
How Psychological Pitfalls Generated the Global Financial Crisis

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In this article, I present evidence that psychological pitfalls played a crucial role in generating the global financial crisis that began in September 2008. The evidence indicates that specific psychological phenomena—reference point–induced risk seeking, excessive optimism, overconfidence, and categorization—were at work. I am not saying that fundamental factors, such as shifts in housing demand, changes in global net savings rates, and rises in oil prices, were not relevant. They most certainly were relevant. I suggest that specific psychological reactions to these fundamentals, however, rather than the fundamentals themselves, took the global financial system to the brink of collapse.

To what extent did analysts see the crisis coming? In late 2007, four analysts (among others) forecasted that the financial sector would experience severe difficulties. They were Meredith Whitney, then at Oppenheimer; Dick Bove, then at Punk Ziegel & Company; Michael Mayo, then at Deutsche Bank; and Charles Peabody at Portales Partners (see Berman 2009). For example, in October 2007, Mayo issued a sell recommendation on Citigroup stock. Two weeks later, Whitney issued a research report on Citigroup stating that its survival would require it to raise \$30 billion, either by cutting its dividend or by selling assets. More than any other analyst, Whitney raised concerns about the risks posed by the subprime mortgage market—and by the attendant threat to overall economic activity.

How timely were analysts in raising the alarm? As it happens, public markets had begun to signal concerns early in 2007. At that time, the VIX was fluctuating in the 9.5–20 range, having fallen from its 20–50 range for 2001–2002. On 27 February 2007, an 8.8 percent decline in the Chinese stock market set off a cascade in the global financial markets. In the United States, the S&P 500 Index declined by 3.5 percent, which was unusual during a period of relatively low volatility. Among the explanations that surfaced in the financial press for the decline in U.S. stocks was concern about weakness in the market for subprime mortgages.

In a book published in 2008, I argued that psychological pitfalls have three impacts that analysts should be aware of (Shefrin 2008a): First is the impact on the pricing of assets, particularly the securities of firms followed by analysts. Second is the impact on decisions by corporate managers that are germane to companies' operational risks. Third is the impact on the judgments of analysts themselves.

The financial crisis contains illustrations of all three impacts. I use five specific cases to explain how psychological pitfalls affected judgments and decisions at various points along the supply chain for financial products, particularly home mortgages, in the crisis. The cases involve (1) UBS, a bank; (2) Standard & Poor's (S&P), a rating firm; (3) American International Group (AIG), an insurance company; (4) the investment committee for the town of Narvik, Norway, an institutional investor; and (5) the U.S. SEC, a regulatory agency.

I use these cases to make two points. First, common threads link the psychological pitfalls that affected the judgments and decisions of the various participants along the supply chain. In this respect, a relatively small set of psychological pitfalls were especially germane to the creation of the crisis. The key mistakes made were not the product of random stupidity but of specific phenomena lying at the heart of behavioral finance.

Second, the major psychological lessons to be learned from the financial crisis pertain to *behavioral corporate finance* (Shefrin 2005). Many readers think of behavioral finance as focusing on mistakes made by *investors*, but issuers (corporations, governments, and so on) are people too and are just as prone to mistakes; behavioral corporate finance focuses on their side of the equation. Specifically, behavioral corporate finance focuses on how psychology affects the financial decisions of corporate managers, especially those in markets that feature mispricing. The key decisions that precipitated the crisis need to be understood in the context of behavioral corporate finance. Moreover, behavioral corporate finance offers guidelines about what to do differently in the future. For analysts, the general lesson to be learned is the importance of including a behavioral corporate perspective in their toolbox.

The five cases are intended to be representative. For example, UBS is hardly unique among investment banks, as the fates of Lehman Brothers, Merrill Lynch, and Bear Stearns illustrate. As discussed later in the article, Citigroup engaged in strategies similar to those pursued by the investment banks. Indeed, in April 2009, the *Washington Post* reported that banks relied on intuition instead of quantitative models to assess their exposure to a severe downturn in the economy. This statement was based on interviews with staff at the Federal Reserve Bank of New York and the U.S. Government Accountability Office.

The source material for the five cases is varied. For UBS, the main source is an internal document from the firm itself. For the SEC, the main source material is an audio transcript from an SEC meeting. For the other three cases, the main source material is press coverage. Material from press coverage features both strengths and weaknesses. One of the key strengths is that information comes from the level of the individual decision maker, as revealed in interviews with decision makers and their colleagues. From a behavioral perspective, this level of detail is invaluable. One of the key weaknesses is that press coverage is less than fully comprehensive and is prone to distortion. In this regard, I discuss an example illustrating a case of distorted coverage.

Fundamentals and Controversy

Mohamed El-Erian (2008) described a broad set of fundamentals related to the financial crisis. He identified the following three structural factors associated with changes in the global economy during the current decade: (1) a realignment of global power and influence from developed economies to developing economies, (2) the accumulation of wealth by countries that in the past were borrowers and that have now become lenders, and (3) the proliferation of new financial instruments, such as collateralized debt obligations (CDOs) and credit default swaps (CDS).¹

El-Erian described how these structural factors worked in combination. Developing countries' external accounts, which had been in deficit before 2000, switched to being in surplus after 2000, with the current account surplus rising to more than \$600 billion in 2007. In contrast, the United States ran an external deficit of almost \$800 billion in 2007. El-Erian explained that these imbalances permitted U.S. consumers to sustain consumption in excess of their incomes. He pointed out that U.S. financial markets facilitated this pattern by providing a way for U.S. consumers to monetize their home equity. And, he added, emerging economies purchased U.S. Treasury instruments, mortgages, and corporate bonds as they converted their trade surpluses into long-term investment accounts.

El-Erian described how these structural elements have affected financial markets. For instance, in 2004, the U.S. Federal Reserve Board increased short-term interest rates with the expectation that long-term rates would also rise. Instead, long-term rates fell—to the point where, in November 2006, the yield curve inverted. This phenomenon puzzled many investors at the time. El-Erian suggested that the inversion might have been caused by emerging economies purchasing long-term T-bonds in an attempt to invest their growing trade surpluses at favorable (high) interest rates. Those purchases drove prices up and yields down. During the 2005–06 period, the yield spread of 10-year over 2-year T-bonds fell from +125 bps to more than –25 bps.

Typically, yield-curve inversions are precursors of recessions. The U.S. stock market was robust in 2005 and 2006, however, with the S&P 500 rising from 1,200 to 1,400, which hardly signaled recession. Moreover, perceptions of future volatility, as measured by the Chicago Board Options Exchange Volatility Index, were at very low levels. As a result, El-Erian concluded that the bond market, stock market, and options market were providing mixed signals during a period he characterized as exhibiting “large systemic uncertainty.”

¹For example, in an 18-month period beginning in January 2007, crude oil prices tripled—from \$50 a barrel to \$150 a barrel—and as the financial crisis unfolded in 2008, several sovereign wealth funds in Middle Eastern countries took positions in U.S. financial institutions that were in need of additional equity capital.

The biggest puzzle for El-Erian is what he called “the ability *and* willingness of the financial system to overconsume and overproduce risky products in the context of such large systemic uncertainty” (p. 20). He suggested that as risk premiums declined from 2004 on, investors used leverage in a determined effort “to squeeze out additional returns” (p. 21). This behavior created a feedback loop that further depressed risk premiums, which, in turn, induced additional leverage. He went on to say:

Think of it: At a time when the world’s economies seemed more difficult to understand . . . and multilateral financial regulation mechanisms were failing us, the marketplace ended up taking on greater risk exposures through the alchemy of new structured products, off-balance sheet conduits, and other vehicles that lie outside the purview of sophisticated oversight bodies More generally, the pressure to assume greater risk, especially through complex structured finance instruments and buyout loan commitments, combined with overconfidence in a “just in time” risk management paradigm led to the trio that would (and should) keep any trustee, shareholder, or policy maker awake at night: a set of institutions taking risk beyond what they can comfortably tolerate; another set of institutions taking risk beyond what they can understand and process; and a third set of institutions doing both! (pp. 51–53)

Is the institutional behavior that El-Erian described (1) rational risk taking in which the outcomes simply turned out to be unfavorable, (2) rational risk taking responding to problematic incentives, or (3) irrational risk taking? I argue that the phrases “beyond what they can comfortably tolerate” and “beyond what they can understand and process” suggest that the answer is irrational risk taking. In this regard, it seems to me that El-Erian laid out the market fundamentals that preceded the crisis and then described behavioral patterns that represent *irrational* responses to those fundamentals: Rather than responding to a riskier environment by cutting back on risk, institutions took more risk.

Akerlof and Shiller (2009) argued that irrational decisions associated with the subprime housing market were central to the financial crisis. In this respect, consider some history. From 1997 to 2006, U.S. home prices rose by about 85 percent, even after adjustment for inflation, making this period a time of the biggest national housing boom in U.S. history. The rate of increase was five times the historical rate of 1.4 percent a year. As a result, the authors suggested, the sentiment of many people at the time was that housing prices would continue to increase at well above their historical growth rates. This belief supported a dramatic increase in the volume of subprime mortgages, especially mortgages requiring no documentation and little or no down payment. Later in this article, I discuss the time-series properties of loan-to-value ratios (LTVs), limited documentation, and 100 percent financing in the mortgage market.

