

*Models for Real-World Investors, and the Abyss Between
Value Investing and Financial Engineering*

Donald Richards

Penn State University

You may have come here today expecting to find formulas, theorems, and proofs, to enable you to make money in the financial markets without ever again having to think

I am (mildly) sorry to say that you're going to be disappointed.

My “models” will use very little math, and you will have to think

But don't rush to the exits; you'll benefit from our discussion

Model: The way in which *real-world investors* should *invest* their clients' funds.

Clients: People like us, living in central PA, with cold winters

Recent retirees, or people hoping to retire soon

Parents facing college-tuition bills

Widows, widowers, orphans, etc.

Your family, friends, colleagues

You worked hard for many years to save that money, and you hope that your money managers will do their best for you

“Real-world” money manager: One who manages the pension, college-tuition, or grandchildren savings funds of people like us

Real-world money managers should remember always that they handle hard-earned pension, college-tuition funds, etc.

Real-world clients have *every* right to:

- Request their funds at *any* time

- Expect managers to act always to minimize potential losses

- Expect a reasonable increase in their funds after five years

- Expect managers to exercise *fiduciary responsibility* always

Fiduciary responsibility: A duty to handle finances in a trust-worthy manner; to represent the clients best interests

The adjective “real-world” surely is redundant when used to describe an “investor”

All “investors” are in the real world. If not, their real-world clients may regret it

Casino Royale: A real-world money manager who should have attended this talk

Note: We have not yet defined the word “investor,” but we will get to it

The Good Old Days

Traders (speculators or investors) generated the full range of emotions in the public eye

“Investors” were admired when things went well

“Speculators” were detested when things went badly

I noticed that Exxon was blamed recently for the high price of gasoline; the old days are back with us!

Fair disclosure: My pension fund owns a few shares of Exxon

The Good Old Days: There were very few *recorded* rules on how to be systematically successful at investing or speculation

Lots of non-systematic advice was passed between generations as word-of-mouth rules: “wisdom,” “experience,” etc.

This gave rise to well-known sayings, e.g.,

Buy low, sell high

Buy cheap and sell dear

Buy when there’s blood in the streets (the Rothschilds)

Buy when the cannons boom; sell when the trumpets sound

Dickson G. Watts, “Speculation as a Fine Art and Thoughts on Life.”

Gauss knew something; he traded in government bonds but left no records

One biography of Gauss notes that, on a relatively small salary, he left a very large estate

Walter Bagehot, “Lombard Street: A Description of the Money Market,” 1873

Hartley Withers, “The Quicksands of the City, and a Way through for Investors,” 1930

Let’s move forward to the 20th century: the 1930’s

Benjamin Graham

The “father of financial analysis”

The “father of value investing”

The “Dean of Wall Street”

His father died when he was quite young, and his mother raised the family on her own

Graham graduated from Columbia in 1914 and was admitted to the graduate programs in mathematics*, philosophy, and English

He instead went to work to help support his mother and siblings

* *Graham, "Some calculus suggestions by a student," Amer. Math. Monthly 24 (1917), 265–271*

Graham lost a lot of money in The Great Crash in 1929 and the ensuing depression

He wrote of how badly he felt by the loss of his clients' funds and how hard he worked to recover them

Graham and David Dodd prepared comprehensive rules for analyzing securities

Graham and Dodd, [Security Analysis](#), 1934

The “bible” of value investing

Graham, [The Intelligent Investor](#), 1949

Margin of Safety

Graham's central idea: Margin of Safety

When you buy a stock or bond, don't cut it close

Buy only if the company's financial condition AND stock price are heavily in your favor

To buy is to choose to participate in the economic future of a particular enterprise

You should buy only if the worst-case scenario is improbable (bankruptcy? sleepless nights?)

In the worst case, you want your money back *in real terms*

Waiting for 29 years to get your money back in nominal terms?

