

FECKLESS AND FICKLE: CENTRAL AND SHADOW BANKING
DURING THE GLOBAL FINANCIAL CRISIS

by
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Dissertation Abstract

This dissertation studies the relationship between economic ideas and financial crises. It focuses on a subset of economic ideas, economic conventions, of which there are three types: ergodicity, expert opinion, and conventional expectations. This dissertation argues that conventions account for six inter-related phenomena in financial markets. First, stable economic conventions produce stable markets. Second, some conventions are more likely to produce asset market imbalances than others are. Third, conventions sow epistemic blindness to the prospect of non-routine change in financial markets. Fourth, shocks to agents' convention-given expectations catalyze convention uncertainty in financial markets. Fifth, given sufficient financial fragility, convention uncertainty causes agents to revert to first principles of survival, hoarding liquid capital and disrupting the market's normal price mechanism. Sixth, conventions set the bounds of elite responses to financial crises. These six propositions emerge from a theoretical synthesis of several paradigms of understanding agent behavior in complex social systems, including Post-Keynesian asset market theory, Keynesian epistemology, Charles Doran's power cycle theory, and economic constructivism. The study employs counter-factual, process-tracing, and econometric techniques to demonstrate empirically its causal propositions via a case study of central banking and shadow banking during the global financial crisis. The dissertation finds that economic conventions explain the Federal Reserve's accommodative monetary policy from 2001-2006, and that conventions such as bond ratings, value-at-risk, and conventional expectations in shadow banking markets were key drivers of financial fragility ex-ante the global financial crisis. This dissertation finds that regulators' repeated interventions in financial markets, including their orchestration of

the bailout of hedge fund Long-Term Capital Management in 1998, bailout of investment bank Bear Stearns, and bailouts for the government-sponsored enterprises Fannie Mae and Freddie Mac in 2008, established a conventional expectation in financial markets that regulators would serve as *de facto* deposit guarantors for shadow banking conduits. It is proposed that the failure of Lehman Brothers in September 2008 eviscerated the market's tenuous, convention-engendered stability, thus initiating a period of convention uncertainty in financial markets. Convention uncertainty disrupted the market's normal price mechanism and explains the market's "flight to quality" after Lehman's bankruptcy. Regulators' unconditional bailouts of the U.S. financial system can be understood as an attempt to restore convention certainty to wholesale funding markets. All told, the findings of this dissertation provide support for the argument that economic ideas, and in particular economic conventions, need to be taken seriously as important causal drivers of stability, fragility, and change in financial markets.

Dissertation Committee Members:

- Dr. Charles F. Doran, Ph.D. (Johns Hopkins University, SAIS) – *primary reader*
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- Dr. Roger Leeds, Ph.D. (Johns Hopkins University, SAIS)
- Dr. Mark M. Blyth, Ph.D. (Brown University)

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List of Abbreviations and Acronyms

A-IRB	Advanced internal-ratings based approach
ABCP	Asset-backed commercial paper
ABS	Asset-backed security
AIG	American International Group
AIG-FP	American International Group's Financial Products Group
AMLF	ABCP Money Market Mutual Fund Liquidity Facility
ARM	Adjustable-rate mortgage
BEA	U.S. Bureau of Economic Analysis
BLS	U.S. Bureau of Labor Statistics
CDO	Collateralized debt obligation
CDS	Credit default swap
CPI	Consumer Price Index
CRA	Credit rating agency
FCIC	Financial Crisis Inquiry Commission
The Fed	The Federal Reserve
FHFA	Federal Housing Finance Authority
FOMC	Federal Open Market Committee
FSA	The United Kingdom's Financial Services Authority
GSE	Government-Sponsored Enterprise (e.g. Fannie Mae and Freddie Mac)
HERA	Housing and Economic Recovery Act
LIBOR	London Inter-bank Offered Rate
LTCM	Long-Term Capital Management

MBS	Mortgage-backed Security
MMIFF	Money Market Investor Funding Facility
OER	Owners' Equivalent Rent
PDCF	Primary Dealer Credit Facility
QLR	Quandt Likelihood-Ratio
Repo	Repurchase Agreement(s)
SEC	Securities and Exchange Commission
SIV	Structured Investment Vehicle
TARP	Troubled Asset Relief Program
TSLF	Term Securities Lending Facility
VaR	Value-at-Risk

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By 'uncertain' knowledge, let me explain, I do not mean merely to distinguish what is known for certain from what is only probable. The game of roulette is not subject, in this sense, to uncertainty; nor is the prospect of a Victory bond being drawn...The sense in which I am using the term is that in which the prospect of a European war is uncertain, or the price of copper and the rate of interest twenty years hence, or the obsolescence of a new invention, or the position of private wealth-owners in the social system in 1970. About these matters there is no scientific basis on which to form any calculable probability whatever. We simply do not know. Nevertheless, the necessity for action and for decision compels us as practical men to do our best to overlook this awkward fact and to behave exactly as we should if we had behind us a good Benthamite calculation of a series of prospective advantages and disadvantages, each multiplied by its appropriate probability, waiting to be summed.

- J.M. Keynes¹

There is no truth about markets 'out there' other than the prevailing wisdom that markets have about markets themselves, and this can be a very fickle thing.

- Mark Blyth²

Massive structural change causes the decision maker to miscalculate the strength of established conventions in the face of evidence which runs counter to them...“Hot” processes of emotion and motivation shape perception and therefore judgment. The capacity to think in terms of sequence of causal logic during successful intervals may become blurred. An increase in the mere volume and complexity...can cause stress...When extremely stressful conditions arise, cognition is disrupted, thinking becomes simplistic, memory fades, and the probability of wrong choice among strategic alternatives increases substantially.

- Charles F. Doran³

¹ (Keynes 1937a, 213-214)

² (Blyth 2002, 43)

³ (Doran 1991, 28-30)

**CHAPTER 1:
INTRODUCTION**

Economic Conventions and Financial Stability

This dissertation examines the relationship between economic ideas and financial stability. It focuses on a subset of economic ideas, economic conventions, of which there are three types: ergodicity, expert opinion, and conventional expectations.⁴ Ergodicity is the assumption that the past reliably foretells the future.⁵ Expert opinion refers to the propensity of market participants to adopt the views of authoritative agents and conventional wisdom when forming their own. Conventional expectations describe the tendency of market participants to make second and third order guesses about other actors' beliefs when making individual investment decisions. Together, these three conventions serve as the epistemological basis of agents' decisions in complex social systems.

J.M. Keynes prominently featured economic conventions in his analysis of the economy. According to Keynes, asset markets were plagued by moments of structural uncertainty that, left unchecked, would prevent them from functioning normally. To cope with this uncertainty, agents employ economic conventions to “save [their] faces as rational, economic men” by giving them a *pretense of knowledge* upon which they can base their behavior given uncertainty about the future.⁶ When conventions “maintain the allegiance of the majority of agents, they will help provide continuity and predictability

⁴ (Keynes 1937a, 214)

⁵ (Keynes 1936, 148) I.e.: “The facts of the existing situation enter, in a sense disproportionately, into the formation of our long-term expectations”

⁶ (Keynes 1937b, 13)

to economic life,” and “help produce order and continuity where chaos might have been,” as James Crotty contends.⁷ Confidence in conventions produces stable markets.

This dissertation answers the following theoretical research questions:

1. What is the relationship between economic conventions and financial stability?
2. How can economic conventions be incorporated into the Post-Keynesian model of financial crises?

This dissertation advances six, inductively derived propositions that answer the above questions: first, convention stability produces financial stability. As a corollary, convention-engendered stability initiates a financial system’s endogenous shift from robustness to fragility over time. Second, conventions influence both the amplitude and periodicity of asset market imbalances. Third, conventions blind agents to the prospect of non-ergodic change in financial markets. Fourth, information shocks to agents’ convention-given expectations trigger convention uncertainty. Fifth, within fragile financial systems, convention uncertainty causes agents to revert to “first-principles” of survival by hoarding liquid capital and rationing credit. Sixth, conventions critically determine the nature and success of elite responses to financial market instability.

Building on the Post-Keynesian Model

Theoretically, this dissertation brings economic conventions “back into” the Post-Keynesian model of financial instability in the tradition of Hyman Minsky, Charles Kindleberger, Robert Aliber, Joan Robinson, Sheila Dow, Victoria Chick, James Crotty, and Thomas Palley, among others. In the Post-Keynesian model, financial crises unfold in three stages: a “displacement” or bubble inflation stage, a crisis stage, and a crisis-

⁷ (Crotty 1994, 123-124).

resolution stage.⁸ This dissertation argues that economic conventions are critically important in each stage of the Post-Keynesian model.

According to Hyman Minsky, financial crises begin with an exogenous “displacement” that changes the “anticipated profit opportunities...in at least one important sector of the economy.”⁹ Higher profit expectations cause financial institutions to extend credit to finance capital accumulation in the displaced sector. Asset prices rise. Positive feedback between rising prices and investor optimism ensues. Consumers and firms feel wealthier, and finance consumption via greater leverage. Output rises and unemployment falls. “Euphoria” develops as investors purchase assets to flip them for short-term capital gains, rather than on their long-term income-generating potential. Financial authorities, aware that “something exceptional is happening,” come up with “extensive explanations” that “this time is different,” and that the traditional rules of economic gravity no longer apply. As the boom wears on, insiders sell assets to monetize paper profits. Eventually, capital prices fall. A period of “financial distress” follows. Banks book mark-to-market losses and interbank credit dries up. The failure of a major financial institution, a notable investor boycotting the bubble asset class, or a sharp, unanticipated drop in the price of a security might trigger a financial panic. Declining market confidence exposes the underlying fragility of the financial system, making it difficult for banks and firms to meet their maturing obligations. Trading in certain asset

⁸For the foundational texts in Post-Keynesian asset market theory from which this section is adapted, see: (Minsky 1992) and (Minsky 2008), (Kindleberger and Aliber 2005), (Robinson 1978), (Dow 2010), (Chick 2002), (Crotty 1994), and (Palley 2010).

⁹ Displacements can occur for a variety of reasons, such as an unanticipated decline in the price of a valuable commodity, the commercialization of disruptive technology, or wars and other political transitions, to name a few examples. In the Post-Keynesian model, displacements are *exogenous*. (Kindleberger and Aliber 2005, 25-26)

classes ceases. Investors purchase safe assets in a “flight to quality.” Lenders of last resort might intervene in financial markets to remove bad debts from the financial system and alleviate funding pressures facing financial institutions. If regulators are successful, their interventions can restore market confidence, though other measures might be needed to buffer the real economy from the financial fallout.¹⁰

This dissertation brings economic conventions “back into” the Post-Keynesian model in four ways:

First, economic conventions help us understand the sociological micro-foundations of stability in financial markets. Hyman Minsky believed that prolonged financial stability endogenously produces fragility over time. Minsky claimed that financial systems predominated by robust financing structures (i.e. hedge finance) create incentives for firms to issue increasingly short-term debt with lower margins of safety. As Minsky argues:

As a previous financial crisis recedes in time, it is quite natural for central bankers, government officials, bankers, businessmen, and even economists to believe that a new era has arrived. Cassandra-like warnings that nothing basic has changed...are naturally ignored in these circumstances...Nevertheless, in a world of uncertainty, given capital assets with a long gestation period, private ownership, and the sophisticated financial practices of Wall Street, the successful functioning of an economy within an initially robust financial structure will lead to a structure that becomes more fragile as time elapses. Endogenous forces make a situation dominated by hedge finance unstable, and endogenous disequilibrating forces will become greater as the weight of speculative and Ponzi finance increases.¹¹

This dissertation accepts Minsky’s contention, and recognizes that while stability is a powerful descriptive variable of endogenous financial change, it too is something that

¹⁰ (Kindleberger and Aliber 2005, 21-29)

¹¹ (Minsky 2008, 237-238)

needs to be explained. As such, this dissertation explores the sociological micro-foundations of stable markets, and finds that financial stability critically depends on conventions. When conventions are stable, markets are stable. When conventions are unstable, markets can become unstable. Prolonged, convention-engendered stability catalyzes a financial system's endogenous shift from robustness to fragility over time.

Second, conventions improve our understanding of "displacements" and agents' epistemic blindness to fragility *ex-ante* crises. Conventions specify the social mechanisms by which heightened profit expectations in a specific sector proliferate across the economy (e.g. via expert opinion and conventional expectations) and how market optimism sustains itself (for instance, by agents projecting present trends into the future). In addition, imbalances and fragility often require a critical mass of market participants willing to justify or at least ignore dis-confirmatory (i.e. bubble-indicative) market data.¹² Economic conventions explain why agents are blind to the risks of *ex-post* obvious financial calamities *a priori* their occurrence.

Third, economic conventions provide a framework for understanding how stable (but fragile) financial systems erupt into crisis. As Keynes argued, conventions are subject to "sudden and violent changes," and convention uncertainty can cause "the...calmness and immobility, of certainty and security," to suddenly break down. "Once confidence in the meaningfulness of the forecasting process is destroyed, irreducible objective uncertainty forces its way into the consciousness of agents, breaking down the conventional barriers they have constructed to conceal it," as James Crotty

¹² Reinhart and Rogoff aptly identify pre-crisis epistemic blindness as "this time is different" syndrome, which they view as an important symptom of impending financial collapse. (Reinhart and Rogoff 2011)

adds.¹³ While Keynes and Crotty provide a plausible framework of understanding why convention uncertainty leads to financial instability, these authors underspecify the causes of convention uncertainty in financial markets. To fill this scholarly lacuna, this dissertation draws on insights from Charles Doran’s model of crises in international relations, which argues that shocks to agents’ convention-given expectations of the future catalyze structural uncertainty in complex social systems. According to Doran, when agents realize that their taken-for-granted conventional anchors are “suddenly proven wrong,” convention uncertainty ensues. Doran argues that the “massive structural change” associated with an unforeseen information shock can “cause the decision maker to miscalculate the strength of established conventions in the face of evidence which runs counter to them.” As a result, “the capacity to think in terms of sequence of causal logic...may become blurred.”¹⁴ This dissertation adapts Doran’s insights to the study of financial stability. It proposes that given sufficient financial fragility, shocks to agents’ widely shared, taken-for-granted conventions catalyze convention uncertainty and thus financial instability.¹⁵ Absent convention certainty, agents experience Knightian uncertainty and hoard liquid capital, bidding up the price of safe assets (e.g. money and its substitutes) and selling risky assets.¹⁶

Fourth, economic conventions explain how financial authorities respond to financial crises. Regulators, politicians, bureaucrats, and central bankers rely on

¹³ (Crotty 1994, 125)

¹⁴ (Doran 1991, 28-30)

¹⁵ “Fragility” is described here in the Minsky sense (i.e. comprised primarily of speculative and Ponzi financing structures, or those that require *continued access to new borrowing* to meet maturing obligations).

¹⁶ (Keynes 1937a, 214-216). As Keynes saw it, money demand was a “barometer of the degree of our distrust of our own calculations and conventions concerning the future.”

economic conventions for the same epistemological reasons that financial market participants do. Policymakers have an array of choices to make when faced with a crisis, and which path is chosen ultimately depends on both economic conventions held by regulators and the market's economic conventions about them. Economic elites use economic conventions to both diagnose and react to the novel stress and uncertainty presented by financial market instability, and conventions delimit the permissible choices available to them.

Ontologically, this dissertation advances a strongly constitutive standard of causality that describes conventions and market outcomes as mutually constituted, endogenous, and deeply recursive. It corroborates the view, expressed by Mark Blyth, R. Ned Lebow, and other constructivists, that ideational social science advances its own, distinct social ontology. Methodologically, this dissertation employs a variety of research techniques to demonstrate its causal propositions, including counter-factual analysis, process-tracing via elite interviews and discourse analysis, and econometric analysis of time series financial market data. Empirically, this dissertation contributes to our collective understanding of the inter-subjective drivers of monetary policy and shadow banking outcomes in the U.S. economy from 2001-2009, as explained below.

Conventions and the Global Financial Crisis

To paraphrase an old adage, theory without evidence has no legs upon which to stand, while evidence without theory has no eyes with which to see. To that end, this dissertation presents a conventions-based account of continuity and change in the U.S. economy from 2001-2009. It finds that economic conventions were important causal

drivers of both central banking and shadow banking outcomes in the U.S. economy during this period. This study answers the following empirical research questions:

1. How did economic conventions influence the Federal Reserve's monetary policy from 2001-2006?
2. How did economic conventions contribute to the rise of fragile financial structures in the U.S. economy prior to the global financial crisis?
3. How did the market's conventional expectations determine the stability of shadow banking conduits before, during, and after the global financial crisis?

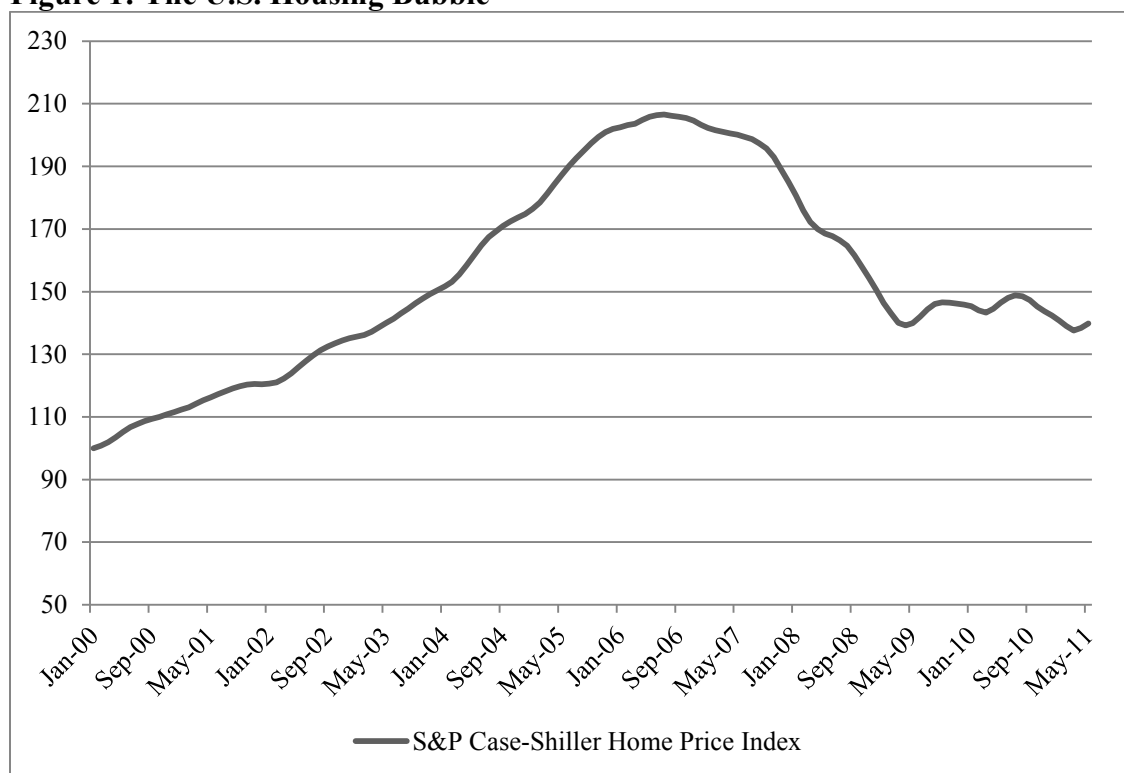
By now, the story of the global financial crisis is clear: from 2001-2007, the U.S. economy experienced a housing boom backed by an unsustainable credit expansion. When housing prices fell, banks booked mark-to-market write-downs on their assets, leading to funding problems and contagion effects in financial markets. The simultaneous failure of investment bank Lehman Brothers and bailout of insurance giant American International Group (AIG) initiated a generalized bank run in the commercial paper and repurchase agreement markets, causing credit rationing and margin calls among systemically important financial institutions. Fearing the total collapse of the U.S. financial system, America's fiscal and monetary authorities granted unconditional bailouts to bank and non-bank financial institutions.¹⁷ These measures succeeded in preventing the financial economy from falling off a cliff, but could not forestall the general contraction of credit and loss of confidence from affecting the real economy. Facing slower growth and rising unemployment, the U.S. Congress passed an \$800

¹⁷ These included asset purchases, buying preferred shares in banks to shore up their capital base, and extending Federal banking deposit insurance to both bank and non-bank market-based liabilities, to name a few examples (see Chapter 6).

billion fiscal stimulus bill, worth roughly six percent of America's 2009 GDP, in February 2009. The Federal Reserve also purchased \$1.1 trillion in mortgage securities and cut short-term interest rates 0%, where they remain to this day, five years after the crisis.¹⁸

Conventions tell several aspects of this story, including the causes of the housing bubble and the rise of fragile financial structures from 2001-2007, as well as the market's epistemic blindness to the economy's systemic vulnerability to instability *ex-ante* the crisis. Conventional change explains why investors ran on shadow banking conduits idiosyncratically before Lehman Brothers' bankruptcy and generally afterward. Moreover, conventions reveal how regulators reacted to the crisis and why their interventions restored market confidence by March 2009.

¹⁸ This account draws on the results of the Financial Crisis Inquiry Commission in the United States (per their *Financial Crisis Inquiry Report*). (The Financial Crisis Inquiry Commission 2011)

Figure 1: The U.S. Housing Bubble

Source: Standard & Poor's

How did the housing bubble relate to economic conventions? Many scholars, such as John Taylor, Marek Jarociński, and Frank Smets argue that the Federal Reserve's accommodative monetary policy caused the housing bubble.¹⁹ They claim that the Fed's interest rate setting body, the Federal Open Market Committee (FOMC), cut and held interest rates "too low for too long" after the 2000-2001 recession, causing mortgage interest rates to fall and housing demand to surge. Higher home prices begat ever-rising expectations of future price increases, as banks extended credit to prospective homeowners in anticipation of capital gains and origination fees. Once the housing bubble took off, consumers tapped into their home equity to finance their above-trend

¹⁹ (Taylor 2007) and (Jarociński and Smets 2008)

consumption, beginning a broad-based economic expansion across many sectors of the U.S. economy led by real estate and financial services.²⁰

Though monetary policy was the *proximate* cause of the housing bubble (with short-term interest rates serving as the key, intervening variable), economic conventions drove the Fed's monetary policy, and were thus the housing bubble's *ultimate* cause. These conventions include the FOMC's members' fears of repeating Japan's historical experience with deflation (i.e. ergodicity), the Fed's use of owners' imputed rent rather than housing prices to calculate housing inflation (i.e. expert opinion that housing prices and rents constituted ontologically distinct categories), and Fed technocrats' widespread acceptance of the "Greenspan Doctrine" that it was preferable to clean up the aftermath of a bubble rather than lean against its inflation (i.e. expert opinion setting the discursive bounds of appropriate policy). It follows that different conventions would have led to different Fed monetary policy, altering both the periodicity and amplitude of the housing bubble.

As Hyman Minsky notes, however, bubbles are necessary but insufficient conditions for systemic crises. Rather, Minsky believed that financial fragility explains why some bubbles cause crises while others deflate benignly.²¹ To understand why the deflating housing bubble triggered the global financial crisis, then, it is necessary to investigate the causes of fragility in the U.S. economy that developed in tandem with the housing bubble.

²⁰ (Gjerstad and Smith 2011, 114-115)

²¹ (Minsky 2008, 234)

Building on Gary Gorton's work on banking crises, this dissertation argues that at its heart, the global financial crisis is best understood as a banking panic that took place in the asset-backed commercial paper (ABCP) and repurchase agreement ("repo") markets that, coupled with securitization, formed the foundation of the global "shadow banking" system. As Gorton contends, shadow banking could be conceptualized analogously to traditional banking, with ABCP and repo counterparties serving as wholesale "depositors" and securitized assets serving as shadow banking "borrowers." Unlike traditional banking, shadow banking lacked Federally-sponsored deposit insurance, so shadow banking conduits were vulnerable to bank runs.²² If ABCP and repo counterparties doubted banks' ability to meet their obligations (as they did when collateral prices fell because of rising mortgage delinquencies), they might refuse to "roll over" banks' maturing liabilities, causing funding costs to rise and financial contagion to spread. The rise of unsecured shadow banking, via ABCP, repo, and securitization, created *systemic vulnerability* to falling housing collateral by predicating banks' liquidity on the continued willingness of counterparties to roll over banks' maturing short-term debt backed by risky collateral.²³ The proliferation of these fragile shadow banking financing structures was facilitated by three kinds of economic conventions, as described below.

First, the stability of shadow banking conduits depended on counterparties' conventional expectations about the creditworthiness of shadow banking conduits.

²² The absence of deposit insurance in shadow banking received little attention from regulators during the boom years, however, because ABCP and repo counter-parties seemed content to "roll over" financial institutions' short-term debt *ad infinitum*, thus maintaining both the liquidity and solvency of shadow banking conduits.

²³ (Gorton 2009, 1-10)

Shadow banking conduits (and their sponsors) remained liquid as long as ABCP and repo counterparties believed that fellow market participants would continue to roll over banks' maturing short-term liabilities. If counterparties doubted the intentions of fellow investors, however, they might refuse to roll over their ABCP and repo holdings, triggering a run on shadow banking conduits.²⁴ Under unsecured shadow banking, rumors of insolvency could prove self-fulfilling, as demonstrated by the swift collapse of Bear Stearns in March 2008 (see Chapter 5). Bank runs occurred idiosyncratically pre-Lehman and generally, across all ABCP and repo issuers, after Lehman's bankruptcy.

Second, shadow banking relied on institutionalized expert opinions rendered by credit rating agencies, which allowed risk-averse investors (e.g. money market mutual funds) to invest in the collateralized debt of financial institutions. Provided that banks posted safe collateral in ABCP and repo transactions, shadow banking carried *de minimis* counter-party and credit risk – in the worst case scenario, counterparties could seize the collateral backing their transaction and sell it for its face value. Bond ratings gave counterparties a conventional anchor to gauge the creditworthiness of ABCP and repo collateral, while also allowing financial institutions to tap into a deep pool of risk-averse capital to fund their shadow banking operations. Thus, ratings served a mutual conventional need for both shadow banking counterparties and financial institutions, leading both parties to believe that ABCP and repo collateral was *information-insensitive*, or immune to adverse selection problems due to information asymmetry. When market participants realized that favorable bond ratings underestimated the likelihood of default

²⁴ (Gorton 2009, 12-14)

of asset-backed securities, conventional change ensued, thus altering market outcomes as well.²⁵

Third, fragility also stemmed from financial institutions' undercapitalization, which also depended on economic conventions. Prior to the global financial crisis, regulators assumed that banks were the best arbiters of their own portfolio risk and left banks to write their own regulatory capital rules. Banks assumed that housing and securities prices would adhere to their historical bounds (i.e. conventions of ergodicity) when making regulatory capital provisions, which made banks susceptible to credit write-downs and undercapitalization when prices deviated from their historical trends. The rise of uninsured shadow banking, coupled with bank capital inadequacy, explains why the deflating housing bubble wreaked such havoc on the U.S. financial system during the global financial crisis.

Yet these factors alone do not give us a point estimate about why markets suffered an acute seizure after the failure of Lehman Brothers. This dissertation found that prior to Lehman's failure, regulators' repeated interventions in financial markets, ranging from their responses to Long-Term Capital Management in 1998, and Bear Stearns, Fannie Mae, and Freddie Mach in 2008, created a *conventional expectation* among ABCP and repo counterparties that regulators would serve as *liquidity providers of last resort* in wholesale funding markets. Ultimately, the market came to believe that regulators would bail out counterparties at the face value of their loans any time a systemically important financial institution ran into trouble. This convention maintained a tenuous stability in financial markets, insofar as fears over counterparty solvency remained isolated to

²⁵ (The Financial Crisis Inquiry Commission 2011, xxv-xxvii)

specific firms, and not generalized across all ABCP and repo markets. After September 15, 2008, things changed. Lehman's failure and AIG's bailout eviscerated the market's conventional expectation about regulators and thus initiated a generalized bank run in the shadow banking markets by ABCP and repo counterparties. Convention uncertainty about regulators' willingness to provide *de facto* deposit insurance to shadow banking conduits caused investors to assume the worst about their counterparties and hoard liquid capital. Investors sold risky assets and purchased perceived safe-havens like short-term Treasury bills, just as Keynes would have predicted.²⁶ Trading in certain derivatives markets ceased, while asset prices plunged.

Faced with this banking panic in commercial paper and repo markets, regulators had a choice: allow the crisis to conclude via Schumpeterian creative destruction, or intervene in financial markets to re-establish convention certainty by offering *de facto* deposit insurance to the shadow banking system. As we now know, regulators opted for the latter option, which raises two inter-related questions: first, how did conventions influence regulators' decision to grant unconditional bailouts to financial institutions after Lehman's bankruptcy, and second, how did the market's conventions about regulators implicate regulators' intervention capacity in the U.S. financial system?

This dissertation found that regulators' historic memories of past crises (namely the Great Depression), coupled with the market's faith in the U.S.'s sovereign creditworthiness (conventional expectations), granted America's regulators a high degree of policy latitude to respond to the crisis. Regulators' response to the crisis is best understood as their attempt to restore *convention certainty* to markets by demonstrating

²⁶ (Keynes 1937a, 216)

their commitment to serving as the guarantor of banks' short-term liabilities, thus obviating counterparty fears in wholesale funding markets and restoring confidence to the financial system. The fact that regulators were successful in their intervention reveals a great deal about the market's perception of regulators' credibility, as well as regulators' preferences about the optimum means of restoring market confidence when faced with a panic.

Relevance

This dissertation contributes to several academic literatures and also has relevance to practical matters of financial stability.

Academically, this dissertation remedies some of the shortcomings of neoclassical financial economics, the primary theoretical lens used by professional economists to investigate asset markets today. It answers a call issued by numerous scholars and practitioners, including David Colander, Joseph Stiglitz, Roman Frydman, Michael Goldberg, Rawi Abdelal, Mark Blyth, Adair Turner, among many others, to re-appraise the core theoretical contentions of neoclassical finance, including market efficiency, rational expectations, *a priori* knowable risk distributions, and materially given equilibria based on "fundamental value."²⁷ This study does not dismiss the notion that agents in financial markets tend to use all publicly known information about a security before investing (i.e. the weak form of market efficiency).²⁸ Rather, it argues that market information must be efficient qua some information set, and that this information set is given by agents' conventions. While the concept of "fundamental value" might hold in

²⁷ See, for example: (Colander, et al. 2009), (Stiglitz 2010), (Frydman and Goldberg 2011), (Blyth 2013b), and (Turner 2012)

²⁸ (Malkiel 2007, 174-176)

the real economy, it is far harder to dis-embed asset prices from their broader social environment in financial markets, where prices and social constructs mutually constitute one another.²⁹ This recursive relationship between ideas and outcomes in asset markets is under-investigated by mainstream economics research, but is nonetheless recognized by many market participants as an everyday fact of life in asset markets.³⁰ While treating ideas and outcomes as mutually constituted might muddy the theoretical waters treaded by this dissertation, this posture reflects the author’s prejudice that it is “better to be vaguely right than exactly wrong” about economic ideas and market outcomes, to quote Carveth Read. Recognizing the endogeneity of ideas and outcomes lends itself to better (if not as parsimonious and elegant) theory.³¹

This dissertation thus makes a theoretical contribution to the field of economic constructivism in the tradition of Rawi Abdelal, Mark Blyth, Matthias Matthijs, Kathleen McNamara, and Craig Parsons, among others.³² A seminal volume on economic constructivism written by Abdelal, Blyth, and Parsons, entitled *Constructing the International Economy*, concludes with a call for scholars “to undertake a more synthetic collective enterprise that produces a richer account of how the world works, and one that will leave us more intellectually ready for future shifts.”³³ This dissertation’s convention-based account of continuity and change in financial markets is exactly the type of

²⁹ (Soros 2003)

³⁰ There are, of course, some notable exceptions to this, especially Donald MacKenzie’s work on *performativity* in financial markets. For more, see: (MacKenzie 2008) and (MacKenzie, Muniesa and Siu 2008)

³¹ (Read 1909, 320)

³² See, for example: (Abdelal 2009), (Finnemore and Sikkink 2001), and (Blyth 1997)

³³ (Abdelal, Blyth and Parsons 2010, 239)

synthetic enterprise envisioned by Abdelal et al. By treating conventions as causal variables of financial stability, this dissertation opens a wide avenue of research on the socially contingent sources of stability and instability in complex social systems. This dissertation's inter-disciplinary theoretical framework, which draws on insights from Post-Keynesian asset market theory, Keynesian epistemology, international relations theory, and economic constructivism, qualifies as a type of collective enterprise envisioned by Abdelal, Blyth, and Parsons.

This dissertation also contributes to the field of Post-Keynesian asset market theory. It builds on the Post-Keynesian model of financial instability by shedding light onto the social processes that drive outcomes in financial markets. Economic conventions allow the researcher to dig deeper into the social interdependencies that lead to market participants' memory loss of past crises, epistemic blindness to fragility and bubbles *ex-ante* crises, and the socially imposed constraints on elite responses to financial instability, to name a few examples. This dissertation thus addresses one of the core critiques of the Minsky model: that it is *narrative* in nature and thus less rigorous than its neoclassical alternatives.

This dissertation's conventions-based theoretical framework also improves our understanding of the inter-subjective triggers of banking crises. As Gary Gorton argues, the global financial crisis is best understood as a banking panic in the ABCP and repo markets. A central feature of Gorton's model is the notion that banking systems provide depositors with so-called "information-insensitive" debt, or debt immune to adverse selection problems because of information asymmetry. Economic conventions explain how agents inter-subjectively construct information-insensitive debt (by institutionalizing

expert opinion via bond ratings, for instance).³⁴ Conventional change also explains why credit events like bond downgrades catalyze change in financial markets. By synthesizing insights about conventions with Gorton's account of banking crises, this dissertation arrives at a more robust model of banking panics.

In addition to contributing to the academic study of financial instability, this dissertation bridges the divide between theory and practice in financial markets. While some collaboration between finance's scholars and practitioners takes place, the information flow tends to be uni-directional, from research universities to Wall Street. Nevertheless, academics have much to gain by incorporating the insights of market practitioners into their theories of financial stability. Notwithstanding potential problems of survivorship and selection biases when building inductive theories of asset markets, some of the most successful investors, such as George Soros and Nassim Taleb, recognize that mainstream accounts of financial markets do not account for the two-way, contingent relationship between the market's "material fundamentals" and realized market outcomes. This dissertation remedies these limitations of the academic study of asset markets by incorporating first-hand accounts from market practitioners that have lived through the market's vicissitudes into its empirical work.³⁵

This dissertation also enhances our understanding of the global financial crisis. To the extent that the crisis has become an object of popular investigation for policymakers and financial journalists alike, much of this analysis falls short on several axes.

³⁴ (Gorton 2009)

³⁵ (Soros 2003) and (Taleb 2007)

Many mainstream accounts of the crisis tend to elevate moral and agency-based explanations of the crisis over alternatives. Notions of swashbuckling traders, imprudent and ideology-fueled central bankers, greedy financiers, and incompetent regulators checker most mainstream accounts of the crisis. No doubt, incompetence was in high supply before the crisis, but *ex-post* theorizing about the moral and intellectual flaws of agents does not lend itself to better theory. Quite the opposite is true. For if we accept that this was a crisis caused by greedy bankers, then our policy prescription for financial stability is misleadingly simple: replace the bankers with their morally circumspect counterparts, and the future crises can be averted.³⁶ However, the regularity of crises in capitalism should cause us to take greedy bankers as ontological givens – most of the time, financial agents will do what is in their best short and medium-term financial interest. It is insufficient to simply blame the crisis on bankers and move on. Instead, we must consider what this crisis means for the broader study of human agency in financial markets, including how economic ideas make some courses of action socially permissible while others unthinkable. Furthermore, many accounts of the global financial crisis tend to treat its occurrence as a once-in-a-generation event, and thankfully, most systemic financial crises are rare in advanced-industrial states. Still, treating the crisis as a unique occurrence runs the risk of over-stating its idiosyncratic features at the cost of ignoring its commonalities with other crises. By focusing on the universal features of financial instability, this dissertation moves beyond a mere description of events and dives deeper

³⁶ Perhaps the best articulation of this line of reasoning was Simon Johnson and James Kwak's *Thirteen Bankers*, in which the authors assert that the crisis was simply the byproduct of thirty years of financial deregulation and Wall Street capture. While there is some truth to this argument, it alone does not provide us with a robust model of financial crises generally, nor does it explain the socially contingent processes by which authoritative actors in the financial system convinced the rest of the country to go along with the deregulation of the financial sector. (Johnson and Kwak 2010)

into the generalizable causal processes at play in financial markets. To paraphrase Rahm Emanuel, Chicago's current mayor and former Chief of Staff to President Barack Obama, academics have a responsibility to ensure that "no crisis should go to waste."³⁷ The crisis should be investigated through a number of lenses, with subsequent interpretations getting us closer to the limit point of truth about why the crisis occurred.

Plan for Subsequent Chapters

This dissertation continues in Chapter 2 by reviewing several perspectives of agent behavior in complex systems, including Post-Keynesian asset market theory, Keynesian epistemology, Charles Doran's power cycle theory, and economic constructivism. These paradigms yield the study's six, inductively derived propositions about the role of economic conventions in financial markets. The chapter then discusses this dissertation's ontology and operationalization via the subsequent case study of the global financial crisis.

Chapters 3, 4, 5, and 6 comprise the empirical chapters of the study, which illustrate the utility of a conventions-based theoretical framework via a case study on the global financial crisis.

Chapters 3 and 4 explain how economic conventions contributed to three inter-related phenomena: the inflation of the U.S. housing bubble from 2001-2007, the rise of so-called "fragile" finance via shadow banking and off-balance sheet financial intermediation, and agents' *ex-ante* epistemic blindness toward the prospect of systemic financial collapse. Chapter 3 argues that the housing bubble stemmed from economic conventions held by Federal Reserve bankers about how best to measure inflation,

³⁷ (Shapiro 2011)

historical memories of Japan's experience with deflation, and the Greenspan Doctrine that central bankers should refrain from using monetary policy to pre-emptively pop bubbles. It follows that if FOMC members maintained different economic conventions, both the amplitude and periodicity of the housing bubble would have differed.

Chapter 4 recounts the emergence of so-called "shadow banking," or off-balance sheet financial intermediation via asset-backed commercial paper (ABCP) and repurchase agreement (repo) conduits and asset-backed securities (ABS). Non-technically speaking, these developments allowed "the market" to provide banking services to different borrowing classes. Like regular banking before deposit insurance, shadow banking was subject to cash crunches, liquidity withdrawals, and bank runs. Chapter 4 argues that institutionalized economic conventions of ergodicity, expert opinion, and pro-cyclical conventional expectations combined to create a toxic incentive mix that allowed several large, systemically important financial institutions to sit at the crossroads of an under-capitalized and under-regulated shadow banking system. Even though these arrangements proved profitable during the boom years, they also served as a key point of vulnerability during the crisis.

Chapters 5 and 6 discuss the global financial crisis from August 2007 – March 2009. Chapter 5 explains how regulators' repeated interventions in financial markets, ranging from hedge fund Long-Term Capital Management in 1998 and Bear Stearns and the GSEs in 2008, created a *conventional expectation* that regulators would serve as *shadow banking liquidity providers of last resort*. Chapter 6 demonstrates how the simultaneous failure of Lehman Brothers and bailout of insurance giant AIG eviscerated this stable (but tenuous) convention-engendered stability in financial markets, thus

initiating a generalized panic in shadow banking markets by ABCP and repo counterparties. Chapter 6 also explores how regulators at the U.S. Department of Treasury and Federal Reserve responded to the panic in financial markets after Lehman and AIG. It finds that regulators' *carte blanche* bailout of systemically important financial institutions depended on two key factors: first, regulators maintained a certain set of economic conventions that predisposed them to granting unconditional bailouts to systemically important financial institutions. Second, the market's conventions about regulators gave America's financial first responders considerable policy latitude in addressing America's shadow banking panic. This convention-enabled leeway allowed regulators to intervene in financial markets and thus gave them considerable intervention capacity in markets.

Chapter 7 re-evaluates the study's primary propositions based on the study's empirical results, discusses the dissertation's limitations and avenues of future research, and concludes the study.

**CHAPTER 2:
LITERATURE REVIEW AND
THEORETICAL FRAMEWORK**

Introduction

This chapter presents this dissertation’s conventions-based theoretical framework of financial instability. This framework emerges from a theoretical synthesis of several academic traditions, including Post-Keynesian asset market theory, Keynesian epistemology, Charles Doran’s power cycle theory, and economic constructivism. The chapter begins with an overview of these four paradigms, from which the study’s causal propositions follow. Thereafter, the chapter discusses the dissertation’s ontology and operationalization in the context of its case study of central and shadow banking during the global financial crisis.

Weaknesses of the Post-Keynesian Model

Overall, the insights of Post-Keynesian asset market theory have received much acclaim after the global financial crisis.³⁸ Post-Keynesianism is praised for problematizing the endogenous tendency of markets to produce asset price bubbles and systemic crises. The Post-Keynesian model also correctly identifies that prolonged periods of stability tend to precede bouts of instability in markets. Minsky and Kindleberger’s depiction of asset market imbalances is also reasonably apt, affording for both micro-level (i.e. individual) and macro-level (market-wide) irrationality in inflating and sustaining bubbles. For all of its benefits, however, Post-Keynesianism is not a perfect theory. This dissertation identifies four shortcomings of this model that the following theoretical framework addresses in its causal propositions.

First, the Post-Keynesian model does not account for the source of “displacements” in financial markets, and claims that they are exogenous to their model.

³⁸ See, for example: (Wolf 2008) and (Barbera 2009)

Nevertheless, to what extent are displacements exogenous in any empirical sense? If we accept a broad and historical view of the economy, then the distinction between exogenous and endogenous causes is, as Mark Blyth describes, mere “convenient artifice,” since what we describe as “exogenous” in complex social systems has its own independent causes that need to be explained.³⁹ Adopting a holistic view of the economy, displacements are important causal variables worthy of our attention. Second, the Post-Keynesian model does not specify the causes of stability in financial markets. While it is intuitive to argue that prolonged periods create incentives for firms to adopt fragile financing arrangements, stability is just the *proximate* cause of fragility. Post-Keynesian asset market theory says little about how agents socially construct stable markets, and treats stability as a model prior, rather than an important object of investigation in the study of financial stability. Third, the Post-Keynesian model does not give us a point estimate about how and why stable but fragile financial systems erupt into crisis. Although Charles Kindleberger and Robert Aliber offer some plausible descriptions of crisis triggers (such as the revelation of widespread fraud in the displaced sector, a sharp price in the fall of a commodity, the failure of a large and interconnected financial institution, among others), they do not put forth a generalized causal mechanism that specifies the conditions under which a stable (but fragile) system yields to instability.⁴⁰ Pure point prediction might be impossible in complex social systems, but it is worth trying to describe the generalizable inter-subjective triggers of instability in financial markets. Fourth, while the Post-Keynesian model argues that regulators will sometimes

³⁹ (Blyth 2011, 86)

⁴⁰ (Kindleberger and Aliber 2005, 28-29)

intervene to restore confidence to the financial system, it does not provide guidelines for understanding when regulators will choose to issue *carte blanche* bailouts of the entire financial system and when they will opt for Schumpeterian ideal-type creative destruction. Furthermore, Post-Keynesians do not offer a unified theory about how cross-national differences in the *intervention capacity* of regulators implicate the ability of states to restore confidence in their financial systems. As any Greek finance minister since 2010 would argue, cross-national differences in regulatory capacity are important. Yet Post-Keynesians say little about this fact, other than presenting intervention as a binary choice about which they provide little guidance.

While these four limitations do not pose a systemic risk to the usefulness of the Post-Keynesian paradigm, addressing them would go a long way toward building a more valid model of financial crises. The following sections outline several complementary paradigms of understanding that yield insights that remedy the above theoretical shortcomings of the Post-Keynesian model.

Keynesian Epistemology

J.M. Keynes believed that economic conventions dominate economic life because of the nature of knowledge in uncertain environments. Keynes claimed that contrary to utilitarian models of agent behavior, in which cost-benefit optimizing automatons made Benthamite calculations about risk and reward under conditions of information symmetry and low transactions costs, capital markets were plagued by fundamental (or “Knightian”) uncertainty.⁴¹ Uncertainty did not just refer to the absence of knowledge

⁴¹ The modern day analog of utilitarian approaches to agent choice is the “subjective expected utility” approach advanced by neoclassical economics. On Knightian uncertainty, see (Knight 1921).

that was, in principle, attainable. Rather, Keynes' uncertainty referred to situations in which rational agents lacked a basis of predicting the probability distributions of future outcomes. Facing irreducible uncertainty about the future, agents lacked the informational basis of making rational decisions. This "extreme precariousness of the basis of knowledge" could prevent capital markets from efficiently allocating credit.⁴²

Still, even though agents know that they have "no scientific basis on which to form any calculable probability whatever," they nevertheless "do [their] best to overlook this awkward fact" and "behave in a manner which saves [their] faces as rational, economic men." How do they do this? According to Keynes, the answer was economic conventions:

We do not know what the future holds. Nevertheless, as living and moving beings, we are forced to act. Peace and comfort of mind require that we should hide from ourselves how little we foresee. Yet we must be guided by some hypothesis. We tend, therefore, to substitute for the knowledge which is unattainable certain conventions...⁴³

Conventions allow agents to ignore their own ignorance of the future and act as though they could make a "good Benthamite calculation of a series of prospective advantages and disadvantages, each multiplied by its appropriate probability, waiting to be summed."⁴⁴ Conventions thus allow agents to believe that they live in a world of calculable risk, rather than irreducible uncertainty. As this dissertation argues, not only

⁴² (Keynes 1936, 149) Modern day studies of information asymmetry, and in particular, *adverse selection*, study the effect of imperfect information on market outcomes. Specifically, the presence of information asymmetry could prevent agents from engaging in Pareto optimal transactions in financial markets. To Keynes, conventions solved this adverse selection problem by giving market participants confidence to act and discern information in financial markets. See, for example: (Akerlof 1970), and (Spence 1974).

⁴³ (Keynes 1937b, 124)

⁴⁴ What Keynes is describing here is *expected value*, which requires agents to have *ex-ante* knowable probabilities of future outcomes and their magnitudes, which then allows agents to compute expected values of decisions in complex systems.

do conventions mitigate uncertainty, but they might also be responsible for generating the very stability that agents end up taking for granted. Keynes identified three types of conventions in financial markets, which form agents' epistemological basis of behavior given fundamental uncertainty about the future.

Keynes' first convention is the belief that the future will resemble the past, which reflects the tendency of market participants to extrapolate linearly from past trends when forming expectations about the future. In the parlance of statistics, agents tend to believe that the world is "ergodic," in which the "relevant statistical properties" of markets "can be known from an adequate sample of the process," as Mark Blyth describes.⁴⁵ Keynes describes ergodicity conventions as follows:

We assume that the present is a much more serviceable guide to the future than a candid examination of past experience would show it to have been hitherto. In other words we largely ignore the prospect of future changes about the actual character of which we know nothing.⁴⁶

This dissertation argues that agents' tendency to use ergodic conventions to mitigate uncertainty, on one hand, while occupying a world that is fundamentally non-ergodic, on the other, is a key driver of fragility in financial markets.⁴⁷

Keynes' second convention, expert opinion, refers to the tendency of market participants to believe that status quo market outcomes (as reflected in market prices) adequately approximate the "true" value of assets. Expert opinion also refer to agents'

⁴⁵ (Blyth 2010, 463)

⁴⁶ (Keynes 1937a, 214)

⁴⁷ For more on how misplaced faith in ergodic conventions produces financial fragility, see Chapter 4 on bond ratings.

tendency to latch onto the narratives of authoritative actors when forming their own expectations of the future.⁴⁸ Keynes described this convention as follows:

We assume that the *existing* state of opinion as expressed in prices and the character of existing output is based on a *correct* summing up of future prospects, so that we can accept it as such unless and until something new and relevant comes into the picture.

Agents over-estimate the stability of status quo market outcomes. This tendency ensures that agents are consistently surprised when the market's "conventional wisdom" is proven wrong.⁴⁹

Keynes' third convention, conventional expectations, describes the tendency of financial market participants to consider what *fellow market participants* believe before acting in the first place. Keynes argued that portfolio allocation decisions are not based on solipsistic calculations of risk and reward (i.e. in a "Benthamite" fashion). Rather, investment is a second and third order practice in which market participants must consider the beliefs of fellow investors. As Keynes put it:

Knowing that our own individual judgment is worthless, we endeavor to fall back on the judgment of the rest of the world which is perhaps better informed. That is, we endeavor to conform with the behavior of the majority or the average. The psychology of a society of individuals each of whom is endeavoring to copy the others leads to what we may strictly term a *conventional* judgment.⁵⁰

⁴⁸ (Pech and Milan 2009, 895-896) Wesley Pech and Marcelo Milan corroborated Keynes' view that agents buy into the wisdom of authoritative opinions because of informational purposes (mimicking the behavior of others because of a lack of knowledge, i.e. uncertainty) and normative purposes (avoiding ostracism via conformity). In either case, authoritatively privileged actors can set the bounds of discourse and thus conventions in financial markets.

⁴⁹ For instance, this dissertation finds that the market's misplaced faith that housing prices would never decline nationally was omnipresent across global capital markets prior to the crash. In this case, the fall in housing prices caused conventions to fail, thus precipitating change in financial markets, just like Keynes would have predicted.

⁵⁰ (Keynes 1937a, 214)

Keynes argued that investment was a *social* activity, and often involved trying to guess the intentions of fellow investors. Seen in this light, investment is not a single-iteration decision of an agent qua the market, but a social process in which many agents simultaneously divine the beliefs of fellow market participants.⁵¹ Conventional expectations explain phenomena such as bank runs, in which rumors of insolvency are self-fulfilling. If investors believe that fellow investors doubt the solvency of counterparty, then it is rational to ration credit to the counterparty in question (based on the logic that fellow market participants believe the same thing). If many investors think the same thing, then a counterparty will be denied access to credit, leading to liquidity and solvency issues. For instance, this dissertation found evidence that the liquidity of shadow banking conduits critically depended on the stability of the market's conventional expectations. When investors feared that fellow investors would ration credit to shadow banking conduits, this created an environment ripe for self-fulfilling credit crises in markets.

Together, these three conventions – the past as a guide to the future, expert opinion, and conventional expectations – serve as pillars of knowledge in the face of uncertainty.