Housing prices peaked in December 2006, when the Federal Reserve was raising short-term interest rates, and then declined by 30 percent over the subsequent 26 months. During the decline, many new homeowners (and some old ones who had engaged in repeated cash-out refinancings) found that the values of their mortgages exceeded the values of their homes. Some in this situation chose to default on their mortgages. Some homeowners had taken out adjustable-rate mortgages with low initial rates that would reset after a period of time to rates that were much higher. These homeowners were planning on refinancing before rates reset. Once housing prices began to decline, however, they did not qualify for refinancing. Many were unable to afford the higher rates and had to default.²

The mortgage product supply chain began with mortgage initiation by financial institutions such as Indy Mac, Countrywide, and Washington Mutual. It continued with such firms as Fannie Mae and Freddie Mac, which purchased and “securitized” mortgages, thus creating mortgage-backed securities (MBS). Next in the chain were investment banks, such as Lehman Brothers, Merrill Lynch, Citigroup, and UBS, which created and sold CDOs backed by the MBS. The supply chain also included financial firms such as AIG, which insured against the risk of default by selling CDS. The risks of both the products and the financial firms were rated by rating agencies, such as Moody’s Investors Service and S&P. At the end of the supply chain were the end investors, such as foreign banks, pension funds, and municipal governments, who ultimately held the claims to cash flows generated by the mortgages.³ Along the way, the supply chain was subject to regulation by various bodies, such as the SEC, the Board of Governors of the Federal Reserve, the Federal Reserve Bank of New York, and the Office of Thrift Supervision.

Taken together, the viewpoints expressed by El-Erian and Akerlof–Shiller suggest that financial institutions exhibited behavior inconsistent with the predictions of the Akerlof adverse-selection, “lemons,” model, in which all agents use the information at their disposal to make rational decisions. The lemons model predicts

²The proportion of all mortgage originations that were subprime increased from near zero in the early 1980s to 20.1 percent in 2006, although not monotonically. Chomsisengphet and Pennington-Cross (2006) described the history of subprime mortgage lending in the United States beginning in 1980 as follows: “Many factors have contributed to the growth of subprime lending. Most fundamentally, it became legal. The ability to charge high rates and fees to borrowers was not possible until the Depository Institutions Deregulation and Monetary Control Act . . . was adopted in 1980. It preempted state interest rate caps. The Alternative Mortgage Transaction Parity Act . . . in 1982 permitted the use of variable interest rates and balloon payments. These laws opened the door for the development of a subprime market, but subprime lending would not become a viable large-scale lending alternative until the Tax Reform Act of 1986 (TRA). The TRA increased the demand for mortgage debt because it prohibited the deduction of interest on consumer loans, yet allowed interest deductions on mortgages for a primary residence as well as one additional home” (p. 38).

³As an example of foreign banks in the supply chain, consider that the Industrial and Commercial Bank of China bought \$1.23 billion in securities backed by mortgages.

the collapse of trade, resulting in, for example, a credit freeze when rational agents who perceive themselves to be at an information disadvantage assume the worst (e.g., all cars are lemons) when forming their expectations. In contrast to this model, despite the opaqueness of securitized asset pools, CDOs, and CDS—with their attendant information asymmetries—the subprime mortgage market did not collapse; it proceeded as if no cars could be lemons.

Whether financial institutions behaved irrationally and whether the associated market movements reflected market inefficiency are the subject of controversy. Posner (2009a) maintained that institutions behaved rationally in light of the incentives they faced. He wrote, “At no stage need irrationality be posited to explain” the collapse of financial markets in 2008 and the deep recession in 2009. In an interview, Eugene Fama contended that past market movements are consistent with the notion of market efficiency.⁴

In his critique of Akerlof and Shiller’s 2009 book, Posner (2009b) stated, “But mistakes and ignorance are not symptoms of irrationality. They usually are the result of limited information.” This line of reasoning leads him to conclude that the stock market increases of the late 1920s and late 1990s did not reflect mispricing and that in 2005 and 2006, people did not overpay for their houses in an *ex ante* sense.

Of Akerlof and Shiller’s (2009) contention that irrational decisions in the subprime housing market were central to the financial crisis, Posner (2009b) wrote, “They think that mortgage fraud was a major cause of the present crisis. How all this relates to animal spirits is unclear, but in any event they are wrong about the causality.”

Posner then provided his own list of what caused the crisis:

The underlying causes were the deregulation of financial services; lax enforcement of the remaining regulations; unsound decisions on interest rates by the Federal Reserve; huge budget deficits; the globalization of the finance industry; the financial rewards of risky lending, and competitive pressures to engage in it, in the absence of effective regulation; the overconfidence of economists inside and outside government; and the government’s erratic, confidence-destroying improvisational responses to the banking collapse. Some of these mistakes of commission and omission had emotional components. The overconfidence of economists might even be thought a manifestation of animal spirits. But the career and reward structures, and the ideological preconceptions, of macroeconomists are likelier explanations than emotion for the economics profession’s failure to foresee or respond effectively to the crisis. (2009b)

Posner might well be correct in identifying problematic decisions in the regulatory process. Whether he is correct in his view that institutions acted rationally is another matter. One way of dealing with this issue is to examine decision making

⁴The interview with Fama titled “Fama on Market Efficiency in a Volatile Market” is at www.dimensional.com/famafrench/2009/08/fama-on-market-efficiency-in-a-volatile-market.html#more.

on a case-by-case basis, as I will do in this article, to identify the nature of the decision processes within financial institutions.⁵

This discussion needs to be based on a well-defined notion of rationality. In financial economics, rationality is typically understood in the neoclassical sense. Neoclassical rationality has two parts: rationality of judgments and rationality of choice. People make rational judgments when they make efficient use of the information at their disposal and form beliefs that are free from bias. People make rational choices when they have well-defined preferences that express the trade-offs they are willing to make and choose the best means to meet their objectives. In financial economics, rationality is typically said to prevail when decision makers act as Bayesian expected-utility maximizers who are averse to risk.

Behavioral Corporate Finance

Behavioral corporate finance highlights the psychological errors and biases associated with major corporate tasks—capital budgeting, capital structure, payout policy, valuation, mergers and acquisitions, risk management, and corporate governance. In my 2008 book, I suggested that suboptimal corporate financial decisions can largely be traced to the impact of psychological errors and biases on specific organizational processes (Shefrin 2008b). These processes involve planning, the setting of standards, the sharing of information, and incentives. Planning includes the development of strategy and the preparation of *pro forma* financial statements. Standards involve the establishment of goals and performance metrics. Information sharing results from the nature of organizational design. Incentives stem from the compensation system and are a major aspect of corporate governance. Sullivan (2009) emphasized the importance of governance failures in generating the crisis.

Among the main psychological pitfalls at the center of behavioral finance are the following:

- reference point-induced risk seeking,
- narrow framing,
- opaque framing,
- excessive optimism,
- overconfidence,
- extrapolation bias,
- confirmation bias,

⁵The five case studies are not intended to provide a comprehensive analysis of decision making in the financial crisis. Rather, the case studies are intended to provide examples of behavior that can be classified as rational or irrational. To deal with the issues raised by Posner (2009b), the focus is on financial institutions and government agencies, not on the behavior of individual homeowners. Nevertheless, many homeowners used subprime mortgages to purchase homes with the unfounded expectation that housing prices would continue to increase and that they would be able to refinance adjustable-rate mortgages in which the future interest rates would reset to a much higher rate.

- conservatism,
- the “affect heuristic,”
- “groupthink,”
- hindsight bias, and
- categorization bias.

I suggest that these pitfalls figured prominently in the decisions that precipitated the financial crisis. For this reason, I provide here a brief description of each.

Psychologically based theories of risk taking emphasize that people measure outcomes relative to reference points. A reference point might be a purchase price used to define gains and losses, as suggested by Shefrin and Statman (1985), building on Kahneman and Tversky (1979), or a level of aspiration, as suggested by Lopes (1987). *Reference point–induced risk seeking* is the tendency of people to behave in a risk-seeking fashion to avoid an outcome that lies below the reference point. As an illustration, consider El-Erian’s comment that as risk premiums declined from 2004 on, investors used leverage in a determined effort “to squeeze out additional returns.” This comment is consistent with the idea that investors had fixed aspirations and became more tolerant of risk as risk premiums declined.

Narrow framing is the practice of simplifying a multidimensional decision problem by decomposing it into several smaller subtasks and ignoring the interaction between these subtasks. The term “silo” is sometimes used to describe the impact of narrow framing because subtasks are assigned to silos.

Opaque framing versus transparent framing involves the level of clarity in the description of the decision task and associated consequences. For illustration, consider El-Erian’s comment about institutions taking risk beyond what they can understand and process. This comment suggests opaque, or nontransparent, framing.

Excessive optimism leads people to look at the world through rose-colored glasses. *Overconfidence* leads people to be too sure of their opinions, a tendency that frequently results in their underestimating risk. Although excessive optimism and overconfidence sound related, they are really quite different psychological shortcomings in a decision maker. For example, somebody might be an overconfident pessimist—one who has too much conviction that the future will be gloomy.

