predicting Long Term Stock Price Movement using Machine Learning. *Journal of Economics Library* 3(2): 288-294.
- Miltersen, K.R. and Schwartz, E.S. (1998) Pricing of options on commodity futures with stochastic term structures of convenience yield and interest rates. *Journal of Financial and Quantitative Analysis* 33(1): 33-59.
- Min, S., Lee, J. and Han, I. (2006) Hybrid genetic algorithms and support vector machines for bankruptcy prediction. *Expert Systems with Applications* 31(3): 652-660.
- Minton, B.A. (1997) An empirical examination of basic valuation models for plain vanilla U.S. interest rate swaps. *Journal of Financial Economics* 44(2): 251-277.
- Mitchell, M. and Pulvino, T. (2001) Characteristics of Risk and Return in Risk Arbitrage. *Journal of Finance* 56(6): 2135-2175.

- Mittal, A. and Goel, A. (2012) Stock Prediction Using Twitter Sentiment Analysis. *Working Paper*. Palo Alto, CA: Stanford University.
- Mitton, T. and Vorkink, K. (2007) Equilibrium Underdiversification and the Preference for Skewness. *Review of Financial Studies* 20(4): 1255-1288.
- Mixon, S. (2007) The implied volatility term structure of stock index options. *Journal of Empirical Finance* 14(3): 333-354.
- Mixon, S. (2011) What Does Implied Volatility Skew Measure? *Journal of Derivatives* 18(4): 9-25.
- Mladina, P. (2014) Dynamic Asset Allocation with Horizon Risk: Revisiting Glide Path Construction. *Journal of Wealth Management* 16(4): 18-26.
- Monkhouse, P.H.L. (1993) The Cost of Equity Under the Australian Dividend Imputation Tax System. *Accounting and Finance* 33(2): 1-18.
- Monoyios, M. (2004) Performance of Utility-Based Strategies for Hedging Basis Risk. *Quantitative Finance* 4(3): 245-255.
- Monoyios, M. and Sarno, L. (2002) Mean reversion in stock index futures markets: a nonlinear analysis. *Journal of Futures Markets* 22(4): 285-314.
- Montelongo, A. and Chang, H.K. (2008) *Flip and grow rich: The heart and mind of real estate investing*. San Antonio, TX: Armondo Montelongo Worldwide, Inc.
- Montrucchio, L. and Peccati, L. (1991) A note on Shiu-Fisher-Weil immunization theorem. *Insurance: Mathematics and Economics* 10(2): 125-131.
- Moore, S., Toepke, J. and Colley, N. (2006) *The encyclopedia of commodity and financial spreads*. Hoboken, NJ: John Wiley & Sons, Inc.
- Moosa, I. (2001) Triangular Arbitrage in the Spot and Forward Foreign Exchange Markets. *Quantitative Finance* 1(4): 387-390.
- Moosa, I.A. (2003a) Two-Currency, Three-Currency and Multi-Currency Arbitrage. In: *International Financial Operations: Arbitrage, Hedging, Speculation, Financing and Investment*. Finance and Capital Markets Series. London, UK: Palgrave Macmillan, Chapter 1, pp. 1-18.
- Moosa, I.A. (2003b) The sensitivity of the optimal hedge ratio to model specification. *Finance Letters* 1(1): 15-20.
- Moran, M.T. and Dash, S. (2007) VIX Futures and Options: Pricing and Using Volatility Products to Manage Downside Risk and Improve Efficiency in Equity Portfolios. *Journal of Trading* 2(3): 96-105.

- Morisawa, Y. (2009) Toward a Geometric Formulation of Triangular Arbitrage: An Introduction to Gauge Theory of Arbitrage. *Progress of Theoretical Physics Supplement* 179: 209-215.
- Morse, D. and Shaw, W. (1988) Investing in Bankrupt Firms. *Journal of Finance* 43(5): 1193-1206.
- Moskowitz, T.J. and Grinblatt, M. (1999) Do Industries Explain Momentum? *Journal of Finance* 54(4): 1249-1290.
- Moskowitz, T.J., Ooi, Y.H. and Pedersen, L.H. (2012) Time Series Momentum. *Journal of Financial Economics* 104(2): 228-250.
- Moss, A., Clare, A., Thomas, S. and Seaton, J. (2015) Trend Following and Momentum Strategies for Global REITs. *Journal of Real Estate Portfolio Management* 21(1): 21-31.
- Mossman, C.E., Bell, G.G., Swartz, L.M. and Turtle, H. (1998) An empirical comparison of bankruptcy models. *Financial Review* 33(2): 35-54.
- Mou, Y. (2010) Limits to Arbitrage and Commodity Index Investment: Front-Running the Goldman Roll. *Working Paper*. Available online: <https://ssrn.com/abstract=1716841>.
- Mouakhar, T. and Roberge, M. (2010) The Optimal Approach to Futures Contract Roll in Commodity Portfolios. *Journal of Alternative Investments* 12(3): 51-60.
- Moyer, S.G., Martin, D. and Martin, J. (2012) A Primer on Distressed Investing: Buying Companies by Acquiring Their Debt. *Journal of Applied Corporate Finance* 24(4): 59-76.
- Mraoua, M. (2007) Temperature stochastic modelling and weather derivatives pricing: empirical study with Moroccan data. *Afrika Statistika* 2(1): 22-43.
- Mueller, G.R. (1993) Refining Economic Diversification Strategies for Real Estate Portfolios. *Journal of Real Estate Research* 8(1): 55-68.
- Mueller, G.R. and Laposa, S.P. (1995) Property-Type Diversification in Real Estate Portfolios: A Size and Return Perspective. *Journal of Real Estate Portfolio Management* 1(1): 39-50.
- Mueller, A. and Mueller, G. (2003) Public and Private Real Estate in a Mixed-Asset Portfolio. *Journal of Real Estate Portfolio Management* 9(3): 193-203.
- Mugwagwa, T., Ramiah, V., Naughton, T. and Moosa, I. (2012) The efficiency of the buy-write strategy: Evidence from Australia. *Journal of International Financial Markets, Institutions and Money* 22(2): 305-328.

Müller, A. and Grandi, M. (2000) Weather Derivatives: A Risk Management Tool for Weather-sensitive Industries. *Geneva Papers on Risk and Insurance* 25(2): 273-287.

Mun, K.-C. (2016) Hedging bank market risk with futures and forwards. *Quarterly Review of Economics and Finance* 61: 112-125.

Mun, K.-C. and Morgan, G.E. (1997) Cross-hedging foreign exchange rate risks: The case of deposit money banks in emerging Asian countries. *Pacific-Basin Finance Journal* 5(2): 215-230.

Mun, J.C., Vasconcellos, G.M. and Kish, R. (2000) The contrarian overreaction hypothesis: An analysis of the US and Canadian stock markets. *Global Finance Journal* 11(1-2): 53-72.

Murphy, J.J. (1986) *Technical analysis of the futures markets: A comprehensive guide to trading methods and applications*. New York, NY: New York Institute of Finance.

Muthuswamy, J., Palmer, J., Richie, N. and Webb, R. (2011) High-Frequency Trading: Implications for Markets, Regulators, and Efficiency. *Journal of Trading* 6(1): 87-97.

Mwangi, C.I. and Duncan, M.O. (2012) An investigation into the existence of exchange rate arbitrage in the Mombasa spot market. *International Journal of Humanities and Social Science* 2(21): 182-196.

Myers, R.J. (1991) Estimating time-varying optimal hedge ratios on futures markets. *Journal of Futures Markets* 11(1): 39-53.

Nakamoto, S. (2008) Bitcoin: A Peer-to-Peer Electronic Cash System. *Working Paper*. Available online: <https://bitcoin.org/bitcoin.pdf>.

Nakano, M., Takahashi, A. and Takahashi, S. (2018) Bitcoin Technical Trading With Artificial Neural Network. *Working Paper*. Available online: <https://ssrn.com/abstract=3128726>.

Nandy (Pal), S. and Chattopadhyay, A.Kr. (2016) Impact of Individual Stock Derivatives Introduction in India on Its Underlying Spot Market Volatility. *Asia-Pacific Journal of Management Research and Innovation* 12(2): 109-133.

Nartea, G. and Eves, C. (2010) Role of farm real estate in a globally diversified asset portfolio. *Journal of Property Investment & Finance* 28(3): 198-220.

Nashikkar, A., Subrahmanyam, M.G. and Mahanti, S. (2011) Liquidity and Arbitrage in the Market for Credit Risk. *Journal of Financial and Quantitative Analysis* 46(3): 627-656.

- Nawalkha, S.K. and Chambers, D.R. (1996) An improved immunization strategy: M-absolute. *Financial Analysts Journal* 52(5): 69-76.
- Nekrasov, V. (2014) Kelly Criterion for Multivariate Portfolios: A Model-Free Approach. *Working Paper*. Available online: <https://ssrn.com/abstract=2259133>.
- Nelken, I. (2006) Variance swap volatility dispersion. *Derivatives Use, Trading & Regulation* 11(4): 334-344.
- Nelling, E. and Gyourko, J. (1998) The Predictability of Equity REIT Returns. *Journal of Real Estate Research* 16(3): 251-268.
- Newell, G. (1996) The inflation-hedging characteristics of Australian commercial property: 1984-1995. *Journal of Property Finance* 7(1): 6-20.
- Newell, G., Chau, K.W. and Wong, S.K. (2009) The significance and performance of infrastructure in China. *Journal of Property Investment & Finance* 27(2): 180-202.
- Newell, G. and Peng, H.W. (2008) The role of US infrastructure in investment portfolios. *Journal of Real Estate Portfolio Management* 14(1): 21-34.
- Newell, G., Peng, H.W. and De Francesco, A. (2011) The performance of unlisted infrastructure in investment portfolios. *Journal of Property Research* 28(1): 59-74.
- Ng, K.Y. and Phelps, B.D. (2015) The Hunt for a Low-Risk Anomaly in the USD Corporate Bond Market. *Journal of Portfolio Management* 42(1): 63-84.
- Ng, V.K. and Pirrong, S.C. (1994) Fundamentals and volatility: storage, spreads, and the dynamics of metals prices. *Journal of Business* 67(2): 203-230.
- Ng, J., Rusticus, T. and Verdi, R. (2008) Implications of Transaction Costs for the Post-Earnings Announcement Drift. *Journal of Accounting Research* 46(3): 661-696.
- Nguyen, V.T.T. and Sercu, P. (2010) Tactical Asset Allocation with Commodity Futures: Implications of Business Cycle and Monetary Policy. *Working Paper*. Available online: <https://ssrn.com/abstract=1695889>.
- Niblock, S.J. (2017) Flight of the Condors: Evidence on the Performance of Condor Option Spreads in Australia. *Applied Finance Letters* 6(1): 38-53.
- Nielsen, M.J. and Schwartz, E.S. (2004) Theory of storage and the pricing of commodity claims. *Review of Derivatives Research* 7(1): 5-24.

- Nisar, T.M. and Yeung, M. (2018) Twitter as a tool for forecasting stock market movements: A short-window event study. *Journal of Finance and Data Science* 4(2): 101-119.
- Noh, J., Engle, R.F. and Kane, A. (1994) Forecasting volatility and option prices of the S&P500 Index. *Journal of Derivatives* 2(1): 17-30.
- Nossman, M. and Wilhelmsson, A. (2009) Is the VIX Futures Market Able to Predict the VIX Index? A Test of the Expectation Hypothesis. *Journal of Alternative Investments* 12(2): 54-67.
- Nothhaft, F.E., Lekkas, V. and Wang, G.H.K. (1995) The Failure of the Mortgage-Backed Futures Contract. *Journal of Futures Markets* 15(5): 585-603.
- Novak, M.G. and Velušček, D. (2016) Prediction of stock price movement based on daily high prices. *Quantitative Finance* 16(5): 793-826.
- Novy-Marx, R. (2009) Hot and Cold Markets. *Real Estate Economics* 37(1): 1-22.
- Novy-Marx, R. (2013) The other side of value: The gross profitability premium. *Journal of Financial Economics* 108(1): 1-28.
- Nyaradi, J. (2010) *Super Sectors: How to Outsmart the Market Using Sector Rotation and ETFs*. Hoboken, NJ: John Wiley & Sons, Inc.
- Odean, T. (2002) Volume, Volatility, Price, and Profit When All Traders Are Above Average. *Journal of Finance* 53(6): 1887-1934.
- O'Doherty, M.S. (2012) On the Conditional Risk and Performance of Financially Distressed Stocks. *Management Science* 58(8): 1502-1520.
- Odom, M.D. and Sharda, R. (1990) A neural network model for bankruptcy prediction. In: *Proceedings of the International Joint Conference on Neural Networks*, Vol. 2. Washington, DC: IEEE, pp. 163-168.
- Oetomo, T. and Stevenson, M. (2005) Hot or cold? A comparison of different approaches to the pricing of weather derivatives. *Journal of Emerging Market Finance* 4(2): 101-133.
- Officer, M.S. (2004) Collars and renegotiation in mergers and acquisitions. *Journal of Finance* 59(6): 2719-2743.
- Officer, M.S. (2006) The market pricing of implicit options in merger collars. *Journal of Business* 79(1): 115-136.

- O'Hara, M. (2015) High frequency market microstructure. *Journal of Financial Economics* 116(2): 257-270.
- Ohlson, J.A. (1980) Financial Ratios and the Probabilistic Prediction of Bankruptcy. *Journal of Accounting Research* 18(1): 109-131.
- Okunev, J. and White, D. (2003) Do Momentum-Based Strategies Still Work in Foreign Currency Markets? *Journal of Financial and Quantitative Analysis* 38(2): 425-447.
- Olmo, J. and Pilbeam, K. (2009) The profitability of carry trades. *Annals of Finance* 5(2): 231-241.
- Olszewski, F. and Zhou, G. (2013) Strategy diversification: Combining momentum and carry strategies within a foreign exchange portfolio. *Journal of Derivatives & Hedge Funds* 19(4): 311-320.
- O'Neal, E.S. (2000) Industry Momentum and Sector Mutual Funds. *Financial Analysts Journal* 56(4): 37-49.
- Opler, T., Pinkowitz, L., Stulz, R. and Williamson, R. (1999) The determinants and implications of corporate cash holdings. *Journal of Financial Economics* 52(1): 3-46.
- Opp, C.C. (2017) Learning, Optimal Default, and the Pricing of Distress Risk. *Working Paper*. Available online: <https://ssrn.com/abstract=2181441>.
- Ortalo-Magné, F. and Rady, S. (2006) Housing Market Dynamics: On the Contribution of Income Shocks and Credit Constraints. *Review of Economic Studies* 73(2): 459-485.
- Ortisi, M. (2016) Bitcoin Market Volatility Analysis Using Grand Canonical Minority Game. *Ledger* 1: 111-118.
- Osborne, M.J. (2005) On the computation of a formula for the duration of a bond that yields precise results. *Quarterly Review of Economics and Finance* 45(1): 161-183.
- Osler, C.L. (2000) Support for Resistance: Technical Analysis and Intraday Exchange Rates. *Federal Reserve Bank of New York, Economic Policy Review* 6(2): 53-68.
- Osler, C.L. (2003) Currency Orders and Exchange Rate Dynamics: An explanation for the predictive success of Technical Analysis. *Journal of Finance* 58(5): 1791-1819.
- Osteryoung, J.S., McCarty, D.E. and Roberts, G.S. (1981) Riding the Yield Curve with Treasury Bills. *Financial Review* 16(3): 57-66.

- Osu, B.O. (2010) Currency Cross Rate and Triangular Arbitrage in Nigerian Exchange Market. *International Journal of Trade, Economics and Finance* 1(4): 345-348.
- O'Tool, R. (2013) The Black-Litterman model: A risk budgeting perspective. *Journal of Asset Management* 14(1): 2-13.
- Ou, P. and Wang, H. (2009) Prediction of stock market index movement by ten data mining techniques. *Modern Applied Science* 3(12): 28-42.
- Oyedele, J.B., Adair, A. and McGreal, S. (2014) Performance of global listed infrastructure investment in a mixed asset portfolio. *Journal of Property Research* 31(1): 1-25.
- Ozdagli, A.K. (2010) The Distress Premium Puzzle. *Working Paper*. Available online: <https://ssrn.com/abstract=1713449>.
- Oztekin, A.S., Mishra, S., Jain, P.K., Daigler, R.T., Strobl, S. and Holowczak, R.D. (2017) Price Discovery and Liquidity Characteristics for U.S. Electronic Futures and ETF Markets. *Journal of Trading* 12(2): 59-72.
- Packer, F. and Zhu, H. (2005) Contractual terms and CDS pricing. *BIS Quarterly Review*, March 2005, pp. 89-100. Available online: https://www.bis.org/publ/qtrpdf/r_qt0503h.pdf.
- Pagnotta, E. and Philippon, T. (2012) Competing on Speed. *Working Paper*. Available online: <https://ssrn.com/abstract=1972807>.
- Pagolu, V.S., Reddy, K.N., Panda, G. and Majhi, B. (2016) Sentiment analysis of Twitter data for predicting stock market movements. In: *Proceedings of the 2016 International Conference on Signal Processing, Communication, Power and Embedded System (SCOPEs)*. Washington, DC: IEEE, pp. 1345-1350.
- Pagonidis, A.S. (2014) The IBS Effect: Mean Reversion in Equity ETFs. *Working Paper*. Available online: http://www.naaaim.org/wp-content/uploads/2014/04/00V_Alexander_Pagonidis_The-IBS-Effect-Mean-Reversion-in-Equity-ETFs-1.pdf.
- Pan, J. and Poteshman, A.M. (2006) The Information in Option Volume for Future Stock Prices. *Review of Financial Studies* 19(3): 871-908.
- Panayiotou, A. and Medda, F.R. (2014) Attracting Private Sector Participation in Transport Investment. *Procedia – Social and Behavioral Sciences* 111: 424-431.
- Panayiotou, A. and Medda, F. (2016) Portfolio of Infrastructure Investments: Analysis of European Infrastructure. *Journal of Infrastructure Systems* 22(3): 04016011.

- Pantalone, C. and Platt, H. (1984) Riding the Yield Curve. *Journal of Financial Education*, No. 13, pp. 5-9.
- Papageorgiou, N.A., Reeves, J.J. and Sherris, M. (2017) Equity investing with targeted constant volatility exposure. *Working Paper*. Available online: <https://ssrn.com/abstract=2614828>.
- Park, K., Jung, M. and Lee, S. (2018) Credit ratings and convertible bond prices: a simulation-based valuation. *European Journal of Finance* 24(12): 1001-1025.
- Parnaudeau, M. and Bertrand, J.-L. (2018) The contribution of weather variability to economic sectors. *Applied Economics* 50(43): 4632-4649.
- Pascalau, R. and Poirier, R. (2015) Bootstrapping the Relative Performance of Yield Curve Strategies. *Journal of Investment Strategies* 4(2): 55-81.
- Paschke, R. and Prokopczuk, M. (2012) Investing in commodity futures markets: can pricing models help? *European Journal of Finance* 18(1): 59-87.
- Passmore, W., Sherlund, S.M. and Burgess, G. (2005) The Effect of Housing Government-Sponsored Enterprises on Mortgage Rates. *Real Estate Economics* 33(3): 427-463.
- Pástor, L' and Stambaugh, R.F. (2003) Liquidity Risk and Expected Stock Returns. *Journal of Political Economy* 111(3): 642-685.
- Pätäri, E. and Vilska, M. (2014) Performance of moving average trading strategies over varying stock market conditions: the Finnish evidence. *Applied Economics* 46(24): 2851-2872.
- Pelaez, R.F. (1997) Riding the yield curve: Term premiums and excess returns. *Review of Financial Economics* 6(1): 113-119.
- Peng, H.W. and Newell, G. (2007) The Significance of Infrastructure in Australian Investment Portfolios. *Pacific Rim Property Research Journal* 13(4): 423-450.
- Pennacchi, G.G. (1991) Identifying the Dynamics of Real Interest Rates and Inflation: Evidence Using Survey Data. *Review of Financial Studies* 4(1): 53-86.
- Pepić, M. (2014) Managing interest rate risk with interest rate futures. *Ekonomika preduzeća* 62(3-4): 201-209.
- Perchanok, K. (2012) *Futures spreads: theory and praxis* (Ph.D. Thesis). Northampton, UK: The University of Northampton. Available online: <http://nectar.northampton.ac.uk/4963/1/Perchanok20124963.pdf>.

- Perchanok, K. and Kakabadse, N. (2013) Causes of Market Anomalies of Crude Oil Calendar Spreads: Does Theory of Storage Address the Issue? *Problems and Perspectives in Management* 11(2): 35-47.
- Perchet, R., de Carvalho, R.L. and Moulin, P. (2014) Intertemporal risk parity: a constant volatility framework for factor investing. *Journal of Investment Strategies* 4(1): 19-41.
- Perez-Gonzalez, F. and Yun, H. (2010) Risk Management and Firm Value: Evidence from Weather Derivatives. *Working Paper*. Available online: <https://ssrn.com/abstract=1357385>.
- Perić, M.R. (2015) *Ekonomski aspekti korporativnih bankrotstava i stečajnih procesa*. Belgrade, Serbia: Modern Business School.
- Perlin, M.S. (2009) Evaluation of pairs-trading strategy at the Brazilian financial market. *Journal of Derivatives & Hedge Funds* 15(2): 122-136.
- Person, J.L. (2007) *Candlestick and Pivot Point Trading Triggers*. Hoboken, NJ: John Wiley & Sons, Inc.
- Peterson, J.D. and Hsieh, C.-H. (1997) Do Common Risk Factors in the Returns on Stocks and Bonds Explain Returns on REITs? *Real Estate Economics* 25(2): 321-345.
- Petre, G. (2015) A Case for Dynamic Asset Allocation for Long Term Investors. *Procedia Economics and Finance* 29: 41-55.
- Pflueger, C.E. and Viceira, L.M. (2011) Inflation-Indexed Bonds and the Expectations Hypothesis. *Annual Review of Financial Economics* 3: 139-158.
- Philosophov, L.V. and Philosophov, V.L. (2005) Optimization of a firm's capital structure: A quantitative approach based on a probabilistic prognosis of risk and time of bankruptcy. *International Review of Financial Analysis* 14(2): 191-209.
- Piazzesi, M. and Schneider, M. (2009) Momentum Traders in the Housing Market: Survey Evidence and a Search Model. *American Economic Review* 99(2): 406-411.
- Picou, G. (1981) Managing Interest Rate Risk with Interest Rate Futures. *Bankers Magazine*, Vol. 164, May-June 1981, pp. 76-81.
- Pindado, J., Rodrigues, L. and de la Torre, C. (2008) Estimating financial distress likelihood. *Journal of Business Research* 61(9): 995-1003.
- Pindyck, R.S. (2001) The dynamics of commodity spot and futures markets: a primer. *Energy Journal* 22(3): 1-30.

Piotroski, J.D. (2000) Value investing: The use of historical financial statement information to separate winners from losers. *Journal of Accounting Research* 38: 1-41.

Piotroski, J.D. and So, E.C. (2012) Identifying Expectation Errors in Value/Glamour Strategies: A Fundamental Analysis Approach. *Review of Financial Studies* 25(9): 2841-2875.

Pirrong, C. (2005) Momentum in Futures Markets. *Working Paper*. Available online: <https://ssrn.com/abstract=671841>.

Pirrong, C. (2017) The economics of commodity market manipulation: A survey. *Journal of Commodity Markets* 5: 1-17.

Pisani, B. (2010) Man Vs. Machine: How Stock Trading Got So Complex. *CNBC* (September 13, 2010). Available online: <https://www.cnbc.com/id/38978686>.

Pitts, M. (1985) The Management of Interest Rate Risk: Comment. *Journal of Portfolio Management* 11(4): 67-69.

Pivar, W. (2003) *Real Estate Investing From A to Z: The Most Comprehensive, Practical, and Readable Guide to Investing Profitably in Real Estate*. New York, NY: McGraw-Hill, Inc.

Pizzutilo, F. (2013) A note on the effectiveness of pairs trading for individual investors. *International Journal of Economics and Financial Issues* 3(3): 763-771.

Podobnik, B., Horvatic, D., Petersen, A.M., Urošević, B. and Stanley, H.E. (2010) Bankruptcy risk model and empirical tests. *Proceedings of the National Academy of Sciences* 107(43): 18325-18330.

Poitras, G. (1990) The distribution of gold futures spreads. *Journal of Futures Markets* 10(6): 643-659.

Pole, A. (2007) *Statistical arbitrage: algorithmic trading insights and techniques*. Hoboken, NJ: John Wiley & Sons, Inc.

Popper, H. (1993) Long-term covered interest parity: evidence from currency swaps. *Journal of International Money and Finance* 12(4): 439-448.

Porter, M.F. (1980) An Algorithm for Suffix Stripping. *Program* 14(3): 130-137.

Poterba, J. (1986) Explaining the yield spread between taxable and tax exempt bonds. In: Rosen, H. (ed.) *Studies in State and Local Public Finance*. Chicago, IL: University of Chicago Press, pp. 5-48.

Poterba, J. (1989) Tax reform and the market for tax-exempt debt. *Regional Science and Urban Economics* 19(3): 537-562.

Poterba, J. and Sinai, T. (2008) Tax Expenditures for Owner-Occupied Housing: Deductions for Property Taxes and Mortgage Interest and the Exclusion of Imputed Rental Income. *American Economic Review* 98(2): 84-89.

Poterba, J.M. and Summers, L.H. (1988) Mean reversion in stock prices: evidence and implications. *Journal of Financial Economics* 22(1): 27-59.

Potjer, D. and Gould, C. (2007) *Global Tactical Asset Allocation: Exploiting the opportunity of relative movements across asset classes and financial markets*. London, UK: Risk Books.

Pounds, H. (1978) Covered Call Option Writing Strategies and Results. *Journal of Portfolio Management* 4(2): 31-42.

Prince, J.T. (2005) Investing in Collateralized Debt Obligations. *CFA Institute Conference Proceedings* 2005(1): 52-61.

Pring, M.J. (1985) *Technical analysis explained: The successful investor's guide to spotting investment trends and turning points*. (3rd ed.) New York, NY: McGraw-Hill, Inc.

Prokopczuk, M. and Simen, C.W. (2014) The importance of the volatility risk premium for volatility forecasting. *Journal of Banking & Finance* 40: 303-320.

Putnam, G., III (1991) Investment Opportunities in Distressed Equities. In: Levine, S. (ed.) *Handbook of Turnaround and Bankruptcy Investing*. New York, NY: HarperCollins, pp. 196-207.

Puttonen, V. (1993) The ex ante profitability of index arbitrage in the new Finnish markets. *Scandinavian Journal of Management* 9(S1): 117-127.

Quintero, R.G. (1989) Acquiring the Turnaround Candidate. In: Levine, S. (ed.) *The Acquisitions Manual*. New York, NY: New York Institute of Finance, pp. 379-441.

Rad, H., Low, R.K.Y. and Faff, R. (2016) The profitability of pairs trading strategies: distance, cointegration and copula methods. *Quantitative Finance* 16(10): 1541-1558.

Rajan, A., McDermott, G. and Roy, R. (eds.) (2007) *The Structured Credit Handbook*. Hoboken, NJ: John Wiley & Sons, Inc.

Ramamurti, R. and Doh, J. (2004) Rethinking Foreign Infrastructure Investment in Developing Countries. *Journal of World Business* 39(2): 151-167.

