The Physics of Wall Street: A Brief History of Predicting the Unpredictable

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The Physics of Wall Street: A Brief History of Predicting the Unpredictable James Owen Weatherall After the economic meltdown of 2008, Warren Buffett famously warned, “beware of geeks bearing formulas.” But as James Weatherall demonstrates, not all geeks are created equal. While many of the mathematicians and software engineers on Wall Street failed when their abstractions turned ugly in practice, a special breed of physicists has a much deeper history of revolutionizing finance. Taking us from fin-de-siècle Paris to Rat Pack-era Las Vegas, from wartime government labs to Yippie communes on the Pacific coast, Weatherall shows how physicists successfully brought their science to bear on some of the thorniest problems in economics, from options pricing to bubbles.

The crisis was partly a failure of mathematical modeling. But even more, it was a failure of some very sophisticated financial institutions to think like physicists. Models—whether in science or finance—have limitations; they break down under certain conditions. And in 2008, sophisticated models fell into the hands of people who didn’t understand their purpose, and didn’t care. It was a catastrophic misuse of science.

The solution, however, is not to give up on models; it's to make them better. Weatherall reveals the people and ideas on the cusp of a new era in finance. We see a geophysicist use a model designed for earthquakes to predict a massive stock market crash. We discover a physicist-run hedge fund that earned 2,478.6% over the course of the 1990s. And we see how an obscure idea from quantum theory might soon be used to create a far more accurate Consumer Price Index.

Both persuasive and accessible, *The Physics of Wall Street* is riveting history that will change how we think about our economic future.

The Physics of Wall Street: A Brief History of Predicting the Unpredictable Details

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ISBN	:	9780547317274
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From Reader Review The Physics of Wall Street: A Brief History of Predicting the Unpredictable for online ebook

Lyndon says

A better review is worth putting up. One illustrious professor of finance wrote an 18-part blog series on why this is the worst book in the world, or at least arrogant and inaccurate (http://www.minyanville.com/business-n...). That series is indeed very informative; to date I haven't quite finished it, but I have finished the book and found it terrific (not knowing so much about economics). The former CFO of Microsoft (a former chair of NASDAQ) praises this work by James Owen Weatherall, agreeing from the back cover with several other luminaries, mostly in finance. Weatherall has a PhD in physics and teaches Logic and Philosophy of Science at UC Irvine. He interviewed all "physicist"-economists in question (he is a little too inclusive about physicists, for example calling the applied mathematician Benoit Mandelbrot a "physicist" to streamline his point) and had them read drafts for accuracy, or else found surviving family members or associates.

The style is easy to read. Equations turn books to depleted uranium on the shelves, but a few equations would have been nice. What drew me to this book was the possibility of learning more about the association between entropy/thermodynamics and real economies. Weatherall did not discuss the particular question I had, but information theory came in from several corners and filled out my appreciation of the subject. Not to mention: I know a great deal more - even with a few glossed-over simplifications, as pointed out carefully in the long critique linked above - about financial markets than I knew going in. A great deal more!

As the book's leading critic (see link above) says, The Physics of Wall Street is a good jumping-off point for a more in-depth correction of its oversights and simplifications. I feel that this fellow has slightly misunderstood the purpose and audience of the book. While the following statement is not always popular, there is an element of truth in it: teaching is often controlled lying. If Weatherall teaches by controlled lying, he makes a gentle and compelling introduction; if inadvertently by naive arrogance, the result is not dramatically different. It is Weatherall's opinion that traditional finance is closed to certain ways of thinking, and we need a kind of Manhattan Project to get more people brainstorming; the blog-series author takes this quite personally and returns the attack on physics departments. None of that is particularly relevant. It's just flavor. People glom onto opinions, especially after a major stock-market collapse, and everyone has opinions to offer.

The real purpose of the book is quite simply to show how physics enthusiasts, and ideas from physics, have unexpectedly contributed to economics. The point is not, as the critic has misinterpreted, to show that physicists have done all the work all along. Weatherall says otherwise repeatedly, throughout the book. He is very clear about his motivation in writing the book, and even his initial need for his advisor to say the idea for the book might have enough merit and material to pursue.