Graham and Dodd developed rules for estimating the *intrinsic value* of a company

Purchase shares at a price lower than what you can get by shutting down the company and liquidating all assets in a fire sale

Calculate the company's net current assets per share (total current assets minus all liabilities)

Buy the shares if the price on the stock exchange drops below the net current asset value per share

Graham used this formula with lots of success: GEICO

Graham's students and followers also have done well

Graham's rules seem to work today only if markets are at extremely low levels (e.g., Japan in the '90's; ?? in 2012)

Martin Whitman (p. 4): Variations on Graham's valuation rules

Each stock market book presents a model for money managers

Graham's "The Intelligent Investor" is superb

Tweedy, Browne's letters to their shareholders

Whitman & Shubik, "The Aggressive Conservative Investor,"
1979

Warren Buffett

Buffett saw that few stocks reached Graham's bargain basement levels anymore, so he developed variations

Buffett's partnership (1957-1969) beat the Dow Jones Industrial Average every year

Total return of 2,749% vs. the Dow's 152.6%

Here is a graph of Buffett's partnership performance

Buffett bought control of Berkshire Hathaway Inc. in 1965

1965-2006

Berkshire Hathaway beat the DJIA in 36 of those 41 years;

Berkshire Hathaway's after-tax total return: 305,134%

Dow's pre-tax return: 5,583%

James R. Thompson, et al. (2003), "Models for Investors in Real World Markets," p. 220:

"As some readers may know, [Warren Buffett] turned a \$10,000 investment in 1955 into \$250 million today ..."

6/30/06-2/8/08: BRK is up 50%; the DJIA is up 11%

Buffett's most important contribution

Over 220,000 people are employed at Berkshire Hathaway

A “stock” is more than a wiggling line on a graph

It's a share of an economic enterprise

It involves the lives of real-world people, like you and me

The future of this country, as an on-going democracy, is highly dependent on economic stability

We academics should endeavor to shun any practices that encourage economic instability

A story about Enron

What is an “investment”?

Graham’s definition, taken from “The Intelligent Investor”

“An investment operation is one which, upon thorough analysis, promises safety of principal and an adequate return. Operations not meeting these requirements are speculative.”

Key words and phrases:

- thorough analysis
- safety of principal
- adequate return

You’re a speculator if your operation omits any of these items

Stanley Kroll: Most speculators lose money

Graham's Principle:

If it is a good investment then it is a good speculation

If it is a good investment then you may well make far more than an adequate return

If you continually make good investments then you'll probably do better than most speculators

Buffett lives by Graham's "Margin of Safety" rules: "You don't try to buy businesses worth \$83 million for \$80 million"

Graham deplored the use of the word "investor" to describe anyone who is trading stocks. Me too.

Graham also deplored the way the stock market was treated like a gambling casino, right down to the "blue chips" terminology.

When Buffett buys a company's shares, he seems prepared to keep the shares even if the stock market closes for 10 years

Mathematical models for real-world investors

Bachelier, 1900: Brownian motion model for financial securities

Optimal portfolio selection, Efficient Market Hypothesis (EMH)

Capital Assets Pricing Model, the Black-Scholes formula

Modern portfolio theory, post-modern portfolio theory

An enormous literature on the mathematics of arbitrage, options, derivatives, financial math, financial engineering

Behavioral finance: Study “cognitive biases” of “investors”

The behavioral finance folks seem to be experts at explaining why you lost money last time

Big controversies about whether or not the EMH is valid

My advice to us little people: Treat the EMH as irrelevant

A future pension report: “Dear Shareholder, in proving that the EMH is valid, we’ve lost 100% of *your* funds ...”

I’m no fan of financial engineering (ditto for Graham, Buffett, Whitman, Tweedy-Browne, Lowenstein, Klarman)

Still, I’ll mention four problems which academics can address and which are of interest to real-world managers

I will pose the problems in a broad way; I’m not after research papers

Hidden Markov models

A simple Markov chain model for the weather

We tracked the weather for 5 years and noticed a pattern:

		Tomorrow	
		Good	Bad
Today	Good	65%	35%
	Bad	45%	55%

This called a *transition matrix*

Question: If the weather on 12/1/06 is good then what is the chance that the weather will be good on 12/21/06?

Solution: Multiply the transition matrix by itself 20 times

Question: What are the *transition probabilities* which will take us from 12/1/06 to 12/1/26?