Extrapolation bias leads people to forecast that recent changes will continue into the future. A pertinent example of extrapolation bias is the belief that housing prices will continue to grow at the same above-average rates that have prevailed in the recent past.

Confirmation bias leads people to overweight information that confirms their prior views and to underweight information that disconfirms those views.

Conservatism is the tendency to overweight base-rate information relative to new (or singular) information. This phenomenon is sometimes called “underreaction.”

The *affect heuristic* refers to the making of judgments on the basis of positive or negative feelings rather than underlying fundamentals. Reliance on the affect heuristic is often described as using “gut feel” or intuition.

Groupthink leads people in groups to act as if they value conformity over quality when making decisions. Groupthink typically occurs because group members value cohesiveness and do not want to appear uncooperative, so they tend to support the positions advocated by group leaders rather than playing devil’s advocate. Group members may also be afraid of looking foolish or poorly informed if they vocally disagree with a leader whom the majority of the group regards as wise.

Hindsight bias is the tendency to view outcomes in hindsight and judge that these outcomes were more likely to have occurred than they appeared in foresight. That is, *ex post*, the *ex ante* probability of the event that actually occurred is judged to be higher than the *ex ante* estimate of that *ex ante* probability. Consider Posner’s (2009b) comment about equities being efficiently priced in the late 1990s or houses being efficiently priced in the first six years of this decade. In making this claim, he effectively charges Akerlof and Shiller (2009) with succumbing to hindsight bias in that he suggests that the subsequent price decline is nothing more than an unfavorable outcome that is being viewed as more likely in hindsight than it was in foresight.

Categorization bias is the act of partitioning objects into general categories and ignoring the differences among members of the same category. Categorization bias may produce unintended side effects if the members of the same category are different from each other in meaningful ways.

In the remainder of this article, I use the behavioral corporate finance framework to analyze each of the five cases. One way to think about this framework is in terms of the interaction of psychological biases with business processes, as illustrated in **Exhibit 1**. (Exhibit 1 is merely for illustration; only the first five pitfalls discussed in this section are displayed.) The intersections of the rows showing organizational processes with the columns depicting psychological pitfalls are shown as question marks to prompt questions for those using such a framework about whether a specific pitfall occurred as part of the business process. This perspective helps to show how psychological pitfalls affect the decisions made in connection with each process.

Exhibit 1. Interaction of Psychological Pitfalls and Business Processes

Process	Reference Point–Induced Risk Seeking	Narrow Framing	Opaque Framing	Excessive Optimism	Overconfidence
Planning	?	?	?	?	?
Standards	?	?	?	?	?
Information sharing	?	?	?	?	?
Incentives	?	?	?	?	?

UBS

At the end of 2007, UBS announced that it would write off \$18 billion of failed investments involving the subprime housing market in the United States. In 2008, the write-offs increased to more than \$50 billion. In October 2008, the Swiss central bank announced its intention to take \$60 billion of toxic assets off UBS's balance sheet and to inject \$6 billion of equity capital.

In April 2008, UBS published a report (2008) detailing the reasons for its losses. In this section, I quote extensively from the report to let UBS management speak for itself.

The report states, "UBS's retrospective review focused on root causes of these losses with the view toward improving UBS's processes" (p. 28). That is, the write-offs were the result of having ineffective processes in place, a statement that, I argue, failed to address psychological biases. In the following discussion, I view the UBS report through the prism of the four specific processes shown in Exhibit 1: planning, standards, information sharing, and incentives. As readers will see, biases permeated many of the decisions UBS made in connection with subprime mortgages and financial derivatives.

Planning at UBS. The report states, "[T]he 5 year strategic focus articulated for 2006–2010 was to aim for significant revenue increases whilst also allowing for more cost expansion. However the Group's risk profile in 2006 was not predicted to change substantially . . ." (p. 8). In retrospect, the firm's risk profile did increase dramatically, which raises the question of whether UBS's management team displayed overconfidence.

UBS says that, in 2005, it engaged the services of an external consultant who compared UBS's past performance with that of its chief competitors.⁶ Notably, UBS's performance trailed that of its competitors. To close the competitive gap, the consultant recommended the following:

[S]trategic and tactical initiatives were required to address these gaps and recommended that UBS selectively invest in developing certain areas of its business to close key product gaps, including in Credit, Rates, MBS Subprime and Adjustable Rate Mortgage products ("ARMs"), Commodities and Emerging Markets. ABS (asset backed securities), MBS, and ARMs (in each case including underlying assets of Subprime nature) were specifically identified as significant revenue growth opportunities. The consultant's review did not consider the risk capacity (e.g. stress risk and market risk) associated with the recommended product expansion. (p. 11)

Notice that, although subprime was specifically identified as providing significant revenue growth opportunities, the consultant's review did not consider the implications for UBS's risk capacity. Given that risk and return lie at the heart of

⁶UBS relied on McKinsey & Company for consulting services. Peter Wuffli, who was UBS Investment Bank CEO at the time, had previously been a principal with McKinsey.

finance and that subprime mortgages feature more default risk than higher rated mortgages, the absence of an analysis of risk is striking.⁷

Standards for Risk at UBS. Standards for risk management include targets and goals that relate to accounting controls and include position limits and other risk-control mechanisms. The report tells how UBS reacted to the consulting firm's failure to address the implications of its recommendations for risk:

There were not however any Operational Limits on the CDO Warehouse, nor was there an umbrella Operational Limit across the IB [the investment banking unit] (or the combination of IB and DRCM [the hedge fund subsidiary Dillon Read Capital Management]) that limited overall exposure to the Subprime sector (securities, derivatives and loans). (p. 20)

That is, UBS did not develop any operational limits that would restrict the firm's overall exposure to subprime loans, securities, and derivatives.

Was this behavior rational, or did UBS irrationally ignore risk for psychological reasons? One possibility is that by virtue of being behind the competition, UBS set a high reference point for itself and exhibited reference point–induced risk-seeking behavior. Perhaps this attitude is why it did not question the consulting firm's failure to address the risk implications of its recommendations and did not develop risk standards for itself. Its psychological profile led it to act as if it implicitly attached little or no value to avoiding risk.

UBS's internal report does indeed suggest that the reference point for the firm corresponded to the superior performance of its competitors. The report states:

It was recognized in 2005 that, of all the businesses conducted by the IB, the biggest competitive gap was in Fixed Income, and that UBS's Fixed Income positioning had declined vis-à-vis leading competitors since 2002. In particular, the IB's Fixed Income, Rates & Currencies ("FIRC") revenues decreased since 2004, and accordingly, FIRC moved down in competitor league tables by revenue. According to an external consultant, the IB Fixed Income business grew its revenue at a slower rate than its peers. (p. 10)

CDOs are akin to families of mutual funds that hold bonds instead of stocks. Each member of the fund family, or tranche, holds bonds with a different degree of priority in the event of default from the priority of other tranches in the family. Investors pay lower prices for riskier tranches. Holders of the equity (riskiest) tranche absorb the first losses stemming from default. If at some point the holders of the equity tranche receive zero cash flows from the underlying assets, holders of

⁷The nature of the consultant's recommendation provides an interesting illustration of how a "follow the leader" approach results in herding. UBS followed a leader in its peer group, plausibly Lehman Brothers, although it does not say so explicitly. As I report later, a consultant advised Citigroup also to increase its risk exposure. Shefrin (2009) discussed how Merrill Lynch sought to emulate the subprime strategy of the industry leader (at the time, Lehman Brothers).

the next tranche begin to absorb losses. Holders of the senior tranche are the most protected, but the existence of a “super senior” tranche is also possible. If the CDO contains leverage, meaning that the issuer of the CDO borrowed money to purchase assets for the CDO, then some party must stand ready to absorb the losses once the holders of even the senior tranche receive no cash flows. Holders of the super senior tranche must play this role. Instead of paying to participate in the CDO, they receive payments that are analogous to insurance premiums.

UBS’s investment banking unit did hold super senior positions, and that unit did consider the risk of those positions. Moody’s and S&P both rated various CDO tranches. The report states:

MRC [Market Risk Control] VaR [value-at-risk] methodologies relied on the AAA rating of the Super Senior positions. The AAA rating determined the relevant product-type time series to be used in calculating VaR. In turn, the product-type time series determined the volatility sensitivities to be applied to Super Senior positions. Until Q3 [third quarter] 2007, the 5-year time series had demonstrated very low levels of volatility sensitivities. As a consequence, even unhedged Super Senior positions contributed little to VaR utilisation. (p. 20)

Piskorski, Seru, and Vig (2009) found, conditional on a loan becoming seriously delinquent, a significantly lower foreclosure rate for loans held by banks than for similar loans that were securitized. Indeed, Eggert (2009) takes the position that securitization *caused* the subprime meltdown. In this regard, UBS’s behavior provides examples of key psychological pitfalls related to securitization. For instance, in relying solely on risk ratings, UBS’s risk management group did no independent analysis. The report states:

In analyzing the retained positions, MRC generally did not “look through” the CDO structure to analyse the risks of the underlying collateral. In addition, the CDO desk does not appear to have conducted such “look through” analysis and the static data maintained in the front-office systems did not capture several important dimensions of the underlying collateral types. For example, the static data did not capture FICO [credit] scores, 1st/2nd lien status, collateral vintage (which term relates to the year in which the assets backing the securities had been sourced), and did not distinguish a CDO from an ABS. MRC did not examine or analyze such information on a regular or systematic basis. (p. 20)

In a similar vein, it appears that no attempt was made to develop an RFL [risk factor loss] structure that captured more meaningful attributes related to the U.S. housing market generally, such as defaults, loan to value ratios, or other similar attributes to statistically shock the existing portfolio. (p. 38)

Was it rational for UBS to ignore the underlying fundamentals of the U.S. mortgage market? Was it rational for UBS to make no attempt to investigate key statistics related to the U.S. housing market, such as LTVs, percentage of loans that featured 100 percent financing, limited-documentation loans, and default rates?