Economic conventions are not just individual biases, but are shared by the epistemic community of the market writ large. As James Crotty contends, conventions “are not mere idiosyncratic figments of the individual’s imagination,” but are “socially constituted and socially and externally sanctioned.” The social construction of economic conventions links them to the level of market confidence and thus stable markets. When

⁵¹ (Allen, Morris and Shin 2004)

conventions “maintain the allegiance of the majority of agents, they will help provide continuity and predictability to economic life.” Shared conventions can “generate an illusion of continuity that can contribute to the creation of stability when conditions are right” and “produce order and continuity where chaos might have been.” Crotty concludes that during periods of “tranquility” or “normality” in which there is convention certainty, forecasts could become “self-fulfilling prophecies that reinforce confidence in the conventions that sustain extrapolative expectations.”⁵² Thus, epistemic consensus or *convention certainty* can produce stable markets. This central insight – that stable conventions produce stable markets – helps us understand the sociological micro-foundations of stability in the Post-Keynesian model, as described in Proposition 1 of this dissertation’s theoretical framework.

Doran’s Model of Systems Transformation and Uncertainty

Markets are stable as long as a critical mass of market participants believes that their conventions provide a reliable basis of knowledge in the face of uncertainty.⁵³ However, what happens when market participants doubt the veracity of their conventions? According to Crotty, “when a majority of agents lose faith in the conventions that sustain the expectations-generating process” in markets, “irreducible objective uncertainty forces its way into the consciousness of agents, breaking down the conventional barriers they have constructed to conceal it.”⁵⁴ As Keynes adds, conventions

⁵² (Crotty 1994, 121-124)

⁵³ Said another way, markets remain stable so long as a majority of market participants believe that their expectations-generating process (i.e. their conventions) has sufficient truth-value for them to rely on when making decisions in financial markets.

⁵⁴ (Crotty 1994, 124-125)

are “subject to sudden and violent change” during which “the practice of calmness and immobility, of certainty and security, suddenly breaks down.”⁵⁵ Furthermore, “at all times the vague panic fears and equally vague and unreasoned hopes are not really lulled, and lie but a little way below the surface,” leading Keynes to conclude that “all these pretty, polite techniques, made for a well-panelled Board Room and a nicely regulated market, are liable to collapse.”⁵⁶ Even though conventions might stabilize markets, then, they cannot stabilize markets ad infinitum because convention-given expectations cannot account for the complete range of possible market futures.

If we accept that conventions stabilize markets, then convention uncertainty could destabilize markets.⁵⁷ To understand the *triggers* of financial instability, we must study the conditions that cause agents to lose faith in their conventions. As this dissertation argues, when agents think that conventions fail to describe the structural realities of markets, accurate expectations of the future cannot be formed and panic results, thus precipitating instability within fragile financial systems.

Charles Doran provides an apt framework for understanding how shocks to agents’ expectations catalyze structural uncertainty. Doran’s model of agent decision-making draws on his power cycle theory, which is a dynamic theory of international relations that describes the behavior of political leaders in anarchy based on the evolution of their state’s relative power over time. Doran, like Keynes, believed that in uncertain

⁵⁵ (Keynes 1937a, 214-215)

⁵⁶ (Keynes 1937a, 215). Emphasis added.

⁵⁷ This dissertation demonstrates that convention stability stabilizes markets via its case study of the shadow banking system during the global financial crisis. It finds that stable *conventional expectations* among shadow banking counterparties ensured the stability of unsecured shadow banking conduits. For more, see Chapters 4, 5, and 6.

environments, agents *extrapolate from past trends* when forming expectations about the future. Since linear projections will be “right more of the time than the multitude of more complicated models conceivable,” they become “ingrained in the consciousness of the decision maker.” Whereas Keynes spoke of irrationality of markets in perpetuity, Doran stresses “conditional non-rationality,” by which he means that markets are rational most of the time, and usually contain enough information upon which firms and individuals can make appropriate decisions about the future. Trouble emerges because linear extrapolations from past trends leave agents unprepared for non-linear moments on their respective state’s power cycle.⁵⁸ Non-linearities in the trajectory of history can produce novel “surprises” for which agents’ linear expectations leave them unprepared to handle. During a crisis, agents have to cope with the stress associated with the realization that their extrapolative forecasts of the future were wrong. Facing “conditional non-rationality,” investors adopt conventions that are rigid and often wrong, thus precipitating massive uncertainty in complex social environments. The moment of acknowledgement of a non-linearity, along with the shock of realizing that the future that does not comport with expectations, is the catalyst of uncertainty in Doran’s decision-making model.

Doran thus provides a *probabilistic* understanding of the likelihood of conflict in the international system, hypothesizing that the likelihood of systemic crises rise as more

⁵⁸ This dissertation’s conventions-based framework of continuity and change in financial markets adopts Doran’s insight that agents tend to linearly extrapolate from past trends. Linear conventions include the assumption, institutionalized into risk metrics by financial institutions, that housing prices would never decline nationally, and the assumption that the Fed would serve as the liquidity provider of last resort in financial markets *ex-ante* Lehman Brothers, to name two prominent examples from this dissertation. It is proposed that the *failure* of these conventions (i.e. housing prices declining, and regulators allowing Lehman Brothers to go bankrupt, respectively) initiated a change in agents’ expectations, thus ushering in a period of acute structural uncertainty in markets. For more, see Propositions 4 and 5.

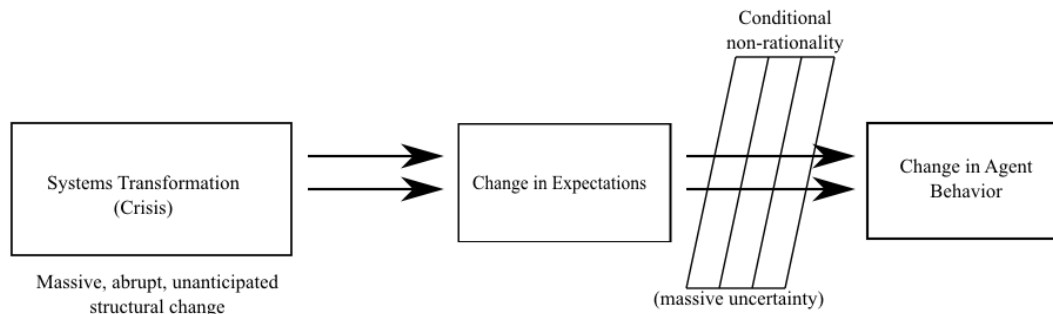
states simultaneously go through critical intervals on their power cycles.⁵⁹ This notion comports with Crotty's contention that conventional certainty breaks down when a "majority of [central actors] lose faith in the conventions that sustain the expectations-generating process" in markets. As more states have to cope with the stress of a critical interval (i.e. upon realizing that their expectations-generating process is no longer reliable), the likelihood of crisis rises. This is because during a moment of convention uncertainty inside of a critical interval, "the abnormal becomes the normal" and "the irrational becomes rational." Coping with the fact that the discovery that "all prior assumptions...are wrong" puts tremendous stress on decision-makers,⁶⁰ and agents no longer face a world of risk as such, but uncertainty as described by Frank Knight, J.M. Keynes, and Mark Blyth.⁶¹ Agents realize that learned patterns of behavior, which were reflected in assumptions about the future that were "rewarded year by year in actual outcomes, suddenly lose credibility."⁶² As more states experience structural uncertainty, their likelihood of over-estimating their material capabilities while under-estimating the costs of violent conflict and capability of their adversaries rises. This dynamic of systems transformation often triggers systemic conflict, which this dissertation analogizes to systemic financial panics. Agents realize that the information that went into the market's price detection process is further from "true value" than previously imagined, in turn sowing structural uncertainty in markets.

⁵⁹ (Doran 1991, 95-98)

⁶⁰ (Doran 1991, 108-111)

⁶¹ (Knight 1921), (Keynes 1937a), and (Blyth 2010). Specifically, Blyth terms this "type-3" uncertainty, in which both the causal processes and probability distributions of outcomes are unknowable.

⁶² (Doran 1991, 97)

Figure 2: A Visualization of Doran's Model

Source: Charles F. Doran⁶³

This dissertation incorporates Doran's model of systems transformations into its study of financial stability, as visualized above. As Doran argues, systems transformation (brought about by massive, abrupt, and unanticipated structural change) belies agents' expectations, initiating a period of *conditional non-rationality* and *massive uncertainty*, in turn leading to a change in agent behavior. To understand why crises emerge in financial markets, one must study the conditions under which agents have to cope with acute uncertainty triggered by defied expectations. Propositions 4 and 5 of this dissertation's theoretical framework argue that given sufficient financial fragility, when a number of agents have to cope with the stress associated with belied, extrapolative, conventions-based expectations of the future, the likelihood of systemic crisis rises. By merging Doran's insights with Keynes' notions of conventionality, this dissertation provides a lens of understanding how stable (but fragile) financial systems erupt into crisis.⁶⁴

⁶³ (Doran 1991)

⁶⁴ For a visualization of non-routine change triggering uncertainty in complex systems, see Appendix I.

Economic Ideas and Agents' Responses to Crisis

Keynes and Doran provide a solid understanding about how agents socially construct stability in financial markets via conventions, and how non-routine deviations from agents' convention-given expectations catalyze uncertainty in complex systems. However, how do elites respond to crises once convention uncertainty takes hold?

Kindleberger and Aliber note that when faced with a crisis, regulators have a choice between restoring confidence in the economy via intervention and letting markets clear via Schumpeterian ideal-type creative destruction. Intervention might include extending lender of last resort insurance to troubled financial institutions, asset purchases, and lowering policy interest rates, among other measures. Non-intervention might mean refraining from using fiscal and monetary policy to restore confidence to the financial system.⁶⁵

By framing regulators' crisis response as a binary choice of intervention, the Post-Keynesian model fails to account for the wide array of policy options that fall on the spectrum between full nationalization of a state's banking system (i.e. total intervention) and allowing Schumpeterian ideal-type creative destruction (i.e. *laissez-faire ad absurdum*). Also, the Post-Keynesian model does not specify how regulators choose certain intervention alternatives over others, nor does it account for the heterogeneity of *intervention capacities* available to regulators across disparate national contexts. After all, the market grants some states more policy latitude than others, and regulators' credibility often determines whether interventions are successful.⁶⁶

⁶⁵ (Kindleberger and Aliber 2005, 28-29)

⁶⁶ "Successful," if we define success as decreasing counterparty fears in credit markets, putting a floor on collapsing asset prices, and restoring general systemic confidence.

To address these concerns, this dissertation draws on the insights of economic constructivists like Matthias Matthijs and Mark Blyth, who put forth a comprehensive framework of understanding how economic ideas influence elite responses to economic crises. In *Ideas and Economic Crises in Britain from Attlee to Blair (1945-2005)*, Matthijs presents a “punctuated evolution” model of ideational change to understand economic policy in Post-War Britain. Matthijs’ framework builds on Mark Blyth’s work on institutional change in the United States and Sweden in the 1930s and 1970s, which he presents in his book, *Great Transformations: Economic Ideas and Institutional Change in the Twentieth Century*. Matthijs and Blyth’s arguments, while not about financial crises per se, nevertheless provide several core insights that specify how regulators respond to moments of crisis, and thus remedy the aforementioned shortcomings of the Post-Keynesian model.

According to Matthijs and Blyth, economic ideas frame elites’ responses to crises by reducing uncertainty, giving agents cogent narratives about the causes of crises, and specifying appropriate crisis responses. As Matthijs claims, “during a moment of ‘crisis’, economic ideas will play a decisive role by explaining what went wrong and how to fix it.”⁶⁷ Blyth found that “in moments of economic crisis, ideas are important explanatory devices that *themselves* reduce uncertainty” by giving agents coherent narratives about the causes of crisis and thus the appropriate regulatory responses to them.⁶⁸ Blyth describes this relationship between economic ideas, uncertainty reduction, and crisis resolution as follows:

⁶⁷ (Matthijs 2011, 29)

⁶⁸ (Blyth 2002, 37)

Enter the political entrepreneur, who touts an analysis that sorts out the confusion of other political actors by suggesting a plausible account of why the world no longer works as it did, and proposes a new programmatic menu grounded in this analysis. The economic ideas that allow agents to do this are therefore crucial resources...They allow agents to define the solutions to their problems, and perhaps more importantly, to define the very problems that agents face in the first place.⁶⁹

According to Matthijs, crises themselves are by no means “self-apparent phenomena,” but instead “need to be constructed and explained in a coherent narrative, which find resonance with the public at large and can convince a majority of the need for a radical intervention.”⁷⁰ By narrowing down “possible interpretations of the crisis, and hence courses of action, to a significant degree,” economic ideas shape how elites respond to crises and enable coalition building by “specifying the ends of collective action,” as Blyth argues.⁷¹ Applying these insights to moments of financial instability, economic ideas help regulators diagnose the causes of the crisis, identify potential crisis responses, and build institutional support for “radical intervention” should bailouts be required.

Economic ideas also explain why the market sanctions some policy choices over alternatives. Jonathan Kirshner finds that economic ideas held by the market about regulators determine the permissibility of certain policy responses over others. Capital mobility implies that states that enact unpopular policies can feel the sting of capital flight and higher interest rates, while states that adopt market-sanctioned policies are rewarded by continued access to international credit at lower interest rates.⁷² As Abdelal et al. put it:

⁶⁹ (Blyth 2002, 38)

⁷⁰ (Matthijs 2011, 28-29)

⁷¹ (Blyth 2002, 37-39)

⁷² (Kirshner 2003)

...policies that are deemed illegitimate by the international financial community, composed also of market participants, simply cannot succeed: capital outflows sparked by an out-of-bounds policy can undermine a choice that, at another historical moment, may have been a perfectly plausible response to a policy challenge.⁷³

Economic ideas held by the market about regulators determine the efficacy of regulators' response to financial instability given capital mobility. How regulators are perceived, qua the market's economic conventions, determines the efficacy and policy latitude of national regulators in responding to bouts of financial instability.

Theoretical Synthesis: Six Propositions about Economic Conventions and Financial Stability

Having presented an overview of the weaknesses of Post-Keynesian asset market theory, along with the main contentions of Keynesian epistemology, Charles Doran's power cycle theory, and economic constructivism, this chapter now presents this study's six, inductively derived causal propositions about economic conventions in financial markets. Throughout the discussion below, effort is made to link this study's propositions to the Post-Keynesian model, while also identifying evidence and causal indicators marshaled in the subsequent empirical chapters.

Propositions 1, 2, and 3 describe the relationship between economic conventions, financial stability, asset market imbalances, fragility, and epistemic blindness *ex-ante* financial crises. Proposition 4 specifies how non-routine shocks to agents' convention-given expectations catalyzes convention uncertainty, while proposition 5 describes how convention uncertainty causes financial instability within fragile financial systems.

⁷³ (Abdelal, Blyth and Parsons 2010, 9-10)

Proposition 6 elucidates the relationship between economic conventions and elite responses to financial instability.

Proposition 1 *Convention stability produces financial stability.*

This first proposition draws on the insights of J.M. Keynes, James Crotty, and Sheila Dow, among others, who argue that economic conventions stabilize financial markets by coordinating agents' expectations and serving as a social basis of knowledge given uncertainty about the future.⁷⁴ As long as a majority of market participants believe in the truth-value of their conventions, then conventions are self-stabilizing and provide continuity to economic life.⁷⁵ This proposition specifies the sociological micro-foundations of stability in the Post-Keynesian model. This study demonstrates the analytical utility of this proposition in three ways.

First, this dissertation explores the role of conventions in stabilizing America's shadow banking system. Based on author interviews, descriptive economic statistics, and secondary sources, this dissertation finds that the stability of shadow banking conduits critically depended on conventional expectations regarding conduit solvency. Prior to the global financial crisis, counterparties' positive conventional expectations regarding the solvency of shadow banking conduits were both pro-cyclical and self-fulfilling, creating incentives for financial institutions to issue short-term debt in the ABCP and repo markets to capture capital gains associated with the housing bubble and credit boom. As long as shadow banking counterparties believed that *fellow counterparties* would continue to roll over banks' maturing commercial paper and repo liabilities (i.e. given

⁷⁴ (Keynes 1937a), (Crotty 1994), and (Dow 2010).

⁷⁵ (Crotty 1994, 123)

stable conventional expectations regarding conduit solvency), then banks routinely rolled over their maturing short-term obligations and shadow banking conduits remained liquid and stable. When conventional expectations became unstable, as they did after the failure of Lehman Brothers, financial instability ensued.

Second, this dissertation explores the relationship between bond ratings and shadow banking outcomes, and argues that bond ratings can be conceptualized as institutionalized conventions of expert opinion. Unrealistically favorable ratings on risky asset-backed securities (ABS) facilitated capital flows into highly rated, risky mortgage securities, depressing bond yields and reifying the very creditworthiness that ratings were meant to reflect.⁷⁶ Stable bond ratings allowed risk-averse investors, such as money market mutual funds, to lend to shadow banking conduits that purchased ex-post risky (but highly rated) ABS, decreasing bond spreads and incentivizing greater risk-taking by financial institutions and borrowers, thus adding incrementally more risk to the financial system prior to the global financial crisis.⁷⁷

Third, this dissertation describes how banks' ergodic risk management technologies, such as value-at-risk, made them vulnerable to non-ergodic changes in financial markets. The adoption of these ergodic risk measures were self-stabilizing in the near term, as investors trusted banks to monitor their own risks on their balance sheets. However, banks also took advantage of the leeway afforded to them by regulators to set

⁷⁶ While capital flowing into a security class should not theoretically alter the asset classes' default risk, in reality, in certain markets, such as in interbank lending markets, perception is reality. Positive conventional expectations regarding inter-bank liquidity reduces the roll over risk of shadow banking conduits and lowers the debt service burden of off-balance sheet vehicles. The availability of liquidity reduces the likelihood of default of shadow banking structures, and liquidity critically depends on *expectations* of future liquidity.

⁷⁷ Changes in the underlying conventions also precipitated changes in market outcomes, which is why bond downgrades were such important triggers of financial instability when the housing bubble burst. See Propositions 4 and 5.

their own regulatory capital standards, taking on greater risks while justifying their high leverage on the basis of their own internal risk management technologies. During the boom years, banks appeared well capitalized while simultaneously adding more risk to their balance sheets. In this way, institutionalized economic conventions such as value-at-risk endogenously produced incentives for banks to adopt fragile financing structures prior to the global financial crisis.

Proposition 2 *Conventions influence the amplitude and periodicity of asset market imbalances.*

Proposition 2 is the most intuitive proposition of the study: if economic conventions serve as the epistemological basis of agents' beliefs in financial markets, and some beliefs are more prone to producing asset market imbalances than others, then variance in agents' economic conventions can produce divergent outcomes in financial markets, *ceteris paribus*. The empirical challenge faced by this dissertation is demonstrating that agents based their behavior on their governing economic conventions (and not caprice), such that different economic conventions would have led to different outcomes in financial markets.⁷⁸

To demonstrate the analytic utility of this proposition, Chapter 3 draws on the research of John Taylor, Marek Jarociński, and Frank Smets, who argue that the Federal Reserve's accommodative monetary policy contributed to the unsustainable increase in housing prices in the U.S. economy from 2001-2006.⁷⁹ This dissertation shows how economic conventions explain the Fed's monetary policy from 2001-2006. Three economic conventions are discussed, including the Fed's use of imputed rent as opposed

⁷⁸ Alternatively, at a minimum, would have *increased the probability* that they would have taken a different course of action, *ceteris paribus*.

⁷⁹ (Taylor 2007) and (Jarociński and Smets 2008).

to housing prices to calculate housing inflation in their preferred inflation metrics (i.e. expert opinion of metric construction), FOMC members' fears of deflation based on memories of Japan's monetary history (i.e. ergodicity of advanced-industrial state monetary policy), and central bankers' ideology that it was better to "clean up" after the deflation of a bubble rather than "lean against" its inflation *ex-ante* a bubble's deflation (known in the literature as the "Greenspan Doctrine," or expert opinion setting the discursive bounds of appropriate monetary policy). By showing that the Fed's monetary policy depended on a specific set of economic conventions (ranging from institutionalized metrics to informal ideology), this dissertation demonstrates how economic conventions shaped housing market outcomes in the U.S. economy as intermediated by short-run interest rates. It suggests that different economic conventions would have led to different monetary policy choices and thus different housing market outcomes prior to the global financial crisis.

Proposition 3 *Conventions blind agents to the prospect of non-routine change in financial markets.*

This particular proposition draws on the work of Mark Blyth, Frank Knight, and J.M. Keynes, who argued that agents do not live in a world of risk as such, but one of uncertainty, in which both the causal generators and probability distributions of outcomes are in principle unknowable.⁸⁰ This proposition argues that economic conventions are responsible for the market's epistemic blindness to non-routine change *ex-ante* crises.⁸¹

⁸⁰ See, for example: (Abdelal, Blyth and Parsons 2010, 10-12) (Blyth 2006), (Blyth 2010), (Knight 1921), and (Keynes 1937a).

⁸¹ (Kindleberger and Aliber 2005, 26). Implicit in Post-Keynesian accounts of financial crises is the presence of epistemic blindness *ex-ante* crises.

Markets, like all complex social systems, are uncertain arenas. As rational actors, agents come up with different narratives and conventions that serve as a basis of social knowledge that end up generating the very stability that agents take for granted. Trouble emerges because no amount of past sampling yields perfect conventions that give agents complete knowledge of the future because complex social systems are prone to discrete and *a priori* unknowable shifts. As Keynes puts it, “we simply do not know.”⁸²

Conventions are useful because they elevate certain narratives over alternatives, such that prolonged periods of convention stability tunnel agents’ expectations and sow epistemic blindness to non-routine change in financial markets. In the process of taking conventions for granted, agents become blind to futures not illuminated by their animating conventions. As a result, long-run uncertainty mitigation via conventions is simply a mirage because markets are non-ergodic systems.⁸³

This dissertation shows how the *institutionalization* of certain economic conventions, such as bond ratings and ergodic risk metrics, created epistemic blindness among banks, their counterparties, regulators, and the market writ large toward non-routine change in financial markets. The conventions underpinning these models were based on assumptions of normally distributed asset price returns and low default correlations given by historical asset returns. Because agents based their expectations of losses on their conventions, they underestimated the likelihood of situations in which realized market outcomes diverged from their convention-given expectations.⁸⁴

⁸² (Keynes 1937a, 214)

⁸³ In markets, no amount of past sampling of historical data will give agents’ perfect foresight into *future* outcomes. For more, see: (Blyth 2011).

⁸⁴ As Abdelal et al. put it, economic conventions become the “most powerful when they become taken for granted.” (Abdelal, Blyth and Parsons 2010, 11)

Proposition 4 *Information shocks to agents' convention-given expectations catalyze convention uncertainty.*

Propositions 4 and 5 consider the conditions under which stable (but fragile) financial systems erupt into crisis. Proposition 4 draws on the work of Charles Doran to argue that non-linear deviations from agents' extrapolative forecasts of the future catalyze structural uncertainty in complex social systems. Doran's insights delineate how stable systems yield to structural uncertainty when non-linearities in the trajectory of history occur, and refine the Post-Keynesian model by offering a mode of understanding how and why fragile financial systems erupt into crisis.⁸⁵

Recall that Keynes believed that the “conventional method of calculation will be compatible with a considerable measure of continuity and stability...*so long as we can reply upon the maintenance of the convention.*”⁸⁶ When convention certainty yields to uncertainty, as Keynes believed it periodically would, “the practice of calmness and immobility, of certainty and security, suddenly breaks down.” As a result, “new fears and hopes will, *without warning*, take charge of human conduct. The forces of disillusion may suddenly impose a new conventional basis of valuation.”⁸⁷

What causes the conventional method of decision-making to break down? According to Crotty, a “rupture of expectations” causes agents to question their conventional method of decision-making, thus catalyzing convention uncertainty:

Once confidence in the meaningfulness of the forecasting process is destroyed, irreducible objective uncertainty force its way into the

⁸⁵ For an apt visualization of this phenomenon, see Appendix I.

⁸⁶ (Keynes 1964, 152). Emphasis added.

⁸⁷ (Keynes 1937a, 214-215). Emphasis added.

consciousness of agents, breaking down the conventional barriers they have constructed to conceal it.⁸⁸

Crotty, like Doran, argued that novel shocks, or “surprises” to agents’ expectations causes them to question their most taken-for-granted ontological assumptions. Absent conventional anchors of behavior, agents must cope with acute informational uncertainty. If a majority of actors experience convention uncertainty, the likelihood of systemic crisis rises dramatically.

How does this study illustrate the analytic utility of this proposition in the context of the global financial crisis? The following empirical chapters discuss the rise of the shadow banking system, in which various wholesale “depositors” lent to securitized “borrowers” via asset-backed commercial paper (ABCP) and repurchase agreement (repo) conduits. Unlike traditional banking, shadow banking lacked Federally-sponsored deposit insurance, and was thus vulnerable to bank runs. This dissertation found evidence that regulators’ successive interventions in financial markets, ranging from orchestrating the bailout of hedge fund Long-Term Capital Management (LTCM) in 1998, investment bank Bear Stearns in March 2008, and the Federal Housing Agencies in September 2008, created a conventional expectation in financial markets that regulators would serve as *de facto* liquidity providers of last resort in the wholesale funding markets, as argued in Chapter 5. Agents’ acceptance of this convention maintained a tenuous stability in shadow banking markets and ensured that the deflating housing bubble did not lead to a generalized panic across all shadow banking conduits.

Regulators’ decision to allow Lehman Brothers to fail while bailing out the larger and more systemically important American International Group (AIG) changed

⁸⁸ (Crotty 1994, 125-126)

everything. Fears of counterparty solvency, idiosyncratically limited to specific financial institutions pre-Lehman, metastasized into a generalized bank run against all shadow bank-sponsoring financial institutions in the wholesale funding markets. Seen via the paradigm of conventionality, regulators' disparate treatment of Lehman Brothers and AIG introduced *convention uncertainty* into markets regarding regulators' commitment to backstopping shadow banking conduits, eviscerating the very stability to which markets had grown accustomed because of regulators' prior interventions. The absence of conventional anchors of behavior translated Lehman's failure into broader financial instability, as described in the following proposition.

Proposition 5 *Given the prior existence of a fragile financial structure, convention uncertainty causes agents to revert to first principles of survival, disrupting the market's normal price mechanism and triggering financial instability.*

This proposition draws on the insights of J.M. Keynes, Charles Doran, and Frank Knight to explain how agents behave during moments of convention uncertainty.⁸⁹ Lacking conventional anchors of behavior, agents revert to "first-principles" of survival by hoarding safe assets and trying to sell risky ones.⁹⁰ This "flight to quality" disrupts the market's normal price mechanism and can lead to adverse selection problems in markets, causing liquidity to dry up, securities prices to fall, and trading in entire asset classes to cease.⁹¹

⁸⁹ (Keynes 1937a), (Doran 1991), and (Knight 1921).

⁹⁰ Specifically, agents' demand for money and its equivalents, such as cash and short-term U.S. Treasury securities, increases during periods of convention uncertainty. Note that the observed price adjustment (i.e. rise in the price of safe assets and fall in the price of risky assets) occurs because of changes in expectations, which in turn causes conventions to change (and agent behavior to change with it).

⁹¹ (Jacobellis v. Ohio 1964)

Keynes recognized that one of the main indicators of convention uncertainty in markets was elevated money demand, which Keynes saw as a symptom of the market's degree of "disquietude" regarding conventions:

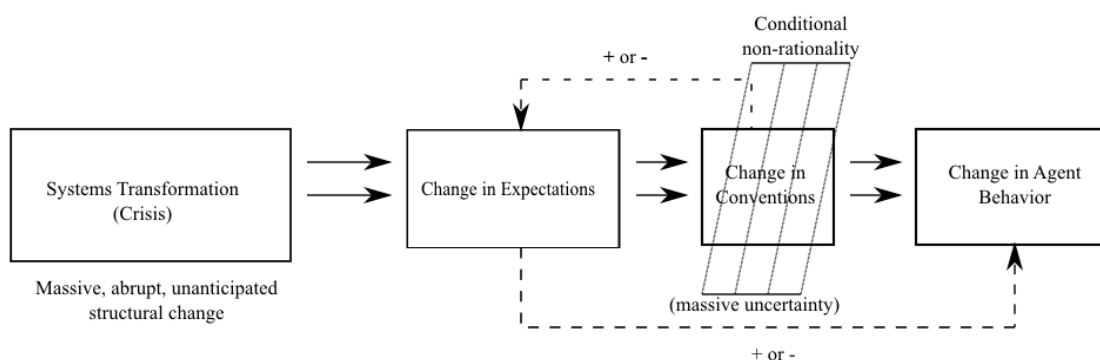
...our desire to hold Money as a store of wealth is *a barometer of the degree of our distrust of our own calculations and conventions concerning the future*. Even tho (sic) this feeling about money is itself conventional or instinctive, it operates...at a deeper level of our motivation. It takes charge at moments when the higher, more precarious conventions have weakened. The possession of actual money lulls our disquietude; and the premium which we require to make us part with money is the measure of the degree of our disquietude.⁹²

In modern parlance, the *price* of safe assets (such as bank deposits and short-term U.S. Treasury securities) increases because of convention uncertainty, thus causing the yield on these securities to fall. Individual attempts to make portfolios liquid and less risky reduce the aggregate liquidity in the financial system, precipitating broader market instability.⁹³

A visualization of this dissertation's crisis schematic, as described in Propositions 4 and 5, is presented below:

⁹² (Keynes 1937a, 216). Emphasis added.

⁹³ (Dow 2010, 4). Keynes himself recognized that markets were plagued by situations in which individually rational behavior led to aggregately irrational outcomes. Keynes' paradox of thrift (if everyone practices austerity at the same time, the system as a whole will contract, thus obviating the individual logic of austerity) and the paradox of liquidity (if everyone sells risky assets and gets liquid at the same time, aggregate systemic liquidity falls) are examples of the *fallacy of composition*. Keynes identified this fallacy as the following: "we are faced at every turn with problems of an organic unity, of discreteness, of discontinuity – the whole is not equal to the sum of the parts, comparisons of quantity fail us, small changes produce large effects, the assumptions of a uniform and homogenous continuum are not satisfied." (Keynes 1972, 262)

Figure 3: A Schematic of Crises and Conventions

This visualization shows how massive, abrupt, unanticipated structural change within fragile financial systems shocks agents' expectations of the future. Defied expectations cause agents to reappraise the veracity of their most taken-for-granted economic conventions, and the stress associated with convention uncertainty introduces acute, structural uncertainty into agents' decision-making, causing them to revert to first principles of survival and hoard liquid capital. Convention uncertainty can cause either positive or negative feedback vis-à-vis agents' expectations. Negative feedback entails "divergent equilibria," or situations in which individually rational behavior (for instance, hoarding liquid capital) proves collectively disastrous for all market participants (e.g. exacerbating liquidity issues for the market as a whole). Regardless of these recursive loops, the shock engendered by an unanticipated structural change defies agents' expectations and causes them to reappraise the truth-value of their dominant convention set, changing agent behavior as a result of changed economic conventions.

Applying this proposition to the global financial crisis, this dissertation demonstrates how the simultaneous failure of investment bank Lehman Brothers and bailout of insurance giant AIG catalyzed convention uncertainty in financial markets regarding the willingness of regulators to act as *liquidity providers of last resort* in

shadow banking markets. Convention uncertainty made it rational for agents to hoard liquid capital and withhold financing from shadow banking conduits given their perception of the Fed and Treasury's ambivalence toward bailouts. ABCP and repo counterparties withdrew their funds from shadow banking conduits and sold risky assets while also purchasing safe havens like short-term Treasury securities. The contraction of credit in the wholesale funding markets made it difficult for both bank and non-bank financial institutions to finance their operations, further adding to the dynamic of uncertainty. Other indicators of convention uncertainty include rising stock market volatility, the flight to quality in foreign exchange markets, and the ceasing of trading in certain derivatives markets because of a lack of information symmetry. In particular, this dissertation found that during the most acute phase of the global financial crisis, information asymmetry about collateral quality caused an *adverse selection* problem in certain securities markets, in which securities of disparate quality are sold at the same low price, so too much of the low quality good and too little of the high quality goods are supplied.⁹⁴ It is proposed that convention uncertainty caused trading in certain derivatives asset classes to cease, just as George Akerlof and other scholars of asymmetric information would have predicted.⁹⁵

Proposition 6 *Elite responses to financial market instability are a function of their economic conventions used to diagnose a crisis and the conventions held by the market about regulators.*

This proposition argues that regulators' response to financial instability is a function of both their conventions about markets and the market's conventions about

⁹⁴ (Pindyck and Rubinfeld 2013, 634)

⁹⁵ See, for example: (Akerlof 1970) and (Spence 1974).

regulators. It applies the insights of economic constructivists such as Matthias Matthijs and Mark Blyth to understand how regulators respond to financial instability.⁹⁶ It also draws on the work of Jonathan Kirshner, who argued that open capital markets allow market participants to set the bounds of regulatory intervention in the economy by “punishing” bad policies via capital flight and “rewarding” good policies via capital inflows.⁹⁷ This proposition builds on the Post-Keynesian model by specifying the constraints on elite intervention in the economy when faced with a crisis, and outlines why the market deems identical policy responses legitimate in some national contexts but not others.

After regulators decided to let Lehman Brothers fail, they retreated from their anti-bailout posture to bail out other systemically important financial institutions such as AIG, Citigroup, Bank of America, among many others. Their response to the market’s *convention uncertainty* encompassed a wide array of policies to stem the banking panic and restore confidence in America’s wholesale funding markets, including granting investment banks access to the Federal Reserve’s discount window, asset purchases, the extension of Federal deposit insurance to bank and non-bank short-term market-based liabilities, the passage and adoption of the \$700Bn Troubled Asset Relief Program, among many other measures. Together, these interventions restored *convention certainty* that regulators stood as *liquidity providers of last resort* in wholesale funding markets, successfully reducing funding pressures facing financial institutions.

⁹⁶ (Matthijs 2011) and (Blyth 2002)

⁹⁷ (Kirshner 2003)

This dissertation finds that regulators' response to the crisis stemmed from two sets of economic conventions, including those held by regulators about appropriate crisis responses and the market's conventions about regulators and America's sovereign creditworthiness. This dissertation demonstrates that regulators' response to the crisis followed from their fears of repeating the Great Depression (i.e. ergodicity), which biased them toward *carte blanche* bailouts of the entire U.S. financial system. Moreover, regulators' ability to extend *de facto* deposit insurance to the shadow banking system depended on the market's willingness to accept such invasive interventions and deem them credible over alternatives.⁹⁸

Constitutive Explanations of Financial Instability

One of the primary difficulties of operationalizing a conventions-based model of continuity and change in financial markets is that it does not lend itself to telling a clean causal story with clearly delineated independent and dependent variables, linked by observable and non-recursive causal pathways. Reality, unfortunately, is far more complex.

Constructivists like John Ruggie, Alexander Wendt, R. Ned Lebow, and Mark Blyth, among others, recognize that linear causal standards are inapplicable to matters of social construction.⁹⁹ They argue that complex social systems like financial markets are “emergent” systems, in which outcomes “emerge” from the complex interplay of the system's dynamics. Outcomes are irreducible and unforeseeable *a priori* their

⁹⁸ As Chapter 6 argues, the bank bailouts are best understood as a form of credibility transfer between America's sovereign creditworthiness and private bank liabilities.

⁹⁹ (Ruggie 1998), (Wendt 1998), (Lebow 2009), and (Blyth 2011).

occurrence.¹⁰⁰ Matters are complicated further because ideas and outcomes in markets are inseparable – agents’ thoughts and perceptions are causally imbricated into asset prices and market outcomes.¹⁰¹ For this reason, Mark Blyth concludes that ideational scholarship occupies its own “distinct social ontology” because economic ideas and material outcomes are often the same thing. Blyth finds that the interdependence of economic subjects and objects renders linear causal standards irrelevant because the very narratives and conventions we divine about how markets operate has a two-way, reflexive relationship with the causal generators of markets themselves. Blyth claims that economic ideas “are simultaneously the media through which understand the world and the material that constitutes it.”¹⁰² Thus the relationship between ideas and outcomes is endogenous and recursive, such that it is impossible to separate them when attempting to determine causality in complex social systems. As Blyth describes:

In this case [of markets], and in many other cases in the social and political world, particularly at higher levels of aggregation, subject and object are not independent. Rather, they are interdependent since actions taken in light of beliefs alter the nature of the system itself. Admitting the problem of interdependence as an endemic feature of social systems means that linear causation becomes far more contingent than merely ‘necessary and sufficient.’ For if many causes have their roots in the reciprocal relations of ideas, agents, and objects (financial theorists, financial analysts, and financial systems) then non-linearity due to interdependence must be seen as an endemic feature of social reality rather than simply an added complication to be more or less ignored in the name of parsimony.¹⁰³

¹⁰⁰ (Blyth 2011, 92)

¹⁰¹ For example, in Chapters 4 – 6, this dissertation describes how the *conventional expectations* about the solvency of shadow banking conduits actually reify the very creditworthiness that their ideas were meant to reflect.

¹⁰² (Blyth 2011, 84)

¹⁰³ (Blyth 2011, 93).

Blyth notes that this social ontology allows the researcher to discuss the “unintended consequences of action in [agents’] environments,” and as such, seems well suited to studying the role of economic conventions in financial markets.¹⁰⁴ Rather than disputing or working around these endogenous and recursive causal pathways (via partial equilibrium analysis and comparative statics), this dissertation problematizes and investigates endogeneity in markets.

So if this dissertation rejects linear causality on ontological grounds, where does this leave us? According to R. Ned Lebow, constructivists offer a unique method of social inquiry known as “constitutive causality,” which he describes as follows:

Constitutive causality seeks to develop layered accounts of human behavior in lieu of law-like statements. It rejects the latter, not only because of all the philosophical and methodological problems associated with such a project, but out of recognition that outcomes – and their meanings – almost always depend on idiosyncratic features of context...At the deepest levels, causation is cognitive and works by opening and directing thought to some pathways while closing or foreclosing others.¹⁰⁵

This quotation seems particularly apt to the study of conventions. Conventions explain how agents elevate certain behavioral choices over alternatives and delineate the cognitive pathways by which economic ideas motivate agent behavior and translate into material outcomes in the economy. Conventions thus specify the “idiosyncratic features of context” that explain why some outcomes occur over others.

This dissertation thus adopts a strongly constitutively standards of causation, and argues that economic conventions make some behavior “all but necessary” and others “almost inconceivable.” Furthermore, cognitive frameworks like conventions “shape the

¹⁰⁴ (Blyth 2011, 96-97)

¹⁰⁵ (Lebow 2009, 4).

way in which people formulate goals and choose means of achieving them.” Belief in certain conventions “also influences the kind of information people pay attention to and how they interpret it.” Lebow suggests that to demonstrate the causal importance of social constructs like conventions, one has to “work back from [observed] behavior to understandings and goals and show how they in turn were the product of particular identities or cognitive frames.” Additionally, Lebow argues that in an ideal world, “we should demonstrate that the behavior in question would be inconsistent with other identities and frames.”¹⁰⁶ This is the causal standard employed in the present study, and this dissertation shows how economic conventions foreclose certain outcomes while making others inevitable. To that end, the following section outlines the empirical methods used by this dissertation to test its causal propositions, given this dissertation’s ontology and non-linear causal standards.

Operationalization and Methodology

To illustrate the applicability of this chapter’s theoretical framework in investigating asset markets based on the above ontology, this study marshals evidence from author interviews, discourse analysis of archival documents and speeches, descriptive economic statistics, time series econometric analysis, and other secondary sources to show that economic conventions must be taken seriously as causal drivers of stability and change in financial markets. The empirical methods employed by this dissertation include counter-factual analysis, process-tracing, and econometric techniques.

¹⁰⁶ (Lebow 2009, 6-7)

According to sociologist Max Weber, counterfactual analysis involves “the mental construction of a course of events which is altered through modifications in one or more ‘conditions’.”¹⁰⁷ In evaluating the relationship between conventions and market outcomes, it is necessary to judge whether conventions and conventional change have independent causal weight in determining market outcomes or are epiphenomenal to other, material causal processes. One way of solving this puzzle is by envisioning how different conventions might have altered the decision-making calculi of agents, and thus produced different outcomes in markets.¹⁰⁸ Counter-factual analysis of economic conventions allows the researcher to speculate how variance in agents’ conventions might have caused them to make different decisions, thus producing variance in market outcomes. This dissertation employs counterfactual methods to illustrate its causal propositions. For instance, Chapter 3 argues how policy entrepreneurs’ operationalization of inflation metrics, fears of repeating Japan’s experience with deflation, and ideology that central banks should not pop asset price bubbles explain the Federal Reserve’s monetary policy prior to the global financial crisis. The chapter then provides some reasons why *different* economic conventions would have caused *different* outcomes in the U.S. economy (i.e. counterfactual conventions and their attendant outcomes). Chapter 5 describes how regulators’ repeated interventions in financial markets created a *conventional expectation* in markets that regulators would serve as *lenders of last resort* for shadow banking conduits. Chapter 6 hypothesizes that Lehman Brothers’ bankruptcy nullified this conventional expectation, initiating a period of *convention uncertainty* and

¹⁰⁷ (Weber [1905] 1949, 173)

¹⁰⁸ (King, Keohane and Verba 1994, 10-11)

thus financial instability in financial markets. It is possible to envision an alternative history in which regulators issued a *carte blanche* bailout of the entire financial system before the failure of Lehman Brothers, thus affirming the market's belief in regulators' *de facto* shadow banking deposit insurance and avoiding much of the instability that overwhelmed financial markets after Lehman Brothers.

While counter-factual analysis gives the researcher *prima facie* support for the notion that conventions shape agent behavior and thus outcomes in financial markets, one must employ other methods to show the causal links between *specific* conventions and certain outcomes in financial markets. This dissertation employs process-tracing research techniques, in which the researcher observes “the decision processes by which various initial conditions are translated into outcomes,” as argued by George and McKeown. Process-tracing “attempts to uncover what stimuli...actors attend to; the decision process that makes use of these stimuli to arrive at decisions; the actual behavior that then occurs; the effect of various institutional arrangements on attention, processing, and behavior; and the effect of other variables of interest on attention, processing, and behavior.”¹⁰⁹ King, Keohane, and Verba argue, “Process tracing will...involve searching for evidence - evidence consistent with the overall causal theory - about the decisional process by which the outcome was produced.” To find this evidence, King et al. believe that process-tracing might require the researcher to conduct elite interviews and review their written record to explain their choices over plausible alternatives, as this dissertation does in Chapters 4, 5, and 6 to explain the decision-making processes of market participants,

¹⁰⁹ (George and McKeown 1985, 35)

regulators, and policymakers¹¹⁰ As Matthias Matthijs contends, process-tracing is suited to ideational analysis because it allows the researcher to “gain significant insights into economic decision making since it involves the reconstruction of actors’ motivations as well as their definitions and evaluations of particular situations.”¹¹¹

This dissertation also uses quantitative techniques to show how *changes* in conventions cause material changes in financial markets. Chapter 6 and Appendix IV discuss the results of a series of econometric tests to illustrate that the conjoined failure of Lehman Brothers and bailout of insurance giant AIG initiated a structural break in inter-bank lending markets based off time series econometric data. Furthermore, this dissertation draws on descriptive economic statistics to illustrate the link between economic conventions and market outcomes. Chapter 3 computes several correlations to show that housing related interest rates varied directly with the Fed’s monetary policy. It also uses statistical techniques to demonstrate the existence of a “Great Moderation” in macroeconomic volatility from 1980-2008. All empirical chapters present myriad economic data to help readers understand the aggregate forces facing the U.S. economy from 2001-2009.

Taken together, these three empirical methods – counter-factual analysis, process-tracing, and quantitative techniques – help the study present clear links between economic conventions and financial market outcomes.

This dissertation employs the above empirical methods in the context of a “single-n,” representative case study on the global financial crisis. Helen Simons defines a case

¹¹⁰ (King, Keohane and Verba 1994, 226-227)

¹¹¹ (Matthijs 2011, 6)

study as “an in-depth exploration from multiple perspectives of the complexity and uniqueness of a particular project, policy, institution, program or system in a ‘real life’ context.”¹¹² According to John S. Odell, this dissertation qualifies as a “preliminary illustration of a theory” form of case research, since this dissertation “puts concrete flesh on the bare bones of an abstract idea in order to help readers see its meaning more clearly, and to convince them that the idea is relevant to at least one significant real-world instance.”¹¹³ John Gerring would argue that this dissertation’s case study of the global financial crisis qualifies as a “pathway case,” insofar as it attempts to complete an “intensive analysis of an individual case...to elucidate causal mechanisms (i.e. to clarify a theory).”¹¹⁴ Regardless of one’s terminology, the researcher must keep in mind Gary Thomas’ caveat that a sound case study design requires two complementary components: a subject of the case study (in this case, the global financial crisis) and an object of the study (what he terms “an analytical or theoretical frame,” which this case is the theoretical framework advanced in the above six propositions).¹¹⁵ The present study satisfies Thomas’ criteria of conducting a case study.

To conduct an effective case study, George and Bennett argue that “the investigator should clearly identify the universe – that is, the ‘class’ or ‘subclass’ of events – of which a single case or a group of cases to be studied are instances.” In this case, the global financial crisis is part of the broader universe of systemic financial crises. The authors go on to summarize several strengths and weaknesses associated with the

¹¹² (Simons 2009, 20)

¹¹³ (Odell 2001, 163)

¹¹⁴ (Gerring 2007, 233)

¹¹⁵ (Thomas 2011, 515)

case study approach. First, case studies allow for “conceptual validity,” as social science concepts like power, legitimacy, democracy, among others are context dependent, so forming causal propositions that take into account contextual idiosyncrasies that cloud our ability to elucidate specific concepts can lead to better theory building. Second, case studies allow the researcher to “derive new hypotheses” for deviant cases. Whereas traditional, large-n approaches to financial markets increase the number of data points and, in so doing, lose precision, a targeted single-n study on the global financial crisis can identify the causal links that large-n theorizing ignores. Third, George and Bennett argue that case studies allow the researcher to “explore causal mechanisms” in detailed cases. Fourth, case studies lend themselves to “modeling and assessing complex causal relations,” which is important when trying to understand why humanly-devised social systems like markets erupt into crisis, as these domains are rife with feedback loops and deeper, idiosyncratic complexity that large-n case studies often ignore.

That said, the case study method is not without its faults. George and Bennett identify the following weaknesses of the case study method that the researcher must consider before committing to a case study research design. First, they argue that case studies are subject to case selection bias, or picking cases because they share a desired outcome. Selection bias can lead to invalid results because the researcher might ignore negative cases that also share the same proposed causal variables, in turn leading to false confidence in results.¹¹⁶ Second, George and Bennett argue that case studies suffer from the fact that they do not allow the researcher to test for *variances in scope* of particular

¹¹⁶ This particularly concern is mitigated by the fact that the present study investigates the U.S. economy over a period of *both financial market stability and instability*, so there is adequate variance within the single case to mitigate selection bias concerns.

variables. In the parlance of statistics, case studies might not allow the researcher to gauge the magnitude of the beta coefficients of the variables studied. This is particularly stark when considering that this study advances the claim that convention uncertainty leads to financial market instability. More formally, this study argues that convention uncertainty is a *necessary* (if not sufficient – the critical complement being the existence of a fragile financial structure) condition for initiating financial market instability. Yet a single-case study makes it difficult to conclude that convention uncertainty, coupled with a fragile financial system, generates financial instability *across all cases in all contexts*.

Third, George and Bennett argue that case studies might exhibit a “lack of representativeness” that could result in concept stretching if the researcher mechanically jumps to conclusions based on a single case.¹¹⁷ Although it is impossible to address all of these weaknesses of the case study method, one of the best defenses against these pitfalls is to be aware of them, so every effort will be made to eschew hyperbole, bias, and ideology when presenting the reader with a clear understanding of the causal role of economic conventions during the case in question. This dissertation does not claim to hold a monopoly of explanation over other interpretations of financial instability across cases. Rather, this dissertation argues that a fuller consideration of economic conventions within pre-established and popular lenses of investigating asset market outcomes (e.g. Post-Keynesian asset market theory and neoclassical economics) lends itself to better

¹¹⁷ (George and Bennett 2004, 22-30). When addressing this third criticism, it is important to remember that the present study does not endeavor to provide a mutually exclusive explanation for the global financial crisis, or all financial crises for that matter. Instead, the goal of this study is to show how a theoretical synthesis of different strands of investigating outcomes in complex environments (economics, both neoclassical and Post-Keynesian, on one hand, and ideational studies, including economic constructivism and power cycle theory, on the other) can enable the researcher “to get ever closer to that limit point” of truth, as described by Charles Doran in the opening quotation to this chapter. This conventions-based account of continuity and change in financial markets sits among other competing paradigms of understanding financial market instability

theory and greater empirical validity. It is up to the reader to judge the relative merits of a conventions-based approach compared with alternatives.

Finally, it is worth noting that this dissertation has a number of *units of analysis*, including “sell side” financial institutions, “buy side” money market mutual funds and other bank counterparties, regulators at both the U.S. Treasury and the Federal Reserve, and “the market” writ large. Given the scope of global capital markets, this dissertation’s primary units of analysis might not fit into territorially delimited states. While the Federal Reserve and U.S. Treasury have a clear legal authority over the United States, institutional investors and financial institutions are complicated entities and cross international boundaries. Shadow banking, a major locus of analysis in this dissertation, is decidedly international and globalized (as the losses accrued across the global financial system during the global financial crisis illustrate all too well). Even though many of the world’s biggest financial institutions are incorporated in the United States, firms like Citigroup and J.P. Morgan have operations in over one hundred countries worldwide. Furthermore, international capital flows are unregulated, and thus implicit in any analysis of, for instance, the flight to safety given convention uncertainty, is an interaction of financial flows both *within* and *among* states. States themselves are also important economic actors in the international economy and are thus important objects of study when considering the reflexive relationship between agents and social structures. States are particularly important to Proposition 6 of this dissertation’s conventions-based theoretical framework, as national regulators are often the first line of defense against financial instability.¹¹⁸ Still, the presence of open capital markets, coupled with

¹¹⁸ (Helleiner 2011)

idiosyncratic market perceptions of regulator credibility, begets a divergence of national-level *intervention capacities* in financial markets. Simply put, some national regulators are given more leeway by financial markets than others, and this leeway determines the autonomous power of financial elites to intervene in financial systems given convention uncertainty. State power (qua regulators' intervention capacity) in the age of globalization is not the primary focus of this dissertation.¹¹⁹ Chapter 6 focuses on the actions of the Federal Reserve and U.S. Treasury, which, because of the dollar's dominant global role, exercise autonomous and deep intervention capacity in financial markets. This condition does not hold across all circumstances of financial instability. But since this dissertation is studying the United States and not, say, Thailand in 1997, or Greece in 2010, stateness and power are important but ultimately not decisive variables in this study's theoretical framework.

