



Intuitive psychology, natural experiments, and the Greenspan-Bernanke conceptual framework for responding to financial crises

Responding to financial crises

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Abstract

Purpose – During the Greenspan-Bernanke era, the responses of Federal Reserve officials to financial crises resulted in an extraordinary involvement of the US central bank in the non-banking financial sector. The purpose of this paper is to examine the informal and evolving conceptual framework that allows Federal Reserve officials to pursue a strategy of “constrained discretion” in responding to financial disturbances.

Design/methodology/approach – Behavioural economics relies on designed psychological and economic experiments to predict behavioural biases at the group level. As an analogue applicable to understanding biases in the intuitive judgments of individual policymakers, a naïve behavioural economics approach relies on intuitive or naïve psychology and the interpretation of historical events as natural experiments to explain why intuitive judgments of Federal Reserve officials will contain biases.

Findings – Under the Greenspan-Bernanke conceptual framework, Federal Reserve officials exercise “constrained discretion” in responding to disturbances arising from macro structural changes in the financial sector. The two key concepts are the Greenspan-Bernanke doctrine on how the Federal Reserve officials respond to financial asset price bubbles and their collapses, and Bernanke’s financial accelerator. Several examples are cited in which policy errors made by Alan Greenspan were attributable to identifiable biases in his intuitive judgment. In addition, Bernanke’s response to the financial crisis of 2007-2009 was based on his interpretation of the Great Depression as a natural experiment. But that interpretation was heavily biased by the influence of Milton Friedman on Bernanke’s intuitive judgment. While Federal Reserve officials will need to exercise discretionary judgment in responding to financial crises, the potential for errors due to biases in that judgment can be reduced through regulatory reforms that lessen the potential for financial crises to occur.

Originality/value – While quantitative analyses of the effects of the Federal Reserve’s actions on non-bank financial institutions and the financial markets are ongoing, little attention has been given to the psychological aspects of the intuitive judgment that influences the discretionary decisions of the policymakers.

Keywords United States of America, Behavioural economics, Economic policy, Intuitive psychology, Natural experiments, Naïve behavioural economics, Greenspan-Bernanke doctrine, Financial accelerator

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1. Introduction

The Greenspan-Bernanke era at the Federal Reserve started with a financial crisis (the October, 1987 stock market crash), and subsequently experienced the inflation and collapse of two great financial bubbles (the dot.com stock market bubble and the subprime mortgage bubble), inconclusively ending in the worst global financial crisis since the 1930s. In responding to the financial crisis that began in 2007, the Federal Reserve took “extraordinary steps” (Bernanke 2008b, 2009a) in implementing new programs and policies that included providing loans to primary securities dealers, allowing investment banks to become bank holding companies, arranging the financing for a commercial bank to takeover an investment bank, bailing out a major insurance company, providing liquidity for the commercial paper market, the market for asset-backed securities, and money market mutual funds, and purchasing debt of government-sponsored-enterprises. As Meltzer (2009, p. 1243, emphasis added) noted:

Events following the start of the housing, mortgage, and credit crises in summer 2007 opened a new chapter in Federal Reserve history. Never before had it taken responsibility as lender of last resort to the entire financial system.

The legal basis for the Federal Reserve’s extraordinary involvement with non-bank financial institutions and financial markets rested on an interpretation of powers under a depression-era addition to the Federal Reserve Act. Section 13(3) authorized the Federal Reserve to provide secured loans to non-banking corporations in “unusual and exigent circumstances,” defined as the borrowers being “unable to secure adequate accommodations from other banking institutions” (Bernanke, 2009a). But the decision by Federal Reserve officials to use that authority, and the nature of the policies that were implemented, spawned an ongoing policy debate over the extent to which (if any) central bank officials should be permitted to rely on discretionary judgment in responding to instability in the financial markets in the twenty-first century. Some, such as Meltzer (p. 1255), have blamed the financial crises of 2001-2002 and 2007-2009 on discretionary policy errors. Other critics have been more selective in perceiving major errors in judgment, particularly the decision by Ben Bernanke to allow the investment bank Lehman Brothers to fail. Still others, such as Raines *et al.* (2009), have suggested that Bernanke’s policies are confirming predictions in the 1920s that the Federal Reserve would become the patron of the powerful Wall Street investment banks.