- Rao, V.K. (2011) Multiperiod Hedging using Futures: Mean Reversion and the Optimal Hedging Path. *Journal of Risk and Financial Management* 4(1): 133-161.
- Rao, T. and Srivastava, S. (2012) Analyzing stock market movements using twitter sentiment analysis. In: *Proceedings of the 2012 International Conference on Advances in Social Networks Analysis and Mining (ASONAM 2012)*. Washington, DC: IEEE, pp. 119-123.
- Raulji, J.K. and Saini, J.R. (2016) Stop-Word Removal Algorithm and its Implementation for Sanskrit Language. *International Journal of Computer Applications* 150(2): 15-17.
- Ready, R., Roussanov, N. and Ward, C. (2017) Commodity Trade and the Carry Trade: A Tale of Two Countries. *Journal of Finance* 72(6): 2629-2684.
- Reddington, F.M. (1952) Review of the Principles of Life Insurance Valuations. *Journal of the Institute of Actuaries* 78(3): 286-340.
- Refenes, A.N., Zapranis, A.S. and Francis, G. (1994) Stock Performance Modeling Using Neural Networks: Comparative Study with Regressive Models. *Neural Networks* 7(2): 375-388.
- Rehring, C. (2012) Real Estate in a Mixed-Asset Portfolio: The Role of the Investment Horizon. *Real Estate Economics* 40(1): 65-95.
- Reiss, M.F. and Phelps, T.G. (1991) Identifying a Troubled Company. In: Dinapoli, D., Sigoloff, S.C. and Cushman, R.F. (eds.) *Workouts and Turnarounds: The Handbook of Restructuring and Investing in Distressed Companies*. Homewood, IL: Business One-Irwin, pp. 7-43.
- Reitano, R. (1996) Non-parallel yield curve shifts and stochastic immunization. *Journal of Portfolio Management* 22(2): 71-78.
- Remolona, E.M., Wickens, M.R. and Gong, F.F. (1998) What Was the Market's View of UK Monetary Policy? Estimating Inflation Risk and Expected Inflation with Indexed Bonds. *Federal Reserve Bank of New York Staff Reports*, No. 57. Available online: <https://ssrn.com/abstract=937350>.
- Rendleman, R.J. (1999) Duration-Based Hedging with Treasury Bond Futures. *Journal of Fixed Income* 9(1): 84-91.
- Rendleman, R.J., Jones, C.P. and Latané, H.A. (1982) Empirical anomalies based on unexpected earnings and the importance of risk adjustments. *Journal of Financial Economics* 10(3): 269-287.

- Reynauld, J. and Tessier, J. (1984) Risk Premiums in Futures Markets: An Empirical Investigation. *Journal of Futures Markets* 4(2): 189-211.
- Rhee, S.G. and Chang, R.P. (1992) Intra-Day Arbitrage Opportunities in Foreign Exchange and Eurocurrency Markets. *Journal of Finance* 47(1): 363-379.
- Ribeiro, B., Silva, C., Chen, N., Vieira, A. and das Neves, J.C. (2012) Enhanced default risk models with SVM+. *Expert Systems with Applications* 39(11): 10140-10152.
- Richard, S.F. and Roll, R. (1989) Prepayments on fixed-rate mortgage-backed securities. *Journal of Portfolio Management* 15(3): 73-82.
- Richards, T., Manfredo, M. and Sanders, D. (2004) Pricing weather derivatives. *American Journal of Agricultural Economics* 86(4): 1005-1017.
- Richie, N., Daigler, R.T. and Gleason, K.C. (2008) The limits to stock index arbitrage: Examining S&P 500 futures and SPDRS. *Journal of Futures Markets* 28(12): 1182-1205.
- Rickards, D. (2008) Global Infrastructure – A Growth Story. In: Davis, H. (ed.) *Infrastructure Finance: Trends and Techniques*. London, UK: Euromoney Books, pp. 1-47.
- Rime, D., Schrimpf, A. and Syrstad, O. (2017) Segmented Money Markets and Covered Interest Parity Arbitrage. *Working Paper*. Available online: <https://ssrn.com/abstract=2879904>.
- Riordan, R. and Storkenmaier, A. (2012) Latency, liquidity and price discovery. *Journal of Financial Markets* 15(4): 416-437.
- Rising, J.K. and Wyner, A.J. (2012) Partial Kelly portfolios and shrinkage estimators. In: *Proceedings of the 2012 International Symposium on Information Theory (ISIT)*. Washington, DC: IEEE, pp. 1618-1622.
- Rödel, M. and Rothballer, C. (2012) Infrastructure as Hedge against Inflation – Fact or Fantasy? *Journal of Alternative Investments* 15(1): 110-123.
- Rodríguez-González, A., García-Crespo, Á., Colomo-Palacios, R., Iglesias, F.G. and Gómez-Berbís, J.M. (2011) CAST: Using neural networks to improve trading systems based on technical analysis by means of the RSI financial indicator. *Expert Systems with Applications* 38(9): 11489-11500.
- Rogers, L.C.G. and Shi, Z. (1995) The Value of an Asian Option. *Journal of Applied Probability* 32(4): 1077-1088.
- Roll, R. (1996) U.S. Treasury Inflation-Indexed Bonds: The Design of a New Security. *Journal of Fixed Income* 6(3): 9-28.

- Roll, R. (2004) Empirical TIPS. *Financial Analysts Journal* 60(1): 31-53.
- Roll, R. and Yan, S. (2008) An explanation of the forward premium ‘puzzle’. *European Financial Management* 6(2): 121-148.
- Rompotis, G.G. (2011a) The performance of actively managed exchange traded funds. *Journal of Index Investing* 1(4): 53-65.
- Rompotis, G.G. (2011b) Active vs. passive management: New evidence from exchange traded funds. *International Review of Applied Financial Issues and Economics* 3(1): 169-186.
- Ronn, A.G. and Ronn, E.I. (1989) The Box Spread Arbitrage Conditions: Theory, Tests, and Investment Strategies. *Review of Financial Studies* 2(1): 91-108.
- Rosales, E.B. and McMillan, D. (2017) Time-series and cross-sectional momentum and contrarian strategies within the commodity futures markets. *Cogent Economics & Finance* 5(1): 1339772.
- Rosenberg, H. (1992) *Vulture Investors*. New York, NY: HarperCollins.
- Rosenberg, B., Reid, K. and Lanstein, R. (1985) Persuasive evidence of market inefficiency. *Journal of Portfolio Management* 11(3): 9-16.
- Ross, J. (2006) Exploiting spread trades. *Futures Magazine*, December 2006, pp. 34-36.
- Ross, S. and Zisler, R. (1991) Risk and return in real estate. *Journal of Real Estate Finance and Economics* 4(2): 175-190.
- Rothballer, C. and Kaserer, C. (2012) The Risk Profile of Infrastructure Investments: Challenging Conventional Wisdom. *Journal of Structured Finance* 18(2): 95-109.
- Routledge, B., Seppi, D.J. and Spatt, C. (2000) Equilibrium forward curves for commodities. *Journal of Finance* 55(3): 1297-1338.
- Rouwenhorst, K.G. (1998) International Momentum Strategies. *Journal of Finance* 53(1): 267-284.
- Roy, O. and Vetterli, M. (2007) The effective rank: A measure of effective dimensionality. In: *Proceedings – EUSIPCO 2007, 15th European Signal Processing Conference*. Poznań, Poland (September 3-7), pp. 606-610.
- Ruan, Y., Durresi, A. and Alfantoukh, L. (2018) Using Twitter trust network for stock market analysis. *Knowledge-Based Systems* 145: 207-218.

- Ruchin, A. (2011) Can Securities Lending Transactions Substitute for Repurchase Agreement Transactions? *Banking Law Journal* 128(5): 450-480.
- Ruder, S. (2017) An overview of gradient descent optimization algorithms. *Working Paper*. Available online: <https://arxiv.org/pdf/1609.04747.pdf>.
- Rudy, J., Dunis, C. and Laws, J. (2010) Profitable Pair Trading: A Comparison Using the S&P 100 Constituent Stocks and the 100 Most Liquid ETFs. *Working Paper*. Available online: <https://ssrn.com/abstract=2272791>.
- Rujivan, S. and Zhu, S.P. (2012) A simplified analytical approach for pricing discretely sampled variance swaps with stochastic volatility. *Applied Mathematics Letters* 25(11): 1644-1650.
- Rumelhart, D.E., Hinton, G.E. and Williams, R.J. (1986) Learning representations by back-propagating errors. *Nature* 323(6088): 533-536.
- Rusnáková, M. and Šoltés, V. (2012) Long strangle strategy using barrier options and its application in hedging. *Actual Problems of Economics* 134(8): 452-465.
- Rusnáková, M., Šoltés, V. and Szabo, Z.K. (2015) Short Combo Strategy Using Barrier Options and its Application in Hedging. *Procedia Economics and Finance* 32: 166-179.
- Ryabkov, N. (2015) Hedge Fund Price Pressure in Convertible Bond Markets. *Working Paper*. Available online: <https://ssrn.com/abstract=2539929>.
- Saad, E.W., Prokhorov, D.V. and Wunsch, D.C. (1998) Comparative study of stock trend prediction using time delay, recurrent and probabilistic neural networks. *IEEE Transactions on Neural Networks* 9(6): 1456-1470.
- Sack, B. and Elsasser, R. (2004) Treasury Inflation-Indexed Debt: A Review of the U.S. Experience. *Federal Reserve Bank of New York, Economic Policy Review* 10(1): 47-63.
- Sadka, R. (2002) The Seasonality of Momentum: Analysis of Tradability. *Working Paper*. Available online: <https://ssrn.com/abstract=306371>.
- Sagi, J. and Seasholes, M. (2007) Firm-specific Attributes and the Cross-section of Momentum. *Journal of Financial Economics* 84(2): 389-434.
- Salcedo, Y. (2004) Spreads for the fall. *Futures Magazine*, September 2004, pp. 54-57.

Saltyte-Benth, J. and Benth, F.E. (2012) A critical view on temperature modelling for application in weather derivatives markets. *Energy Economics* 34(2): 592-602.

Samuelson, P.A. (1945) The effect of interest rate increases on the banking system. *American Economic Review* 35(1): 16-27.

Samuelson, P. (1971) The “fallacy” of maximizing the geometric mean in long sequences of investing or gambling. *Proceedings of the National Academy of Sciences* 68(10): 2493-2496.

Samuelson, W. and Rosenthal, L. (1986) Price Movements as Indicators of Tender Offer Success. *Journal of Finance* 41(2): 481-499.

Samworth, R.J. (2012) Optimal weighted nearest neighbour classifiers. *Annals of Statistics* 40(5): 2733-2763.

Sanchez-Robles, B. (1998) Infrastructure Investment and Growth: Some Empirical Evidence. *Contemporary Economic Policy* 16(1): 98-108.

Saretto, A. and Goyal, A. (2009) Cross-section of option returns and volatility. *Journal of Financial Economics* 94(2): 310-326.

Sassetti, P. and Tani, M. (2006) Dynamic Asset Allocation Using Systematic Sector Rotation. *Journal of Wealth Management* 8(4): 59-70.

Satchell, S. and Scowcroft, A. (2000) A demystification of the Black-Litterman model: Managing quantitative and traditional portfolio construction. *Journal of Asset Management* 1(2): 138-150.

Savor, P. and Wilson, M. (2013) How Much Do Investors Care About Macroeconomic Risk? Evidence from Scheduled Economic Announcements. *Journal of Financial and Quantitative Analysis* 48(2): 343-375.

Sawant, R.J. (2010a) *Infrastructure Investing: Managing Risks & Rewards for Pensions, Insurance Companies & Endowments*. Hoboken, NJ: John Wiley & Sons, Inc.

Sawant, R.J. (2010b) Emerging Market Infrastructure Project Bonds: Their Risks and Returns. *Journal of Structured Finance* 15(4): 75-83.

Schaede, U. (1990) The introduction of commercial paper – a case study in the liberalisation of the Japanese financial markets. *Japan Forum* 2(2): 215-234.

Schap, K. (2005) *The complete guide to spread trading*. New York, NY: McGraw-Hill, Inc.

- Schatz, H.R. (2012) The Characterization of Repurchase Agreements in the Context of the Federal Securities Laws. *St. John's Law Review* 61(2): 290-310.
- Schierreck, D., Bondt, W.D. and Weber, M. (1999) Contrarian and momentum strategies in Germany. *Financial Analysts Journal* 55(6): 104-116.
- Schiller, F., Seidler, G. and Wimmer, M. (2010) Temperature models for pricing weather derivatives. *Quantitative Finance* 12(3): 489-500.
- Schizas, P. (2014) Active ETFs and their performance vis-à-vis passive ETFs, mutual funds, and hedge funds. *Journal of Wealth Management* 17(3): 84-98.
- Schizas, P., Thomakos, D.D. and Wang, T. (2011) Pairs Trading on International ETFs. *Working Paper*. Available online: <https://ssrn.com/abstract=1958546>.
- Schmidhuber, J. (2015) Deep learning in neural networks: An overview. *Neural Networks* 61: 85-117.
- Schmidt, W. and Ward, I. (2002) Pricing default baskets. *Risk*, January 2002, pp. 111-114.
- Schneeweis, T. and Gupta, R. (2006) Diversification benefits of managed futures. *Journal of Investment Consulting* 8(1): 53-62.
- Schneider, F. and Windischbauer, U. (2008) Money laundering: some facts. *European Journal of Law and Economics* 26(3): 387-404.
- Scholes, M. and Williams, J. (1977) Estimating Betas from Nonsynchronous Data. *Journal of Financial Economics* 5(3): 309-327.
- Schönbucher, P.J. (2003) *Credit Derivatives Pricing Models*. Hoboken, NJ: John Wiley & Sons, Inc.
- Schoutens, W. (2005) Moment swaps. *Quantitative Finance* 5(6): 525-530.
- Schultz, G.M. (2016) *Investing in Mortgage-Backed and Asset-Backed Securities: Financial Modeling with R and Open Source Analytics + Website*. Hoboken, NJ: John Wiley & Sons, Inc.
- Schumaker, R.P. and Chen, H. (2010) A Discrete Stock Price Prediction Engine Based on Financial News. *Computer* 43(1): 51-56.
- Schwartz, E.S. (1997) The Stochastic Behavior of Commodity Prices: Implications for Valuation and Hedging. *Journal of Finance* 52(3): 923-973.
- Schwartz, E.S. (1998) Valuing long-term commodity assets. *Journal of Energy Finance & Development* 3(2): 85-99.

Schwartz, T.V. and Laatsch, F. (1991) Price Discovery and Risk Transfer in Stock Index Cash and Futures Markets. *Journal of Futures Markets* 11(6): 669-683.

Schwartz, E.S. and Smith, J.E. (2000) Short-term variations and long-term dynamics in commodity prices. *Management Science* 46(7): 893-911.

Schwartz, E.S. and Torous, W.N. (1989) Prepayment and the Valuation of Mortgage-Backed Securities. *Journal of Finance* 44(2): 375-392.

Schwartz, E.S. and Torous, W.N. (1992) Prepayment, Default, and the Valuation of Mortgage Pass-through Securities. *Journal of Business* 65(2): 221-239.

Schwert, G.W. (2003) Anomalies and market efficiency. In: Constantinides, G.M., Harris, M. and Stulz, R.M. (eds.) *Handbook of the Economics of Finance, Vol 1B*. (1st ed.) Amsterdam, The Netherlands: Elsevier, Chapter 15, pp. 939-974.

Sefton, J.A. and Scowcroft, A. (2005) Understanding Momentum. *Financial Analysts Journal* 61(2): 64-82.

Seiler, M.J., Webb, J.R. and Myer, F.C.N. (1999) Diversification Issues in Real Estate Investment. *Journal of Real Estate Literature* 7(2): 163-179.

Seppälä, J. (2004) The term structure of real interest rates: theory and evidence from UK index-linked bonds. *Journal of Monetary Economics* 51(7): 1509-1549.

Serban, A.F. (2010) Combining mean reversion and momentum trading strategies in foreign exchange markets. *Journal of Banking & Finance* 34(11): 2720-2727.

Seymour, B. (2008) Global Money Laundering. *Journal of Applied Security Research* 3(3-4): 373-387.

Sezer, O.B., Ozbayoglu, M. and Dogdu, E. (2017) A Deep Neural-Network Based Stock Trading System Based on Evolutionary Optimized Technical Analysis Parameters. *Procedia Computer Science* 114: 473-480.

Shackman, J.D. and Tenney, G. (2006) The Effects of Government Regulations on the Supply of Pawn Loans: Evidence from 51 Jurisdictions in the US. *Journal of Financial Services Research* 30(1): 69-91.

Shah, A. (2017) Hedging of a Portfolio of Rainfall Insurances using Rainfall Bonds and European Call Options (Bull Spread). *Working Paper*. Available online: <https://ssrn.com/abstract=2778647>.

- Shah, D. and Zhang, K. (2014) Bayesian regression and Bitcoin. *Working Paper*. Available online: <https://arxiv.org/pdf/1410.1231.pdf>.
- Shaikh, I. and Padhi, P. (2015) The implied volatility index: Is ‘investor fear gauge’ or ‘forward-looking’? *Borsa Istanbul Review* 15(1): 44-52.
- Shan, L., Garvin, M.J. and Kumar, R. (2010) Collar options to manage revenue risks in real toll public-private partnership transportation projects. *Construction Management and Economics* 28(10): 1057-1069.
- Sharpe, W.F. (1966) Mutual Fund Performance. *Journal of Business* 39(1): 119-138.
- Sharpe, W.F. (1994) The Sharpe Ratio. *Journal of Portfolio Management* 21(1): 49-58.
- Sharpe, W.F. (2009) Adaptive Asset Allocation Policies. *Financial Analysts Journal* 66(3): 45-59.
- Sharpe, W.F. and Perold, A.F. (1988) Dynamic Strategies for Asset Allocation. *Financial Analysts Journal* 44(1): 16-27.
- Shaviro, D. (2002) Dynamic Strategies for Asset Allocation. *Chicago Journal of International Law* 3(2): 317-331.
- Shen, P. (2006) Liquidity Risk Premia and Breakeven Inflation Rates. *Federal Reserve Bank of Kansas City, Economic Review* 91(2): 29-54.
- Shen, P. and Corning, J. (2001) Can TIPS Help Identify Long-Term Inflation Expectations? *Federal Reserve Bank of Kansas City, Economic Review* 86(4): 61-87.
- Sher, G. (2014) Cashing in for Growth: Corporate Cash Holdings as an Opportunity for Investment in Japan. *Working Paper*. Available online: <https://ssrn.com/abstract=2561246>.
- Sherrill, D.E. and Upton, K. (2018) Actively managed ETFs vs actively managed mutual funds. *Managerial Finance* 44(3): 303-325.
- Shi, H.-L., Jiang, Z.-Q. and Zhou, W.-X. (2015) Profitability of Contrarian Strategies in the Chinese Stock Market. *PLoS ONE* 10(9): e0137892.
- Shiller, R.J. (1979) The Volatility of Long-Term Interest Rates and Expectations Models of the Term Structure. *Journal of Political Economy* 87(6): 1190-1219.

- Shiller, R.J. and Modigliani, F. (1979) Coupon and tax effects on new and seasoned bond yields and the measurement of the cost of debt capital. *Journal of Financial Economics* 7(3): 297-318.
- Shimko, D.C. (1994) Options on futures spreads: Hedging, speculation, and valuation. *Journal of Futures Markets* 14(2): 183-213.
- Shin, K. and Lee, Y. (2002) A genetic algorithm application in bankruptcy prediction modeling. *Expert Systems with Applications* 23(3): 321-328.
- Shiu, E.S.W. (1987) On the Fisher-Weil immunization theorem. *Insurance: Mathematics and Economics* 6(4): 259-266.
- Shiu, E.S.W. (1988) Immunization of multiple liabilities. *Insurance: Mathematics and Economics* 7(4): 219-224.
- Shiu, Y.-M. and Lu, T.-H. (2011) Pinpoint and Synergistic Trading Strategies of Candlesticks. *International Journal of Economics and Finance* 3(1): 234-244.
- Shum, P., Hejazi, W., Haryanto, E. and Rodier, A. (2016) Intraday Share Price Volatility and Leveraged ETF Rebalancing. *Review of Finance* 20(6): 2379-2409.
- Shumway, T. (2001) Forecasting Bankruptcy More Accurately: A Simple Hazard Model. *Journal of Business* 74(1): 101-104.
- Siganos, A. and Chelley-Steeley, P. (2006) Momentum Profits Following Bull and Bear Markets. *Journal of Asset Management* 6(5): 381-388.
- Sill, K. (1996) The Cyclical Volatility of Interest Rates. *Business Review of the Federal Reserve Bank of Philadelphia*, January/February 1996, pp. 15-29.
- Simmons, E. (1954) Sales of Government Securities to Federal Reserve Banks Under Repurchase Agreements. *Journal of Finance* 9(1): 23-40.
- Simon, D.P. and Campasano, J. (2014) The VIX Futures Basis: Evidence and Trading Strategies. *Journal of Derivatives* 21(3): 54-69.
- Simpson, M.W. and Grossman, A. (2016) The Role of Industry Effects in Simultaneous Reversal and Momentum Patterns in One-Month Stock Returns. *Journal of Behavioral Finance* 17(4): 309-320.
- Simutin, M. (2014) Cash Holdings and Mutual Fund Performance. *Review of Finance* 18(4): 1425-1464.

- Sing, T.-F. and Low, S.-H.Y. (2000) The inflation-hedging characteristics of real estate and financial assets in Singapore. *Journal of Real Estate Portfolio Management* 6(4): 373-386.
- Singh, Y. and Chandra, P. (2003) A class +1 sigmoidal activation functions for FFANNs. *Journal of Economic Dynamics and Control* 28(1): 183-187.
- Singhal, S., Newell, G. and Nguyen, T.K. (2011) The significance and performance of infrastructure in India. *Journal of Property Research* 28(1): 15-34.
- Siriopoulos, C. and Fassas, A. (2009) Implied Volatility Indices – A Review. *Working Paper*. Available online: <https://ssrn.com/abstract=1421202>.
- Skelton, J.L. (1983) Banks, firms and the relative pricing of tax-exempt and taxable bonds. *Journal of Financial Economics* 12(3): 343-355.
- Skiadopoulos, G. (2004) The Greek implied volatility index: construction and properties. *Applied Financial Economics* 14(16): 1187-1196.
- Skiadopoulos, G., Hodges, S. and Clewlow, L. (1999) The Dynamics of the S&P 500 Implied Volatility Surface. *Review of Derivatives Research* 3(3): 263-282.
- Slowinski, R. and Zopounidis, C. (1995) Application of the rough set approach to evaluation of bankruptcy risk. *Intelligent Systems in Accounting, Finance and Management* 4(1): 27-41.
- Smit, H.T.J. and Trigeorgis, L. (2009) Valuing infrastructure investment: An option games approach. *California Management Review* 51(2): 82-104.
- Smith, D.M. and Pantilei, V.S. (2015) Do “Dogs of the World” Bark or Bite? Evidence from Single-Country ETFs. *Journal of Investing* 24(1): 7-15.
- Smith, K.V. and Shulman, D. (1976) Institutions Beware: The Performance of Equity Real Estate Investment Trusts. *Financial Analysts Journal* 32(5): 61-66.
- Sollinger, A. (1994) The Triparty Is Just Beginning. *Institutional Investor* 28(1): 133-135.
- Šoltés, M. (2010) Relationship of speed certificates and inverse vertical ratio call back spread option strategy. *E+M Ekonomie a Management* 13(2): 119-124.
- Šoltés, V. (2011) The application of the long and short combo option strategies in the building of structured products. In: Kocourek, A. (ed.) *Proceedings of the 10th International Conference: Liberec Economic Forum 2011*. Liberec, Czech Republic: Technical University of Liberec, pp. 481-487.

- Šoltés, V. and Amaitiek, O.F.S. (2010a) The Short Put Ladder Strategy and its Application in Trading and Hedging. *Club of Economics in Miskolc: Theory, Methodology, Practice* 6(2): 77-85.
- Šoltés, V. and Amaitiek, O.F.S. (2010b) Inverse Vertical Ratio Put Spread Strategy and its Application in Hedging against a Price Drop. *Journal of Advanced Studies in Finance* 1(1): 100-107.
- Šoltés, V. and Rusnáková, M. (2012) Long Combo strategy using barrier options and its application in hedging against a price drop. *Acta Montanistica Slovaca* 17(1): 17-32.
- Šoltés, V. and Rusnáková, M. (2013) Hedging Against a Price Drop Using the Inverse Vertical Ratio Put Spread Strategy Formed by Barrier Options. *Engineering Economics* 24(1): 18-27.
- Sørensen, C. (1999) Dynamic Asset Allocation and Fixed Income Management. *Journal of Financial and Quantitative Analysis* 34(4): 513-531.
- Sorensen, E.H. and Burke, T. (1986) Portfolio Returns from Active Industry Group Rotation. *Financial Analysts Journal* 42(5): 43-50.
- Sørensen, C. and Trolle, A.B. (2005) A General Model of Dynamic Asset Allocation with Incomplete Information and Learning. *Working paper*. Available online: <https://ssrn.com/abstract=675625>.
- Sörensson, T. (1993) Two methods for valuing convertible bonds – A comparison. *Scandinavian Journal of Management* 9(S1): 129-139.
- Soudijn, M.R.J. (2016) Rethinking money laundering and drug trafficking: Some implications for investigators, policy makers and researchers. *Journal of Money Laundering Control* 19(3): 298-310.
- Sprenger, T.O., Tumasjan, A., Sandner, P.G. and Welpe, I.M. (2014) Tweets and trades: The information content of stock microblogs. *European Financial Management* 20(5): 926-957.
- Spyrou, S.I. (2005) Index Futures Trading and Spot Price Volatility: Evidence from an Emerging Market. *Journal of Emerging Market Finance* 4(2): 151-167.
- Staal, A., Corsi, M., Shores, S. and Woida, C. (2015) A Factor Approach to Smart Beta Development in Fixed Income. *Journal of Index Investing* 6(1): 98-110.
- Stambaugh, R.F. (1988) The information in forward rates: Implications for models of the term structure. *Journal of Financial Economics* 21(1): 41-70.

- Stanton, R. (1995) Rational Prepayment and the Valuation of Mortgage-Backed Securities. *Review of Financial Studies* 8(3): 677-708.
- Statman, M., Thorley, S. and Vorkink, K. (2006) Investor Overconfidence and Trading Volume. *Review of Financial Studies* 19(4): 1531-1565.
- Stattman, D. (1980) Book Values and Stock Returns. *Chicago MBA: A Journal of Selected Papers* 1980(4): 25-45.
- Stefanini, F. (2006) *Investment Strategies of Hedge Funds*. Chichester, UK: John Wiley & Sons, Ltd.
- Stein, J.C. (1992) Convertible bonds as backdoor equity financing. *Journal of Financial Economics* 32(1): 3-21.
- Stein, J.C. (1995) Prices and Trading Volume in the Housing Market: A Model with Down-Payment Effects. *Quarterly Journal of Economics* 110(2): 379-406.
- Steinert, M. and Crowe, S. (2001) Global Real Estate Investment: Characteristics, Optimal Portfolio Allocation and Future Trends. *Pacific Rim Property Research Journal* 7(4): 223-239.
- Stevenson, S. (2001) Bayes-Stein Estimators and International Real Estate Asset Allocation. *Journal of Real Estate Research* 21(1/2): 89-104.
- Stevenson, S. (2002) Momentum Effects and Mean Reversion in Real Estate Securities. *Journal of Real Estate Research* 23(1/2): 47-64.
- Stickel, S.E. (1991) Common stock returns surrounding earnings forecast revisions: More puzzling evidence. *Accounting Review* 66(2): 402-416.
- Stivers, C. and Sun, L. (2010) Cross-Sectional Return Dispersion and Time Variation in Value and Momentum Premiums. *Journal of Financial and Quantitative Analysis* 45(4): 987-1014.
- Stoll, H.R. (1969) The Relationship Between Put and Call Option Prices. *Journal of Finance* 24(5): 801-824.
- Stotz, O. (2016) Investment strategies and macroeconomic news announcement days. *Journal of Asset Management* 17(1): 45-56.
- Stovall, S. (1996) *Sector Investing*. New York, NY: McGraw Hill, Inc.
- Stroebel, J. and Taylor, J.B. (2012) Estimated Impact of the Federal Reserve's Mortgage-Backed Securities Purchase Program. *International Journal of Central Banking* 8(2): 1-42.