Conclusion

The purpose of this chapter was four-fold: first, it placed the present study in its appropriate academic context, summarizing the core weaknesses of Post-Keynesian asset market theory and the main theoretical contentions of Keynesian epistemology, Doran's power cycle theory, and economic constructivism. Second, this chapter presented this dissertation's primary theoretical framework, which consists of six inductively derived causal propositions about economic conventions, continuity, and change in financial markets. When describing these propositions, effort was made to link them to the Post-Keynesian model of financial instability while also discussing their operationalization in the subsequent case study. Third, this chapter discussed this dissertation's ontology and

¹¹⁹ See, for example Proposition 6 and (Kirshner 2003).

methodological posture of “strong constitutive causality,” in which economic conventions and market outcomes are treated as mutually constituted, endogenous, and recursive. Fourth, the chapter described the operationalization of this dissertation’s theoretical framework in the context of a representative case study of the global financial crisis. It described this dissertation’s empirical methods, including counter-factual analysis, process-tracing, and econometric techniques, and the types of evidence marshaled via these techniques to illustrate the applicability of the study’s causal propositions.

Having described this study’s research design, the next two chapters present the operationalization of the first three propositions of this dissertation’s conventions-based theoretical framework. They describe how, in the years prior to the 2008 global financial crisis, the U.S. Federal Reserve’s interest-rate setting body, the Federal Open Market Committee, kept interest rates “too low for too long,” thus inducing the precipitous rise in housing prices in the U.S. economy from 2001-2006. Chapters 3 and 4 also describe the economic conventions that underpinned the Fed’s interest rate decisions, and argue that different economic conventions would have produced different housing market outcomes in the U.S. economy.

Chapter 4 picks up where Chapter 3 leaves off, and describes how many of America’s systemically important financial institutions adopted risky financing arrangements in tandem with the unsustainable increase in housing prices. It too argues that the emergence of financial fragility was due to several enabling economic conventions, including pro-cyclical conventional expectations in the wholesale funding market, institutionalized, favorable bond ratings for risky ABS, and bank-determined

capital charges based on ergodic risk models, which permitted authoritative actors to add more risk into the U.S. financial system, sowing systemic vulnerability to credit write-downs when the housing market collapsed.

In both chapters, effort is made to show how convention adoption produced stability, fragility, and epistemic blindness to non-routine change *ex-ante* the global financial crisis, as described in Propositions 1-3 of this dissertation's theoretical framework.

Of course, any time that there is a public involvement that softens the blow of private-sector losses – even as obliquely as in this episode – the issue of moral hazard arises...Over time, economic efficiency will be impaired as some uneconomic investments are undertaken under the implicit assumption that possible losses may be borne by the government.

- Alan Greenspan¹²⁰

In the shadow banking system, loans, instead of being held on the books of banks as was virtually always the case in the 1930s, were packaged together in complex ways and sold to investors. Many of these complex securities were held in off-balance-sheet vehicles financed by short-term funding. When the housing slump shook investors' faith in the values of the loans underlying the securities, short-term funding dried up quickly, threatening the banks and other financial institutions that explicitly or implicitly stood behind the off-balance-sheet vehicles. This was a new type of run, analogous in many ways to the bank runs of the 1930s, but in a form which was not well anticipated by financial institutions or regulators. In an additional variation on the theme of the bank run, in September 2008 money market mutual funds saw massive outflows after one prominent fund suffered losses related to the failure of Lehman Brothers.

- Ben Bernanke¹²¹

...yet for all the risks they're taking on, banks insist they're safer than ever. They've hired many of the greatest mathematical minds in the world to create impossibly complex risk models. They deal in so many markets that the chances of all of them going haywire simultaneously appear minuscule.

- Businessweek Magazine, 2006¹²²

More and more leverage in the system, The whole building is about to collapse anytime now...Only potential survivor, the fabulous Fab...standing in the middle of all these complex, highly leveraged, exotic trades he created without necessarily understanding the implications of those monstrosities (sic)!!!

- "Fabulous" Fabrice Tourre¹²³

¹²⁰ (Greenspan 1998)

¹²¹ (Bernanke 2010b)

¹²² (BusinessWeek 2006)

¹²³ (G. White 2010); Tourre was a Vice President at Goldman Sachs, subsequently indicted by the Securities and Exchange Commission for fraud.

**CHAPTER 3:
CONVENTIONS AND MONETARY POLICY**

Proposition 1: Stable conventions produce stable markets.

Proposition 2: Conventions influence the amplitude and periodicity of asset market imbalances.

Proposition 3: Conventions blind agents to the prospect of non-routine change in financial markets.

Introduction

Chapters 3 and 4 of this dissertation empirically demonstrate the first three propositions of this study's theoretical framework. Chapter 3 discusses the relationship between economic conventions and the Federal Reserve's monetary policy prior to the global financial crisis. It traces how Federal Reserve monetary policy contributed to the housing bubble, and it identifies three links between accommodative monetary policy and higher housing prices: lower housing related interest rates, higher asset prices, and reduced macroeconomic volatility. Together, these factors link the Fed's monetary policy to housing market outcomes prior to the global financial crisis. Thereafter, the chapter identifies the economic conventions that motivated the Federal Reserve's monetary policy. This dissertation finds that three sets of economic conventions – including the Fed's use of owners' equivalent rent to measure housing inflation in their official inflation statistics, FOMC members' fears of repeating Japan's historical experience with deflation, and the ideology, held by senior Fed central bankers, that it was better to clean up the aftermath of a deflated asset price bubble rather than lean against its inflation – explain the Fed's monetary policy during the 2000s. It follows from this analysis that different conventions would have led to different housing market outcomes in the U.S. economy, *ceteris paribus*.

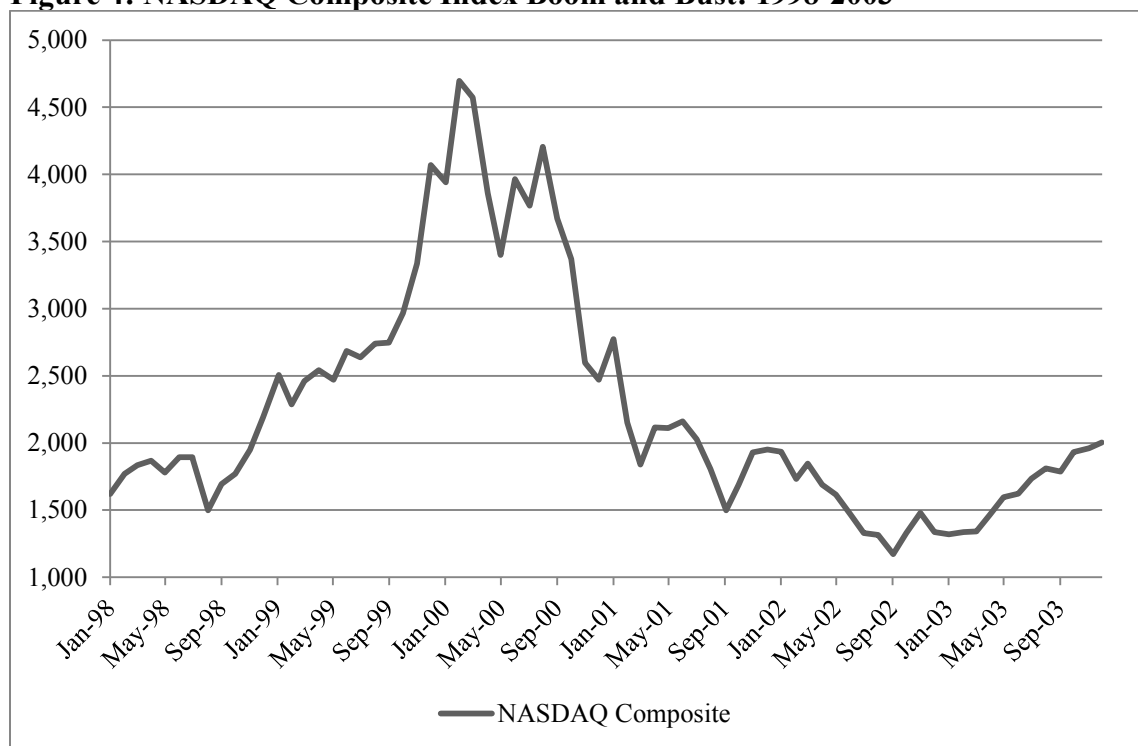
The Federal Reserve and the Global Financial Crisis

Like the 2000s, which bore witness to the housing bubble, the late 1990s had its own version of "irrational exuberance" in the public equity markets. The NASDAQ composite, a stock index of leading technology companies, increased from 1,500 in August 1998 to nearly 4,700 in February 2000, with many of its constituent companies

boasting stock prices several hundred times their annual earnings. It did not take long for the stock market's momentum to give way to fundamental economic realities, however, and from 2000-2002, the NASDAQ composite stock index lost seventy percent of its value.¹²⁴

The deflation of the technology stock bubble, along with the September 11 terrorist attacks, caused the U.S. economy to fall into recession in 2001. GDP growth contracted in the first and third quarters of that year, while the unemployment rate increased from four percent in 2000 to just above six percent in 2003. In 2002, a wave of corporate scandals hit Wall Street, further adding to the dynamic of economic uncertainty.

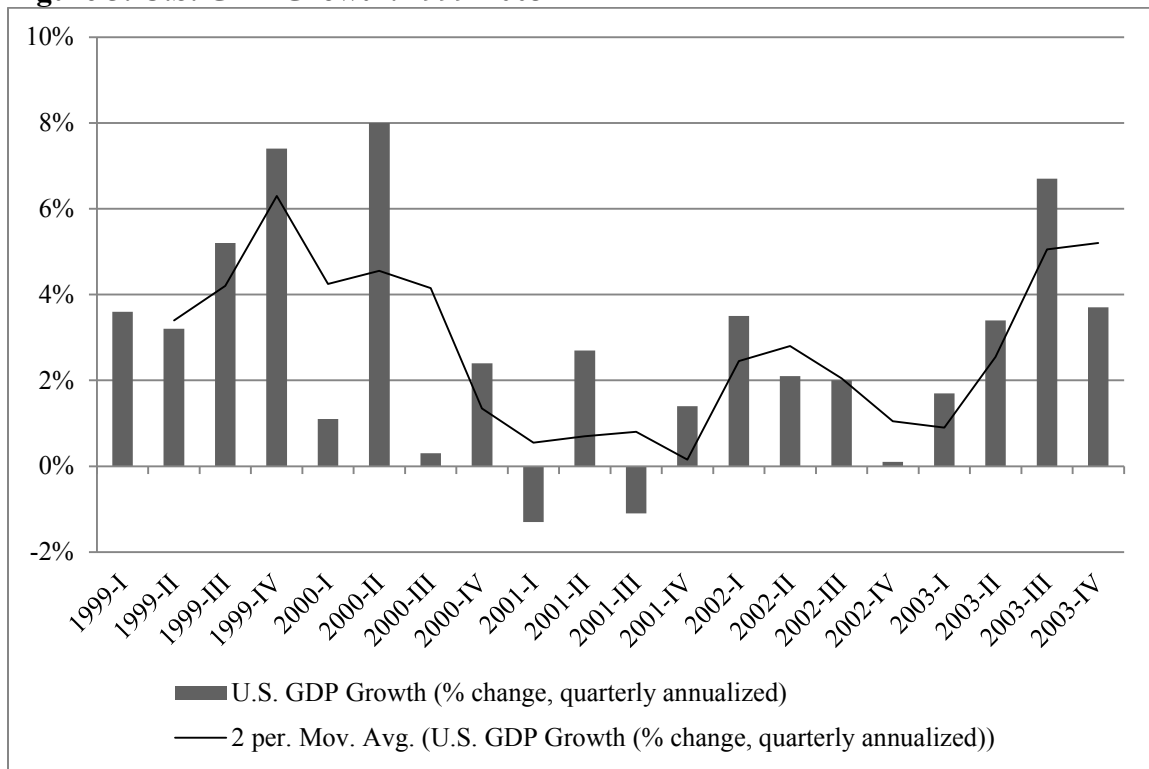
Figure 4: NASDAQ Composite Index Boom and Bust: 1998-2003



Source: Yahoo™ Finance

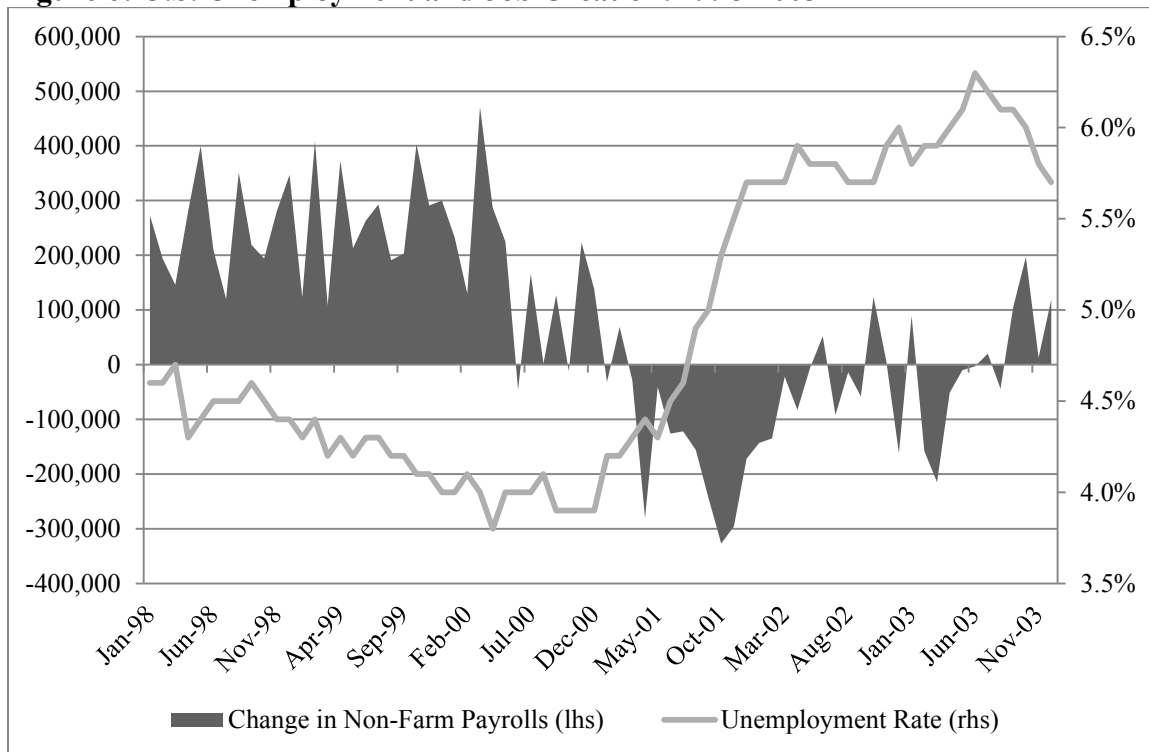
¹²⁴ (Brunnermeier and Nagel 2004)

Figure 5: U.S. GDP Growth: 1999-2003



Source: U.S. Bureau of Economic Analysis

Figure 6: U.S. Unemployment and Job Creation: 1998-2003



Source: U.S. Bureau of Labor Statistics

In response to collapsing public equity prices, contracting output, and rising unemployment, the Federal Reserve's interest rate-setting body, the Federal Open Market Committee (FOMC), cut the target federal funds rate from 6.5% in January 2001 to 1% by June 2003.¹²⁵ Accommodative monetary policy succeeded in cushioning growth in the U.S. economy, as the 2000-2002 contraction was relatively shallow compared with other Post-War recessions, though unemployment remained elevated throughout 2003.¹²⁶

Low interest rates can stimulate many aspects of the economy, however, not just output and employment. William White, one of the few economists who foresaw the crisis, argued that prolonged, lax monetary conditions could lead to “significant deviations” in home prices from their fundamental value. White found that low interest rates and financial liberalization “increased the likelihood of boom-bust cycles of the Austrian sort,” and went on to identify what he saw as a bubble dynamic taking root in the U.S. economy because of the Fed's easy monetary policy:

The dynamics of the process can be described in the following way. Buoyed by justified optimism about some particular development, credit is extended which drives up related asset prices. This both encourages fixed investment..., and increases collateral values, which supports still more credit expansion. With time, and underpinned by an associated increase in output growth, this process leads to increasing willingness to take on risks ('irrational exuberance'), which gives further impetus to the credit cycle.

¹²⁵ Minutes from the FOMC's November meeting in 2002 reveal the Fed's rationale for their 2001-2003 rate cutting cycle: “While the current stance of monetary policy was still accommodative and was providing important support to economic activity, the members were concerned that the generally disappointing data since the previous meeting, reinforcing the general thrust of the anecdotal evidence in recent months, pointed to a longer-lasting spell of subpar economic performance than they had anticipated earlier. In the circumstances, *a relatively aggressive easing action could help to ensure that the current soft spot in the economy would prove to be temporary and enhance the odds of a robust rebound in economic activity next year.*” (Federal Open Market Committee 2002). Emphasis added.

¹²⁶ (B. S. Bernanke 2010a) Even though GDP growth remained positive, the broader economic recovery was “jobless” throughout 2003, which might have contributed to the Fed's decision to keep interest rates low despite rebounding output. The Fed has a dual mandate to support stable employment and stable prices, and with inflation low, the Fed felt it was within its purview to maintain accommodative monetary policy to spur employment growth in the early 2000s.

As White saw it, the primary risk facing the U.S. economy was that “exaggerated expectations concerning both risk and return are eventually disappointed,” and that “the whole process...[could go] into reverse.” When the reckoning occurred, asset price values would fall, output would contract, and unemployment would rise.¹²⁷

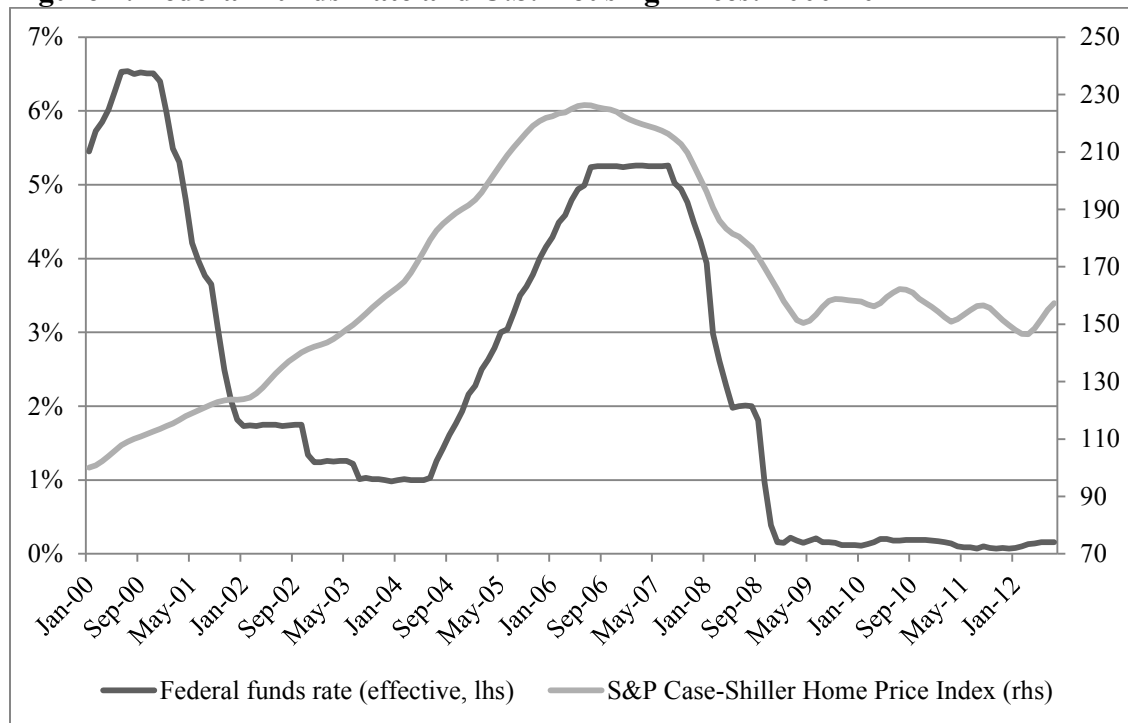
Indeed, there is *prima facie* evidence that comports with White’s narrative of events, as short-term interest rates inversely correlated with housing prices from 2001-2007. In 2002, the average annual federal funds effective rate was 1.7%, while home prices increased 15% over the same period. The following year, in 2003, the Fed’s policy rate hovered near 1% on average, while home prices increased another 13.4%. In 2004, when the Fed was debating whether to raise interest rates, housing inflation spiked to roughly 19% on the year. When the Fed did tighten monetary policy in 2006 and kept the federal funds rate at 5% on average, housing prices increased a scant .22%.

Table 1: Average Annual Federal Funds Rate and Change in Housing Prices

Year	Average Annual Federal Funds Effective Rate	Change in Home Prices (% change, YoY)
2001	3.7%	8.9%
2002	1.7%	15.0%
2003	1.1%	13.4%
2004	1.3%	18.7%
2005	3.2%	15.9%
2006	5.0%	0.2%
2007	5.0%	-9.8%

Source: The Federal Reserve, Standard and Poor’s

¹²⁷ (W. R. White 2006, 3-9). The trigger of White’s irrational exuberance – “optimism about some particular development” – is analogous to a “displacement” in the Post-Keynesian model.

Figure 7: Federal Funds Rate and U.S. Housing Prices: 2000-2012

Source: The Federal Reserve, Standard and Poor's

Still, the mere existence of an inverse correlation between interest rates and rising housing prices does not necessarily allow us to conclude a causal relationship exists between these variables.¹²⁸ What links existed between the Fed's accommodative monetary policy and the housing market? This study identified three channels by which monetary policy affected the U.S. housing market.

First, the federal funds rate affected interest rates tied to real estate investment, adding incremental demand to the housing market. The federal funds rate is the interest rate at which banks borrow from one another on an overnight basis to maintain their Fed-mandated reserve requirements. If banks can borrow cheaply in the federal funds market, so the theory goes, they will be more inclined to lend at lower interest rates to other

¹²⁸ Based on these annual averages, the federal funds effective rate inversely correlated with housing prices at approximately -0.85.

borrowers. Therefore, when the Fed wants to stimulate economic activity, it will lower the federal funds target, and when the Fed wants to contain inflation and curtail economic activity, it will raise interest rates to reduce lending, investment, and output.

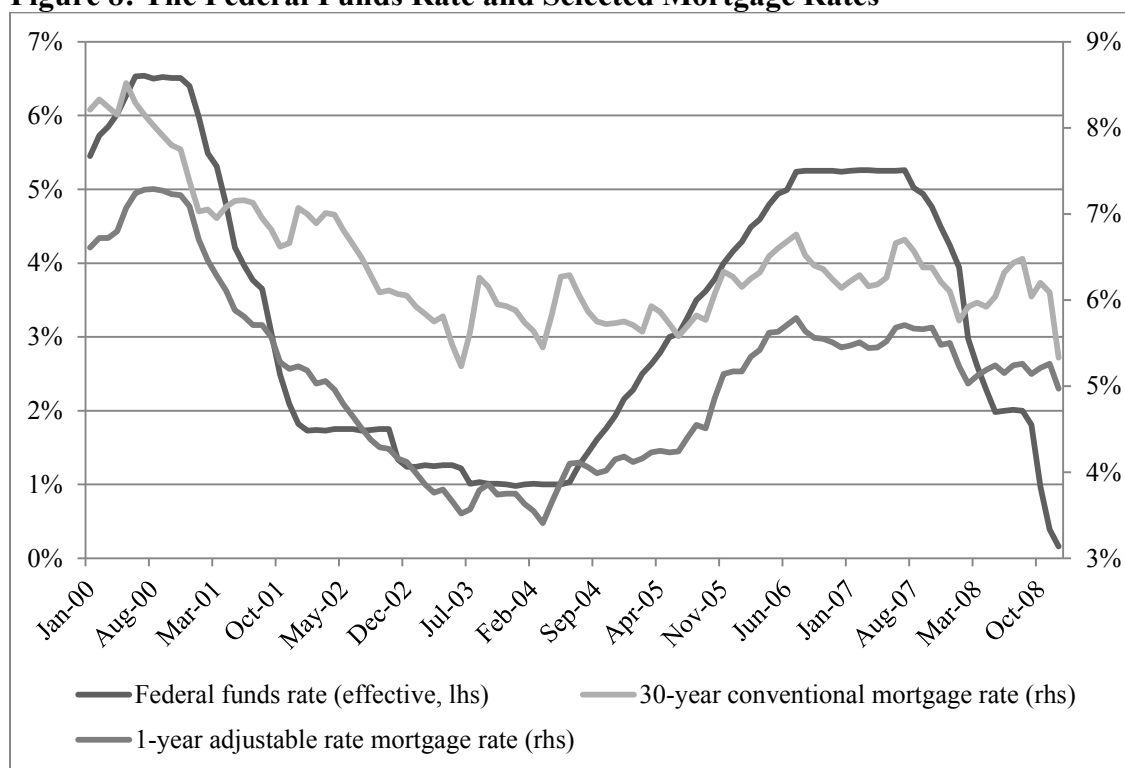
There is empirical evidence that the federal funds rate affected interest rates tied to residential real estate investment, which could have contributed to the market's "irrational exuberance" in the housing market.¹²⁹ From early 2001 through mid-2004, when the Fed cut the federal funds rate from above 6% to 1%, thirty-year fixed mortgage rates fell from above 8% to 5%. From January 2000 through December 2008, the thirty-year conventional mortgage rate had a 0.66 correlation to the federal funds effective rate. During the same period, adjustable mortgage rates had a 0.86 correlation to the federal funds effective rate. Lower policy interest rates also affected real interest rates, as measured by the yield on the 1997 vintage 10-year Treasury Inflation Protected Security (TIPS). From 1997-2006, the TIPS yield correlated with the federal funds rate approximately 0.84, and appears to fall lock-step with the Fed's interest rate cutting cycle in 2001-2003, falling from just above 4% in 2000 to less than 0% by early 2004.

Low interest rates also allowed mortgage originators to offer adjustable-rate mortgages (ARM) to borrowers with poor credit histories, many of whom borrowed at low "teaser" rates that were tied to short-term interest rates. Benjamin Tal found that housing prices rose most in markets with higher proportions of exotic mortgage

¹²⁹ (Greenspan 2005). Though short-term interest rates can have an effect on other interest rates, this relationship is ambiguous. For instance, a monetary expansion (i.e. falling short-term interest rates) could cause both lower or higher long-term bond yields, depending on whether market participants view the monetary expansion as an effective economic stimulus (and thus an inflation pressure), or a sign of continued economic stagnation (thus lowering inflation expectations and bond yields with them). Alan Greenspan once called the decoupling of long-term interest rates from short-term rates a "conundrum," and pointed out that long-term interest rates are determined by countless other factors, such as inflation expectations, risk tolerance of money managers, and global supply and demand for Treasury bonds, among other causes.

structures, such as ARMs.¹³⁰ When the FOMC raised interest rates, these teaser interest rates rose as well, thus increasing borrowers' monthly payments and their likelihood of default. Anthony Sanders argued that the Fed's rate tightening cycle was an important determinant in the timing of rising defaults after the housing bubble burst, and claimed that the "payment shock" accompanied by higher interest rates in 2006 was "enormous" for ARM homeowners.¹³¹

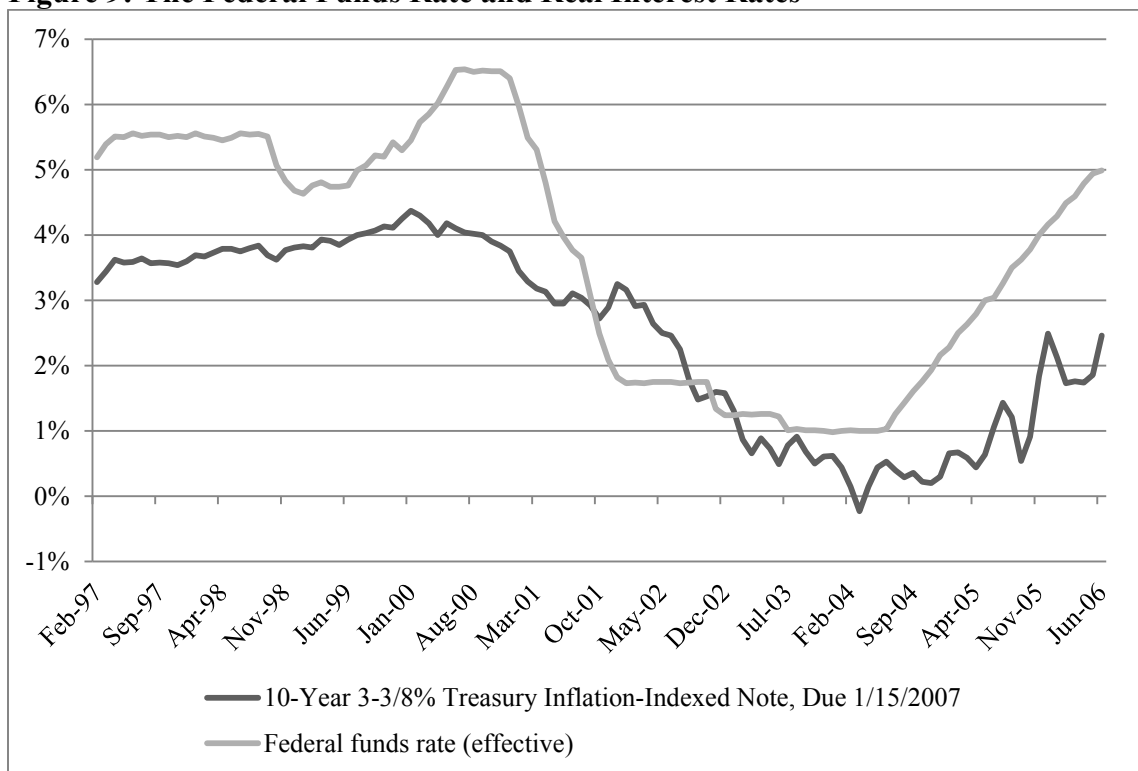
Figure 8: The Federal Funds Rate and Selected Mortgage Rates



Source: The Federal Reserve

¹³⁰ (Tal 2006)

¹³¹ (Sanders 2008)

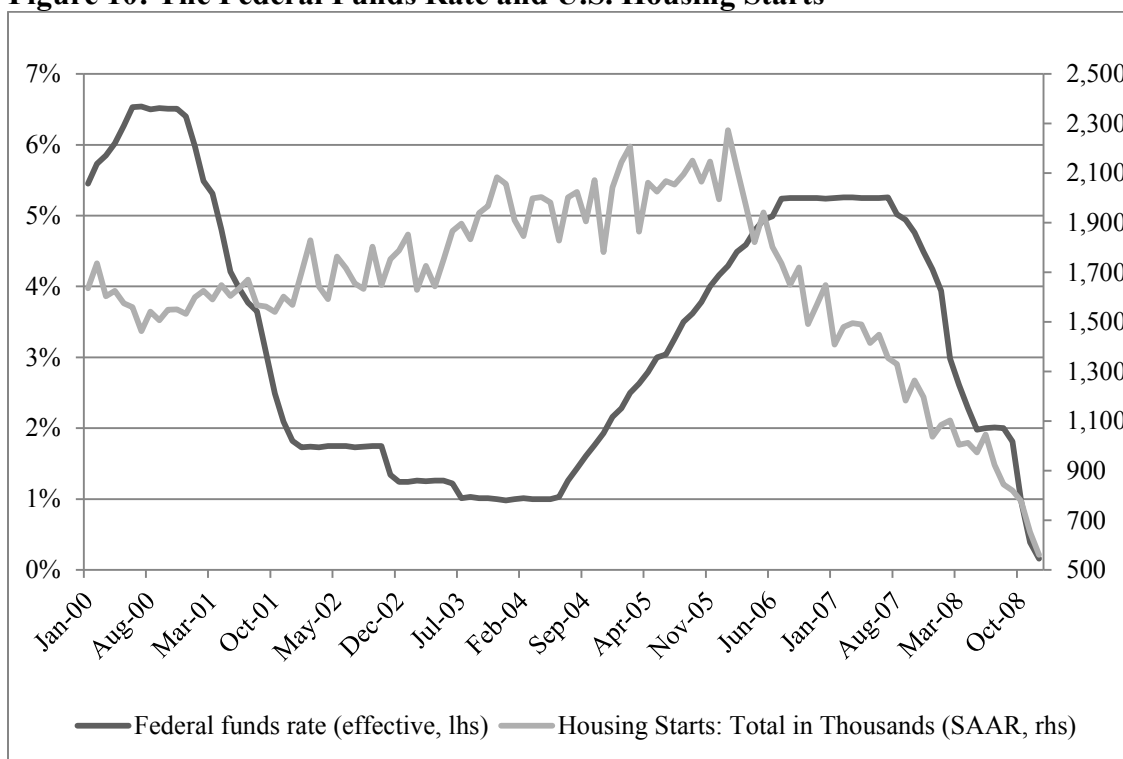
Figure 9: The Federal Funds Rate and Real Interest Rates

Source: The Federal Reserve

The Fed's monetary policy also incentivized housing construction. By 2003, in the midst of the Fed's rate cutting cycle, housing starts climbed to a twenty-five year high, which economist John Taylor attributed to accommodative monetary policy.¹³² Using Bayesian vector auto regression techniques, Federal Reserve economists Marek Jarociński and Frank Smets concurred with Taylor, and found that monetary policy had a "significant effect on housing investment and house prices and that easy monetary policy designed to stave off perceived risks of deflation in 2002-2004 has contributed to the boom in the housing market in 2004 and 2005."¹³³

¹³² (Taylor 2007, 2-7)

¹³³ (Jarociński and Smets 2008, 362)

Figure 10: The Federal Funds Rate and U.S. Housing Starts

Source: The Federal Reserve

The second channel by which monetary policy affected housing demand was via other asset prices in the economy, including stock prices. According to Barry Eichengreen, lax monetary policy tended to increase equity valuations, which in turn made banks more inclined to lend across the economy. Higher share prices also make consumers feel wealthier and more willing to spend money on consumption and other assets, including homes.¹³⁴ Andrew Smithers found that low short-term interest rates created “excessive liquidity” in the loanable funds market, which served as a “major transmission mechanism between monetary policy and aggregate demand.”¹³⁵ Harold Vogel argued that based on his empirical tests, the Fed’s monetary policy had an

¹³⁴ (Eichengreen 2011, 113)

¹³⁵ (Smithers 2009, 3-5)

appreciable effect on asset prices, observing the following relationship between the federal funds rate and asset price bubbles:

Interest-rate policy levers such as Fed funds rates appear to have some effect on the creation and sustainability of bubble conditions. Experiments... indicate that bank credit creation begins with decreases in non-borrowed reserves that then work through to increases in business and/or consumer lending. A plausible theory is thus that once such lending exceeds what can be readily absorbed by or used for GDP transactions, the excess spills over into incremental demand for shares and/or other leveragable financial assets, including real estate and commodities. This is entirely consistent with what happened in the Japanese bubble of the late 1980s and also the subsequent credit and housing bubble of the early 2000s.¹³⁶

Some commentators argued that the FOMC implicitly targeted asset prices when formulating monetary policy. This notion, colloquially described as the “Greenspan-Bernanke Put,” held that the Federal Reserve, led by Chairmen Alan Greenspan and later Ben Bernanke, cut interest rates to buoy market confidence whenever share valuations fell past a certain level.¹³⁷ Anecdotal evidence seems to support the case for the existence of the Greenspan (and later Bernanke) put. After every recession in the United States since the 1980s, the Federal Reserve cut its target interest rate to spur economic activity. While the real economy rebounded during these periods, the financial economy took off as well. Though difficult to quantify, the existence of the Greenspan Put helps explain a source of moral hazard among equity market investors, many of whom might have maintained unrealistic expectations for stock prices because of their belief that the Fed

¹³⁶ (Vogel 2010, 224)

¹³⁷ (Goodhart 2009) Greenspan himself dismissed the notion of a Greenspan put, while scholars such as Charles Goodhart speculated that Fed officials would not allow asset prices to fall past the point of what they deemed logical valuations. Thus, one could expect to see the Fed to cut interest rates if valuations fell past a certain point.

would intervene in asset markets to protect investors from downside risk, thus “bailing out” equity investors should valuations fall below the Fed’s perceived “correct” level.¹³⁸

The third channel by which monetary policy contributed to the U.S. housing bubble was by stabilizing output and unemployment volatility. Throughout the mid-2000s, the U.S. economy exhibited signs of profound resilience and stability, leading some policymakers to hypothesize that the United States was undergoing a macroeconomic shift in which economic volatility had been conquered. In 2004, Ben Bernanke gave a speech about the decline in macroeconomic volatility in the United States since the 1980s, noting that based on most macroeconomic aggregates, including the variability of quarterly GDP growth and quarterly inflation, U.S. macroeconomic volatility was declining. He termed this development the “Great Moderation” and hypothesized three explanations of diminished macroeconomic volatility: ‘structural change’, better macroeconomic management, and luck.

The first view – structural change – held that changing economic institutions, smarter inventory management by firms, and a greater sophistication of financial markets made the United States economy more resilient to cyclical fluctuations. The second view, monetary policy, claimed that sound macroeconomic management by America’s central bankers improved the resilience of the economy, since better monetary policy could lessen the sensitivity of wage and price functions to external shocks. Chairman Ben Bernanke, a proponent of this view, also believed that better monetary policy could dampen inflation expectations, which made firms less likely to pass on the costs of commodity price shocks to customers, thus insulating the broader economy from these

¹³⁸ (Miller, Weller and Zhang 2001)

forms of macroeconomic volatility.¹³⁹ The third view, luck, views lower volatility as the result of randomness: while reduced macroeconomic volatility might have coincided with certain monetary policy choices, there was no causal link between the two.

Regardless of one's preferred explanation (in reality, there was some truth to all of them before the crisis), macroeconomic volatility had not been vanquished, and the 2008 crisis debunked many of the myths associated with the Great Moderation. Revisiting the Great Moderation thesis after the global financial crisis, it seems like Bernanke ignored one of the key reasons for the decline in economy volatility from 1980-2008, namely the accumulation of debt on the balance sheets of U.S. households. The link between debt accumulation and reduced macroeconomic volatility is as follows: when the Federal Reserve lowers interest rates in response to an economic shock, households and firms add leverage to their balance sheets because of lower funding costs. Greater consumer leverage buffers the real economy from the inevitable economic reckoning associated with the initial economic shock that caused the Fed to lower interest rates in the first place. As a result, each rate loosening cycle added debt onto household balance sheets, giving the appearance of lower volatility while sowing fragility realized during the 2008 global financial crisis.

Despite the *ex-post* debunking of the Great Moderation thesis, this dissertation found evidence that from 1970 through 2008, output, inflation, and unemployment volatility declined, even if this took place against a backdrop of rising debt to GDP.¹⁴⁰ Reduced macroeconomic volatility might have lulled financial market participants into

¹³⁹ (B. S. Bernanke 2004)

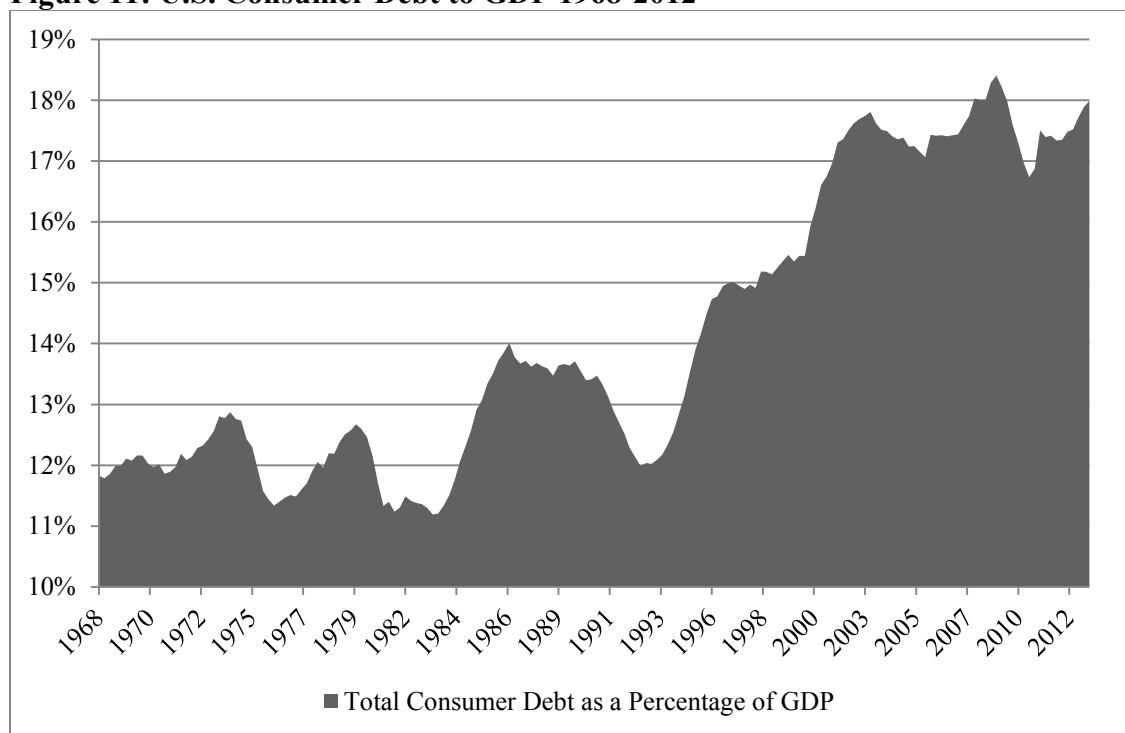
¹⁴⁰ GDP, unemployment, and inflation volatility were calculated on the basis of the *coefficient of variation*, which is found by taking 3-year trailing standard deviation and dividing it by the 3-year trailing sample mean, which allows the researcher to normalize and control for scalar changes in the underlying series.

taking more risk, per the Minsky logic of stability begetting fragility over time. Federal Reserve Board Vice Chairman Donald Kohn suggested as much in a speech given during the height of the global financial crisis:

In a broader sense, perhaps *the* underlying cause of the current crisis was complacency. With the onset of the ‘Great Moderation’ back in the mid-1980s, households and firms in the United States and elsewhere have enjoyed a long period of reduced output volatility and low and stable inflation. These calm conditions may have led many private agents to become less prudent and to underestimate the risks associated with their actions.¹⁴¹

Perhaps the Federal Reserve was too good at satisfying its statutory mandate of stable prices and full employment, lulling financial market participants into a false sense of security and sowing the seeds for future macroeconomic troubles.

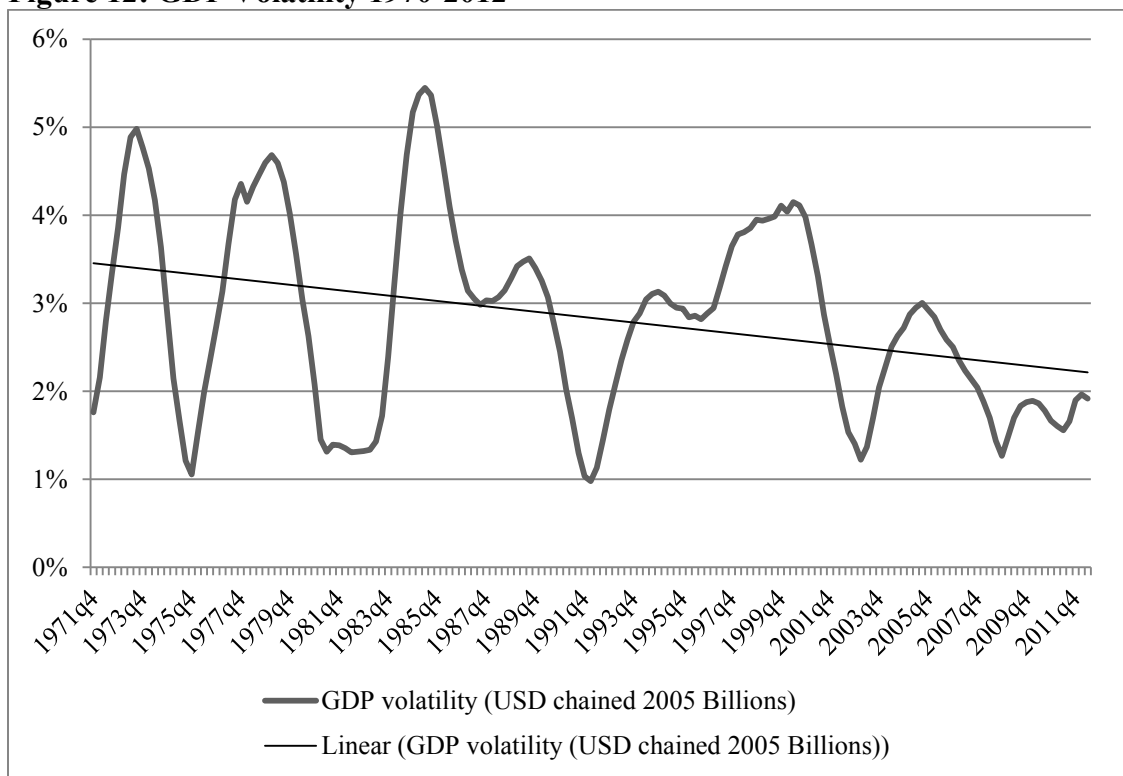
Figure 11: U.S. Consumer Debt to GDP 1968-2012



Source: The Federal Reserve

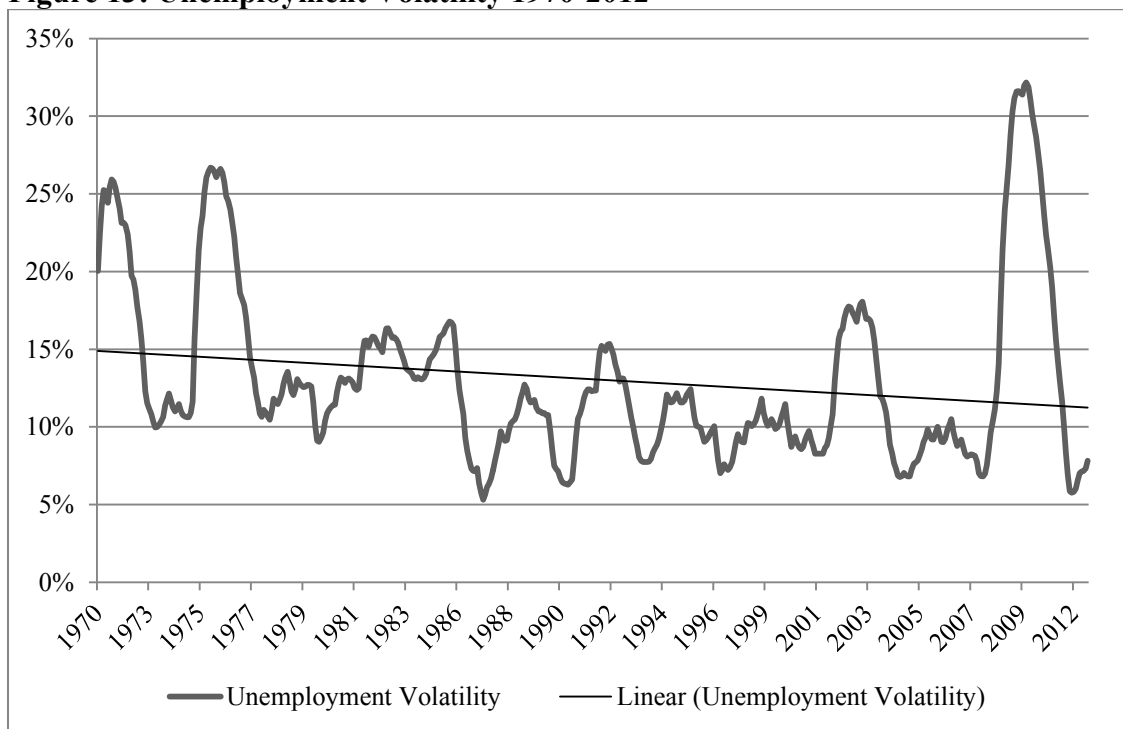
¹⁴¹ (Kohn 2008)

Figure 12: GDP Volatility 1970-2012

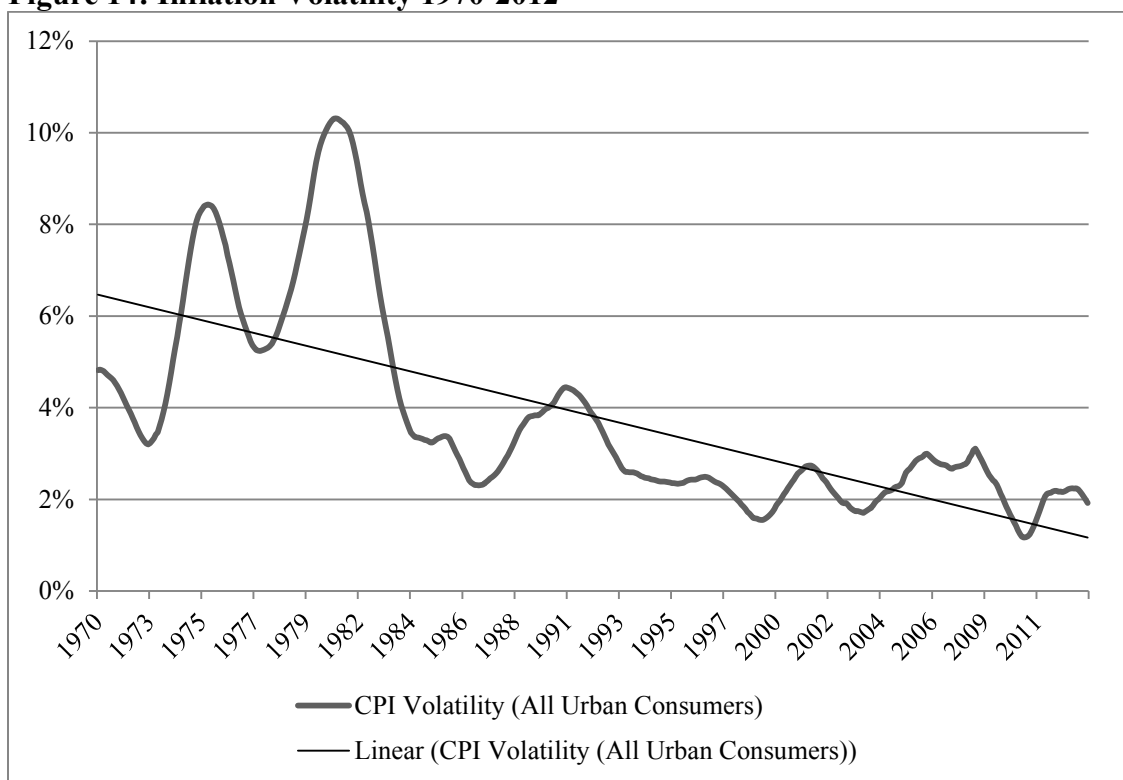


Source: U.S. Bureau of Economic Analysis, author calculations

Figure 13: Unemployment Volatility 1970-2012



Source: U.S. Bureau of Labor Statistics, author calculations

Figure 14: Inflation Volatility 1970-2012

Source: U.S. Bureau of Economic Analysis, author calculations

Economic Conventions and Monetary Policy

Given the causal importance of monetary policy to U.S. housing market outcomes, this chapter now explains the economic conventions that motivated the Fed's pre-crisis monetary policy. These conventions include how Fed technocrats measured inflation in the U.S. economy, the Fed's fears of repeating Japan's historical experience with deflation, and the FOMC's widespread belief in the "Greenspan Doctrine" regarding central bank posture toward potential asset market imbalances.