In this paper, we offer a somewhat different perspective on the discretionary judgment of Federal Reserve officials as to when and how to respond to financial crises. First, we address the charge levied by some critics that Federal Reserve officials exercised their discretionary judgment in an unrestrained manner. In behavioral economics, decisions of investors and policymakers are influenced by how perceptions of the consequences of economic and financial events are “framed” (Tversky and Kahneman, 1987). In Section 2, we note that an informal and evolving conceptual framework provided the “framing” that supported a transition from a reliance on monetary policy rules to the exercise of discretionary judgment by Federal Reserve officials. Our particular interest is the progression to the “extraordinary” involvement in financial markets under the operative term “constrained discretion”. Two key concepts in that framework provided the “constraint” on discretionary policy responses to disturbances in financial markets. The Greenspan-Bernanke doctrine defined when and how the Federal Reserve should respond to financial asset bubbles.

Bernanke's "financial accelerator" shaped perceptions of how disturbances in financial markets affect the overall economy, and hence the type of discretionary policy actions that would be called for.

While the Greenspan-Bernanke conceptual framework does impose some constraints on discretionary policymaking, any discretionary judgment of Federal Reserve officials is inherently subject to biases that may lead to policy errors. As we explain in Section 3, the reason is in the nature of the cognitive reasoning processes that give rise to intuitive judgments. Since those processes cannot be observed, we employ a methodological approach that draws from both behavioral economics and evolutionary psychology.

At the group level, behavioral economics uses empirical results from controlled experiments to validate psychological theories of behavioral biases in financial decision making that are predictable. Psychological principles and predictive models that are derived through group experiments cannot be applied to predict behavioral tendencies of individuals. But for our purposes, there is an analogue that is applicable for individuals in what we term "naïve behavioral economics." The discretionary judgment of individuals is shaped by what evolutionary psychologists (Boyer, 2001; Kirkpatrick, 2005) call intuitive or naïve psychology. Essentially, the human mind has evolved through natural selection a number of psychological systems or mechanisms that function automatically to generate inferences or intuitions of what other people are doing, thinking, feeling, and planning to do. Further by way of providing a naïve analogue to the experimental approach of formal behavioral economics, we note that Greenspan and Bernanke based their discretionary judgment to some extent on intuitive interpretations of historical events in financial markets as natural experiments.

We cite several of examples in which discretionary policy errors in responding to financial crises are attributable to biases in the intuitive judgment of Federal Reserve officials. Because of the volatile and innovative nature of the financial sector and its impact on the real economy, some measure of discretionary policymaking to cope with financial instability will remain a necessity. We conclude in Section 4 by suggesting that the danger of policy errors may be lessened through regulatory reforms that reduce the potential for financial crises to occur.

2. The evolving Greenspan-Bernanke conceptual framework

Explicit references to this conceptual framework by Alan Greenspan and Ben Bernanke indicate its evolution in response to developments in the financial sector. Near the end of his first decade as Chairman of the Federal Reserve Board, Greenspan (1997a) explained that Federal Reserve policymakers must:

[...] develop as best we can a stable *conceptual framework*, so policy actions are as regular and predictable as possible – that is governed by systematic behavior *but open to evidence of structural macroeconomic changes that require policy to adapt* (emphasis added).

During the 1990s, Greenspan (1998a) perceived that innovations in information technologies were producing macroeconomic structural changes, plausibly to the extent of creating a "new economy" that allowed a higher rate of economic growth and lower rate of employment before inflationary pressures required a tighter monetary policy. But increasingly, his perceptions of macroeconomic structural changes focused on developments in the financial sector from financial innovations,

especially financial derivatives. A decade after the 1987 stock market crash, Greenspan (1997b) acknowledged that Federal Reserve policymakers were routinely monitoring and responding to “a whole host of financial variables.” Seven years later, in explaining the conceptual framework for the Federal Reserve’s new financial risk management approach to policymaking, Greenspan (2004) stated that the most prominent-specific issue facing officials was the appropriate role of financial asset prices in policymaking.

