



The Babe Ruth Effect: Frequency versus Magnitude

“In the real world there is no ‘easy way’ to assure a financial profit. At least, it is gratifying to rationalize that we would rather lose intelligently than win ignorantly.”

Richard A. Epstein
The Theory of Gambling and Statistical Logic

Batting with the Babe

A well-known and very successful portfolio manager recently told us a story that initially sounded incongruous. He explained that he was one of roughly 20 portfolio managers running money for a company. The company's treasurer, dismayed with the aggregate performance of his active managers, decided to evaluate each manager's decision process in an effort to weed out the poor performers. The treasurer figured that even a random process would result in a portfolio of stocks with roughly one-half outperforming the benchmark (in this case the S&P 500) and the other half underperforming it. So he measured each portfolio based on what *percentage* of its stocks beat the market.

The portfolio manager found himself in an unusual position. While his total portfolio performance was among the best in the group, he was among the worst based on this batting average. After having fired all of the other “poor” performing managers, the treasurer called a meeting with this portfolio manager to sort out the divergence between the good performance and the “bad” batting average.

The portfolio manager's explanation for the discrepancy underscores a lesson inherent in any probabilistic exercise: *the frequency of correctness does not matter; it is the magnitude of correctness that matters*. Say that you own four stocks, and that three of the stocks go down a bit but the fourth rises substantially. The portfolio will perform well even as the majority of the stocks decline.

Building a portfolio that can deliver superior performance requires that you evaluate each investment using expected value analysis. What is striking is that the leading thinkers across varied fields—including horse betting, casino gambling, and investing—all emphasize the same point.¹ We call it the Babe Ruth effect: even though Ruth struck out a lot, he was one of baseball's greatest hitters.

The reason that the lesson about expected value is universal is that all probabilistic exercises have similar features. Internalizing this lesson, on the other hand, is difficult because it runs against human nature in a very fundamental way. While it's not hard to show the flaw in the treasurer's logic, it's easy to sympathize with his thinking.

The Downside of Hard Wiring

In 1979, Daniel Kahneman and Amos Tversky outlined prospect theory, which identifies economic behaviors that are inconsistent with rational decision-making.² One of the most significant insights from the theory is that people exhibit significant aversion to losses when making choices between risky outcomes, no matter how small the stakes. In fact, Kahneman and Tversky found that a loss has about *two and a half times* the impact of a gain of the same size. In other words, people feel a lot worse about losses of a given size than they feel good about a gain of a similar magnitude.

con • sili • **ence**, *n.* [con- + salire to leap]
con • sili • **ence**, *n.* [con- + salire to leap]
interlocking explanations of cause and effect between disciplines
interlocking explanations of cause and effect between disciplines

Michael J. Mauboussin
212-325-3108
michael.mauboussin@csfb.com

Kristen Bartholdson
212-325-2788
kristen.bartholdson@csfb.com

This behavioral fact means that people are a lot happier when they are right frequently. What's interesting is that being right frequently is not necessarily consistent with an investment portfolio that outperforms its benchmark (as the story above illustrates). The *percentage* of stocks that go up in a portfolio does not determine its performance, it is the dollar change in the portfolio. A few stocks going up or down dramatically will often have a much greater impact on portfolio performance than the batting average.

Bulls, Bears and Odds

In his wonderful book, *Fooled by Randomness*, Nassim Taleb relates an anecdote that beautifully drives home the expected value message.³ In a meeting with his fellow traders, a colleague asked Taleb about his view of the market. He responded that he thought there was a high probability that the market would go up slightly over the next week. Pressed further, he assigned a 70% probability to the up move. Someone in the meeting then noted that Taleb was short a large quantity of S&P 500 futures—a bet that the market would go down—seemingly in contrast to his “bullish” outlook. Taleb then explained his position in expected value terms. He clarified his thought process with the following table:

Event	Probability	Outcome	Expected value
Market goes up	70%	+1%	+0.7%
<u>Market goes down</u>	<u>30%</u>	-10%	<u>-3.0%</u>
Total	100%		-2.3%

In this case, the most *probable* outcome is that the market goes up. But the expected value is negative, because the outcomes are asymmetric.⁴ Now think about it in terms of stocks. Stocks are sometimes priced for perfection. Even if the company makes or slightly exceeds its numbers the majority of the time (frequency), the price doesn't rise much. But if the company misses its numbers, the downside to the shares is dramatic. The satisfactory result has a high frequency, but the expected value is negative.