- Stübinger, J. and Bredthauer, J. (2017) Statistical Arbitrage Pairs Trading with High-frequency Data. *International Journal of Economics and Financial Issues* 7(4): 650-662.
- Stübinger, J. and Endres, S. (2017) Pairs trading with a mean-reverting jump-diffusion model on high-frequency data. *Quantitative Finance* (forthcoming). DOI: <https://doi.org/10.1080/14697688.2017.1417624>.
- Stulz, R.M. (1996) Rethinking risk management. *Journal of Applied Corporate Finance* 9(3): 8-25.
- Stulz, R.M. (2010) Credit Default Swaps and the Credit Crisis. *Journal of Economic Perspectives* 24(1): 73-92.
- Su, X. (2006) Hedging basket options by using a subset of underlying assets. *Working paper*. Available online: https://www.econstor.eu/bitstream/10419/22959/1/bgse14_2006.pdf.
- Su, E. and Knowles, T.W. (2010) Measuring Bond Portfolio Value at Risk and Expected Shortfall in US Treasury Market. *Asia Pacific Management Review* 15(4): 477-501.
- Subha, M. and Nambi, S. (2012) Classification of stock index movement using k-Nearest Neighbours (k-NN) algorithm. *WSEAS Transactions on Information Science and Applications* 9(9): 261-270.
- Subramanian, A. (2004) Option pricing on stocks in mergers and acquisitions. *Journal of Finance* 59(2): 795-829.
- Suhonen, A., Lennkh, M. and Perez, F. (2017) Quantifying Backtest Overfitting in Alternative Beta Strategies. *Journal of Portfolio Management* 43(2): 90-104.
- Sul, H.K., Dennis, A.R. and Yuan, L.(I). (2017) Trading on Twitter: Using Social Media Sentiment to Predict Stock Returns. *Decision Sciences* 48(3): 454-488.
- Sullivan, R., Timmermann, A. and White, H. (1999) Data-snooping, technical trading rule performance, and the bootstrap. *Journal of Finance* 54(5): 1647-1691.
- Summers, B.J. (1980) Negotiable Certificates of Deposit. *Federal Reserve Bank of Richmond, Economic Review* 66(4): 8-19.
- Suresh, A.S. (2015) Analysis of Option Combination Strategies. *Management Insight* 11(1): 31-40.

- Svec, J. and Stevenson, M. (2007) Modelling and forecasting temperature based weather derivatives. *Global Finance Journal* 18(2): 185-204.
- Swank, T.A. and Root, T.H. (1995) Bonds in Default: Is Patience a Virtue? *Journal of Fixed Income* 5(1): 26-31.
- Swinkels, L. (2002) International Industry Momentum. *Journal of Asset Management* 3(2): 124-141.
- Swishchuk, A. and Cui, K. (2013) Weather derivatives with applications to Canadian data. *Journal of Mathematical Finance* 3(1): 81-95.
- Switzer, L.N. and Jiang, H. (2010) Market Efficiency and the Risks and Returns of Dynamic Trading Strategies with Commodity Futures. In: Stanley, H.E. (ed.) *Proceedings Of The First Interdisciplinary Chess Interactions Conference*. Singapore: World Scientific Publishing, pp. 127-156.
- Symeonidis, L., Prokopczuk, M., Brooks, C. and Lazar, E. (2012) Futures basis, inventory and commodity price volatility: An empirical analysis. *Economic Modelling* 29(6): 2651-2663.
- Szado, E. and Schneeweis, T. (2010) Loosening Your Collar: Alternative Implementations of QQQ Collars. *Journal of Trading* 5(2): 35-56.
- Szado, E. and Schneeweis, T. (2011) An Update of ‘Loosening Your Collar: Alternative Implementations of QQQ Collars’: Credit Crisis and Out-of-Sample Performance. *Working Paper*. Available online: <http://ssrn.com/abstract=1507991>.
- Szakmary, A.C., Shen, Q. and Sharma, S.C. (2010) Trend-following trading strategies in commodity futures: A re-examination. *Journal of Banking & Finance* 34(2): 409-426.
- Szakmary, A.C. and Zhou, X. (2015) Industry momentum in an earlier time: Evidence from the Cowles data. *Journal of Financial Research* 38(3): 319-347.
- Tang, C.H. and Jang, S.H. (2011) Weather risk management in ski resorts: Financial hedging and Geographical diversification. *International Journal of Hospitality Management* 30(2): 301-311
- Tang, H. and Xu, X.E. (2013) Solving the Return Deviation Conundrum of Leveraged Exchange-Traded Funds. *Journal of Financial and Quantitative Analysis* 48(1): 309-342.
- Tavakoli, J.M. (1998) *Credit Derivatives & Synthetic Structures: A Guide to Instruments and Applications*. (2nd ed.) Hoboken, NJ: John Wiley & Sons, Inc.

- Tay, F.E.H. and Cao, L. (2001) Application of support vector machines in financial time series forecasting. *Omega* 29(4): 309-317.
- Taylor, C.R. (1999) Time-on-the-Market as a Sign of Quality. *Review of Economic Studies* 66(3): 555-578.
- Taylor, N. (2004) Modeling discontinuous periodic conditional volatility: Evidence from the commodity futures market. *Journal of Futures Markets* 24(9): 805-834.
- Taylor, N. (2016) Roll strategy efficiency in commodity futures markets. *Journal of Commodity Markets* 1(1): 14-34.
- Taylor, M.P. and Allen, H. (1992) The use of technical analysis in the foreign exchange market. *Journal of International Money and Finance* 11(3): 304-314.
- Teixeira, L.A. and de Oliveira, A.L.I. (2010) A method for automatic stock trading combining technical analysis and nearest neighbor classification. *Expert Systems with Applications* 37(10): 6885-6890.
- Telser, L.G. (1958) Futures Trading and the Storage of Cotton and Wheat. *Journal of Political Economy* 66(3): 233-255.
- The Options Institute (1995) *Options: Essential Concepts and Trading Strategies*. (2nd ed.) Chicago, IL: Richard D. Irwin, Inc.
- Thibodeau, T.G. and Giliberto, S.M. (1989) Modeling Conventional Residential Mortgage Refinancing. *Journal of Real Estate Finance and Economics* 2(4): 285-299.
- Thomsett, M.C. (2003) *Support and Resistance Simplified*. Columbia, MD: Marketplace Books.
- Thornes, J.E. (2006) An introduction to weather and climate derivatives. *Weather* 58(5): 193-196.
- Thorp, E.O. (2006) The Kelly criterion in blackjack, sports betting, and the stock market. In: Zenios, S.A. and Ziemba, W.T. (eds.) *Handbook of Asset and Liability Management: Theory and Methodology (Vol. 1)*. Amsterdam, The Netherlands: Elsevier, pp. 385-428.
- Thorp, E.O. and Kassouf, S.T. (1967) *Beat the Market: A Scientific Stock Market System*. New York, NY: Random House.
- Till, H. (2008) Case Studies and Risk Management Lessons in Commodity Derivatives Trading. In: Geman, H. (ed.) *Risk Management in Commodity Markets: From Shipping to Agricultural and Energy*. Chichester, UK: John Wiley & Sons, Ltd., pp. 255-291.

Till, H. and Eagleeye, J. (2017) Commodity Futures Trading Strategies: Trend-Following and Calendar Spreads. *Working Paper*. Available online: <https://ssrn.com/abstract=2942340>.

Tille, C., Stoffels, N. and Gorbachev, O. (2001) To What Extent Does Productivity Drive the Dollar? *Current Issues in Economics and Finance* 7(8): 1-6.

Timmermans, S.H.J.T., Schumacher, J.M. and Ponds, E.H.M. (2017) A multi-objective decision framework for lifecycle investment. *Working Paper*. Available online: <http://ssrn.com/abstract=3038803>.

Tinoco, M.H. and Wilson, N. (2013) Financial distress and bankruptcy prediction among listed companies using accounting, market and macroeconomic variables. *International Review of Financial Analysis* 30: 394-419.

Titman, S. and Warga, A. (1986) Risk and the Performance of Real Estate Investment Trusts: A Multiple Index Approach. *AREUEA Journal* 14(3): 414-431.

Todorov, V. (2010) Variance Risk-Premium Dynamics: The Role of Jumps. *Review of Financial Studies* 23(1): 345-383.

Toevs, A. and Jacob, D. (1986) Futures and Alternative Hedge Ratio Methodologies. *Journal of Portfolio Management* 12(3): 60-70.

Tokic, D. (2013) Crude oil futures markets: Another look into traders' positions. *Journal of Derivatives & Hedge Funds* 19(4): 321-342.

Topaloglou, N., Vladimirov, H. and Zenios, S.A. (2011) Optimizing International Portfolios with Options and Forwards. *Journal of Banking & Finance* 35(12): 3188-3201.

Torrance, M.I. (2007) The Power of Governance in Financial Relationships: Governing Tensions in Exotic Infrastructure Territory. *Growth and Change* 38(4): 671-695.

Torricelli, L. (2018) Volatility Targeting Using Delayed Diffusions. *Working Paper*. Available online: <https://ssrn.com/abstract=2902063>.

Trainer, F.H., Jr. (1983) The Uses of Treasury Bond Futures in Fixed Income Portfolio Management. *Financial Analysts Journal* 39(1): 27-34.

Trainor, W.J., Jr. (2010) Do Leveraged ETFs Increase Volatility? *Technology and Investment* 1(3): 215-220.

Trehan, B. (2005) Oil price shocks and inflation. *Federal Reserve Bank of San Francisco, Economic Letter*, No. 2005-28. Available online: <https://www.frbsf.org/economic-research/files/el2005-28.pdf>.

Trifonov, Y., Yashin, S., Koshelev, E. and Podshibyakin, D. (2011) Application of Synthetic Straddles for Equity Risk Management. In: Černák, Z. (ed.) *Materiály VII mezinárodní vědecko – praktická konference “Zprávy vědecké ideje – 2011”*. Prague, Czech Republic: Education and Science.

Trifonov, Y., Yashin, S., Koshelev, E. and Podshibyakin, D. (2014) Testing the Technology of Synthetic Straddles. *Working Paper*. Available online: <https://ssrn.com/abstract=2429657>.

Tripathi, V. and Garg, S. (2016) A Cross-Country Analysis of Pricing Efficiency of Exchange Traded Funds. *Journal of Applied Finance* 22(3): 41-63.

Trzcinka, C. (1982) The Pricing of Tax-Exempt Bonds and the Miller Hypothesis. *Journal of Finance* 37(4): 907-923.

Tsai, C.F. and Hsiao, Y.C. (2010) Combining multiple feature selection methods for stock prediction: Union, intersection, and multi-intersection approaches. *Decision Support Systems* 50(1): 258-269.

Tsai, C., Hsu, Y. and Yen, D.C. (2014) A comparative study of classifier ensembles for bankruptcy prediction. *Applied Soft Computing* 24: 977-984.

Tse, Y. (2017) Return predictability and contrarian profits of international index futures. *Journal of Futures Markets* 38(7): 788-803.

Tsiveriotis, K. and Fernandes, C. (1998) Valuing convertible bonds with credit risk. *Journal of Fixed Income* 8(2): 95-102.

Tuckman, B. and Serrat, A. (2012) *Fixed Income Securities: Tools for Today's Markets*. (3rd ed.) Hoboken, NJ: John Wiley & Sons, Inc.

Tulchinsky, I. et al. (2015) *Finding Alphas: A Quantitative Approach to Building Trading Strategies*. New York, NY: John Wiley & Sons, Inc.

Turnovsky, S.J. (1989) The Term Structure of Interest Rates and the Effects of Macroeconomic Policy. *Journal of Money, Credit and Banking* 21(3): 321-347.

Tuzun, T. (2013) Are Leveraged and Inverse ETFs the New Portfolio Insurers? *Finance and Economics Discussion Series (FEDS)*, Paper No. 2013-48. Washington, DC: Board of Governors of the Federal Reserve System. Available online: <https://www.federalreserve.gov/pubs/feds/2013/201348/201348pap.pdf>.

Tversky, A. and Kahneman, D. (1992) Advances in prospect theory: Cumulative representation of uncertainty. *Journal of Risk and Uncertainty* 5(4): 297-323.

Uhlenbeck, G.E. and Ornstein, L.S. (1930) On the Theory of the Brownian Motion. *Physical Review* 36(5): 823-841.

Vaitonis, M. and Masteika, S. (2016) Research in high frequency trading and pairs selection algorithm with Baltic region stocks. In: Dregvaite, G. and Damasevicius, R. (eds.) *Proceedings of the 22nd International Conference on Information and Software Technologies (ICIST 2016)*. Cham, Switzerland: Springer, pp. 208-217.

Van Alstyne, M. (2014) Why Bitcoin has value. *Communications of the ACM* 57(5): 30-32.

van den Goorbergh, R.W.J. (2004) *Essays on optimal hedging and investment strategies and on derivative pricing* (Ph.D. Thesis). Tilburg, The Netherlands: Tilburg University.

van den Noord, P. and André, C. (2007) Why has Core Inflation Remained so Muted in the Face of the Oil Shock? *Working Paper*. Available online: <http://dx.doi.org/10.1787/206408110285>.

Van Kervel, V. and Menkveld, A.J. (2017) High-Frequency Trading around Large Institutional Orders. *Journal of Finance* (forthcoming). Available online: <https://ssrn.com/abstract=2619686>.

van Marle, M. and Verwijmeren, P. (2017) The long and the short of convertible arbitrage: An empirical examination of arbitrageurs' holding periods. *Journal of Empirical Finance* 44: 237-249.

Van Oord, J.A. (2016) *Essays on Momentum Strategies in Finance* (Ph.D. Thesis). Rotterdam, The Netherlands: Erasmus University. Available online: <https://repub.eur.nl/pub/80036/EPS2016380F-A9789058924445.pdf>.

Vanstone, B. and Finnie, G. (2009) An empirical methodology for developing stockmarket trading systems using artificial neural networks. *Expert Systems with Applications* 36(3): 6668-6680.

Van Tassel, P. (2016) Merger Options and Risk Arbitrage. *Federal Reserve Bank of New York Staff Reports*, No. 761. Available online: https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr761.pdf?la=en.

Vasicek, O.A. (2015) Probability of Loss on Loan Portfolio. In: Vasicek, O.A. (ed.) *Finance, Economics and Mathematics*. Hoboken, NJ: John Wiley & Sons, Inc., Chapter 17.

Vassalou, M. and Xing, Y. (2004) Default Risk in Equity Returns. *Journal of Finance* 59(2): 831-868.

Vedenov, D.V. and Barnett, B.J. (2004) Efficiency of Weather Derivatives as Primary Crop Insurance Instruments. *Journal of Agricultural Economics* 29(3): 387-403.

Vickery, J. and Wright, J. (2010) TBA Trading and Liquidity in the Agency MBS Market. *Federal Reserve Bank of New York Staff Reports*, No. 468. Available online: https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr468.pdf.

Vidyamurthy, G. (2004) *Pairs Trading: Quantitative Methods and Analysis*. Hoboken, NJ: John Wiley & Sons, Inc.

Viezer, T.W. (2000) Evaluating “Within Real Estate” Diversification Strategies. *Journal of Real Estate Portfolio Management* 6(1): 75-95.

Villani, R. and Davis, C. (2006) *FLIP: How to find, fix, and sell houses for profit*. New York, NY: McGraw-Hill, Inc.

Vipul (2009) Box-spread arbitrage efficiency of Nifty index options: The Indian evidence. *Journal of Futures Markets* 29(6): 544-562.

Viswanath, P.V. (1993) Efficient Use of Information, Convergence Adjustments, and Regression Estimates of Hedge Ratios. *Journal of Futures Markets* 13(1): 43-53.

Vives, A. (1999) Pension Funds in Infrastructure Project Finance: Regulations and Instrument Design. *Journal of Structured Finance* 5(2): 37-52.

Volpert, B.S. (1991) Opportunities for Investing in Troubled Companies. In: Dinapoli, D., Sigoloff, S.C. and Cushman, R.F. (eds.) *Workouts and Turnarounds: The Handbook of Restructuring and Investing in Distressed Companies*. Homewood, IL: Business One-Irwin, pp. 514-542.

Vrugt, E.B., Bauer, R., Molenaar, R. and Steenkamp, T. (2007) Dynamic commodity trading strategies. In: Till, H. and Eagleeye, J. (eds.) *Intelligent Commodity Investing: New Strategies and Practical Insights for Informed Decision Making*. London, UK: Risk Books, Chapter 16.

Walker, J. (1999) How Big is Global Money Laundering? *Journal of Money Laundering Control* 3(1): 25-37.

- Walker, M.B. (2008) The static hedging of CDO tranche correlation risk. *International Journal of Computer Mathematics* 86(6): 940-954.
- Walkling, R.A. (1985) Predicting tender offer success: A logistic analysis. *Journal of Financial and Quantitative Analysis* 20(4): 461-478.
- Wang, K.Q. (2005) Multifactor Evaluation of Style Rotation. *Journal of Financial and Quantitative Analysis* 40(2): 349-372.
- Wang, L. (2014) Margin-Based Asset Pricing and the Determinants of the CDS Basis. *Journal of Fixed Income* 24(2): 61-78.
- Wang, J., Brooks, R., Lu, X. and Holzhauer, H.M. (2017) Sector Momentum. *Journal of Investing* 26(2): 48-60.
- Wang, C.-H. and Min, K.J. (2013) Electric Power Plant Valuation Based on Day-Ahead Spark Spreads. *Engineering Economist* 58(3): 157-178.
- Wang, S. and Vergne, J.-P. (2017) Buzz factor or innovation potential: What explains cryptocurrencies returns? *PLoS ONE* 12(1): e0169556.
- Wang, C. and Yu, M. (2004) Trading activity and price reversals in futures markets. *Journal of Banking & Finance* 28(6): 1337-1361.
- Ward, D. and Griepentrog, G. (1993) Risk and Return in Defaulted Bonds. *Financial Analysts Journal* 49(3): 61-65.
- Watts, R.L. (1978) Systematic ‘abnormal’ returns after quarterly earnings announcements. *Journal of Financial Economics* 6(2-3): 127-150.
- Webb, J.R., Curcio, R.J. and Rubens, J.H. (1988) Diversification gains from including real estate in mixed-asset portfolios. *Decision Sciences* 19(2): 434-452.
- Weber, B.R., Adair, A. and McGreal, S. (2008) Solutions to the five key brown-field valuation problems. *Journal of Property Investment & Finance* 26(1): 8-37.
- Weber, B., Staub-Bisang, M. and Alfen, H.W. (2016) *Infrastructure as an Asset Class: Investment Strategy, Sustainability, Project Finance and PPP*. Chichester, UK: John Wiley & Sons, Ltd.
- Weinert, H.L. (2007) Efficient computation for Whittaker-Henderson smoothing. *Computational Statistics & Data Analysis* 52(2): 959-974.
- Weiser, S. (2003) The strategic case for commodities in portfolio diversification. *Commodities Now*, September 2003, pp. 7-11.

- Weller, P.A., Friesen, G.C. and Dunham, L.M. (2009) Price trends and patterns in technical analysis: a theoretical and empirical examination. *Journal of Banking & Finance* 6(33): 1089-1100.
- Wells, B. (2016) The Foreign Tax Credit War. *Brigham Young University Law Review* 2016(6): 1895-1965.
- Whaley, R.E. (2000) The Investor Fear Gauge. *Journal of Portfolio Management* 26(3): 12-16.
- Whaley, R.E. (2002) Return and Risk of CBOE Buy Write Monthly Index. *Journal of Derivatives* 10(2): 35-42.
- Whaley, R.E. (2009) Understanding the VIX. *Journal of Portfolio Management* 35(3): 98-105.
- Wheaton, W.C. (1990) Vacancy, Search, and Prices in a Housing Market Matching Model. *Journal of Political Economy* 98(6): 1270-1292.
- White, L.H. (2015) The Market for Cryptocurrencies. *Cato Journal* 35(2): 383-402.
- Whittaker, E.T. (1923) On a New Method of Graduations. *Proceedings of the Edinburgh Mathematical Society* 41: 63-75.
- Whittaker, E.T. (1924) On the theory of graduation. *Proceedings of the Royal Society of Edinburgh* 44: 77-83.
- Wilder, J.W., Jr. (1978) *New Concepts in Technical Trading Systems*. Greensboro, NC: Trend Research.
- Willett, P. (2006) The Porter stemming algorithm: then and now. *Program: Electronic Library and Information Systems* 40(3): 219-223.
- Wilner, R. (1996) A new tool for portfolio managers: Level, slope, and curvature durations. *Journal of Fixed Income* 6(1): 48-59.
- Wilson, D.J. (2016) The Impact of Weather on Local Employment: Using Big Data on Small Places. *Federal Reserve Bank of San Francisco Working Papers Series*, No. 2016-21. Available online: <https://www.frbsf.org/economic-research/files/wp2016-21.pdf>.
- Wilson, A.C., Roelofs, R., Stern, M., Stern, N. and Recht, B. (2018) The Marginal Value of Adaptive Gradient Methods in Machine Learning. *Working Paper*. Available online: <https://arxiv.org/pdf/1705.08292.pdf>.
- Wilson, R.L. and Sharda, R. (1994) Bankruptcy prediction using neural networks. *Decision Support Systems* 11(5): 545-557.

Windas, T. (2007) *An Introduction to Option-Adjusted Spread Analysis*. (Miller, T. (ed.) Revised and Expanded Third Edition.) Princeton, NJ: Bloomberg Press.

Wolf, A. (1987) Optimal hedging with futures options. *Journal of Economics and Business* 39(2): 141-158.

Wolf, V. (2014) *Comparison of Markovian Price Processes and Optimality of Payoffs* (Ph.D. Thesis). Freiburg im Breisgau, Germany: Albert-Ludwigs-Universität Freiburg. Available online: <https://freidok.uni-freiburg.de/fedora/objects/freidok:9664/datastreams/FILE1/content>.

Wong, W.-K., Thompson, H.E. and Teh, K. (2011) Was There Abnormal Trading in the S&P 500 Index Options Prior to the September 11 Attacks? *Multinational Finance Journal* 15(3/4): 1-46.

Wood, J. (1997) A Simple Model for Pricing Imputation Tax Credits Under Australia's Dividend Imputation Tax System. *Pacific-Basin Finance Journal* 5(4): 465-480.

Woodard, J. and Garcia, P. (2008) Weather Derivatives, Spatial Aggregation, and Systemic Risk: Implications for Reinsurance Hedging. *Journal of Agricultural and Resource Economics* 33(1): 34-51.

Woodlock, P. and Dangol, R. (2014) Managing bankruptcy and default risk. *Journal of Corporate Accounting & Finance* 26(1): 33-38.

Woodward, G.T. (1990) The Real Thing: A Dynamic Profile of the Term Structure of Real Interest Rates and Inflation. *Journal of Business* 63(3): 373-398.

Working, H. (1953) Futures Trading and Hedging. *American Economic Review* 43(3): 314-434.

Worzala, E. and Newell, G. (1997) International real estate: A review of strategic investment issues. *Journal of Real Estate Portfolio Management* 3(2): 87-96.

Wright, R., Tekin, E., Topalli, V., McClellan, C., Dickinson, T. and Rosenfeld, R. (2017) Less Cash, Less Crime: Evidence from the Electronic Benefit Transfer Program. *Journal of Law and Economics* 60(2): 361-383.

Wu, H. (2009) Global stability analysis of a general class of discontinuous neural networks with linear growth activation functions. *Information Sciences* 179(19): 3432-3441.

Wu, L. (2003) Jumps and Dynamic Asset Allocation. *Review of Quantitative Finance and Accounting* 20(3): 207-243.

Wurstbauer, D., Lang, S., Rothballer, C. and Schäfers, W. (2016) Can common risk factors explain infrastructure equity returns? Evidence from European capital markets. *Journal of Property Research* 33(2): 97-120.

Wurstbauer, D. and Schäfers, W. (2015) Inflation hedging and protection characteristics of infrastructure and real estate assets. *Journal of Property Investment & Finance* 33(1): 19-44.

Wurtzebach, C.H., Mueller, G.R. and Machi, D. (1991) The Impact of Inflation and Vacancy on Real Estate Returns. *Journal of Real Estate Research* 6(2): 153-168.

Wystup, U. (2017) *FX Options and Structured Products*. (2nd ed.) eBook: John Wiley & Sons, Inc.

Wystup, U. and Zhou, Q. (2014) Volatility as investment – crash protection with calendar spreads of variance swaps. *Journal of Applied Operational Research* 6(4): 243-254.

Xiao, T. (2013) A simple and precise method for pricing convertible bond with credit risk. *Journal of Derivatives & Hedge Funds* 19(4): 259-277.

Xie, W., Liew, Q.R., Wu, Y. and Zou, X. (2014) Pairs Trading with Copulas. *Working Paper*. Available online: <https://ssrn.com/abstract=2383185>.

Xing, Y., Zhang, X. and Zhao, R. (2010) What Does Individual Option Volatility Smirk Tell Us About Future Equity Returns? *Journal of Financial and Quantitative Analysis* 45(3): 641-662.

Yadav, P.K. and Pope, P.F. (1990) Stock index futures arbitrage: International evidence. *Journal of Futures Markets* 10(6): 573-603.

Yadav, P.K. and Pope, P.F. (1994) Stock index futures mispricing: profit opportunities or risk premia? *Journal of Banking & Finance* 18(5): 921-953.

Yamada, S. (1999) Risk Premiums in the JGB Market and Application to Investment Strategies. *Journal of Fixed Income* 9(2): 20-41.

Yan, X. (2006) The Determinants and Implications of Mutual Fund Cash Holdings: Theory and Evidence. *Financial Management* 35(2): 67-91.

Yang, C.C., Brockett, P.L. and Wen, M.-M. (2009) Basis risk and hedging efficiency of weather derivatives. *Journal of Risk Finance* 10(5): 517-536.

- Yang, Z., You, W. and Ji, G. (2011) Using partial least squares and support vector machines for bankruptcy prediction. *Expert Systems with Applications* 38(7): 8336-8342.
- Yao, Y. (2012) Momentum, contrarian, and the January seasonality. *Journal of Banking & Finance* 36(10): 2757-2769.
- Yao, J. and Tan, C.L. (2000) A case study on using neural networks to perform technical forecasting of forex. *Neurocomputing* 34(1-4): 79-98.
- Yao, J., Tan, C.L. and Poh, H.L. (1999) Neural networks for technical analysis: a study on KLCI. *International Journal of Theoretical and Applied Finance* 2(2): 221-241.
- Yared, F. and Veronesi, P. (1999) Short and Long Horizon Term and Inflation Risk Premia in the US Term Structure: Evidence from an Integrated Model for Nominal and Real Bond Prices Under Regime Shifts. *Working Paper*. Available online: <https://ssrn.com/abstract=199448>.
- Yavas, A. and Yang, S. (1995) The Strategic Role of Listing Price in Marketing Real Estate: Theory and Evidence. *Real Estate Economics* 23(3): 347-368.
- Yawitz, J.B., Maloney, K.J. and Ederington, L.H. (1985) Taxes, Default Risk, and Yield Spreads. *Journal of Finance* 40(4): 1127-1140.
- Yawitz, J.B. and Marshall, W.B. (1985) The Use of Futures in Immunized Portfolios. *Journal of Portfolio Management* 11(2): 51-55.
- Yeutter, C. and Dew, J.K. (1982) The Use of Futures in Bank Loans. In: Prochnow, H.V. (ed.) *Bank Credit*. New York, NY: Harper and Row.
- Yim, H.L., Lee, S.H., Yoo, S.K. and Kim, J.J. (2011) A zero-cost collar option applied to materials procurement contracts to reduce price fluctuation risks in construction. *International Journal of Social, Behavioral, Educational, Economic, Business and Industrial Engineering* 5(12): 1769-1774.
- Yo, S.W. (2001) Index Futures Trading and Spot Price Volatility. *Applied Economics Letters* 8(3): 183-186.
- Yoshikawa, D. (2017) An Entropic Approach for Pair Trading. *Entropy* 19(7): 320.
- Youbi, F., Pindza, E. and Maré, E. (2017) A Comparative Study of Spectral Methods for Valuing Financial Options. *Applied Mathematics & Information Sciences* 11(3): 939-950.