2.1 Bernanke’s “constrained discretion” and the financial sector

In posing the question of “the right *conceptual framework* for thinking about inflation expectations in the current context,” Bernanke (2007d, emphasis added) explained how evolutionary changes in the economic structure had reduced the applicability of the traditional rational-expectations model in which long-run expectations are perfectly “anchored”, i.e. do not vary over time in response to new information. The new conceptual framework recognizes that “imperfectly anchored” expectations vary over time in response to economic and financial developments and monetary policies, thus allowing a greater reliance on discretionary judgment of Federal Reserve officials.

While serving as a member of the Federal Reserve Board, Bernanke (2003) had explained how “constrained discretion” was fast becoming the standard approach to policymaking. While a commitment to keeping inflation low and stable provided the constraint, policymakers were allowed considerable discretion to respond to financial disturbances. As Chairman of the Federal Reserve Board, Bernanke became increasingly focused on developments in the financial sector. By the onset of the financial crisis in 2007, a conceptual framework for analyzing the macroeconomic impacts of financial developments and establishing financial markets policy options had become clearly defined (Mishkin, 2008a; Kroszner, 2008). The two key concepts in that framework were the Greenspan-Bernanke doctrine on how the Federal Reserve should respond to euphoric booms in financial markets, and Bernanke’s financial accelerator that incorporates changes in confidence and the wealth effect of asset prices during periods of financial euphoria followed by pessimism and uncertainty.

2.2 The Greenspan-Bernanke doctrine

At its core, the Greenspan-Bernanke conceptual framework rests on an advocacy of broad-based financial deregulation under the premise that free market competition naturally regulates financial markets and encourages financial innovations that reduce risk and instability. Greenspan (2007) brought to the Federal Reserve a mindset deeply influenced by Ayn Rand’s libertarian views and Adam Smith’s free market philosophy, and to a less extent by Joseph A. Schumpeter’s concept of the “creative destruction” from innovations. In response to Congressman Waxman’s questioning about the influence of his “ideology” on his policy decisions, Greenspan responded by saying that “remember what an ideology is. It is a *conceptual framework* about the way people deal with reality” (www.europeaninstitute.org/Winter/Spring-2009/alan-greenspan-explains-mistake, 2009, emphasis added).

Bernanke (2007a) followed Greenspan in advocating deregulation of financial markets, arguing that Adam Smith’s “invisible hand” in the financial markets:

[...] takes the form of creating market incentives for market participants to monitor and control the risk-taking behavior of financial firms – that is, to exert market discipline – thereby reducing the need for direct oversight by the government.

Echoing Greenspan's praise of innovative financial products and processes, Bernanke (2006, 2007b) declared that "an extraordinary amount of financial innovation had greatly enhanced the liquidity, efficiency, and risk-sharing capabilities of the financial system".

But beginning with his "irrational exuberance" speech in 1996, Greenspan qualified his assertions that most market behavior must be rational with repeated warnings that the economy and financial markets remain primarily driven by human psychology inextricably linked to an immutable human nature which remains subject to recurring episodes of irrational exuberance and fear (Greenspan, 1996, 1998a, 1999a, b, 2001a, 2002a, b, 2005a). Federal Reserve policymakers must be students of human nature because there will be "psychologically driven" euphoric booms in stock prices, with bubbles feeding on themselves until ended by abrupt breaks in confidence that cannot be predicted (Greenspan, 2007, p. 17).