Now consider the downtrodden stock. The majority of the time it disappoints, nudging the stock somewhat lower. But a positive result leads to a sharp upside move. Here, the probability favors a poor result, but the expected value is favorable.

Investors must constantly look past frequencies and consider expected value. As it turns out, this is how the best performers think in all probabilistic fields. Yet in many ways it is unnatural: investors want their stocks to go up, not down. Indeed, the main practical result of prospect theory is that investors tend to sell their winners too early (satisfying the desire to be right) and hold their losers too long (in the hope that they don't have to take a loss). We now turn to three leading practitioners in separate probabilistic fields: investing, pari-mutuel betting, and black jack.

From OTC to OTB

Warren Buffett, undoubtedly one of the 20th century's best investors, says that smarts and talent are like a motor's horsepower, but that the motor's *output* depends on rationality. “A lot of people start out with a 400-horsepower motor but only get 100 horsepower of output,” he said. “It's way better to have a 200-horsepower motor and get it all into output.”⁵ And one of the keys is to consider all investment opportunities in terms of expected value. As Buffett's partner Charlie Munger notes, “one of the advantages of a fellow like Buffett is that he automatically thinks in terms of decision trees.”⁶ Says Buffett, “Take the probability of loss times the amount of possible loss from the probability of gain times the amount of possible gain. That is what we're trying to do. It's imperfect, but that's what it's all about.”⁷

Naturally, coming up with likely outcomes and appropriate probabilities is not an easy task. But the discipline of the process compels an investor to think through how various changes in expectations for value triggers—sales, costs, and investments—affect shareholder value, as well as the likelihood of various outcomes. Such an exercise also helps overcome the risk aversion pitfall.⁸

The expected value mindset is by no means limited to investing. A recently published book, *Bet with the Best*, offers various strategies for pari-mutuel bettors. Steven Crist, CEO, editor and publisher of *Daily Racing Form*, shows the return on investment, including the track's take, of a hypothetical race with four horses. To summarize the lesson, he writes, “The point of this exercise is to illustrate that even a horse with a very high likelihood of winning can be either a very good or a very bad bet, and that the difference between the two is determined by only one thing: the odds.” So a horse with a 50% probability of winning can be either a good or bad bet based on the payoff, and the same

holds true of a 10-1 shot. He is saying, in plain words, it is not the frequency of winning that matters, but the frequency times the magnitude of the payoff.⁹

Crist also solicits a confession from his readers, “Now ask yourself: Do you really think this way when you’re handicapping? Or do you find horses you ‘like’ and hope for the best on price? Most honest players admit they follow the latter path.” Replace the word “handicapping” with “investing” and “horses” with “stocks” and Crist could be talking about the stock market.

Yet another domain where expected value thinking is pertinent is black jack, as Edward Thorp’s best-selling book, *Beat the Dealer*, shows. In black jack, the payoffs are set, and the player’s principal task is to assess the probability of drawing a favorable hand. Thorp showed how to count cards in order to identify when the probabilities of a winning hand tilt in player’s favor. When the odds favor the player, the ideal strategy is to increase the bet (effectively increasing the payout). Thorp notes that even under ideal circumstances, favorable situations only arise 9.8% of the time; the house has the advantage the other 90.2%.¹⁰

So we see that the leading thinkers in these three domains—all probabilistic exercises—converge on the same approach. We also know that in these activities, the vast majority of the participants don’t think through expected value as explicitly as they should. That we are risk adverse and avoid losses compounds the challenge for stock investors, because we shun situations where the probability of upside may be low but the expected value is attractive.