My five-star rating has more to do with how much I got from this book (and its long outside responses!) than with any pretense at measuring its objective value. (The same goes for every review I write with a score on it!)

Andrewcharles420 says

A great primer or history of the mathematics of finance, and the interplay between theory and empirical results. This book does a good job of showing how scientific economic theories are intuited and build upon

one another, and how their complexity increases with the maturity of the field. Clearly written, with well illustrated connections between the principal actors and suggestions of their motivations. There is a surprisingly deep connection between physics and quantitative economics--and we shouldn't put [all] the blame of recent economic problems at the feet of the so-called quants. Unfortunately there were very few actual equations printed--I would not have minded to see some math--but the theories were all generally explained using intuitive metaphors, and the figures at least were instructive.

A chapter near the end of the book introduces gauge theory without doing a very thorough job of telling what the implications are, or of how this could be used to make money, or predict a market--which all of the other chapters and methods do. It was said that this might best have an impact on public policy. In the epilogue the author writes that gauge theory was mentioned as a possible new direction for economics to go--it was one of many areas of interest in economic analysis, but not necessarily one that will 'win' or be widely used. This seems a little speculative or premature to include in the book's analysis, and, as he mentions, with the sluggish inertia of economic policy it seems like we'll have a long time to wait before it might pay off.

I would have liked to hear something about high-frequency trading, something commonly used to demonize quants that I'm still unsure of the benefits of (societally, or to the market--I'm sure individuals can use high-frequency trading much to their advantage). I also think some game theoretic ideas might help elucidate some trading behaviors, and perhaps addressing how feedback of these schemes affects the markets (though this was probably included in predicting market instability--the dragon kings--if not elsewhere). Perhaps I'll peruse the notes and references section a little better to see if there's a suggested book for continuing this analysis.

I was encouraged to read this book after seeing the author, James Owen Weatherall, give a very captivating, multidisciplinary lecture on the nature of the relationship between Newton's and Einstein's laws of gravity--at a philosophy seminar, of all places. I hope he continues to write about multi-field-spanning ideas!

Thomas Martino says

This book won't get me rich : (

Jonathan Chen says

The author is a physics professor and someone who holds academics in high regard. The latter becomes a big problem later on in the book.

The good chunk of the book is devoted to the history of how academic and finance intersect. The section on a Louis Bachelier, whose pioneering work was largely ignored by his peers, was particularly fascinating. Other interesting anecdotes include Edward Thorp, a mathematician who beat the casinos at blackjackHowever, and how the DuPont team that invented pantyhose came to head the Manhattan project. However, the ultimate problem is Weatherall's aim at linking research and success in finance and economics (i.e. predicting the unpredictable). He makes a ridiculous claim that all is needed to reshape the world's economic policies for the better, is an interdisciplinary conference (with physicists, of course), dubbed the New Manhattan Project.

The problem that Weatherall glossed over, is that academics haven't exactly been able to predict the unpredictable. Yes, there are a few hedge fund managers with strong academic backgrounds (see "The

Quants: How a New Breed of Math Whizzes Conquered Wall Street and Nearly Destroyed It" by Scott Patterson), but they were not immune from catastrophic losses during the 2008 financial crisis. In fact, the two of the academic giants lauded by Weatherall, Merton and Scholes, were the key founders of Long-term Capital Management.
However, their roles in LTCM's collapse was barely mentioned in the book (basically, their mathematical model failed). Weatherall seems to claim that, science can be used to "crack" the problems in finance and economics, if only we put enough scientists (preferably physicists) together.

Ultimately, I am of the opinion that finance/economics are not scientific problems that can be solved, like a mathematical formula. If that were the case, we'd have more obscenely rich scientist-turned-hedge-fund-managers, or better economic policies derived from Kaynes and Freeman. Talib's "Black Swan" is much more appealing because it has the humility to concede that we cannot predict the unpredictable (therefore the Black Swans happen more frequently than mathematical models predict, e.g. LTCM and every financial crisis)

Alberto says

I was going to give this book 3 stars as I was not particularly impressed. Midway through the book, I could already see that it had two very big flaws.