Young, M. and Graff, R.A. (1996) Systematic Behavior in Real Estate Investment Risk: Performance Persistence in NCREIF Returns. *Journal of Real Estate Research* 12(3): 369-381.

Ysmailov, B. (2017) Interest Rates, Cash and Short-Term Investments. *Working Paper*. Available online: http://www.fmaconferences.org/Boston/Interest_Rates_Cash_and_ShortTermInv.pdf.

Yu, L., Wang, S. and Lai, K.K. (2005) Mining Stock Market Tendency Using GA-Based Support Vector Machines. In: Deng, X. and Ye, Y. (eds.) *Internet and Network Economics. WINE 2005. Lecture Notes in Computer Science, Vol. 3828*. Berlin, Germany: Springer, pp. 336-345.

Yu, S. and Webb, G. (2014) The Profitability of Pairs Trading Strategies Based on ETFs. *Working Paper*. Available online: http://swfa2015.uno.edu/B_Asset_Pricing_III/paper_196.pdf.

Zabolotnyuk, Y., Jones, R. and Veld, C. (2010) An empirical comparison of convertible bond valuation models. *Financial Management* 39(2): 675-706.

Zakamulin, V. (2014a) The Real-Life Performance of Market Timing with Moving Average and Time-Series Momentum Rules. *Journal of Asset Management* 15(4): 261-278.

Zakamulin, V. (2014b) Dynamic Asset Allocation Strategies Based on Unexpected Volatility. *Journal of Alternative Investments* 16(4): 37-50.

Zakamulin, V. (2015) A Comprehensive Look at the Empirical Performance of Moving Average Trading Strategies. *Working Paper*. Available online: <https://ssrn.com/abstract=2677212>.

Zapranis, A. and Alexandridis, A. (2008) Modelling the temperature time-dependent speed of mean reversion in the context of weather derivatives pricing. *Applied Mathematical Finance* 15(3-4): 355-386.

Zapranis, A. and Alexandridis, A. (2009) Weather derivatives pricing: modeling the seasonal residual variance of an Ornstein-Uhlenbeck temperature process with neural networks. *Neurocomputing* 73(1-3): 37-48.

Zapranis, A. and Tsinaslanidis, P.E. (2012) Identifying and evaluating horizontal support and resistance levels: an empirical study on US stock markets. *Applied Financial Economics* 22(19): 1571-1585.

Zaremba, A. (2014) A Performance Evaluation Model for Global Macro Funds. *International Journal of Finance & Banking Studies* 3(1): 161-171.

- Zeng, L. (2000) Pricing weather derivatives. *Journal of Risk Finance* 1(3): 72-78.
- Zeng, Z. and Lee, C.G. (2014) Pairs trading: Optimal thresholds and profitability. *Quantitative Finance* 14(11): 1881-1893.
- Zhang, C. (2015) Using Excel's Data Table and Chart Tools Effectively in Finance Courses. *Journal of Accounting and Finance* 15(7): 79-93.
- Zhang, L. (2005) The Value Premium. *Journal of Finance* 60(1): 67-103.
- Zhang, L. (2014) A closed-form pricing formula for variance swaps with mean-reverting Gaussian volatility. *ANZIAM Journal* 55(4): 362-382.
- Zhang, X.F. (2006) Information Uncertainty and Stock Returns. *Journal of Finance* 61(1): 105-136.
- Zhang, J.Z., Fargher, N.L. and Hou, W. (2018) Do Banks Audited by Specialists Engage in Less Real Activities Management? Evidence from Repurchase Agreements. *AUDITING: A Journal of Practice & Theory* (forthcoming). DOI: <https://doi.org/10.2308/ajpt-52017>.
- Zhang, X., Fuehres, H. and Gloor, P.A. (2011) Predicting Stock Market Indicators Through Twitter "I hope it is not as bad as I fear". *Procedia – Social and Behavioral Sciences* 26: 55-62.
- Zhang, J.E., Shu, J. and Brenner, M. (2010) The new market for volatility trading. *Journal of Futures Markets* 30(9): 809-833.
- Zhang, J.E. and Xiang, Y. (2008) The implied volatility smirk. *Quantitative Finance* 8(3): 263-284.
- Zhang, J.E. and Zhu, Y. (2006) VIX futures. *Journal of Futures Markets* 26(6): 521-531.
- Zheng, W. and Kwok, Y.K. (2014) Closed form pricing formulas for discretely sampled generalized variance swaps. *Mathematical Finance* 24(4): 855-881.
- Zheng, H., Thomas, L.C. and Allen, D.E. (2003) The Duration Derby: A Comparison of Duration Strategies in Asset Liability Management. *Journal of Bond Trading and Management* 1(4): 371-380.
- Zhou, L. (2013) Performance of corporate bankruptcy prediction models on imbalanced dataset: The effect of sampling methods. *Knowledge-Based Systems* 41: 16-25.

This is a preview version containing parts of the following book:
Z. Kakushadze and J.A. Serur. *151 Trading Strategies*. Cham, Switzerland:
Palgrave Macmillan, an imprint of Springer Nature, 1st Edition (2018), XX,
480 pp; ISBN 978-3-030-02791-9. Full version:
<https://www.springer.com/us/book/9783030027919>. Copyright © 2018
Zura Kakushadze and Juan Andrés Serur. All Rights Reserved.

Zhou, L., Yao, S., Wang, J. and Ou, J. (2016) Global financial crisis and China's pawnbroking industry. *Journal of Chinese Economic and Business Studies* 14(2): 151-164.

Zhu, H. (2006) An Empirical Comparison of Credit Spreads between the Bond Market and the Credit Default Swap Market. *Journal of Financial Services Research* 29(3): 211-235.

Zmijewski, M.E. (1984) Methodological Issues Related to the Estimation of Financial Distress Prediction Models. *Journal of Accounting Research* 22: 59-82.

Glossary

absolute momentum: time-series momentum.

acquirer company: the company purchasing another company (target company) in a corporate acquisition.

activation function: a function that defines the output of a node (artificial neuron) in an artificial neural network given an input (or a set of inputs).

active investing (a.k.a. active management): an investment strategy that involves active (frequent) buying and selling of securities in a portfolio (cf. *passive investing*) with the view of exploiting (perceived) profit-generating opportunities.

actively managed ETF: an exchange-traded fund whose underlying portfolio allocation is actively managed.

adjusted price: a stock's price adjusted for splits and dividends.

adverse selection: an effect caused by smart order flow, whereby most limit orders to buy at the bid (sell at the ask) get filled when the market is trading through them downward (upward).

aggressive order: a market order, or a marketable limit order (to buy at the ask or higher, or to sell at the bid or lower).

aggressive order flow: order flow comprised of aggressive orders.

alpha: following common trader lingo, any reasonable “expected return” that one may wish to trade on.

alpha portfolio (a.k.a. alpha combo): a portfolio of (typically, a large number of) alphas combined with some weights.

alpha rotation: a type of ETF trading strategy.

American option: an option (e.g., call or put) that can be exercised on any trading day on or before expiration.

announcement days: days with important economic announcements such as FOMC announcements (cf. *non-announcement days*).

annualization factor: a multiplicative factor for annualizing a quantity.

annualized return: an average daily return times 252 (the number of trading days in a year).

annualized Sharpe ratio: a daily Sharpe ratio times the square root of 252 (the number of trading days in a year).

appraised value: an evaluation of a property's or some other valuable object's (e.g., jewelry) value at a given time.

arbitrage: taking advantage of a (perceived) mispricing (a.k.a. arbitrage opportunity) in one or more securities to make a profit.

arbitrage trade: a set of transactions executed with the view of exploiting an arbitrage opportunity.

artificial neural network (ANN): a computing system (inspired by the neural structure of a brain) of nodes (artificial neurons) linked by connections (akin to the synapses in a brain) that can transmit signals from one node to another.

Asian option: an option whose payoff is determined by the average underlying price over some preset time period.

ask (a.k.a. ask price, or offer, or offer price): the price at which a seller is willing (offering) to sell.

asset allocation: assigning weights (allocation percentages) to the assets in a portfolio, typically based on risk-reward considerations.

asset-backed security (ABS): a financial security collateralized by a pool of assets such as loans, mortgages, royalties, etc.

asset class: a group of securities with similar characteristics.

at-the-money (ATM) option: an option whose exercise price is the same as the current price of the underlying asset.

attachment (a.k.a. attachment point): the percentage of the underlying portfolio loss at which a tranche of a CDO (collateralized debt obligation) starts to lose value.

back leg: longer-maturity bonds in a yield curve spread strategy (flattener or steepener).

backspread: a type of options strategies.

backtest: a simulation of strategy performance using historical data.

backtesting period: the historical period over which a backtest is performed.

backwardation: when the futures curve (term structure) is downward-sloping.

bank deposit certificate (a.k.a. certificate of deposit, or CD): a savings certificate (a promissory note issued by a bank) with a fixed maturity date and interest rate.

banker's acceptance (BA): a short-term debt instrument issued by a company and guaranteed by a commercial bank.

bankruptcy: a legal status (imposed by a Court order) of a company that cannot repay debts to its creditors.

barbell: a bond portfolio consisting of bonds with only two (typically, short and long) maturities.

barrier option: an option that can be exercised only if the underlying security's price passes a certain level or "barrier".

base form (a.k.a. stem): in linguistics, the part of a word that is common to all its inflected variants.

basis point (bps): 1/100 of 1%.

basket: a portfolio of assets combined with some weights.

Bayes' theorem: $P(A|B) = P(B|A) \times P(A)/P(B)$, where $P(A|B)$ is the conditional probability of A occurring assuming B is true, and $P(A)$ and $P(B)$ are the probabilities of A and B occurring independently of each other.

bearish outlook: when a trader expects the market or a security to trade lower.

bearish strategy: a directional strategy where the trader profits if the underlying instrument's price goes down.

Bermudan option: an option that can be exercised only on specified dates on or before expiration.

Bernoulli probability distribution: a discrete probability distribution of a random variable which takes the value 1 with probability p and the value 0 with probability $q = 1 - p$.

bias: in an artificial neural network, the inhomogeneous component of the argument of an activation function.

bid (a.k.a. bid price): the price at which a buyer is willing to buy.

bid-ask spread: ask price minus bid price.

binary industry classification: an industry classification where each company belongs to one and only one sub-industry, industry, sector, etc.

binary option (a.k.a. digital option, or all-or-nothing option): an option that pays a preset amount, say, \$1, if the underlying security meets a predefined condition on expiration, otherwise it simply expires without paying anything to the holder.

bisection method: a root-finding method that repeatedly bisects an interval and selects a subinterval in which a root must lie for further examination.

Bitcoin (BTC): the world's first decentralized digital currency (cryptocurrency).

black-box algorithm: an algorithm that can be viewed in terms of its inputs and outputs, without any knowledge of its internal workings.

Black-Scholes model (a.k.a. Black-Scholes-Merton model): a mathematical model of stock (or other underlying asset) dynamics used in pricing options and other derivatives, where the log of the underlying price is described by a Brownian motion with a constant drift.

blockchain: a distributed ledger for keeping a record of all transactions that consists of a sequential chain of blocks, linked using cryptography and time-stamping, and containing transaction records.

body: the middle (by maturity in bond portfolios, and by strike price in option portfolios) leg of a butterfly portfolio.

bond: a fixed-income instrument, a promise of being paid some amount (principal) at some future time T (maturity), and possibly some smaller amounts (coupon

payments) at some times prior to T .

bond immunization: matching the duration of a bond portfolio to the maturity of a future cash obligation.

bond maturity: the time at which the principal of a bond is paid.

bond principal: the amount the borrower (bond issuer) owes to the bondholder in full at bond maturity.

bond value: the worth of a bond at a given time before maturity.

bond yield (here, yield to maturity): the overall interest rate earned assuming the bond is held until maturity and all coupon and principal payments are made as promised.

bond yield spread (a.k.a. bond spread): the spread between the bond yield and the risk-free rate.

bondholder: bond owner.

book-to-market ratio: the company's total book value divided by its market capitalization (same as B/P ratio).

book-to-price ratio (a.k.a. B/P ratio): the company's book value per share outstanding divided by its stock share price.

book value: the company's total assets minus its total liabilities.

Boolean: a binary variable with only two possible values, TRUE and FALSE.

box: an option trading strategy.

break-even price (a.k.a. break-even point): a price of the underlying security (e.g., stock) in an option trading strategy at which it breaks even (i.e., when the P&L is zero).

breakeven rate: the fixed rate of an inflation swap.

broad market index: an index based on a broad cross-section of securities (e.g., S&P 500, Russell 3000, etc.).

brownfield project: a project associated with established infrastructure as-

sets in need of improvement.

Brownian motion (a.k.a. Wiener process): a continuous-time (t) stochastic process W_t , where $W_0 = 0$, W_t is a normal random variable with mean 0 and variance t , and the increment $W_{s+t} - W_s$ is a normal random variable with mean 0 and variance t and is independent of the history of what the process did up to time s .

Btu: British thermal unit, approximately 1,055 Joules.

bubble (a.k.a. economic, asset, speculative, market, price or financial bubble): an asset trading at prices strongly inflated compared with its intrinsic value.

bullet: a bond portfolio where all bonds have the same maturity.

bullish outlook: when a trader expects the market or a security to trade higher.

bullish strategy: a directional strategy where the trader profits if the underlying instrument's price goes up.

butterfly: a portfolio (of bonds or options) with 3 legs, two peripheral (by maturity in bond portfolios, and by strike price in option portfolios) wings and a body in the middle.

butterfly spread: a butterfly option strategy.

buy-and-hold asset/investment: an asset/investment for a passive long-term strategy where the investor holds a long position irrespective of short-term fluctuations in the market.

buy-write strategy: buying stock and writing (selling) a call option against the stock position.

calendar spread (for futures): buying (selling) a near-month futures and selling (buying) a deferred-month futures.

calendar spread (for options): buying a longer-expiration option (call or put) and selling a shorter-expiration option (of the same type, for the same underlying, and with the same strike price).

call option (a.k.a. call): see *European call option, option*.

Canary option: an option that can be exercised, say, quarterly, but not before

a determined time period, say, 1 year, has elapsed.

cancel-replaced order: a placed order that has been subsequently canceled and replaced with another order.

canceled order: a placed order that has been subsequently canceled.

capital allocation: see *asset allocation*.

capital gain strategy: a strategy that profits from buying and selling an asset (or, more generally, establishing and liquidating a position).

Carhart's momentum factor (a.k.a. MOM): winners minus losers by (12-month) momentum.

carry (a.k.a. cost of carry): a return (positive or negative) from holding an asset.

carry trade (a.k.a. carry strategy): a strategy based on earning a spread between borrowing a low carry asset and lending a high carry asset.

cash (for indexes): in common trader lingo, “cash” refers to the underlying index portfolio (e.g., the S&P 500 stocks for the S&P 500 index).

cash-equivalent asset: a highly liquid short-term investment security with high credit quality (e.g., REPO).

cash flow: the net amount of cash and cash-equivalent assets being transferred into and out of a company (in the business context) or a portfolio (in the trading context).

cash flow shortfall: the amount by which a financial obligation or liability exceeds the amount of cash (or, more generally, liquid funds) that is available.

cash merger: a merger where the acquirer company pays the target company's shareholders cash for its stock.

CDO tranche: a part of a CDO consisting of assets with different credit ratings and interest rates.

CDO tranche spread: for achieving a null MTM of a CDO tranche, the value of the default leg of the tranche divided by its risky duration.

CDS basis: CDS spread minus bond yield spread.

CDS basis arbitrage (a.k.a. CDS arbitrage): buying a bond and insuring it with a CDS.

CDS index: a credit default swap index such as CDX and iTraxx.

CDS spread: a periodic (e.g., annual) premium per dollar of the insured debt.

cents-per-share (CPS): the realized P&L in cents (as opposed to dollars) divided by the total shares traded (which includes both establishing and liquidating trades).

channel: a range/band, bounded by a ceiling and a floor, within which the stock price fluctuates.

Chapter 11: a chapter of Title 11, the United States Bankruptcy Code.

cheap stock: a stock that is perceived to be undervalued by some criterion.

claim: the payoff of an option (or some other derivative).

class: in machine learning, one of the possible predicted outcomes of a machine learning algorithm.

close (a.k.a. close price, or closing price): the closing price of a stock at the NYSE close (4:00 PM Eastern Time).

close-to-close return: the return from the close of the previous trading day to the close of the current trading day.

close-to-open return: the return from the close of the previous trading day to the open of the current trading day.

clustering algorithm: grouping objects (into clusters) based on some similarity criterion (or criteria).

Cochrane-Piazzesi predictor: a bond return predictor.

collar (a.k.a. fence): an option trading strategy.

collateral: something of value pledged as security for repayment of a loan, forfeited if the borrower defaults.

collateralized debt obligation (CDO): an asset-backed security (ABS) consisting of a basket of assets such as bonds, credit default swaps, etc.

combo (for options): a type of option trading strategies.

commercial paper: short-term unsecured promissory notes issued by companies.

commercial real estate: real estate property used for business purposes (rather than living space), e.g., shopping centers, retail shops, office space, etc.

Commitments of Traders (COT): weekly reports provided by CFTC.

commodity: a raw material (e.g., gold, silver, oil, copper) or an agricultural product (e.g., wheat, soy, rice) that can be bought and sold.

commodity allocation percentage (CA): the allocation weight for commodities included as an inflation hedge in a portfolio of other assets.

commodity futures: futures contracts on commodities.

common stock: a security representing ownership in a corporation entitling its holder to exercise control over the company affairs (e.g., via voting on electing a board of directors and corporate policy), with the lowest priority (after bondholders, preferred stockholders, etc.) for rights to the company's assets in the event of its liquidation.

compounding: reinvestment of interest earned to generate additional interest in the future.

compounding period: the period between two consecutive points in time when interest is paid or added to the principal.

conditional expectation (a.k.a. conditional expected value, or conditional mean): an average value of a quantity assuming some condition occurs.

conditional independence: A and B are conditionally independent assuming C is true iff the occurrence of A assuming C is independent from the occurrence of B assuming C and vice versa, i.e., $P(A \cap B|C) = P(A|C) \times P(B|C)$, where $P(A|B)$ is a conditional probability.

conditional probability: $P(A|B)$, the probability of A occurring assuming

B is true.

condor: a type of options strategies.

constrained regression: a linear regression subject to a set of linear or non-linear constraints, e.g., non-negative least squares (NNLS), where the regression coefficients are required to be nonnegative.

Consumer Price Index (CPI): a measure of the price level of a market basket of consumer goods and services.

contango: when the futures curve (term structure) is upward-sloping.

contingent leg: in a CDO, the default leg, the other leg being the premium leg.

continuous compounding: an idealized mathematical limit of compounding where the number of compounding periods n goes to infinity, the length δ of each compounding period goes to zero, and the product $n \times \delta$ is kept fixed and finite.

contrarian effect: see *mean-reversion effect*.

control rights: the legal entitlements granted to an investor (e.g., a shareholder holding common stock), such as the right to transfer shares, receive regular and accurate financial disclosure, vote on specific issues at the company, etc.

conversion factor: the quoted price a bond would have per dollar of principal on the first day of the delivery month of an interest rate futures contract assuming that the interest rate for all maturities equals 6% per annum with semiannual compounding.

conversion factor model: a model (based on the conversion factor) commonly used to calculate hedge ratios when hedging interest rate risk with interest rate futures.

conversion price: the price of the underlying stock at which a convertible bond can be converted into stock.

conversion ratio: the number of the issuer's stock shares into which a convertible bond can be converted.

convertible arbitrage: a trading strategy involving a convertible bond and stock of the same issuer.

convertible bond: a hybrid security with an embedded option to convert a bond to a preset number (conversion ratio) of the issuer's stock when, e.g., the stock price reaches a preset level (conversion price).

convexity (for bonds): a measure of non-linear dependence of bond prices on changes in interest rates, which involves the second derivative of the bond price w.r.t. the interest rates.

core inflation (CI): long run inflation, with items subject to volatile prices (such as food and energy) excluded (cf. *headline inflation*)

corporate actions: events initiated by a publicly traded company such as stock splits, dividends, mergers and acquisitions (M&A), rights issues, spin-offs, etc.

correlation: a measure of how closely two securities move in relation to each other, defined as the covariance of their returns divided by a product of the standard deviations of said returns.

correlation matrix: an $N \times N$ matrix with unit diagonal elements, whose off-diagonal elements are the pair-wise correlations of N different securities.

correlation trading: arbitraging the average pair-wise correlation of the index constituents vs. its future realized value.

counterparty: the other party that participates in a financial transaction.

coupon bond: a bond that makes periodic coupon payments before maturity.

coupon rate: an uncompounded, fixed or variable rate at which a coupon bond makes coupon payments.

covariance: a mean value of the product of the deviations of the returns of two securities from their respective mean values.

covariance matrix: an $N \times N$ matrix, whose off-diagonal elements are the pair-wise covariances of N different securities, and whose diagonal elements are the corresponding variances.

covered call: see *buy-write strategy*.

covered interest arbitrage: a trading strategy that exploits deviations from CIRP.

covered put: see *sell-write strategy*.

credit default swap (CDS): a swap that provides insurance against default on a bond.

credit derivatives: financial contracts (e.g., CDS) that allow parties to transfer or receive exposure to credit risk.

credit rating (for bonds): a measure of the creditworthiness of corporate or government bonds (e.g., S&P's credit ratings AAA, AA+, AA, AA-, A+, A, A-, BBB+, BBB, BBB-, BB+, BB, BB-, B+, B, B-, CCC+, CCC, CCC-, CC, C, D).

credit spread: the difference between the bond yield and the risk-free rate (same as the bond yield spread).

cross-border tax arbitrage: exploiting differences in the tax regimes of two or more countries.

cross-hedging: managing risk exposure to one security by taking an opposite position (with some hedge ratio) in another security (or its derivative, e.g., futures), where the two securities are positively correlated and have similar price movements.

cross-sectional quantity: a quantity (e.g., mean, standard deviation, etc.) computed across a set of securities (e.g., stocks in a portfolio) as opposed to serially (i.e., across a time series for each security).

cross-sectional regression: a regression where the independent variables are vectors whose elements are labeled by a cross-sectional index, e.g., that which labels stocks in a portfolio (cf. *serial regression*).

cross-validation (a.k.a. out-of-sample testing): a technique to evaluate predictive models by partitioning the original data sample into a training set to train the model, and a test set to evaluate it.

cryptoassets: cryptocurrencies and similar digital assets.

cryptocurrency: a digital medium of exchange that uses cryptography (e.g., BTC).

cryptography: constructing and analyzing protocols that prevent third parties from reading private messages.

cum-dividend: when the stock buyer is entitled to receive a dividend that has been declared but not paid (cf. *ex-dividend*).

cumulative inflation: inflation rate measured from time t_1 to time t_2 (cf. *year-on-year inflation*).

cumulative return: an asset's return from time t_1 to time t_2 .

curvature: in a yield curve, the change in the slope thereof as a function of maturity.

curve-neutrality: approximate neutrality of a bond portfolio to small steepening and flattening of the yield curve.

curve trade: a flattener or steepener (in bonds or CDOs).

daily roll value: futures basis divided by the number of business days until the settlement.

dark spread: the difference between the wholesale price of electricity and the price of coal required to produce it by a coal-fired power plant.

data mining: a process of finding patterns/trends in large data sets.

debt seniority: the order of repayment of debt in the event of a sale or bankruptcy of the debt issuer.

decentralized digital currency: a decentralized cryptocurrency such as BTC, ETH, etc.

decile: each of the 10 (approximately) equal parts of a sample (e.g., data sample).

default: a failure to repay a loan/debt.

default risk: the (estimated/perceived) risk of a default of a borrower.

deferred-month futures: a futures contract with the settlement date in the later months (cf. *front-month futures*).

delay- d backtest: a backtest in which all quantities used for establishing or liquidating simulated positions at any given time t are computed using historical quantities from times at least d trading days prior to t .

deliverable bond: a bond in the delivery basket of an interest rate futures contract.

delivery: transferring the underlying instrument (or commodity) in a contract (e.g., futures or forward) to the buyer at maturity (delivery date) at a pre-agreed price (delivery price).

delivery basket: in interest rate futures, the array of bonds that can be delivered at the delivery date.

delivery month: the month in which the delivery in a futures contract occurs.

Delta: the first derivative of the value of a derivative asset (e.g., option) w.r.t. the price of the underlying asset.

Delta-hedge: hedging a long (short) position in a derivative asset with a short (long) position in the underlying asset with the hedge ratio equal the Delta of the derivative asset.

Delta-neutral strategy: a trading strategy which achieves null Delta via, e.g., Delta-hedging.

demeaning: subtracting from the elements of a sample their mean value across said sample.

derivative (a.k.a. derivative contract, or contingent claim): a security (e.g., option) whose future payoff depends on the value of its underlying asset (e.g., stock) and is contingent on some uncertain future event.

desired holdings: portfolio holdings to be attained by a trading strategy.

detachment (a.k.a. detachment point): the percentage of the underlying portfolio loss at which a tranche of a CDO (collateralized debt obligation) loses all its value.

diagonal spread: an option trading strategy.

dimnames: a command in R for the names of column and row labels of a matrix.

directional strategy: a strategy that profits based on the underlying secu-

urity's (or securities') future direction (cf. *non-directional strategy*).

discount bond (a.k.a. zero-coupon bond): a bond that pays only its principal at maturity but makes no coupon payments.

discount factor: the worth of a discount bond with \$1 principal at time t prior to its maturity T .

discount rate (a.k.a. Fed discount rate, or Federal discount rate): the interest rate charged to commercial banks and other depository institutions for loans received from the U.S. Federal Reserve.

discretionary strategy: a strategy that relies on the fund manager's skills (cf. *systematic strategy*).

discretionary macro: discretionary global macro strategies based on analysts' subjective opinions.

dispersion trading: arbitraging the index implied volatility vs. implied volatilities of its constituents.

distress risk puzzle: an empirical occurrence that companies with lower bankruptcy risk tend to yield higher returns than riskier ones.

distressed asset: an asset (e.g., debt) of a distressed company.

distressed debt: see *distressed asset*.

distressed debt strategy: strategies based on acquiring debt of a distressed company.

distressed company: a company undergoing financial or operational distress.

distributed ledger: a database shared and synchronized across a (typically large, peer-to-peer) network encompassing multiple sites.

diversification: allocating capital to reduce exposure to any one particular asset or risk by investing in a variety of assets.

dividend: a distribution of some of the earnings of a company, as decided by its board of directors, to a class of its shareholders, usually (but not always) quarterly.

dividend imputation: a corporate tax system in which some or all of the

tax paid by a company may be attributed, or imputed, to the shareholders via a tax credit to reduce the income tax payable on a distribution via, e.g., dividends.

dollar carry trade: an FX trading strategy.

dollar duration: a measure of the absolute bond price sensitivity to changes in the interest rates, defined as the modified duration times the bond price.

dollar-duration-neutrality: when the sum of dollar durations of a bond portfolio is null (with dollar durations of short bond positions defined to be negative).

dollar holding (a.k.a. dollar position): the dollar value of an asset's position in a portfolio.

dollar-neutrality: when the sum of dollar holdings in a portfolio is null (with dollar holdings of short positions defined to be negative).

domestic currency: the currency of the investor's home country.