Between 2001 and 2006, the following occurred: The LTVs of newly originated mortgages rose from 80 percent to 90 percent; the percentage of loans that were 100 percent financed climbed from 3 percent to 33 percent; and limited-documentation loans almost doubled—rising from 27 percent to 46 percent. In terms of increasing risk, these trends are akin to powder kegs waiting for a match.⁸

As for defaults, the insufficient focus on fundamentals, in combination with an overattention to historical default rates—a strong illustration of conservatism bias (i.e., the tendency to overweight base-rate information)—gave rise to the “risk-free illusion.” UBS’s CDO desk considered a super senior position to be fully hedged if 2–4 percent of the position was protected. They referred to such super seniors as AMPS (amplified mortgage protected trades). In this regard, UBS erroneously judged that it had hedged its AMPS positions sufficiently and that the associated VaR was effectively zero.

Was this judgment rational? Not in my opinion, because UBS assumed that historical default rates would continue to apply, despite the changed fundamentals in the U.S. housing market. The UBS report indicates in respect to AMPS that

Amplified Mortgage Portfolio: . . . at the end of 2007, losses on these trades contributed approximately 63% of total Super Senior losses.

Unhedged Super Senior positions: Positions retained by UBS in anticipation of executing AMPS trades which did not materialise. . . . at the end of 2007, losses on these trades contributed approximately 27% of total Super Senior losses. (p. 14)

Information Sharing at UBS. Narrow framing and opaque framing are two of the psychological pitfalls described previously. UBS’s report criticizes its risk managers for *opaquely* presenting information about risks to be managed and decisions to be taken. The report states:

Complex and incomplete risk reporting: . . . Risks were siloed within the risk functions, without presenting a holistic picture of the risk situation of a particular business.

Lack of substantive assessment: MRC did not routinely put numbers into the broader economic context or the fundamentals of the market when presenting to Senior Management. (p. 39)

⁸In this regard, the President’s Working Group on Financial Markets (2008) concluded, “The turmoil in financial markets was triggered by a dramatic weakening of underwriting standards for U.S. subprime mortgages, beginning in late 2004, and extending into early 2007.” In contrast, studies by Bhardwaj and Sengupta (2008a, 2008b) from the Federal Reserve Bank of St. Louis suggest that subprime mortgage quality did not deteriorate after 2004 because FICO scores improved at the same time that the other indicators of credit quality worsened. The authors also pointed out that adjustable-rate subprime mortgages are designed as bridge loans, with the view that they be prepaid when interest rates reset as homeowners refinance. They attributed the subprime meltdown to the decline in housing prices that began at the end of 2006 rather than to a lowering of lending standards.

When risk managers eventually recognized the deteriorating values of their subprime positions, they mistakenly assumed that the problem was restricted to subprime and would not affect the values of their other ABS positions.

As a general matter, risk managers did not properly share information with those who needed the information at UBS, and the information they did share was overly complex and often out of date. Examples of what went wrong are that risk managers often netted long and short positions, which obscured the manner in which positions were structured, and they did not make the inventory of super senior positions clear.

Information sharing takes place as part of the deliberations about which decisions to take. UBS managers exhibited groupthink in these deliberations by not challenging each other about the ways their various businesses were developing. The report states:

Members of the IB Senior Management apparently did not sufficiently challenge each other in relation to the development of their various businesses. The Fixed Income strategy does not appear to have been subject to critical challenge, for instance in view of the substantial investments in systems, people and financial resources that the growth plans entailed. (p. 36)

UBS's risk managers also appeared vulnerable to confirmation bias. As the firm began to experience losses on its inventories of MBS in the first and second quarters of 2007, the risk management team did not implement additional risk methodologies. Then, matters got worse. In a subsection titled "Absence of risk management," the report states:

In Q2 2007, the CDO desk was giving a relatively pessimistic outlook in relation to certain aspects of the Subprime market generally in response to questions from Group and IB Senior Management about UBS's Subprime exposures. Notwithstanding this assessment, the MBS CDO business acquired further substantial Mezz RMBS [mezzanine residential MBS] holdings and the CDO desk prepared a paper to support the significant limit increase requests. The increase was ultimately not pursued. (p. 29)

Incentives and Governance at UBS. In theory, compensation provides managers with incentives to maximize the value of their firms. Incentive compensation frameworks (beyond the base salary) often rely on a combination of (1) a bonus plan that relates to the short term and (2) equity-based compensation that relates to the long term.

In practice, UBS's compensation system was plagued by at least three serious flaws. The first flaw was that UBS's incentive structure did not take risk properly into account. The report states, "The compensation structure generally made little recognition of risk issues or adjustment for risk/other qualitative indicators" (p. 42).

Did this amount to rational governance? Keep in mind that fundamental value is based on discounted cash flow, where the discount rate reflects risk as well as the time value of money. Higher risk leads to a higher discount rate and, therefore, to lower discounted cash flows. UBS's compensation structure barely took risk issues into consideration and made little to no adjustment for risk. Therefore, employees had no direct incentive to focus on risk when making decisions, including decisions about positions involving subprime mortgages and their associated derivatives.

The second flaw concerned undue emphasis on short-term profit and loss (P&L) in overall employee compensation—specifically, bonuses—and insufficient attention to the implications of decisions about positions for long-term value. The report states, “Day1 P&L treatment of many of the transactions meant that employee remuneration (including bonuses) was not directly affected by the longer term development of positions created” (p. 42). To be sure, the compensation structure featured an equity component, which could have provided UBS employees with an indirect incentive to avoid risks that were detrimental to long-term value. The bonus focus, however, dominated. Bonus payments for successful and senior fixed-income traders, including those in businesses holding subprime positions, were significant. Particularly noteworthy is that UBS based bonuses on gross revenue after personnel costs but did not take formal account of the quality or sustainability of earnings.

The third flaw was that UBS's incentives did not differentiate between skill-based returns and returns attributable to cost advantages. The report states:

[E]mployee incentivisation arrangements did not differentiate between return generated by skill in creating additional returns versus returns made from exploiting UBS's comparatively low cost of funding in what were essentially carry trades. There are no findings that special arrangements were made for employees in the businesses holding Subprime positions. (p. 42)

Are these reward systems, policies, and practices consistent with rational governance? The authors of the UBS report suggest not, and I concur.

Standard & Poor's

One of the major elements of the financial crisis was the fact that rating agencies assigned AAA ratings to mortgage-related securities that were very risky. As a result, many investors purchased these securities under the impression that they were safe, and they found out otherwise only when housing prices declined and default rates rose. Financial intermediaries such as UBS also paid a steep price when the securities they held in inventory declined in value and became illiquid.

In this section, I discuss the psychological issues that affected the judgments and decisions made by rating agencies. The processes of planning, standards, and information sharing were the most germane processes; also important were agency issues.

Planning and Standards at S&P. Consider some background. In August 2004, Moody's unveiled a new credit-rating model that enabled securities firms to increase their sales of top-rated subprime mortgage-backed bonds. The new model eliminated a nondiversification penalty that was present in the prior model, a penalty that applied to concentrated mortgage risk. According to Douglas Lucas, head of CDO research at UBS Securities in New York City, Moody's was pressured to make the change. He was quoted by Smith (2008) as having stated, "I know people lobbied Moody's to accommodate more concentrated residential mortgage risk in CDOs, and Moody's obliged."⁹

Notably, Moody's competitor, S&P, revised its own methods one week after Moody's did. In important ways, S&P shared traits with UBS at this time. Both firms found themselves behind their respective industry leaders and were thus susceptible to reference point-induced risk-seeking behavior.

The *Wall Street Journal* reported that in August 2004, S&P commercial mortgage analyst Gale Scott sent the following message to colleagues: "We are meeting with your group this week to discuss adjusting criteria for rating CDOs of real-estate assets . . . because of the ongoing threat of losing deals" (see Lucchetti 2008b). Richard Gugliada, a former S&P executive who oversaw CDOs from the late 1990s until 2005, replied to the e-mail, "OK with me to revise criteria" (see Smith 2008). The criteria for rating commercial mortgages were changed after several meetings. According to an S&P report that Scott co-wrote in May 2008, the change in criteria directly preceded "aggressive underwriting and lower credit support" in the market for commercial MBS from 2005 to 2007. The report went on to say that this change led to growing delinquencies, defaults, and losses.