The Federal Reserve Act of 1913 states that the Federal Reserve is responsible for ensuring three goals: maximum employment, stable prices, and moderate long-term interest rates. Since the great inflation of the 1970s, the Fed has focused on price stability as its main economic target, based on the rationale that stable prices lead to both

sustainable growth and low unemployment. While the “price level” is a straightforward concept, coming up with an appropriate abstraction of the actual price level is subject to the discretion by policy entrepreneurs.¹⁴²

Consider the case of the CPI, which is an inflation metric compiled by the Bureau of Labor Statistics (BLS) that measures the prices of a “representative basket” of goods and services across twenty-three thousand retail stores in eighty-seven municipalities in the United States.¹⁴³ This representative consumption basket includes food and beverages, housing, water and utilities, clothing, transportation, and medical care, among other categories. The BLS weights the different components of the market basket to come up with an index of prices for the entire economy.

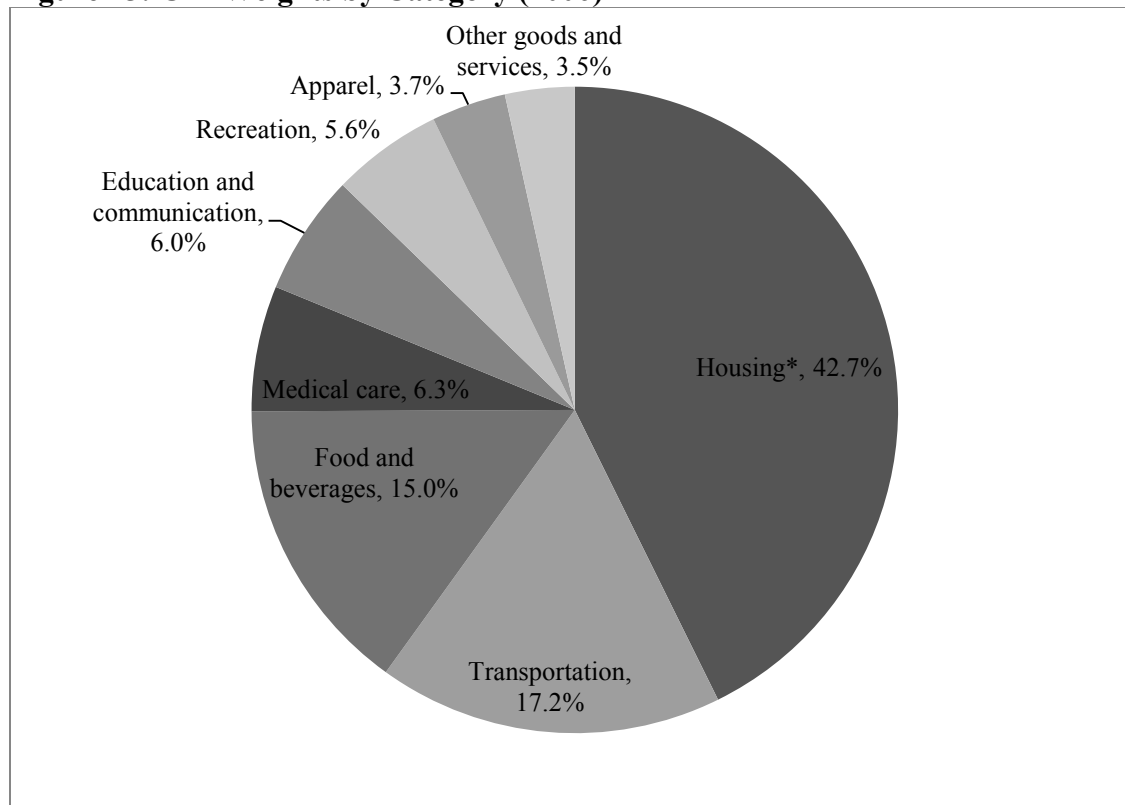
Housing is the biggest component of the CPI, comprising nearly 42% of the consumption basket. The BLS calculates housing inflation based on “owners’ equivalent rent,” which the BLS finds by asking survey respondents the following two questions: for those who own their own homes, the survey asks, “if someone were to rent your home today, how much do you think it would rent for monthly, unfurnished and without utilities?” For those who rent their primary residences, the BLS CPI survey asks, “What is the rental charge to your [household] for this unit including any extra charges for garage and parking facilities? Do not include direct payments by local, state or federal agencies. What period of time does this cover?” Based on these questions, it is evident

¹⁴² According to Yash Mehra and Bansi Sawhney, the FOMC’s preferred inflation measure has evolved over time, with the Fed originally opting for the GDP deflator measure of inflation through 1988, followed by the Consumer Price Index (CPI) through 2000, and thereafter choosing for the personal consumption expenditures (PCE) deflator (with an emphasis on so-called “core” PCE inflation) from 2004 onwards. (Mehra and Sawhney 2010, 123-124)

¹⁴³ (Tainer 2006, 160-188)

that the BLS does not measure housing inflation based on actual housing prices per se, but on changes in actual and imputed housing rent paid by consumers.¹⁴⁴

Figure 15: CPI Weights by Category (2006)



Source: U.S. Bureau of Labor Statistics; *Housing is Owners' Equivalent Rent

The effect of using owners' equivalent rent rather than housing prices in the CPI is as follows: during periods of rising housing prices relative to owners' rent, overall inflation rates as measured by the CPI might understate the prevailing inflation rate facing consumers, given that almost two thirds of all Americans own their own homes. For instance, owners' equivalent rent increased a scant 3.3% in 2002, while housing prices increased 15% over the same period. In 2004, a banner year for homeowners in which prices increased nearly 19%, owners' equivalent rent increased a paltry 2.3%.

¹⁴⁴ (Bureau of Labor Statistics 2009)

Based on original CPI data, the Case-Shiller home price index, and homeownership rates, it is possible to construct counter-factual CPI measure that better accounts for the cost of living facing consumers in the U.S. economy. Doing so shows that if the BLS were to have used a weighted value for housing based on the relative proportion of homeowners to renters (and otherwise holding all other components of the CPI constant in both their weightings and values, see Appendix II), the average annual inflation rate between 2001 and 2005 would have been 7.5%. The original value of the CPI, using only owners' equivalent rent, showed an average annual CPI increase of 2.6% during the same period.

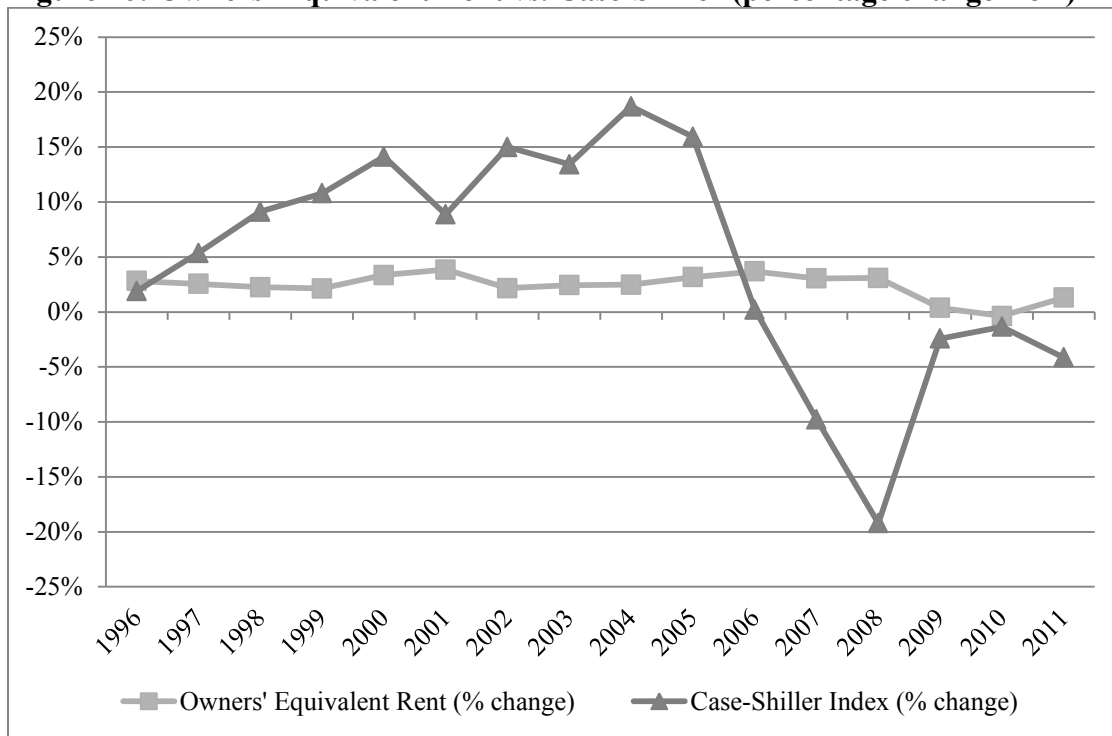
Table 2: Annual Growth Rates in Rent, Housing Prices, CPI, and Modified CPI

	OER (% Δ)	Case- Shiller Index (% Δ)	Home- ownership Rates	Weighted Average Housing Index (% Δ) ¹⁴⁵	CPI (% Δ)	Modified CPI (% Δ)
1996	2.8%	1.9%	65.3%	2.2%	3.0%	2.7%
1997	2.6%	5.4%	65.5%	4.4%	2.3%	3.2%
1998	2.2%	9.1%	66.0%	6.8%	1.6%	3.7%
1999	2.1%	10.8%	66.7%	8.1%	2.2%	5.1%
2000	3.4%	14.1%	67.1%	11.1%	3.4%	7.0%
2001	3.9%	8.9%	67.6%	7.7%	2.8%	4.9%
2002	2.2%	15.0%	67.9%	11.8%	1.6%	6.6%
2003	2.4%	13.4%	68.1%	10.9%	2.3%	6.8%
2004	2.5%	18.7%	68.7%	15.6%	2.7%	9.8%
2005	3.2%	15.9%	69.2%	13.9%	3.4%	9.5%
2006	3.7%	0.2%	68.6%	0.4%	3.2%	1.5%
2007	3.0%	-9.8%	68.5%	-7.5%	2.8%	-3.1%
2008	3.1%	-19.2%	67.9%	-14.9%	3.8%	-6.3%
2009	0.4%	-2.4%	67.4%	-1.9%	-0.4%	-1.1%
2010	-0.4%	-1.3%	67.2%	-1.2%	1.6%	1.1%
2011	1.3%	-4.1%	66.5%	-2.9%	3.2%	0.9%

Source: U.S. Bureau of Labor Statistics, Standard and Poor's, U.S. Census Bureau, Author calculations

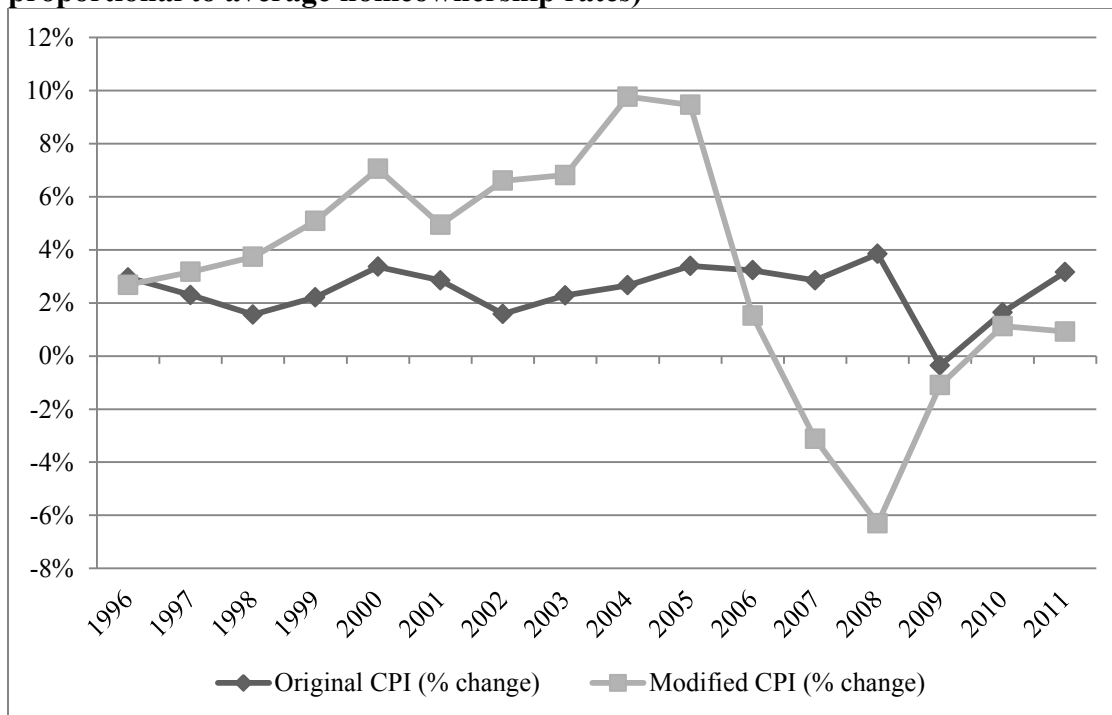
¹⁴⁵ This weighted average was calculated by the following equation: $a*(1-c) + b*c$, where a = owners' equivalent rent, b = Case-Shiller index value, and c = homeownership rates.

Figure 16: Owners' Equivalent Rent vs. Case-Shiller (percentage change YoY)



Source: U.S. Bureau of Labor Statistics, Standard and Poor's

Figure 17: CPI vs. Modified CPI (Case-Shiller and owners' equivalent rent, proportional to average homeownership rates)



Source: U.S. Bureau of Labor Statistics, Standard and Poor's, U.S. Census Bureau

In August 2003, just as the housing bubble took off, meeting minutes reveal that FOMC members believed that “further disinflation was probable over the year ahead,” during which this dissertation’s modified CPI measure increased roughly seven percent.¹⁴⁶ Minutes from the FOMC’s January 2004 meeting show that a majority of FOMC members believed that “disinflation appeared to be the most likely prospect” for the U.S. economy based on their forecasts of inflation based on the CPI. Over the course of 2004, the modified CPI measure increased nearly 10%.¹⁴⁷ Throughout the inflation of the housing bubble, Fed officials affirmed that inflation threats remained subdued based on their inflation metrics, while ignoring evidence of home price inflation based on their inflation statistics.

Rent was also used to represent housing prices in the Fed’s other preferred measure of inflation, the Personal Consumption Expenditure (PCE) deflator. In the 2000s, Chairman Alan Greenspan claimed that the PCE deflator was a better approximation of the “real” inflation rate of the economy because it measures the price change of a variable basket of goods, rather than the CPI, which uses a fixed basket of goods. Note that the PCE deflator is based on the CPI, though the PCE deflator measures housing prices on the basis of “rent of nonfarm owner-occupied homes,” which is similar to owners’ equivalent rent, since it measures inflation on the basis of rent paid and not housing prices. The primary difference between these indicators is that owners’ equivalent rent is derived based on the unobserved opportunity cost of foregone rent in an owner-occupied home in the CPI, while the PCE deflator measures rent based on actual

¹⁴⁶ (Federal Open Market Committee 2003)

¹⁴⁷ (Federal Open Market Committee 2004)

rent paid. In both cases, rent is the primary means of representing housing in the Fed's chosen inflation basket. Therefore, the methodological deficiencies that existed with the CPI are also present in the construction of the PCE deflator.

Many Fed officials also expressed their preference for so-called "core" CPI, which is the CPI less food and energy prices. According to the Federal Reserve Bank of Cleveland, core CPI is a better measure of the price level because food and energy prices can cause "fluctuations in the inflation measure that are not characteristic of the inflation statistic's longer-term trend" value.¹⁴⁸ Core CPI also measures housing inflation based on owners' equivalent rent, so it too is subject to the same blindness as the regular CPI measure.

This counter-factual analysis shows that metric construction could have affected the FOMC's monetary policy. The choice of a specific inflation measure (e.g. between one that includes housing prices and one that includes owners' rent) could cause central banks to make different monetary policy choices *ceteris paribus*, depending on which economic metric they employed, which could influence prices not included in officials' inflation metric. In other words, the monetary policy decision made because of a specific inflation basket affects the total inflation rate of *all* commodities in an economy, not just those in the basket. Based on the above exercise, it follows that if the Fed used an inflation metric that better captured the underlying realities of homeownership in America, the likelihood that the FOMC would have raised interest rates given

¹⁴⁸ (Federal Reserve Bank of Cleveland n.d.) Of course, others claim that the CPI actually *overstates* inflation because it does not take into account substitution that occurs between commodities when relative prices increase (e.g. substituting other paper products when the price of paper towels rises). See: (Reed and Rippy 2012, 2-3)

appreciating home prices would have increased.¹⁴⁹ By choosing to measure inflation based on owners' equivalent rent as opposed to actual home prices, the Fed might have underestimated the cost of living facing consumers and, as a result, kept interest rates too accommodative given prevailing macroeconomic conditions. This is the essence of the two-way relationship between metric construction and market outcomes. In this case, the first-order decision about what to include in an inflation basket has secondary effects on market outcomes, as intermediated by the cognition of central bankers and their short-term interest rate decisions.

A second economic convention that motivated the Federal Reserve's monetary policy was the Fed's fears of the U.S. economy falling into a deflationary spiral, much like Japan did in the 1990s. This dissertation found that from 2002-2004, fears of deflation loomed large in the minds of the Federal Reserve's central bankers. As a result, FOMC members believed that accommodative monetary policy might have been necessary to stave off deflation in the U.S. economy.

To see why the Fed was so concerned about deflation, it is worth discussing some macroeconomic theory. While the Federal Reserve affects nominal short-term interest rates, real interest rates are the primary transmission mechanism between monetary policy and the real economy. Economist Irving Fisher points out that the real interest rate

¹⁴⁹ At least, the probability of the FOMC raising short-term interest rates would have risen, given the overwhelming evidence of housing prices affecting the overall inflation rate. In addition, the point of this exercise is not to indict the Fed with hindsight bias and claim that Fed officials *ought* to have used a consumption basket based on home prices instead of rents. On the contrary, there is considerable debate about where to draw the line with expanded price indices. Should the Fed include stock and bond prices, in addition to housing? Should they target commodity prices? Moreover, if the Fed were to use monetary policy to target one specific sector (e.g. residential real estate), they would run the risk of cooling sectors that might have been growing at sustainable rates, thereby running the risk of toppling the whole economy into recession. The point of this exercise is to show that *how* the Fed chooses to construct its economic metrics has a causal, intervening effect on macroeconomic outcomes in the U.S. economy.

is equal to nominal interest rates less the expected inflation rate. Central banks can lower nominal interest rates to zero percent, though the lowest real interest rate possible (i.e. the most accommodative) is the negative inflation rate. Therefore, if inflation were three percent annually and nominal interest rates were zero, the lower bound of monetary policy would be real interest rates of negative three percent. In theory, negative real interest rates are a powerful disincentive against saving and push consumers and entrepreneurs to borrow and invest, thus spurring real economy activity, though recent history in Japan and post-crisis in the United States might cause economists to rethink this proposition.¹⁵⁰

The Fisher relationship highlights the circumstances under which monetary policy might be ineffective at spurring growth: with deflation (or more formally, negative inflation), real interest rates rise as the price level falls. Left unchecked, the momentum of falling prices can lead to a deflationary spiral wherein rising real interest rates depress consumption and investment, leading to lower aggregate demand, falling prices and further increasing real interest rates, leading to a phenomenon that J.M. Keynes termed a “liquidity trap.” Under these conditions, the momentum of falling prices might render traditional monetary policy ineffective.¹⁵¹

Fears of repeating Japan’s experience with deflation contributed to the Fed’s pre-crisis accommodative monetary policy. According to Ben Bernanke, in 2002, the FOMC worried that the United States might experience deflation, hitting the lower bound of monetary policy and rendering monetary policy ineffective to spurring growth in the U.S. economy. Bernanke claimed that at the time, the consensus opinion of the FOMC was

¹⁵⁰ (Levi and Makin 1978)

¹⁵¹ (Krugman, Dominquez and Rogoff 1998)

that when facing the prospect of deflation, monetary policy should become preemptively accommodative to avoid hitting the lower bound of policy interest rates. Bernanke summarized this consensus of the FOMC as follows:

Taking note of the painful experience of Japan, policymakers worried that the United States might sink into deflation and that, as one consequence, the FOMC's target interest rate might hit its zero bound, limiting the scope for further monetary accommodation. FOMC decisions during [2002-2004] were informed by a *strong consensus* among researchers that, when faced with the risk of hitting the zero lower bound, *policymakers should lower interest rates preemptively, thereby reducing the probability of ultimately being constrained by the lower bound on the policy interest rate.*¹⁵²

In an influential 2002 study, Federal Reserve economists Alan Ahearne, Joseph Gagnon, Jane Haltmaier, and Steve Kamin argued that when on the verge of a deflationary spiral, both fiscal and monetary stimulus “should go beyond the levels conventionally implied by baseline forecasts of future inflation and economic activity.”¹⁵³ As Frederic Mishkin argues, Ahearne et al.'s findings might have influenced the thinking of FOMC members in the early 2000s.¹⁵⁴ FOMC minutes from 2003 reveal that the Fed fixated on the prospect of a Japan-style deflationary trap, which cemented the FOMC's consensus to cut interest rates and keep them low. For instance, at June and December 2003 FOMC meetings, Fed officials repeatedly mentioned the prospect “pernicious” deflation as a reason to keep monetary policy accommodative.¹⁵⁵ Based off these sources, Japan proved a cautionary tale that added incremental justification for the FOMC to keep short-term interest rates low, despite the precipitous increase in real estate prices.

¹⁵² (B. S. Bernanke 2010a). Emphasis added.

¹⁵³ (Ahearne, et al. 2002, 1)

¹⁵⁴ (Mishkin 2011, 20)

¹⁵⁵ (Federal Open Market Committee 2003a) and (Federal Open Market Committee 2003b)

A third convention that motivated the FOMC's interest rate policy was the belief, professed by Chairman Alan Greenspan and shared by fellow members of the FOMC, that it was better for central banks to allow asset price bubbles to run their course and deflate on their own momentum rather than to use monetary policy to pop bubbles preemptively. This view, known as the "Greenspan Doctrine" explains why the FOMC was reluctant to raise interest rates when faced with *prima facie* evidence of a housing bubble.

In general, there are two schools of thought regarding central bank posture toward potential asset market imbalances: the first view holds that monetary policy should *lean* against an inflating asset price bubble by raising interest rates and popping the bubble before it grows too large.¹⁵⁶ The second view, as articulated by Fed Chairman Alan Greenspan, holds that it is easier to *clean* up after a bubble bursts rather than to lean against its inflation. This view rests on the assumption that the costs for leaning against a bubble with monetary policy are high, whereas the costs of cleaning up a bubble are low.¹⁵⁷ The Greenspan Doctrine traces its roots to a 2002 speech given by Chairman Greenspan at the Jackson Hole conference of central bankers in which he claimed that "it was very difficult to identify a bubble until after the fact – that is, when bursting confirmed its existence" and that "it was far from obvious that bubbles, even if identified early, could be pre-empted short of the central bank inducing a substantial contraction in

¹⁵⁶ See, for example: (Roubini 2006)

¹⁵⁷ (Mishkin 2011, 17-21); for an example of a piece that staunchly urges central banks to *refrain* from popping bubbles, see: (Posen 2006); Post-crisis, William White argues that it is better for central banks to only lean against bubbles backed by *unsustainable credit expansions* (W. R. White 2009)

economic activity – the very outcome [monetary authorities] would be seeking to avoid.”¹⁵⁸

The Greenspan Doctrine rested on four pillars. First, central bankers faced an “identification problem” of discerning the difference between a bubble and a secular shift in equilibrium market prices. Deflating a bubble using monetary policy implies that the Fed had an information advantage over private markets. According to the rational expectations and efficient markets hypothesis, if there were a bubble, financial market participants would make trades to restore equilibrium to the market. Why should the Fed’s economists, many of whom were strong adherents to neoclassical financial economics, believe that they had a unique advantage in identifying bubbles when compared with private actors? Second, proponents of the Greenspan Doctrine did not believe that raising interest rates could pop bubbles, since market participants already expected high returns from buying bubble-inflated securities, such that different monetary policy would do little to alter agents’ bubble-level optimism. If an investor expects double-digit returns from the bubble asset class, would a marginally higher policy interest rate really deter bubble speculation? Third, the Greenspan Doctrine held that monetary policy was too blunt of a tool to target asset prices and that the spillover effects of trying to target a narrow asset class using broad-based monetary aggregates diminished the net benefit of popping a bubble in the first place. After all, monetary aggregates affect all prices, not just certain asset classes. Fourth, Fed officials believed that attempting to pop a bubble could cause the bubble to burst more severely than had it just run its own course, thus violating the central bankers’ Hippocratic Oath to the

¹⁵⁸ (Greenspan 2002)

economy. If private markets are prepared for a looming bubble deflation, then fickle monetary policy could make things worse.¹⁵⁹

Regardless of the merits of these arguments (and the author believes that they might bear reconsideration after the global financial crisis), according to Frederic Mishkin, they were popular among senior FOMC central bankers in the mid-2000s. As Mishkin concludes, the Greenspan Doctrine “held great sway in the central banking world before the crisis” and was “strongly supported by Federal Reserve officials” prior to the global financial crisis.¹⁶⁰

Discussion

What does all this mean for this dissertation’s conventions-based theoretical framework put forth in Chapter 2?

The first issue is identifying whether the Fed’s inflation metrics, fears of deflation, and the “Greenspan Doctrine” qualify as economic conventions. Recall that according to J.M. Keynes, economic conventions can take three forms: the past as a guide to the future (i.e. ergodicity), expert opinion, and conventional expectations.¹⁶¹ The Fed’s inflation metrics qualify as economic conventions, as it would be impossible for the Fed to make interest rate decisions without first rendering an *expert opinion* or judgment on how best to measure the price level. There is nothing structurally preordained about using rent instead of housing prices in a preferred inflation metric. Rather, central bankers must make an authoritative judgment about what constitutes the price level and what does not,

¹⁵⁹ (Mishkin 2011, 18-19)

¹⁶⁰ (Mishkin 2011, 20)

¹⁶¹ (Keynes 1937a, 214)

which in turn serves as a basis of knowledge for their decisions when faced with uncertainty about how to operationalize abstract notions like the “price level.”

The second convention studied by this chapter, the FOMC’s fears of repeating Japan’s historical experience with deflation, qualifies as an economic convention, since the recency and poignancy of Japan’s monetary policy history loomed large in the minds of FOMC members. As Keynes argued, the chief tendency of agents when faced with uncertainty is to assume that the “future will resemble the past.”¹⁶² Much as Keynes would have argued, FOMC members considered information in idiosyncratic and historically contingent ways. Had the FOMC adopted a broader appraisal of Japan and other advanced-industrial states’ monetary policy, they might have viewed accommodative monetary policy as a precursor to financial fragility and economic stagnation, as the Japan case makes all too clear. With hindsight, the FOMC might have “extrapolated too mechanically” from the Japanese case, as Barry Eichengreen put it, and their decision to keep short-term interest rates low to stave off deflation might have sowed the seeds for “an even greater boom and bust down the road.”¹⁶³ Indeed, ‘mechanical extrapolation’ is a *sine qua non* of conventional judgment in the economy. The tendency of FOMC officials to extrapolate linearly from Japan’s historical case illustrates how Federal Reserve technocrats are subject to the same types of conventional biases as market participants. The FOMC’s fixation on avoiding Japan’s past errors caused the Fed to adopt a monetary policy posture that paradoxically produced the economic malaise their policies were intended to avoid.

¹⁶² (Keynes 1937b, 13)

¹⁶³ (Eichengreen 2011, 111)

The third monetary policy rationale studied above, the Greenspan Doctrine, qualifies as a convention of *expert opinion*, since Chairman Greenspan occupied a privileged position within the FOMC, and could thus set the discursive boundaries of appropriate policy among other voting FOMC members. The Greenspan Doctrine also reflected Chairman Greenspan's tendency to adopt conventions of expert opinion, since one of the pillars of the Greenspan Doctrine was that the Fed did not maintain an informational advantage over private markets in identifying bubbles *a priori* their deflation. When defending the Greenspan Doctrine, Greenspan argued that it was difficult for central banks to identify nascent bubbles, invoking information uncertainty as a key reason for his Doctrine:

If equity premiums were redefined to include both the unrealistic part of profit projections and the unsustainably low segment of discount factors, and if we had associated measures of these concepts, we could employ this measure to infer emerging bubbles. That is, if we could substitute realistic projections of earnings and dividend growth, perhaps based on structural productivity growth and the behavior of the payout ratio, the residual equity premium might afford some evidence of a developing bubble. *Of course, if the central bank had access to this information, so would private agents, rendering the development of bubbles highly unlikely.*¹⁶⁴

Implicit in Greenspan's defense of the Greenspan Doctrine is his tendency to defer to the collective judgment of informationally efficient private markets, exhibiting the natural tendency of economic agents to "assume that the *existing* state of opinion as expressed in prices...is based on a *correct* summing up of future prospects," as Keynes put it.¹⁶⁵ So not only was the Greenspan Doctrine a convention of expert opinion that guided the

¹⁶⁴ (Greenspan 2002)

¹⁶⁵ (Keynes 1937a, 214). Emphasis in original.

FOMC's behavior, but it was also based on the conventional premise of expert opinion regarding the information efficiency of the market.

Based on the evidence, is it possible to conclude that the Fed's economic conventions motivated FOMC decision-making in the early 2000s? There is no way to know for sure. The evidence marshaled by this dissertation includes speeches by senior central bankers, FOMC meeting minutes, and secondary accounts of the Fed's governing ideas in the mid-2000s. This chapter also presented the results of a counter-factual analysis that showed how metric construction could influence the market's perceived "prevailing" inflation rate. Underpinning this chapter's evidentiary standard was an assumption that the FOMC practiced good faith in preparing their meeting minutes and that secondary source material accurately depicted the prevailing views of key FOMC decision-makers *ex-ante* the global financial crisis. While it is hard to say that conventions *caused* the FOMC's monetary policy *per se*,¹⁶⁶ it is equally difficult to account for the fact that had it not been for economic conventions, something else had to have driven the FOMC's decisions. Was it caprice, randomness, or some under-reported cause for which their stated conventions served as public justifications? We cannot know for certain. What we do know is that that conventions suffice as the most probable explanation for the Fed's interest rate decisions, and that different economic conventions would have raised the probability of the Fed making different monetary policy choices, *ceteris paribus*. If headline inflation were 7%, as opposed to more benign level of 2-3%, if Japan had not experienced deflation, and if the Greenspan Doctrine advocated for central bank hawkishness in the face of potential asset market imbalances rather than

¹⁶⁶ After all, ideas cannot act, the most they can do is motivate individuals to action.

ambivalence, the Fed would have been more likely to raise short-term interest rates when faced with rapidly appreciating housing prices.¹⁶⁷

That said, the Federal Reserve does not deserve mono-causal blame for inflating the housing bubble and causing the global financial crisis. After all, the Fed only controls short-run interest rates, so even if the Federal Reserve wanted to raise interest rates to pop the housing bubble, it is unclear whether they had the means of influencing long-term interest rates to do so.¹⁶⁸ Also, it would be a stretch to hold the Fed responsible for the systematic dismantling of America's Depression and Bretton Woods-era regulatory apparatus, most of which stemmed from legislation by the U.S. Congress and other bodies over which the Federal Reserve had no regulatory jurisdiction.¹⁶⁹ The FOMC did not control the lending activity of America's Government-Sponsored Enterprises (GSEs), Fannie Mae and Freddie Mac – Chairman Greenspan himself testified to Congress about the potential consequences of the GSEs' populist credit expansion.¹⁷⁰ The Fed did not

¹⁶⁷ (Mehra and Sawhney 2010), (W. R. White 2009), and (Mishkin 2011)

¹⁶⁸ (Wu 2008) Federal Reserve economist Tao Wu identified that long-term interest rates might have decoupled from short-term rates in the years preceding the global financial crisis, so if the Fed had raised the Federal Funds target to cool the housing bubble, this might not have achieved its intended result. Worse, pre-emptively raising interest rates prior to the housing bubble bursting runs the risk of causing the rest of the economy, which might be operating at or below potential, to contract as well, essentially causing an “elective” economic recession. Wu identified four factors that might have accounted for this conundrum: higher foreign official purchases of long-term U.S. Treasury debt, higher demand from pension funds, decreases in macroeconomic uncertainty, and lower asset market volatility.

¹⁶⁹ (Kohn 2008) In a speech during the crisis, Federal Reserve Vice Chairman Donald Kohn openly questioned whether the Fed could have reversed the “complacency” of excessive risk taking in the housing market and among financial institutions, thus averting the crisis. He answered his rhetorical question thusly: “Would a somewhat tighter stance of policy in recent years have reversed this complacency? It seems doubtful. Central banks would likely have needed to produce recessions of some consequence in order to force agents to reevaluate the costs of taking on risk--an outcome unlikely to improve societal welfare. Rather than using the blunt tool of monetary policy to induce prudence, we should examine more closely the possibility of using regulation and prudential supervision to address concerns about overleveraging and other risk-taking behavior.” That said, many top Fed officials, including Greenspan himself, were proponents of financial sector deregulation, to the point where Greenspan felt it necessary to recant his prior support for deregulation after the global financial crisis. For more, see: (Andrews 2008)

¹⁷⁰ (Greenspan 2005)

render unrealistically favorable credit ratings on risky ABS, nor does America's central bank control foreign savings and investment decisions, which might have also contributed to lower long-term interest rates. Therefore, even if monetary policy did influence the housing market, it would be a stretch to pin mono-causal blame for the bubble and crisis on the Fed.

Yet the Fed is not free from blame, insofar as it had non-material recourse to contain the housing bubble. Since the Fed is viewed as an authoritative actor in financial markets, it could have engaged in so-called "open-mouth operations" to convince markets that it would stand ready to pop the housing bubble should prices continue to trend above equilibrium.¹⁷¹ Such a pronouncement could have changed the market's expectations about future housing price increases, thus dampening the amplitude of the housing bubble regardless of short-term interest rates. Alan Greenspan also championed financial market deregulation for much of his career, reversing his position after the global financial crisis struck and a majority of the damage had been done.¹⁷² Moreover, the Fed did have some regulatory jurisdiction over financial institutions, ignoring their heightened leverage and risk-taking prior to the crisis.

That said, a central bank is only as good as its mandate. The Fed was not legally tasked to prick bubbles. Rather, the Fed's reluctance to use monetary policy to pop the housing bubble was not an issue of their mandate per se, but instead related to how Fed technocrats came to interpret their mandate from a *conventional* perspective. In hindsight, it is easy to re-assess these conventions and deem them foolish, but America's central

¹⁷¹ (Mishkin 2011b, 61)

¹⁷² (Andrews 2008)

bankers were simply victims of the frailty of human cognizance given fundamental uncertainty about the future. The conventions employed by Fed technocrats helped them make sense of these novel features of the global economy in the face of uncertainty, providing decision-making anchors for the FOMC while also sowing the seeds of their own invalidity down the road when the global financial crisis struck.

Conclusion

Many scholars argue that Federal Reserve's monetary policy contributed to the increase in housing prices and credit boom that culminated in the global financial crisis. According their version of events, in response to the deflation of the technology stock bubble and September 11 terrorist attacks, the Federal Reserve's interest rate-setting body, the Federal Open Market Committee (FOMC), expanded the money supply and kept interest rates "too low for too long," causing a surge in demand for real estate assets and boom in housing prices. When housing prices fell, the Fed had no choice but to bail out an insolvent financial system that its monetary policy helped to create.¹⁷³ While debate over the Fed's responsibility for the global financial crisis is of tremendous academic and policy importance, it is not this dissertation's primary focus.¹⁷⁴

¹⁷³ (Gjerstad and Smith 2011, 114-115)

¹⁷⁴ (Tempelman 2010) The notion that central banks bear responsibility for inflating asset price bubbles traces its roots to the economic theory of Ludwig Von Mises and Friedrich Von Hayek. According to these Austrian school economists, when central banks set interest rates artificially low, entrepreneurs misread market signals and expand the capital supply based off of a flawed cost-benefit analysis, which induces a temporary economic expansion that causes to oversupply of capital goods relative to the needs of society. Eventually, the boom runs out of momentum and capital prices fall. Financial intermediaries, having extended credit based off of inflated collateral values, are left holding large portfolios of devalued assets, leading to their insolvency. This Austrian narrative of the crisis has intuitive appeal and seems to describe the U.S. economy in the years prior to the global financial crisis. For instance, anti-Fed U.S. Congressman Ron Paul is a self-avowed adherent to the Austrian school of economics, and routinely cites Von Mises and Hayek in his missives about the Fed's lack of monetary rectitude. For more, see: (Paul 2011). That said, not all economists accept the Austrian depiction of the Fed as the primary driver of the housing bubble and ensuing crisis. Defenders of the Fed's monetary policy, including former Federal Reserve Chairmen Alan

Rather than joining the chorus of scholars seeking to impugn or exonerate the Fed for its pre-crisis monetary policy, this dissertation uses the Federal Reserve as a case study of the political power of economic ideas, and shows how several economic conventions held by the Fed's senior central bankers determined the Fed's accommodative monetary policy during the mid-2000s. This chapter finds that if Fed technocrats employed different economic conventions in the mid-2000s, the U.S. economy could have averted the precipitous rise in housing prices that took place from 2001-2006.

Still, as Hyman Minsky notes, asset price bubbles are necessary but insufficient conditions for systemic financial crises. To understand why the U.S. economy experienced an acute banking panic when the housing bubble burst, it is necessary to investigate the sources of fragility that pervaded financial markets prior to the global financial crisis. Chapter 4 picks up where this chapter leaves off, describing how the Fed's monetary policy caused the U.S. Treasury interest rate term structure to become upward sloping, thus creating incentives for firms to engage in *term structure arbitrage* and adopt speculative financing structures prior to the global financial crisis. The chapter describes the rise of shadow banking, in which wholesale depositors make loans to securitized borrowers via ABCP and repo conduits sponsored by systemically important financial institutions. It argues that shadow banking is best understood as a socially

Greenspan and Ben Bernanke, claim that the crisis was the result of financial market deregulation and low long-term interest rates, rather than the Federal Reserve's monetary policy. Greenspan went so far as to claim that the Fed had little influence over long-term interest rates in the U.S. economy, identifying this decoupling as a "conundrum" for monetary policy. Not everyone agrees with Greenspan's exculpatory view. Stanford University economist John Taylor found empirical evidence that if the Fed raised interest rates more aggressively in the mid-2000s, housing prices would not have inflated as precipitously as they did. Had the Fed followed a more predictable, "rules based" approach to interest rates in the mid-2000s, the U.S. economy could have averted an unsustainable increase in housing prices. For more, see: (B. S. Bernanke 2010a), (Thornton 2012), and (Taylor 2007).

contingent process, dependent on three types of economic conventions, including pro-cyclical conventional expectations among shadow banking counterparties, institutionalized conventions of expert opinion vis-à-vis bond ratings, and banks' risk management technologies based on assumptions of perpetual asset price ergodicity. The institutionalization of these economic conventions into banks and regulators' risk management regime sowed financial fragility *ex-ante* the global financial crisis, such that different economic conventions might have caused different outcomes in the U.S. financial system, *ceteris paribus*.

CHAPTER 4:
THE RISE OF FRAGILE FINANCE

Introduction

Having described the economic conventions behind the Fed’s accommodative monetary policy in Chapter 3, this chapter discusses the rise of America’s fragile financial system from 2001-2006 that emerged in tandem with the U.S. housing bubble. It describes the mechanics of shadow banking, or off-balance-sheet financial intermediation, in which wholesale “depositors” made loans to securitized “borrowers” via asset-backed commercial paper (ABCP) and repurchase agreement (repo) conduits. It builds on the work of Gary Gorton, Andrew Metrick, Viral Acharya, Matthew Richardson, Eric Helleiner, Tobias Adrian, and Hyun Song Shin, among others, who argue that shadow banking was analogous to traditional banking.¹⁷⁵

This dissertation argues that at its core, the global financial crisis can be conceptualized as a generalized banking panic in wholesale funding markets, triggered by a fall in home prices and accelerated by the simultaneous failure of investment bank Lehman Brothers and insurance giant AIG. On the eve of the crisis, America and Europe’s financial institutions stood at the crossroads of a global banking system that fell largely outside of the legal and regulatory domain of traditional banking authorities but still allocated credit across the global economy. Within this shadow banking system, financial institutions took advantage of favorable financing conditions in wholesale funding markets, using their proceeds of short-term ABCP and repo borrowing to purchase longer-dated (and higher yielding) securitized assets. Going into 2008,

¹⁷⁵ (Gorton and Metrick 2010b), (Acharya and Richardson 2011), (Helleiner 2011), (Adrian and Shin 2009), and (Shin 2012). A key difference between shadow banking and traditional banking, however, was that shadow banking lacked government-sponsored deposit insurance, and was thus susceptible to bank runs and contagion effects once collateral prices fell. Shadow banking structures depended on continued access to fresh capital to maintain their liquidity and solvency, and thus qualified as speculative finance per Minsky’s taxonomy of finance. See: (Minsky 1992, 7-8) and (Minsky 2008, 230-235).

America's banks were over-reliant on short-term financing and under-capitalized relative to the risk in their loan portfolios, such that the simultaneous failure of Lehman Brothers and bailout of insurance giant American International Group (AIG) tipped a fragile financial system into a full-blown bank run on all wholesale funding markets and shadow banking conduits.

This chapter explains how financial institutions ended up presiding over an unsecured, under-regulated, and under-capitalized shadow banking system prior to the global financial crisis, and how economic conventions fundamentally drove this process. These conventions include pro-cyclical conventional expectations about the solvency of shadow banking conduits by ABCP and repo counterparties, institutionalized expert opinions via bond ratings for measuring the credit risk of ABS, and banks' risk management technologies based on assumptions of ergodicity that made banks vulnerable to so-called "tail risks" in their loan portfolios.

Shadow Banking as Fragile Finance

Why was the global financial system vulnerable to disruptions in the supply of wholesale funding credit when housing prices fell starting in 2007? After all, asset price bubbles occur with a reliable degree of regularity in market economies, but they do not always cause systemic banking crises. As Hyman Minsky argues, asset market imbalances are necessary but insufficient conditions for systemic crises. The presence of financial fragility, coupled with a deflating asset price bubble, explains why some bubbles produce systemic crises while others deflate benignly. So to understand the U.S. economy's proneness to systemic crisis in 2007, it is necessary to investigate the sources of financial fragility that emerged in tandem with the inflating housing bubble from

2001-2007. Two developments in particular, including securitization and banks' reliance on wholesale funding, explain the U.S. economy's vulnerability to systemic financial collapse on the eve of the global financial crisis.¹⁷⁶

Securitization is the process by which banks pool loans to resell them as a tradable security to a third party. The buyer of a securitized asset (or asset-backed security, (ABS)) receives the cash flows generated by the loans comprising the original asset pool, though they also bear both the interest and credit risk associated with the underlying collateral.¹⁷⁷ Although securitization was invented in the late 1960s, it took off in the mid-2000s, with financial institutions pooling and securitizing a wide array of different loans into tradable securities, including mortgages, credit card receivables, student loans, health club account receivables, auto leases, and movie ticket receipts, among other asset classes. From 2002 through 2006, the total market of securitized loans rose from roughly \$2 trillion to \$5 trillion.¹⁷⁸

In theory, securitization lowered the barriers to "Pareto optimal" credit transactions in the global financial system.¹⁷⁹ Before the crisis, analysts assumed that securitization would spread out the risks associated with a specific asset class to investors across the global economy, matching borrowers with different risk profiles to lenders

¹⁷⁶ (Adrian and Shin 2009)

¹⁷⁷ (Helleiner 2011, 70-71)

¹⁷⁸ (Gorton 2010, 22 and 39)

¹⁷⁹ (Helleiner 2011, 70-72). The main exception to this was the securitized debt insured and sponsored by America's Government-Sponsored Enterprises, Fannie Mae and Freddie Mac, which carried full credit guarantees (which themselves were implicitly and, after the financial crisis, explicitly backed by the U.S. government). Holders of so-called Agency-backed MBS were exposed to prepayment risk associated with changing mortgage interest rates.

with commensurate risk appetites.¹⁸⁰ In practice, rather than serving as financial intermediaries in the securitization chain, financial institutions ended up becoming the primary investors in ABS. As Viral Acharya and Matthew Richardson find, securitization *concentrated* the risk associated with ABS on banks' balance sheets, rather than dispersing it among investors.¹⁸¹

Why did this happen, especially if the benefit of securitization was to move loans off the balance sheets of financial institutions? As it turns out, prior to the global financial crisis, banks borrowed in the short-term wholesale funding markets via asset-backed commercial paper (ABCP) and repurchase agreements (repo) to fund their purchases of ABS. The difference between the cost of borrowing in short-term wholesale funding markets and lending via long-term ABS created an incentive for banks to engage in *term structure arbitrage*, capturing rents from the upward-sloping yield curve.¹⁸²

ABCP is a form of collateralized debt issued for short durations (usually less than ninety days). By 2007, U.S. and European commercial banks sponsored some \$900 billion worth of asset-backed commercial paper conduits with full credit guarantees.¹⁸³

¹⁸⁰ See, for example, Alan Greenspan's defense of derivatives comports with his vision of financial sophistication begetting stability. A choice quotation: "the history of the development of [derivatives] *encourages confidence* that many of the newer products will be *successfully embraced* by the markets." (Greenspan 2005). Emphasis added.

¹⁸¹ (Acharya and Richardson 2011, 188)

¹⁸² (Gorton and Metrick 2010), (Gorton and Metrick 2010b), (Gorton 2010), (Acharya and Richardson 2011), and (Blyth 2013a).

¹⁸³ (Acharya, Schnabl and Suarez 2013) In addition to issuing ABCP, many financial institutions ended up insuring ABCP and repo conduits via liquidity puts. For instance, the Financial Crisis Inquiry Commission finds that commercial banks like Citigroup issued *liquidity puts* that provided guarantees to mitigate the liquidity risk facing ABCP investors, which subsequently caused the credit rating agencies to issue favorable ratings on the ABCP backing risky ABS. As the FCIC finds, banks like Citigroup "did not have to hold any capital against such contingencies. Rather, [they were] permitted to use [their] own risk models to determine the appropriate capital charge." Their report goes on to discuss how Citigroup vastly underestimated the possibility that their liquidity puts would be triggered, thus leading to their

Repo is a form of collateralized borrowing in which a bank sells an asset that it agrees to purchase at a future date at a pre-determined price. The percentage difference between the future price paid and present price received is the functional equivalent of an interest rate on a bank deposit.¹⁸⁴ The greater the difference between the future and present price on a repo transaction, the higher the repo interest rate. The discount to face value of repo is known as a ‘haircut’, and the greater the repo haircut facing a bank (i.e. the deeper the discount of the present value relative to the repurchase price of a repo transaction), the more expensive it is for banks to borrow in repo markets.¹⁸⁵

Because ABCP and repo transactions were short-term and collateralized (such that in the worst case scenario, a repo counterparty could seize the underlying collateral and sell it in the open market in case of default) repo interest rates tended to be several percentage points lower than the yields on ABS. Thus, ABCP and repo were attractive sources of financing available to financial institutions as long as they posted high quality collateral.