Replace “weather” by “stock market”, “good” by “up”, “bad” by “down”

Bad news: This method is too simple to do well for the stock market

There are too many “exogenous” events which affect the stock market

The stock market has long-range memory (its behavior on days three months apart can have high “correlation”)

Hidden Markov models: A generalization of Markov models

Invented to model data which have long-range memory and where “hidden” decisions which influence the data

A large corporation decides to acquire a smaller competitor, but the news was leaked (insider trading?), causing abnormal stock price fluctuations

In a hidden Markov model, we have a transition matrix, a finite set of “states,” and a set of observed outcomes

We can see the actual outcomes of the process, but the states are hidden from us

Problem 1: Develop a hidden Markov model approach which matches the S&P 500 over moving 5-year periods after taxes, commissions, and stratospheric manager salaries

Restrictions: No short-selling, leverage, or arbitrage

No trading of puts, calls, options, synthetics, derivatives

Match Buffett over moving 5-year periods (good luck!)

Buffet's headaches from dealing with derivatives (Mark Twain)

Jia Li and I: Unpublished research on hidden Markov models (“unpublished” because I’m scared of losing little folks’ money)

Edgar Peters: Chief investment officer of PanAgora Asset Management

“Chaos and Order in the Capital Markets” 1996

“Patterns in the Dark: Free Markets, Complexity, and the Need for Uncertainty” 1999

We all want to know if and when the stock market might crash

The River Nile: Floods are truly a life-and-death matter for residents of the Nile River valley

For us mutual fund clients: If we lose all our money, hey, it's only paper!

“Chaos and Order”: A model based on calculating the Hurst parameter for the stock market

Peters’ approach uses all data going back to the 1950’s

It should be possible to *estimate* the parameter more efficiently and as accurately using random sampling

Problem 2: Find more efficient schemes for carrying out Peters’ calculations

Peters' comments:

The “overall investment philosophy at PanAgora is that market inefficiencies occur because ... people overweight information which they believe they understand, and they underweight information which they don't understand or that doesn't fit in with their concept of how things are. A good example of this is the recent tech bubble. ...”

Note carefully: Peters feels that the EMH is invalid and states that PanAgora's investment philosophy exploits that invalidity

Peters and his group did just fine during the turbulent times of 1999-2003

James R. Thompson, et al. “Models for Investors in Real World Markets,” 2003: An intriguing book

Perform a fundamental (Graham-style) balance sheet analysis of a company

Use novel methods to estimate the company’s future earnings

Apply stochastic differential equations to predict its future stock price, likelihood of dropping sharply during short-term market downturns

Problem 3: Improve on Thompson, et al. with no increase in the complexity of the mathematical techniques used therein?

Joel Greenblatt, “The Little Book that Beats the Market”

Another intriguing book: Written for 12 year olds

Rank all U.S. stocks by return on capital (x) and by earnings yield (y). Then rank all stocks by $x + y$

Is $x + y$ too easy to be true?

Greenblatt provides evidence that the formula will return about 17% compounded annually over 10-year periods.

Problem 4: Is there a better ranking based on x and y only?

Your ranking should be a simple function of x and y ; no calculus; simple enough for 12 year-olds.

Buffett's historical record: Ignore it at your peril

What should we do starting here and now? Buy Google?

My advice: Find managers who follow Graham's principles

Where do we find such people?

Tweedy, Browne's article: [What has Worked in Investing](#)

Buffett's article, "The Superinvestors of Graham-and-Doddsville" in an appendix to "The Intelligent Investor"

The results of a group of investors who follow Graham and Dodd

I found the group's long-term compound returns remarkable

I was more fascinated by how they avoided losing money

They lost money (temporarily) only when the rest of the market went crazy

Richards' Theorem: Any time is almost always a good time to buy shares in true-blue value funds. A terrific time to buy shares in those funds is when they have LOST money!

Corollary: Almost anytime is a bad time to sell shares in true-blue value mutual funds.

And where do you find these true-blue value funds?

Louis Lowenstein, professor emeritus of finance and law,
Columbia Univ.