Donchian Channel: a commonly used definition of a channel in channel trading strategies.

double-taxation: a corporate taxation system (e.g., in the U.S.) where the corporate income is first taxed at the corporate level, and then again when dividends are received by the shareholders.

downside risk: the risk associated with losses.

drawdown: a peak-to-trough decline in the P&L during a given period, where the peak (trough) is defined as the P&L maximum (minimum) in said period.

drift: a mean change in a time-dependent quantity over a period of time, i.e., a serial mean.

dual-momentum sector rotation: an ETF momentum strategy.

dumb order flow (a.k.a. uninformed order flow): aggressive order flow not based on a predictive expected return.

dummy variable (a.k.a. binary variable): a predictor variable taking binary values 0 or 1 to indicate the absence or presence of some effect or belonging or not belonging to some category that may affect the outcome (e.g., if a company belongs to a given economic sector).

duration: see *dollar duration*, *Macaulay duration*, *modified duration*, *risky duration*.

duration-hedging: hedging duration risk (i.e., interest rate risk) with interest rate swaps or interest rate futures.

duration-targeting strategy: a strategy (e.g., a bond ladder) that maintains an approximately constant duration by selling shorter-maturity bonds as they approach maturity and replacing them with new longer-maturity bonds.

dynamic asset allocation: frequently adjusting the asset allocations in a portfolio according to changing market conditions.

earnings: the after-tax net income of a company.

earnings-momentum: a momentum strategy based on earnings.

economic activity: production, distribution, exchange and consumption of goods and services.

economic data: data (typically, time series) pertaining to an actual economy.

eigenvalue: a root of the characteristic equation of a matrix (see *eigenvector*).

eigenvector: for a square symmetric $N \times N$ matrix A , an N -vector V that solves the characteristic equation $A V = \lambda V$, where λ is the corresponding eigenvalue (which is a number).

electronic trading: trading securities electronically, as opposed to by human traders on the trading floors of the exchanges.

EMA: an exponential moving average, a serial moving average with past contributions suppressed with exponentially decreasing weights.

embedded option: in a convertible bond, the option to convert the bond to a preset number of the issuer's stock.

EMSD: an exponential moving standard deviation, a serial moving standard deviation with past contributions suppressed with exponentially decreasing weights.

equally-weighted portfolio: a portfolio where all assets have equal dollar

holdings.

equity: a company's stock or other security representing its ownership interest.

equity market: a stock market.

equity tranche: the lowest quality tranche of a CDO.

eRank (a.k.a. effective rank): a measure of effective dimensionality of a matrix.

error function: in machine learning, a function to be minimized that is constructed from the errors (or similar), e.g., the sum of squares of the errors, or some other suitable function (not to be confused with the Gauss error function $\text{erf}(x)$).

establishing: buying or shorting an asset or portfolio from a null position.

estimation period: the length of a time-series data sample used in estimating some parameters, e.g., regression coefficients.

ETH: ether/Ethereum, a cryptocurrency.

Euclidean distance: the distance between two vectors defined as the square root of the sum of squares of the differences between their components.

EUR: euro, a unit of the eurozone currency.

eurodollar: a USD deposit held in a bank outside the U.S.

European call option: a right (but not an obligation) to buy a stock at the maturity time T for the strike price k agreed on at time $t = 0$.

European put option: a right (but not an obligation) to sell a stock at the maturity time T for the strike price k agreed on at time $t = 0$.

ex-dividend when the stock seller is entitled to receive a dividend that has been declared but not paid (cf. *cum-dividend*).

excess return: a return of an asset in excess of some benchmark return (e.g., risk-free rate).

exchange rate (a.k.a. FX rate): the rate of exchange between two dif-

ferent currencies.

execution price: the price at which an order (e.g., to buy stock) is filled (executed).

exercise date: a date on which an option can be exercised.

exotic options: a broad category of options that typically are complexly structured.

expected return: a future return of an asset expected based on some reasonable consideration, e.g., an average realized return over some past period.

expiration: the last date on which a derivatives contract (e.g., option or futures) is valid.

explanatory variable: a variable that has (or is expected to have) some explanatory power for an observed variable (e.g., hours studied by a student for a final exam can be expected to be an explanatory variable for the student's final exam grade/score).

exponential smoothing parameter: the exponential suppression factor in an exponential moving average.

exposure: the amount that can be lost (or gained) in an investment.

face value (a.k.a. principal): the amount paid to the bondholder at maturity.

factor (a.k.a. risk factor): a common explanatory variable for a cross-section of asset returns (e.g., stocks).

factor loadings matrix: the $N \times K$ matrix Ω_{iA} ($i = 1, \dots, N$, $A = 1, \dots, K$, typically $K \ll N$) in a K -factor model $Y_i = \sum_{A=1}^K \Omega_{iA} F_A + \epsilon_i$, where Y_i are the observed variables, F_A are the unobserved variables (common factors), and ϵ_i are the unobserved error terms.

factor portfolio: a portfolio that aims to attain exposure to a given factor.

fair value: a market value of a security or, in the absence of a market value, a theoretical value based on some reasonable modeling.

Fama-French factors: MKT, the excess return (defined as the return in excess of the risk-free rate, in turn defined as the one-month Treasury bill rate) of

the market portfolio; SMB, the excess return of the Small minus Big (by market capitalization) portfolio; HML, the excess return of the High minus Low (by book-to-market) portfolio.

Fama puzzle: see *forward discount anomaly*.

feature (in machine learning): a predictor, an input variable.

fiat currency: a legal tender declared by a government (e.g., U.S. dollar) but not backed by a physical commodity (such as gold).

fill: when an order to buy or sell a security or commodity is completed, with a partial completion (e.g., only 100 shares of a 200 share buy order are filled) known as a partial fill.

fill or kill limit order (a.k.a. FOK): a limit order to buy or sell stock that must be executed immediately and completely or not at all (no partial fills are allowed).

financial crisis: when some financial assets suddenly lose a large part of their nominal value.

first-month contract: see *front-month futures*.

fix-and-flip: a real estate strategy.

fixed coupon bond (a.k.a. fixed rate coupon bond): a bond with a fixed (as opposed to variable) coupon rate.

fixed-income asset: a debt instrument that generates fixed returns in the form of interest payments.

fixed interest rate (a.k.a. fixed rate): an interest rate on a liability that remains unchanged either for the entire term of the loan or for its part.

fixed rate payment: a coupon payment of a fixed coupon bond.

flattener: a yield curve spread bond strategy.

floating coupon bond (a.k.a. floating rate coupon bond, or variable coupon bond, or variable rate coupon bond): a bond with a variable (as opposed to fixed) coupon rate.

floating interest rate (a.k.a. floating rate, or variable interest rate, or variable rate): interest rate on a liability that varies during the term of the loan.

floating rate payment: a coupon payment of a floating coupon bond.

FOMC announcements: Federal Open Market Committee announcements such as interest rate hikes.

forecasting future returns: predicting future returns.

foreign currency: a currency (that is different from the domestic currency) of a country other than the investor's home country.

formation period: in momentum strategies, the period over which the momentum indicator is computed.

forward (a.k.a. forward contract): a contract struck at time $t = 0$, where one of the two parties agrees to sell the other an asset at some future time T (known as the expiry, delivery date or maturity of the contract) for the pre-agreed strike price k .

forward discount: when the forward FX rate is lower than the spot FX rate.

forward discount anomaly (a.k.a. forward premium anomaly, or forward discount puzzle, or forward premium puzzle, or Fama puzzle): an empirical occurrence whereby on average high interest rate currencies tend to appreciate (somewhat) w.r.t. low interest rate currencies.

forward FX rate: the FX rate of a forward FX contract.

forward premium: when the forward FX rate is higher than the spot FX rate.

front leg: shorter-maturity bonds in a yield curve spread strategy (flattener or steepener).

front-month futures: a futures contract with the settlement date closest to the current date (cf. *deferred-month futures*).

fundamental analysis: evaluating securities based on fundamental data.

fundamental data: data pertaining to the fundamentals of stocks or other

securities, including time series and/or cross-sectional data.

fundamental industry classification: an industry classification of companies (into sectors, industries, sub-industries, etc.) based on fundamental/economic data, such as companies' products and services, revenue sources, suppliers, competitors, partners, etc. (cf. *statistical industry classification*).

fundamental trading strategy: a trading strategy based on fundamental analysis.

fundamentals: quantitative and qualitative information on the financial/economic health and valuation of a company, security, currency, etc.

futures (a.k.a. futures contract): a standardized forward contract traded on a futures exchange.

futures basis: the futures price minus the underlying spot price.

futures curve (a.k.a. futures term structure): the dependence of the futures prices on time to delivery.

futures delivery basket: see *delivery basket*.

futures spread: see *calendar spread (for futures)*.

FX pair: currencies of 2 different countries.

FX rate: see *exchange rate*.

FX rate risk: exposure to FX rate changes.

FX spot rate: see *spot FX rate*.

FX triangular arbitrage: arbitraging 3 FX pairs.

Gamma: the second derivative of the value of a derivative asset (e.g., option) w.r.t. the price of the underlying asset.

Gamma hedging: an options hedging strategy to eliminate or reduce the exposure caused by changes in an option portfolio's Delta as a result of the underlying security's price movements.

Gamma scalping: Gamma hedging by buying and selling the underlying secu-

rity in response to its price movements that cause changes in an option portfolio's Delta.

global macro: trading strategies seeking to capitalize on regional, economic and political changes around the world.

Greeks: see *Delta, Gamma, Theta, Vega*.

greenfield project: a project associated with infrastructure assets to be constructed.

guaranteed loan: a loan guaranteed by a third party in case the borrower defaults.

guts: an option trading strategy.

hard-to-borrow security: a security on a “Hard-to-Borrow List”, an inventory record used by brokerages for securities that are difficult to borrow for short sale transactions due to short supply or high volatility.

headline inflation (HI): a measure of the total inflation within an economy, including commodity prices such as food and energy (cf. *core inflation*).

heat rate: the efficiency with which an electricity production plant converts fuel into electricity.

hedge: an investment (typically, via an offsetting position in a related security) to reduce the risk of losing money on an existing position.

hedge ratio: in a hedge, the number of units (or the dollar notional) of the offsetting security for each unit (or dollar) of the security to be hedged.

hedger: a market participant attempting to reduce risk associated with a security's price movement (cf. *speculator*).

hedging pressure (HP): in (commodities) futures markets, the number of long contracts divided by the total number of contracts (long plus short).

hedging strategy: see *hedge*.

heterotic risk model: a multifactor risk model combining a multilevel fundamental industry classification with principal component analysis.

hidden layers: in an artificial neural network, the intermediate layers of nodes (artificial neurons) between the input layer and the output layer.

high (a.k.a. high price): the maximum price attained by a stock (or other security) within a given trading day (or some other time interval).

high-minus-low carry: an FX trading strategy based on the forward discount anomaly.

High Yield bonds (a.k.a. junk bonds): bonds with S&P credit ratings below BBB-.

historical quantity: a quantity (e.g., correlation, variance, volatility, return, etc.) computed based on historical data.

HMD (a.k.a. healthy-minus-distressed): buying the safest companies and selling the riskiest ones by probability of bankruptcy.

HML (a.k.a. High minus Low): see *Fama-French factors*.

Hodrick-Prescott filter (a.k.a. HP filter, or Whittaker-Henderson method in actuarial sciences): a time-series filter for separating a lower-frequency (“regular”) component from a higher-frequency (“irregular”) component (noise).

holding period: the period for which a position in a security or a portfolio is held after being established and before being liquidated (or, more loosely, rebalanced).

holding weights: the weights with which assets are held in a portfolio.

holdings: the contents of a portfolio; also, a shorthand for, e.g., dollar holdings.

horizon (a.k.a. investment horizon): see *holding period*.

horizontal spread (a.k.a. time spread): see *calendar spread*.

Hybrid Market: a blend of an automated electronic trading platform and a traditional (human-operated) floor broker system.

hybrid security: a security with mixed characteristics of two asset classes, e.g., a convertible bond.

IBS: internal bar strength, defined as the difference between the close price

and the low price divided by the difference between the high price and the low price.

implied volatility: in option pricing, the volatility of the underlying instrument, which, when used as an input in an option pricing model (such as the Black-Scholes model), yields the model value of the option price equal to its market value.

imputation system: see *dividend imputation*.

in-sample: when a computation or backtest is not out-of-sample.

in-the-money (ITM) option: a call (put) option whose exercise price is below (above) the current price of the underlying asset.

income strategy: a trading strategy that generates income, usually via some risk exposure.

incomplete basket: a subset of the portfolio that would ideally be traded, e.g., in index arbitrage.

index: a diversified portfolio of assets combined with some weights.

index arbitrage (a.k.a. cash-and-carry arbitrage): an arbitrage strategy exploiting mispricings between the index spot price and index futures price (i.e., the index futures basis).

index basket: an index portfolio.

index constituents: the assets in an index portfolio.

index ETF: an ETF that tracks an index.

index futures: a futures on an index.

index hedging: hedging a position (e.g., a CDO tranche) with a pertinent index.

index level: for market cap weighted indexes, the current value of the index level $I(t) = I(0) \times C(t)/C(0)$, where $I(0)$ is the initial value of the index level (which is defined, not calculated), $C(t)$ is the current total market cap of the index constituents, and $C(0)$ is its initial value.

index spot price: the current market price of an index basket, where the number of units of each constituent is determined by the index weighting scheme

(market cap weighted index, price weighted index, etc.) with the overall normalization constant fixed depending on a specific purpose, e.g., to match the index portfolio to be delivered at the index futures delivery in the case of index arbitrage.

indexed payments: payments adjusted according to the value of some index, e.g., CPI in inflation swaps or TIPS.

industrial properties: commercial real estate properties including manufacturing buildings and property, warehouses, etc.

industry (in economy): a group of companies that are related based on their primary business activities.

industry (in industry classification): a grouping of companies based (among other things) on which economic industry they belong to.

industry classification: a taxonomy of companies (stocks) based on some similarity criterion (or criteria), e.g., a company's main source of revenues, how closely stock returns follow each other historically, etc.

inflation: a sustained increase in the price level of goods and services in an economy over a period of time, which is measured as an annual percentage change known as the inflation rate.

inflation hedge: a hedge against inflation.

inflation index: e.g., CPI.

inflation-indexed product: a security (e.g., TIPS) with indexed payments based on an inflation index.

inflation swap: a swap whose buyer is long the inflation and receives a floating rate (based on an inflation index) and pays a fixed rate (breakeven rate).

informed order flow: see *smart order flow*.

infrastructure funds: unlisted infrastructure funds (private equity-type investments), listed infrastructure funds (exchange-traded).

infrastructure investment: investing in long-term projects such as transportation (roads, bridges, tunnels, railways, ports, airports, etc.), telecommunications (transmission cables, satellites, towers, etc.), utilities (electricity generation, gas or electricity transmission or distribution, water supply, sewage, waste, etc.), en-

ergy (including but not limited to renewable energy), healthcare (hospitals, clinics, senior homes, etc.), educational facilities (schools, universities, research institutes, etc.), etc.

input layer: in an artificial neural network, the layer of nodes (artificial neurons) that processes the input data.

institutional trader: a trader who buys and sells securities for an account of a group or institution such as a pension fund, mutual fund, insurance company, ETF, etc.

integration: the final step of the money laundering process whereby money launderers get back the money via legitimate-looking sources.

intercept: in a linear regression, the regression coefficient of the independent variable (which is also colloquially referred to as the intercept) whose elements are all equal 1.

interest: the amount paid by the borrower to the lender above the principal (the actual amount borrowed).

interest rate: the interest per \$1 of the principal.

interest rate futures: a futures contract typically with an array (delivery basket) of underlying instruments (e.g., bonds) that pay interest.

interest rate risk (a.k.a. interest rate exposure): the exposure to interest rate fluctuations, which affect bond and other fixed-income asset prices.

interest rate spread: the difference between the interest rates paid by two instruments.

interest rate swap: a contract that exchanges a stream of floating rate payments for a stream of fixed rate payments or vice versa.

intra-asset diversification: in real estate investments, diversification by property type (residential, commercial, etc.), economic diversification (by different regions divided according to economic characteristics), geographic diversification, etc.

intraday arbitrage: taking advantage of intraday mispricings, e.g., in ETFs and stocks.

intraday signal: a trading signal used by an intraday strategy.

intraday strategy: a trading strategy that starts with a null position, buys and sells/shorts securities intraday, and ends with a null position by the close (in trader lingo, “goes home flat”).

inverse ETF: an ETF designed to track the return inverse to its underlying index.

inverse matrix: for an $N \times N$ square matrix A , the inverse matrix A^{-1} is the $N \times N$ square matrix such that $A A^{-1} = A^{-1} A = I$, where I is the $N \times N$ identity matrix (whose diagonal elements equal 1, and off-diagonal elements equal 0).

investment: allocating money with an expectation of a positive return.

Investment Grade bonds (a.k.a. IG bonds): bonds with S&P credit ratings AAA through AA- (high credit quality) and A+ through BBB- (medium credit quality).

investment vehicle: an investment product (e.g., ETF) used by investors for generating positive returns.

iron butterfly: a type of option trading strategies.

iron condor: a type of option trading strategies.

iShares (ticker IVV): an S&P 500 tracking EFT.

Jensen’s alpha: an abnormal return of a security or portfolio, usually calculated as the intercept coefficient in a linear model, where excess returns of said security or portfolio are serially regressed over excess returns of one or more factor portfolios (e.g., MKT).

Joule: a unit of work, heat and energy in the International System of Units (SI).

JPY: Japanese Yen, a unit of Japanese currency.

junior mezzanine tranche: the next (by increasing quality) tranche of a CDO after the equity tranche.

k-nearest neighbor algorithm (a.k.a. KNN or k-NN): a statistical classification algorithm based on a similarity criterion such as distance, angle, etc., between multi-dimensional vectors.

Kalman filter: a time-series filter for separating signal from noise.

Kelly strategy: an allocation (betting) strategy based on maximizing the expectation of the logarithm of wealth.

keyword: in sentiment analysis (e.g., Twitter sentiment) using machine learning techniques, a word in the learning vocabulary pertinent to the goal (e.g., predicting stock or cryptocurrency price movements).

ladder (for bonds): a bond portfolio with (roughly) equal capital allocations into bonds of a sizable number of different (and usually approximately equidistant) maturities.

ladder (for options): a vertical spread consisting of 3 options, all 3 are call options or put options, 2 are long and 1 is short, or 1 is long and 2 are short.

Lagrange multiplier: when minimizing a (multivariate) function $g(x)$ w.r.t. x subject to a constraint $h(x) = 0$, an additional variable λ in the function $\tilde{g}(x, \lambda) = g(x) + \lambda h(x)$, whose (unconstrained) minimization w.r.t. x and λ is equivalent to the original constrained minimization problem.

layer: see *input layer*, *output layer*, *hidden layer*.

layering: the middle step in the money laundering process, which amounts to moving the money around between different accounts and even countries thereby creating complexity and separating the money from its source by several degrees.

learning vocabulary: in sentiment analysis (e.g., Twitter sentiment) using machine learning techniques, a set of keywords pertinent to the goal (e.g., predicting stock or cryptocurrency price movements).

least squares: in regression analysis, minimizing the sum of squares of the residuals (possibly, with nonuniform weights).

ledger: a book or other collection of financial accounts and transaction records.

leg: a component in a trading portfolio, usually when a portfolio can be thought of as consisting of a relatively small number of groupings (e.g., short leg and long leg, referring to short and long positions, respectively).

LETF: leveraged (inverse) ETF, an ETF designed to track the return (inverse to) n times the return of its underlying index, where n is the leverage (usually, 2 or 3).

leverage: using borrowed funds to purchase an asset.

limit order: an order to buy or sell a stock (or other security) at a specified price or better.

linear homogeneous constraint: for an N -vector x_i ($i = 1, \dots, N$), a constraint of the form $\sum_{i=1}^N a_i x_i = 0$, where at least some a_i are nonzero.

linear regression (a.k.a. linear model): fitting data for the observable variable using a linear combination of some number of (linear or nonlinear) functions of independent variables, with or without the intercept.

liquid asset: an asset that can be converted into cash quickly with minimal transaction costs.

liquid U.S. stocks: a subset of U.S. listed stocks usually defined using ADDV and market cap filters (e.g., top 2,000 most liquid stocks by ADDV).

liquidation (for assets or portfolios): closing of the open positions.

liquidation (for companies): winding up (bringing to an end) a company's business and distributing its assets to claimants, usually when the company is insolvent.

liquidity: availability of liquid assets/funds.

loadings matrix: see *factor loadings matrix*.

loan: lending of money or another asset by one party (lender) to another (borrower).

loan shark: a lender offering a loan at excessively high interest rates.

loan-to-own strategy: financing a distressed company via secured loans with the view of obtaining equity with control rights if the company files for bankruptcy.

log: a logarithm (usually, unless specified otherwise, the natural logarithm).

log-return: the natural log of the ratio of an asset's price at time t_2 to its price at time t_1 ($t_2 > t_1$).

log-volatility: a standard deviation of the natural logarithms of prices.

logistic regression (a.k.a. logit model): a statistical model typically applied to a binary dependent variable.

long-only: a portfolio or strategy with only long holdings.

long-run mean: in a mean-reverting Ornstein-Uhlenbeck process, the mean value of the state variable in the infinite time limit.

long-short: a portfolio or strategy with both long and short holdings.

lookback (a.k.a. lookback period): the length of a time-series data sample used in a backtest or historical computation.

losers: stocks or other assets in a portfolio or trading universe that underperform based on some criterion (benchmark).

low (a.k.a. low price): the minimum price attained by a stock (or other security) within a given trading day (or some other time interval).

low-volatility anomaly: an empirical occurrence that future returns of previously low-return-volatility portfolios outperform those of previously high-return-volatility portfolios.

Macauley duration: a weighted average maturity of a bond's cash flows, where the weights are the present values of said cash flows.

machine learning (ML): a method of data analysis that automates predictive analytical model building based on the premise that computational systems can “learn” from data, identify patterns and make decisions with minimal human intervention.

macro: macro trading strategies.

Manhattan distance: the distance between two vectors defined as the sum of the absolute values of the differences between their components.

margin account: a brokerage account in which the broker lends the customer cash to purchase securities.

mark-to-market (MTM): valuing assets or portfolios based on the most recent pertinent market prices.

market: a medium that allows buyers and sellers to interact to facilitate an exchange of securities, commodities, goods, services, etc.

market beta: a measure of the volatility (systematic risk) of an asset or portfolio in comparison to the broad market.

market capitalization (a.k.a. market cap, or cap): the market value of a company's shares outstanding.

market crash: a sudden dramatic decline of asset prices across their significant cross-section.

market data: price and trade-related data for a financial security reported by a trading exchange (or similar).

market-making: providing liquidity by simultaneously quoting both buy and sell prices in a financial instrument or commodity held in inventory with the view of making a profit on the bid-ask spread.

married call: see *protective call*.

married put: see *protective put*.

maturity (a.k.a. maturity date, or maturity time): the time at which a financial instrument will cease to exist and any principal and/or interest are repaid in full.

mean: an average value.

mean-reversion effect (a.k.a. mean-reversion, or contrarian effect): a tendency of asset prices and/or their returns to revert to their mean values, which mean values can be serial and/or cross-sectional, depending on the context.

mean-reversion parameter: in a mean-reverting Ornstein-Uhlenbeck process, the parameter that controls the rate of mean-reversion.

mean-reversion strategy: a trading strategy based on a mean-reversion effect.

mean-variance optimization: an optimization technique for constructing a portfolio of assets such that its expected return is maximized for a given level of its risk.

Megawatt: 1,000,000 watts.

Megawatt hour (Mwh): 1,000,000 watts times 1 hour, which equals 3.6×10^9 Joules.

merger: a consolidation of two companies into one.

merger arbitrage (a.k.a. risk arbitrage): a trading strategy that attempts to capture excess returns generated via corporate actions such as mergers and acquisitions (M&A).

metropolitan statistical area (MSA): a core area containing a substantial population nucleus, together with adjacent communities having a high degree of economic and social integration with that core.

mini-S&P futures (a.k.a. e-mini): a futures contract on S&P 500 with the notional value of 50 times the value of the S&P 500 stock index.

mishedge: an imperfect hedge, or when a hedge becomes undone (e.g., by underlying price movements).

mispricing: an inefficiency in the pricing of a security, when its price does not match its intrinsic value or (perceived) fair value.

MKT: see *Fama-French factors*.

modified duration: a measure of the relative bond price sensitivity to changes in the interest rates, defined as the negative first derivative of the bond price w.r.t. the bond yield.

MOM: see *Carhart's momentum factor*.

momentum (a.k.a. momentum effect): an empirical occurrence whereby assets' future returns are positively correlated with their past returns.

momentum strategy: a trading strategy based on momentum.

monetary policy: usually by a central bank, a process by which the monetary authority of a country controls the size and rate of growth of the money supply, via modifying the interest rates, buying or selling government bonds, and changing the required bank reserves (the amount of money banks are required to keep in their vaults).

money laundering: an activity wherein cash is used as a vehicle to trans-

form illegal profits into legitimate-appearing assets.

moneyness: where a derivative contract's strike price is in relation to its underlying asset's current price, which determines the derivative's intrinsic value.

mortgage: a debt instrument, secured by a real estate property as a collateral, that the borrower is obligated to pay back with a predetermined set of payments.

mortgage-backed security (MBS): an asset backed by a pool of mortgages.

moving average (a.k.a. rolling average): in a time series, an average (possibly computed with nontrivial weights) over a time interval of fixed length (moving average length), where the most recent time in said interval can take various values in the time series.

moving standard deviation: in a time series, a standard deviation (possibly computed with nontrivial weights) over a time interval of fixed length, where the most recent time in said interval can take various values in the time series.

multi-currency arbitrage: arbitraging 4 or more FX pairs.

multifactor risk model: a risk model based on a number (which can be sizable) of risk factors.

multifactor strategy: a trading strategy based on combining exposures to multiple factors, e.g., momentum, value, etc. (multifactor portfolio).

multinomial probability distribution: a discrete probability distribution of a random variable which takes k different values with probabilities p_1, \dots, p_k .

municipal bond (a.k.a. muni bond): a bond issued by a local government/territory or its agency.

municipal bond tax arbitrage: a trading strategy based on borrowing money and buying tax-exempt municipal bonds.

mutual fund: an investment vehicle funded by a pool of money collected from many investors for the purpose of buying various securities (stocks, bonds, money market instruments, etc.).

naked call: a stand-alone short call option.

naked put: a stand-alone put call option.

near-month contract: see *near-month futures*.

near-month futures: see *front-month futures*.

neutral curve butterfly: a bond butterfly strategy with curve-neutrality.

neutral outlook: when a trader expects the market or a security to trade around its current level.

no-risk-free-arbitrage condition: a condition that ensures that no risk-free profits can be made by a trading strategy (at least, in excess to the risk-free rate).

node: in an artificial neural network, an artificial neuron, which (using an activation function) processes a set of inputs and generates an output.

noise: in a financial time series, random fluctuations without any apparent trend.

non-announcement days: days without any important economic announcements such as FOMC announcements (cf. *announcement days*).

non-deliverable bond: a bond not in the delivery basket of an interest rate futures contract.

non-directional strategy (a.k.a. neutral strategy): a strategy not based on the underlying security's (or securities') future direction, so the trader is oblivious to whether its price goes up or down (cf. *directional strategy*).

non-discretionary strategy: a trading strategy based on a systematic approach (as opposed to discretionary).

non-systematic risk: specific (a.k.a. idiosyncratic) risk, which is specific to each company, asset, etc., and exposure to which can be reduced via diversification, albeit never completely eliminated (cf. *systematic risk*).

nonlinear least squares: least squares used to fit a set of observations with a model that is nonlinear in the unknown parameters (regression coefficients).

notional (a.k.a. notional value): the total (dollar) value of a position.

objective function: a function to be maximized or minimized in optimization.

open (a.k.a. open price, or opening price): the opening price of a stock at the NYSE open (9:30 AM Eastern Time).

open interest (a.k.a. open contracts, or open commitments): the total number of open futures (or options) contracts at any given time (i.e., those contracts that have not been settled).

optimal hedge ratio: a hedge ratio calculated by minimizing the variance of a hedged portfolio.

optimization: see *portfolio optimization*.

option: a financial derivative contract that gives the buyer (option holder) the right (but not the obligation) to buy (call option) or sell (put option) the underlying asset at an agreed-upon price during a predefined period of time or on a specific date.

option-adjusted spread (OAS): a parallel shift in the Treasury curve (or some other benchmark yield curve) that matches a security's price calculated based on a pricing model to its market value, with the view to account for the security's embedded options.

option premium: the cost charged by the option seller to the option buyer.

option writer: an option seller.

order: an investor's instructions to a broker or brokerage firm to purchase or sell a security.

order execution system: a software component that executes trades based on input buy and/or sell order sequences.