The Greenspan-Bernanke doctrine on asset price bubbles reflected both the fundamental assertion that stock prices are rational, efficiently capitalizing expected future profits, and the acknowledgement that "irrational exuberance" can precipitate bubbles and the negative wealth effects and pessimism that follow their collapse (Greenspan, 2001b, 2002b, 2005b; Bernanke and Gertler, 1999; Bernanke, 2002a). Under the assertion that it was impossible for policymakers to know whether rises in stock prices constituted a speculative bubble driven by "irrational exuberance" or rational valuations of future corporate earnings, the doctrine calls for the Federal Reserve to take no action. If a bubble proves its existence by collapsing, then the Federal Reserve should flood the financial system with liquidity to mitigate the negative impacts on the financial system and the economy. Thus, the near-record low interest rates after the dot.com bubble burst, and the "extraordinary" actions taken by the Federal Reserve after the subprime mortgage bubble collapsed.

2.2.1 A weak corollary: macroprudential regulations. Beginning with Greenspan's (1998b) defense of the role played by the Federal Reserve in the bailout of the Long Term Capital Management Hedge Fund in 1998, Federal Reserve officials increasingly acknowledged that large non-bank financial institutions posed systemic risks. By 2009, a corollary to the Greenspan-Bernanke doctrine was being explicitly articulated under the heading of the need for "macroprudential regulations" (Bernanke, 2009c, 2009d, 2011). But it was a weak corollary as Federal Reserve officials would take with no action until a systemically important non-bank financial institution was verging on failure.

2.3 The financial accelerator and the wealth effect of asset prices

In the late 1990s, Greenspan repeatedly hailed the positive wealth effect of rising stock prices on consumption spending and capital investment, and subsequently expressed concern about the negative wealth effect from falling stock prices in 2001-2002 (Greenspan, 2002c). Again, the rising housing prices through 2005 were hailed as producing a positive wealth effect on consumption that more than offset the negative wealth effect of the aforementioned falling stock prices. A more sophisticated concept of psychological factors affecting confidence in the financial sector and the "wealth effects" of changing asset values and balance sheets was incorporated in Bernanke's "financial accelerator," a mechanism through which changes in financial and credit conditions play important roles in the propagation of business cycles (Bernanke, 2007d).

In the prosperity phase of a cycle, increasing cash flows lower the external finance premium which encourages or accelerates investments beyond the point at which

the factors behind the prosperity have dissipated. When the cycle enters the recession phase, decreased cash flows and balance sheets increase the external finance premium, resulting in reduced investment expenditures and its negative effects on the level of aggregate demand. The psychological element enters because financial euphoria not only contributes to the excessive level of investment, but produces a speculative bubble in a market for financial assets. On the negative side, the acceleration effect occurs in the form of an “adverse feedback loop” that results when the bubble collapses and becomes reinforced by economic and financial stress (Bernanke, 2008a; Mishkin, 2008b). In Federal Reserve terminology, financial markets “seize up” as the herd psychology of fear and uncertainty lead financial institutions to adopt defensive positions of hoarding liquidity.

Of special importance was Bernanke’s linking the financial accelerator with the wealth effect to explain why the effects of changes in home values on household borrowing and spending exceeded the conventional wealth effect from rising asset prices. Because households’ wealth positions also affect their external finance premiums, their costs of credit change inversely with changes in wealth. When the housing market bubble was inflating, equity wealth was increasing while the cost of credit was falling. When the subprime mortgage bubble collapsed in 2007, the combination of falling equity wealth and rising cost of credit contributed to the adverse feedback loop. In February 2008, Bernanke told a congressional committee that the financial accelerator was having an especially important effect on the economy (Ip, 2008). Stress from the financial crisis had a negative effect on aggregate demand and employment, which in turn increased the uncertainty behind the stress in the financial markets that resulted in a credit crisis.

3. A naïve behavioral economics perspective: intuitive psychology and natural experiments

Research in behavioral economics has focused primarily on participants in financial markets, with little attention to central bank officials. But several behavioral economists have viewed the Greenspan-Bernanke doctrine within the context of the cognitive influence of stories in explaining financial market instability has been discussed. As Shiller (2000, pp. 138-9) explained, “a psychological principle that much of human thinking that results in action [...] takes the form of storytelling [...] reasoning through complicated issues by constructing a story.” In discussing how the psychology of Keynes’ “animal spirits” drives the macro economy and financial markets, Akerlof and Shiller (2009, pp. xi, 51) explained that:

The human mind is built to think in terms of narratives, of sequences of events with an internal logic and dynamic that appear as a unified whole. Stories and storytelling are fundamental to human knowledge.