First, there's not as much meat as I was hoping for. In particular, he goes in for very long tangents unrelated to Wall Street, e.g., the creation of nylon and the Manhattan Project. Those are great topics, but if I wanted to read about that there are many fine books about the Manhattan Project (don't know about the creation of nylon). I wanted to read about the physics of Wall Street.

Second, he is extremely overly enamored with the idea of the use of physics in financial markets. He strongly implies that if you have the right model you can predict financial markets. He talks about randomness a lot, but he seems to be thinking of it as if it were statistical mechanics, where exact predictions can nevertheless be made. He remains blissfully unaware of the nature of financial risk and the unpredictability (rather than randomness) of financial markets.

However, what made him lose one more star was his epilogue. He quotes Taleb and his mistrust of financial models. I am not a fan of Taleb, whose writings consist mainly of belaboring the bleeding obvious. However, the obvious point about extreme fat tails and the unpredictability of extreme events seems to have totally eluded the author. He actually reasons by analogy that if Taleb were right then we'd never build a skyscraper because it could be hit by a meteor. At the risk of breaking out the hand-puppets for Dr. Weatherall, the difference between those two situations is obvious. A meteor striking a skyscraper is an externality. The engineering models used in constructing the building never intended for the building to survive a meteor impact. Financial extreme events, on the other hand, are an intrinsic part of what's being modeled. Surviving October 1987 or the Great Recession is precisely what Weatherall's mythical models are supposed to do.

Bottom line: This book is not worth reading, either by the layman or the specialist.

Angela says

Journalistic wish-wash. Some stories are interesting for entertainment value but opinions by author ironically highlight his own lack of rigor.

Asif says

Loved this book. While being a book on how finance was influenced by physics it managed to get me really interested in some physics concepts. The history of how physicists got involved in finance is very interesting by itself.

Russ says

I don't understand the purpose of this book. I though it would describe how physicists gave up science for Wall Street. It comes across as the type of book you'd find in a college's career center.

Kevin P Webb says

The role that Math & Physics plays on Wall Street has a controversial and complicated history. This book was a fun read and helped provide an historical context to place people like Thorp, Black, Simons, Mandelbrot and others from just the criticisms or praises I've heard/read elsewhere about them. In the controversy surrounding the EMH (Efficient Markets Hypothesis), the point that Weatherall makes about the Scientific Process as applied in the Financial Markets is a good one:

"...the methodology in action: one uses simplifying assumptions to make a problem tractable and solve it. Then, once you see how your solution works, you can double back and begin asking what happens when you play with your assumptions. Sometimes you realize that your original solution is no good, because it depends too heavily on assumptions that never really apply; other times, you discover that the solution is pretty good but can be improved in simple ways; and other times still, you realize that your solution is great under certain circumstances, but you need to think about what to do when those circumstances don’t apply." [Weatherall, James Owen (2013-01-08). The Physics of Wall Street: A Brief History of Predicting the Unpredictable (p. 209). Houghton Mifflin Harcourt. Kindle Edition.]

This seems like a reasonable assertion and builds on the point made earlier in the book (something that seems lost perhaps on many Quants and those that use their models) regarding the distinction between a model and a theory:

"A theory, at least as it is usually thought of in physics, is an attempt to completely and accurately describe some feature of the world. A model, meanwhile, is a kind of simplified picture of how a physical process or system works." [Weatherall, James Owen (2013-01-08). The Physics of Wall Street: A Brief History of Predicting the Unpredictable (p. 20). Houghton Mifflin Harcourt. Kindle Edition.]

And whether one looks at the events of the Great Financial Crisis and calls into question whether Physics/Mathematics is beneficial or not, the warning at the close of the book provided by the reference to

Derman and Wilmott's Manifesto is a sobering reminder:

"Derman and Wilmott, in their Manifesto, make this point quite clearly. We should never mistake a good model for the “truth” about financial markets. The most important reason for this is that markets are themselves evolving, in response to changing economic realities, new regulations, and, perhaps most importantly, innovation ." [Weatherall, James Owen (2013-01-08). The Physics of Wall Street: A Brief History of Predicting the Unpredictable (p. 209). Houghton Mifflin Harcourt. Kindle Edition.]