“Sense and Nonsense in Corporate Finance” 1991

“Searching for rational investors in a perfect storm”, J.
Corporation Law, 30 (2005), 539-565

Which mutual funds avoided the boom/crash years of '99-'03?

Nicholas-Applegate Global Tech Fund: Up 325% during
1/1-11/17/99; terrible losses in '00-'03; now defunct

Lowenstein asked Robert Goldfarb of the Sequoia Fund for a list
of 10 true-blue, Graham-style, value mutual funds

Goldfarb's off-the-cuff list:

Clipper Fund	Mutual Beacon
FPA Capital	Oak Value
First Eagle Global	Oakmark Select
Longleaf Partners	Source Capital
Legg Mason Value	Tweedy, Browne American Value

Richards' off-the-cuff additions to Goldfarb's list:

Cundill Value	Third Avenue Value
Sequoia Fund	Vanguard Windsor II
Davis Funds	Wintergreen Fund

None of these 16 funds suffered permanent losses in '99-'03

They did this by using plain-vanilla Graham-style principles

Investing is about commonsense, ethics, morality, accounting,
not high-level mathematics

Also important: An appreciation of the classics

Buffett: “Once you have ordinary intelligence, what you need is the temperament to control the urges that get other people into trouble in investing.”

See “The Intelligent Investor”

The Abyss Between FE and Value Investing

“Let us mince no words at the outset” (“The Intelligent Investor,” p. 228)

My view: Financial engineering is too abstract and theoretical; heavy duty mathematics; little or no regard for the real world

The literature seems to be of little use, if any, to managers of “little-people money”

Christopher Browne has joked that he and his colleagues should endow chairs in academia to fund professors who teach EMH

When professors train students in EMH theory, it makes life easier for bargain-hunting money managers

Note: My criticisms come from someone who is well-disposed to higher mathematics

If I see the financial engineering literature as impractical then, maybe I'm not as smart as the authors but, I won't let their students manage my hard-earned money

Financial engineers need to ask the fundamental questions:

Why are their journal publications of no interest to many prominent real-world money managers?

When do they start to bridge the abyss?

Theory vs. Practice

Some financial engineering assumptions (“Theory”) vs. real-world conditions (“Practice”):

Theory: The number of assets is fixed

Practice: The number of assets is random

Theory: Risk is quantified by beta, a measure of volatility

Practice: Risk is measured by “how much we can lose and the probability of losing it.”

See [Seth Klarman's comments](#) on risk

Martin Whitman: At times, the risk is lowest when volatility is highest and people are scared (General Motors' bonds)

Theory: A “continuum” (and therefore infinite number) of traders

Practice: A finite number of traders, random in number (in times of panic, there may be no buyers)

Theory: All traders are assumed to be rational and competitive

Practice: The majority of traders, plausibly, lose money over the long term and therefore are irrational

See “The Intelligent Investor,” p. 325, for the incredible-but-true story of the Aetna Maintenance Co.

As for traders being “competitive,” have you heard of insider-trading? Competitive with whom?

Theory: Market makers are competitive.

Practice: Some market makers pleaded guilty recently to federal indictments for front-running

Competitive with whom?

Theory: “To enhance tractability of the model, we assume that all random variables are normally distributed”.

Practice: Assumptions are the parents of permanent loss of capital (bankruptcy).

A future annual report: “We lost all your money because the stock market contained two non-normal random variables ...”

Theory: Research papers that study the “thermodynamics of the stock market”

Practice: I fear that the authors of those papers are “trying to substitute theory for experience, and usually also to give to speculation the deceptive guise of investment.”

Theory: A graph, appearing in certain academic papers, which shows that the market “conforms to Marčenko-Pastur” and provides an arrow labeled “Market”

Fall, 2006: Neither Jack Silverstein nor I can get a clear explanation of how this graph is related to the stock market. When we asked, we were told:

Practice: “They surely know what they’re doing because they’re running a hedge fund”!

J. K. Galbraith: “The end was at hand but was not yet in sight”

I recommend that us real-world people stay away from financial engineers

An insidious consequence of financial engineering

The literature has many results which start with:

“The stock market consists of n risky assets. Let p_i be the proportion of our funds which we put into the i th risky asset ... Then (p_1, \dots, p_n) is a vector in the *open unit simplex* ...”