The excesses in financial market that cause failures in the economy are driven by stories that people tell themselves (Akerlof and Shiller, 2009, p. 173). Citing the example of Ponzi schemes, Shiller (2003, p. 94) stated that an amplifying feedback effect occurs as stories are seemingly validated by actions of market participants who are under the psychological influence of the stories.

According to this view, the Greenspan-Bernanke conceptual framework is essentially a new story with an unfolding narrative told in speeches and testimonies by Greenspan

and Bernanke, and echoed and amplified in the speeches by other members of the Federal Reserve Board. In keeping with the evolutionary emergence of the Greenspan-Bernanke conceptual framework, stories and their mental representational impacts vary over time. Akerlof and Shiller (2009, pp. 75-85) observed how “standard story” of the ability of the central bank to manage the macro economy through interest rate and money supply policies was being revised by Bernanke’s intuitive responses to the failure of Bear Stearns (Akerlof and Shiller, 2009, pp. xii, 82-3). The narrative to a new story justifies targeting financial markets in their evolving and increasingly sophisticated forms, e.g. the rapid emergence of the importance of “shadow banking” (Akerlof and Shiller, 2009, pp. 95-6). Indeed, Bernanke (2008b) recognized the psychological importance of stories in lamenting that “Adverse economic or financial news has the potential to increase financial strains and lead to further constraints on the supply of credit to households and businesses.” The feedback transmitted by word of mouth and the media in Shiller’s (2003, p. 94) stories is the same as adverse feedback loop in Bernanke’s financial accelerator.

3.1 Intuitive or naïve psychology and biases in intuitive judgment

The problem with the cognitive role of stories is that it fails to provide any real understanding of the cognitive reasoning processes behind the discretionary judgment of Federal Reserve officials. Those processes cannot be observed, nor can the group-oriented psychological insights and predictive models of formal behavioral economics be applied to individuals. But evolutionary psychology provides a natural analogue to the psychological insights derived from controlled experiments of behavioral economics in the form of intuitive or naïve psychology. Of particular importance is that it explains why intuitive policy judgment of highly informed Federal Reserve officials will be naturally subject to biases that may lead to serious policy errors.

In evolutionary psychology, the human mind has evolved through a process of natural selection a complex of modules designed to receive specific types of information and to automatically generate mental inferences. Various groups of these information-receiving-and-processing modules interact to form psychological systems or mechanisms that operate the fundamental cognitive reasoning processes. The intuitive psychological system generates mental representations or impressions of what is going on in the minds of other people – what they are feeling, thinking, planning, and how they will react in certain situations (Boyer, 2001, pp. 106-54; Kirkpatrick, 2005, pp. 270-9).

Most of the information receiving and processing into mental images or intuitions occur automatically at the subconscious level. But some of these implicit intuitions move into the realm of explicit intuitive conceptualization. Just as those explicit intuitional concepts will be shaped by a variety of factors such as environment, experience, training, and intelligence, so too will be any actions that they may induce (Boyer, 2001, pp. 350-1). Evolutionary psychologists stress that humans possess a “social mind,” which means that intuitive psychology systems feed on information from other people and thrives on social exchange relationships. Indeed, some argue that the intuitive psychology systems developed to enable people to deal with other people (Boyer, 2001, pp. 165 and 171). In addition, the intuitions generated by the naïve psychological system will be influenced by other innate mental systems in the mind, in particular those that when stimulated will generate emotions and sense of morality (Boyer, 2001, p. 352).