Many authors, such as Gary Gorton, Mark Blyth, and the Financial Crisis Inquiry Commission, believe that shadow banking *was* banking, and can be conceptualized analogously to traditional banking.¹⁸⁶ In shadow banking, “depositors” are the many money market mutual funds, institutional investors, and other asset-backed commercial paper and repurchase agreement counterparties that “lend” to financial institutions, which

undercapitalization when the ABCP market seized after Lehman Brothers. For more, see: (The Financial Crisis Inquiry Commission 2011, 137-138) and (Kacperczyk and Schnabl 2010, 33)

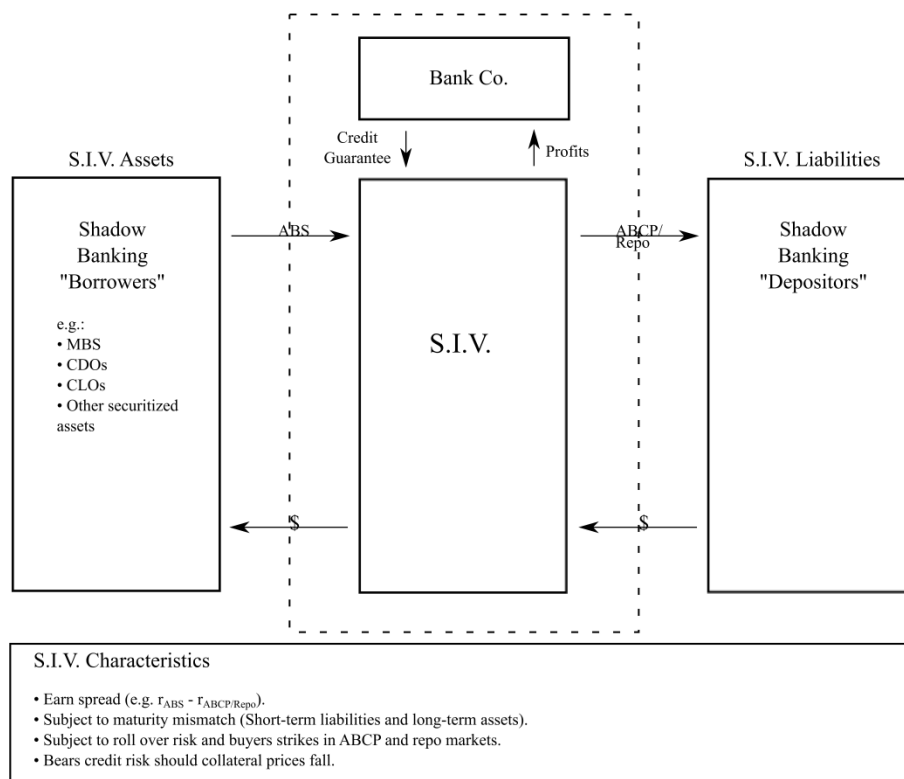
¹⁸⁴ $([FP - PP]/PP)$, or the difference between the price the repo counterparty *receives in the future* (FP) for purchasing an asset at its *present price* (PP).

¹⁸⁵ (Gorton and Metrick 2010, 263-264)

¹⁸⁶ See, for example: (Gorton 2010), (Blyth 2013a, 23-24), and (The Financial Crisis Inquiry Commission 2011, 29-34)

in turn “make loans” to different borrowers via ABS. Unlike in traditional banking, however, where banks kept minimum reserves and depositors had deposit insurance to protect their assets, shadow banking had repo haircuts and collateral to protect counterparties from losses. A visualization of this relationship is presented below. Note that in this case, shadow banking “depositors” purchase ABCP and repo obligations from the S.I.V., which in turn uses its proceeds to purchase ABS. The ultimate bank sponsor (i.e. “Bank Co.”) provides credit guarantees to the S.I.V. and gains profits from the S.I.V.’s term structure arbitrage.¹⁸⁷

Figure 18: A Visualization of Off-Balance Sheet Financial Intermediation



Thus is the answer to the original question about how banks accumulated such large ABS exposures prior to the global financial crisis. Financial institutions sponsored

¹⁸⁷ (Gorton and Metrick 2010) and (Gorton and Metrick 2010b).

structured investment vehicles (SIVs) that borrowed in wholesale funding markets to invest in ABS.¹⁸⁸ Because markets and regulators assumed that SIVs invested in high quality collateral sponsored by ostensibly creditworthy financial institutions, SIV collateral tended to command the highest ratings from America's credit rating agencies. Favorable bond ratings enabled conservative investment funds, such as money market mutual funds, to invest in SIV-sponsored ABCP and repo.¹⁸⁹ ABCP and repo also enabled financial institutions to hypothecate and re-hypothecate their risky collateral and increase their leverage to accumulate large exposures to the real estate market during the housing boom. For instance, banks could use risky ABS to raise funds in the repo market and then reinvest their funds to accumulate more assets. By tapping short-term debt markets via ABCP and repo, financial institutions could borrow at near-LIBOR interest rates and then invest their proceeds into higher yielding (but more risky) assets.¹⁹⁰ Repo allowed broker-dealers to run leverage ratios thirty to forty times their equity, making them vulnerable to minor changes in the face value of their collateral when housing prices fell.¹⁹¹ As such, leverage was a double-edged sword: it increased banks' profits during the boom years, but was a point of vulnerability during the bust.

As long as investors were willing to "roll over" banks' ABCP and repo debt, however, SIVs remained liquid. If ABCP and repo investors feared for the solvency of a SIV-sponsoring financial institution, or grew dubious of the collateral quality underlying

¹⁸⁸ (M. K. Brunnermeier 2009, 79-80)

¹⁸⁹ (Johnson and Kwak 2010, 73-85)

¹⁹⁰ (Gorton and Metrick 2010, 278-280)

¹⁹¹ (Blyth 2013a, 25-26) Indeed, when real estate prices fell and collateral prices collapse, banks found it difficult to raise liquidity in theretofore-buoyant repo markets, leading them to sell assets *en masse*, as described in the following chapter.

their ABCP and repo transaction, they could refuse to roll over the SIVs debt, leading to liquidity issues for financial institutions.¹⁹² Kacperczyk and Schnabl describe this risk as follows:

Most investors in the commercial paper market purchase the paper at issuance and hold it until maturity. Hence, there is little trading of commercial paper in secondary markets. Instead, many investors continuously roll over maturing commercial paper, which means that they purchase newly issued commercial paper from the same issuer once their holdings of commercial paper mature. As a result, issuers usually refinance the repayment of maturing commercial paper with newly issued commercial paper. This risk is often called roll-over or liquidity risk. In this case, the issuer needs to find financing elsewhere to repay maturing commercial paper.¹⁹³

Indeed, counterparties' refusal to roll over banks' ABCP and repo was a key transmission mechanism of instability between falling collateral prices and liquidity issues for financial institutions during the crisis. That said, this risk seemed remote before the crisis. Broker-dealers and commercial banks regularly issued and rolled over ABCP and repo to purchase long-dated ABS, earning the spread differential between their low cost of financing and higher returns from securitized assets.

Why did ABCP and repo borrowing take off prior to the global financial crisis, and how did banks' increased reliance on ABCP and repo borrowing qualify as *speculative* finance, in the Minsky sense?

Hyman Minsky believed that firms could choose among three types of financing structures, the relative mix of which determined an economy's proneness to crisis. These financing arrangements include hedge, speculative, and Ponzi structures. Hedge finance units have income sufficient to cover both the interest and principal of their liabilities.

¹⁹² (Gorton 2010, 13-15)

¹⁹³ (Kacperczyk and Schnabl 2010, 31). Emphasis added.

Speculative units have operating income that covers interest and principal payments, but must rely on continued access to fresh capital to refinance maturing obligations. Ponzi finance units have insufficient operating income to cover both interest and principal, so they must use balance sheet cash or sell assets to meet their debt burden.

If an economy is comprised of hedge financing units, it will be “an equilibrium seeking and containing system.” The greater the proportion of speculative and Ponzi financing arrangements relative to hedge finance, however, the more likely an economy will be a “deviation amplifying system,” or one prone to asset market imbalances and fragility. Thus the first theorem of Minsky’s financial instability hypothesis: some financing regimes are more stable than others.¹⁹⁴ Minsky believed that economies predominated by hedge financing structures are more robust to instability compared to speculative and Ponzi structures, since hedge finance units were “vulnerable only to cost escalation or to revenue declines,” as their “balance-sheet payment commitments will not be directly affected by developments in financial markets.” Conversely, speculative and Ponzi financing arrangements are vulnerable to adverse financial market developments, such as credit downgrades, rising interest rates, and flagging investor confidence.¹⁹⁵

Hyman Minsky argued that within a robust financial system and given an upward-sloping interest rate term structure, firms had an incentive to issue short-term debt to capture rents associated with the yield differential between short-term and long-term interest rates. For this reason, economies with upward-sloping yield curves created

¹⁹⁴ (Minsky 1992, 7-8)

¹⁹⁵ (Minsky 2008, 232). Emphasis added. In other words, hedge finance units are only vulnerable to product market disruptions, whereas speculative and Ponzi finance units are vulnerable to both product market and financial market disruptions.

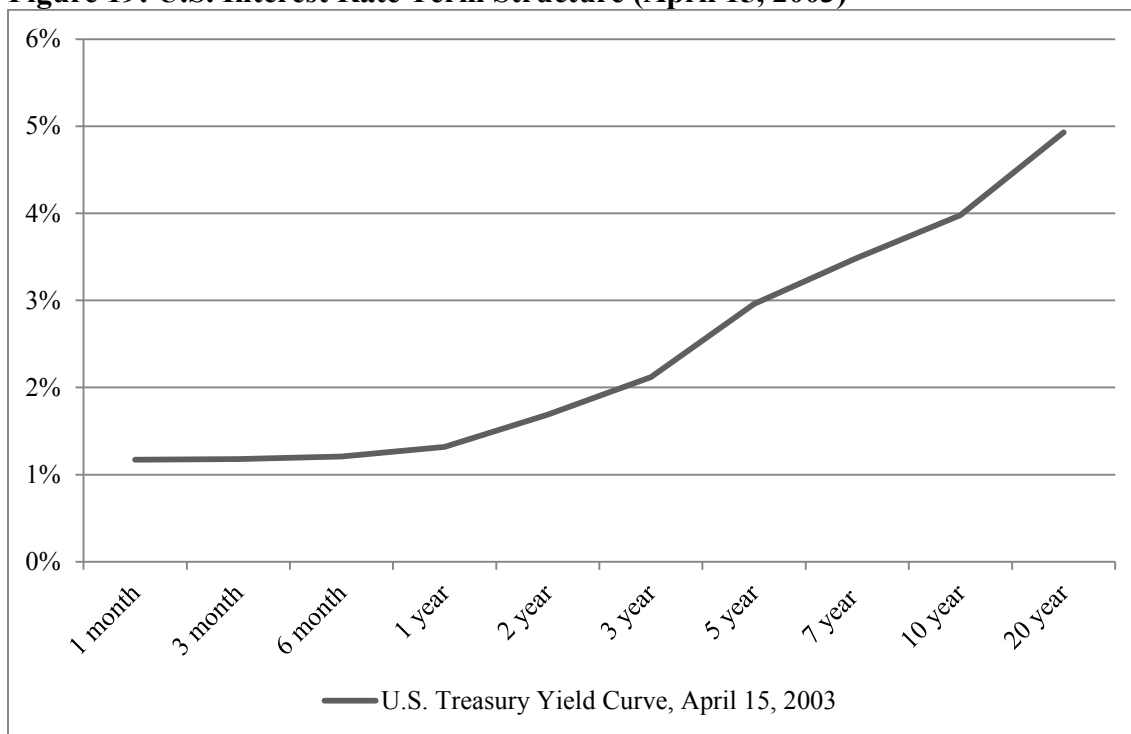
endogenous incentives for financial institutions to accumulate risky assets. As Minsky describes:

In a world dominated by hedge finance and in which little value is placed on liquidity because it is so plentiful, the interest rate structure yields profit opportunities in financing positions in capital assets by using short-term liquid liabilities. . . . In addition, the interest rate on short-term money-like liabilities of firms and financial institutions will be lower than on the longer-term liabilities used in hedge-financing positions in capital assets. There are profit prospects that induce units to engage in *speculative* finance. With such a rate pattern, one can make on the carry by financing positions in capital assets by long- and short-term debts, and positions in long-term financial assets by short-term, presumably liquid, debts. Hence a double set of profit opportunities exists. . . . The existence of a wide spectrum of financial instruments by which bankers can raise money means that bankers are able to finance capital-asset holdings and investment whenever the structure of asset prices and interest rates makes it profitable to do so. In a world dominated by hedge finance, profit opportunities exist for both borrowing units and banks to shift to a greater use of short-term debt to finance positions in capital assets and in long-term debt.¹⁹⁶

This selection from Minsky’s theory seems apt to describe the U.S. financial system in the early 2000s. Recall from Chapter 3 that after the 2000-2001 recession, the Federal Reserve slashed short-term interest rates to one percent, thus causing the interest rate term structure to become upward sloping. In such an environment, liquidity was “plentiful” and low interest rates on “short-term money-like liabilities” (e.g. ABCP and repo) enabled firms to earn “carry” by issuing short-term debt to purchase long-term assets. It should not surprise us that banks’ ABCP and repo borrowing took off within this robust financing environment. From 2001-2007, combined ABCP and repo borrowing rose from roughly \$950 billion to \$2.4 trillion.

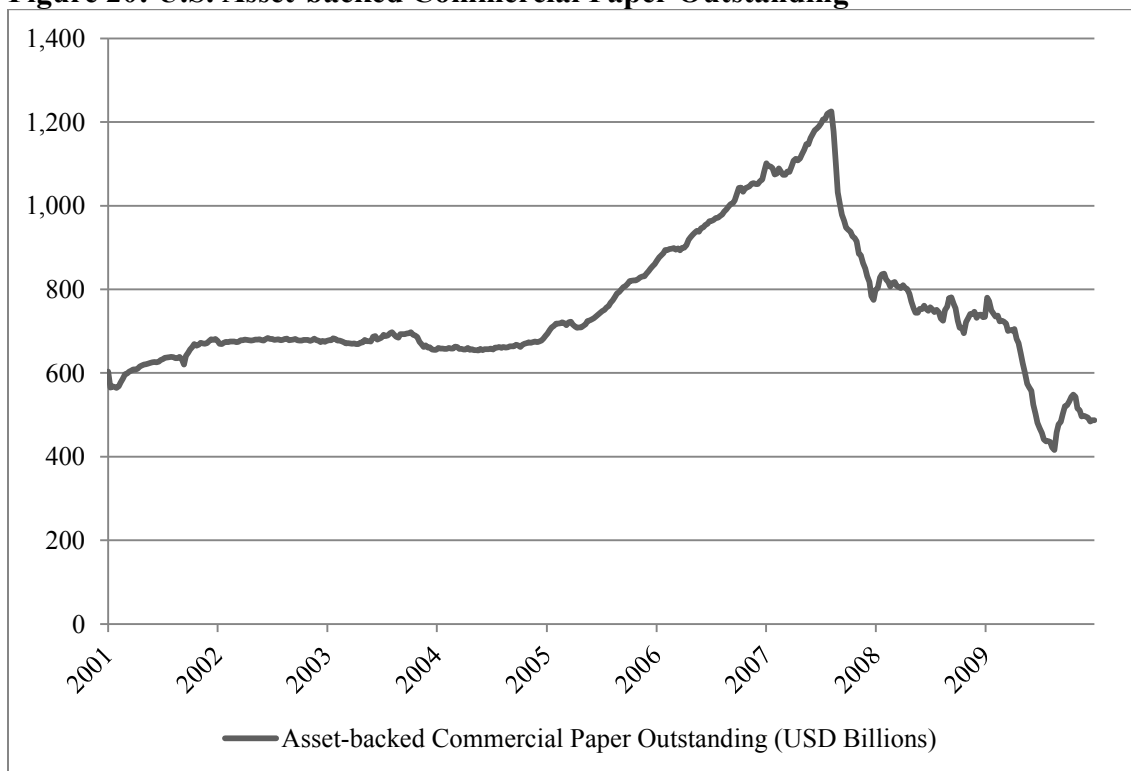
¹⁹⁶ (Minsky 2008, 234-235)

Figure 19: U.S. Interest Rate Term Structure (April 15, 2003)

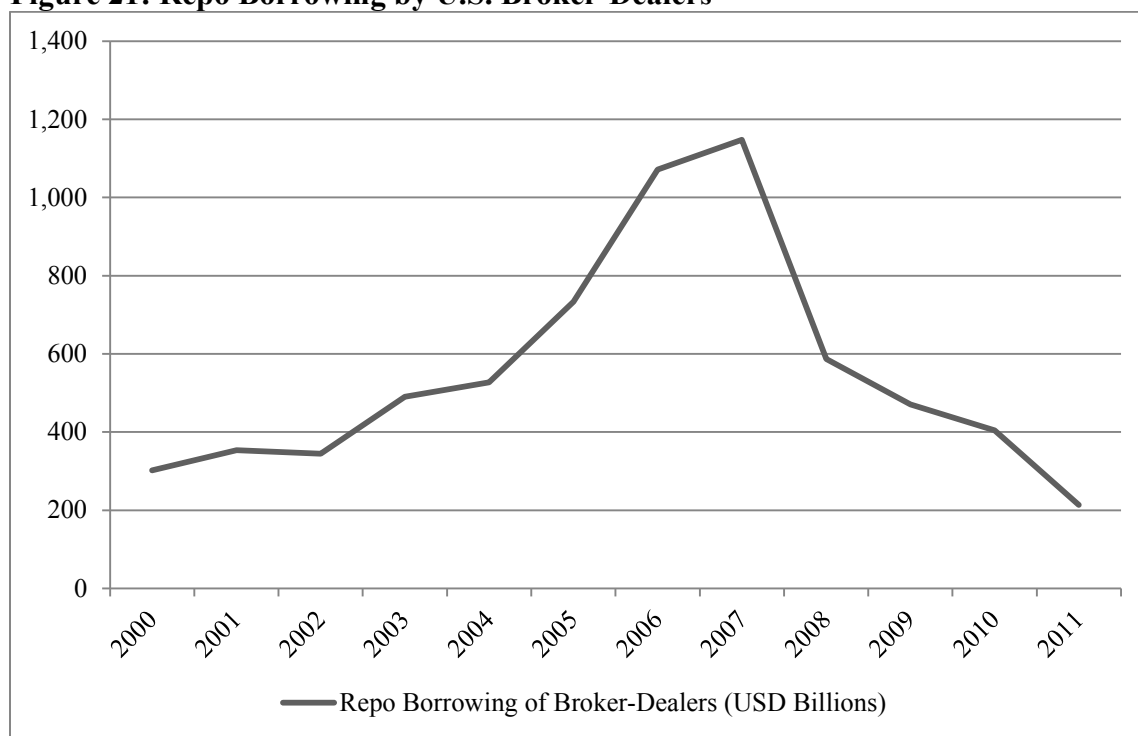


Source: U.S. Department of Treasury

Figure 20: U.S. Asset-backed Commercial Paper Outstanding



Source: The Federal Reserve

Figure 21: Repo Borrowing by U.S. Broker-Dealers

Source: The Federal Reserve

Note that there was nothing inherently fragile about using short-term debt to purchase longer-dated, risky assets. Indeed, this is what banks do. As long as ABCP and repo counterparties believe that banks' ABS collateral was information-insensitive, such that no actor could gain an unfair competitive advantage based on information asymmetry about the quality of ABCP and repo collateral, then investors would continuously roll over the maturing liabilities of ABCP and repo conduits.¹⁹⁷ Even if banks faced a creditor strike in the wholesale funding market, provided they had capital reserves sufficient to compensate for their capital shortfall, then shadow banking would not carry a substantial risk to banks' micro-prudential solvency.

¹⁹⁷ Gorton describes information-insensitivity thusly: "Repo is essentially depository banking built around information-insensitive debt. In a repo transaction, one side of the transaction wants to borrow money and the other side wants to save money by 'depositing' it somewhere safe. Think of the borrowers as a bank and the lender as a depositor, although the lender is another firm, such as a bank, insurance company, pension fund, institutional investor, or hedge fund. The depositor receives a bond as collateral for his deposits." For more, see: (Gorton 2010, 44).

Yet shadow banking in the mid-2000s was fragile because it was speculative in nature, since ABCP and repo conduits required fresh infusions of capital to maintain their liquidity. As Minsky argued, speculative finance units need to “roll over” their maturing liabilities, even if they can meet their obligations out of their operating income.¹⁹⁸ Tobias Adrian and Hyun Song Shin estimate that by March 2008, Wall Street’s five biggest commercial and investment banks rolled over roughly twenty-five percent of their balance sheets on an overnight basis.¹⁹⁹ It was banks’ susceptibility to roll over risk, on one hand, along with their undercapitalization, on the other, that made financial institutions vulnerable to creditor panics in the wholesale funding markets when housing prices fell.

It is here where economic conventions, and in particular conventional expectations, play a decisive role in determining the stability of the shadow banking system. Recall that according to Keynes, conventional expectations described the tendency of agents to “conform with the behavior of the majority or the average” when faced with uncertainty about the future.²⁰⁰ Such is the case of counter-party confidence in the shadow banking system. As long as a majority of ABCP and repo counterparties believes that a sufficient number of fellow counterparties will extend credit to ABCP or repo conduits, then they will continue to roll over maturing SIV obligations. If, however, ABCP and repo counterparties believed that other counterparties would no longer deem SIVs and their sponsors creditworthy, then they might refuse to roll over SIVs’ maturing obligations, thus disrupting the supply of credit available to financial institutions and

¹⁹⁸ (Minsky 1992, 7)

¹⁹⁹ (Adrian and Shin 2009)

²⁰⁰ (Keynes 1937a, 214)

triggering financial instability.²⁰¹ The causal importance of conventional expectations in shadow banking is discussed in the following two chapters. For now, it is worth reiterating that in the absence of deposit insurance, favorable conventional expectations were critically important to the liquidity of shadow banking conduits and their sponsors.

Based on this exposition of shadow banking as fragile finance, this chapter now describes how shadow banking depended on two sets of economic conventions, including institutionalized expert opinions about collateral quality represented by bond ratings, and bank-determined capital charges based on ergodic risk models. Throughout the following sections, effort is made to specify how bond ratings and banks' risk models qualified as economic conventions and why broader financial stability became predicated upon the continued perceived truth-value of these economic conventions *ex-ante* the global financial crisis, such that changes in underlying conventions catalyzed changes in financial markets when housing prices fell.

Bond Ratings and the Creation of Information-Insensitive Debt

In January 2011, the Financial Crisis Inquiry Commission (FCIC) issued a report summarizing the results of their investigation of the primary causes of the global financial crisis. While there was some dissent among the Commission about the crisis' primary causes, the Commission agreed that the credit rating agencies (CRAs) were “essential cogs in the wheel of financial destruction” prior to the crisis. The report began with the following statement:

²⁰¹ (Gorton and Metrick 2010) The fragility of (and changes to) agents' *conventional expectations* (and the concomitant impact on financial instability) is discussed in the following two chapters. For now, it is worth reiterating that the solvency of shadow banking institutions depended on the *conventional judgment* of bank counterparties in the wholesale funding market, such that creditor panics (or the anticipation of fellow creditors panicking) could trigger bank runs against ABCP and repo borrowers. Note that conventional expectations in the shadow banking market are the particular focus of chapters 5 and 6.

The three credit rating agencies were key enablers of the financial meltdown. The mortgage-related securities at the heart of the crisis could not have been marketed and sold without their seal of approval. Investors relied on them, *often blindly*. In some cases, they were obligated to use them, or regulatory capital standards were hinged on them. This crisis could not have happened without the rating agencies.²⁰²

Post-Keynesian economist James Crotty agreed with the FCIC's sentiment, and argued the following about ratings:

...the recent global financial boom and crisis might not have occurred if perverse incentives had not induced credit rating agencies to give absurdly high ratings to illiquid, non-transparent, structured financial products such as MBSs, CDOs, and collateralized loan obligations.²⁰³

Why did investors “blindly” rely on credit ratings? How did the three independent CRAs – Moody’s, Standard and Poor’s, and Fitch – become “key enablers” of America’s real estate bubble and credit boom? In addition, what led the FCIC and James Crotty to conclude that the CRAs were *decisive* factors of the unsustainable increase in real estate prices and concomitant credit boom, such that their activities were *necessary preconditions* for the global financial crisis? Why did the CRAs face incentives to grant “absurdly high ratings” to such in hindsight risky ABS?

There are no easy answers for these difficult questions. In the following paragraphs, effort is made to put the idiosyncratic features of credit ratings into the context of this dissertation’s conventions-based theoretical framework. When appropriate, background on the CRAs is presented throughout the discussion.

All credit markets suffer from information asymmetries – in general, borrowers know more about their ability to repay than their lenders. In extreme cases, this information asymmetry can cause adverse selection problems in financial markets,

²⁰² (The Financial Crisis Inquiry Commission 2011, xxv). Emphasis added.

²⁰³ (Crotty 2009, 566). Emphasis added.

wherein the least creditworthy borrowers crowd out the most creditworthy, leading to foregone Pareto-optimal transactions and market failure.²⁰⁴ One way to solve this problem is for borrowers to enlist third parties to render independent judgments on their creditworthiness, based on the rationale that dispassionate observers lack a vested interest in a transaction and can thus be trusted to provide an objective appraisal of a borrower's ability to repay their loans. The big three CRAs, including Moody's, Standard and Poor's, and their European counterpart, Fitch, provided authoritative opinions on the creditworthiness of different borrowers, including sovereign governments, corporations, and ABS, to name a few examples. These firms rendered independent judgments about the credit quality of various issuers and thus satisfied a mutual need in capital markets: creditors valued having third party opinions on the creditworthiness of their borrowers, while debtors found that being rated by the CRAs enhanced their ability to raise capital.

Do credit ratings qualify as economic conventions? Moody's Investors Service defines credit ratings as "credible and independent assessments of credit risk" that "contribute to efficiencies in fixed-income markets and other obligations."²⁰⁵ Standard & Poor's (S&P) states that credit ratings are "opinions about relative credit risk" that represent independent judgments "about the ability and willingness of an issuer, such as a corporation, state or city government, to meet its financial obligations in accordance with the terms of those obligations." Furthermore, S&P claims that credit ratings provide information about the "relative likelihood that [a security] may default," though they warn that "ratings should not be viewed as assurances of credit quality or exact measures

²⁰⁴ (Akerlof 1970)

²⁰⁵ (Moody's Investors Service 2013)

of the likelihood of default.”²⁰⁶ Based on these definitions, credit ratings qualify as economic conventions of *expert opinion*. The widespread use of bond ratings shows that market participants and regulators believe that the CRAs have an information advantage that allows them to render authoritative judgments about borrowers *that is otherwise unattainable by the investor public*. In this sense, ratings represent agents’ tendency to “fall back on the judgment of the rest of the world which is perhaps better informed,” as Keynes argued.²⁰⁷ As the FCIC found, “many investors, such as some pension funds and university endowments, relied on credit ratings because they had neither access to the same data as the rating agencies nor the capacity or analytical ability to assess the securities they were purchasing.”²⁰⁸ The FCIC’s findings comport with Keynes’ depiction of conventions in financial markets, specifically that time, resource, and information constraints compel agents to employ economic conventions to mitigate uncertainty in financial markets, allowing agents to “save [their] faces as rational, economic men” by providing expectation anchors upon which they can base their decisions given uncertainty about the future.²⁰⁹

In 1975, the Securities and Exchange Commission (SEC) mandated that bond issuers have their securities rated by one of the “nationally recognized statistical rating organizations” (or NRSROs, such as S&P, Moody’s and Fitch) when issuing bonds to investors.²¹⁰ Around the same time, the rating agencies switched their fee structure from

²⁰⁶ (Standard & Poor’s 2012). Emphasis added.

²⁰⁷ (Keynes 1937a, 214)

²⁰⁸ (The Financial Crisis Inquiry Commission 2011, 119)

²⁰⁹ (Keynes 1937a, 214)

²¹⁰ (Abdelal and Blyth 2012, 7-9)

an “investor pay” to an “issuer pay” business model. This change “[opened] the door to potential conflicts of interest,” as rating agencies “might shade [their] ratings upward so as to keep the issuer happy and forestall the issuer’s taking its rating business to a different rating agency,” as William White described it.²¹¹ This conflict of interest, coupled with the law requiring the CRAs to rate ABS, created a toxic mix of incentives for CRAs and ABS originators alike. As the FCIC found, these competitive pressures incentivized the CRAs to issue unrealistically favorable ratings to ABS issuers. The *Final Report* of the FCIC states the following:

If an issuer didn’t like a Moody’s rating on a particular deal, it might get a better rating from another ratings agency. The agencies were compensated only for rated deals – in effect, only for the deals for which their ratings were accepted by the issuer. So the pressure came from two directions: in-house insistence on increasing market share and direct demands from the issuers and investment bankers, who pushed for better ratings with fewer conditions.²¹²

Since the SEC required that ABS be rated by the CRAs, the rating agencies became important enablers of mortgage origination and securitization prior to the global financial crisis. The SEC set legal limits on the kind of collateralized debt ABCP and repo counterparties could purchase, limiting their holdings to top-rated collateral. Throughout the 2000s, financial institutions engineered risky financial products designed to game the CRAs’ ratings methodology to garner the highest ratings possible for risky tranches of debt.²¹³ Because ABS received high ratings from the CRAs, many risk-averse investors such as money market mutual funds, pension funds, and university endowments

²¹¹ (L. J. White 2010, 215)

²¹² (The Financial Crisis Inquiry Commission 2011, 210). Emphasis added.

²¹³ (L. J. White 2010, 214)

could invest in ABCP and repo of conduits, based on the logic that these loans were backed by sound collateral.²¹⁴

As Gary Gorton, Stefan Lewellen, and Andrew Metrick describe, investor confidence in shadow banking conduits depended on their belief that the collateral backing ABCP and repo was *information-insensitive* or “immune to adverse selection in trading because agents have no desire to acquire private information about the current health of the issuer.” Gorton et al. describe information-insensitivity as follows:

In this context, ‘safe’ means two, related, things. First, the value of the bank debt does not change much, a ten dollar check is pretty much always worth ten dollars. And, second, because of this it is not susceptible to adverse selection when it is used in transactions (traded in markets). That is, it does not pay anyone to produce private information about the value of the bank debt and speculate on that information.²¹⁵

Thus, according to Gorton, the ability to mint information-insensitive debt was “socially valuable” because it obviated depositor fears of information asymmetry in banking markets.²¹⁶

Gorton finds that banking panics (in both traditional and shadow banking markets) occur when information-insensitive debt becomes information-sensitive, which shakes investors’ faith in banks’ collateral. This is why states, which have a vested

²¹⁴ (Abdelal and Blyth 2012, 9-10) For instance, many financial institutions took pools of high-risk assets, such as bonds backed by subprime mortgages, and turned them into highly rated assets by slicing them into securities based on first losses in the underlying portfolio of assets. The riskiest slice, or *tranche*, of the newly created instrument (known as the equity portion of the asset pool’s capital structure) absorbed first losses in the underlying portfolio of assets and as such, commanded the lowest ratings from the CRAs and thus offered the highest yields. The most senior part of the capital structure earned the highest ratings from rating agencies and offered the lowest yield, based on the logic that barring catastrophe (or an environment of 100% asset price correlation), total losses on the underlying mortgage pool would never exceed the cushion of loss below the senior tranche of the asset pool, usually capped between fifteen and thirty per cent.

²¹⁵ (Gorton 2009, 18)

²¹⁶ (Gorton, Lewellen and Metrick 2012, 1)

interest in financial stability, sponsor deposit insurance, which prevents bank runs by ensuring depositors that their deposits will remain information-insensitive, regardless of the idiosyncratic credit risks among depository institutions.²¹⁷

The CRAs played a critical role in enabling the rise of shadow banking by allowing financial institutions to mint collateral that, for a time, was viewed as information-insensitive debt by ABCP and repo counterparties. For debt to qualify as information-insensitive, agents must have faith that it is immune from adverse selection problems that emerge due to information asymmetries about the underlying collateral quality of the bonds themselves. As Gorton describes:

Intuitively, informationally-insensitive debt is debt that no one need devote a lot of resources to investigating. It is exactly designed to avoid that. Just as consumers do not spend a lot of time doing due diligence on the bank that is holding the money of someone buying something from you, the counterpart amount firms and institutional investors will turn out to be collateral, i.e. informationally-insensitive debt. Think of it as like electricity. Millions of people turn their lights on and off every day without knowing how electricity really works or where it comes from. The idea is for it to work without every consumer having to be an electrician.²¹⁸

The CRAs' ratings gave ABCP and repo counterparties confidence that banks' collateral was information-insensitive.²¹⁹ By providing value anchors about the credit worthiness of ABS, bond ratings allowed counterparties to outsource their due diligence on ABS to the CRAs. The market's misplaced faith in the truth-value of bond ratings allowed banks to mint information-insensitive debt to use as ABCP and repo collateral, which allowed them to profit from the difference between short-term funding costs in the wholesale

²¹⁷ (Gorton 2009, 5). Deposit insurance protects against bank runs as long as the sovereign is deemed creditworthy by the market. Of course, this is not always the case.

²¹⁸ (Gorton 2009, 10)

²¹⁹ i.e. equivalent to demand deposits in traditional banking markets

funding market and returns on risky ABS. Further, Gorton claimed that favorable ratings signaled to investors that there was “no real point to doing due diligence because nothing will be found out,”²²⁰ so they “blindly relied on credit ratings as their arbiters of risk.”²²¹ As such, bond ratings filled a valuable market niche by rendering ostensibly independent and credible opinions on the information-insensitivity of ABCP and repo ABS collateral as institutionalized economic conventions.²²²

In this way, shadow banking can be understood as a socially contingent process enabled by economic conventions, which permitted financial institutions and ABCP and repo counterparties to create and invest in information-insensitive, high grade assets to take advantage of the interest rate differential between short-term liabilities and long-term assets. The creation of information-insensitive debt is an inter-subjective process, which follows from financial market participants placing faith in certain key economic conventions about what qualifies as information-insensitive debt and what does not.

So if bond ratings qualify as economic conventions, and ratings performed a ‘socially valuable’ role by allowing financial institutions to manufacture highly rated, information-insensitive ABS for shadow banking conduits, why did the CRAs underestimate the probability of default of the assets underlying ABS *ex-ante* the global financial crisis? Again, the answer hinges on economic conventions. As Rawi Abdelal

²²⁰ (Gorton 2010, 181)

²²¹ (The Financial Crisis Inquiry Commission 2011, xvii and 206)

²²² In hindsight, of course, it is clear that there existed a tremendous opportunity for anyone willing to do due diligence on the assets underlying highly rated ABS that the CRAs seemingly refused to do. The quotation at the start of this chapter by Fabrice Tourre illustrates an important point about capital markets before the crisis, specifically that those who took the time to understand the opaque financial instruments at the heart of shadow banking system stood to make outsized profit by identifying the flaws in the market’s taken-for-granted conventional judgment on the riskiness of ABS. For a particularly interesting volume on those investors who saw the crisis coming, see (Lewis 2011)

and Mark Blyth find, the CRAs' ratings methodology was based on historical mortgage default rates from the worst post-Depression default episode, Texas in the 1980s.²²³ As the FCIC found, the "M3 Prime" model used by Moody's to automate ABS ratings assumed that, on average, home prices would increase roughly 4% per year. The FCIC also found that the CRAs' models "put little weight on the possibility [home] prices would fall sharply nationwide," and the CRAs were loath to adjust scenarios "to put greater weight on the possibility of a decline," despite mounting evidence of the unsustainability of rising home prices.²²⁴ The CRAs needed some basis of projecting future default rates of residential mortgages, and chose an ergodic measure that underestimated the *correlation risk* of multiple, heterogeneous housing geographies collapsing simultaneously. This should not come as a surprise, since Keynes notes that asset market participants have a tendency "to substitute for knowledge which is unattainable²²⁵ certain conventions, the chief of which is to assume, contrary to all likelihood, that the future will resemble the past."²²⁶ When the CRAs rendered their credit opinions, they assumed that the future would resemble the past, to disastrous effect when housing prices declined beginning in 2006.

What do ratings tell us about the theoretical framework advanced in Chapter 2, which ties convention constitution to market outcomes? There are four implications.

²²³ (Abdelal and Blyth 2012, 12). Another reason why the CRAs might have been marginally more willing to grant favorable ratings to ABS is because of their fee-for-rating billing structure, which meant that the profitability of the CRAs depended on whether they could keep banks "happy" for repeat business. For instance in 2005, over 40% of Moody's revenue came from rating ABS. And from 2003 to 2006, Moody's revenue tied to rating ABS rose from \$12 million to \$91 million.

²²⁴ (The Financial Crisis Inquiry Commission 2011, 120-121)

²²⁵ E.g. future default rates on ABS.

²²⁶ (Keynes 1937b, 13)

First, ratings were an important source of *epistemic blindness* in markets prior to the global financial crisis. Because the CRAs occupied an ontologically privileged position in financial markets, where their opinions were codified into laws regulating the portfolio allocation decisions of entire classes of investors, many market participants assumed that ratings provided an accurate assessment of the probability of default of ABS. After all, the CRAs employed the experts who had access to troves of historical data, maintained close relationships with ABS originators, and boasted sophisticated risk management technologies with the best human resources. Therefore, it was only natural for market participants to defer judgment to the CRAs, especially when their record seemed so impeccable during the boom years.

Second, the institutionalization of bond ratings into regulations about the types of collateral ABCP and repo investors could hold predicated market stability on the continued perceived truth-value of favorable bond ratings. As long as market outcomes comported with agents' convention-given expectations vis-à-vis ratings, markets would remain "tranquil" and "calm." If, however, outcomes diverged from agents' convention-given expectations based on bond ratings, then agents would reappraise their governing conventions, thus precipitating change in financial markets. If the "shock" associated with a ratings downgrade was pervasive, this could cause market participants to shun, say, all of the commercial paper and repo issued by a specific shadow banking entity (i.e. an idiosyncratic bank run).²²⁷ Credit ratings are useful as long as they maintain the allegiance of a majority of market participants. This is why credit downgrades in 2007 and 2008 were such watched events in financial markets. When downgrades occurred,

²²⁷ This is exactly what happened to Bear Stearns (see following chapter).

agents had to reappraise their convention-given expectations, altering their decision-making calculi and leading to different market outcomes. As Keynes argued, downgrades can cause “the practice of calmness and immobility, of certainty and security,” to “suddenly” break down. This is because the conventions underlying ratings were based on a “flimsy foundation” that housing prices would never decline nationally.

Third, credit ratings might have changed the very material fundamentals of financial markets that they were meant to reflect. As Donald MacKenzie argues, bond ratings were not cameras that passively record events, but were engines of financial change.²²⁸ The logic underpinning this contention is as follows. High ratings for ABS provided an *allocative* decision-making anchor on behalf of both financial institutions and ABCP and repo counterparties: all else being equal, highly rated assets were in greater demand than lower rated ones. Initially favorable ratings permitted large pools of risk-averse capital to invest in highly rated ABS (via ABCP and repo conduits), thus driving down credit spreads in the highly rated asset class. Lower risk spreads facilitated by high ratings incentivized *greater credit extension* to the highly rated asset class in the short-run, reifying the material creditworthiness that favorable ratings were meant to reflect. As Hyun Song Shin found, permissive credit conditions in the shadow banking market, via ABCP and repo conduits sponsored by American and European financial institutions, added fuel to the fire of the unsustainable increase in real estate prices in the U.S. economy from 2001-2007.²²⁹ While it is difficult to dis-embed rising housing prices from the credit extension underpinning them, there is good reason to believe that credit

²²⁸ (MacKenzie 2008) MacKenzie dubs this phenomenon “performativity,” or how economic theories influence the material constitution of financial markets.

²²⁹ (Shin 2012)

extension contributed to the unsustainable increase in housing prices in the 2000s. The empirical challenge we face, not being able to run a controlled experiment holding the rest of the global economy as a control variable and changing bond ratings, is showing that high ratings *caused* the credit boom that accompanied the housing bubble. A less ambitious (but more plausible) claim is that ratings contributed to both the *amplitude* and *periodicity* of the housing bubble: during the boom years, high ratings endogenously contributed to pro-cyclical capital flows into ABS, but when housing prices fell, downgrades precipitated falling collateral prices among financial institutions, thus exposing their fragility and vulnerability to investor panics in the shadow banking market. Without high ratings, it is hard to imagine a scenario in which so many risk-averse investors like money market mutual funds would have been legally permitted to invest in the risky collateral peddled by America and Europe's shadow banking conduits. For this reason, ratings remain a key story in the driver of asset prices before the global financial crisis.

Fourth, bond ratings' short-run success as economic conventions might have been responsible for sowing long-term structural changes in the economy that undermined their usefulness as value anchors in financial markets. Because bond ratings were popular prior to the global financial crisis, more capital flowed into highly rated but risky asset classes, compounding the momentum of rising prices in the short term but reifying the inexorable downturn in prices in the long term. Such is the case of *data hysteresis*, which Post-Keynesians describe as the tendency of the macroeconomy to evolve, such that historical outcome generators shift in non-ergodic ways over time.²³⁰ Paradoxically,

²³⁰ (Palley 2011, 42) and (Setterfield 1997)

perhaps the rise in popularity of ratings in the short term sowed the seeds of their own irrelevance in the long term.

In hindsight, it is tempting to blame money managers for blindly relying on ratings to make investment decisions, but prior to the crisis, ratings seemed like good indications of the credit quality of financial derivatives. In addition, since triple-A rated credit derivatives yielded more than Treasury debt, competitive pressures often forced money managers to purchase highly rated risky assets to maintain their edge against fellow fund managers. While institutional investors did have the option to ignore ratings, they did so at their own bureaucratic peril, since underperforming money managers were replaced with those willing to take on more risk during the boom years.

Yet bond ratings were only one piece of the puzzle of financial fragility in the U.S. economy prior to the global financial crisis. If banks had regulatory capital reserves sufficient to absorb losses in their mortgage portfolios, then the deflating housing bubble might not have necessarily led to financial turmoil. The following section explores banks' pre-crisis undercapitalization, and finds that economic conventions as institutionalized into banks' risk management technologies left banks vulnerable to collapsing asset prices when the housing bubble burst.

Ergodicity and Undercapitalization

If financial institutions were adequately capitalized when housing prices fell, then buyer strikes by ABCP and repo counterparties would not have necessarily led to financial instability. As we now know, however, banks were undercapitalized heading into the global financial crisis, leading some to seek government support to make up for their capital shortfalls. Bank capital inadequacy was thus a key source of fragility *ex-ante*

the global financial crisis, distinct from the liquidity risk associated with shadow banking. This chapter now turns its attention to explaining how banks' risk management technologies used to determine regulatory capital charges for risky assets was a causal driver of their pre-crisis undercapitalization. This dissertation finds that banks' risk management techniques depended on economic conventions of ergodicity (i.e. assuming that future asset price returns would adhere to historical returns), which simultaneously made banks appear well capitalized during the bubble years while increasing their systemic vulnerability to a collapse in housing prices when realized market outcomes belied their convention-given expectations.

While there is broad agreement among both banks and regulators that financial institutions should hold capital reserves in case of losses (and indeed, it is in everyone's interest that they do), there is far less consensus about the "right" amount of regulatory capital banks should hold. Banks could be perfectly capitalized, with a 100% capital ratio (i.e. zero liabilities), though this would make it impossible for banks to earn revenue. Conversely, banks could carry a thin capital cushion as a percentage of their loans outstanding, but this could leave them exposed to falling collateral prices should default rates rise.²³¹ Regulators thus face two challenges when determining banks' optimum amount of regulatory capital: first, there is a natural tension between banks' desire to hold capital while also maximizing profits. When growth is strong and default rates are low, banks prefer to hold the minimum capital required under law so they can increase their profits by making more loans (or, in the case of shadow banking, buy more securities). Therefore, banks' preference for regulatory capital varies pro-cyclically with changing

²³¹ (Tarullo 2008, 1-9)

market conditions. Regulators, on the other hand, prefer that banks reserve capital counter-cyclically, to serve as a buffer against losses during downturns.²³² So banks and regulators have divergent interests about optimal amounts of regulatory capital banks should hold. Second, banks and regulators face a quantification problem regarding how best to determine capital charges commensurate with the risk associated with a given loan. In theory, regulatory capital charges should reflect the probability of default of a loan. In practice, it is difficult to estimate default rates on securities *ex-ante* fluctuations in the business cycle.

This dissertation argues that the regulators' solution to this capital quantification problem, letting banks determine their own regulatory capital charges via their internal ratings methodology, directly led to banks' undercapitalization *ex-ante* the global financial crisis. Regulators' willingness to let banks "risk-weight" capital charges based on internal ratings meant that banks' capitalization became predicated on their ability to predict the default risk in their loan portfolios. Since their risk management technologies assumed market ergodicity, this left banks systemically vulnerable to non-ergodic changes asset prices.

Risk-weighting ties the capital charge of an asset to its perceived risk of default, such that banks reserve less capital for less risky investments and vice versa. Under risk-weighting, a loan to a start-up company would carry a greater risk-weighted capital charge than a loan to a triple A-rated government. While intuitively sensible, risk-weighting presents banks and regulators with a practical challenge: how best to identify

²³² (Gordy and Howells 2006) In other words, banks have a natural desire to maintain pro-cyclical capital reserves, in which banks, facing competitive pressures, seek to hold fewer reserves during boom times and more reserves when they face economic headwinds.

the appropriate level of regulatory capital given imperfect knowledge about borrowers. This issue is exacerbated when banks invent new financial products that lack a trading history to guide estimates of future default probabilities. And even for products with long trading histories, historical default rates might not provide a meaningful guide to future default rates, especially if the market's historical data generating process evolves in non-ergodic ways (i.e. due to data hysteresis). As Keynes would argue, risk-weighting is uncertain because "there is no scientific basis on which to form any calculable probability whatsoever" about the appropriate capital charges associated with opaque financial instruments.²³³ Of course, agents nevertheless try to derive hypotheses to divine calculable probabilities of future default risk, and often rely on ergodic measures to do so, but these methods are mere approximations of knowledge because no amount of past sampling can give the practitioner certainty about the future.²³⁴

Notwithstanding these caveats, national regulators and financial institutions alike began favoring risk-weighted capital requirements by the 1980s. Banks preferred risk-weighting because it allowed them to make more loans to ostensibly less risky borrowers. Regulators also preferred risk-weighting because it provided a way to get banks to count their off-balance-sheet loans among their total assets for calculating capital charges. This convergence of preferences between bankers and regulators among the G-7 countries culminated in the 1988 Basel Accord (i.e. Basel I) by the Basel Committee on Banking Supervision, which issued international standards for risk-weighting by classifying five risk profiles of bank assets (and thus reduced cross-national idiosyncrasies of risk-

²³³ (Keynes 1937a, 214)

²³⁴ (Blyth 2010, 457)

weighted capital adequacy regimes). Basel I's risk tranches ranged from assets that carried no capital charge, such as cash and loans made to highly rated sovereign governments, to assets that carried 100% capital charges (e.g. claims on non-OECD governments). Basel I also mandated that banks with international operations hold an eight percent capital buffer of their total value of their risk-weighted assets at any given time.²³⁵

Despite some initial success at synchronizing national capital adequacy regimes, during the 1990s, regulators realized that Basel I fell short in a number of respects. Risk-weighting created incentives for banks to engage in “regulatory arbitrage,” or lending more to borrowers that required less regulatory capital. Securitization complicated matters further, since retained ABS were riskier than their capital charges would suggest. By the late 1990s, regulators agreed that something had to be done.²³⁶ The 2004 Basel II agreement was signed in response to these concerns and amended Basel I by changing the weighting system used by banks to determine capital charges, creating more latitude for national regulators to demand higher capital requirements in excess of international standards, and encouraging banks to disclose their risks more transparently.

²³⁵ (Tarullo 2008, 45-60). The original agreement deserves praise for its simplicity in that it enshrined a set of international principles on capital adequacy, which served an institutional function among signatory governments: namely how to ensure that national banking systems had robust capital cushions that adhered to a shared set of risk-weighted capital standards. Also, it is worth noting that originally, though the banks had a clear preference to risk-weight their capital charges, regulators still had a choice between accommodating banks and maintaining a simple approach that would require banks to make a fixed capital reserve for every asset on their books regardless of quality. The simple method lent itself to easy cross-bank and transnational comparisons of capital adequacy, but did not cover off-balance-sheet risks nor account for risk heterogeneities across asset classes, so regulators opted for risk-weighting as well, despite its drawbacks.

²³⁶ (Tarullo 2008, 90-95) and (Crotty, Structural causes of the global financial crisis: a critical assessment of the 'new financial architecture' 2009, 570) The practice of regulatory arbitrage after Basel I shows how bank capital requirements had the capability of producing undercapitalized financial institutions while exacerbating internal imbalances in the economy.

Yet Basel II also constituted a clear break from Basel I insofar as it permitted banks to use their own internal ratings to determine the credit risk of loan portfolios, as opposed to Basel I's centrally directed risk weights. This "advanced internal ratings-based approach" (A-IRB) allowed banks to use their own internal models to gauge portfolio risk to determine regulatory capital charges.²³⁷ Banks preferred A-IRB because it allowed them to hold lower levels of regulatory capital and thus make more loans (and earn more profit), provided that they had justification on the basis of their internal ratings.²³⁸ From regulators' perspective, knowing that they knew far less about banks' risks than banks themselves, financial institutions seemed like the ideal arbiters of the risks that they faced. Regulators supported A-IRB because they deemed that the alternative, ratings from external agencies, were not rigorous and subject to abuse via "ratings shopping." Knowing that member states' financial institutions could abuse A-IRB, the Basel Committee placed several eligibility requirements on banks before they were allowed to use their own internal ratings for assessing capital charges, based on the rationale that banks that met the Basel Committee's stringent A-IRB prerequisites had a vested interest in disclosing their risks to national regulators.

The Basel Committee suggested that that banks use the value-at-risk (VaR) approach to calculate market risk and determine capital charges for different assets. VaR, as its name implies, is a weighted risk measure that looks at historical asset price returns to estimate the likelihood of loss in a loan portfolio over a given period.²³⁹ Even though the Basel Committee advocated for VaR in the late 1990s and throughout the 2000s,

²³⁷ (The Economist 2004)

²³⁸ (Tarullo 2008, 65)

²³⁹ (Risk.net 2012)

VaR's flaws were well known by regulators and banks alike, particularly after the 1998 failure of hedge fund Long-Term Capital Management (LTCM, see the next chapter).

VaR was limited by the following factors:

First, VaR relies on historical price data to project future market prices, which is not a realistic assumption because future asset price distributions might not conform to their historical range. Second, back testing VaR models was difficult because credit events (e.g. defaults and downgrades) rarely occurred in financial markets. Third, VaR underestimated correlation risk, or the likelihood of spillover risks across portfolios, which we now know was a key driver of the contagion in banking system during the height of the crisis. Fourth, VaR underestimated the likelihood of “tail risk” because it assumed a normal distribution of historical asset price returns. In reality, asset prices might take on so-called “fat tails,” for which the bell curve is ill equipped to describe (usually classifying low probability, high impact events as so-called “ten standard deviation” occurrences).²⁴⁰ For these reasons, VaR ill-equipped at capturing the full range of possible futures in financial markets, and was thus a key endogenous driver of banks' underestimation of portfolio risk *ex-ante* the global financial crisis. As James Crotty argues, “reliance on VaR...left banks with woefully inadequate capital reserves when [the crisis] broke out.”²⁴¹ While the inadequacy of VaR is well documented by *ex-post* accounts of the crisis, VaR's flaws reveal a lot how misplaced faith in economic metrics based on ergodicity can sow financial fragility. There are three conclusions one can draw about VaR for this dissertation's theoretical framework.