Consider S&P against the backdrop of its parent organization, McGraw-Hill Companies. According to reports that appeared in the *Wall Street Journal*, CEO and Chairman Harold McGraw established unrealistic profit goals for his organization (Lucchetti 2008a). I suggest that these goals induced risk-seeking behavior in the rating of mortgage-related products. The *Wall Street Journal* reported that because McGraw-Hill had been suffering financially in other areas, it exerted pressure on S&P to expand 15–20 percent a year. McGraw-Hill's financial services unit, which includes S&P, generated 75 percent of McGraw-Hill's total operating profit in 2007, up from 42 percent in 2000. In 2007, the ratings business generated a third of McGraw-Hill's revenue.

Goal setting is the basis for establishing standards and planning, through which goals are folded into strategy. S&P's efforts to achieve its goals focused on increasing its revenues from rating mortgage-related products while keeping its costs down. In regard to the latter, Gugliada told *Bloomberg* that he was given tough budget targets (see Smith 2008).

⁹Interestingly, Lucas had been an analyst at Moody's and claims to have invented the diversity score in the late 1980s.

According to Lucchetti (2008a), the combination of high revenue goals and low cost goals led understaffed analytical teams to underestimate the default risk associated with mortgage-related products. Before the collapse in housing prices, S&P and Moody's earned approximately three times more from grading CDOs than from grading corporate bonds.

Consider how the ratings on mortgage-related securities came to be lowered over time. Once housing prices began to decline and homeowners began to default, raters eventually downgraded most of the AAA rated CDO bonds that had been issued in the prior three years. On 10 July 2008, Moody's reduced its ratings on \$5.2 billion in subprime-backed CDOs. The same day, S&P said it was considering reductions on \$12 billion of residential MBS. By August 2007, Moody's had downgraded 90 percent of all asset-backed CDO investments issued in 2006 and 2007, including 85 percent of the debt originally rated Aaa. S&P reduced 84 percent of the CDO tranches it had rated, including 76 percent of all those rated AAA.¹⁰

Information Sharing at S&P. Former employees at S&P have provided insights into the ways that information used for rating CDOs was shared. Kai Gilkes is a former S&P quantitative analyst in London. The following comments in Smith (2008) recreate the tenor of the discussion about the sharing of information and points of view:

“Look, I know you're not comfortable with such and such [an] assumption, but apparently Moody's are even lower, and, if that's the only thing that is standing between rating this deal and not rating this deal, are we really hung up on that assumption?” You don't have infinite data. Nothing is perfect. So the line in the sand shifts and shifts, and can shift quite a bit.

Gilkes' remark about shifting lines needs to be understood in the context of group processes. The behavioral decision literature emphasizes that working in a group tends to reduce the biases of the group's members when the tasks feature clearly correct solutions, which everyone can confirm once the solution has been presented. For judgmental tasks that have no clearly correct solution, however, working in groups actually exacerbates the biases of the group members. Gilkes' remark about “shifting lines” effectively points to the judgmental character of the ratings decision.

Additional insight about the sharing of information and exchange of viewpoints has come from Gugliada, who told *Bloomberg* that when a proposal to tighten S&P's criteria was considered, the codirector of CDO ratings, David Tesher, responded: “Don't kill the golden goose.”

¹⁰Still, in the last week of August 2007, Moody's assigned Aaa grades for at least \$12.7 billion of new CDOs, which would be downgraded within six months.

Was groupthink an issue here, or were managers behaving rationally? The answer might depend on their personal ethics. In retrospect, Gugliada stated, competition with Moody's amounted to a "market-share war where criteria were relaxed. . . . I knew it was wrong at the time. It was either that or skip the business. That wasn't my mandate. My mandate was to find a way" (see Smith 2008).

To be sure, analysts at S&P were not oblivious to the possibility of a housing bubble. In 2005, S&P staff observed that the housing market was in a bubble, the bursting of which might lead housing prices to decline by 30 percent at some stage. The vague "at some stage" could have meant, however, next month or 10 years hence. The timing of the bursting of a bubble is highly uncertain. The report, including its implications for ratings, was discussed internally, but the discussion did not alter the rating methodology.

S&P had been telling investors that its ratings were but one piece of information about securities and that ratings were not a perfect substitute for being diligent about acquiring additional information to assess security risk. S&P's protocol was to accept the documentation as presented and to issue a rating conditional on that information. The firm's practice was not to verify the documentation. If S&P rated a security on the basis of limited-documentation mortgages, it did not seek to verify whether or not the information was correct. Just as UBS did, however, the investment bank treated AAA ratings on mortgage-related securities as unconditional ratings. Moreover, the same was true for many other investors, especially end investors, who were much less sophisticated than investment bankers.

As it happens, some of the analysts engaged in rating CDOs were highly skeptical of their assignments, and they shared this skepticism with colleagues. Lucchetti (2008b) reports that one S&P analytical staffer e-mailed another saying that a mortgage or structured-finance deal was "ridiculous" and that "we should not be rating it." The recipient of the e-mail famously responded, "We rate every deal," and added that, "it could be structured by cows and we would rate it." An analytical manager in the CDO group at S&P told a senior analytical manager in a separate e-mail that "rating agencies continue to create" an "even bigger monster—the CDO market. Let's hope we are all wealthy and retired by the time this house of cards falters" (Lucchetti 2008b).

AIG

AIG is an insurance company with a financial products division (AIGFP).¹¹ Because of AIGFP's involvement in the market for subprime mortgages, AIG required a \$182 billion bailout from the U.S. government. In September 2008, the decision to bail out AIG was a defining moment in the unfolding of the global financial crisis. To understand the decisions that led to this event, consider some background.

¹¹The source material for AIG is Lewis (2009).

AIGFP was created in 1987; it generated income by assuming various parties' counterparty risks in such transactions as interest rate swaps. It was able to do so because its parent, AIG, had a AAA rating and a large balance sheet. AIGFP was highly profitable during its first 15 years and, by 2001, was generating 15 percent of AIG's profit.

AIGFP's main role in the global financial crisis involved its trades in the market for CDS associated with subprime mortgages. Effectively, AIG provided insurance against defaults by homeowners who had taken out subprime mortgages.

AIGFP entered the market for CDS in 1998 by insuring against the default risk of corporate bonds issued by investment-grade public corporations. The default risk associated with these bonds as a group was relatively low. Although insuring corporate debt remained AIGFP's key business, over time the company also began to insure risks associated with credit card debt, student loans, auto loans, pools of prime mortgages, and eventually, pools of subprime mortgages.

Planning and Risk Standards at AIGFP. The need for a bailout of AIG stemmed from AIGFP having underestimated its risk exposure to subprime mortgages. The psychological pitfalls underlying the underestimation were categorization, overconfidence, and groupthink.

When the Federal Reserve began to increase short-term interest rates in June 2004, the volume of prime mortgage lending fell by 50 percent. At the same time, however, the volume of subprime mortgage lending increased dramatically.¹² Lewis (2009) related that, as a result, the composition of mortgage pools that AIGFP was insuring shifted over the next 18 months; the proportion of mortgages that were subprime increased from 2 percent to 95 percent of the total over that period. Yet, AIGFP's decisions were invariant to the change. The decision makers succumbed to categorization; that is, they treated a pool with 2 percent subprime mortgages as equivalent to a pool with 95 percent subprime mortgages.

Recall the failure of the rational lemons paradigm. A major reason the subprime market thrived instead of collapsed is that during 2004 and 2005, AIGFP assumed the default risk of subprime mortgages apparently unknowingly. AIGFP failed to assume the worst, as rational behavior in the lemons framework requires.

In addition to categorization, overconfidence and groupthink played key roles. AIGFP was headed by Joseph Cassano. His predecessor at the helm of AIGFP was Tom Savage, a trained mathematician who understood the models used by AIGFP traders to price the risks they were assuming. Savage encouraged debates about the models AIGFP was using and the trades being made. According to Lewis (2009), in contrast to Savage, Cassano stifled debate and intimidated those who expressed

¹²In 2003, the volume of subprime mortgages was less than \$100 billion. Between June 2004 and June 2007, the volume of subprime loans increased to \$1.6 trillion and Alt-A loans (limited-documentation loans) increased to \$1.2 trillion.

views he did not share. Cassano was not a trained mathematician. His academic background was in political science, and he spent most of his career in the back office doing operations. Lewis reports that his reputation at AIGFP was that of someone who had a crude feel for financial risk and a strong tendency to bully people who challenged him. One of his colleagues said of him, “The way you dealt with Joe was to start everything by saying, ‘You’re right, Joe’” (Lewis 2009). When the issue of a shift toward taking more subprime mortgage risk eventually made its way onto a formal agenda, Cassano, pointing to the AAA ratings from Moody’s and S&P, dismissed any concerns as overblown.

Eventually, Cassano did change his mind. It happened when he was persuaded to meet with a series of AIGFP’s Wall Street trading partners to discuss the premises underlying the rating of CDO tranches based on subprime mortgages. Cassano learned that the main premise was that the historical default rate for the U.S. housing market would continue to apply in the future, a judgment consistent with conservatism bias. To his credit, Cassano did not accept the premise, and at the end of 2005, AIGFP ceased its CDS trades.