As a word of caution, “naïve” does not mean that the understandings of concepts are primitive or misguided, but only that they are developed spontaneously without the systematic training needed to acquire scientific concepts (Boyer, 2001, p. 288). While evolutionary psychologists have identified other “naïve” systems in the mind, e.g. naïve physics and naïve biology (Kirkpatrick, 2005, p. 270), our focus is on the naïve psychology system. It is of some relevance in establishing the intellectual legitimacy of intuitive psychology that there is a well-established link with heuristic theory in behavioral economics. Tversky and Kahneman (1974, 2002) noted that people often have to make important decisions in which the choices must be based on beliefs about the likelihood of uncertain events. Because they normally lack adequate formal models for computing the subjective probabilities of such events, intuitive judgment is often the only practical method for assessing uncertainty. When expressing beliefs about uncertain events in numerical form as subjective probabilities, they rely on a limited number of heuristic principles or intuitive judgments which reduce the complex tasks of assessing probabilities and predicting values to simpler intuitive judgmental operations. Frantz (2006, p. 58) noted that “Intuition can be an expression or form of a heuristic because both usually bypass all conscious thinking processes.” But heuristic theory does not yield any insights into the cognitive reasoning processes of individuals. Rather, the heuristics that are validated by empirical psychological tests are those that are predictable behavioral biases of groups.

The relevant point of interest for us is that biases are inevitable in the intuitions of individuals. The nature of intuitive psychological systems is that they only generate perceptions of reality, not reality itself. In ordinary language, intuitive psychology means is that the discretionary judgment of individual decision makers such as the Federal Reserve policymakers will inevitably be heavily shaped to some extent by the processing of information through their own intuitive psychological systems. And further, the intuitive understanding of reality that leads to intuitive judgment will be inevitably shaped by the individual’s own experiences. Moreover, information received by any individual mind from other people and from the external environment will not only be imperfect but will be processed in different ways by the intuitive psychological systems of individuals. Consequently, intuitive judgments are inherently less than accurate, which has the potential for errors in decisions informed by those judgments.

3.2 Intuitive psychology and biases in Greenspan’s intuitive judgment

Tetlock (2002, p. 582) observed that:

In the domain of judgment, people are assumed to be intuitive scientists, psychologists, and statisticians who seek causal understanding and predictive leverage, and in the domain of choice, they are assumed to be intuitive economists who seek to maximize subjective expected utility.

There can be no question that Greenspan would agree that includes Federal Reserve officials, given his assertion that economic policymakers must be psychologists studying human nature (2007, p. 17). While Federal Reserve policies are officially determined by the seven members of the Federal Reserve Board, plus five of the 12 presidents of the Federal Reserve banks (on a rotating basis), policy decisions are invariably made by the Chairman of the Federal Reserve Board. What can we ascertain about errors in discretionary policies that are attributable to biases in intuitive judgment?

In a perfect world, insights into how intuitive judgment of Federal Reserve officials has been shaped by intuitive psychological systems would be gained through interviews by professional psychologists. Lacking such access into their innate inferential reasoning processes, a second-best approach is to derive insights from their public pronouncements. Because Greenspan tended to be more philosophical and prone to reveal aspects of his intuitive psychology, we can offer several examples of documented policy errors that are attributable to particular biases revealed in his speeches, testimonies, and autobiography (for detailed critiques of those errors, see Leathers and Raines, 2004; Canterbury, 2006; for Greenspan's admission of an error in judgment that contributed to the 2007-2009 financial crisis, see Andrews, 2008).

Recall that the functioning of intuitive psychology involves the social mind, which means that intuitions generated feed heavily on information received from other people. In that regard, particularly relevant to biases in Greenspan's intuitive judgment is the distinction by Frantz (2006, p. 51) between intuitionism as a philosophy that people have the innate ability to know the truth, and intuition as a subconscious form of thinking that is subject to errors. As noted earlier, Greenspan defined an ideology as a conceptual framework for dealing with reality. His libertarian ideological preconceptions that he attributed to the influence of Ayn Rand and Adam Smith suggest Frantz's "intuitionism," with rational people presumed to know the "truth" and to use that knowledge to make optimal decisions. (Viewed from a developmental and evolutionary psychology perspective, Smith and Rand would appear to stand as "attachment figures" for Greenspan to whom he turns for a sense of comfort and security (Kirkpatrick, 2005, p. 28)). The close relationship between Greenspan's "intuitionism" and his intuitive psychology helps to explain his bias toward limited government regulation. That judgment proved very wrong, as deregulation of financial institutions and funds using unregulated financial innovations contributed to the financial crises of 2001-2002 and 2007-2009.