²⁴⁰ (Tarullo 2008, 63-65)

²⁴¹ (Crotty 2009, 571-572)

First, it turns out that the methodologies used by financial institutions to gauge portfolio risk were *endogenous drivers* of adding cumulatively more risk into America's financial system prior to the global financial crisis. As more banks used VaR, the credit available to ostensibly riskless asset classes increased, leading to lower bond spreads, greater risk appetites, and broader fragility. VaR also allowed broker-dealers to carry thinner capital cushions than a simple approach would suggest. As the FCIC reported, VaR helped broker-dealers lower average capital charges by 40% on average.²⁴² In addition, to the extent that VaR provided banks with an adequate gauge of risk, the trading prescriptions suggested by VaR's computer models often caused banks to purchase derivatives that would lower their VaR numbers, but also presented a risk to banks if derivatives proved inadequate risk mitigations during crisis. Banks' derivatives exposed them to counterparty risk should their counterparties be unable to meet their derivative obligations, which often occurred when many banks purchased the same types of hedges from the same company. This is what happened to insurance giant AIG, which ended up becoming Wall Street's *de facto* insurance provider of last resort for risky ABS (see Chapter 6). This example shows that that VaR (and the policy prescriptions suggested by VaR, e.g. purchasing CDS insurance on risky ABS) might sow the very fragility that it was meant to avoid (e.g. a single, large, systemically important firm insuring a majority of the mortgage market). As Abdelal et al. note, "what is rational for one bank²⁴³ can create systemic risk for all banks as asset positions become serially correlated." These authors conclude that "once the entire banking system had loaded up

²⁴² (The Financial Crisis Inquiry Commission 2011, 152)

²⁴³ E.g. hedging based on the prescriptions of VaR

on mortgage derivatives and credit default swaps, the accident was just waiting to happen.”²⁴⁴

Second, VaR *blinded* market participants to tail risks in banks’ portfolios. Because VaR assumed that asset prices adhered to a normal distribution, individual banks’ VaR levels underestimated the expected value of loss in banks’ portfolio. In reality, normal distributions based on historical asset price returns were proven inapplicable to all market states since, as Mark Blyth surmised, “ten-sigma events actually happen nine years apart.”²⁴⁵ Blyth further argues that because of VaR, “not only did we not see [the global financial crisis] coming, we didn’t see it coming because we didn’t think it was possible in the first place.”²⁴⁶ The point is not to impugn the intellectual progenitors of VaR, nor to fault bank risk managers for their incompetence and moral failings like so many other accounts of the crisis.²⁴⁷ Rather, this dissertation claims that VaR illustrates an important point about the risks of *institutionalizing* economic metrics based on ergodicity (via assumptions of normally distributed asset prices based on historical returns) in a non-ergodic world: misplaced faith in ergodic measures of market risk blind market participants to non-ergodic shifts in financial markets. If a metric is shared, such that the realization of its inapplicability causes agents to question the truth-value of their conventions, then agent behavior can change in non-stochastic ways.

²⁴⁴ (Abdelal, Blyth and Parsons 2010, 231)

²⁴⁵ (Blyth 2013a, 35)

²⁴⁶ (Blyth 2013a, 37)

²⁴⁷ See, for example: (Taleb 2007) and (Johnson and Kwak 2010).

Thus the third take-away about VaR: that the widespread acceptance of VaR *ex-ante* the global financial crisis meant that VaR was causally imbricated into market outcomes, such as instability in VaR could create instability in financial markets. When it was revealed to banks that VaR underestimated their portfolio risk, asset managers logically liquidated risky assets and purchased safe assets. This individually rational behavior proved collectively disastrous, as the correlation risk among disparate markets spiked as multiple asset managers attempted to “get liquid” at the same time. VaR deserves some of the blame for this phenomenon, insofar as VaR caused multiple systemically linked financial institutions to adopt the same risk hedges, thus increasing the serial correlation of the entire global banking system, such that a fall in collateral prices triggered systemic crisis. As more firms adopted VaR, the stability of the financial system became increasingly predicated on the reliability of VaR methodology. For instance, Mark Blyth found that during the Asian financial crisis, when the price of short-dated options rose with volatility as the Asian financial crisis spread, many financial institutions sought to reduce their overall VaR numbers and liquidate large portions of their portfolios, leading to widening bond spreads across asset classes unrelated to the Asian financial crisis. Blyth notes that no material change in the underlying riskiness of banks occurred: it was simply the increase in the cost of insurance via equity derivatives that caused banks to sell risky assets. In this case, a convention adopted to measure the risk of losses actually led to constitutive effects on market outcomes. The point remains that VaR risk management techniques, which were created to increase transparency and reduce risk in the financial sector, actually did the opposite.²⁴⁸

²⁴⁸ (Blyth 2003)

These three insights show what happens when the stability of the financial system depends on an ergodic risk measure based on the assumption of normally distributed asset price returns. VaR stands out as an institutionalized metric based on key economic conventions that, once adopted, sowed epistemic blindness to the risks in banks' loan portfolios while also making it appear as though banks were well capitalized headed into the crisis. Daniel Tarullo finds that the ten largest U.S. banks had risk-weighted capital ratios in excess of 10% in 2006, well above the 8% Basel II minimum. Therefore, from the standpoint of regulators, banks were well capitalized heading into the global financial crisis.²⁴⁹ VaR was also an endogenous driver of market outcomes, making it easier for banks to extend credit to risky asset classes that, for a time, supported rising prices and seemingly justified the favorable risk ratings generated by VaR. On the downside, VaR contributed to adverse feedback loops wherein risks were magnified by the fact that since many banks used VaR, they all sought to sell the same assets simultaneously, thus exacerbating already tumultuous market conditions. As Tarullo explains:

VaR ... create[d] a kind of negative feedback loop that makes the sources of risk partly endogenous. That is, where market actors are using similar models, an initial decline in the market price of an asset can prompt many of these actors more or less simultaneously to sell their holdings of this asset in order to minimize their losses or improve their capital position. But sales by a significant number of actors will drive the price of the asset down further, possibly prompting another round of sell-offs. This self-reinforcing dynamic can magnify volatility and thus, on net, increase risk.²⁵⁰

This insight corroborates what this dissertation's conventions-based framework says we should expect from institutionalized economic metrics based on assumptions of

²⁴⁹ (Tarullo 2008, 193)

²⁵⁰ (Tarullo 2008, 155)

ergodicity: when complex social systems move in non-ergodic ways, and when agents' *believe* that they occupy a world of ergodicity qua their animating conventions-cum-metrics, novel surprises can catalyze non-stochastic changes in markets.

Conclusion

The purpose of this chapter was two-fold: first, it described the emergence of off-balance sheet financial intermediation in which systemically important financial institutions sponsored asset-backed commercial paper and repurchase agreement conduits to borrow in wholesale funding markets to invest in asset-backed securities. This chapter argued that this parallel, or “shadow” banking system fell outside of the regulatory purview of banking authorities, and its lack of deposit insurance made shadow banking conduits vulnerable to bank runs in the wholesale funding markets. This chapter put the rise of shadow banking into the context Minsky's financial instability hypothesis, and argued that the particular form of shadow banking that emerged in the U.S. economy prior to the global financial crisis was speculative in nature, in the Minsky sense, since ABCP and repo conduits relied on *fresh infusions* of capital to remain liquid.

Second, this chapter argued that the rise of shadow banking was best understood as a function of banks' accumulation of risky ABS and their capital inadequacy, which were both convention-driven phenomena. Bond ratings issued by the credit rating agencies served as institutionalized conventions of expert opinion that allowed theretofore risk-averse investors like money market mutual funds to invest in the risky commercial paper and repo of banks. Banks' undercapitalization stemmed from the norm-cum-law of allowing banks to determine their own capital charges based on their internal risk models that assumed market ergodicity when reserving regulatory capital.

These developments created a toxic incentive mix for financial institutions, allowing them to adopt speculative financing arrangements to capture rents from the inflating housing bubble and credit boom.

Once adopted, these conventions were responsible for two inter-related outcomes in financial markets: first, conventions made it easier for banks to extend credit to high risk borrowers in mortgage market and created ever-permissive credit conditions that in turn justified the rosy convention-given views of banks' risk. As a result, conventions became *self-stabilizing*, at least in the short run, but also contributed to the amplitude and periodicity of the unsustainable increase in housing prices in the U.S. economy from 2001-2006 in the long run. Second, economic conventions blinded agents to non-routine (i.e. non-convention-given) risks in the shadow banking system.

By early 2007, the stage was set for a full-blown crisis. The following two chapters describe the market dynamic that ensued during these tumultuous years in the U.S. and global economy. Chapter 5 describes how regulators repeated interventions in financial markets created a *conventional expectation* that regulators would act as liquidity providers of last resort in shadow banking markets. This conventional expectation prevented funding pressures in wholesale funding markets from metastasizing into a full-blown banking panic, which is what happened after the near-simultaneous failure of investment bank Lehman Brothers and bailout of insurance giant AIG. As such, chapter 6 argues that regulators' decision to let Lehman Brothers go bankrupt created *convention uncertainty* regarding regulators' intentions, thus catalyzing a generalized banking panic in wholesale funding markets. Chapter 6 also explains how regulators' unconditional bailouts of the U.S. financial system can be understood as a byproduct of the economic

conventions held by senior economic technocrats in the U.S. Federal Reserve and Department of the Treasury. It is hypothesized that the bank bailouts were successful because they re-established convention equilibrium qua regulators' liquidity provider of last resort function to shadow banking conduits.

CHAPTER 5:
REGULATORS AS *DE FACTO* SHADOW BANKING
DEPOSIT GUARANTORS

Proposition 4: Information shocks to agents' convention-given expectations catalyze convention uncertainty.

Proposition 5: Given the prior existence of a fragile financial structure, convention uncertainty causes agents to revert to first principles of survival, disrupting the market's normal price mechanism and triggering financial instability.

Proposition 6: Elite responses to financial market instability are a function of their economic conventions used to diagnose a crisis and the conventions held by the market about regulators.

Introduction

Chapters 5 and 6 of this dissertation explore the relationship between the market's conventional expectations and liquidity of shadow banking conduits. Chapter 5 argues that regulators' repeated interventions in financial markets in the decade prior to Lehman Brothers' bankruptcy created a *conventional expectation* among shadow banking counterparties that regulators would serve as liquidity providers of last resort for shadow banking conduits. This conventional expectation maintained a tenuous stability in financial markets, as bank runs throughout this period were *idiosyncratic* rather than *generalized* across all commercial paper and repo issuers.

Chapter 6 hypothesizes that the near-simultaneous bankruptcy of Lehman Brothers and bailout of insurance giant American International Group (AIG) negated the market's conventional expectations about regulators, leading to a generalized banking panic in the wholesale funding markets and transmitting financial contagion in shadow banking conduits to the broader economy. Regulators' response to the crisis can be understood as an attempt to re-establish conventional equilibrium regarding their *de facto* status as liquidity providers of last resort in financial markets by extending the public creditworthiness of the Federal government to guarantee private shadow banking liabilities.

LTCM and the Origins of the Weekend Bailout

The global financial crisis was not without historical precedent. One episode in particular – the rise and fall of hedge fund Long-Term Capital Management (LTCM) in the 1990s – presaged the regular weekend meetings held at the Federal Reserve Bank of New York that took place throughout the global financial crisis. Many of the key players

of the LTCM episode, including bank chief executives and senior Fed officials played key roles resolving the global financial crisis ten years later. And the problems that brought down LTCM, namely exposure to tail risk amplified by excessive leverage without sufficient capital reserves, foreshadowed the problems facing America's financial institutions in 2008.

LTCM signifies a key turning point in regulators' posture toward systemically important financial institutions, as it opened the door for more invasive interventions during the global financial crisis. Although the Fed did not risk its own capital to bail out LTCM, it arranged the market's private response to LTCM's insolvency, revealing its willingness to use its privileged market position to cajole private actors into bailout out a troubled counterparty in the name of financial stability. LTCM's bailout, deemed successful since it did not put taxpayer dollars at risk and avoided the disorderly bankruptcy of the fund, also had a subtle but ultimately more important consequence for the market's conventional expectations about the Fed's posture on financial instability. According to Kevin Dowd, LTCM's bailout signaled "a major open-ended extension of Federal Reserve responsibilities," which established the market's belief that "the Fed should prevent the failure of large financial firms."²⁵¹ Fed and Treasury officials would repeatedly revisit this issue of moral hazard when deliberating how best to respond to the global financial crisis.

In 1993, a former bond arbitrageur from the investment bank Salomon Brothers, John Meriwether, founded Long Term Capital Management (LTCM) with \$2.5 billion of funds raised from investors worldwide. Meriwether tapped into his deep network of

²⁵¹ (Dowd 1999, 1)

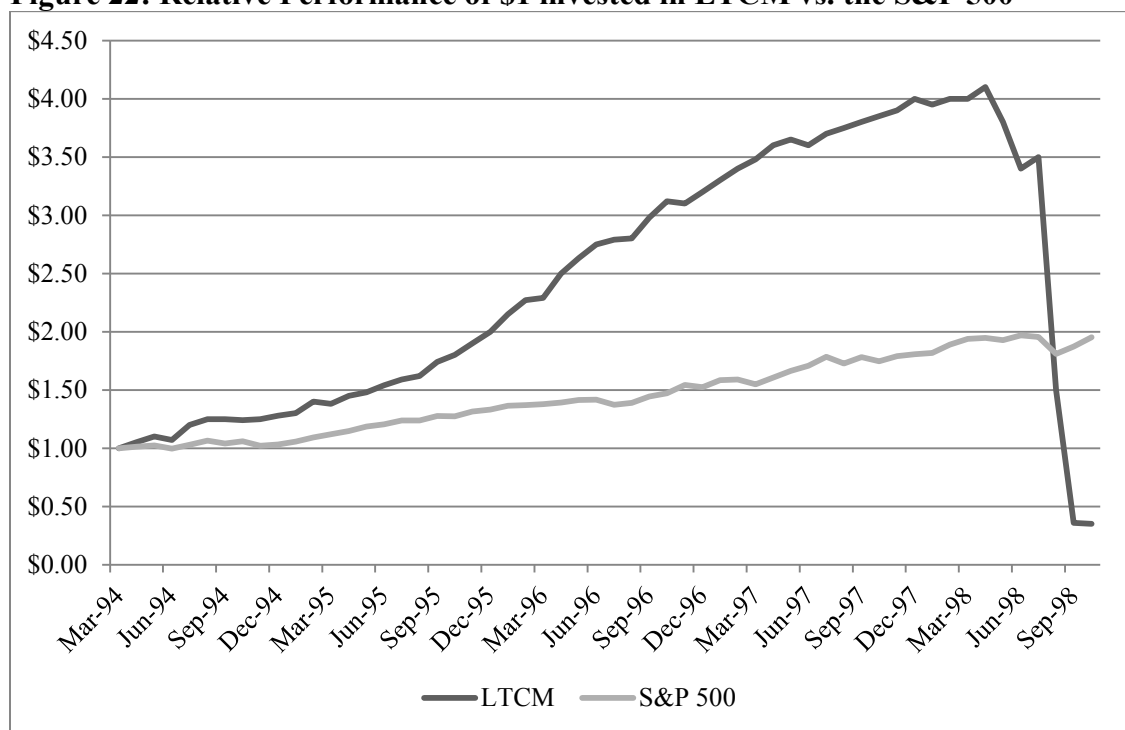
seasoned Wall Street veterans and leading financial economists to recruit LTCM's investment professionals, including numerous Nobel Prize laureates and many of his former colleagues at Salomon. LTCM's primary investment strategy was "fixed income arbitrage," or the simultaneous buying and selling of assets to take advantage of momentary price differences across different markets. LTCM's strategy was not pure arbitrage per se; rather, its trades usually involved assets that were nearly identical (such as an off-the-run twenty-nine and a half year vintage Treasury bond and its on-the-run, thirty-year, counterpart). LTCM based its trading strategy on ergodicity, or the assumption that historical price relationships determined long-run equilibrium asset prices. When securities prices deviated from their historical trends, LTCM's traders piled into the market, making highly levered bets that asset prices would self-correct back to their equilibrium value. When prices normalized, LTCM's leverage allowed it to earn many times its initial investment. At one point, LTCM had a leverage ratio of approximately one hundred to one.

For the first few years of its existence, LTCM was successful. By 1996, LTCM had more assets than two investment banks, Lehman Brothers and Morgan Stanley, and was four-times bigger than the world's next-largest hedge fund. At the end of 1997, LTCM's traders brimmed with confidence in their ability to make above-market returns in what they viewed as relatively efficient markets, and their phenomenal growth caused Meriwether and his partners to engage in ever-riskier transactions in theretofore under-traded asset classes, such as merger arbitrage in public equity markets.

By summer 1998, however, LTCM's fortunes began to turn. In August 1998, Russia defaulted on its debt, which led to a flight to quality in bond markets, causing

risky bond prices to fall and Treasury bond prices to rise. LTCM was caught on the wrong side of this market stampede: having made levered bets against Treasuries to accumulate large holdings of risky bonds, LTCM's losses ballooned. On August 21 alone, the firm lost \$550 million.²⁵²

Figure 22: Relative Performance of \$1 invested in LTCM vs. the S&P 500



Source: Lowenstein, *When Genius Failed*; Yahoo™ Finance

Normally, the failure of an unlevered hedge fund does not make waves in financial markets. However, because of LTCM's high leverage ratio, almost every bank on Wall Street had exposure to the fund. Regulators feared that if LTCM went bankrupt, it could lead to cascading losses and bank runs against LTCM's counterparties. By September 1998, it became clear that LTCM had become a systemic risk to the global economy. Fearful of what a disorderly bankruptcy of LTCM might mean for the stability

²⁵² This summary of LTCM is based off of Roger Lowenstein's book, *When Genius Failed: The Rise and Fall of Long-Term Capital Management* (Lowenstein 2000).

of the global financial system, the Federal Reserve Bank of New York (FRBNY) organized a consortium of banks to recapitalize LTCM by employing “moral suasion”²⁵³ to convince LTCM’s main creditors that a private sector bailout of LTCM would be preferable to a disorderly bankruptcy of the fund.²⁵⁴ The bailout consortium infused roughly \$3.5 billion into LTCM and bought out its remaining assets. When markets stabilized, most of LTCM’s counterparties sold their positions for small profits. Since then, the episode has been seen as a success for taxpayers, since the Fed did not risk its own capital and nevertheless succeeded in avoiding a chaotic unwinding of LTCM.²⁵⁵

In defense of the Fed’s involvement, Fed Chairman Alan Greenspan echoed the language that his successor, Ben Bernanke, would often use to defend the Fed’s bank bailouts during the global financial crisis. Greenspan testified to Congress that the Fed judged that it was far better for all parties, including LTCM’s creditors and the broader economy, to “engender...an orderly resolution rather than let the firm go into disorderly fire-sale liquidation following a set of cascading cross defaults.”²⁵⁶ New York Fed President Richard McDonough affirmed Greenspan’s sentiment, and claimed “the American people would suffer in a way that is not appropriate for them to suffer if LTCM

²⁵³ (Investopedia n.d.) i.e. persuasion to convince banks to go along with Fed policy

²⁵⁴ One historical footnote from the episode was that a consortium of investors, led by Warren Buffett, Goldman Sachs, and insurance giant AIG offered a bid for LTCM without any Fed involvement, though it was widely known at the time that LTCM’s principals viewed the offer as considerably lower than the Fund’s value. Dowd speculates that had the Fed not gotten involved in the negotiations, LTCM would have had no choice but to accept Buffett’s offer. For more, see (Dowd 1999)

²⁵⁵ (Lowenstein 2000)

²⁵⁶ (Greenspan 1998) As Greenspan continued, “...of course, any time that there is a public involvement that softens the blow of private-sector losses – even as obliquely as in this episode – the issue of moral hazard arises...Over time, economic efficiency will be impaired as some uneconomic investments are undertaken under the implicit assumption that possible losses may be borne by the government.”

[had] failed.” McDonough also conjectured that LTCM would have failed had it not been for the Fed’s involvement in orchestrating the bailout consortium.²⁵⁷

The significance of LTCM, in light of the 2008 financial crisis, cannot be overstated. LTCM’s problems – its excessive leverage, its over-reliance on sophisticated risk-management technologies like value-at-risk (VaR), its susceptibility to creditor panics, and its traders’ supreme belief in the ergodicity of market prices – were universal pathologies exhibited by America’s financial institutions throughout the 2000s. Moreover, the Fed’s ad-hoc approach to LTCM foreshadowed the regular weekend meetings at the New York Fed that took place throughout fall 2008.

Although it is impossible to know for certain, many commentators, such as economist Tyler Cowen, argued that LTCM’s bailout created the expectation among creditors that their imprudent lending to feckless counterparties such as LTCM would be rewarded with bailouts. Cowen lamented that “1998 should have been the time to send a credible warning that bad loans to overleveraged institutions would mean losses, and that neither the Fed nor the Treasury would make these losses good.”²⁵⁸ Instead, regulators demurred, and fomented the market’s moral hazard that culminated in the 2008 global financial crisis ten years after LTCM.

By organizing LTCM’s creditor-led bailout, the Fed showed that it was willing to use its clout among financial institutions to narrate, cajole, and persuade private companies to aid its goals of financial market stability. Implicit in their involvement in LTCM was the Fed’s belief that the economic costs of inaction (e.g. a domino effect of

²⁵⁷ (Haubrich 2007) Specifically, McDonough claimed that “in the absence of any involvement by the Federal Reserve Bank of New York... Long-Term Capital would have collapsed.”

²⁵⁸ (Cowen 2008)

defaults and financial contagion if LTCM were to have failed) exceed the benefits of exercising forbearance and allowing markets to clear on their own devices (in a “disorderly” fashion, as Greenspan described it). LTCM thus marked the beginning of the market’s conventional expectation that the Fed would serve as a liquidity provider of last resort in financial markets whenever systemically important financial institutions posed a systemic risk to the U.S. financial system.

Early Signs of Trouble

Despite the exigency and suspense of LTCM’s bailout in 1998, the episode had faded to the recesses of the market’s collective memory eight years later. 2006 was a banner year for financial institutions, and again, Wall Street’s risk takers received the same praise that the media heaped on John Meriwether and his traders a decade prior. Traders and bankers, only a few years removed from school, earned seven-figure bonuses, while the real economy enjoyed the fruits of a widespread economic expansion.²⁵⁹ Yet beneath this placid veneer, several developments were underway that would threaten the solvency of the entire U.S. financial system.

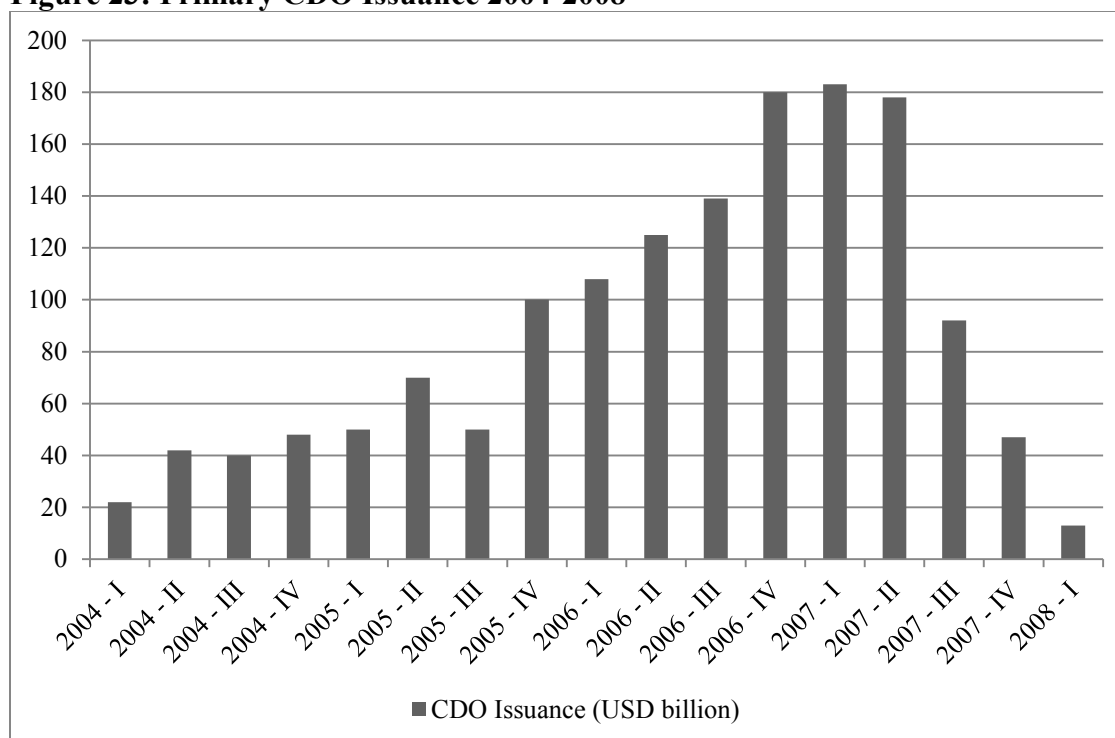
By 2006, signs emerged that the housing market was beginning to cool, while rising interest rates caused ARM monthly payments to rise, increasing the likelihood of default among the riskiest mortgage holders. By 2007, home prices in the most buoyant real estate markets fell, with the hardest hit markets in the so called “sand states” of Arizona, California, Florida, and Nevada.²⁶⁰ At the start of the fourth quarter 2007, subprime mortgage origination fell to \$13 billion, down from \$75 billion in the second

²⁵⁹ (Anderson 2006)

²⁶⁰ (The Financial Crisis Inquiry Commission 2011, 213-215)

quarter of the same year. CDO origination also fell, from \$183 billion in the first quarter of 2007, to \$47 billion in the fourth quarter.

Figure 23: Primary CDO Issuance 2004-2008

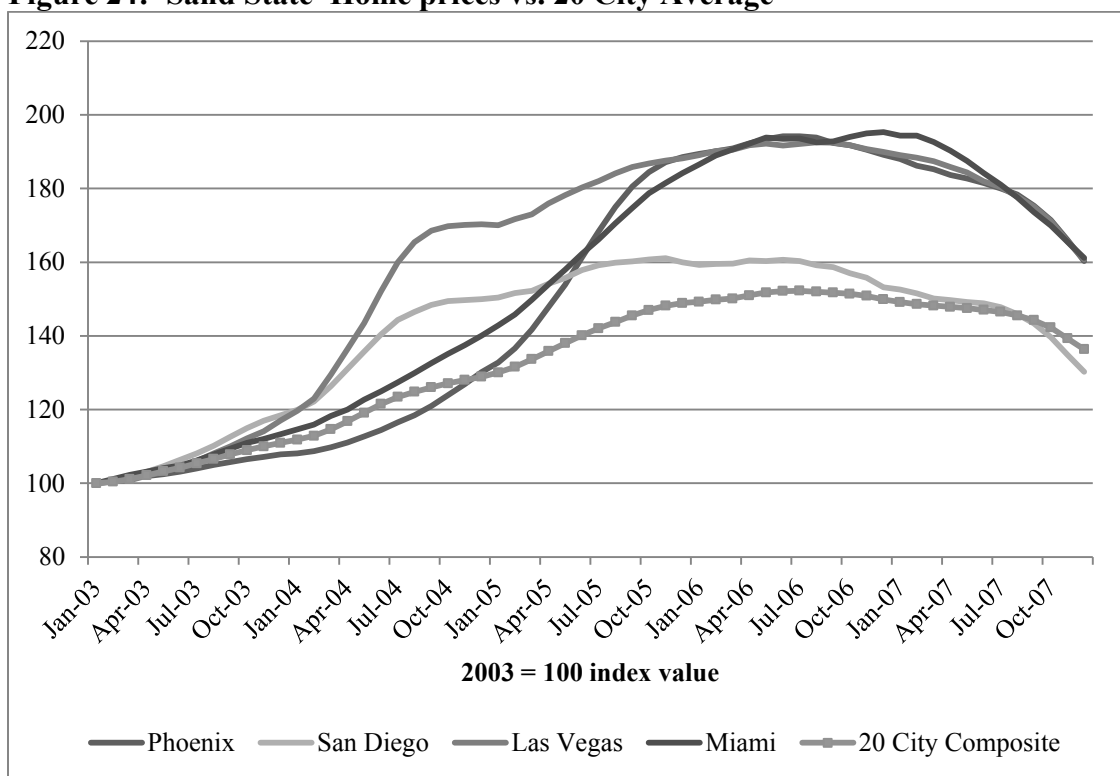


Source: Asset-Backed Alert

Table 3: Falling Home Prices (Peak-to-trough)

Municipality	Home Price Decline	Municipality	Home Price Decline
Las Vegas	-62%	Atlanta	-40%
Phoenix	-56%	Chicago	-39%
Miami	-51%	Portland	-39%
Detroit	-49%	Minneapolis	-38%
Tampa	-48%	New York	-32%
Los Angeles	-47%	Cleveland	-24%
San Francisco	-46%	Charlotte	-21%
San Diego	-42%	Boston	-20%
Washington	-42%	Denver	-14%
Seattle	-40%	Dallas	-11%
20 City Composite Average		-35%	

Source: Standard & Poor's

Figure 24: 'Sand State' Home prices vs. 20 City Average

Source: Standard & Poor's

With housing prices falling and mortgage default rates rising, the big three CRAs downgraded swaths of high grade MBS and CDOs. In July 2007, Moody's downgraded nearly four hundred subprime MBS. Banks booked large mark-to-market write-downs in their mortgage portfolios, which caused interest rates to rise in wholesale funding markets.²⁶¹ Banks in the U.S. and in Europe booked losses in their ABS portfolios, illustrating how shadow banking and securitization was a double-edged sword: in theory, it technologies the allocation of capital to its most productive uses; in practice, they created a transmission mechanism of financial instability among disparate financial geographies.

²⁶¹ (The Financial Crisis Inquiry Commission 2011, 223)

Thus, one of the first victims of the U.S. housing bubble was Germany's IKB Deutsche Industriebank AG, which, like many of its American counterparts, borrowed in the ABCP market to finance its purchases of MBS.²⁶² As home prices fell and default rates rose, IKB's shadow banking counterparties started to fear IKB's ABS exposure, leading to a run against IKB and causing and IKB's biggest owner, KfW Bankengruppe, to bail out IKB at a considerable loss.

Figure 25: The Run on IKB



Source: Yahoo™ Finance

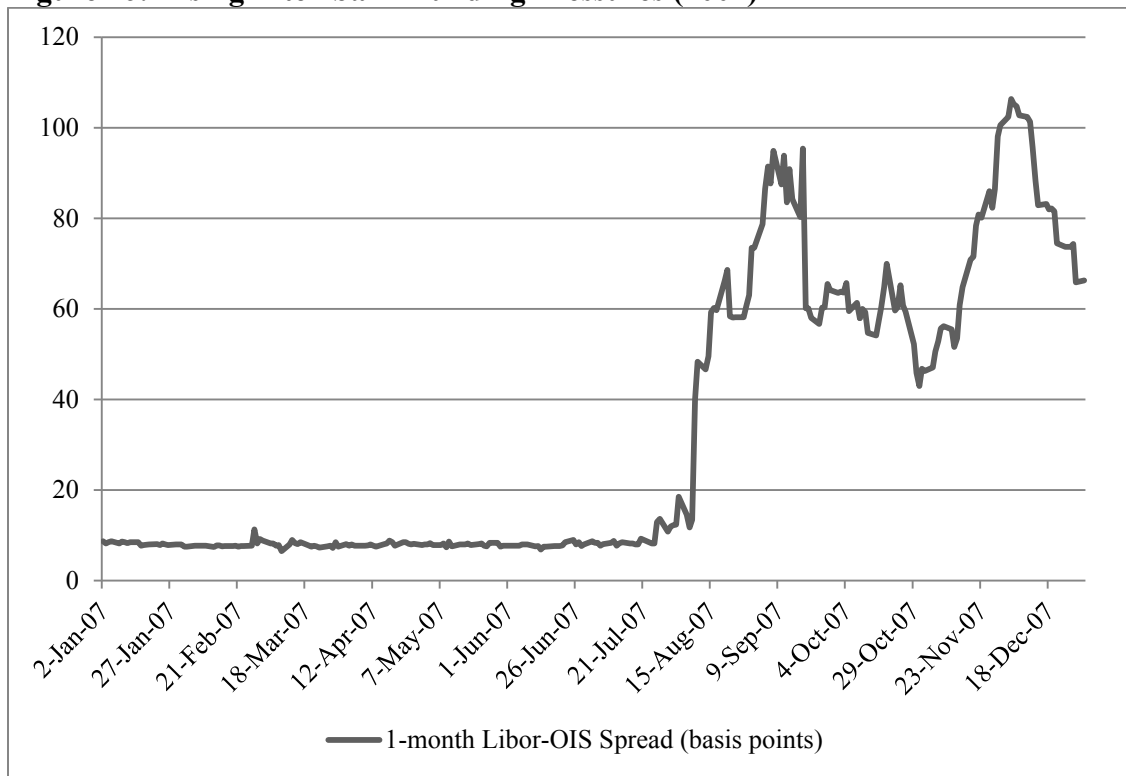
Other firms in the U.S. faced comparable pressures. In August 2007, Countrywide Financial, a mortgage broker, experienced a buyers' strike in the commercial paper market and sold itself to Bank of America. Throughout fall 2007, America's largest financial institutions booked billions of dollars of losses in their mortgage portfolios:

²⁶² These assets included Goldman Sachs' ill-fated Abacus 2007-AC1 deal, a synthetic CDO that led to a lawsuit against Goldman by the Securities and Exchange Commission in 2010.

Citigroup and Merrill Lynch each lost roughly \$24 billion, while Bank of America and Morgan Stanley lost nearly \$10 billion each. The most exposed financial institutions, such as Bear Stearns and Lehman Brothers, saw their credit default swap insurance prices rise. At the end of 2007, it cost an investor \$176,000 to insure \$10 million of Bear Stearns' debt, compared to just \$68,000 for the ostensibly less risky Goldman Sachs.²⁶³ Risk among financial institutions remained high for the rest of the year. The one-month dollar Libor-OIS spread, a common measure of bank counterparty risk, shot up in summer 2007 and stayed elevated, as fears about collateral quality caused funding stress in interbank lending markets. Even though fixed income market confidence took a hit during this period, U.S. equity markets told a different story altogether. In October 2007, the Dow Jones Industrial Average reached an all-time high, even as numerous banks scrambled to raise capital and interbank funding markets remained stressed.

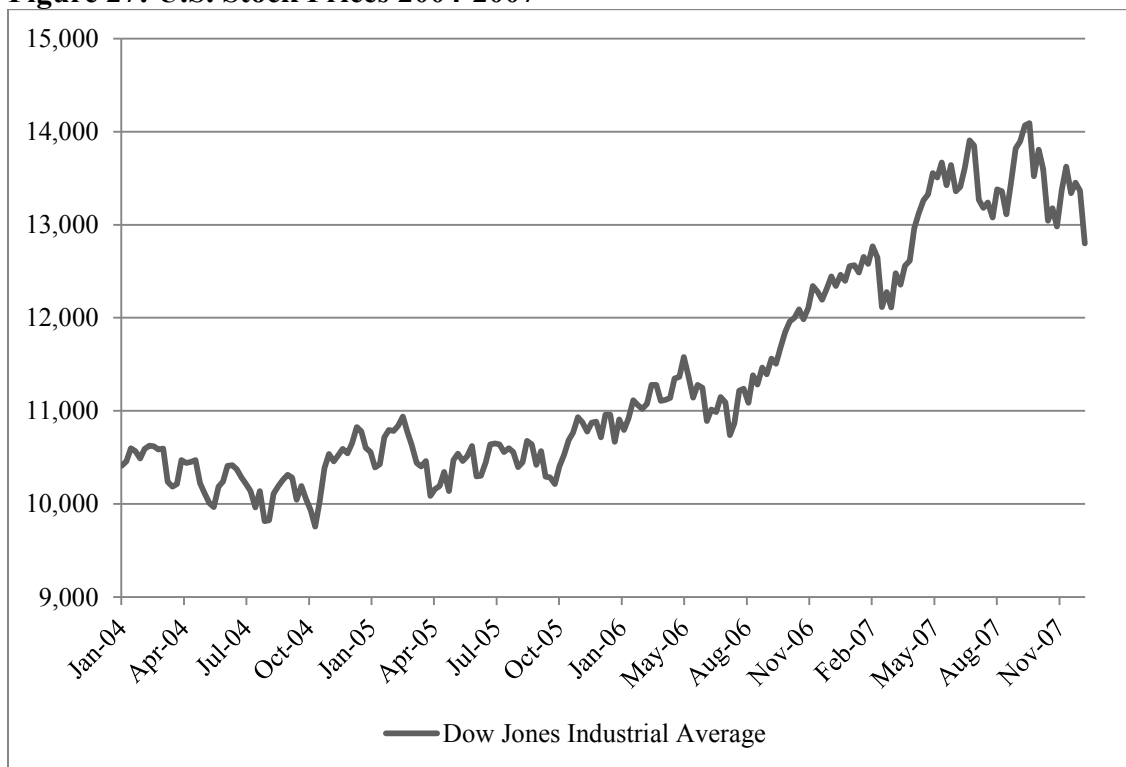
²⁶³ (The Financial Crisis Inquiry Commission 2011, 256)

Figure 26: Rising Inter-bank Funding Pressures (2007)



Source: Bloomberg™

Figure 27: U.S. Stock Prices 2004-2007



Source: Yahoo™ Finance

Despite these early signs of financial distress, most regulators seemed to believe that the fallout of the deflating housing bubble did not threaten financial stability or the real economy. Federal Reserve Chairman Ben Bernanke averred that “the impact on the broader economy and financial markets of the problems in the subprime market seems likely to be contained.”²⁶⁴ Treasury Secretary Hank Paulson echoed Bernanke’s rosy view, arguing that “from the standpoint of the overall economy... [The crisis] appears to be contained.”²⁶⁵ To both Bernanke and Paulson, 2007 marked the beginning of what Gary Gorton termed the “subprime” phase of the global financial crisis, during which regulators believed that private markets could absorb the mortgage-related losses without spillover risks to the global financial system.²⁶⁶

The Bailout and Sale of Bear Stearns

Events soon belied Bernanke and Paulson’s sanguine view of the crisis when investment bank Bear Stearns experienced a shadow banking panic in March 2008. Bear Stearns’ issues largely mimicked LTCM’s ten years earlier: Bear Stearns made highly levered bets on the U.S. housing market via ABS funded by ABCP and repo through two internal hedge funds. When housing prices fell and collateral prices collapsed, Bear Stearns’ creditors feared for a total loss of their initial investment. Bear Stearns’ counterparties boycotted the firm, demanding greater repo haircuts and higher interest rates, leading to a bank run that culminated in Bear Stearns’ sale to J.P. Morgan for \$2 a

²⁶⁴ (Bernanke 2007)

²⁶⁵ (Gross 2007)

²⁶⁶ (Gorton 2010)

share. The main difference between LTCM and Bear was in the latter case, the Fed risked its own capital to backstop a private deal to save a troubled financial institution.

Like most broker-dealers during the 2000s, Bear Stearns geared its business toward capturing capital gains and management fees associated with the booming housing market. Mortgage securitization accounted for 45% of Bear Stearns' revenue, and Bear had the second-largest prime brokerage business on Wall Street, which involves lending and brokering trades with hedge funds, many of whom traded ABS through Bear. Even though it was the smallest of the five biggest investment banks, Bear Stearns was a top three underwriter of private label MBS from 2000-2007, and it was a big buyer of ABS as well, sponsoring several in-house hedge funds to invest in real estate assets financed with short-term borrowing in the ABCP and repo markets. During the boom, Bear's strategy paid off – from 2001-2006, Bear Stearns' stock price tripled based on earnings from securitization fees and capital gains in the real estate market.

However, by June 2007, with mortgage prices falling, Bear Stearns had to refuse redemptions from its High-Grade Structured Credit Strategies Enhanced Leverage Fund, which was an internal hedge fund that, as its name implied, invested in highly rated ABS financed by short-term borrowing. In July, Bear Stearns liquidated two of its largest internal hedge funds. Despite these evasive maneuvers, by November 2007, Bear Stearns still had a leverage ratio of thirty-eight to one, with a bulk of its loan portfolio tied up in risky ABS.²⁶⁷ As the crisis spread, Bear Stearns booked losses on its mortgage holdings, which hit the firm's earnings and further depressed Bear's stock price. Facing mounting losses and downgrades from the rating agencies, Bear scrambled for capital but could not

²⁶⁷ (The Financial Crisis Inquiry Commission 2011, 280-281)

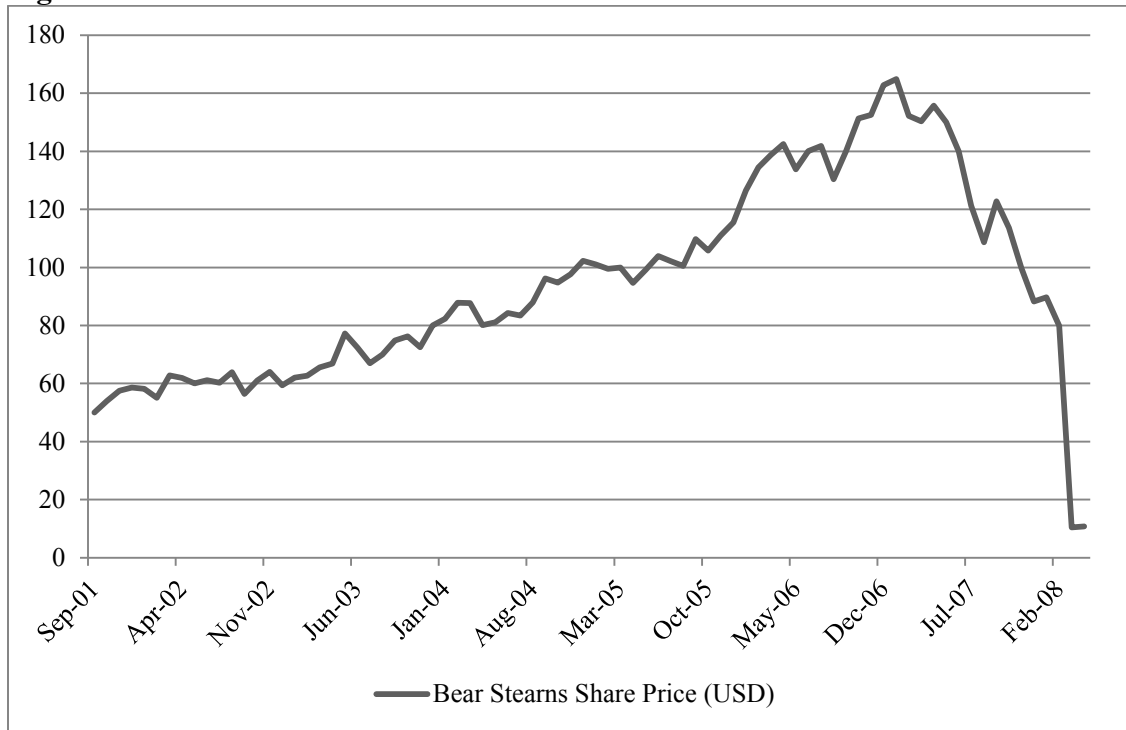
keep up with its deteriorating collateral quality and growing ABCP and repo redemptions.²⁶⁸

When Moody's downgraded fifteen Bear Stearns-issued MBS, this news sent Bear into a death spiral: market headlines read "Moody's downgrades Bear Stearns," which, while technically untrue, was enough to ignite a full-blown creditor panic against Bear Stearns. Bear's reliance on short-term borrowing and its large prime brokerage business – a business that boosted Bear's profitability during the boom years – turned into points of vulnerability that destroyed the company. Hedge funds stopped trading through Bear Stearns, closing their prime brokerage accounts and further exacerbating Bear's dire cash position. ABCP and repo counterparties refused to roll over Bear's maturing obligations, demanding higher repo haircuts and more collateral to continue doing business with the firm.²⁶⁹

²⁶⁸ (Federal Reserve Bank of St. Louis n.d.)

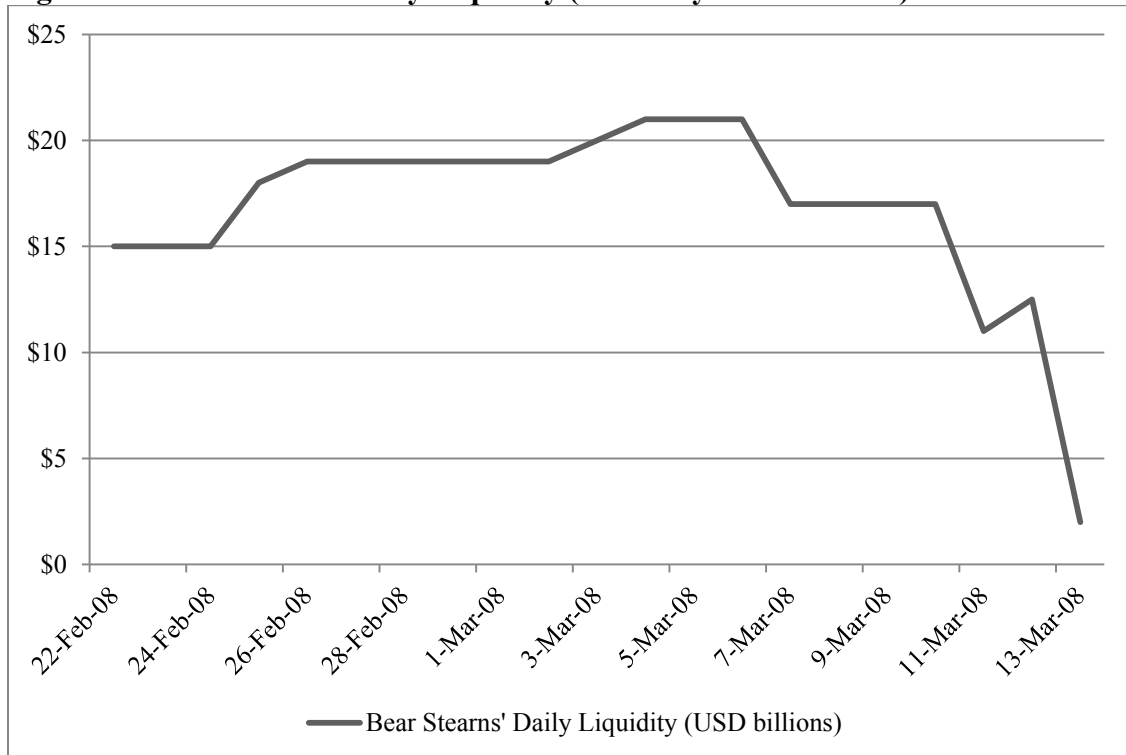
²⁶⁹ (Fleming, Hrungrung and Keane 2009)

Figure 28: Bear Stearns' Stock Price



Source: Factset™

Figure 29: Bear Stearns' Daily Liquidity (February - March 2008)



Source: The Financial Crisis Inquiry Commission

With Bear Stearns entering terminal decline and recognizing that Bear Stearns' disorderly bankruptcy would be a considerable blow to investor confidence in global capital markets, the Federal Reserve and Treasury organized another weekend meeting at the Federal Reserve Bank of New York to discuss Bear's future on March 15, 2008. Negotiating with rival J.P. Morgan, Bear Stearns agreed to sell itself for \$2 a share (a figure that was later raised to \$10 a share at the behest of Bear Stearns' board of directors). J.P. Morgan financed its purchase with \$1.15 billion of its own capital and a \$28.82 billion loan from the New York Fed in a structure called "Maiden Lane," designed to get the bad assets off Bear's balance sheet before being sold to J.P. Morgan.²⁷⁰ Roughly half of Maiden Lane's thirty billion dollars in capital was used to purchase mortgage assets directly from Bear Stearns.²⁷¹

Table 4: Maiden Lane's Capital Structure

Assets	Liabilities
Residential Loan Trust Certificates Commercial Loan Trust Certificates Securities Derivatives	FRBNY Senior Loan \$28.82 Bn. J.P. Morgan Subordinated Loan \$1.15 Bn.

Source: Federal Reserve Bank of New York

²⁷⁰ (The Financial Crisis Inquiry Commission 2011, 290)

²⁷¹ (Federal Reserve Bank of New York n.d.)

Table 5: Maiden Lane Asset Composition

Assets	Asset Composition by Fair Value (December 2008, USD billions)
Agency MBS	13.6
Non-Agency RMBS	1.8
Commercial Loans	5.6
Residential Loans	0.9
Derivatives	2.5
Other Investments	3.4
Cash & Cash Investments	2.5
Other Assets and Liabilities	-4.6

Source: Federal Reserve Bank of New York

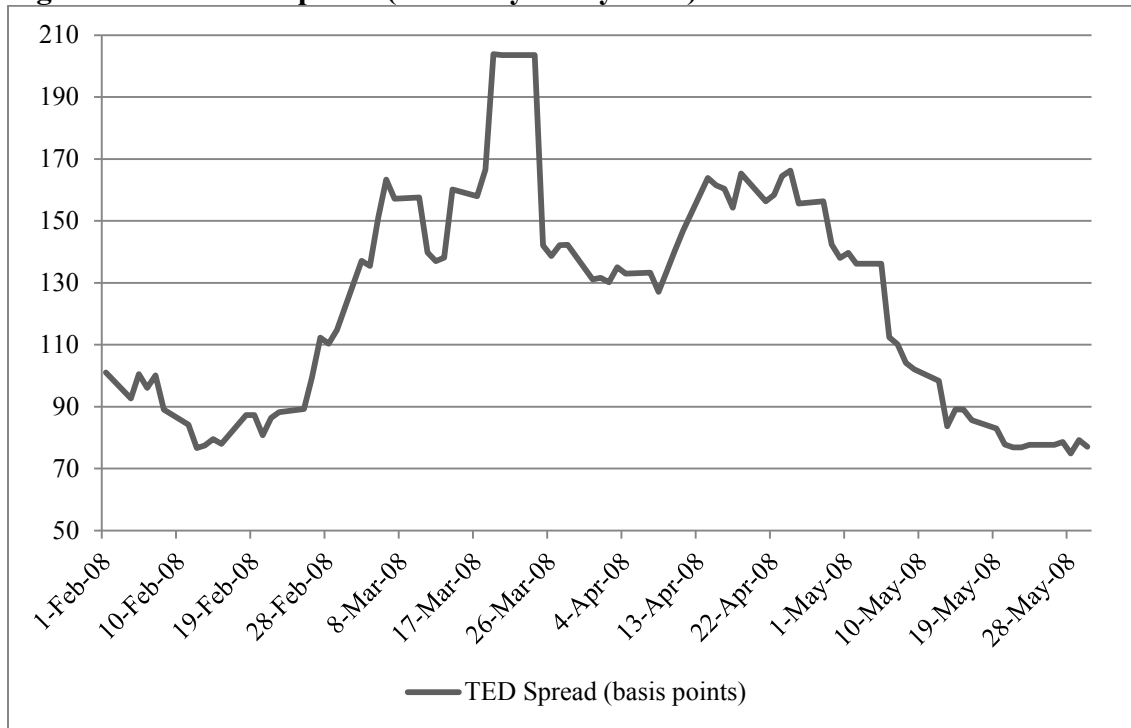
Although some of the names had changed, the story of Bear was largely the same as LTCM: again, the Federal Reserve intervened in financial markets to avoid the disorderly bankruptcy of systemically important financial institution. This time, however, the Fed used its own funds to finance a private transaction to save a bank. In defending the Fed's bailout of Bear Stearns to Congress, Bernanke echoed Greenspan's defense of LTCM, claiming that "the adverse impact of a [Bear Stearns'] default would not have been confined to the financial system but would have been felt broadly in the real economy through its effects on asset values and credit availability."²⁷² In both cases, Chairmen Greenspan and Bernanke testified that allowing the firms to fail would have had significant negative externalities across the financial system and in the real economy. Indeed, Bear Stearns and LTCM were too inter-connected to fail, and a disorderly bankruptcy of Bear Stearns could have led to tremendous turmoil in global capital markets.