AIGFP’s decision to stop insuring mortgage defaults did not stop Wall Street firms from continuing to create CDOs based on subprime mortgages. It did force Wall Street firms to bear some of the default risk, however, that AIGFP had previously borne. That outcome is a major reason Merrill Lynch, Morgan Stanley, Lehman Brothers, and Bear Stearns took the losses they did.

In August 2007, in a conference call to investors, Cassano made the following statement: “It is hard for us, without being flippant, to even see a scenario within any kind of realm of reason that would see us losing \$1 on any of those transactions” (Lewis 2009). Major surprises are the hallmark of overconfidence. Cassano apparently based his statement on the fact that the subprime mortgages that were beginning to default had originated in 2006 and 2007, which were riskier years for mortgage issuance than 2004 and 2005, the years in which AIGFP had taken its CDS positions. The CDS contracts on which Cassano had signed off stipulated, however, that AIG would post collateral if its credit rating were downgraded. As it happens, AIG’s credit rating did come to be downgraded, in September 2008 from AA to A, thereby triggering calls for collateral that AIG was unable to meet.

Incentives and Governance at AIGFP. Poor incentives were not the problem at AIGFP, which balanced long-term against short-term results. To its credit, AIGFP required that employees leave 50 percent of their bonuses in the firm, a policy that skewed their incentive toward the long run.¹³ As for Cassano, in 2007, he was paid \$38 million in total, but he left almost all of that amount (\$36.75

¹³When AIG collapsed, employees lost more than \$500 million of their own money.

million) in the firm. Clearly, he had a strong financial incentive to maximize the long-term value of AIG. His decisions destroyed value at AIG, however, and nearly brought down the firm.

Why did Cassano behave in ways that seem highly irrational? The reason is that when it comes to behaving rationally, psychological pitfalls can trump incentives. Good governance involves more than structuring good incentives.

A host of additional governance questions can be raised about AIG. Why did AIGFP's board of directors agree to appoint someone with Cassano's temperament to head the division? How thoroughly did the executives at the parent firm monitor Cassano's actions? To what extent did the resignation of AIG CEO Hank Greenberg in March 2005 make a difference to the risks assumed by the firm as a whole?

Most of these questions are difficult to answer. We do know that Greenberg, who had run AIG since 1968, was known for being a diligent monitor. His successor, Edward Liddy, lacked Greenberg's deep understanding of the firm. For the six-month period preceding the bailout, the firm had neither a full-time chief financial officer nor a chief risk assessment officer and was engaged in a search for both. As a result, in the period leading up to the bailout, the executives of the 18th-largest firm in the world had no clear sense of their firm's exposure to subprime mortgage risk.

Narvik

At the end of the supply chain for the financial products in this story are the investors who purchased and held the complex securities at the heart of the tale. Narvik, Norway, population 17,000 and located above the Arctic Circle, is just such an investor. It was featured in a February 2009 CNBC documentary titled "House of Cards," which explored issues surrounding the financial crisis.¹⁴ Narvik had been losing population and its tax base. To address the issue, its local council invested \$200 million in a series of complex securities that included CDOs. The purchase of the CDOs was part of a larger strategy in which the town took out a loan, using as collateral future revenues from its hydroelectric plant, and invested the proceeds in complex securities with the intent of capturing the spread. Narvik ended up losing \$35 million, roughly a quarter of its annual budget.

Two main psychological features tie the situation in Narvik to the discussion in previous sections. First, given the decline in population and tax revenues, the council members in Narvik quite plausibly exhibited reference point-induced risk-seeking behavior. They were fiduciary managers of cash flows derived from their hydroelectric plant, but because money and population were higher in the past, they swapped those monies for what they hoped would be higher cash flows from U.S. mortgages and municipal bond payments.

¹⁴A video of the program is available at www.cnbc.com/id/28892719.

Second, the mayor of Narvik at the time, Karen Kuvaas, insists that the council members were not naive, but in this respect, she might have been overconfident; she also admits that she did not read the prospectus before signing off on the deal and was not aware that if some of the securities declined in value, Narvik would have to post payments. In defense of the council, Kuvaas indicated that the securities they purchased were represented to them as AAA rated and, therefore, as very safe.

The lesson here is that fiduciaries or other agents who may be knowledgeable enough in one set of circumstances may be way over their heads in another. One should always be on the lookout to see if one is falling prey to overconfidence.

The SEC

The SEC came under intense criticism for its lax oversight of investment banking practices and for failing to detect a large hedge fund Ponzi scheme run by Bernard Madoff.

A focal point of the criticism of investment bank oversight involved a meeting that took place at the SEC on 28 April 2004, when the commission was chaired by William Donaldson. That meeting established the Consolidated Supervised Entities (CSE) program, a voluntary regulatory program that allowed the SEC to review the capital structure and risk management procedures of participating financial institutions. Five investment banks joined the CSE program, as did two bank holding companies. The investment banks were Bear Stearns, Goldman Sachs, Lehman Brothers, Merrill Lynch, and Morgan Stanley, and the bank holding companies were Citigroup and JPMorgan Chase.

As part of the CSE program, the SEC agreed to a change in elements of the net capital rule, which limited the leverage of broker/dealer subsidiaries. Some analysts have suggested that this change led the CSE participants to increase their leverage—from approximately 12:1 to ratios exceeding 30:1—thereby greatly magnifying the losses these institutions later incurred on their subprime mortgage positions (Labaton 2008; Coffee 2008).

Prior to 2004, the SEC had limited authority to oversee investment banks. In 2004, the European Union passed a rule permitting the SEC's European counterpart to oversee the risk of both broker/dealers and their parent holding companies. This change could have meant that the European divisions of U.S. financial institutions would be regulated by European agencies, but the European Union agreed to waive regulatory oversight by its own agencies if equivalent oversight was provided by the host countries' agencies. This policy is what led the SEC to institute the CSE program, although the SEC required that the entities be large firms, firms with capital of at least \$5 billion. Indeed, U.S. investment banks, anxious to avoid European oversight, lobbied the SEC for the change.

The change to the net capital rule made it consistent with the Basel II standards. The key feature of the change was an alteration in the way net capital is measured. Prior to the change, net capital was measured by financial statement variables and was subject to formulaic discounts (“haircuts”) to adjust for risk. The main change to the rule replaced the formulaic approach with discounts derived from the risk management models in use at the financial institutions.

Controversy surrounds the impact associated with the change to the net capital rule. The *New York Times* first reported the change to the rule (Labaton 2008), and this report was subsequently echoed by academics (e.g., Coffee 2008). The coverage by the *New York Times* might have been misleading, however, in that it suggested that this change allowed the leverage levels at parent holding companies to grow from 15 to above 30, thereby exacerbating faulty decisions about subprime mortgages. The SEC maintains that the change in provisions of the net capital rule applied to broker/dealer subsidiaries and had no discernible impact on the degree of leverage of the parent holding companies. Sirri (2009) argued that the change in the net capital rule left the same leverage limits in place and changed only the manner in which net capital is measured.¹⁵

Perhaps the most important feature of the CSE program was the SEC’s failure to provide effective oversight of the risk profiles at the financial institutions in question. Consider the following remarks by Coffee (2008):

Basel II contemplated close monitoring and supervision by regulators. Thus, the Federal Reserve assigns members of its staff to maintain an office within a regulated bank holding company in order to provide constant oversight. In the case of the SEC, a team of only three SEC staffers were [sic] assigned to each CSE firm (and a total of only 13 individuals comprised the SEC’s Office of Prudential Supervision and Risk Analysis that oversaw and conducted this monitoring effort). From the start, it was a mismatch: three SEC staffers to oversee an investment bank the size of Merrill Lynch, which could easily afford to hire scores of highly quantitative economists and financial analysts, implied that the SEC was simply outgunned.

Planning at the SEC. Did the SEC display overconfidence in its planning process for the CSE program? Perhaps. Evidence suggesting overconfidence can be observed in the following two excerpts from the transcript of the 28 April

¹⁵The purpose of the net capital rule is not to limit overall leverage at financial institutions, so the rule did not impose leverage restrictions on parent holding companies. The rule’s purpose is to provide protection of such assets as consumer receivables in case of liquidation by a broker/dealer. Indeed, leverage ratios for the major investment banks during the late 1990s averaged 27, well above the maximum ratio associated with the net capital rule.

2004 meeting. In the excerpt, Harvey Goldschmid, who was an SEC commissioner at the time, directs a question to an SEC staffer:¹⁶

Harvey Goldschmid: We've talked a lot about this. This is going to be much more complicated—compliance, inspection, understanding of risk—than we've ever had to do. Mike, I trust you no end. But I take it you think we can do this?

Group: [Laughter.]

Mike: Well we've hired Matt Eichler and other folks as well who are skilled in quantitative analysis. They're both PhDs right now. And we've hired other people as well who are quantitatively skilled. So we're going to continue to develop that staff. And then we have a good accounting staff as well. And then our auditors in New York, as well as in Washington will be useful in this process.