But Greenspan's intuitive judgment is perhaps best explained in terms his intuitive psychology producing inferences or beliefs of how people behave in their financial decision making and the consequent inferences of how financial markets and institutions function. That was reflected in his argument that Federal Reserve policymakers had to develop "broad hypotheses" about how the world works and how financial market participants will behave (Greenspan, 2004). There are two aspects of Greenspan's judgment that may seem inconsistent with the intuitive psychology analysis, when in fact they are. While his core intuitive judgment was that people are rational and financial markets are naturally regulated by competition (the Rand-Smith influence), we noted in Section 2 that he repeatedly warned about the psychology of "irrational exuberance" rooted in the immutability of human nature producing booms that end in financial crises, which worked against the anti-regulation bias that was influenced by his intuitionism. This is in keeping with what evolutionary psychologists know about the intuitions generated by the intuitive psychology systems. The same system will process a number of different, often competing, intuitions from the same information received. In most cases, a single intuition will move on to the explicit concept level. But where several have the ability to strongly stimulate the intuitive psychology system at the subconscious level, both may enter the realm of conscious thought.

In related fashion, Boyer's concept of the consequences of "counter-intuitive" events is especially relevant in explaining the Greenspan-Bernanke doctrine

on financial bubbles. One of the documented policy errors made by Greenspan was his intuitive judgment that financial innovations promoted efficiency and stability in the financial sector. Instead, they contributed to the stock market bubble that collapsed in 2001-2002, and especially to the financial crisis of 2007-2009. Greenspan's intuitive psychology infers that people are generally rational in their financial decision making, which in turn infers that financial markets are generally efficient. Thus, the Federal Reserve should take no discretionary action unless reality presents a counter-intuitive development, e.g. the collapse of the dot.com bubble and the collapse of the subprime mortgage/derivatives bubble. The extraordinary policy responses to deal with the immediate negative consequences then mark a sharp departure from the "normal" guidance of his intuitive judgment that infers efficient and stable markets. The policy error arising from that is the failure to intercede before the financial bubble reaches a dangerous inflation point. That would be interpreted as a "counter-intuitive" event causing a reconsideration of the intuitive judgment.

Greenspan's intuitive psychology also produced intuitions that had a time dimension. As Sicilia and Cruikshank (2000, pp. 12 and 14) noted, his presumed intuitive ability to see beyond empirical indicators and implement "pre-emptive strikes" against inflation gave rise to his celebrity status in the 1990s. Similarly, between 2002 and 2005, he was able to persuade Federal Open Market Committee members to refrain from raising interest rates as the unemployment rate fell because he intuitively judged that producers' costs were being held down by an increase in labor productivity that quantitative analysts were unable to detect (Greenspan, 2004, 2007, p. 173). This produced a false confidence that when financial asset prices are rising, any negative events are expected to occur in the more distant future. Hence, the more abstract notion of rational pricing dominated discretionary judgment, justifying a policy of non-intervention. But again, when a bubble collapses, Greenspan's intuitive psychology is faced with a counter-intuitive event with serious negative consequences, influencing a resort to extraordinary policies such as those of 2007-2009.

3.3 Natural experiments and Bernanke's extraordinary financial policies

While behavioral economics draws upon designed experiments (Oxoby, 2002), naïve behavioral economics draws upon interpretations of historical events as natural experiments. Shiller (2003, p. 94) argued that evidence from natural experiments that occur in real time, e.g. Ponzi schemes, may be more supportive of behavioral tendencies than results of laboratory experiments. Natural experiments were also cited by Shiller as providing supportive evidence of the feedback effect of stories. Greenspan (2004) argued that Federal Reserve policymakers' inferences about the behavior of financial market participants, and their broader hypotheses of how the world works, should be heavily influenced by the "bits and pieces" of history. But the most important influence came from Friedman (2005, 2006), who argued that three natural experiments had verified that changes in the money supply was the causal factor in determining national income and stock prices. Those were the boom of the 1920s and the Great Depression of the 1930s, the boom in Japan in the 1980s and the recession of the 1990s, and the boom of the 1990s in the USA that was followed by a recession in 2001-2002.