A Useful Analogy

Long-term success in any of these probabilistic exercises shares some common features. We summarize four of them:

- *Focus.* Professional gamblers do not play a multitude of games—they don’t stroll into a casino and play a little black jack, a little craps, a spend a little time on the slot machine. They focus on a specific game and learn the ins and outs. Similarly, most investors must define a circle of competence—areas of relative expertise. Seeking a competitive edge across a spectrum of industries and companies is a challenge, to say the least. Most great investors stick to their circle of competence.
- *Lots of situations.* Players of probabilistic games must examine lots of situations, because the “market” price is usually pretty accurate. Investors, too, must evaluate lots of situations and gather lots of information. For example, the very successful president and CEO of Geico’s capital operations, Lou Simpson, tries to read 5-8 hours a day, and trades very infrequently.
- *Limited opportunities.* As Thorp notes in *Beat the Dealer*, even when you know what you’re doing and play under ideal circumstances, the odds still favor you less than 10% of the time. And rarely does anyone play under ideal circumstances. The message for investors is even when you are competent, favorable situations—where you have a clear-cut variant perception vis-à-vis the market—don’t appear very often.
- *Ante.* In the casino, you must bet every time to play. Ideally, you can bet a small amount when the odds are poor and a large sum when the odds are favorable, but you must ante to play the game. In investing, on the other hand, you need not participate when you perceive the expected value as unattractive, and you can bet aggressively when a situation appears attractive (within the constraints of an investment policy, naturally). In this way, investing is much more favorable than other games of probability.

Constantly thinking in expected value terms requires discipline and is somewhat unnatural. But the leading thinkers and practitioners from somewhat varied fields have converged on the same formula: focus not on the frequency of correctness, but on the magnitude of correctness.

N.B.: CREDIT SUISSE FIRST BOSTON CORPORATION may have, within the last three years, served as a manager or co-manager of a public offering of securities for or makes a primary market in issues of any or all of the companies mentioned.

¹ We are not equating investing to gambling. In fact, long-term investing is really the opposite of gambling. In gambling, the more you play the greater the odds that you lose. In investing, the longer you invest, the greater the odds that you generate positive returns.

² Daniel Kahneman and Amos Tversky, “Prospect Theory: An Analysis of Decision Under Risk” *Econometrica*, 47: 263-291 (1979).

³ Nassim Nicholas Taleb, *Fooled By Randomness: The Hidden Role of Chance in Markets and in Life* (New York: Texere, 2001), pp. 87-88.

⁴ Taleb points out that well-known investor Jim Rogers avoids options because “90 percent of all options expire as losses.” Rogers is confusing frequency with how much money is made on average.

⁵ Brent Schlender, “The Bill & Warren Show,” *Fortune* (July 20, 1998).

⁶ Charlie Munger, “A Lesson on Elementary, Worldly Wisdom As It Relates to Investment Management & Business” *Outstanding Investor Digest*, May 5, 1995, p. 50.

⁷ Berkshire Hathaway Annual Meeting, 1989.

⁸ Alfred Rappaport and Michael J. Mauboussin, *Expectations Investing* (Boston: Harvard Business School Press, 2001), pp. 105-108.

⁹ *Bet With the Best* (New York: Daily Racing Forum, 2001), pp. 63-64.

¹⁰ Edward O. Thorp, *Beat the Dealer* (New York: Vintage Books, 1966), pp. 56-57.