I mean, so we're going to have to depend on the firms, obviously. They're frontline. They're going to have to develop their entire risk framework. We'll be reading that first. And they'll have to explain that to us in a way that makes sense. And then we'll do the examinations of that process. In addition to approving their models and their risk control systems.

It's a large undertaking. I'm not going to try to do it alone.

Group: [Laughter.]

The two instances of group laughter in the above excerpt mark points at which “Mike” might have exhibited overconfidence about his ability to oversee risk management at seven major financial institutions with combined assets of about \$4 trillion with the help of only two PhDs, some additional quantitatively oriented personnel, and agency accountants and auditors.¹⁷

Consider a second excerpt involving Goldschmid and Annette Nazareth, who at the time was the SEC director of the Division of Market Regulation. Their interchange is particularly interesting in light of the later collapse of Bear Stearns, Lehman Brothers, and Merrill Lynch:

Goldschmid: We've said these are the big guys but that means if anything goes wrong, it's going to be an awfully big mess.

Group: [Laughter.]

¹⁶An audio file of the relevant portion of the SEC meeting is available at www.nytimes.com/2008/10/03/business/03sec.html. Transcripts of open meetings of the SEC can be accessed at www.sec.gov/news/openmeetings.shtml.

¹⁷The audio contains information (especially about what the laughter signifies) that does not come across in the written transcript. In the first instance, the laughter comes as a response to the contrast between Goldschmid's remark about trusting staff and his question, including tone of voice, about the staff being capable of performing the task. The second instance of laughter comes in response to Mike's humorous statement that he will not be doing the task alone. Notably, he is serious when he describes the resources he envisages being allocated to the task. In my view, the group laughter in the second instance does not reflect doubt that the SEC staff was capable of performing the task or doubt that the resources described were woefully inadequate.

Annette Nazareth: Again, we have very broad discretionary As we mentioned, we're going to be meeting with these firms on a monthly basis. And hopefully from month to month you don't see wild swings. Among other things, we can require firms to put in additional capital, to keep additional capital against the risks. We can actually—the commission has the authority to limit their ability to engage in certain businesses, just as any prudent regulator would. We have hopefully a lot of early warnings and the ability to constrict activity that we think is problematic.

Goldschmid: I think you've been very good at thinking this through carefully and working this through with skill

The deliberations to establish the CSE program lasted less than an hour. The vote by the SEC was unanimous. Little probing for weaknesses in such a far-reaching proposal occurred. I suggest that overconfidence and confirmation bias were high. This kind of setting is where groupthink thrives.

Goldschmid left the commission in 2005. In an October 2008 interview with the *New York Times*, he reflected: "In retrospect, the tragedy is that the 2004 rule making gave us the ability to get information that would have been critical to sensible monitoring, and yet the SEC didn't oversee well enough" (Labaton 2008). I suggest that this recollection indicates that Goldschmid was overconfident in 2004.

Although Goldschmid was apparently overconfident at that time, other forces that led to weak oversight were also at work. In April 2004, when Goldschmid was serving as one of the commissioners, the SEC was chaired by Donaldson, but in 2005, Christopher Cox replaced Donaldson. Cox was generally regarded as favoring weaker regulations, which might explain why so few resources were allocated to the CSE program. In February 2009, Linda Thomsen, the director of enforcement at the SEC, resigned under pressure. It was on her watch that Wall Street investment banks made disastrous risk management decisions and the Ponzi scheme conducted by Madoff went undetected. In describing her resignation, the press noted that she should not have to bear the entire blame for these failures because Cox set the tone, including public criticism of SEC staff, for weak regulatory oversight.

Madoff and Behavioral Pitfalls at the SEC. According to an internal report by the SEC (2009), between 1992 and 2008, the agency received six distinct complaints about Madoff's operations, one of which involved three versions. Several of the complaints suggested that Madoff was running a Ponzi scheme. The report reveals that the SEC conducted investigations and examinations related to Madoff's investment advisory business but failed to uncover the fraud.

I suggest that confirmation bias lay at the heart of the SEC's failure to detect Madoff's Ponzi scheme. An excerpt from the SEC's internal report follows.¹⁸ As

¹⁸The SEC's internal report rejects the possibility that political influence played a part in the SEC's failure to detect the Madoff fraud. Rather, it focuses the blame squarely on the judgment calls of agency investigators and staff.

you read through the excerpt, keep in mind that a person exhibits confirmation bias when he or she overweights information that confirms a view or hypothesis and underweights information that disconfirms the view or hypothesis. The report states:

The OIG investigation found the SEC conducted two investigations and three examinations related to Madoff's investment advisory business based upon the detailed and credible complaints that raised the possibility that Madoff was misrepresenting his trading and could have been operating a Ponzi scheme. Yet, at no time did the SEC ever verify Madoff's trading through an independent third-party, and in fact, never actually conducted a Ponzi scheme examination or investigation of Madoff.

In the examination of Madoff, the SEC did not seek Depository Trust Company (DTC) (an independent third-party) records, but sought copies of such records from Madoff himself. Had they sought records from DTC, there is an excellent chance that they would have uncovered Madoff's Ponzi scheme in 1992.

The teams assembled were relatively inexperienced, and there was insufficient planning for the examinations. The scopes of the examination were in both cases too narrowly focused on the possibility of front-running, with no significant attempts made to analyze the numerous red flags about Madoff's trading and returns

The investigation that arose from the most detailed complaint provided to the SEC, which explicitly stated it was "highly likely" that "Madoff was operating a Ponzi scheme," never really investigated the possibility of a Ponzi scheme. The relatively inexperienced Enforcement staff failed to appreciate the significance of the analysis in the complaint, and almost immediately expressed skepticism and disbelief. Most of their investigation was directed at determining whether Madoff should register as an investment adviser or whether Madoff's hedge fund investors' disclosures were adequate.

As with the examinations, the Enforcement staff almost immediately caught Madoff in lies and misrepresentations, but failed to follow up on inconsistencies. They rebuffed offers of additional evidence from the complainant, and were confused about certain critical and fundamental aspects of Madoff's operations. When Madoff provided evasive or contradictory answers to important questions in testimony, they simply accepted as plausible his explanations.

Although the Enforcement staff made attempts to seek information from independent third-parties, they failed to follow up on these requests. They reached out to the NASD [now, FINRA, the Financial Industry Regulatory Authority] and asked for information on whether Madoff had options positions on a certain date, but when they received a report that there were in fact no options positions on that date, they did not take any further steps. An Enforcement staff attorney made several attempts to obtain documentation from European counterparties (another independent third-party), and although a letter was drafted, the Enforcement staff decided not to send it. Had any of these efforts been fully executed, they would have led to Madoff's Ponzi scheme being uncovered. (pp. 23–25)

People who succumb to confirmation bias test hypotheses by searching for information that confirms the hypothesis they are testing. The antidote to confirmation bias is to search for information that *disconfirms* the hypothesis, to ask whether the hypothesis is untrue, a lie. What the SEC report strongly indicates is that its staff members actively avoided seeking disconfirming information to their view that Madoff was innocent of running a Ponzi scheme.

Confirmation bias was not the only psychological pitfall afflicting the SEC in connection with its investigations of Madoff. An incentive issue was also involved in respect to the way the SEC rewarded investigators. Nocera (2009) pointed out that the SEC bases its success on quantitative measures, such as the number of actions it brings and the number of cases it settles. He suggests that through its choice of standards and incentives, the SEC tends to pursue small cases, cases in which those being investigated will prefer to settle and pay a fine even if they are innocent. Madoff was not a small case.

Reference point–induced risk seeking was also a factor. Nocera indicated that the SEC finds it difficult to shut cases down once they have been initiated. Such behavior is throwing good money after bad, a phenomenon technically known as “escalation of commitment.” Nocera stated:

Even if the facts start to look shaky, the internal dynamics of the agency push its lawyers to either settle or go to trial, but never to abandon it. [quoting] “The staff has a real problem persuading the commission to cut off a case once it has begun.”¹⁹

Given the SEC’s limited resources, the costs of escalation of commitment can be very high.

In addition to confirmation bias and escalation of commitment, the SEC also exhibited poor information sharing. In this regard, the SEC report relates that the agency was unaware that it was running separate examinations out of two offices. The report states:

Astoundingly, both examinations were open at the same time in different offices without either knowing the other one was conducting an identical examination. In fact, it was Madoff himself who informed one of the examination teams that the other examination team had already received the information they were seeking from him. (SEC 2009, p. 24)

Discussion and Conclusion

Opinions about the root cause of the financial crisis differ. Some argue that the root lies with a weak regulatory structure, within which private-sector decisions were largely rational. Others argue that the root lies with irrational decisions associated with the occurrence of a housing market bubble, a surge in subprime mortgage

¹⁹The person Nocera quoted is John A. Sten, a former SEC lawyer who represented a former Morgan Stanley broker whom the SEC prosecuted unsuccessfully for almost a decade.

lending, and the breakdown of the rational lemons paradigm. Still others blame poor corporate governance, explicit corruption, and unwise governmental mandates and guarantees. Differentiating among these various views requires a search for the devil in the details.