²⁷² (B. S. Bernanke 2008b)

Bear's bailout stabilized interbank lending, at least for a while. A popular metric of interbank credit risk, the Ted spread, which measures the difference between three-month dollar LIBOR and the three-month Treasury bill rates, rose to two hundred basis points during the Bear Stearns episode, and immediately fell seventy basis points after the announcement of Bear's sale to J.P. Morgan. Investment bank CDS spreads also tightened after Bear's bailout, demonstrating the palliative effect of Fed involvement on counterparty fears about the solvency of financial institutions. On the Friday before Bear Stearns' bailout, it cost an investor \$300,000 and \$240,000 to insure \$10 million worth of Morgan Stanley and Goldman Sachs' senior debt, respectively. By the end of May 2008, these insurance prices fell to \$150,000 and \$86,000.²⁷³ It was the certainty about Bear's solvency, coupled regulators' commitment to backstopping private deals to save troubled financial institutions, that was responsible for the market's improved confidence in systemically important financial institutions.

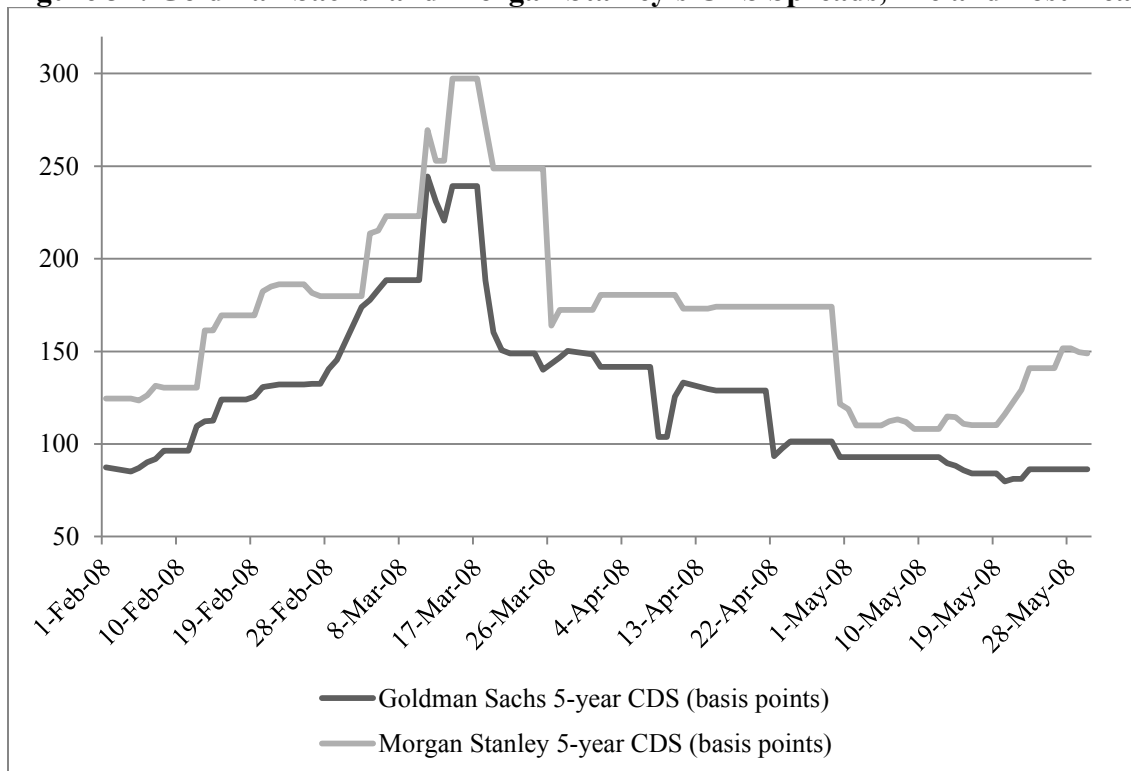
²⁷³ (B. S. Bernanke 2012)

Figure 30: The Ted Spread (February - May 2008)



Source: Bloomberg™

Figure 31: Goldman Sachs' and Morgan Stanley's CDS Spreads, Pre and Post-Bear



Source: Bloomberg™

What is the significance of Bear Stearns for this dissertation’s conventions-based theoretical framework on financial instability? There are three takeaways.

First, the most important consequence of Bear Stearns’ bailout was the establishment of an expectation among market participants that the Fed and Treasury were willing to go “all the way” to risk taxpayer dollars to avoid a chaotic unwinding of a systemically important financial institution. The Financial Crisis Inquiry Commission (FCIC) found that “the Bear episode...*set a precedent* for extraordinary government intervention” in financial markets.²⁷⁴ Several traders interviewed for this dissertation corroborated the FCIC’s findings. A structured credit trader at one of Bear Stearns’ peer investment banks claimed that Bear’s bailout created a “precedent” for other financial institutions by telling the market that the government would “step in and prop up financial institutions” when needed.²⁷⁵ According to a currency trader whose New York-based commercial bank served as a major counterparty to Bear Stearns, Bear’s bailout created an “implicit understanding that banks would not go bankrupt.” The currency trader also recalled that ABCP and repo traders expressed to him that Bear’s bailout convinced them “there was an implicit safety net that large financial institutions would not fail.” The trader remarked that in the minds of market participants, Bear Stearns became the baseline “worst case scenario for any bank,” and that larger firms, if they experienced similar trouble, would receive comparable treatment from regulators.²⁷⁶ Alan

²⁷⁴ (The Financial Crisis Inquiry Commission 2011, 292). Emphasis added.

²⁷⁵ (Structured credit trader 2013)

²⁷⁶ (Foreign exchange trader 2013) This *conventional expectation* that regulators would serve as *liquidity providers of last resort in shadow banking markets* would be reinforced by the nationalization of the government-sponsored enterprises, Fannie Mae and Freddie Mac, though it would ultimately get eviscerated by regulators’ decision to allow Lehman Brothers to go bankrupt.

Greenspan echoed these traders' views, telling ABC's *This Week* talk show that "when Bear Stearns was bailed out, it drew a line under that level of firm, implying that anything that was larger than that firm was capable of getting federal assistance."²⁷⁷ In the minds of ABCP and repo counterparties, the Fed had become, via LTCM and Bear, a *de facto* liquidity provider of last resort in financial markets.

Second, Bear's failure highlights the causal importance of stable conventional expectations in determining the liquidity of shadow banking conduits. As discussed in the preceding chapter, many large, interconnected bank and non-bank financial institutions, such as investment banks, commercial banks, insurance companies, among others, sponsored "structured investment vehicles" (SIVs) that issued ABCP and repo to finance purchases of risky ABS. SIVs carried two types of risks: credit risk, or the probability of defaults in their ABS portfolios, and roll over risk, or the risk that ABCP and repo counterparties would demand greater collateral or outright refuse to refinance SIVs' maturing obligations. During the crisis, these risks were inter-related: facing a maturity mismatch between short-term liabilities and long-term assets, banks were vulnerable to disruptions in the supply of interbank credit triggered by waning investor confidence on the back of collapsing collateral values. In the wholesale funding markets, rumors of insolvency become self-fulfilling prophecies, wherein the market restricts credit to shadow banking conduits based on fears of insolvency, thus creating the very funding problem that the market feared in the first place. This self-fulfilling, or reflexive, dynamic of market confidence and bank solvency precipitated Bear Stearns' and sale in March

²⁷⁷ (Zumbrun 2008)

2008.²⁷⁸ Bear Stearns' swift demise shows that using short-term, unsecured liabilities to accumulate long-term, risky assets is akin to "picking up nickels in front of a steam roller," insofar as basing banks' long-term solvency on the caprice of investors left banks vulnerable to liquidity risk in the wholesale funding markets.²⁷⁹ When Bear's collateral prices fell because of falling home prices and rising mortgage delinquencies, ABCP and repo investors demanded higher collateral (in the forms of higher yields and greater repo "haircuts") to roll over Bear's maturing obligations. When investors denied Bear Stearns commercial paper and repo market access, Bear Stearns' liquidity position deteriorated in a matter of days, leading to its failure.²⁸⁰

The speed by which Bear Stearns' creditors and depositors pulled their funds from the company also illustrates an important point about confidence in financial markets. Bear Stearns' failure shows how confidence in financial markets is determined not on an atomistic calculation on behalf of a shadow banking counterparty qua debtors, but by the market's *conventional expectations* regarding second and third-order guesses about fellow investors' intentions. If creditors believe that a borrower will remain liquid and that *fellow market participants* hold similar beliefs, then speculative financing arrangements (in the Minsky sense) will remain liquid. If an individual investor believes that the rest of the market will continue to roll over maturing ABCP and repo obligations of a SIV-sponsoring financial institution, then he too will continue to roll over banks' maturing ABCP and repo. If, on the other hand, an investor believes that fellow market

²⁷⁸ (Jablecki and Machaj 2011)

²⁷⁹ (Duarte and Longstaff 2007)

²⁸⁰ (Gorton and Metrick 2010b) Gary Gorton claims that this dynamic is fundamentally similar to a traditional bank run, only in the shadow banking market, it is wholesale lenders demanding their deposits, as opposed to retail depositors.

participants believe that a bank might face funding pressures, then it might be rational to withdraw funds from shadow banking conduits, even without a material change in the ability of SIVs to meet their obligations out of their investment income. Note here how the so-called “material fundamentals” of the SIVs’ collateral quality is a secondary consideration to whether fellow counterparties will continue rolling over SIV conduit liabilities. Bear Stearns built its reputation over decades of steady returns and reliable advice to clients. Once the run on the bank was on, and once market confidence yielded to investor fears over Bear Stearns’ insolvency, it was only a matter of days before Bear Stearns ran out of cash.

Third, Bear’s failure also illustrates an important point about credit ratings as both enablers of pro-cyclical credit creation and triggers of financial distress. This dissertation argues that bond ratings represent institutionalized conventions of expert opinion that provide investors with a common benchmark of comparing risk across many issuers. In theory, ratings were passive reflections of the likelihood of default of securities, such that the probability of default of a triple-A rated municipal bond issuer was the same as a triple-A rated mortgage-backed security. In practice, ratings were endogenous drivers of outcomes in financial markets, rather than passive abstractions of assets’ material fundamentals.

Consider how ratings became *amplifiers* of pro-cyclical capital flows into ABS prior to global financial crisis. High ratings for ABS had a constitutive effect on securities prices by allowing risk-averse pools of capital to invest in highly-rated, higher-yielding asset classes via ABCP and repo conduits. Since many money market mutual funds were legally prohibited from investing in ABCP and repos that were backed by

risky collateral, high ratings allowed financial institutions to tap into a deep reservoir of risk-averse capital to finance their purchases of risky assets via SIV conduits. Likewise, banks' access to these wholesale funding markets (enabled by high ratings for their SIV collateral) led to higher demand for ABS and lower ABS yields, thus validating the perceived truth-value of ratings. In the short run, high ratings were self-stabilizing and reified the very creditworthiness that they were meant to reflect. Favorable bond ratings also sowed financial fragility that ended up rendering large swaths of the global financial system insolvent when housing prices fell. Also, many financial institutions used high ratings to justify their thin capital cushions to regulators, so high ratings allowed banks to make more loans, further fueling the credit availability in risky asset classes. To paraphrase Donald Mackenzie, ratings became "engines" that "drove" market prices, rather than being passive reflections of securities' underlying value. This is the essence of how economic conventions stabilize markets, where convention institutionalization leads to initial positive feedback, thereby legitimizing the perceived truth-value of economic conventions in the short term.²⁸¹

Even though institutionalized conventions lead to self-stabilizing market outcomes in the short run, bond ratings' increased institutionalization also predicated broader market stability on the continued reliability of ratings as ultimate arbiters of value in financial markets. Bear Stearns benefitted from high mortgage bond ratings and the ability to set their own internal ratings for capital adequacy during the boom years, but suffered when the rating agencies downgraded the MBS held on their balance sheet during the crash. Moody's decision to downgrade several Bear Stearns-issued MBS sent

²⁸¹ (MacKenzie 2008)

the firm into terminal decline, leading to its sale to J.P. Morgan. Ratings can thus be seen as both an amplifier of pro-cyclical capital flows into ABS and a trigger of financial market instability via downgrades. The institutionalization of ratings into investors' decision-making calculi led bond ratings themselves to become causally imbricated into market outcomes, so when rating agencies downgraded Bear Stearns' ABS, Bear Stearns' counterparties refused to roll over Bear's maturing ABCP and repo, thus precipitating the bank run that caused Bear's bailout and sale to J.P. Morgan. Bear Stearns illustrates that ratings are endogenous drivers of material change in financial markets, such that a high rating on a bond sets the market's opinion on that bond by providing a conventional, inter-subjective anchor of the security's value.²⁸²

Nationalizing Fannie and Freddie

Summer 2008 provided a brief respite from the spring's turmoil, as concerns about bank solvency ebbed, financial institutions' CDS spreads narrowed, and America's fourteen biggest financial institutions raised roughly \$140 billion in fresh capital. On March 27, 2008, the Federal Reserve created the Term Securities Lending Facility (TSLF), which allowed broker dealers and commercial banks exchange their Agency debt for U.S. Treasury bonds at par value. The Fed would later revise the terms of the TSLF, accepting all triple-A rated private label ABS. They also created the Primary Dealer Credit Facility (PDCF) to lend cash to primary dealers at interest rates comparable to those paid by commercial banks to borrow from the Fed's discount window. These programs provided banks with a liquidity lifeline should markets deny them access to fresh capital. Despite banks' initial enthusiasm for the TSLF and PDCF in the wake of

²⁸² (Abdelal and Blyth 2012, 3-4)

Bear Stearns, their use of these programs “ceased completely” by late July, according to the FCIC. Even though the Fed offered banks favorable terms via the TSLF and PCDF, banks refrained from using them out of fear that accepting the Fed’s capital would be construed as a sign of weakness by their counterparties, thus eroding the market’s confidence in their solvency.²⁸³

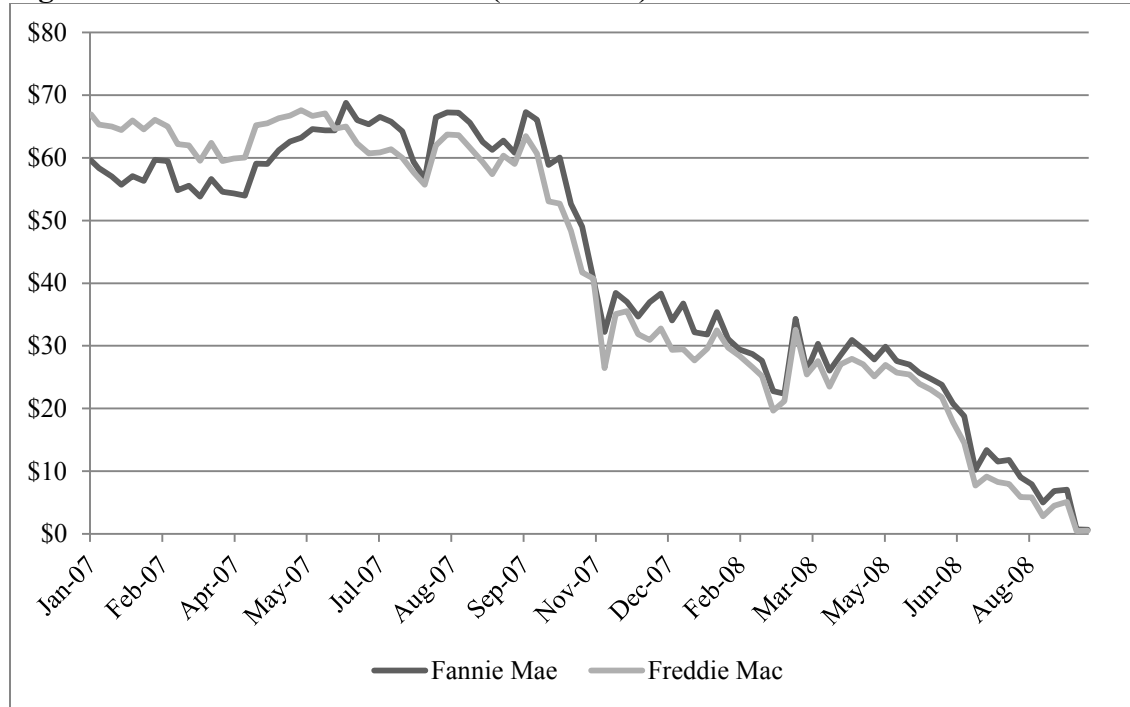
While Bear’s sale to J.P. Morgan and the Fed’s emergency lending programs were successful in restoring confidence to financial institutions, signs of stress persisted in interbank funding markets, where the Ted spread remained elevated at one hundred basis points, which was well above its pre-crisis average of thirty basis points. Additionally, the Federal Housing Agencies, Fannie Mae and Freddie Mac, saw their stock prices decline throughout the summer 2008. Fed officials and regulators knew that the Agencies had little room to maneuver when it came to falling collateral prices, and the GSEs’ primary regulator, James B. Lockhart, testified that the market’s declining confidence in the GSEs had the potential to induce a “self-fulfilling credit crisis” against the companies.

Throughout summer 2008, with mortgage prices falling, defaults rising, and the Agencies writing down large swaths of their mortgage portfolio every quarter, confidence in the two companies reached new lows. In the first half of 2007, the cost of insuring Freddie Mac’s debt was identical to the cost of insuring U.S. government debt at the same maturity, reflecting the market’s view that the GSEs’ debt was tantamount to the U.S. government’s. As fears mounted throughout 2007 and into 2008, however, the

²⁸³ (The Financial Crisis Inquiry Commission 2011, 292-295). This was one of the reasons why regulators insisted that all banks accept TARP capital infusions, much to the chagrin of healthy banks.

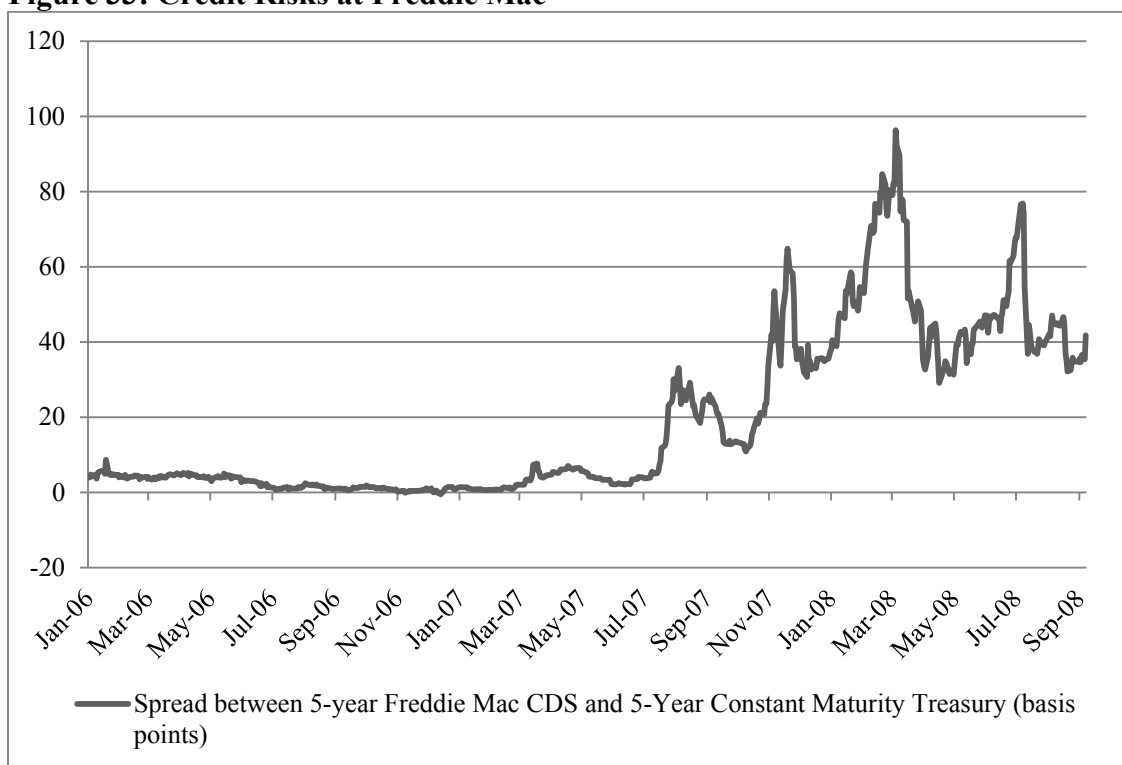
spread between Freddie Mac and U.S. Treasury's CDS contracts rose to seventy-five basis points by summer 2008.²⁸⁴

Figure 32: The GSEs' Stock Prices (2006-2008)



Source: Yahoo™ Finance

²⁸⁴ (The Financial Crisis Inquiry Commission 2011, 307-318)

Figure 33: Credit Risks at Freddie Mac

Source: Bloomberg™

Wanting to make the government’s commitment to the companies clear, Treasury Secretary Paulson requested and was granted the right by the U.S. Congress to inject capital in the GSEs and, if necessary, nationalize the nominally private corporations in July 2008.²⁸⁵ The Housing and Economic Recovery Act (HERA) provided Paulson with a self-described “bazooka” of financial firepower, authorizing the Treasury to inject capital into the GSEs and giving the Federal Housing Financing Agency (FHFA) the authority to place the companies into government conservatorship if necessary.²⁸⁶ To alleviate the firms’ funding pressures in repo markets, the Fed agreed to provide emergency, short-term liquidity to the Agencies. Paulson believed that HERA and his financial bazooka

²⁸⁵ (Labaton 2008)

²⁸⁶ (The Financial Crisis Inquiry Commission 2011, 313-316)

would provide a boon to market confidence, thus obviating the need to use his new authority as Treasury Secretary to save the firms.²⁸⁷

Despite the Treasury Secretary's leeway to do what he saw fit to manage the companies, the GSEs' stock prices continued to plummet throughout the summer. By the third quarter 2008, Fannie and Freddie had losses totaling nearly \$50 billion. Foreign central banks stopped purchasing GSE securities, while the spread between the GSEs' preferred stock and Treasuries increased roughly four-fold from June through August. Facing falling share prices, rising borrowing costs, and rising delinquency rates in their mortgage portfolios, the housing Agencies turned to the Federal government for help. In August 2008, Fannie Mae told the Treasury and the FHFA that it had no way of raising private capital to shore its capital base, given its mounting losses. Paulson and Lockhart, along with their colleagues at the Federal Reserve, decided to place the housing Agencies into government conservatorship on September 7, 2008, eight days before Lehman Brothers' bankruptcy.

When announcing the decision, Treasury Secretary Hank Paulson assured reporters that he did not make this decision lightly. Paulson argued that Fannie and Freddie were so interwoven and systemically important that a failure of the firms would be a catastrophe for financial market stability. Paulson claimed the following:

Fannie Mae and Freddie Mac are so large and so interwoven in our financial system that a failure of either of them would cause great turmoil in our financial markets here at home and around the globe. This turmoil would directly and negatively impact household wealth: from family budgets, to home values, to savings for college and retirement. A failure would affect the ability of Americans to get home loans, auto loans and other consumer credit and business finance. And a failure would be

²⁸⁷ (The Economist 2008)

harmful to economic growth and job creation. That is why we have taken these actions today.

To Paulson, nationalizing the companies was a bitter pill to swallow. The Agencies did not become over-levered financial behemoths during his two year reign as Treasury secretary, nor did nationalizing the companies comport with Paulson's ideology that was, in theory, pro-free market and Republican.²⁸⁸

Still, when faced with the choice between a disorderly unwinding of a systemically important financial institution and a bailout, Fed and Treasury officials blinked, thus reinforcing the conventional expectation set by Bear that the Federal government would serve as liquidity providers of last resort to troubled financial institutions. Former Federal Reserve Bank of New York President (and later Treasury Secretary) Timothy Geithner acknowledged as much when he told the FCIC that the housing Agencies were large sources of moral hazard in financial markets – a charge confirmed by their nationalization.²⁸⁹

Conclusion

This chapter argued the Fed and Treasury's repeated interventions in financial markets, including on behalf of hedge fund Long-Term Capital Management in 1998, investment bank Bear Stearns, and the federal housing Agencies, Fannie Mae and Freddie Mac in 2008, created a conventional expectation in financial markets that regulators would serve as liquidity providers of last resort in wholesale funding markets. Although some firms became the victims of self-fulfilling credit crises, ABCP and repo counterparty fears remained idiosyncratically isolated to specific institutions during this

²⁸⁸ (Paulson Jr. 2010, 2-6)

²⁸⁹ (Katz and Christie 2011)

period. Generalized contagion did not occur during these episodes because regulators intervened and eased credit conditions in interbank lending markets whenever a systemically important institution was on the brink of disorderly bankruptcy, thus preventing full-on bank runs against all ABCP and repo borrowers in the economy. As long as the market maintained confidence in this conventional expectation, the likelihood of system-wide bank runs in the wholesale funding markets remained low.

Even so, this convention became predicated upon the willingness of regulators to backstop troubled financial institutions. If this convention were to fail, as it did following Lehman Brothers' bankruptcy, then markets could become unstable. The following chapter presents a theoretically informed understanding about how regulators' decision to let Lehman Brothers fail initiated a period of convention uncertainty and thus financial instability in markets. It argues that Lehman's failure can be conceptualized as a non-routine deviation from agents' convention-given expectations about regulators' willingness to provide *de facto* deposit insurance to shadow banking conduits. The evisceration of this conventional expectation initiated a period of convention uncertainty in financial markets, leading to acute financial instability and adverse selection problems in financial markets.

**CHAPTER 6:
CONVENTION UNCERTAINTY, INSTABILITY,
AND INTERVENTION**

Introduction

According to the Financial Crisis Inquiry Commission, Monday, September 15, 2008 “marked the beginning of the worst market disruption in postwar American history.” Within twenty-four hours, Lehman Brothers declared bankruptcy, Bank of America consummated a shotgun takeover of investment bank Merrill Lynch, and regulators risked billions of dollars of taxpayer funds to rescue insurance giant American International Group (AIG). ABCP and repo counterparties refused to roll over financial institutions’ maturing short-term liabilities, leading to a “run on the bank” scenario in which “the entire investment banking business model came under siege,” as described by Morgan Stanley’s then-Chief Executive John Mack.²⁹⁰

The market’s reaction to the failure of Lehman Brothers was nothing short of catastrophic. In the wholesale funding market, investors withdrew their capital from ABCP and repo conduits to purchase safe havens like short-run U.S. Treasury securities. Financial institutions rationed credit and sold entire portfolios of risky assets *en masse* to meet collateral calls. Liquidity conditions in derivatives markets suffered, with investors facing wider bid-ask spreads, asset price volatility, and collapsing prices. Some markets did not trade at all.

Most analysts agree that the global financial crisis took an ominous turn after the failure of Lehman Brothers. But what explains this sudden onset of full-blown financial panic? What made the first thirteen months of the crisis so different from markets after Lehman? How did Lehman’s bankruptcy alter agents’ conventional expectations about regulators’ lender of last resort function in shadow banking markets? What was the

²⁹⁰ (The Financial Crisis Inquiry Commission 2011, 353-357)

relationship between convention uncertainty and financial instability? And what role did economic conventions play in setting the bounds on elite intervention in the economy when faced with bank runs in the commercial paper and repo markets?

This chapter presents theoretically informed answers to the above questions. It argues that Lehman Brothers' bankruptcy and subsequent financial fallout took market participants by surprise. Lehman Brothers' bankruptcy eviscerated the market's *conventional expectation* that regulators would serve as liquidity providers of last resort in wholesale funding markets. When Lehman Brothers went bankrupt, financial market participants pulled their funds from ABCP and repo conduits and purchased short-term risk-free securities, initiating a bank run in the commercial paper and repo markets. Vis-à-vis this dissertation's theoretical framework, market perceptions of regulators' ambivalence toward saving troubled financial institutions catalyzed acute convention uncertainty and thus instability in financial markets.

Letting Lehman Fail

Immediately after the failure of Bear Stearns in March 2008, regulators viewed investment bank Lehman Brothers as the “next big worry” facing financial markets.²⁹¹ Lehman Brothers, much like Bear Stearns, geared its business toward capturing rents from the inflating housing bubble and credit boom, and presided over the entire value chain of mortgage origination and securitization. Lehman owned several retail mortgage brokers, earned fees for securitizing Agency and private label mortgage-backed securities (MBS), and was a large investor in securitized assets via off-balance sheet vehicles.

²⁹¹ (The Financial Crisis Inquiry Commission 2011, 325)

In 2007, while the rest of Wall Street was scaling back their ABS exposure, Lehman Brothers doubled down on real estate. In October 2007, Lehman purchased Archstone Smith, a firm that owned and leased some 90,000 apartments across the United States. Later that year, Lehman adopted a “countercyclical growth strategy” and directed its traders to accumulate more exposure to the mortgage market. In the eyes of Lehman’s senior management, the firm was changing its business model from the “moving business,” of brokering trades for third parties, to the “storage business,” by retaining swaths of ABS in their mortgage portfolio. Lehman’s mortgage holdings ballooned from \$67 billion in 2006 to \$111 billion by the end of 2007.²⁹²

Yet as 2008 wore on, markets grew skittish about Lehman Brothers’ mortgage exposure, demanding higher premia to insure Lehman’s debt compared to its peer institutions. Investors questioned whether Lehman Brothers accurately valued its real estate investments. Lehman claimed that it had capital sufficient to cover any potential losses, though many investors, including activist shareholder David Einhorn, claimed that Lehman’s “fair value” calculations of their mortgage assets were not realistic. Einhorn told his investors that “there [was] good reason to question Lehman’s fair value calculations” and that “greater transparency” of Lehman’s mortgage holdings would “not inspire market confidence.”

Facing uncertainty over Lehman’s mortgage exposure, investors feared for the worst, demanding more collateral to continue rolling over Lehman’s maturing ABCP and repo obligations. Because Lehman depended on short-term borrowing to finance its long-term assets, regulators knew that Lehman’s fortunes hinged on the confidence of its

²⁹² (The Financial Crisis Inquiry Commission 2011, 176-177)

counterparties. The FCIC found that when “money market [mutual] funds, hedge funds, and investment banks believed Lehman’s assets were worth less than Lehman’s valuations, they would withdraw funds, demand more collateral, and curtail lending.” As a result, withdrawn short-term credit lines “could force Lehman to sell its assets at fire-sale prices, wiping out capital and liquidity virtually overnight,” since Bear Stearns “proved it could happen.” Lehman’s reluctance to revalue its mortgage assets and take credit write-downs while also refusing to reduce its reliance on short-term funding and raise capital proved toxic to Lehman’s credibility and ultimately precipitated the firm’s bankruptcy.

In June 2008, Lehman’s trading partners demanded higher collateral to trade with the firm.²⁹³ The cost of insuring Lehman Brothers’ debt rose from approximately 160 basis points in May 2008 to 350 basis points by mid-August. That summer, Lehman Brothers’ C.E.O., Richard “Dick” Fuld, requested that the Fed allow Lehman Brothers to become a bank holding company to gain access to the Fed’s discount window. However worried he might have been about Lehman Brothers, then-Federal Reserve Bank of New York President Timothy Geithner dismissed Fuld’s request as “gimmicky,” even though one week after Lehman’s bankruptcy, he afforded Morgan Stanley and Goldman Sachs this same privilege. Under pressure to raise capital and reassure investors, Dick Fuld sought a deal to shore up Lehman’s capital base, but could not agree on a fair valuation of the firm with Lehman’s suitors. After news broke that Lehman’s deal talks with Korea Development Bank soured, Lehman’s stock price crashed 55% to \$8 a share - a far cry from its pre-crisis peak above \$80 in 2007. News of the failed talks caused Lehman’s

²⁹³ (The Financial Crisis Inquiry Commission 2011, 324-328). In this context, ‘higher collateral’ implies greater repo haircuts and higher interest rates on ABCP.

creditors to demand more collateral from the firm, further depleting Lehman's dwindling cash reserves. On the Wednesday before its bankruptcy, Lehman Brothers announced a \$3.9 billion loss, and money market mutual funds like Fidelity Investments pulled their capital from the firm.²⁹⁴ According to Lehman Brothers' bankruptcy estate, Lehman ended up posting \$3.6 billion in collateral with J.P. Morgan in under the threat of withheld repo financing just days before its bankruptcy. Entering the weekend of September 13-14, 2008, regulators knew that if they could not find a buyer for Lehman that weekend, the firm would not have enough cash to finance its operations by the time Asian markets opened early Monday morning.²⁹⁵

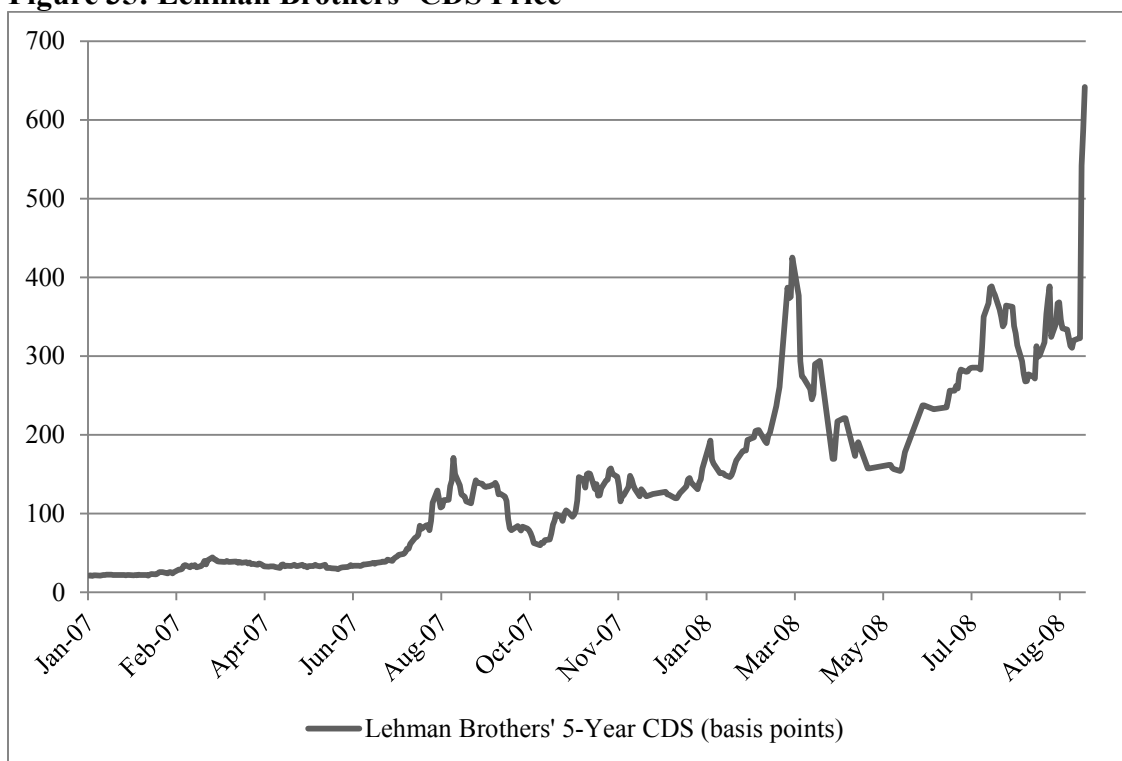
Figure 34: Lehman Brothers' Share Price



Source: FactSet™

²⁹⁴ By the Friday, September 12, just days before Lehman Brothers' bankruptcy, Fidelity had reduced its Lehman repo exposure from \$12 billion to \$2 billion.

²⁹⁵ (The Financial Crisis Inquiry Commission 2011, 312-213)

Figure 35: Lehman Brothers' CDS Price

Source: Bloomberg™

To avoid a disorderly bankruptcy of Lehman Brothers, on Friday, September 12, 2008, Treasury Secretary Hank Paulson summoned the heads of America's biggest financial institutions to the Federal Reserve Bank of New York to discuss a plan to save the firm. Going into what is known as the "Lehman weekend," regulators believed that Bank of America was Lehman's most logical suitor. However, Merrill Lynch's C.E.O., John Thain, had plans of his own. Knowing that Merrill Lynch was "next in line" should Lehman Brothers go under, he positioned his firm as Bank of America's ultimate takeover target, selling the whole firm, including its highly coveted retail brokerage business, for forty billion dollars' worth of Bank of America common stock. In doing so, the transaction dashed Lehman's hopes of being purchased by Bank of America.

Throughout the weekend deliberations, Paulson maintained that there would be no government assistance for Lehman. Some meeting participants, such as Sullivan &

Cromwell bankruptcy attorney H. Rodgin Cohen, viewed Paulson's edicts as mere posturing. According to Cohen, several bank chiefs believed that regulators were trying to play a game of "chicken" or "poker" with financial institutions to avoid having to risk taxpayer dollars to avert Lehman's bankruptcy. The FCIC confirmed Cohen's suspicion, claiming that since regulators took a great deal of political "blowback" for their Bear Stearns bailout, they had to keep the potential of Federal support for a Lehman deal under strict confidentiality. According to the United Kingdom's former Chancellor of the Exchequer, Lord Alistair Darling, Secretary Paulson told him that regulators might have been willing to give a potential Lehman buyer, Barclays investment bank, "regulatory assistance to support a transaction if it was required." Outwardly, however, Paulson maintained that banks had to arrange a private sector solution to bail out Lehman Brothers, since Federal assistance would not be forthcoming.²⁹⁶

Despite the withdrawal of Bank of America from negotiations, by Saturday evening, September 13, it appeared as though Lehman found a buyer in the British investment bank Barclays. To finance Barclays' purchase of Lehman, a private consortium of banks agreed to provide bridge financing for Lehman's forty to fifty billion dollars of mortgage assets to allow Barclays to purchase Lehman's coveted broker-dealer unit. Even though Barclays, Lehman, and U.S. regulators agreed to a deal in principle, England's Financial Services Authority (FSA) refused to exempt Barclays from their requirement for a shareholder vote for such an acquisition. The FSA said that it would sanction the deal, provided the Fed, and not Barclays, guaranteed Lehman's debts until the transaction could be completed. Paulson's team demurred, since such a guarantee

²⁹⁶ (The Financial Crisis Inquiry Commission 2011, 334)

would violate their policy of not risking taxpayer dollars to save Lehman Brothers, and would leave regulators exposed to tens of billions of dollars of bad assets should the deal fail at the last minute. The FSA's reluctance to fast-track Barclays' acquisition of Lehman, coupled with the Fed and Treasury's refusal to backstop Lehman's liabilities to facilitate a transaction, killed the Barclays deal. With Barclays out of the running, it became clear that there would be no buyer for Lehman Brothers. By Sunday night, Fuld convened his board of directors and, at the behest of regulators, filed for Chapter 11 bankruptcy protection early in the morning of September 15, 2008.²⁹⁷

The events of that fateful weekend have received much scrutiny by journalists, academics, and everyday observers, all wanting to know the same thing: why did Lehman Brothers go bankrupt? The short answer is that regulators chose to let it fail. Although Federal Reserve Chairman Ben Bernanke insisted that he did not have the legal authority to bail out Lehman Brothers, the FCIC found that the Fed had statutory authority under the Federal Reserve Act that allowed them to engage in "emergency lending" under extraordinary circumstances. If Bear Stearns warranted a bailout on the basis of the Fed's emergency lending powers, then Lehman Brothers, both larger and more interconnected than Bear Stearns, deserved equal consideration.²⁹⁸

So if regulators had the statutory authority (if not the willingness) to bail out Lehman Brothers, why did they choose to let it fail? The short answer is that regulators wanted to contravene the notion that they would roll over and grant bailouts any time a financial institution ran into trouble. In other words, Lehman failed because of regulators'

²⁹⁷ (The Financial Crisis Inquiry Commission 2011, 335-339)

²⁹⁸ (Federal Reserve Board of Governors 2013)

desire to fight moral hazard. Recall from Chapter 5 that LTCM, Bear, Fannie, and Freddie created a conventional expectation among market participants that regulators would serve as liquidity providers of last resort in wholesale funding markets. Federal Reserve and Treasury officials believed that the promise of this *de facto* shadow banking deposit insurance risked sowing moral hazard among banks. To contravene this notion, regulators wanted to show that they were willing to “play chicken” with the market by letting a systemically important financial institution fail.²⁹⁹ At a press conference on the morning of September 15, 2008, Secretary Paulson claimed “moral hazard is something” that he did not “take lightly.”³⁰⁰ In hindsight, while regulators were successful in dashing the market’s hopes for future bailouts (or least confusing the market about regulators’ intentions), the market’s reaction to Lehman’s failure was far worse than regulators had anticipated.

Bailing Out AIG

Even though regulators let Lehman Brothers fail based on the premise of moral hazard, regulators immediately retreated from their hardline stance when insurance giant American International Group (AIG) teetered on the brink of bankruptcy because of its exposure to the U.S. housing market. From 2001-2007, AIG’s financial products group (AIG-FP) sold billions of dollars’ worth of credit default swap (CDS) protection on subprime ABS, and by 2007, AIG-FP sat on a portfolio of roughly \$2.7 trillion notional CDS tied to the mortgage market. AIG also issued \$6 billion in commercial paper liquidity puts on ABCP and repo issued by CDOs. During the boom years, these

²⁹⁹ (The Financial Crisis Inquiry Commission 2011, 334)

³⁰⁰ (The White House: President George W. Bush 2008)

businesses earned AIG steady income. Housing prices continued to rise, liquidity in wholesale funding markets was plentiful, and AIG seemed to earn a risk-free profit by selling insurance on a doomsday scenario that its risk models anticipated would never occur.³⁰¹

Yet once homeowners began defaulting on their mortgages, AIG faced the prospect of having to make a large, simultaneous cash payout to their counterparties because of its CDS exposure. By summer 2008, with mortgage prices plummeting, the rating agencies put AIG on notice for a bond downgrade, which triggered collateral calls by AIG's trading partners and further depleted AIG's dwindling cash reserves. AIG's CDS contracts stipulated that AIG's counterparties could use their own trading marks when determining the market value of their CDS contracts facing AIG. Thus, firms like Goldman Sachs could demand as much collateral as they wanted from AIG, based on their internal trading marks on thinly traded over-the-counter derivatives contracts.³⁰²

On September 12, 2008, AIG faced a buyer's strike in the commercial paper and repo markets and struggled to raise the cash necessary to meet Wall Street's relentless collateral calls. Facing obligations in excess of their \$9 billion on hand, AIG reached out to the New York Fed for a loan under the Federal Reserve's 13(3) emergency lending authority. Privately, the Fed believed that such a loan might not be necessary since a consortium of banks had agreed in principle to provide bridge financing to AIG, but Lehman Brothers' bankruptcy caused AIG's loan syndicate to fall apart. Rather than lending to AIG, syndicate banks hoarded cash to protect their own balance sheets.

³⁰¹ (The Financial Crisis Inquiry Commission 2011, 139-142)

³⁰² (The Financial Crisis Inquiry Commission 2011, 244-245)

Without a private sector loan for AIG, the Fed knew that it faced a choice between allowing the firm to go bankrupt or invoking its 13(3) authority to save the company. Fearing that a “a disorderly failure of AIG could add to already significant levels of financial market fragility and lead to substantially higher borrowing costs, reduced household wealth, and materially weaker economic performance” of the U.S. economy, on Tuesday, September 16, 2008, the Fed made an \$85 billion loan to AIG in exchange for preferred stock in AIG and its subsidiaries. In defending AIG’s bailout just hours after allowing Lehman Brothers to go bankrupt, Fed Chairman Ben Bernanke told Congress that a disorderly bankruptcy of AIG would have been a devastating market blow to confidence in already-reeling commercial paper and money markets, which were experiencing full-on bank runs after Lehman’s bankruptcy.³⁰³ Regulators feared that an AIG bankruptcy would have disastrous consequences for the U.S. economy, bankrupting state pensions, damaging AIG’s counterparties, and shattering confidence in the entire financial system. Bernanke concluded that an AIG bankruptcy “could have resulted in a 1930s-style global financial and economic meltdown, with catastrophic implications for production, income, and jobs.”³⁰⁴

What does the rise, fall, and bailout of AIG tell us about the role of economic conventions in financial markets? There are two key takeaways.

First, AIG, much like Bear Sterns and Lehman Brothers, demonstrates the causal importance of credit ratings as both an *amplifier* of pro-cyclical capital flows and a *trigger* of financial instability. The FCIC found that “AIG’s most valuable asset was its

³⁰³ (The Financial Crisis Inquiry Commission 2011, 344-350)

³⁰⁴ (Bernanke 2009)

credit rating,” which allowed the firm to “borrow cheaply and deploy the money in lucrative investments.” Firms that purchased mortgage insurance from AIG were permitted by regulators to reserve less regulatory capital because they insured their mortgage exposure vis-à-vis a highly credible counterparty. Banks that purchased CDS from AIG could carry thinner capital cushions, allowing them to make more loans and earn more revenue. Thus, there was a *social pro-cyclicality* to AIG’s triple-A rating, wherein AIG’s rating endowed the company with a “halo-effect” that helped the firm earn rents from insuring risky mortgages. During the boom years, AIG earned hefty profits from insuring Wall Street’s riskiest assets, in turn making the entire company (and by extension, the global financial system) appear safer.³⁰⁵ However, favorable bond ratings also sowed AIG’s financial fragility, since the terms of AIG’s CDS contracts tied its collateral requirements to the firm’s favorable credit rating. When the CRAs downgraded AIG after Lehman Brothers’ bankruptcy, AIG had to meet Wall Street’s collateral calls simultaneously. For this reason, the institutionalization of bond ratings into AIG’s CDS contracts made AIG vulnerable to credit downgrades when collateral prices declined, which is what happened (and went into overdrive) after Lehman’s bankruptcy. AIG stands out as a case study in how institutionalized, ergodic conventions such as bond ratings can be both *amplifiers* of pro-cyclical capital flows into risky asset classes and also *triggers* of instability within fragile financial systems. When conventions changed, agent behavior and market outcomes changed with them. Rather than being cameras that passively expressed the market’s “material fundamentals,” ratings were

³⁰⁵ (The Financial Crisis Inquiry Commission 2011, 139-142)

important engines of non-stochastic change in financial markets, as Donald MacKenzie, Rawi Abdelal, and Mark Blyth have argued.³⁰⁶

Second, AIG's fragility illustrates how risk models based on ergodic conventions can sow financial fragility. AIG-FP retained Yale University economist (and shadow banking expert) Gary Gorton as a consultant to build models to forecast potential losses in AIG's CDS portfolio. In December 2007, Gorton told AIG's investors that AIG's risk models were "very robust" and introduced "as little model risk as possible." Gorton mined reams of historical data of real estate prices across the United States to forecast the likelihood of default in AIG's subprime MBS insurance business. According to one of AIG's pre-crisis SEC filings in 2006, AIG claimed that the likelihood of having to make simultaneous payouts on its entire mortgage portfolio remained "remote, even in severe recessionary market scenarios," based on the assumption that housing prices would not decline nationally. Even if there were a housing bubble, AIG told its investors that housing prices would plateau, rather than fall across the board.³⁰⁷ As the FCIC found, AIG-FP "predicted with 99.85% confidence that there would be no realized economic loss on the safest portions of the CDOs on which they wrote CDS protection, and failed to make any provisions whatsoever for declines in value – or unrealized losses – a decision that would prove fatal...in 2008."³⁰⁸ By basing their loan loss provisions on historical default and home price data, AIG predicated its solvency on the reliability of their risk models, which vastly underestimated the likelihood of home prices declining nationally and thus left AIG vulnerable to creditor panics when the housing bubble burst.

³⁰⁶ (MacKenzie 2008), (Blyth 2013b), and (Abdelal and Blyth 2012).

³⁰⁷ (Mollenkamp, et al. 2008)

³⁰⁸ (The Financial Crisis Inquiry Commission 2011, 140)

Convention Uncertainty and Financial Instability

Immediately after Lehman's bankruptcy, the market experienced a "flight to quality," as money poured out of wholesale funding markets, causing healthy, non-financial companies to have trouble raising money via commercial paper and repo. Trading in entire derivatives markets ceased. Stock prices collapsed as equity volatility surged. Without irony and exaggeration, Fed Chairman Ben Bernanke testified to the FCIC that he "honestly believe[d] that September and October of 2008 was the worst financial crisis in global history..."³⁰⁹

How can we make sense of this market dynamic, given the theoretical framework put forth in Chapter 2?