AMSTERDAM.....	31 20 5754 890	KUALA LUMPUR.....	603 2143 0366	SAN FRANCISCO.....	1 415 836 7600
ATLANTA	1 404 656 9500	LONDON	44 20 7888 8888	SÃO PAULO	55 11 3841 6000
AUCKLAND	64 9 302 5500	MADRID	34 91 423 16 00	SEOUL	82 2 3707 3700
BALTIMORE	1 410 223 3000	MELBOURNE	61 3 9280 1888	SHANGHAI.....	86 21 6881 8418
BANGKOK.....	62 614 6000	MEXICO CITY	52 5 283 89 00	SINGAPORE	65 212 2000
BEIJING	86 10 6410 6611	MILAN	39 02 7702 1	SYDNEY	61 2 8205 4433
BOSTON.....	1 617 556 5500	MOSCOW.....	7 501 967 8200	TAIPEI	886 2 2715 6388
BUDAPEST	36 1 202 2188	MUMBAI.....	91 22 230 6333	TOKYO	81 3 5404 9000
BUENOS AIRES	54 11 4394 3100	NEW YORK	1 212 325 2000	TORONTO	1 416 352 4500
CHICAGO	1 312 750 3000	PALO ALTO.....	1 650 614 5000	WARSAW	48 22 695 0050
FRANKFURT	49 69 75 38 0	PARIS.....	33 1 53 75 85 00	WASHINGTON.....	1 202 354 2600
HOUSTON	1 713 220 6700	PASADENA	1 626 395 5100	WELLINGTON.....	64 4 474 4400
HONG KONG.....	852 2101 6000	PHILADELPHIA	1 215 851 1000	ZURICH	41 1 333 55 55
JOHANNESBURG.....	27 11 343 2200	PRAGUE	420 2 210 83111		

Copyright Credit Suisse First Boston, and its subsidiaries and affiliates, 2002. All rights reserved.

This report is not directed to, or intended for distribution to or use by, any person or entity who is a citizen or resident of or located in any locality, state, country or other jurisdiction where such distribution, publication, availability or use would be contrary to law or regulation or which would subject Credit Suisse First Boston or its subsidiaries or affiliates (collectively "CSFB") to any registration or licensing requirement within such jurisdiction. All material presented in this report, unless specifically indicated otherwise, is under copyright to CSFB. None of the material, nor its content, nor any copy of it, may be altered in any way, transmitted to, copied or distributed to any other party, without the prior express written permission of CSFB. All trademarks, service marks and logos used in this report are trademarks or service marks or registered trademarks or service marks of CSFB.

The information, tools and material presented in this report are provided to you for information purposes only and are not to be used or considered as an offer or the solicitation of an offer to sell or to buy or subscribe for securities or other financial instruments. CSFB may not have taken any steps to ensure that the securities referred to in this report are suitable for any particular investor. The contents of this report does not constitute investment advice to any person and CSFB will not treat recipients as its customers by virtue of their receiving the report.

Information and opinions presented in this report have been obtained or derived from sources believed by CSFB to be reliable, but CSFB makes no representation as to their accuracy or completeness and CSFB accepts no liability for loss arising from the use of the material presented in this report unless such liability arises under specific statutes or regulations. This report is not to be relied upon in substitution for the exercise of independent judgment. CSFB may have issued other reports that are inconsistent with, and reach different conclusions from, the information presented in this report. Those reports reflect the different assumptions, views and analytical methods of the analysts who prepared them.

CSFB may, to the extent permitted by law, participate or invest in financing transactions with the issuer(s) of the securities referred to in this report, perform services for or solicit business from such issuers, and/or have a position or effect transactions in the securities or options thereon. In addition, it may make markets in the securities mentioned in the material presented in this report. CSFB may, to the extent permitted by law, act upon or use the information or opinions presented herein, or the research or analysis on which they are based, before the material is published. CSFB may have, within the last three years, served as manager or co-manager of a public offering of securities for, or currently may make a primary market in issues of, any or all of the companies mentioned in this report. Additional information is available on request.

Some investments referred to in the research will be offered solely by a single entity and in the case of some investments solely by CSFB, or an associate of CSFB.