Each proportion p_i is strictly positive and they add to 1

When the FE folks enter the real world, will they put a portion of their money into each and every stock?

FE folks seem willing to trade anything

Imagine a restaurant that will cook anything: stale carrots, veal

You'd be gullible to say, eagerly, “Bring it on!”

The FE crowd, by being willing to trade everything, seem to be:

Unable to distinguish between sense and nonsense in corporate finance

Believe in The Greater Fool Theory: We may be fools to buy Enron but we'll flip it to a greater fool

Thompson and Williams: "Future Enrons await, unless ..."

Financial engineering made it easier for Enron to maintain a facade longer after value investors smelled a rat

FE may foster the development of fraudulent corporate operators

None of the 16 Graham-style funds owned a share of Enron

Going beyond assumptions in a financial engineering book

In the middle of an abstract theorem, they'll suddenly make a comment about a related real-world item

The authors repeatedly serve tantalizing real-world data on the dollar value of American put options traded in 1994, etc.

Real-world data interlaced repeatedly with FE theory

The reader's mouth kept watering in the hope that concrete stuff was just around the corner

As for the Efficient Market Hypothesis, read the incisive and trenchant comments by Whitman, Browne, and by Lowenstein

Still, the tide may be turning

Thompson, et al., “Models for Investors in Real World Markets”

They use high-level math, but only for high-quality companies

Thompson, et al. are willing to eat at only the finest restaurants!

The FE crowd may have much to learn from this book.

The FE crowd seem unaware that the money managers they influence are handling the sweat-and-blood-saved money of little people

It is unwise to assemble abstract theorems that may enable fraudulent behavior

It may be arrogance to write material which seems to be (sort-of) linked with the real world

It even suggests a lack of concern for “the whole truth”

No overriding concern for the kind of truth which can't be exploited by fraudsters

On Bullshit

And speaking of a lack of concern for truth ...

Some time ago, I bought “On Bullshit,” a little book by Harry Frankfurt, professor emeritus of philosophy, Princeton University

I noticed some strong resemblances between FE and some b.s.-type behavior described in Frankfurt’s book

Let’s watch a short movie containing an interview of Prof. Frankfurt

By means of this movie, we’ll see strong resemblances between some aspects of FE and “buncombe”

[Frankfurt’s interview](#)

Note Frankfurt's comment connecting b.s. with arrogance, and the increasing amount of b.s. due to the constant marketing of products (stocks, bonds, auction-rate securities, CPDOs, ...)

The correlation between "level of [formal] education" and "production of b.s."

"humbug, balderdash, claptrap, hokum, drivel, buncombe, imposture, or quackery" all come from Frankfurt's book.

Why, then, should our students study FE? Well, maybe they shouldn't

I think we need some students to learn the language so as to be able to understand and repel the worst of the FE stuff

Some ageless comments from Benjamin Graham

“The Intelligent Investor”:

p. 37:

“The work of a financial analyst falls somewhere between that of a mathematician and an orator.”

Graham is very clear that, in the financial markets, the precision of mathematics is a false precision:

p. 147:

“... security analysts today find themselves compelled to become most mathematical and ‘scientific’ in the very situations which lend themselves least auspiciously to exact treatment.”

The Warning!

p. 321 of “The Intelligent Investor”:

“In forty-four years of Wall Street experience and study I have never seen dependable calculations made about common-stock values ... that went beyond simple arithmetic or the most elementary algebra. Whenever calculus is brought in, or higher algebra, you could take it as a warning signal that the operator was trying to substitute theory for experience, and usually also to give to speculation the deceptive guise of investment.”

Seven important questions to ask of any FE speaker

Have you (personally) ever bought or sold a stock or bond?

Have you ever LOST money on a stock or bond purchase?

What percentage of your total pension funds have you committed to your FE models?

What percentage of your total financial assets have you committed to your models?

Does your strategy require any assumptions about the ethics of traders, brokers, market-makers, specialists, etc.?

What is your favorite book on accounting?

What is your favorite book on corporate finance?