Ornstein-Uhlenbeck process: Brownian motion with mean-reversion.

orthogonality: vectors x_i and y_i ($i = 1, \dots, N$) are orthogonal if $\sum_{i=1}^N x_i y_i = 0$.

out-of-sample backtest: a backtest in which all quantities used for establishing or liquidating simulated positions corresponding to any given time t are computed using historical quantities from times prior to t .

out-of-sample computation: a computation where all quantities to be used for forecasting purposes at any given simulated time t are computed using historical quantities from times prior to t .

out-of-the-money (OTM) option: a call (put) option whose exercise price is above (below) the current price of the underlying asset.

outcome (a.k.a. class): in machine learning, one of the possible results (outputs, predictions) of a machine learning algorithm.

output gap: the difference between the actual output of an economy and its maximum potential output as a percentage of GDP.

output layer: in an artificial neural network, the layer of nodes (artificial neurons) that generates the output data (the result).

over-fitting: in a statistical model, fitting more free parameters than justified by the data, thereby (often unwittingly) essentially fitting noise and rendering the model unproductive out-of-sample.

overnight return: broadly, a return from some time during the previous trading day to some time during the current day (e.g., close-to-open return, close-to-close return); usually, close-to-open return.

overreaction: in financial markets, an irrational response by market participants (based on greed or fear) to new information.

pairs trading: a mean-reversion strategy involving two historically correlated assets.

parallel shift: in a yield curve, all interest rates for all maturities changing by the same amount.

passive investing: a longer-horizon, essentially buy-and-hold, investment strategy with the view of minimizing transaction costs and replicating the performance of a (typically, well-diversified) benchmark portfolio.

passive limit order: a liquidity-providing limit order to buy at the bid (or lower) or sell at the ask (or higher).

passive trading strategy: a trading strategy based on the passive investing approach.

passthrough MBS: an MBS where cash flows are passed from debtors to investors through an intermediary.

pawnbroker: a lender that extends a secured cash loan with pre-agreed interest and period (which can sometimes be extended), where the loan is secured with a collateral (forfeited if the borrower defaults), which is some valuable item(s), such as jewelry, electronics, vehicles, rare books or musical instruments, etc.

payment period: the period between two consecutive bond coupon payments.

payoff: the amount the option seller pays to the option buyer if and when the option is exercised.

peer-to-peer (P2P) network: a distributed computing application architecture with workload partitioned between equally privileged peers.

pension fund: a pool of funds that provides retirement income.

performance characteristics: for a portfolio or strategy, characteristics such as return-on-capital, Sharpe ratio, cents-per-share, maximum drawdown, etc.

periodic compounding: compounding with equal compounding periods, e.g., quarterly, semiannual or annual compounding.

physical commodity: the actual commodity (e.g., copper) that is delivered to a commodity futures contract buyer at the expiration.

pivot point (a.k.a. center): in support and resistance strategies, a definition-dependent quantity, e.g., defined as the equally weighted average of the previous trading day's high, low and close prices.

placed order: an order that has been submitted to an exchange and placed in a queue for execution.

placement: the initial stage in the money laundering process, whereby illegal funds are introduced into the legal economy via fraudulent means.

Porter stemming algorithm: an algorithm for reducing words to their base form (stemming).

portfolio: a collection of assets held by an institution or individual investor.

portfolio diversification: see *diversification*.

portfolio optimization: selecting the best portfolio based on some criterion (e.g., maximizing the Sharpe ratio).

portfolio weights: the relative percentages of the dollar holdings in a portfolio to its total notional value (defined as the total notional value of the long positions plus the total absolute notional value of the short positions).

position: the amount of stock or other security held, expressed in dollars, shares, or some other units, with short positions possibly having negative values depending on a convention used.

position bounds: upper or lower bounds on the dollar holdings of various assets in a portfolio.

predicted class: in machine learning, the outcome predicted by an algorithm.

predictor (a.k.a. predictor variable): in machine learning, an input variable.

premium (for insurance-type products): a periodic payment for insurance coverage, e.g., in a CDS, CDO, etc.

premium (for options): the cost of buying an option.

premium leg: the leg of a CDO corresponding to the CDO premiums, the other leg being the default leg.

prepayment: settling a debt or installment payment before its due date (e.g., mortgage prepayment).

prepayment risk: the main risk to investors in a passthrough MBS whereby homeowners have an option to prepay their mortgages (e.g., by refinancing their mortgages as the interest rates drop).

price-momentum strategy: a momentum strategy where the momentum indicator is based on past returns.

pricing data: historical and real-time data containing prices, trading volumes and related quantities (see *market data*).

pricing model: a model for valuing (pricing) a security or a set of securities.

principal: the amount the debt issuer (borrower) owes the lender at debt maturity.

principal component: for a symmetric square matrix, an eigenvector thereof normalized such that the sum of squares of its components equals 1, with different principal components ordered in the descending order by the corresponding eigenvalues.

principal component analysis (PCA): a mathematical procedure that transforms some number of (typically, correlated) variables into a (typically, smaller) number of uncorrelated variables (principal components), with the first principal component accounting for as much of the variability in the data as possible, and each succeeding principal component accounting for as much of the remaining variability as possible.

probability distribution: a function that provides the probabilities of occurrence of different possible outcomes.

probability measure: a real function valued in the interval between 0 and 1 (0 corresponding to the empty set and 1 corresponding to the entire space) defined on a set of events in a probability space that satisfies the countable additivity property, i.e., simply put, that the probability of a union of disjoint events A and B equals the sum of their probabilities.

protection buyer: a buyer of insurance.

protection seller: a seller of insurance.

protective call (a.k.a. married call, or synthetic put): hedging a short stock position with a long call option position.

protective put (a.k.a. married put, or synthetic call): hedging a long stock position with a long put option position.

publicly traded company (a.k.a. public company): a company whose shares are freely traded on a stock exchange or in over-the-counter markets.

put-call parity: the relationship whereby the payoff of a European call option (with a strike price K and expiration T) minus the payoff of a European put option (on the same underlying and with the same strike and expiration) equals the payoff of a forward contract (on said underlying) with the strike K and expiry T .

put option (a.k.a. put): see *European put option, option*.

quantile: each of the n (approximately) equal parts of a sample (e.g., data sample), where $n > 1$.

quantitative trading: systematic trading strategies based on quantitative analysis and mathematical computations with little to no human intervention outside of developing a strategy (which includes coding it up in a suitable computer language).

quark spread: the analog of the spark spread and the dark spread for nuclear power plants.

quintile: each of the 5 (approximately) equal parts of a sample (e.g., data sample).

R: R Package for Statistical Computing.

R-squared: in a regression, 1 minus a ratio, whose numerator is the sum of squares of the residuals, and whose denominator is the sum of squares of the deviations of the values of the observable variable from their mean value across the data sample.

rally: in financial markets, a period of sustained gains.

rank (for matrices): the maximum number of linearly independent columns of a matrix.

rank (a.k.a. ranking): the position of an element of a set after sorting it according to some criterion (with a prescription for resolving possible ties).

rate: see *interest rate*, *inflation*.

rating: see *credit rating*.

ratio spread: a type of options strategies.

real estate: tangible immovable assets including land, structures built on it, etc.

real estate investment trust (REIT): a company (often traded on major exchanges and thus allowing investors to take a liquid stake in real estate) that owns, operates or finances income-producing real estate.

real interest rate: interest rate adjusted for inflation.

realized P&L: the P&L on a completed trade, i.e., the P&L resulting from establishing a position and then completely liquidating it.

realized profit: see *realized P&L*.

realized return: historical return.

realized volatility: historical volatility.

rebalancing: changing the holding weights in a portfolio.

recovery rate: the percentage of the principal and accrued interest on defaulted debt that can be recovered.

rectified linear unit (ReLU): the function of x given by $\max(x, 0)$.

reference entities: in a CDS, bonds, loans, names of companies or countries, etc., on which default protection is provided.

regression: see *linear regression*.

regression coefficient: the slope of an independent variable in a linear regression.

regression residuals: the differences between the observed values and the fitted (model predicted) values of the dependent variable in a linear regression.

regression-weighted butterfly: a type of bond butterfly portfolio.

regression weights: the positive weights w_i (which need not equal 1) in the sum of squares $\sum_{i=1}^N w_i \epsilon_i^2$, whose minimization determines the regression coefficients and regression residuals ϵ_i .

reinvestment risk: the risk that the proceeds (from the coupon payments and/or principal of a bond or similar instrument) would be reinvested at a lower rate than the original investment.

relative momentum: cross-sectional momentum.

relative strength index (RSI): during a specified timeframe, the average gain of the up periods divided by the sum of the average gain of the up periods and the absolute value of the average loss of the down periods.

relative value strategy: a strategy that aims to exploit differences in the prices, returns or rates (e.g., interest rates) of related (by some criterion) securities (e.g., historically correlated stock pairs in pairs trading).

reorganization: a Court-supervised process of restructuring a company's finances in bankruptcy.

reorganization plan: a plan for reorganization of a company in bankruptcy that can be submitted (e.g., by a creditor with the view of obtaining participation in the management of the company) to Court for approval.

replication: a strategy whereby a dynamic portfolio of assets precisely replicates cash flows of another asset or portfolio.

repurchase agreement (a.k.a. REPO or repo): a cash-equivalent asset that provides immediate liquidity at a preset interest rate for a specific period of time in exchange for another asset used as a collateral.

resistance: in technical analysis, the (perceived) price level at which a rising stock price is expected to bounce back down.

retail trader: a non-professional individual trader.

reverse repurchase agreement: a REPO from the standpoint of the lender.

rich stock: a stock that is perceived to be overvalued by some criterion.

risk: the possibility that the realized return will differ from the expected return.

risk-adjusted return: return divided by volatility.

risk arbitrage: see *merger arbitrage*.

risk factor: see *factor*.

risk-free arbitrage: making profit without any risk.

risk-free asset (a.k.a. riskless asset): an asset with a certain future return, e.g., Treasury bills.

risk-free discount factor: a discount factor that uses a risk-free rate for discounting future cash flows.

risk-free probability measure (a.k.a. risk-neutral measure): a theoretical probability measure under which an asset's current price equals its future

expected value discounted by a risk-free rate.

risk-free rate: the rate of return of a risk-free asset, often taken to be the one-month Treasury bill rate.

risk management: identifying, analyzing and mitigating potential risks.

risk model: a mathematical model for estimating risk (e.g., modeling a covariance matrix).

risk premia (same as risk premiums): plural of *risk premium*.

risk premium: the (expected) return in excess of the risk-free rate from an investment.

risk reversal (a.k.a. combo): a type of options strategies.

risk sentiment: investor risk tolerance in response to global economic patterns, whereby when risk is perceived as low (high), investors tend to engage in higher-risk (lower-risk) investments (a.k.a. “risk-on risk-off”).

risky duration: a weighted sum (over the payment dates) of the (discounted) differences between the notional (of a CDO tranche or similar) and expected loss for each such date, where each weight is the time from the previous payment date.

roll: in futures contracts, rebalancing futures positions, whereby when the current long (short) futures contract is about to expire, it is sold (covered) and another futures contract with longer expiration is bought (sold).

roll loss (a.k.a. contango loss): in ETNs such as VXX and VXZ consisting of VIX futures portfolios, a decay in their values (when the VIX futures curve is in contango) due to their daily rebalancing required to maintain a constant maturity.

roll value: see *daily roll value*.

roll yield: in commodity futures, positive returns from the roll generated by long (short) positions when the term structure is in backwardation (contango).

rolling down the yield curve (a.k.a. rolling down the curve): a trading strategy that amounts to buying long- or medium-term bonds from the steepest segment of the yield curve (assuming it is upward-sloping) and selling them as they approach maturity.

root mean square error (RMSE): the square root of the mean value of the squares of the differences between the predicted and observed values of a variable.

rotation: see *alpha rotation*, *sector momentum rotation*.

rung: in a bond ladder portfolio, the bonds of the same maturity.

Russell 3000: a market cap weighted index of the 3,000 largest U.S.-traded stocks by market cap.

S&P 500: a market cap weighted index of the 500 largest U.S. publicly traded companies by market cap.

sample correlation matrix: a correlation matrix for a set of securities computed based on the time series of their historical returns.

sample covariance matrix: a covariance matrix for a set of securities computed based on the time series of their historical returns.

sample variance: a variance computed based on the time series of a security's historical returns.

scale invariance: a function $f(x_i)$ of N variables x_i ($i = 1, \dots, N$) is scale invariant if $f(\zeta x_i) = f(x_i)$ for an arbitrary scale factor ζ taking values in a continuous interval (e.g., positive real values).

seagull spread: a type of options strategies.

second-month futures: a futures contract with the nearest expiration after the front-month futures.

sector (in economy): an area of the economy in which businesses share similar products or services.

sector (in industry classification): usually, the least granular level in a multilevel industry classification (e.g., sectors are split into industries, industries are split into sub-industries).

sector momentum rotation: a type of momentum strategy for ETFs.

secured loan: a loan secured with a collateral.

security: in finance, usually a fungible, negotiable financial instrument with

monetary value.

selectivity: a quantitative measure of active management of mutual funds (as well as actively-managed ETFs).

sell-write strategy: shorting stock and writing (selling) a put option against the stock position.

senior mezzanine tranche: the next (by increasing quality) tranche of a CDO after the junior mezzanine tranche.

senior tranche: the next (by increasing quality) tranche of a CDO after the senior mezzanine tranche.

sentiment analysis (a.k.a. opinion mining): the use of natural language processing and other computational techniques to extract information from (electronic) documents (e.g., tweets) pertinent to a security, e.g., for forecasting the direction of its price movements.

sentiment data: the textual data used in sentiment analysis (e.g., the contents of tweets).

Separate Trading of Registered Interest and Principal of Securities (a.k.a. STRIPS): zero-coupon Treasury securities.

serial correlation: a pair-wise correlation between two securities computed based on their time series of historical returns.

serial quantity: a quantity (e.g., mean, standard deviation, etc.) computed serially (i.e., across the time series for each security) as opposed to cross-sectionally (i.e., across a set of securities).

serial regression: a regression where the independent variables are time series (cf. *cross-sectional regression*).

settlement: the fulfillment of the obligations under a futures or forward contract at expiration.

share: a unit of ownership interest in a corporation or financial asset.

shareholder (a.k.a. stockholder): an owner of shares in a company.

shares outstanding: the total number of a company's shares held by all its

shareholders.

Sharpe ratio: (excess) return divided by volatility.

short position (a.k.a. short): selling an asset without owning it by borrowing it from someone else, typically, a brokerage firm.

short-sale (a.k.a. short-selling, or shorting): establishing a short position.

sideways market: when prices remain in a tight range, without clear up or down trends.

sideways strategy: a trading strategy that aims to capitalize on an expected low volatility environment, e.g., by selling volatility.

sigmoid: the function of x given by $1/(1 + \exp(-x))$.

signal: a trading signal, e.g., to buy (buy signal) or sell (sell signal) a security.

simple moving average (SMA): a moving average without suppressing past contributions (cf. *exponential moving average*).

simple moving standard deviation: a moving standard deviation without suppressing past contributions (cf. *exponential moving standard deviation*).

single-name CDS: a CDS on a single reference entity.

single-stock option: an option on a single underlying stock (as opposed to, e.g., an option on a portfolio of stocks such as an index).

single-stock strategy: a trading strategy that derives a trading signal for any given stock using data for only that stock and no other stocks.

skewness: a measure of asymmetry in a probability distribution, defined as the mean value of the cubic power of the deviation from the mean divided by the cubic power of the standard deviation.

skewness premium: in commodity futures, an empirical occurrence whereby future expected returns tend to be negatively correlated with the skewness of historical returns.

skip period: in price-momentum and similar strategies, the period (usually, the last 1 month) skipped before the formation period (usually the last 12 months prior to the skip period).

slippage: the difference between the price at which an (initial) order is placed (or expected/hoped to be executed) and at which it is filled (including after cancel-replacing the initial order when chasing the bid or ask with buy or sell limit orders, respectively), sometimes averaged over multiple orders (e.g., when a large order is broken up into smaller ones).

smart order flow (a.k.a. toxic order flow): order flow based on some predictive expected return.

SMB (a.k.a. Small minus Big): see *Fama-French factors*.

social media sentiment: the sentiment on stocks or other securities extracted from social media posts or messages (e.g., on Twitter).

softmax: the function $\exp(x_i) / \sum_{j=1}^N \exp(x_j)$ of an N -vector x_i ($i = 1, \dots, N$).

sorting: organizing a set in an ascending or descending order based on some quantity (with a prescription for resolving possible ties).

source code (a.k.a. code): computer code written in some computer programming language.

sovereign risk: the risk that a government could default on its debt (sovereign debt, e.g., government-issued bonds) or other obligations, or that changes in a central bank's policy may adversely affect FX contracts.

spark spread: the difference between the wholesale price of electricity and the price of natural gas required to produce it.

SPDR Trust (ticker SPY): an S&P 500 tracking EFT.

specialist system: a (largely) human-controlled and operated market-making system at NYSE prior to switching to (mostly) electronic trading.

specific risk (a.k.a. idiosyncratic risk): see *non-systematic risk*.

speculative asset: an asset with little to no intrinsic value.

speculative bubble: see *bubble*.

speculator: a market participant attempting to profit from a security's price movement (cf. *hedger*).

spike: a relatively large upward or downward movement of a security's price in a short period of time.

split (a.k.a. stock split): a corporate action in which a company divides its existing shares into multiple shares (forward stock split) or combines multiple shares into one (reverse stock split).

spot (a.k.a. spot price, or spot value): the current price of an asset.

spot FX rate (a.k.a. FX spot rate, or spot rate): the current FX rate.

spread: the difference between two quantities, or a portfolio consisting of two (or more) legs comprised of the same type of assets different only by one or more specific quantities (e.g., strike price, or strike price and expiration).

standard deviation: the square root of the variance.

standardized unexpected earnings (SUE): a ratio, whose numerator (unexpected earnings) is the difference between the most recently announced quarterly earnings per share and those announced 4 quarters ago, and whose denominator is the standard deviation of the unexpected earnings over the last 8 quarters.

state variable: one of a set of variables (which may or may not be observable) used to describe a dynamical system.

statistical arbitrage (a.k.a. Stat Arb, or StatArb): typically, shorter-horizon trading strategies with sizable trading universes (e.g., a few thousand stocks) based on complex cross-sectional (and serial) statistical mean-reversion signals.

statistical industry classification: a multilevel clustering of companies based on purely statistical techniques, e.g., distance-based clustering of the companies' returns (cf. *fundamental industry classification*).

statistical risk model: a risk model built using only the pricing data (e.g., using principal components of the sample correlation matrix of stock returns), without any reference to fundamental data (including any fundamental industry classification).

steepener: a yield curve spread bond strategy.

stemming: reducing a word to its base form, the part of a word that is common to all its inflected variants.

stemming algorithm: see *Porter stemming algorithm*.

stochastic dynamics: see *stochastic process*.

stochastic gradient descent (SGD): an iterative method for optimizing a differentiable objective function.

stochastic process: a collection of random variables that change with time.

stock: a security representing fractional ownership in a corporation.

stock merger: a merger where each share of the target company is swapped for some number (which can be fractional) of the acquirer company's shares.

stop-loss price: the price of an asset at which a position in said asset is (automatically) liquidated.

stop-word: the most commonly used words in a language (e.g., “the”, “is”, “in”, “which”, etc.) that add no value in a particular context and are ignored by a natural language processing tool.

straddle: an option trading strategy.

strangle: an option trading strategy.

strap: an option trading strategy.

strategy: see *trading strategy*.

strike price (a.k.a. strike): the price at which a derivative contract can be exercised.

strip: an option trading strategy.

structured asset: a complexly structured (debt) instrument such as a CDO or ABS.

style risk factor (a.k.a. style factor): risk factors such as value, growth, size, momentum, liquidity and volatility.

sub-industry (in industry classification): usually, a subgroup of companies within the same industry grouped together based on a more granular criterion.

super senior tranche: the highest quality tranche of a CDO.

support: in technical analysis, the (perceived) price level at which a falling stock price is expected to bounce back up.

support and resistance strategy: a technical analysis strategy based on support and resistance.

support vector machine (SVM): in machine learning, a type of supervised learning models.

swap (a.k.a. swap agreement, or swap contract): a derivative contract through which two parties exchange financial instruments.

swap spread: the difference between the fixed rate of an interest rate swap and the yield on a Treasury security with a similar maturity.

swap-spread arbitrage: a dollar-neutral strategy consisting of a long (short) position in an interest rate swap and a short (long) position in a Treasury bond with the same maturity as the swap.

synthetic security (a.k.a. synthetic): a financial instrument created (via a portfolio of assets) to replicate (or approximately reproduce) the same cash flows as another security (e.g., synthetic put, call, straddle, forward, futures, etc.).

systematic approach: methodical, rules-based trading strategies with well-defined trade goals and risk controls (as opposed to, e.g., analysts' subjective opinions).

systematic macro: non-discretionary, systematic macro trading strategies.

systematic risk: non-diversifiable risk inherent to the entire market or its segment, such as exposure to broad market movements, which cannot be diversified away in long-only portfolios, but can nonetheless be substantially reduced or even essentially eliminated in long-short (e.g., dollar-neutral) portfolios.

tactical asset allocation: a dynamic investment strategy that actively adjusts a portfolio's asset allocation weights.

tanh: hyperbolic tangent.

target company: the company chosen by the acquirer company for a potential corporate merger or acquisition.

target variable: in machine learning, the variable whose values are to be modeled and predicted.

tax arbitrage: profiting from differences in how income, capital gains, transactions, etc., are taxed.

tax credit: see *dividend imputation*.

tax-exempt municipal bonds: e.g., municipal bonds that are not subject to Federal income taxes (on the interest earned) in the U.S.

tax shield: the reduction in income taxes that results from taking an allowable deduction from taxable income.

technical analysis: a methodology for forecasting the direction of prices using historical market data, primarily price and volume (cf. *fundamental analysis*).

technical indicator: a mathematical quantity used in technical analysis.

tercile: each of the 3 (approximately) equal parts of a sample (e.g., data sample).

term spread: an interest rate spread corresponding to two different maturities.

term structure (in futures): the dependence of futures prices on time to maturity.

term structure (in interest rates): see *yield curve*.

Theta: the first derivative of the value of a derivative asset (e.g., option) w.r.t. time.

Theta-decay: the time decay of an option's (or other asset's) value as time nears the expiration.

ticker (a.k.a. ticker symbol): a short character string representing a particular publicly traded security.

time series: a series of data points indexed in time order, i.e., labeled by time values.

time-to-maturity (TTM): time left before an option expires.

TIPS-Treasury arbitrage: a trading strategy consisting of selling a T-bond and offsetting the short position by a lower-cost replicating portfolio consisting of TIPS, inflation swaps and STRIPS.

Treasury Inflation-Protected Securities (TIPS): Treasury securities that pay semiannual fixed coupons at a fixed rate, but the coupon payments (and principal) are adjusted based on inflation.

tracking error: the square root of the variance of the differences between the returns of a portfolio and those of the benchmark or index said portfolio is meant to mimic or beat.

tracking ETF: an ETF that tracks an index.

trader: a person who buys and sells goods, currency, stocks, commodities, etc.

trading bounds: upper or lower bounds on the dollar amounts of allowed trades for various assets in a portfolio, when establishing, rebalancing or liquidating.

trading on economic announcements: a trading strategy that buys stocks on important announcement days, such as FOMC announcements, while holding risk-free assets on other days.

trading costs (a.k.a. transaction costs): costs associated with trading securities, including (as applicable) exchange fees, brokerage fees, SEC fees, slippage, etc.

trading days: usually, the days on which NYSE is open.

trading rule: a set of buy and sell instructions, with the quantities of the assets to be bought or sold.

trading signal: see *signal*.

trading strategy: a set of instructions to achieve certain asset holdings by some predefined times t_1, t_2, \dots , which holdings can (but need not) be null at one or more of these times.

trading universe (a.k.a. universe): the tickers of stocks (or other securi-

ties) in a trading portfolio.

traditional assets: stocks, bonds, cash, real estate and, in some cases, also currencies and commodities.

training: in machine learning, fixing free parameters in an algorithm using training data.

training data (a.k.a. training dataset): in machine learning, a set of input-output pairs known in advance, which are used to train a machine learning algorithm.

training period: in machine learning, the period spanned by the training data when it is a time series.

tranche: see *CDO tranche*.

Treasuries: Treasury securities.

Treasury: the U.S. Department of Treasury.

Treasury bill (a.k.a. T-bill): a short-term debt obligation issued by the U.S. Treasury with maturity under 1 year.

Treasury bond (a.k.a. T-bond): a bond issued by the U.S. Treasury with maturity of more than 10 years.

Treasury curve: the yield curve of Treasury securities.

Treasury ETF: a tracking ETF for an index composed of U.S. government debt obligations.

Treasury note (a.k.a. T-note): a debt security issued by the U.S. Treasury with maturity between 1 and 10 years.

tree boosting: a machine learning technique.

trend: the general direction of a market or asset's price, essentially, momentum.

trend following: a trading strategy that aims to capture gains from an asset's momentum in a particular direction.

triangular arbitrage: see *FX triangular arbitrage*.

Twitter sentiment: the sentiment on stocks or other securities extracted from tweets.

U.S. regions: East, Mid-West, South and West.

unadjusted quantity: price or volume unadjusted for splits or dividends.

uncompounded rate: an interest rate applied to the principal during some period without any compounding.

underlying: underlying instrument (e.g., stock in a single-stock option).

underreaction: in financial markets, an insufficient response to news, as some market participants tend to be conservative and rely too much on their prior beliefs.

unexpected earnings: see *standardized unexpected earnings*.

value: a factor based on the book-to-price (B/P) ratio.

value strategy: buying high value (high B/P ratio) stocks and selling low value (low B/P ratio) stocks.

variable coupon bond: see *floating coupon bond*.

variable rate: see *floating interest rate*.

variance: a mean value of the squares of the deviations of the values of a quantity from their mean value.

variance swap: a derivative contract whose payoff at maturity is a product of a preset coefficient (variance notional) times the difference between the realized variance at maturity of the underlying and the preset variance strike.

Vega: the first derivative of the value of a derivative asset (e.g., option) w.r.t. the implied volatility of the underlying asset.

vertical spread: an option strategy that involves all identical put or all identical call options with the exception of their strike prices.

volatility: a statistical measure of the dispersion of returns for a security or market index, which is expressed via the standard deviation or variance of said returns.

