

the consilient observer

applying cross-discipline frameworks to investing

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

A Process for Outperformance

Thoughts on Organizing for Investing Success

*The more that you read,
the more things you will know.
The more that you learn,
the more places you'll go.*

Dr. Seuss
I Can Read With My Eyes Shut!

Ant Brain

In the fall of 2000, we gathered a small group of leading investors to hear from various finance, strategy, and business luminaries. While these presenters were terrific on balance, none got the award for creating the most buzz. That honor went to Los Alamos National Laboratory scientist Norman Johnson, who opened his talk in a seemingly inauspicious way: "I've been asked here to talk about what's wrong with experts—as an expert in this area—in a subject area, finance, that I know almost nothing about."¹

What did Johnson say to cause these smart investors to slide forward in their chairs? Simply put, he showed how diverse groups of "average" people, acting together, solve problems better than experts do. Johnson illustrated his point by discussing the behavior of social insects, including ants and bees. It was the incredible performance of these insects, above all, that sparked the imaginations of the listeners.

Most of Johnson's talk was at the macro level, or how the collective solves problems. This has obvious relevance for understanding how market efficiency arises.² Our focus here is on the micro level or how investors, *as individuals*, should organize for investment success. While the unit of analysis is different, the message is the same: diverse information and perspectives can help improve investment performance.

Now think carefully for a moment about your information sources. Do you read the same newspapers, talk to the same people, and review the same type of research reports over and over? Or do you allocate time to entertain new ideas, even at the risk of wasting time on intellectual cul-de-sacs? There is strong evidence to suggest that the leading thinkers in many fields—not just investing—benefit from input diversity.

A-Mazing

Before we dwell on the individual, we would like to show how diversity leads to better answers and how a lack of diversity can create inefficiencies. Johnson demonstrates how the collective is better than the average individual with a maze problem:

- First, he asks individuals of identical capabilities to solve a maze. Because the individuals have no global sense of the problem, they simply explore until they find a solution.

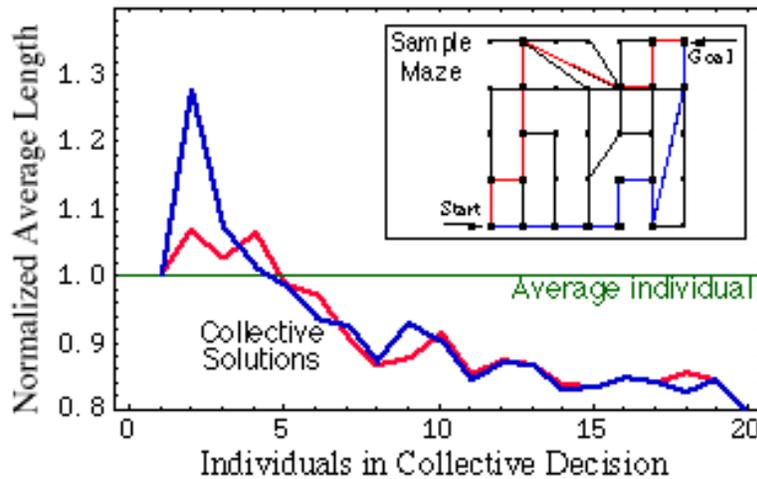
Michael J. Mauboussin
212-325-3108
michael.mauboussin@csfb.com

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

- Next, he asks the individuals to solve the problem again. With some learned information, they tend to improve.
- Finally, he constructs a linear combination of each individual's experiences and uses the same rules to find a collective solution.

Because each individual's initial search is random, a collection of individuals reflects diverse experience (maze regions), preferences (preferred paths), and performance (path lengths).³ So the collective is really just a normal individual with super information. Because of this diverse information, the collective solution is vastly more robust than average individual solution. (See Figure 1.)

Figure 1
The Collective Beats the Individual



The insert in the figure shows the demonstration maze. The main figure shows the effect on the collective solutions as more individuals contribute to the collective solution, for two different sets of random numbers. The number of steps of the collective is normalized by the average number of steps of the individuals contributing to collective solution.

Source: Norman L. Johnson. See <http://www.ishi.lanl.gov/symintel.html>.

The power of this collective effect has not been lost on nature. This is where Johnson's stories about ants come in. How do the ants do it? Foraging ants depart the nest with one job in mind, to find and retrieve food. They also have the ability to leave and follow chemical trails. At first, they disperse randomly. When the ants that find food come back to the nest, they leave a chemical trail that their sisters can follow. Studies show that this process allows ants to consistently find the shortest path to the food.⁴

Once researchers understood this collective ability, they decided to play a trick on the ants. In a controlled setting, the scientists placed two food sources at identical path lengths from the nest. As it turned out, the ants ended up using just one of the paths, although which one they chose was random. Why? Because they follow chemical trails, a couple more ants going down one path will attract other ants, triggering a positive feedback loop. So instead of finding an optimal solution, the ants have one crowded path and an equidistant, empty path.

Amazingly, though, nature anticipated this problem as well. As it turns out, ants periodically break from the main path and begin a random search process again. The ants are programmed to strike a balance between exploiting a known food source and exploring for the next food source. (See Figure 2.) Johnson calls this the "wild hair" alternative. The ants are hard-wired to seek diversity.