Past performance should not be taken as an indication or guarantee of future performance, and no representation or warranty, express or implied, is made regarding future performance. Information, opinions and estimates contained in this report reflect a judgement at its original date of publication by CSFB and are subject to change. The price, value of and income from any of the securities or financial instruments mentioned in this report can fall as well as rise. The value of securities and financial instruments is subject to exchange rate fluctuation that may have a positive or adverse effect on the price or income of such securities or financial instruments. Investors in securities such as ADR's, the values of which are influenced by currency volatility, effectively assume this risk.

Structured securities are complex instruments, typically involve a high degree of risk and are intended for sale only to sophisticated investors who are capable of understanding and assuming the risks involved. The market value of any structured security may be affected by changes in economic, financial and political factors (including, but not limited to, spot and forward interest and exchange rates), time to maturity, market conditions and volatility, and the credit quality of any issuer or reference issuer. Any investor interested in purchasing a structured product should conduct their own investigation and analysis of the product and consult with their own professional advisers as to the risks involved in making such a purchase.

Some investments discussed in the research may have a high level of volatility. High volatility investments may experience sudden and large falls in their value causing losses when that investment is realised. Those losses may equal your original investment. In the case of some investments the potential losses may exceed the amount of initial investment, in such circumstances you may be required to pay more money to support those losses. Income yields from investments may fluctuate and in consequence initial capital paid to make the investment may be used as part of that income yield.

Some investments may not be readily realisable and it may be difficult to sell or realise those investments, similarly it may prove difficult for you to obtain reliable information about the value, or risks, to which such an investment is exposed. The investments and services contained or referred to in this report may not be suitable for you, it is recommended you consult an independent investment advisor if you are in doubt about those investments or investment services. Nothing in this report constitutes investment, legal, accounting or tax advice nor a representation that any investment or strategy is suitable or appropriate to your individual circumstances. Nothing in the report constitutes a personal recommendation to you. CSFB does not advise on the tax consequences of investments. You are advised to contact an independent tax adviser. Please note the bases and levels of taxation may change.

This report may contain hyperlinks to websites. CSFB has not reviewed the linked site and takes no responsibility for the content contained therein. The link is provided solely for your convenience and information and the content of the linked site does not in any way form part of this document. Following the link through this report or CSFB's website shall be at your own risk.

This report is issued in Europe by Credit Suisse First Boston (Europe) Limited, which is regulated in the United Kingdom by The Securities and Futures Authority ("SFA"). This report is being distributed in Europe by Credit Suisse First Boston (Europe) Limited, in the United States by Credit Suisse First Boston Corporation; in Switzerland by Credit Suisse First Boston; in Canada by Credit Suisse First Boston Securities Canada, Inc.; in Brazil by Banco de Investimentos Credit Suisse Boston Garantia S.A; in Japan by Credit Suisse First Boston Securities (Japan) Limited; elsewhere in Asia by Credit Suisse First Boston (Hong Kong) Limited, Credit Suisse First Boston Australia Equities Limited, Credit Suisse First Boston NZ Securities Limited, Credit Suisse First Boston (Thailand) Limited, CSFB Research (Malaysia) Sdn Bhd, Credit Suisse First Boston Singapore Branch and elsewhere in the world by an authorised affiliate. Research on Taiwanese securities produced by Credit Suisse First Boston, Taipei Branch has been prepared and/or reviewed by a registered Senior Business Person.

In jurisdictions where CSFB is not already registered or licensed to trade in securities, transactions will only be effected in accordance with applicable securities legislation, which will vary from jurisdiction to jurisdiction and may require that the trade be made in accordance with applicable exemptions from registration or licensing requirements. Non-U.S. customers wishing to effect a transaction should contact a CSFB entity in their local jurisdiction unless governing law permits otherwise. U.S. customers wishing to effect a transaction should do so only by contacting a representative at Credit Suisse First Boston Corporation in the U.S.

Please note that this research was originally prepared and issued by CSFB for distribution to their market professional and institutional investor customers. Recipients who are not market professional or institutional investor customers of CSFB should seek the advice of their independent financial advisor prior to taking any investment decision based on this report or for any necessary explanation of its contents