This book would make an excellent read for anyone remotely interested in the underpinnings of a still unresolved debate within the halls of Wall Street and Academia. And, as a side note, if you have ever heard the Hedge Fund named Renaissance mentioned in hushed and reverent tones the close of the book should inspire you to read further...

"The people charged with running the world’s economies should be as good as Renaissance. In fact, they should be better." [Weatherall, James Owen (2013-01-08). The Physics of Wall Street: A Brief History of Predicting the Unpredictable (p. 225). Houghton Mifflin Harcourt. Kindle Edition.]

Micah Neely says

Sort of like Michael Lewis finance journalism in tone but less skeptical of the whole enterprise. Less of a narrative, but a little better about getting into the gritty facts. As always, I'd like more math, but that wouldn't sell, would it?

Enjoyed.

Loraine says

I very much enjoyed this one. You don't have to be a physicist to catch all the author wants us to understand. He does a very good job of popularizing the science involved. There is more story-telling and history than science anyway, and that makes it quite entertaining. I particularly loved all the examples of borrowing between different disciplines like beating odds at gambling to predicting stress fractures in Kevlar to earthquakes to wall street and beyond. Quite fascinating and surprisingly took away the "ick" factor that I had previously associated with Wall Street quants.

Grumpus says

The quote that stands out for me from this book is, “The business of prediction has become an industry.”

I am always tinkering around in Excel spreadsheets building models in my unsophisticated, non-formally trained manner, trying to predict everything from various customer behaviors at work to stock prices and lottery numbers in personal life. While I’ve had some success at work and on picking stocks that meet my goal of making a 5% profit in nine days or less (in which I consider myself a long-term day trader), I have not hit upon anything that helps with lottery numbers (obviously).

Anything related to successful modeling or predictions are always awe inspiring to me and I eagerly long to be one of those success stories by stumbling into the hidden pattern in the data. Oh, to find the secret key! The ability to live vicariously through successful individuals in this trade, is the reason this book originally appealed to me.

I thoroughly enjoyed this brief history of predicting the unpredictable . I originally gave this a 3-star rating. However, after coming back few days later to write these comments, I have now increased it to 4-stars because it has again encouraged me to continue to work on my models and more importantly. . .to dream. . . and discover.

Sven Weber says

The book started nice but got worse from chapter to chapter. It should definitely have another title: Physicists of Wall Street. But even then: the author is loosing the path of the story after the first two chapters. It is nice to tell all these little stories how a physicist turns into a hedge fund manager but what does this really mean? Btw: being a physicist managing a VC fund myself.

David says

This book is a wonderful introduction to history of predicting stock prices using mathematics and concepts from physics. It is basically a history of pricing models; from the earliest mathematical models to the most modern ones. Of course, the best ones are maintained in secret by some super-secretive investment companies, for good reason. The only way a pricing model can be profitable is it to be better than most others being used.

The author, James Weatherall, has a PhD in physics, and is presently an assistant professor of logic and philosophy of science at the University of California, Irvine. He writes with clarity and an engaging style. His narrative follows a logical path, and does not take big diversions along the way.

Now, many of the subjects of this book are not physics at all, but applied mathematics. For example, the so-called "black box" model does not use any physics, but use purely statistical associations that are discovered algorithmically. Their name stems from the fact that they are opaque; they may make accurate predictions, but they offer no insight into the reasons for their predictions. Hence, it is difficult to judge how much confidence should be given to their results. But, for example, a model that predicts an investment strategy that returns a hundred times the S&P 500 over a fifteen-year period is nothing to be sneezed at.

Some of the models are definitely an application of physics concepts, such as the gauge theory model. I find if fascinating that this arcane physics concept has some practical applications in economics and predictions.

Some people blame these computer models for the disastrous economic downturns and stock market volatility that occur from time to time. While Weatherall sympathizes with this attitude, he wholeheartedly endorses the models, as they are simply tools. Sometimes, the assumptions and limitations of these tools are ignored, with dire consequences.

Ami Iida says

It's the relationship among math, finance, physics, and chaos fractals.