Figure 2
The Wild Hair Alternative

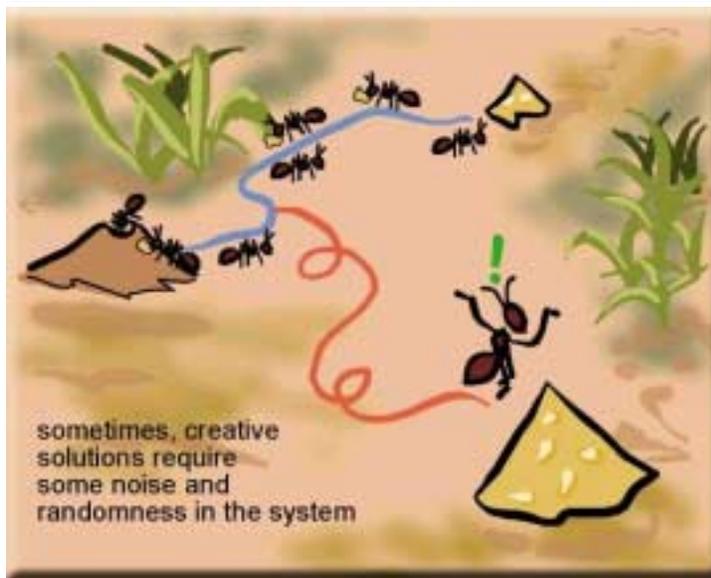


Illustration by Sente Corporation. www.senteco.com

Getting a Diversity Degree

What do mazes and ants have to do with the challenging job of managing money? A lot, as it turns out. Physiologist Horace Barlow says that intelligence is all about making a guess that discovers some new underlying order. This includes solving a problem, seeing the logic of an argument, or finding an appropriate analogy.⁵ Where does investment intelligence come from?

Here is where Norman Johnson's message is so important for investors. In well defined systems, experts are useful because they can provide rule-based solutions. But when a system becomes complex, a collection of individuals often solves a problem better than an individual—even an expert. This means that the stock market is likely to be smarter than most people most of the time, a point the empirical facts bear out.

To be an expert in a complex system like the stock market, he continues, you need two essential features. First, you must be able to create a "simulation" in your head, allowing you to conceive and select strategies.⁶ A description of the legendary hedge fund manager George Soros illustrates the point:

"[Gary] Gladstein, who has worked closely with Soros for fifteen years, describes his boss as operating in almost mystical terms, tying Soros's expertise to his ability to visualize the entire world's money and credit flows. 'He has the macro vision of the entire world. He consumes all this information, digests it all, and from there he can come out with his opinion as to how this is going to be sorted out. He'll look at charts, but most of the information he's processing is verbal, not statistical'."⁷

Second, you must populate your mental system with information from diverse sources. While the ability to simulate may be largely hard-wired (although you can improve your skills in this area), the pursuit of diverse ideas is within your control.

Psychologist Donald Campbell describes the situation in similar terms, referring to the process of creative thinking as "blind variation and selective retention." In other words, creative thinkers seek a variety of ideas, but only choose those that are useful given their current goals.

Idea diversity allows you to find what Johnson calls "weak signals." A weak signal may be the start of a trend that's away from the dominant path (think new technology or development), or the right piece of information at the right time from an unexpected source. In fact, a recent study suggests that informal learning fulfills up to 70% of learning needs inside some organizations.⁸ It's often difficult to know where the next beneficial idea will come from. The

evidence suggests that exposure to diverse information sources can improve the likelihood of finding a useful idea.

Creativity and Investing

In a classic article, former Merrill Lynch Asset Management president Arthur Zeikel argued that superior investment performance requires key personnel within the firm to be creative.⁹ He suggested that creative people are:

- Intellectually curious
- Flexible and open to new information
- Able to recognize problems and define them clearly and accurately
- Able to put information together in many different ways to reach a solution
- Antiauthoritarian and unorthodox
- Mentally restless, intense, and highly motivated
- Highly intelligent
- Goal-oriented

Diversity is the fuel for many natural and cognitive processes. Investors that have investment approaches, or information sources, that are too narrow risk missing out on the power of diversity. The downside, of course, is that entertaining diverse ideas means sorting through lots of potentially useless input. But on balance diversity seems to enrich the investment performance —and the lives—of thoughtful investors.

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 Michael J. Mauboussin, "Thought Leader Forum: Connect to the Idea Frontier" *Credit Suisse First Boston Equity Research*, 2001, 64-81.

² Michael J. Mauboussin, "Revisiting Market Efficiency: The Stock Market As A Complex Adaptive System" *Journal of Applied Corporate Finance*, 14, 4, Winter 2002, 8-16.

³ Norman L. Johnson, "Diversity in Decentralized Systems: Enabling Self-Organizing Solutions, LANL, LA-UR-99-6281, 1999. For more on this, see <http://ishi.lanl.gov>.

⁴ James Kennedy and Russell C. Eberhart, *Swarm Intelligence* (San Francisco, CA: Morgan Kaufmann Publishers, 2001), 105.

⁵ William H. Calvin "The Emergence of Intelligence" *Scientific American Presents*, 9, 4, November 1998, 44-51. <http://www.sciam.com/1998/1198intelligence/1198quicksummary.html>

⁶ Gary Klein, *Sources of Power: How People Make Decisions* (Cambridge, MA: MIT Press, 1998).

⁷ Michael T. Kaufman, *Soros: The Life and Times of a Messianic Billionaire* (New York: Knopf, 2002), 141.

⁸ See <http://www.learning-org.com/98.01/0331.html>.

⁹ Arthur Zeikel, "Organizing for Creativity" *Financial Analyst Journal*, 39, November/December 1983, 25-29.

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