As an economic historian with a special research interest in the role of the Federal Reserve in the Great Depression, Bernanke's cognitive processes have been guided by interpretations of the Great Depression and other historical events as natural experiments. The Great Depression as a natural experiment strongly influenced development of Bernanke's financial accelerator concept, which in turn influenced his extraordinary policy responses to the financial crisis of 2007-2009. Hailing Friedman's research as "paradigm-shifting" in its influence on contemporary monetary economics, Bernanke (2002b) recounted how his own personal views and his early research were influenced by Friedman's special genius in the use of natural experiments. Because natural experiments are uncontrolled and impossible to replicate, a single such experiment is not convincing. But the multiple experiments cited by Friedman made a powerful case.

Bernanke declared agreement with Friedman's argument that monetary policy played a central role in the Great Depression in the USA and the world-wide depression. But he actually accepted only part of Friedman's conclusions, namely, that the Federal Reserve caused the Great Depression by failing to support banks and increase the money supply. A full acceptance of the argument that the three natural experiments had validated Friedman's monetarist doctrine would have required an adherence monetary policy rules, i.e. maintaining an "optimal" growth rate in the monetary aggregates, which the Greenspan-Bernanke conceptual framework had rejected in favor of "constrained discretion." That explains the extraordinary involvement in financial markets after taking an essentially *laissez faire* position with the housing market bubble was inflating, fulfilling Bernanke's promise to Friedman that the Federal Reserve would not repeat its mistake of the early 1930s.

Here again an understanding of intuitive psychology alerts us to the nature of the bias in Bernanke's view of the lessons to be derived from the Great Depression as a natural experiment. The "social mind" feeds on information received from others, but the imperfection of the information received and the particular way in which each mind processes that information produces biased intuitions. Whereas Bernanke's intuitive judgment of what caused the Great Depression was biased by the mental influence of Friedman, someone whose intuitive judgment was influenced by the writings of John Kenneth Galbraith or John Maynard Keynes would have a very different interpretation of the results of this "natural experiment".

4. What lessons have been learned?

Etzioni (2010) noted that behavioral economics has focused on individual's behavioral tendencies and has not effectively incorporated influences of culture and society. Under the Greenspan-Bernanke conceptual framework, the discretionary policy judgments of individuals on the Federal Reserve Board and the Federal Open Market Committee have major influences on society's level of economic welfare. Hence, it is important to understand as much as possible what is involved in the inferential cognitive processes behind the key concepts in that framework, the Greenspan-Bernanke doctrine and Bernanke's financial accelerator. As Frantz (2006) noted, intuitive judgment as subconscious thinking is subject to error. As we have explained, both the intuitive psychological system and interpretations of earlier financial crises as natural experiments are inherently subject to biases in intuitive judgment that has been further shaped by such factors as experience, training, and environment.

While those biases do not necessarily translate into serious errors in discretionary policymaking, they do have that potential, as demonstrated by our examples of Greenspan's policy errors.

Because of the inherently volatile nature of the financial sector, especially in the modern era of financial innovations and corporate structures that encourage excessive risk taking by "too big to fail" financial institutions, and the increasing extent to which financial instability affects the real economy, Federal Reserve officials will need to exercise discretionary flexibility in responding to financial disturbances. To minimize the risk of serious discretionary policy errors arising from biases in their intuitive judgments, increased regulations of large financial institutions and funds are needed to limit the possibility of failures that have systemic impacts. In view of the opposition to current proposed legislation such as the Dodd-Frank Act from the powerful lobby for large financial institutions, the prospects of serious action in that direction remains doubtful. But as financial failures continue to roil the global economy, the US Congress may be forced to enact the requisite regulatory reforms.

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