VIX: CBOE Volatility Index, a.k.a. the “uncertainty index” or the “fear gauge index”.

volatility carry strategy: a trading strategy consisting of shorting VXX and offsetting the short position with long VXZ (see *volatility ETN*), generally with a non-unit hedge ratio.

volatility ETN: an ETN that tracks VIX, e.g., VXX or VXZ.

volatility index: an index (e.g., VIX) that measures the market’s expectation of future (30-day for VIX) volatility based on implied volatilities of the underlying instruments (the S&P 500 stocks for VIX).

volatility risk premium: an empirical occurrence that implied volatility tends to be higher than realized volatility most of the time.

volatility skew: an empirical occurrence whereby, with all else being equal, the implied volatility for put options is higher than for call options.

volatility strategy: a trading strategy that aims to capitalize on an expected high volatility environment, e.g., by buying volatility.

volatility targeting strategy: a trading strategy that aims to maintain a constant volatility level (volatility target, or target volatility) by rebalancing between a risky asset and a risk-free asset.

volume: the number of shares or contracts traded in a security during some period.

watt: a unit of power in the International System of Units (SI).

weather derivative: a derivative (e.g., option or futures) on a synthetic weather index.

weather index: a synthetic index usually based on temperature, using, e.g., cooling-degree-days (CDD) and heating-degree-days (HDD).

weather risk: a risk stemming from businesses and sectors of the economy being affected by weather conditions.

weighted average: for N values x_i ($i = 1, \dots, N$), the weighted mean given by $\frac{1}{N} \sum_{i=1}^N w_i x_i$, where w_i are the weights.

weighted regression: a linear regression with nonuniform regression weights.

weighting scheme: assigning portfolio weights according to some rule, e.g., by suppressing contributions of volatile stocks.

weights (in ANN): in an artificial neural network, the coefficients of the inputs in the argument of an activation function.

weights (in portfolios): see *portfolio weights*.

Whittaker-Henderson method: see *Hodrick-Prescott filter*.

wing: one of the 2 peripheral (by maturity in bond portfolios, and by strike price in option portfolios) legs of a butterfly portfolio.

winners: stocks or other assets in a portfolio or trading universe that outperform based on some criterion (benchmark).

word (a.k.a. keyword): a keyword in a learning vocabulary.

year-on-year (YoY) inflation: annual inflation (cf. *cumulative inflation*).

year-on-year inflation swap: an inflation swap that references annual inflation (cf. *zero-coupon swap*).

yield: see *bond yield*.

yield curve (a.k.a. term structure): the dependence of interest rates or bond yields on maturities.

yield curve spread: the spread between shorter and longer maturity bonds on the yield curve.

yield curve spread strategy: a bond strategy that makes a bet on the yield curve spread (flattener or steepener).

zero-cost strategy: a dollar-neutral strategy.

zero-coupon bond: see *discount bond*.

zero-coupon inflation swap: an inflation swap that has only one cash flow at maturity and references the cumulative inflation over the life of the swap (cf. *year-on-year inflation swap*).

Acronyms

| | |
|--------------|--|
| ABS: | asset-backed security. |
| ADDV: | average daily dollar volume. |
| ANN: | artificial neural network. |
| ATM: | at-the-money. |
| B/P: | book-to-price. |
| BA: | banker's acceptance. |
| BICS: | Bloomberg Industry Classification System. |
| bps: | basis point. |
| BTC: | Bitcoin. |
| Btu: | British thermal unit. |
| CA: | commodity allocation percentage. |
| CBOE: | Chicago Board Options Exchange. |
| CD: | certificate of deposit. |
| CDD: | cooling-degree-days. |
| CDO: | collateralized debt obligation. |
| CDS: | credit default swap. |
| CFTC: | U.S. Commodity Futures Trading Commission. |
| CI: | core inflation. |
| CIRP: | Covered Interest Rate Parity. |
| CME: | Chicago Mercantile Exchange. |
| COT: | Commitments of Traders. |

- CPI:** Consumer Price Index.
- CPS:** cents-per-share.
- CTA:** commodity trading advisor.
- DJIA:** Dow Jones Industrial Average.
- EMA:** exponential moving average.
- EMSD:** exponential moving standard deviation.
- ETF:** exchange-traded fund.
- ETH:** Ethereum.
- ETN:** exchange-traded note.
- EUR:** euro.
- FOMC:** Federal Open Market Committee.
- FX:** foreign exchange.
- GDP:** Gross Domestic Product.
- GICS:** Global Industry Classification Standard.
- HDD:** heating-degree-days.
- HFT:** high frequency trading.
- HI:** headline inflation.
- HMD:** healthy-minus-distressed.
- HML:** High minus Low.
- HP:** hedging pressure; Hodrick-Prescott.
- IBS:** internal bar strength.

ITM: in-the-money.

JPY: Japanese Yen.

LETF: leveraged (inverse) ETF.

LIBOR: London Interbank Offer Rate.

M&A: mergers and acquisitions.

MA: moving average.

ML: machine learning.

MBS: mortgage-backed security.

MBtu: 1,000 Btu.

MKT: market (excess) return.

MMBtu: 1,000,000 Btu.

MOM: Carhart's momentum factor.

MSA: metropolitan statistical area.

MTM: mark-to-market.

Mwh: Megawatt hour.

NYSE: New York Stock Exchange.

OAS: option adjusted spread.

OTM: out-of-the-money.

P&L: profit(s) and loss(es).

P2P: peer-to-peer.

PCA: principal component analysis.

REIT: real estate investment trust.

ReLU: rectified linear unit.

REPO/repo: repurchase agreement.

RMSE: root mean square error.

RSI: relative strength index.

S&P: Standard and Poor's.

SIC: Standard Industrial Classification.

SMA: simple moving average.

SMB: Small minus Big.

SGD: stochastic gradient descent.

SS: sum of squares.

StatArb: statistical arbitrage.

STRIPS: Separate Trading of Registered Interest and Principal of Securities.

SUE: standardized unexpected earnings.

SVM: support vector machine.

TTM: time-to-maturity.

TIPS: Treasury Inflation-Protected Securities.

UIRP: Uncovered Interest Rate Parity.

USD: U.S. dollar.

VAR: vector autoregressive model.

VWAP: volume-weighted average price.

YoY: year-on-year.

Some Math Notations

iff if and only if.

\max (\min) maximum (minimum).

$\text{floor}(x)$ the largest integer less than or equal x .

$\text{ceiling}(x)$ the smallest integer greater than or equal x .

$(x)^+$ $\max(x, 0)$.

$\text{sign}(x)$ sign of x , defined as: $+1$ if $x > 0$; -1 if $x < 0$; 0 if $x = 0$.

$|x|$ absolute value of x if x is a real number.

$\text{rank}(x_i)$ rank of x_i when N values x_i ($i = 1, \dots, N$) are sorted in the ascending order.

$\exp(x)$ or e^x natural exponent of x .

$\ln(x)$ natural log of x .

$\sum_{i=1}^N x_i$ sum of N values x_i ($i = 1, \dots, N$).

$\prod_{i=1}^N x_i$ product of N values x_i ($i = 1, \dots, N$).

$A|_{B=b}$ (or $A|_b$) the value of A when some quantity B it implicitly depends on (usually evident from the context) takes value b .

$f(x) \rightarrow \min$ (\max) minimizing (maximizing) $f(x)$ w.r.t. x (where x can, e.g., be an N -vector x_i , $i = 1, \dots, N$).

$\arg\max_z f(z)$ the value of z for which $f(z)$ is maximized.

$\partial f / \partial x$ the first partial derivative of the function f (which may depend on variables other than x) w.r.t. x .

$\partial^2 f / \partial x^2$ the second partial derivative of the function f (which may depend on variables other than x) w.r.t. x .

$G : A \mapsto B$ G is a map from set A to set B .

$A \subset B$ set A is a subset of set B .

$\{i | f(i) = a\}$ the set of values of i such that the condition $f(i) = a$ is satisfied.

$\min(i : f(i) > a)$ the minimum value of i such that the condition $f(i) > a$ is satisfied.

$i \in J$ i is an element of set J .

$|J|$ the number of elements of J if J is a finite set.

δ_{AB} (or $\delta_{A,B}$) 1 if $A = B$; otherwise, 0 (Kronecker delta).

$\text{diag}(x_i)$ diagonal $N \times N$ matrix with x_i ($i = 1, \dots, N$) on its diagonal.

A^T transpose of matrix A .

A^{-1} inverse of matrix A .

$E_t(A)$ expected value of A at time t .

$dX(t)$ an infinitesimal increment of a continuous process $X(t)$.

dt an infinitesimal increment of time t .

$P(A|B)$ conditional probability of A occurring assuming B is true.

Explanatory Comments for Index

In the index entries, plural in many (but not all) cases is reduced to singular (so, e.g., “commodity” also includes “commodities”). Parentheses contain acronyms or definitions, and in some (but not all) cases both versions are present in the main text. Most (but not all) index entries with commas, i.e., “*noun, adjective*”, correspond to text entries such that the precise string “*adjective noun*” is not directly present in the text, but is present indirectly (e.g., as “*adjective (...) noun*”) or contextually.

Index

- absolute momentum, 56
- academic alpha, 53
- acquirer company, 46
- acquisition, 119
- activation function, 113
- active approach, 84
- active distressed investing, 103
- active investing, 103
- active management, 58
- actively managed ETF, 58
- adjusted close price, 121
- adjusted open price, 121
- adjusted price, 121
- adjustment factor, 121
- adverse selection, 52
- aggressive order, 52
- aggressive order flow, 52
- allocation weight, 74
- alpha, 53, 57, 58
- alpha combo, 53
- alpha combo strategy, 53
- alpha portfolio weights, 54
- alpha return, 54
- alpha rotation, 57
- alpha rotation strategy, 58
- alpha weights, 54
- alternative real estate vehicles, 107
- American option, 11
- American put option, 98
- announcement days, 117
- annual inflation, 99
- annualization factor, 78
- annualized return, 123
- annualized Sharpe ratio, 123
- anomaly, forward discount, 80
- appraised value, 109
- arbitrage, 100
- arbitrage trade, 71
- artificial neural network (ANN), 110–113
- Asian option, 11
- ask, 52, 83
- ask price, 74
- asset, 36
- asset class, 9, 10, 59, 74, 113, 115, 116, 118
- asset-backed security (ABS), 91
- ATM option, 72
- ATM straddle, 77
- attachment, 92
- attachment point, 91
- average daily dollar volume (ADDV), 119, 120
- average underlying price, 11
- B/P ratio, 36
- back leg, 69
- backspread, 24, 25
- backtest, 10, 49, 122, 123
- backtesting, 119, 122
- backtesting period, 123
- backwardation, 75, 83, 84
- bank deposit certificate (CD), 108
- banker's acceptance, 108
- bankruptcy, 102–104, 119
- bankruptcy probability, 104
- bankruptcy protection, 103
- bankruptcy-filing month, 103
- barbell, 63, 64
- barbell portfolio, 64, 65
- barbell strategy, 63
- barrier option, 11
- base form, 114
- basis point (bps), 103, 120
- basis risk, 87
- basket, 76, 82, 91, 117
- Bayes' theorem, 114
- bearish strategy, 12, 17
- Bermudan option, 11
- Bernoulli probability distribution, 114
- bias, 113

- bid, 52, 83
- bid price, 74
- bid-ask spread, 52
- binary industry classification, 55, 122
- bisection method, 96
- Bitcoin (BTC), 110, 113–115
- Bitcoin trading, 115
- black-box machine learning techniques, 86
- Black-Scholes model, 86
- blockchain, 110
- blockchain technology, 110
- Bloomberg Industry Classification System (BICS), 122
- body, 66
- bond, 9, 11, 60–65, 67–70, 88, 91, 92, 94–96, 105, 106, 115–117
- bond credit rating, 67
- bond immunization, 64, 65
- bond maturity, 67
- bond portfolio, 64
- bond price, 60, 62, 63
- bond spread, 69, 70
- bond value, 68
- bond yield, 67–69, 88
- bond yield spread, 69
- bond, deliverable, 88
- bond, non-deliverable, 88
- bond, Treasury, 99
- book value, 36
- book-to-market ratio, 36
- book-to-price (B/P) ratio, 36
- Boolean, 119
- bounds, position, 51
- bounds, trading, 51
- box, 31
- box option strategies, 31
- break-even point, 20
- break-even price, 12
- breakeven rate, 99
- broad index, 70
- broad market, 56, 91
- broad market index, 57
- broad market index ETF, 56, 57
- brownfield project, 118
- Brownian motion, 85, 86
- BTC price, 111, 114
- Btu (British thermal unit), 102
- bullet, 63, 64
- bullet portfolio, 63, 65
- bullet strategy, 63
- bullish strategy, 12, 17
- business cycle, 116
- business cycle trends, 116
- butterfly, 26, 27, 29, 30, 66
- butterfly bond strategy, 66
- butterfly spread, 26
- butterfly strategy, 26, 27
- buy signal, 80, 86, 113
- buy-and-hold investment, 118
- buy-write strategy, 12
- calendar call spread, 18, 19
- calendar put spread, 18–20
- calendar spread, 88
- call option, 11–33, 78, 96, 101
- call spread, 13, 14, 16, 17, 28, 30, 31
- call, naked, 13
- call, short, 13
- Canary option, 11
- capital allocation, 64
- capital allocation weights, 89
- capital gain strategy, 14–16, 20–26, 28–33
- Carhart's momentum factor (MOM), 57
- carry, 68, 71, 93, 94
- carry factor, 68
- carry strategy, 68, 80–82
- carry trade, 80
- cash, 9, 71, 108, 109
- cash flow, 61, 62, 94, 96, 99, 100, 105, 118
- cash flow shortfall, 109
- cash merger, 46
- cash-and-carry arbitrage, 71
- cash-equivalent asset, 109

- CDO notional, 92
- CDO tranche, 91, 92
- CDO tranche hedging, 93
- CDS arbitrage trade, 70
- CDS basis, 69
- CDS basis arbitrage, 69
- CDS hedging, 94
- CDS index, 92, 93
- CDS price, 69
- CDS spread, 69, 70
- cents-per-share, 52, 123
- channel, 46, 54
- channel break, 46
- channel indicator, 46
- channel trading strategy, 46
- Chapter 11, 103, 104
- cheap stock, 39
- Chicago Board Options Exchange (CBOE), 74
- claim, 11
- claim pricing argument, 86
- class, 114, 115
- close, 54, 76, 119
- close price, 120
- close-to-close return, 73
- close-to-open return, 121
- closing price, 45, 59, 122
- cluster, 40–42
- clustering algorithm, 55
- Cochrane-Piazzesi predictor, 117
- collar, 31
- collar strategy, 31
- collateral, 109, 110
- collateralized debt obligation (CDO), 9, 91, 92, 94
- combo, 15, 16, 32, 33
- combo strategy, 16
- commercial paper, 108
- commercial real estate, 107
- Commitments of Traders (COT), 84
- commodity, 9, 11, 83–85, 115–117
- commodity allocation percentage (CA), 117
- commodity futures, 9, 83–85, 88, 109
- commodity futures term structure, 85
- commodity investment, 84
- commodity market, 84
- commodity price, 116
- commodity return, 84
- common stock, 11
- compounding period, 65, 80, 100
- computation, out-of-sample, 121
- conditional expectation, 86
- conditional independence assumption, 115
- conditional probability, 114, 115
- condor, 28, 29
- condor strategy, 26
- constrained regression, 95
- constraints, inhomogeneous, 51
- constraints, nonlinear, 51
- Consumer Price Index (CPI), 99, 100, 116
- contango, 75, 76, 83, 84
- continuous compounding, 60, 62, 63
- contrarian trading, 89
- control rights, 104
- conversion factor, 88
- conversion factor model, 88
- conversion option, 95, 96
- conversion price, 95
- conversion ratio, 95
- convertible arbitrage, 95
- convertible arbitrage strategy, 95
- convertible bond, 9, 95, 96
- convertible bond pricing, 96
- convertible option-adjusted spread, 96
- convertibles, 95
- convexity, 62–65, 94
- cooling-degree-days (CDD), 101
- core inflation (CI), 116, 117
- corporate actions, 46
- correlation, 59, 72, 73, 84, 85, 90, 105, 106, 110
- correlation matrix, 73
- correlation trading, 72
- correlation, implied, 72
- correlation, serial, 82

- counterparty, 109
- coupon, 60, 64, 88
- coupon bond, 60, 68
- coupon payment, 60, 61, 64, 99, 100
- coupon payment, fixed rate, 70
- coupon rate, 60, 100
- covariance matrix, 38, 59, 90
- covariance matrix, sample, 49
- covered call, 12, 23, 31
- covered call option strategy, 13
- covered call strategy, 12, 18
- covered interest arbitrage, 81
- Covered Interest Rate Parity (CIRP), 80, 81
- covered put, 12, 31
- covered put option strategy, 13
- covered put strategy, 13, 19
- covered short straddle, 23
- covered short strangle, 23
- covered straddle, 20
- credit default swap (CDS), 69, 70, 91, 92, 94
- credit derivatives, 92
- credit rating, 67, 91
- credit spread, 67
- cross-border tax arbitrage, 97, 98
- cross-entropy, 113
- cross-hedging, 87
- cross-sectional analysis, 53, 117
- cross-sectional standard deviation, 90
- cross-sectional strategy, 48
- cross-sectional trade, 81
- cross-validation, 48
- cryptoassets, 110
- cryptocurrency, 9, 110, 113
- cryptocurrency trading, 114, 115
- cryptocurrency trading strategy, 110
- cryptography, 110
- CTA (commodity trading advisor), 116
- cum-dividend, 97, 98
- cumulative ETF return, 57
- cumulative inflation, 99
- cumulative return, 34, 47, 56, 59, 90, 91
- currency, 9, 11, 80–83, 115, 116
- currency carry trade, 81
- currency pair, 83
- curvature, 66
- curve trade, 94
- curve-neutrality, 66
- daily roll value, 75
- dark spread, 102
- data mining, 10
- data, cross-sectional, 54
- data, economic, 55
- data, fundamental, 47, 55
- data, single-stock, 54
- data, technical, 47
- debt seniority level, 103
- decentralized digital currency, 110
- decile, 34, 36–39, 56, 58, 59, 67, 68, 81, 104, 116
- default, 69, 92, 102, 103
- default month, 103
- default payment, 92
- default risk, 91
- defaulted credit, 92
- deferred-month contracts, 88
- deferred-month futures, 88
- delay, 122
- delay-0 strategy, 122
- delay-1 strategy, 122
- delivery, 71, 87
- delivery date, 86
- delivery month, 88
- delivery price, 15
- delivery time, 71
- Delta, 77, 93, 96
- Delta-hedging, 78
- Delta-hedging strategy, 78
- demand, 88, 101
- demand hedging, 100
- demand risk, 101
- demeaned rank, 38
- demeaned return, 40–43, 91
- derivative, 9, 75, 115

- derivative contract, 78
- desired holdings, 53, 122, 123
- detachment, 92
- detachment point, 91
- diagonal call spread, 19
- diagonal put spread, 19
- diagonal spread, 19
- directional exposure, 78
- directional strategy, 12, 78, 116
- discount bond, 60
- discount factor, 100
- discount rate, 70
- discretionary macro, 116
- discretionary strategy, 116
- dispersion strategy, 72, 79
- dispersion trading, 71, 72
- dispersion trading strategy, 73
- distress risk puzzle, 104
- distress risk puzzle strategy, 104
- distress situation, 103, 104
- distress, financial, 102
- distress, operational, 102
- distressed asset, 9, 102, 103
- distressed company, 103
- distressed debt, 102, 103
- distressed debt market, 103
- distressed debt passive trading strategy, 103
- distressed debt portfolio, diversified, 103
- distressed firm, 103, 104
- distressed security, 102
- distributed ledger, 110
- diversification, 105–107, 118
- diversification power, 59
- diversification strategy, 84
- diversified portfolio, 63, 70
- diversifier, 110
- dividend, 34, 39, 71, 97, 98, 120
- dividend imputation, 97
- dividend payment, 97
- dollar carry trade, 82
- dollar duration, 62, 66, 69, 88
- dollar holding, 49, 119, 120
- dollar position, 41
- dollar-duration-neutral butterfly, 65, 66
- dollar-duration-neutrality, 66
- dollar-neutral book, 71
- dollar-neutral portfolio, 35–37, 39, 44, 50, 51
- dollar-neutral strategy, 39, 56, 58, 70
- dollar-neutral trade, 81
- dollar-neutrality, 40, 50, 51, 66, 91, 122
- dollar-neutrality condition, 91
- dollar-neutrality constraint, 41, 50, 51
- domestic currency, 80, 81
- domestic interest rate, 80
- Donchian Channel, 46
- double-taxation system, 97
- Dow Jones Industrial Average (DJIA), 70
- downside risk, 59
- drawdown, 76, 108
- drift, 59
- dual-momentum sector rotation, 56
- dumb order flow, 52, 53
- dummy variable, 67
- duration, 62, 64
- duration-targeting strategy, 64
- dynamic asset allocation, 59
- earnings, 35, 36, 53
- earnings-momentum, 35
- earnings-momentum strategy, 36
- economic activity, 106
- economic announcement, 117
- economic diversification, 106
- effect, contrarian, 34
- effect, mean-reversion, 34, 90
- eigenvalue, 73
- electricity futures, 102
- electricity futures contract, 102
- electronic trading, 10
- embedded option, 95, 96
- EMSD (exponential moving standard deviation), 111, 112
- energy, 9, 41, 102, 118
- energy hedging, 102

- energy spreads, 102
- equally-weighted portfolio, 120
- equities, 11, 89, 106, 113, 116, 117
- equity index, 71, 116
- equity market, 75, 84
- equity market excess return, 116
- equity portfolio, 84
- equity tranche, 93
- equity tranche credit events, 93
- equity tranche trade, 93
- equity value, 104
- eRank (effective rank), 73
- error function, 113
- establishing, 12, 48, 120
- estimation period, 57, 58, 80
- ETF alpha, 57
- ETF arbitrage, 73
- ETF portfolio, 59
- ETF return, 57, 59
- ETF, leveraged, 58
- ETF, leveraged inverse, 58
- ETH (ether/Ethereum), 110
- Euclidean distance, 38, 48
- EUR (euro), 110
- eurodollars, 108
- European call option, 11
- European option, 11
- European put option, 11
- ex-dividend, 97, 98
- excess return, 38, 46
- exchange rate, 83
- exchange-traded fund (ETF), 9, 55–59, 73, 117
- exchange-traded note (ETN), 9, 76
- execution price, 53
- exercise date, 11
- exotic options, 11
- expected alpha return, 54
- expected return, 38, 48, 51–54, 59, 85, 90, 119, 120, 122
- expected stock return, 49
- expiration, 11, 18, 19, 72, 83, 98
- explanatory variable, 104
- exponential moving average (EMA), 44, 91, 111, 112
- exponential smoothing parameter, 111
- exposure, 37, 59, 64, 70, 84, 86, 88, 93, 105, 118
- extreme market events, 105
- face value, 60, 63
- factor, 37, 38, 57, 59, 117
- factor investing, 117
- factor loadings matrix, 51
- factor portfolio, 38
- factor rankings, 38
- factor-based strategies, 105
- fair value, 71, 95
- false signal, 45, 79
- Fama puzzle, 80
- Fama-French factors, 38, 57
- fear gauge index, 75
- feature, 114, 115
- feature vector, 114
- Fed discount rate, 84
- Fed monetary policy, 84
- Federal Open Market Committee (FOMC), 117
- fence, 31
- fiat currency, 110
- fifty-fifty butterfly, 66
- fill or kill limit order, 74
- fills, 52
- filter, Hodrick-Prescott, 79
- financed portfolio, 68
- financial crises, 105
- financial derivative, 11
- financial distress, 109
- financial markets, 10
- firm's equity, 103, 104
- first-month contract, 75
- fix-and-flip, 108
- fixed coupon, 99
- fixed coupon bond, 61
- fixed coupon rate, 100
- fixed income, 60

- fixed rate, 61, 99, 100
- fixed rate cash flow, 99
- fixed rate coupon bond, 62
- fixed rate payment, 61
- fixed-income asset, 87, 117
- fixed-income instrument, 95
- flattener, 69, 94
- floating coupon payment, 61
- floating rate, 99
- floating rate bond, 61
- floating rate cash flow, 99
- floating rate payment, 61
- FOMC announcements, 117
- forecasting future returns, 57
- foreign currency, 80–82
- foreign currency forward, 82
- foreign exchange (FX), 79
- foreign interest rate, 80
- formation period, 34, 39, 56
- forward, 80, 81
- forward contract, 15, 81
- forward discount, 80–82
- forward FX rate, 80
- forward premium, 80
- front leg, 69
- front-month futures price, 83
- fuel futures, 102
- fundamental analysis, 54, 55
- fundamental data, 53
- fundamental industry classification, 122, 123
- fundamental macro momentum, 116
- fundamental trading strategies, 110
- fundamentals, 55, 88, 110
- futures, 9, 11, 71, 75–77, 83, 85–91, 102, 107, 117
- futures basis, 88
- futures calendar spread, 88
- futures contract, 71, 83, 86–88
- futures contract size, 102
- futures contract, front-month, 76
- futures delivery basket, 88
- futures position, 15, 83, 87, 101
- futures price, 71, 75, 83, 85–87
- futures return, 76, 89
- futures spread, bear, 88
- futures spread, bull, 88
- futures yield, 88
- futures, CTA, 116
- futures, managed, 116
- futures, T-bond, 88
- futures, T-note, 88
- FX momentum strategy, 82
- FX rate, 80
- FX rate risk, 80, 81
- FX spot rate, 79
- FX spot rate time series, 79
- FX triangular arbitrage, 83
- Gamma, 77
- Gamma hedge, 78
- Gamma hedging, 77, 78, 96
- Gamma scalping, 78
- gas futures contract, 102
- GDP (gross domestic product), 116, 117
- geographic diversification, 107
- Global Industry Classification Standard (GICS), 122
- global macro, 9, 115
- global macro inflation hedge, 116
- global macro inflation hedge strategy, 117
- global macro strategy, 116
- government bond, 116, 117
- government security, 70
- Greeks, 77
- greenfield project, 118
- guts, 20–22
- guts strategy, 20
- hard-to-borrow securities, 71
- headline inflation (HI), 116, 117
- healthy-minus-distressed (HMD), 104, 105
- heat rate, 102
- heating-degree-days (HDD), 101
- hedge, 87, 88, 102, 107, 117
- hedge position, 87
- hedge ratio, 76, 87, 88, 93–96, 101, 102

- hedgers, 84, 90
- hedging, 9, 76
- hedging pressure (HP), 84
- hedging strategy, 9, 12, 13
- heterotic risk model, 122
- hidden layer, 111, 113
- high frequency trading (HFT), 10, 52, 53, 71
- high minus low (HML), 38
- High Yield bonds, 67
- high-minus-low carry, 81
- high-return-volatility portfolio, 36
- historical correlation, 39, 76, 77
- historical data, 66, 67, 86, 88, 95
- historical return, 37, 49, 72, 82, 85
- historical stock price, 44
- historical variance, 77, 82
- historical volatility, 37, 38, 43, 59, 74, 76, 77, 89, 90, 120
- Hodrick-Prescott filter, 91
- holding horizon, 55
- holding period, 35–37, 39, 56, 84, 105, 116
- holding weights, 49, 50
- horizon, 52, 53, 55, 106
- horizontal spread, 18
- HP filter, 79
- Hybrid Market, 10
- hybrid security, 95
- hyperbolic tangent (tanh), 113
- implied index volatility, 72
- implied volatility, 37, 72, 74, 77–79
- imputation system, 97
- income strategy, 14, 16, 17, 21, 22, 25, 27, 28, 30
- income-generating real estate portfolio, 105
- incomplete basket, 71
- index, 9, 11, 70–74, 79, 93, 94, 116
- index arbitrage, 71
- index basket, 71
- index constituents, 71, 79
- index ETF, 73
- index futures, 70, 71
- index futures price, 71
- index hedging, 93
- index implied volatility, 72
- index level, 72
- index option, 72, 77
- index option straddle, 72
- index portfolio, 71
- index position, 93
- index spot price, 71
- index volatility, 71, 72
- index volatility targeting, 74
- index, market cap weighted, 72
- index-based ETF, 70
- indexed payment, 100
- industrial properties, 106
- industry, 40, 43, 54–56, 103, 123
- industry classification, 55
- industry classification data, 53
- inflation, 98, 99, 107, 116, 117
- inflation hedge, 117
- inflation hedging, 98, 107, 118
- inflation index, 99
- inflation rate, 107
- inflation swap, 98, 99
- inflation-hedging investment, 118
- inflation-indexed products, 99
- infrastructure, 9, 117, 118
- infrastructure asset, 118
- infrastructure company, 118
- infrastructure fund, 118
- infrastructure investment, 118
- infrastructure project, 118
- input layer, 110–112
- institutional trader, 53
- integration, 108
- intercept, 38, 42, 43, 48, 54, 57, 68, 76
- interest, 61, 80, 109
- interest rate, 60, 62, 63, 66, 68, 69, 71, 80, 81, 87, 88, 91, 94, 97, 109, 110
- interest rate exposure, 94