The details considered here involve five cases, all of which highlight (to a greater or lesser degree) irrational decision making at key points in the financial product supply chain. Consider decisions made at AIG. AIG facilitated the explosive growth in subprime mortgage lending in 2004 and 2005 by selling CDS that insured against default. AIG's financial product division irrationally failed to track the proportion of subprime mortgages in the pools being insured, thereby misgauging the risk of those assets and causing the associated CDS to be mispriced. Interestingly, this failure occurred despite incentives that balanced long-term performance against short-term performance. Moreover, conversations that AIG had with its trading partners indicate the presence of a widespread conservatism bias regarding the assumption that historical mortgage default rates would continue to apply.

Similarly, the UBS investment banking division admitted to misgauging subprime mortgage risk by not "looking through" the CDO structures and by assuming that historical default rates would continue to apply. UBS's underperformance relative to competitors led it to exhibit reference point-induced risk seeking. This behavior was compounded by poor incentive structures at UBS that emphasized short-term performance over long-term performance.

Recall that UBS placed no operational limits on the size of its CDO warehouse. It was not alone. Investment banks are typically intermediaries, not end investors planning to hold large positions in subprime mortgages. Some hold the equity tranches of CDOs as a signal to the buyers of the less risky tranches. What created many of the losses for investment banks, however, was inventory risk—risk stemming from warehousing the subprime positions that underlay CDOs. As the housing market fell into decline, many investment banks found that they could not find buyers for the CDOs and, as a result, inadvertently became end investors.

The rating agencies and investors' reliance on them played a huge role in the financial crisis. Both (supposedly) sophisticated investors, such as the investment bankers at UBS, and naive end investors, such as the Narvik town council, relied on the risk assessments of rating agencies. The rating agencies, however, explicitly indicated that their ratings were premised on accepting the information they received as accurate, even if the mortgages featured limited documentation. For this reason, the agencies suggested that their ratings be treated as only one piece of information when assessing risk. By this argument, users who accepted their ratings at face value behaved irrationally.

Did the rating agencies exhibit irrational behavior by weakening their risk assessment criteria to cultivate more business? This question is different from asking whether the ratings agencies behaved ethically. The major problem with the

behavior of rating agencies might arise more from a conflict of interests (the principal–agent conflict) than irrationality, in the sense that the issuers of securities, not the end investors in the securities, pay for ratings. Still, the evidence suggests that reference point–induced risk seeking and groupthink were issues at S&P.

In addition to the five entities highlighted here, many others participated in the financial product supply chain. For example, press coverage suggests that the value–destructive dynamics at UBS were also at work at other financial institutions active in initiating subprime mortgages and in creating CDOs that included subprime mortgages (see Shefrin 2009).

In 2004 and 2005, the activities of these financial institutions might have been rational because they were able to shift default risk to AIG by purchasing CDS. Lewis (2009) quoted AIG employees as stating that their firm’s willingness to sell CDS allowed the CDO market to grow at a rapid rate. After AIG stopped selling CDS, however, many financial firms took on the risk themselves, apparently under the illusion that housing prices would continue to rise and that default rates would not be affected by the increased ratio of subprime to prime mortgages. At one point, Merrill Lynch used CDS to create synthetic CDOs because the number of subprime mortgages available to create traditional CDOs was insufficient relative to the firm’s aspirations.

The financial crisis also raises issues involving being “too big to fail” and moral hazard. Some might argue that the root of the financial crisis was a rational response by executives of large financial institutions to the perception that they could take on excessive risk because the U.S. government would intervene should those risks prove disastrous. To be sure, the executives must have been aware of such a possibility. The management failures at these institutions bore the telltale signs, however, of psychological pitfalls. In addition, a sign that intervention was not guaranteed came with the government’s choice to let Lehman Brothers fail.

Not only was the SEC subject to confirmation bias, but also I believe overconfidence might have pervaded the entire regulatory landscape. Consider the comments of Alan Greenspan, who chaired the Federal Reserve during the key years in which the seeds of the crisis were sown. In June 2005, Greenspan testified before Congress that some local housing markets exhibited “froth.” He pointed to the use of risky financing by some homeowners and suggested that the price increases in those local markets were unsustainable. He concluded, however, that there was no national housing bubble and that the economy was not at risk.²⁰ In the same vein, Greenspan’s successor at the Fed, Ben Bernanke, gave a speech on

²⁰Under Greenspan, in the recession that followed the bursting of the dot-com bubble, the Federal Reserve cut interest rates to 1 percent. Some have criticized the Fed for keeping interest rates too low for too long, thereby encouraging the dramatic increase in mortgage volume. See www.federalreserve.gov/BOARDDOCS/TESTIMONY/2005/200506092/default.htm.

17 May 2007 in which he stated, “[W]e do not expect significant spillovers from the subprime market to the rest of the economy or to the financial system.”²¹

In 2008, Greenspan testified before the House of Representatives Committee on Oversight and Government Reform as follows:

[T]his crisis, however, has turned out to be much broader than anything I could have imagined Those of us who have looked to the self-interest of lending institutions to protect shareholders’ equity—myself especially—are in a state of shocked disbelief. (Felsenthal 2008)

Consider the behavioral issues raised by Greenspan’s comment about self-interest. Lending institutions are not masochists. The behavioral point is that psychological pitfalls created a gap between perceived self-interest and objective self-interest, thereby inducing irrational decisions.

Most parties involved in the financial crisis are asking what they can learn from the experience. Under the leadership of the SEC’s new enforcement chief, Robert Khuzami, the SEC is instituting a series of new procedures, such as providing senior enforcement officers the power to issue subpoenas without requesting permission from commissioners. UBS has created a presentation titled “Risk Management and Controls at UBS.” The presentation emphasizes that managers must pay explicit attention to a series of behavioral issues, such as irrational exuberance in asset pricing.

These steps are in the right direction. A body of academic literature describes how organizations can take steps to avoid behavioral pitfalls (see Heath, Larrick, and Klayman 1998), but dealing with psychological pitfalls is not easy. The application of behavioral corporate finance and behavioral asset-pricing theory is not yet widespread. Moreover, little evidence indicates that organizations have developed systematic procedures along these lines.

The most useful behavioral lessons we can learn from the crisis are how to restructure processes to incorporate the explicit elements of behavioral corporate finance that this article has discussed. I have suggested that to avoid the kinds of process weaknesses exemplified by the five cases described here, systematic procedures within organizations should focus on the four key organizational processes listed in Exhibit 1: planning, standards, information sharing, and incentives (Shefrin 2008b).²² Checklists are no panacea, but they do make the issue of vulnerability an explicit agenda item.

Still, the removal of psychological biases is not easy. Psychological pitfalls are likely to persist and to continue to affect decisions. For this reason, managers, analysts, investors, and regulators would be well advised to keep three main points

²¹The speech was given at the Federal Reserve Bank of Chicago’s 43rd Annual Conference on Bank Structure and Competition held in Chicago. See www.federalreserve.gov/newsevents/speech/bernanke20070517a.htm.

²²Only a thumbnail sketch of the approach can be provided here; for the detailed approach, see Shefrin (2008b).

in mind. First, sentiment can affect asset pricing, particularly pricing of the securities of companies followed by analysts. Second, corporate managers are vulnerable to psychological biases (as we all are); therefore, these pitfalls are germane to companies' operational risks. Third, analysts themselves are vulnerable to psychological pitfalls and need to be mindful of how these pitfalls affect their own processes and decisions.

For example, consider what analysts might have missed about Citigroup before October 2007. Were Citigroup and AIG connected? In this regard, consider the CDS deals that AIGFP did in 2004 and 2005. Lewis (2009) quoted an AIGFP trader as saying, "We were doing every single deal with every single Wall Street firm, except Citigroup. Citigroup decided it liked the risk and kept it on their books. We took all the rest" (p. 1).

This remark should hold a lesson for analysts about applying tools from behavioral corporate finance. For example, analysts might use the framework encapsulated by Exhibit 1 to focus on the combination of process and psychological pitfalls in a situation. In the case of Citigroup, analysts could have focused on Citigroup's planning process in late 2004 and early 2005, when it was dealing with flagging profit growth. In that situation, Citigroup would have been especially vulnerable to reference point-based risk seeking. Indeed, Citigroup's board did decide to increase the firm's risk exposure after a presentation from a consultant, thereby taking a path similar to that of UBS.

Although analysts have no direct access to boardroom discussions, keeping the quality of governance in mind can be worthwhile. Consider whether Citigroup's board exhibited groupthink. In a *Wall Street Journal* article about Citigroup board member Robert Rubin, Brown and Enrich (2008) stated, "Colleagues deferred to him, as the only board member with experience as a trader or risk manager. 'I knew what a CDO was,' Mr. Rubin said" (p. 1).

As the cases discussed in this article attest, assuming that financial institutions will make intelligent, bias-free risk-reward decisions is a mistake. Looking back after the crisis unfolded, Brown and Enrich (2008) quoted Rubin as saying about Citigroup's decision to take on more risk, "It gave room to do more, assuming you're doing intelligent risk-reward decisions" (p. 1). Learning that decision makers have psychological biases is an important lesson, not just for analysts but for everyone. Moreover, the lesson applies at all times, a point to keep in mind even as economic conditions improve and the financial crisis that erupted in 2007–2008 fades into memory.

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