- interest rate futures, 87
- interest rate futures contract, 88
- interest rate futures hedge ratio, 88
- interest rate risk, 63, 64, 87
- interest rate risk hedging, 87
- interest rate spread, 66, 99
- interest rate swap, 70, 94, 98
- Internal Bar Strength (IBS), 58
- international trade, 116
- international trade trends, 116
- intra-asset diversification, 106
- intraday arbitrage, 73
- intraday signal, 52
- intraday strategy, 119
- intraday trading strategy, 120
- inverse, 50
- inverse ETF, 59
- inverse model covariance matrix, 122
- investment, 9, 35, 40, 41, 64, 80, 105, 118
- Investment Grade bonds, 67
- investment level, 35, 37, 50, 119, 120
- investment opportunity, 109
- investment portfolio, 116
- investment strategy, 118
- investment style, 115
- investment vehicle, 70, 107
- investment, equity, 84
- iron butterfly, 26, 28
- iron condor, 30
- iShares, 73
- Jensen's alpha, 53, 57
- Joule, 102
- JPY (Japanese Yen), 80
- k-nearest neighbor (KNN) algorithm, 47, 48, 111
- Kalman filter, 91
- Kelly strategy, 109
- keyword, 114
- ladder, 16, 17, 64
- ladder portfolio, 64
- ladder strategy, 17
- Lagrange multiplier, 51
- layering, 108
- learning vocabulary, 114, 115
- leg, contingent, 92
- leg, default, 92
- level, resistance, 45
- level, support, 45
- leverage, 58, 59, 74, 105
- leveraged ETF (LETF), 58, 59
- leveraged inverse ETF, 59
- limit order, 52
- limit order, aggressive, 52
- limit order, marketable, 74
- linear homogeneous constraints, 51
- linear model, 48
- linear regression, 41, 42
- linear trading costs, 119, 120
- liquid funds, 108
- liquid stake, 105
- liquid U.S. stocks, 53
- liquidating, 48
- liquidation, 109
- liquidity, 34, 55, 109
- liquidity management, 109
- liquidity management tool, 108
- listed infrastructure funds, 118
- loadings matrix, 42, 43, 55
- loan, 81, 92, 97, 109, 110
- loan shark, 110
- loan sharking, 110
- loan-to-own, 104
- log forward FX rate, 81
- log spot FX rate, 81
- log-return, 78
- log-volatility, 86
- logistic regression, 104, 115
- logit model, 115
- London Interbank Offer Rate (LIBOR), 61, 70
- long portfolio, 67, 73
- long risk reversal strategy, 78
- long-maturity wing, 66
- long-only, 44

- long-only portfolio, 34, 35
- long-only strategy, 56
- long-only trend-following portfolio, 59
- long-run mean, 86
- long-short strategy, 116
- lookback, 119
- lookback period, 73
- losers, 34–36, 38, 89, 91
- loss, contango, 76
- loss, roll, 76
- low-return-volatility portfolio, 36
- low-risk anomaly, 67
- low-risk factor, 67
- low-volatility anomaly, 36
- Macaulay duration, 62
- machine learning, 10, 47, 49, 53
- machine learning algorithm, 48
- machine learning classification scheme, 114
- machine learning methods, 53, 115
- machine learning techniques, 47, 110
- macro strategy, 116
- macro trading strategy, 115, 117
- macroeconomic trends, 116
- managed futures, 116
- Manhattan distance, 38, 48
- margin account, 70
- mark-to-market (MTM), 92, 93
- market, 10, 11, 52, 55, 59, 64, 77, 104, 107
- market activity, 89
- market beta, 104
- market cap, 53, 72, 110
- market cap weighted index, 71
- market capitalization, 36, 38, 70, 110
- market crashes, 35
- market data, 83
- market downturn, 104
- market index, 89, 91
- market index return, 89, 91
- market portfolio, 38
- market price, 46, 86, 96, 108
- market underreaction, 116
- market value, 105
- market volatility, 88
- market-making, 52, 53
- married call, 13
- married put, 13
- maturity, 11, 12, 15, 18, 19, 60–65, 67–70, 75, 76, 78, 81, 87, 88, 98–100
- maturity date, 63, 81
- maturity time, 11, 60
- maturity-weighted butterfly, 67
- MBS passthrough, 94
- MBS price, 94, 95
- MBtu, 102
- mean-reversion, 40, 41, 43, 48, 54, 58, 75, 86, 89, 122
- mean-reversion parameter, 86
- mean-reversion strategy, 39, 41, 58, 75, 89
- mean-variance optimization, 51, 106, 120
- Megawatt, 102
- Megawatt hour (Mwh), 102
- merger, 119
- merger arbitrage, 46
- merger arbitrage opportunity, 46
- mergers and acquisitions (M&A), 46
- metropolitan statistical area (MSA), 107
- mini-S&P 500 futures, 75, 76
- mishedge, 71
- mispricing, 39, 73
- mixed-asset diversification, 105
- MMBtu, 102
- model covariance matrix, 49, 51
- modified duration, 62–64, 66, 68, 88
- momentum, 37, 38, 55, 56, 59, 90, 91, 117, 122
- momentum & carry combo, 82
- momentum effect, 34, 35, 54, 55, 107
- momentum strategy, 35, 54, 82, 90
- momentum, absolute, 56
- momentum, cross-sectional, 56
- momentum, industry, 56
- momentum, relative, 56
- momentum, sector, 56

- momentum, time-series, 56
- monetary policy, 116
- monetary policy trends, 116
- money laundering, 108
- moneyiness abbreviations
(ATM, ITM, OTM), 12
- mortgage, 94
- mortgage-backed security (MBS), 9, 94, 96
- moving average, 43–45, 47, 54, 56, 57, 59, 79, 80
- moving average length, 111
- moving average, exponential, 111
- moving standard deviation, 119
- moving standard deviation, exponential, 111
- multi-asset portfolio, 59
- multi-asset trend following, 59
- multi-currency arbitrage, 83
- multifactor model, 51, 85
- multifactor portfolio, 37, 117
- multifactor risk model, 51
- multifactor strategy, 38
- multinomial distribution, 114
- municipal bond, 97, 118
- municipal bond tax arbitrage, 96
- mutual fund, 53, 57, 58, 105
- mutual fund return, 57

- naked call, 13
- naked put, 12
- near-month contract, 88
- near-month futures, 88
- neutral curve butterfly, 66
- New York Stock Exchange (NYSE), 10
- no-risk-free-arbitrage condition, 81
- node, 112
- noise, 79, 91, 116
- non-announcement days, 117
- non-deliverable bond, 88
- non-directional strategy, 12
- non-discretionary strategy, 116
- non-systematic risk, 106

- non-systematic risk reduction, 106
- nonlinear least squares, 86
- normalized demeaned return, 54
- notional, 100
- notional amount, 92

- objective function, 50, 51, 79
- open, 119, 122
- open interest, 89, 90
- open price, 45, 121
- operational distress, 102
- opportunity management tool, 108
- optimal hedge ratio, 76, 77, 87
- optimal weighting scheme, 37
- optimization, 49, 51, 122
- optimization strategy, 90
- optimization techniques, 65
- optimization, mean-variance, 119
- optimizer function, 122
- option, 9, 11, 12, 15, 72, 74, 75, 77, 78, 98, 107
- option Gamma, 96
- option holder, 11
- option premia, 12, 78
- option pricing, 11
- option straddle, 72
- option styles, 11
- option trading strategy, 31–33, 74
- option writer, 11
- option, all-or-nothing, 11
- option, ATM (at-the-money), 13–28, 31–33, 72
- option, binary, 11
- option, call, 20, 21, 78, 98
- option, digital, 11
- option, ITM (in-the-money), 19–22, 25–29, 31, 98
- option, OTM (out-of-the-money), 12–17, 19–21, 23–33, 78
- option, put, 20, 21, 78, 98
- option-adjusted spread (OAS), 96
- order, 52, 122
- order execution system, 74

- order flow, dumb, 52
- order flow, informed, 52
- order flow, smart, 52
- order flow, toxic, 52
- order, market, 52
- orders, cancel-replaced, 52
- orders, canceled, 52
- orders, placed, 52
- Ornstein-Uhlenbeck process, 85
- orthogonality condition, 43
- OTM option, 72
- out-of-sample backtest, 112
- out-of-sample backtesting, 10, 119
- outcome, 114, 115
- output gap, 117
- output layer, 110, 112, 113
- over-fitting, 112
- overnight return, 120
- overreaction, 89, 103
- P&L, 70, 78, 87, 94, 98, 123
- P&L drawdown, 76
- pairs trading, 39–41
- pairs trading strategy, 40
- parallel shift, 62, 64, 66, 69, 96
- passive approach, 84
- passive distressed debt strategy, 103
- passive limit order, 52
- passive trading strategy, 103
- passthrough MBS, 94
- passthrough MBS price, 95
- pawnbroker, 109
- pawnbroking, 109, 110
- pawnbroking strategy, 109
- payment period, 60
- payment, coupon, 100
- payment, principal, 100
- payoff, 11–13, 72, 78, 87
- peer-to-peer (P2P) internet protocol, 110
- pension fund, 53
- performance characteristics, 84, 106, 123
- period, formation, 84
- periodic compounding, 60, 62, 65
- periodic premium payment, 91, 92
- periodic premium payment rate, 91
- physical commodity, 109
- pivot point, 45
- placement, 108
- Porter stemming algorithm, 114
- portfolio, 9, 34, 35, 37, 38, 49, 56, 59, 61, 63–66, 68, 69, 72, 73, 76, 77, 84, 85, 89, 104, 106, 108, 109, 116, 117, 119, 120
- portfolio construction techniques, 106
- portfolio diversification, 84
- portfolio management, 109
- portfolio optimization, 119
- portfolio P&L, 49
- portfolio performance, 106
- portfolio weights, 50
- portfolio, barbell, 63
- portfolio, HML, 38
- portfolio, ladder, 63
- portfolio, MKT, 38
- portfolio, SMB, 38
- position bounds, 119
- position, bearish, 17
- position, bullish, 17
- predicted class, 113
- predicted value, 48
- predictor variable, 47
- premium, 9, 11, 78, 93
- premium leg, 92
- premium payment, 94
- premium, annual, 69
- premium, periodic, 69
- prepayment model, 95
- prepayment risk, 94
- price and volume data, 47, 120
- price reversal, 46
- price, close, 58
- price, fully adjusted, 34, 39, 120, 121
- price, high, 45, 58, 120
- price, intraday, 120
- price, low, 45, 58, 120
- price-momentum, 34

- price-momentum strategy, 34–36, 38
- price-volume, 53
- pricing data, 55
- pricing model, 85, 96
- principal, 60, 61, 64, 88, 99, 100
- principal component analysis (PCA), 73
- principal components, 55, 73
- private equity-type investments, 118
- probability distribution, 114
- probability measure, 86
- property type, 107
- property type diversification, 106
- protection buyer, 92
- protection seller, 91
- protective call, 13
- protective call option strategy, 13
- protective put, 13
- protective put option strategy, 13
- protective put strategy, 13
- publicly traded company, 46
- publicly traded infrastructure companies, 118
- put option, 11–33, 78, 98, 101
- put spread, 14, 17, 28, 30–32
- put, naked, 12
- put, short, 12
- put-call parity, 12
- quantile, 81, 112–114, 117
- quantitative trading alpha, 53
- quark spread, 102
- quintile, 38, 58, 84, 85
- R Package for Statistical Computing (R), 119
- R-squared, 57
- R-squared strategy, 58
- rallies, 75
- rank, 38, 73
- ranking, 38, 116
- rate, fixed, 98
- rate, floating, 98
- ratio call spread, 25
- ratio put spread, 25
- raw close price, 121
- raw inflation, 116
- raw open price, 121
- raw spot rate, 79
- real estate, 9, 105–107, 118
- real estate asset, 105, 106
- real estate holdings, 106
- real estate investment, 105, 106
- real estate investment strategy, 108
- real estate investment trust (REIT), 105, 107
- real estate momentum, 107
- real estate momentum strategy, 107
- real estate property, 107
- real estate return, 107
- real estate, commercial, 105
- real estate, residential, 105
- real interest rate, 117
- realized alpha return, 54
- realized P&L, 52
- realized profit, 44
- realized variance, 78
- realized volatility, 77, 79, 105
- rebalancing, 74, 76, 83, 84, 104
- recovery rate, 92
- rectified linear unit (ReLU), 113
- reference entities, 92
- reference pools, 92
- regression, 39, 42, 43, 48, 54, 66, 67
- regression coefficient, 39, 42, 57, 67, 68
- regression R-squared, 57
- regression residual, 42, 67
- regression weights, 43
- regression, cross-sectional, 67
- regression-weighted butterfly, 66, 67
- reinvestment risk, 64
- relative momentum, 56
- relative strength index (RSI), 111, 112
- relative value strategy, 116
- reorganization, 103, 104
- reorganization plan, 103
- reorganization process, 103
- replication, 100

- repo rate, 70
- repo strategy, 109
- repurchase agreement (repo), 108, 109
- residual momentum, 38
- residual momentum strategy, 39
- resistance, 45, 54
- retail trader, 52
- return, risk-adjusted, 34, 39, 106, 118
- reverse repurchase agreement, 109
- rich stock, 39
- risk, 9, 13, 22, 27, 29, 30, 36, 46, 56, 64,
71, 75, 76, 81, 86, 93, 94, 106, 119
- risk arbitrage, 46
- risk factor, 43, 73
- risk management, 9, 51, 104, 122
- risk management tool, 108
- risk model, 119, 121, 122
- risk premium, 104
- risk reversal, 15, 16, 32, 33, 78
- risk sentiment, 116
- risk sentiment trends, 116
- risk, idiosyncratic, 73
- risk, interest rate, 64
- risk, specific, 73
- risk-free arbitrage, 81
- risk-free arbitrage opportunity, 80
- risk-free asset, 74, 80, 117
- risk-free discount factor, 92
- risk-free instrument, 69
- risk-free interest rate, 80
- risk-free interest rate curve, 96
- risk-free position, 81
- risk-free probability measure, 86
- risk-free profit, 21, 70
- risk-free rate, 38, 67–69, 71, 88
- riskless asset, 74
- risky duration, 93, 94
- roll loss, 76
- roll yield, 83
- roll-down component, 68
- rolling down the curve, 69
- rolling down the yield curve, 68
- rolling down the yield curve strategy, 69
- root mean square error (RMSE), 48
- rotation, industry, 56
- rotation, sector, 56
- Russell 3000, 70
- S&P 500, 70, 73, 77
- S&P 500 ETFs, 73
- S&P 500 option, 77
- sample correlation matrix, 72, 73
- sample covariance matrix, 49, 77, 82
- sample variance, 54
- scale invariance, 50, 51
- seagull spread, 31–33
- second-month futures price, 83
- sector, 40, 41, 43, 55, 56, 59, 100, 118
- sector ETF, 56
- sector momentum rotation, 55, 56
- sector momentum rotation strategy, 55–
57, 59
- sector rotation signal, 56
- secured cash loan, 109
- secured loan, 104
- security, 109
- selectivity, 58
- sell signal, 80, 86, 113
- sell-offs, 75
- sell-write strategy, 12
- semiannual compounding, 88
- semiannual fixed coupons, 99
- sentiment analysis, 114
- sentiment data, 53, 115
- serial regression, 38, 57, 76, 87
- serial variance, 82
- serially demeaned return, 54, 111
- settlement, 75
- share, 11, 35, 36, 40, 46, 52
- shareholder, 97
- shares outstanding, 72
- Sharpe ratio, 49, 50, 52, 59
- Sharpe ratio maximization, 50, 51
- short-maturity wing, 66
- short-sale, 41
- short-selling issues, 71

- shorting ETFs, 56
- shorting stock, 12, 13, 22, 23, 36, 37, 39
- shorting Vega, 77
- shorting VIX futures, 75
- sideways market, 77
- sideways strategy, 12, 21–23, 26–30
- sigmoid, 113
- signal, 10, 44, 46, 48, 49, 52, 122
- signal, buy, 114
- signal, ephemeral, 10
- signal, machine learning, 51
- signal, mean-reversion, 51
- signal, momentum, 51
- signal, sell, 114
- simple moving average (SMA), 43, 44, 121
- simple moving standard deviation, 121
- single-stock KNN, 47, 54
- single-stock KNN trading strategy, 111
- single-stock methods, 53
- single-stock option, 11, 72, 73, 77
- single-stock option straddle, 72
- single-stock strategy, 47
- single-stock technical analysis strategies, 54
- single-stock trading, 48
- single-tranche CDO, 92
- skew, 78
- skewness, 85
- skewness premium, 85
- skip period, 34, 37, 39
- slippage, 10, 35, 71, 74
- Small minus Big (SMB), 38
- smart order flow, 52
- smoothing parameter, 79
- social media sentiment analysis, 114
- softmax, 113
- sorting, 58
- source code, 10, 51, 73, 119
- sovereign risk, 117
- spark spread, 102
- SPDR Trust, 73
- specialist system, 10
- specific risk, 51, 73
- speculative bubble, 110
- speculative buy-and-hold asset, 110
- speculator, 84, 102
- spike, 76
- splits, 34, 39, 120
- spot, 71, 76
- spot FX rate, 80, 116
- spot price, 71, 85, 87
- spot value, 71
- spread, 63, 69, 77, 94, 96, 102, 117
- spread change, 66
- spread curve, 94
- spread, calendar, 18
- spread, CDO tranche, 92–94
- spread, diagonal, 18
- spread, ratio, 24, 25
- standard deviation, 36
- Standard Industrial Classification (SIC), 122
- standardized unexpected earnings (SUE), 36
- state variable, 116
- statistical arbitrage, 9, 48, 49, 55
- statistical arbitrage strategy, 10, 55
- statistical industry classification, 119, 122
- statistical risk model, 73, 122
- steepener, 69, 94
- stemming, 114
- stochastic dynamics, 86
- stochastic gradient descent (SGD), 113
- stochastic processes, 85
- stochastic volatility models, 85
- stock loan, 98
- stock market, 55
- stock merger, 46
- stock price, break-even, 12
- stock trading strategy, 54
- stock, cheap, 40
- stock, rich, 40
- stop-loss price, 18, 19
- stop-loss rule, 44
- stop-words, 114

- straddle, 20–23, 27, 29, 30, 73, 74, 77, 79
- strangle, 20, 21, 27, 29, 30
- strap, 24
- strategy, ANN, 114
- strategy, barbell, 63
- strategy, bullet, 63
- strategy, capital gain, 12, 29, 30
- strategy, contrarian, 43
- strategy, delay-0, 122
- strategy, delay-1, 122
- strategy, Delta-neutral, 77
- strategy, earnings-momentum, 36
- strategy, HMD, 104, 105
- strategy, income, 12, 29, 30
- strategy, ladder, 64
- strategy, mean-reversion, 43
- strategy, momentum, 54
- strategy, price-momentum, 36
- strategy, resistance, 45
- strategy, straddle, 20
- strategy, strangle, 20
- strategy, strap, 24
- strategy, strip, 24
- strategy, support, 45
- strategy, trend following, 54
- strategy, zero-cost, 104
- strike, 26–30, 78
- strike price, 11–33, 78, 98, 101
- strip, 24
- STRIPS (Separate Trading of Registered Interest and Principal of Securities), 100
- structured assets, 9, 91
- style factor, 55
- style risk factor, 55
- subset portfolio, 72
- sum of squares (SS), 57
- supply, 88
- support, 45, 54
- support vector machine (SVM), 115
- survivorship bias, 119
- swap, 61, 70, 99
- swap agreement, 98
- swap contract, 99
- swap fixed rate, 99
- swap rate, 95
- swap spread, 70
- swap strategy, 70, 98
- swap-spread arbitrage, 70
- synthetic call, 13, 22, 23
- synthetic CDO, 92
- synthetic coupon payment, 100
- synthetic forward, 15, 31
- synthetic forward contract, 15
- synthetic futures, 15
- synthetic index, 100
- synthetic portfolio, 100
- synthetic put, 13, 22
- synthetic short bond position, 70
- synthetic straddle, 22, 23
- systematic approach, 116
- systematic macro, 116
- systematic macro trading strategy, 117
- systematic risk, 73
- T-bond, 88
- T-note, 88
- tactical asset allocation, 84
- target company, 46
- target variable, 47
- target volatility, 105
- tax arbitrage, 9, 96
- tax credit, 97, 98
- tax credit rate, 97, 98
- tax shield, 97
- tax strategy, 31
- tax-exempt municipal bonds, 96, 97
- technical analysis strategies, 55
- technical indicator, 110, 111
- tercile, 85
- term spread, 117
- term structure, 68, 83, 86
- Theta, 77
- Theta play, 77
- Theta-decay, 78
- ticker, 73, 119–121

- ticker symbol, 121
- time series, 34, 37, 44, 49, 54, 72, 74, 85
- time-series filter, 91
- time-stamping, 110
- time-to-maturity (TTM), 12, 18, 19, 23
- TIPS principal, 100
- TIPS-Treasury arbitrage, 99
- tracking error, 76, 77
- tracking ETF, 118
- tradables, 9
- trade execution system, 83
- traded volume, 46
- trader's outlook, 63
- trader's outlook, bearish, 13–17, 19, 24, 32
- trader's outlook, bullish, 13–16, 19, 23, 24, 31, 33
- trader's outlook, conservatively bearish, 17
- trader's outlook, conservatively bullish, 16
- trader's outlook, moderately bullish, 31
- trader's outlook, neutral, 20–23, 26–31
- trader's outlook, neutral to bearish, 13, 18, 25
- trader's outlook, neutral to bullish, 12, 18, 25
- trader's outlook, non-directional, 16, 17
- trader's outlook, strongly bearish, 25
- trader's outlook, strongly bullish, 24
- trades, establishing, 52
- trades, liquidating, 52
- trading bounds, 119
- trading costs, 10, 35, 50, 51, 53
- trading day, 11, 37, 44, 47, 73, 78, 120–122
- trading portfolio, 9, 90
- trading rule, 75, 113, 114
- trading signal, 45, 79, 113
- trading signal, faint, 10
- trading strategy, 9–11, 46, 79, 84, 109
- trading universe, 34, 53, 119, 121
- traditional assets, 105, 106, 110
- traditional portfolio, 106
- training, 48, 112, 113
- training data, 114, 115
- training dataset, 112
- training period, 47
- tranche, 91–94
- tranche hedging, 93
- tranche MTM, 94
- tranche notional, 93, 94
- tranche value, 91
- tranche, equity, 91, 93
- tranche, junior mezzanine, 91
- tranche, senior, 91
- tranche, senior mezzanine, 91
- tranche, super senior, 91
- transaction costs, 11, 65, 71, 73, 74, 80, 81, 98, 100, 106, 109
- Treasuries, 117
- Treasury bill rate, 38
- Treasury bills, 74, 108
- Treasury bond, 70, 99, 100, 103
- Treasury bond coupons, 100
- Treasury curve, 96
- Treasury ETF, 57, 59
- Treasury Inflation-Protected Securities (TIPS), 99, 100
- Treasury note, 99
- tree boosting algorithms, 115
- trend, 46, 57, 91, 116
- trend component, 79
- trend data mining, 110
- trend following, 90
- trend, ephemeral, 10
- Twitter sentiment, 115
- U.S. regions, 107
- unadjusted close price, 120
- unadjusted open price, 120
- unadjusted volume, 120
- uncertainty index, 74
- uncompounded rate, 60
- Uncovered Interest Rate Parity (UIRP), 80

- underlying, 77, 78
- underlying asset, 11, 70, 87
- underlying index, 58, 59, 73
- underlying index portfolio, 71
- underlying instrument, 53, 59
- underlying price, 87
- underlying security, 11
- underlying single-stock options, 73
- underlying stock, 19, 20, 53, 56, 71, 95
- underlying stock price, 95
- underreaction, 116
- unexpected earnings, 36
- unlisted infrastructure fund, 118
- USD (U.S. dollar), 80, 110
- value, 36–38, 55, 67, 68, 84, 85, 117
- value factor, 67
- value strategy, 36, 84
- value-based strategies, 110
- variable coupon bond, 61
- variable rate, 61
- variable rate coupon payment, 70
- variable, feature, 47
- variable, predictor, 47
- variance, 77, 82
- variance notional, 78
- variance strike, 78
- variance swap, 78, 79
- variance, conditional, 86
- vector autoregressive model (VAR), 106
- vector, feature, 114
- Vega, 77
- Vega play, 77
- vertical spread, 13, 14, 16, 17
- VIX (CBOE Volatility Index), 74–77
- VIX futures, 75, 76
- VIX futures basis, 75
- VIX futures basis trading, 75
- VIX futures contract, 76
- VIX futures curve, 75, 76
- VIX futures price, 75, 76
- VIX price, 75
- volatility carry, 76
- volatility ETN, 76
- volatility index, 75
- volatility risk premium, 77
- volatility skew, 78
- volatility spike, 77
- volatility strategy, 12, 20, 22, 24, 27–31, 72, 74
- volatility target, 74
- volatility targeting strategy, 74
- volatility, constituent, 72
- volatility, index, 72
- volume, 47, 89, 90
- weather, 9
- weather conditions, 100, 101
- weather derivative, 100, 101
- weather index, 100, 101
- weather risk, 100
- weighted average, 38, 62, 89
- weighted regression, 43, 51
- weighting scheme, 35, 38, 48, 59, 89
- well-diversified portfolio, 118
- Whittaker-Henderson method, 79
- wing, 66
- winners, 34–36, 38, 89, 91
- word, 114, 115
- world, 116
- year-on-year inflation swap, 99
- yield, 60, 62–65, 68–70, 103
- yield curve, 62–66, 68, 69
- yield curve dynamics, 69
- yield curve spread, 69
- yield curve spread strategy, 69
- YoY (year-on-year), 99, 117
- zero-cost combination, 65
- zero-cost long-short portfolio, 83
- zero-cost portfolio, 36, 84, 85, 104, 116, 117
- zero-cost strategy, 34, 66, 68, 85, 107
- zero-coupon bond, 60, 63, 64, 68
- zero-coupon discount bond, 100

This is a preview version containing parts of the following book:
Z. Kakushadze and J.A. Serur. *151 Trading Strategies*. Cham, Switzerland:
Palgrave Macmillan, an imprint of Springer Nature, 1st Edition (2018), XX,
480 pp; ISBN 978-3-030-02791-9. Full version:
<https://www.springer.com/us/book/9783030027919>. Copyright © 2018
Zura Kakushadze and Juan Andrés Serur. All Rights Reserved.

zero-coupon government Treasury curve,

96

zero-coupon inflation swap, 99, 100

zero-coupon swap, 99

This is a preview version containing parts of the following book:
Z. Kakushadze and J.A. Serur. *151 Trading Strategies*. Cham, Switzerland:
Palgrave Macmillan, an imprint of Springer Nature, 1st Edition (2018), XX,
480 pp; ISBN 978-3-030-02791-9. Full version:
<https://www.springer.com/us/book/9783030027919>. Copyright © 2018
Zura Kakushadze and Juan Andrés Serur. All Rights Reserved.