This dissertation found that the bankruptcy of Lehman Brothers and bailout for AIG negated the market's conventional expectation that regulators would serve as *de facto* deposit guarantors in wholesale funding markets. Absent this credible shadow banking deposit insurance, shadow banking conduits experienced bank runs as shadow banking depositors (e.g. money market mutual funds) refused to roll over banks' maturing short-term debt. According to Charles Doran, "nonlinearities in the reality one is trying to predict" undermine the reliability of conventions-based expectations of the future.³¹⁰ Doran defines nonlinearity as a "discontinuity" that "signals a total break with the past" in complex social systems.³¹¹ As this dissertation argues, given sufficient financial fragility, when agents realize that a pre-existing, taken-for-granted conventions-based understanding of the future no longer holds, then non-routine change will occur in

³⁰⁹ (The Financial Crisis Inquiry Commission 2011, 354)

³¹⁰ (Doran 1999, 15)

³¹¹ (Doran 1999, 20)

financial markets. The shock of having to cope with defied expectations based on conventions-based forecasts of the future catalyzes convention uncertainty. How do we know that Lehman's bankruptcy eviscerated the market's conventional expectations about regulators as *de facto* liquidity providers of last resort? There are three reasons to believe this is the case, and that Lehman's bankruptcy initiated an interval of massive structural uncertainty in markets, just as Charles Doran depicts.

First, there is evidence that regulators themselves believed that the market had grown accustomed to repeated interventions in financial markets. At the beginning of the weekend meeting to save Lehman, Secretary Paulson told the bank chiefs in attendance that the Fed would not provide "any form of extraordinary credit support" to save Lehman.³¹² As the *Wall Street Journal* surmised on the eve of Lehman's bankruptcy, Lehman presented regulators with a 'Catch-22': "in rescuing those businesses to prevent chaos in the markets, the government *may have created the expectation* that it would be a major financial player in other distressed situations." As a result, Lehman served as a "line in the sand" regarding future bailouts.³¹³ Secretary Paulson told President George W. Bush that "allowing Lehman to fail would send a strong signal to the market that his administration wasn't in the business of bailing out Wall Street firms any longer."³¹⁴ Based on these accounts, we can conclude that moral hazard (or more specifically, regulators' desire to fight moral hazard) was the *causa prima* of Lehman Brothers' bankruptcy. Second, several econometric tests confirm the existence of structural breaks in the model parameters of the time series relationship between interbank lending and

³¹² (The Financial Crisis Inquiry Commission 2011, 334)

³¹³ (Moore 2008). Emphasis added.

³¹⁴ (Sorkin 2009, 374)

bank credit spreads on September 15, 2008, the day of Lehman’s bankruptcy (see Appendix IV). Since nothing else lest the market’s perceptions regarding regulators’ posture toward systemically important financial institutions changed that weekend, there is reason to believe that Lehman’s failure was responsible for this structural break in financial markets. Third, several traders interviewed for this dissertation confirm that Lehman’s bankruptcy negated whatever preconceptions market participants had about regulators’ intentions to bail out troubled Wall Street firms. According to a foreign exchange derivatives trader at a major New York commercial bank, many of his clients believed that a Bear Stearns scenario was the “worst case scenario” for any bank, and prior to Lehman’s bankruptcy, ABCP and repo counterparties believed that “everything would get sorted out” by regulators and the Fed. This trader claimed that Bear Stearns, Fannie, and Freddie convinced market participants that regulators “would always agree to step in to prevent something much worse from happening.” Prior to Lehman’s bankruptcy, there was an implicit understanding that banks would not go bankrupt or, if they did, shadow banking depositors would be “made whole” for their counter-party exposure. Banks were so intertwined that most market participants took for granted that their trading partners would remain solvent in all scenarios. The trader hypothesized that regulators decision to let Lehman fail reflected regulators’ desire to “to send a signal to the market that systemically important trading partners would fail.”³¹⁵

So what happened after the market realized that regulators would not uniformly backstop troubled financial institutions? In other words, what effect did *convention uncertainty* have on financial markets?

³¹⁵ (Foreign exchange trader 2013)

The most important, proximate effect of Lehman's bankruptcy was undermining confidence in the wholesale funding market creditors, which triggered a bank run in both commercial paper and repo markets. When the Reserve Primary Fund, a money market mutual fund that invested in some \$785 million of Lehman's commercial paper, "broke the buck" of \$1.00 net asset value, this was the first time a money market mutual fund refused redemptions and broke par value since 1994.³¹⁶ This credit event caused an across-the-board run in all commercial paper and repo markets. As Kacperczyk and Schnabl found, "investors interpreted the Lehman's bankruptcy as a signal that commercial paper, issued and sponsored by financial institutions, was far riskier than investors had previously thought."³¹⁷ Lehman Brothers' bankruptcy altered the market's risk perception of ABCP, thus triggering a bank run throughout the commercial paper markets. From September 10 to October 22, 2008, the total amount of financial commercial paper outstanding fell roughly thirty percent as commercial paper spreads widened. Money market mutual funds boycotted all commercial paper issuers, even those with no connection to Lehman Brothers, which initiated a "a broad-based run on commercial paper markets," as Timothy Geithner told the FCIC. Investors withdrew some \$450 billion from prime money market funds, and to meet the rush of redemptions, money market mutual funds sold their illiquid investments, though "there was little market to speak of" and "dealers weren't even picking up their phones," according to the FCIC.³¹⁸

³¹⁶ (Gullapalli, Anand and Maxey 2008)

³¹⁷ (Kacperczyk and Schnabl 2010, 41)

³¹⁸ (The Financial Crisis Inquiry Commission 2011, 358) See section on adverse selection.

Repo markets experienced similar stresses following Lehman's collapse. As Gary Gorton and Andrew Metrick found, the average repo "haircut" (or discount to face value accepted of repo collateral) on structured debt jumped from 25% to 43% percent after Lehman's bankruptcy. As the authors argue, the failure of Lehman Brothers meant, "Repo depositors did not know which securitized banks were most likely to fail (or whether the Fed would let them fail)." As a result, Lehman's failure caused repo counterparties to assume that shadow banking collateral was *information-sensitive*, since regulators knew more about their willingness to backstop troubled counterparties than did their wholesale lenders. When wholesale funding counterparties lost faith in the collateral backing repo transactions, they demanded greater repo haircuts as a hedge against the information asymmetry created by this convention uncertainty.³¹⁹

Rising repo haircuts are to shadow banking as depositor withdrawals are to traditional banking: faced with rising haircuts, financial institutions had to sell risky assets to make up for their funding shortfall, but the collective effect of rising haircuts for all repo issuers for all risky assets was a *generalized banking panic* in which many large, inter-connected financial institutions sold the same assets at the same time. As a result, collateral prices fell further, rendering the shadow banking system potentially insolvent and certainly illiquid.³²⁰

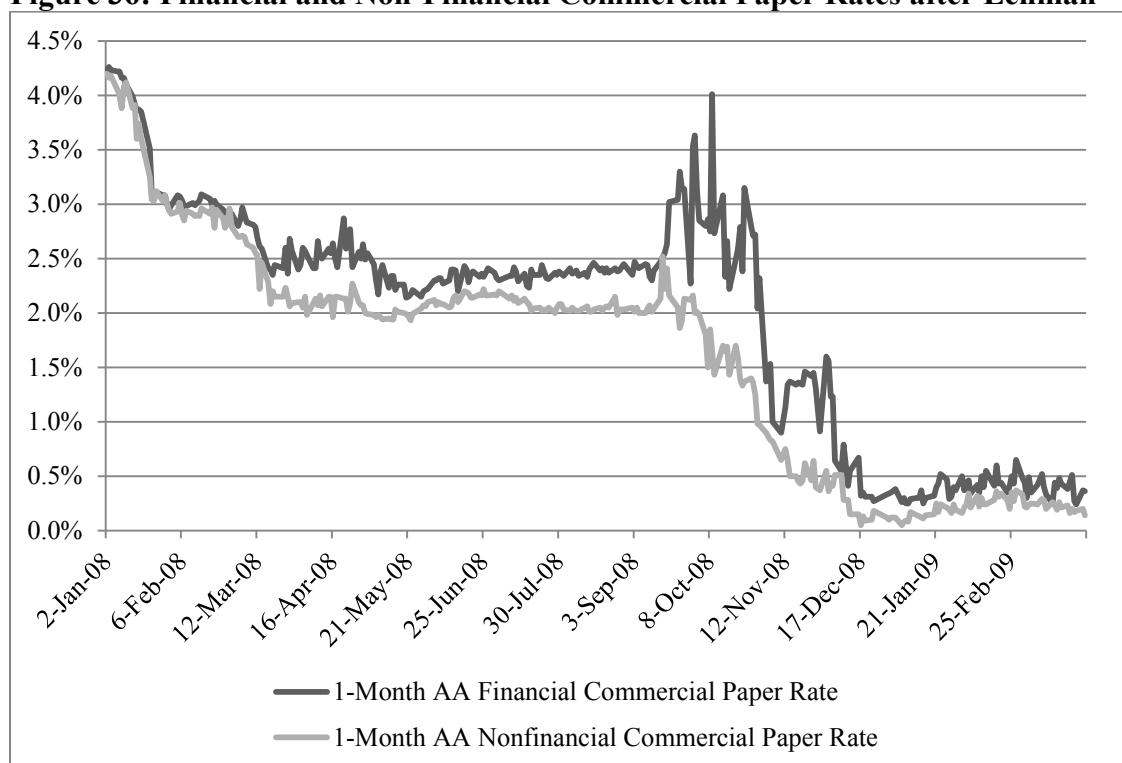
Because of these pressures, interbank lending markets exhibited signs of stress. The one month Libor-OIS spread, a commonly accepted measure of bank counterparty fears, increased from roughly 100 basis points before Lehman to 360 basis points by

³¹⁹ (Gorton and Metrick 2010b, 512-513)

³²⁰ (Gorton 2009, 33-34)

October 10, 2008.³²¹ The spread between three-month dollar LIBOR and three-month U.S. Treasury bills, known as the “Ted spread,” increased from approximately 200 basis points pre-Lehman to 460 basis points by mid-October.³²²

Figure 36: Financial and Non-Financial Commercial Paper Rates after Lehman

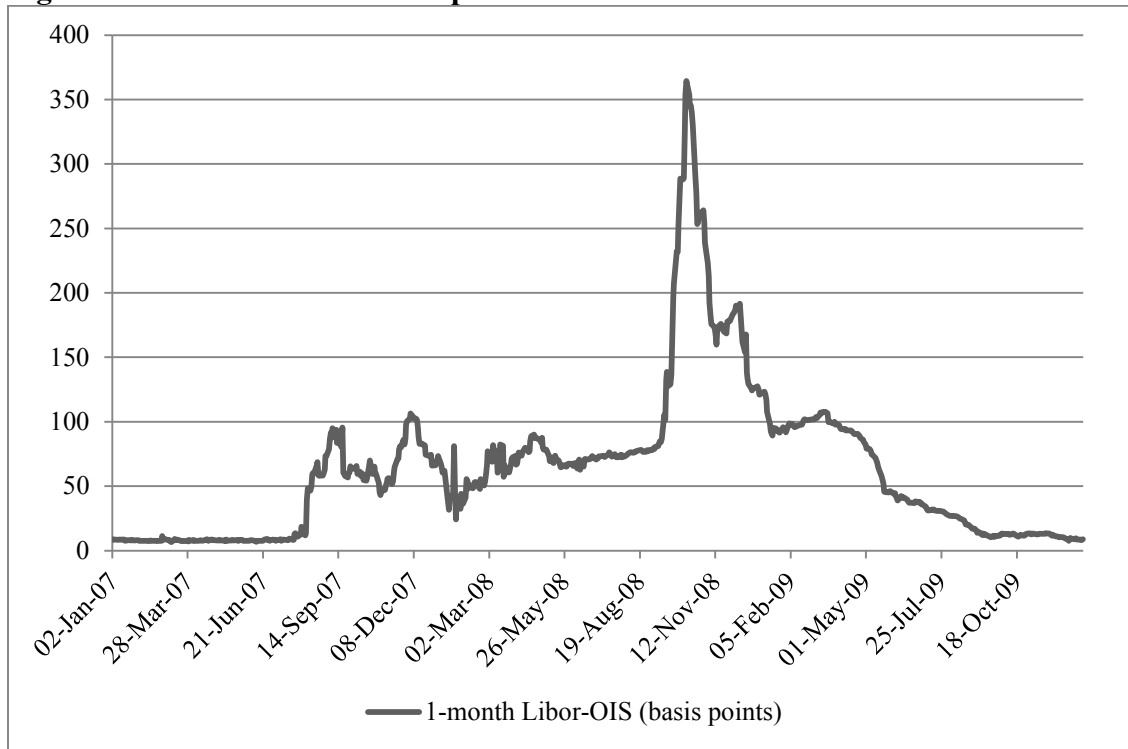


Source: The Federal Reserve

³²¹ For more on the Libor-OIS spread, see: (Thornton 2009)

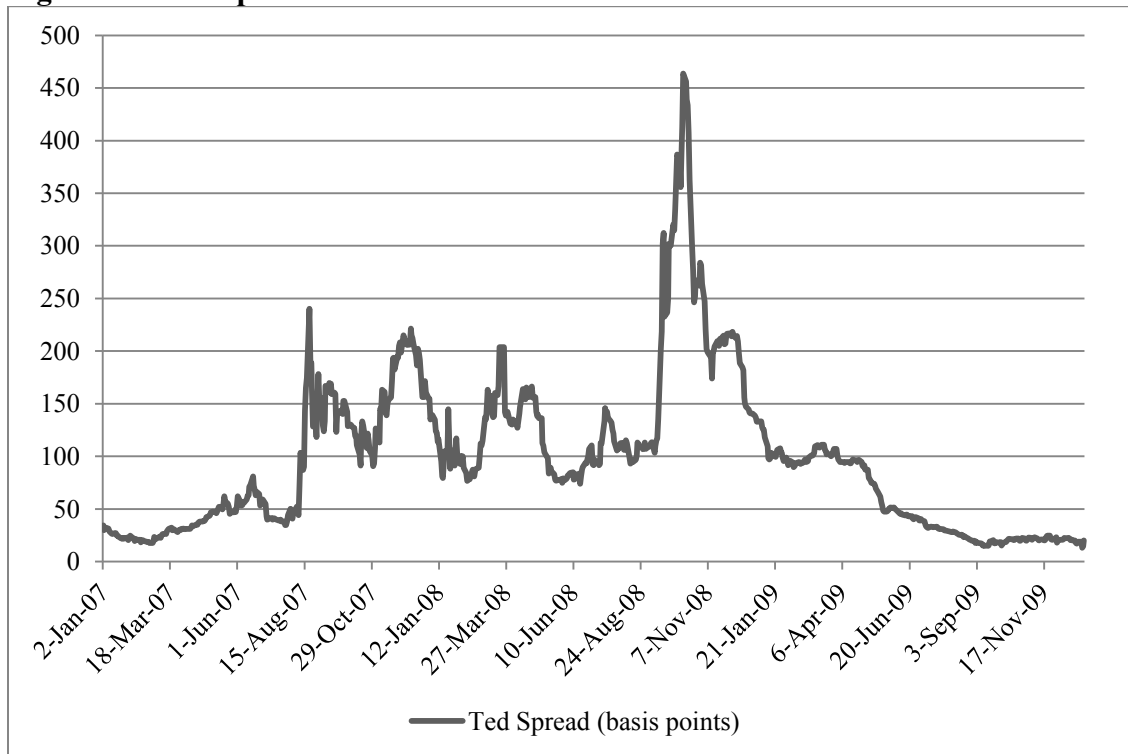
³²² For more on the Ted spread (including its etymology), see: (Econbrowser 2008)

Figure 37: 1-month Libor-OIS Spread



Source: Bloomberg

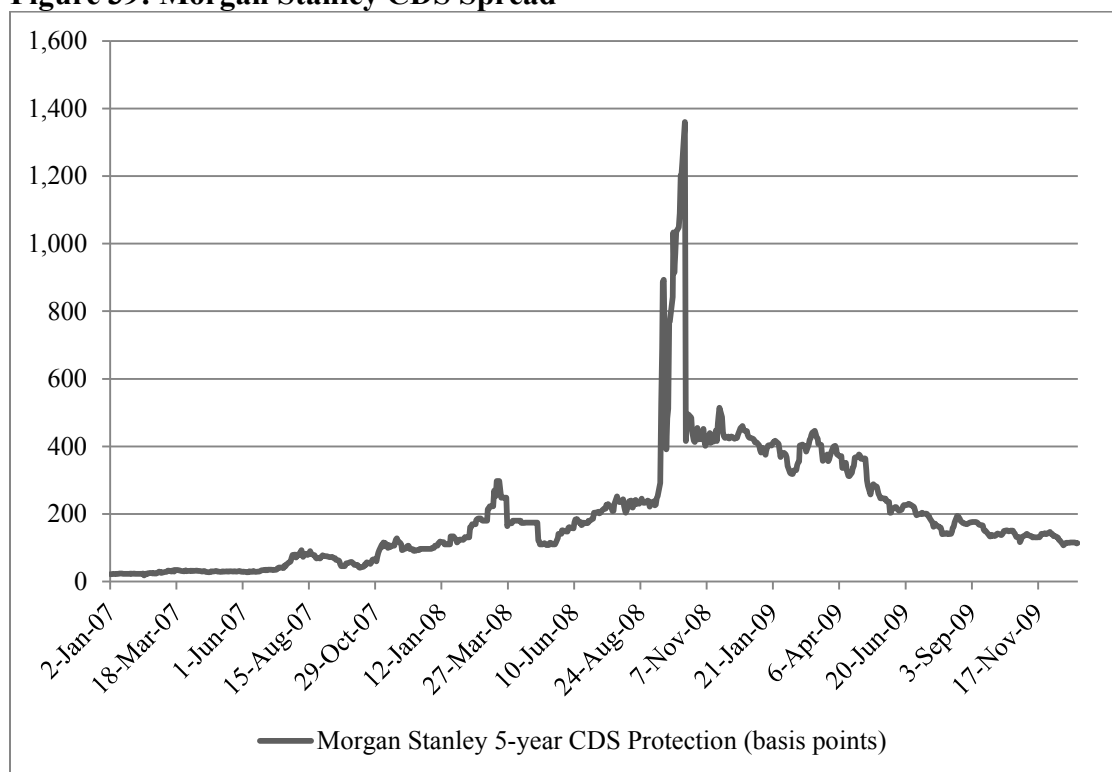
Figure 38: Ted Spread



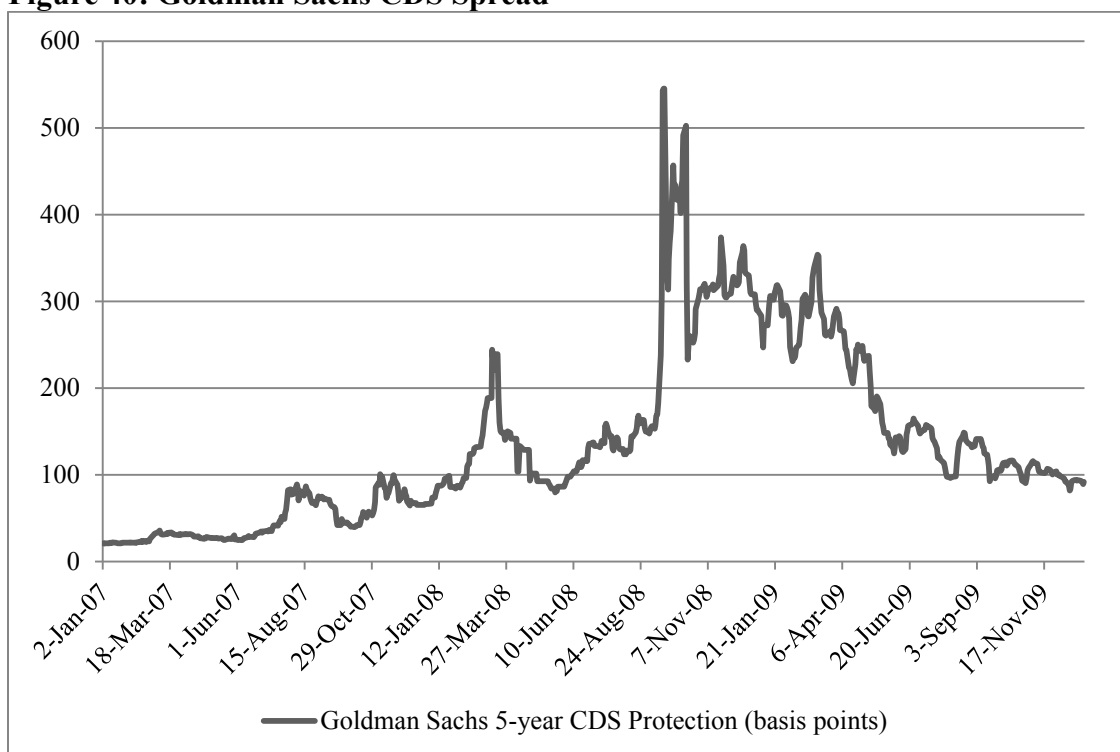
Source: Bloomberg

Credit spreads among the last two standing investment banks, Goldman Sachs and Morgan Stanley, also widened. On Friday, September 12, 2008, it cost 182 basis points to insure Goldman Sachs' five-year debt. By Wednesday, September 17, it cost roughly 550 basis points for the same protection. Morgan Stanley's five-year CDS insurance rose from 250 basis points pre-Lehman to 850 basis points after Lehman's bankruptcy.

Figure 39: Morgan Stanley CDS Spread



Source: Bloomberg

Figure 40: Goldman Sachs CDS Spread

Source: Bloomberg

Another sign of convention uncertainty was the “flight to quality” in financial markets, in which investors sold risky assets and purchased money and money equivalents. As Keynes described, “partly on reasonable and partly on instinctive grounds, our desire to hold Money as a store of wealth is a barometer of *the degree of our distrust of our own calculations and conventions concerning the future.*” Further, money “operates...at a deeper level of our motivation. It takes charge at the moments when the higher, more precarious conventions have weakened.” This quality of money reflects the fact that “the possession of actual money lulls our disquietude; and the premium which we require to make us part with money is the measure of the degree of our disquietude.”³²³ In other words, Keynes believed that money demand, or demand for

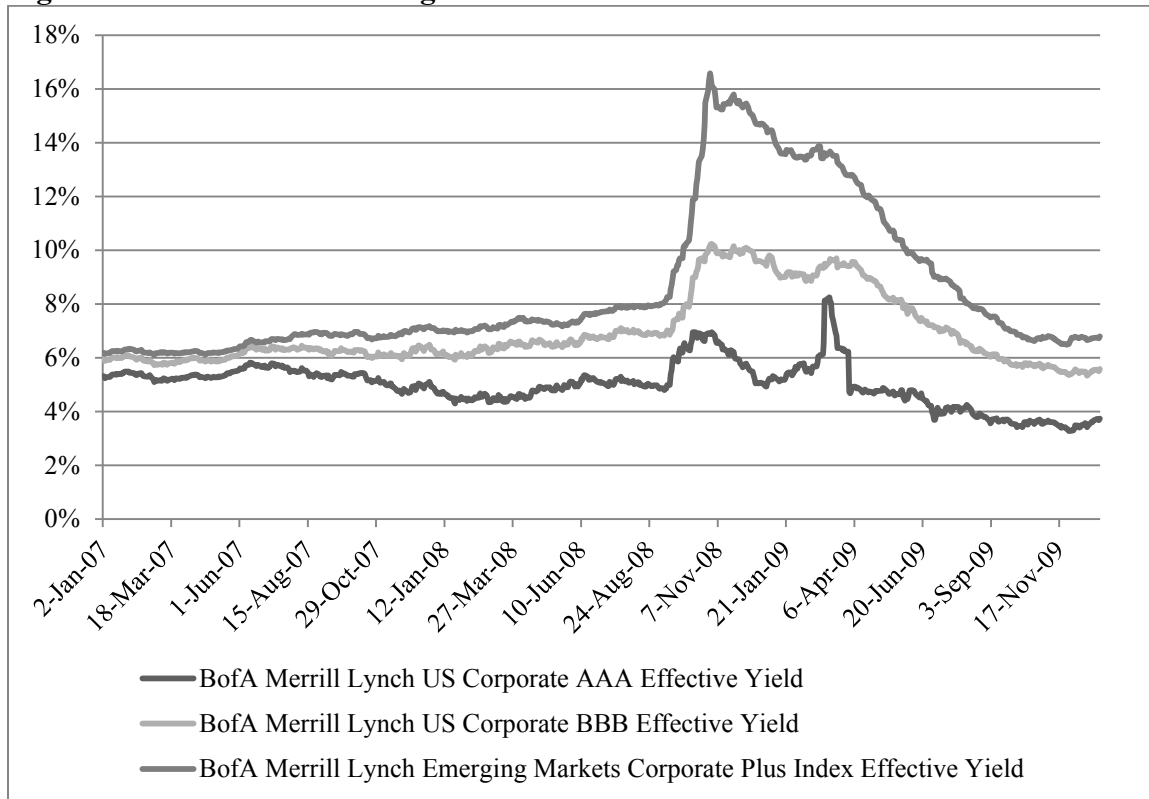
³²³ (Keynes 1937a, 216). Emphasis added.

money and its equivalents, surged during periods of convention uncertainty. The FCIC describes this tendency as the “flight to quality,” which, in the context of the global financial crisis, meant that ABCP and repo investors pulled their funds out of shadow banking conduits and purchased perceived safe-havens like U.S. Treasury securities.³²⁴

After the fall of Lehman Brothers, the market exhibited several signs of the flight to quality because of convention uncertainty. Yields on the riskiest corporate bonds, those rated CCC and higher by the CRAs, shot up from roughly 9% to 16%. The foreign exchange value of the dollar rose approximately 10% in the month after Lehman’s bankruptcy, while four-week Treasury bill interest rates fell from 1.5% before Lehman to 0% afterward. Public equity markets also reeled: stock market volatility surged, with the VIX, or “fear index,” rising almost 200% immediately after the fall of Lehman.

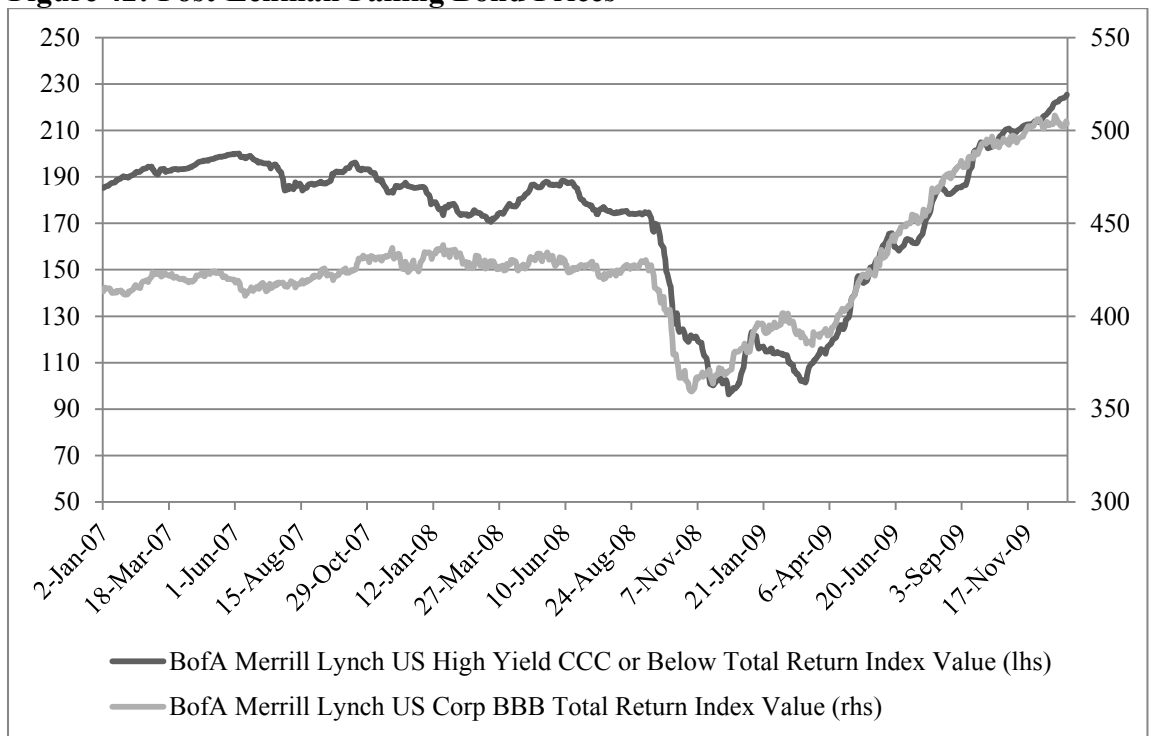
³²⁴ (The Financial Crisis Inquiry Commission 2011, 252)

Figure 41: Post-Lehman Rising Bond Yields



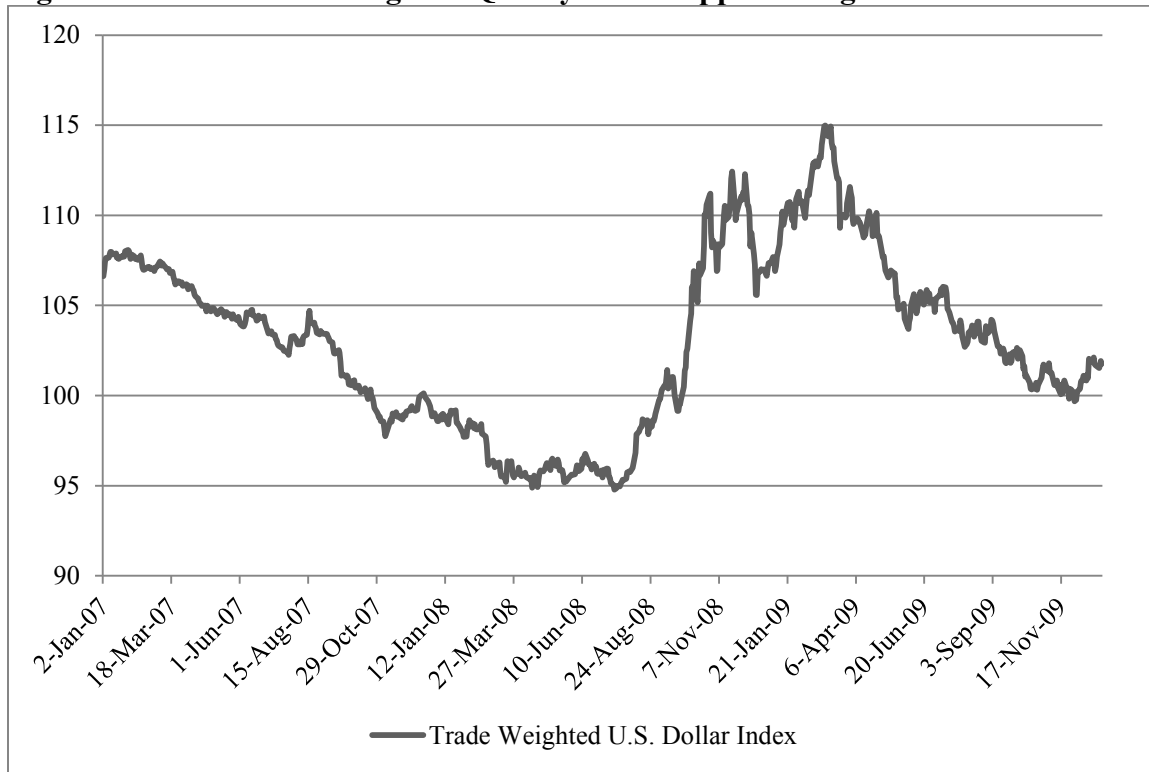
Source: The Federal Reserve

Figure 42: Post-Lehman Falling Bond Prices



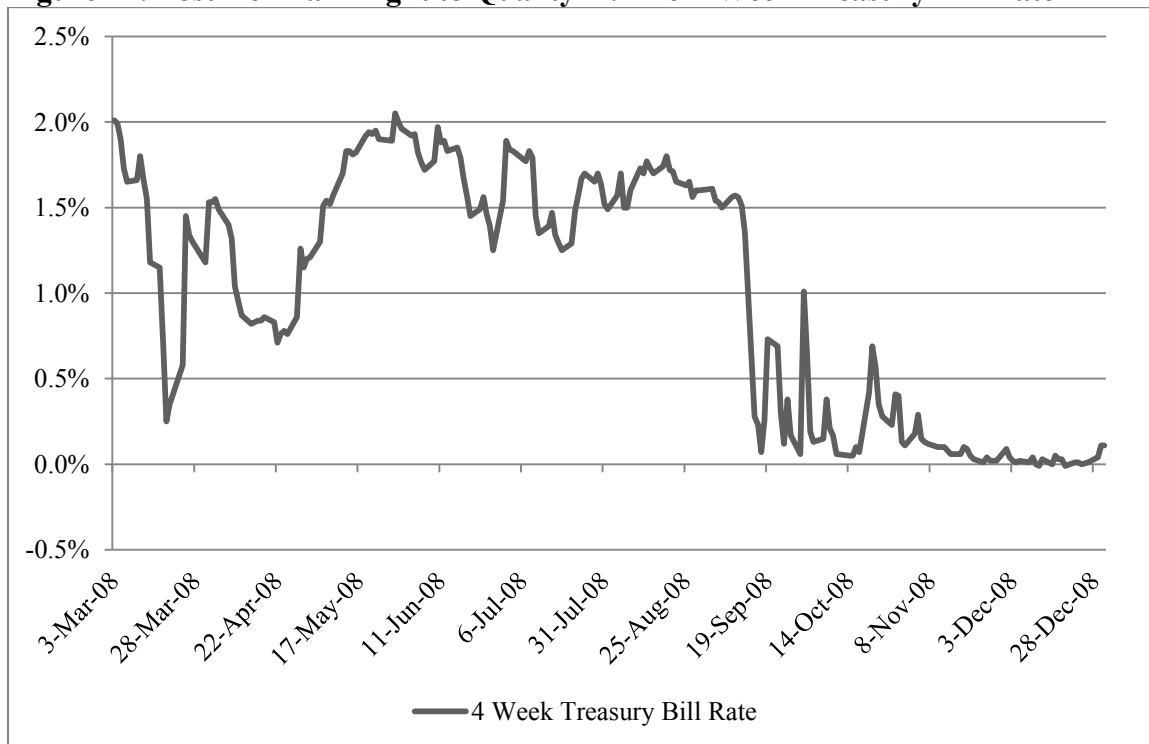
Source: The Federal Reserve

Figure 43: Post-Lehman Flight to Quality I: The Appreciating Dollar

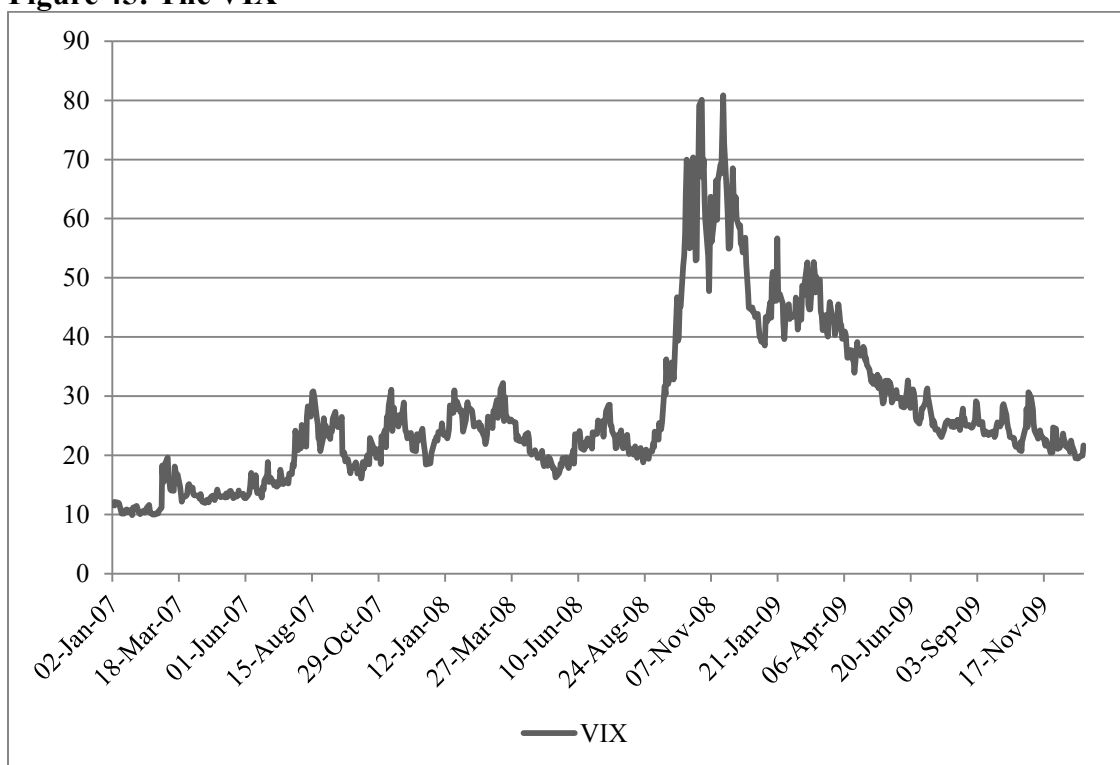


Source: The Federal Reserve

Figure 44: Post-Lehman Flight to Quality II: The 4-Week Treasury Bill Rate



Source: U.S. Treasury Department

Figure 45: The VIX

Source: Bloomberg

Convention uncertainty made it difficult for buyers and sellers to agree upon the value of various illiquid and non-transparent ABS. As a result, some markets were “completely locked” and “some things couldn’t trade at all,” as J.P. Morgan Chief Executive Jamie Dimon told the FCIC.³²⁵ Stephen Morris and Hyun Song Shin argue that the breakdown of “market confidence” led to an adverse selection problem in financial markets. These authors claim that markets will function normally as long as there is “common understanding” about potential losses in an asset class. When markets lack a common understanding of securities values, then adverse selection problems emerge and trading stops. Economic conventions provided this social basis of knowledge in financial

³²⁵ (The Financial Crisis Inquiry Commission 2011, 353)

markets.³²⁶ The FCIC found that the over-the-counter derivatives market came to a “grinding halt” after Lehman’s bankruptcy, which illustrates the relationship between an *absence of convention-given common understanding* and adverse selection in financial markets. As the FCIC described:

...in the absence of a liquid derivatives market and efficient price discovery, every firm’s risk management became more expensive and difficult. The usual hedging mechanisms were impaired. An investor that wanted to trade at a loss to get out of a losing position *might not find a buyer*, and those that needed hedges would find them more expensive or unavailable.³²⁷

Several traders interviewed for this dissertation corroborated the FCIC’s findings. One former Lehman Brothers investment banker claimed that the market came to be dominated by “fear and uncertainty” during this period.³²⁸ Another structured credit trader observed that Lehman’s bankruptcy “threw a lot of pricing off,” and that so-called market fundamentals depended on market confidence, which was absent during the market turmoil. The trader argued that market prices “just didn’t make sense mathematically,” and recalled seeing so-called fifteen standard deviation events occur on almost a daily basis. Implied default rates on loan derivatives appeared “astronomical,” and prices seemed disconnected from fundamental value. Structured credit markets suffered from a “lack of conviction” because there were no value anchors upon which traders could base their decisions.³²⁹

³²⁶ (Morris and Shin 2012)

³²⁷ (The Financial Crisis Inquiry Commission 2011, 364). Emphasis added.

³²⁸ (Lehman Brothers investment banker 2013)

³²⁹ (Structured credit trader 2013)

The structured credit trader claimed that the small size of the derivatives market meant that anticipating the beliefs and actions of fellow traders was crucial for success:

Understanding how other people behave is very important. Knowing what key players think is always important. Understanding how other people are thinking about the world is very important. If certain people are shorting a certain asset class, this causes you reevaluate your strategy and timing specifically... information about what other investment managers are doing is crucial to any successful trading strategy.

Regarding the market uncertainty after Lehman and AIG, Lehman and AIG “changed everything” because “all of a sudden, [traders] had to guess the intentions of regulators. Since there were no clear guidelines about who would fail and who would be saved, everybody just assumed the worst.” Allowing Lehman to fail and bailing out AIG initiated a bank run against all financial institutions that ended only after U.S. authorities guaranteed the solvency of all systemically important financial institutions, as argued in the subsequent section. Lehman and AIG began a period of profound uncertainty in financial markets, in which “every market price *became a call option on a firm’s survival.*”³³⁰

As the results of this selected market data and this interviews show, the failure of Lehman Brothers catalyzed a generalized bank run in the wholesale funding market, which had a profound impact on the stability of shadow banking conduits. Lehman’s bankruptcy invalidated the market’s *conventional expectations* that regulators would serve as liquidity providers of last resort in wholesale funding markets. AIG signaled that some firms would receive bailouts and others would fail, confusing market participants further. Trying to guess the caprice of regulators introduced novel stress in the wholesale funding market, causing banks’ ABCP and repo collateral to become information-

³³⁰ (Structured credit trader 2013)

sensitive while also invalidating the market's "common understanding" of the potential losses in ABS. Generalized convention uncertainty took hold. Wholesale funding markets experienced bank runs and derivatives markets seized. Equity volatility surged and investors partook in a flight to capital. Stock prices fell, and the long-term solvency of all systemically important financial institutions came into question.

In hindsight, the rationale of letting Lehman fail to send a signal to the market of no more bailouts seems moot based on markets' behavior after the default of Lehman Brothers. Rather than adding transparency to the market, Lehman's failure triggered a run on all systemically important financial institutions, thus beginning the most acute and harrowing phase of the global financial crisis. Regulators retreated from their anti-bailout posture and ended up risking hundreds of billions of dollars to rescue the U.S. financial system.³³¹ If the goal of letting Lehman fail was to send a signal to markets that regulators would no longer bail out troubled financial institutions, then regulators failed. Less than twenty-four hours after Lehman's failure, regulators ended up bailing out the much larger and systemically important AIG.

Note that many of these outcomes adhere to Keynes and Crotty's hypotheses about convention uncertainty and financial stability. Keynes claimed that money demand would surge under conditions of convention uncertainty, which is exactly what happened when the dollar's foreign exchange value appreciated and short-term interest rates plummeted.³³² As Crotty describes, "on...occasions when the consensus forecast turns out to be disastrously mistaken, the irreducible ignorance of the collective wisdom will be

³³¹ Regardless, this episode shows that the notion of "moral hazard" might have had causal force as an economic idea, insofar as this narrative prompted regulators to be much more aggressive in their dealings with investment banks and motivating their decision to let Lehman fail.

³³² (Keynes 1937a, 216)

made painfully manifest to all agents, the convention will collapse, and the confidence in the ability to forecast the future that is built on that convention will shatter.” This selection seems apt to describe financial markets after market participants realized that they were “disastrously mistaken” regarding regulators’ intentions to save troubled counterparties.³³³ Lehman’s bankruptcy caused wholesale funding market counterparties’ conventional expectations of regulators’ lender of last resort function to “collapse,” and confidence in their future forecasts to “shatter.”

Responding to the Crisis and Restoring Convention Certainty

After the bailout of AIG, regulators realized that they had a big problem on their hands. Liquidity was pouring out of money markets and into safe Treasury securities, while non-financial corporations struggled to raise cash in short-term money markets. Bank share prices fell as the cost of insuring their debt via CDS rose. Stock market volatility surged. Financial institutions were forced to sell large portfolios of risky assets *en masse* to keep up with margin and collateral calls, which further depressed asset prices and exacerbated banks’ already-dire liquidity and solvency issues. Throughout the crisis, regulators worked around the clock to prevent other systemically important financial institutions from failing. Their response to the crisis sought to achieve three goals: stemming the bank runs in the shadow banking markets, recapitalizing financial institutions, and getting bad assets off of bank balance sheets.

Regulators’ first order of business was to stop the shadow banking bank run in both the ABCP and repo markets. Thus, on September 19, 2008, just days after the failure of Lehman Brothers and after the Reserve Primary Fund “broke the buck,” the Federal

³³³ (Crotty 1994, 125)

Reserve created the Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility (AMLF) under their emergency lending provision of the Federal Reserve Act. The AMLF allowed financial institutions to borrow from the Fed to repurchase their own ABCP, thus allowing money market mutual funds to redeem their commercial paper holdings from financial institutions at par value. When announcing the AMLF, the Federal Reserve stated that illiquidity in money markets and high redemptions meant that in the absence of Federal involvement, more money market mutual funds would “break the buck” of a \$1.00 net asset value, further exacerbating funding pressures in the money markets.³³⁴

Other programs included the Commercial Paper Funding Facility (CPFF), which came into effect on October 7, 2008, and provided a Federal backstop to “eligible issuers” of short-term debt, extending unlimited commercial paper insurance to all issuers, both financial and non-financial, in the commercial paper market.³³⁵ In essence, the Federal Reserve extended sovereign credit to non-financial industrial companies such as General Electric, McDonalds Corporation, and Harley-Davidson, Inc.³³⁶ On October 14, 2008, the Federal Deposit Insurance Corporation created the Temporary Liquidity Guarantee Program, which extended a FDIC deposit guarantee to all senior unsecured debt issued by qualified financial institutions.³³⁷ One week later, on October 21, 2008, the Fed created the Money Market Investor Funding Facility (MMIFF) to purchase assets from U.S. money market mutual funds.

³³⁴ (The Federal Reserve 2008)

³³⁵ (Federal Reserve Bank of New York 2009)

³³⁶ (Federal Reserve Board of Governors 2013)

³³⁷ (Gray 2008)

A second plank of regulators' plan to save the U.S. financial system was to recapitalize financial institutions. Less than one week after Lehman Brothers declared bankruptcy (which occurred, in part, because of New York Federal Reserve Bank President Timothy Geithner's decision to refuse to allow Lehman Brothers to convert to a bank holding company), the Federal Reserve Board allowed Morgan Stanley and Goldman Sachs to become bank holding companies, thereby granting the firms access to the Fed's discount window. Meanwhile, the FOMC slashed the target federal funds rate to 0%, further attempting to ease interbank funding pressures. Some companies received special attention from regulators during this period as well. For instance, on November 23, 2008, the U.S. Treasury and Federal Reserve backstopped over \$300 billion of real estate assets on Citigroup's balance sheet.

Treasury Secretary Hank Paulson convinced the U.S. Congress (after a series of legislative missteps including a Congress' original refusal to pass the bill) to pass the \$700 billion Troubled Asset Relief Program (TARP), which was designed to purchase bad assets from financial institutions but morphed into a recapitalization program after regulators realized that asset purchases would take too long to work themselves through the financial system. So on October 28, 2008, the U.S. Treasury purchased some \$125 billion in preferred stock from nine U.S. financial institutions. On November 14, 2008, the Treasury purchased another \$33.5 billion worth of preferred shares from twenty-one banks, and on November 17, 2008, TARP funding was extended to insurance companies as well.

Finally, regulators knew that in order to help financial institutions, they had to get the bad assets off their balance sheets. To that end, the Federal Reserve ended up

purchasing some \$1.5 trillion in various assets, including MBS, repo transactions, securities lending, asset-backed commercial paper, among countless others. In essence, the Federal Reserve became the U.S. economy's repository of risky financial assets and the Fed's balance sheet remains well above its pre-crisis level to this day. In mid-2009, the Treasury and Federal Reserve also orchestrated the Public-Private Investment Program, designed to remove some \$30 billion of legacy assets off of the balance sheets of financial institutions.³³⁸

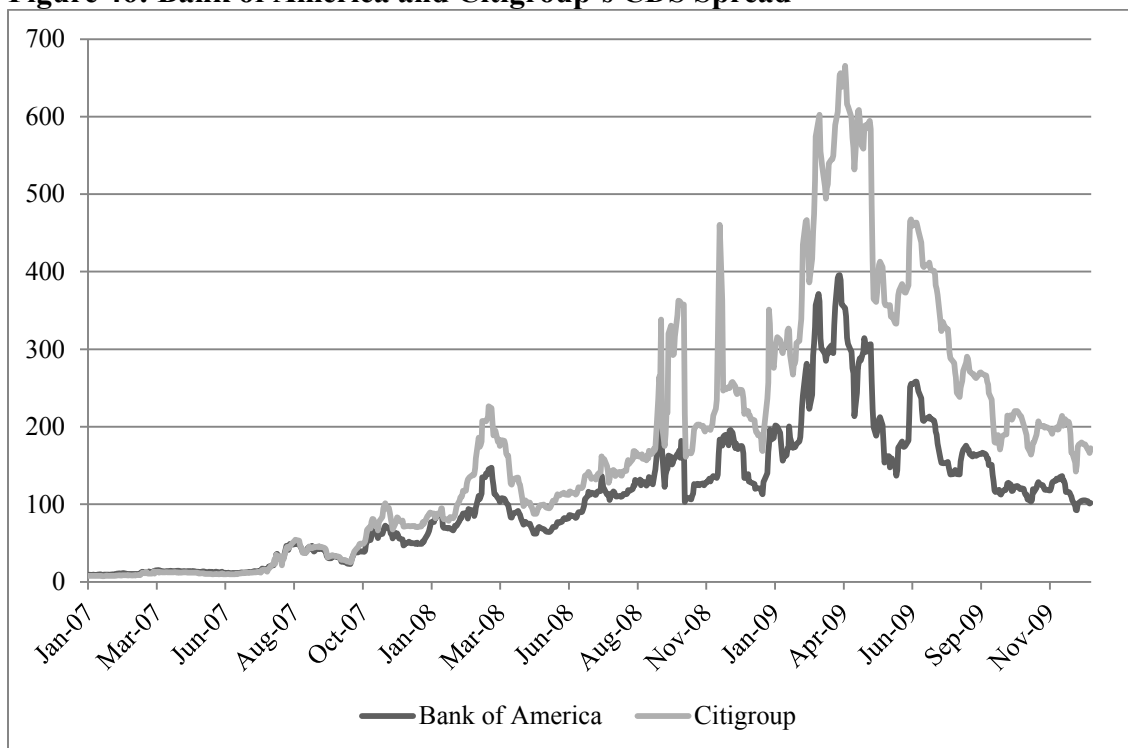
These measures prevented America's financial institutions from falling into disorderly bankruptcy. For instance, the AMLF, CPFF, and MMIFF succeeded in diminishing funding pressures in the interbank lending market. By mid-November 2008, one-month dollar Libor-OIS, the Ted spread, and investment bank CDS spreads fell to about half of their pre-Lehman highs.³³⁹ Idiosyncratic concerns about specific banks, such as Bank of America and Citigroup, persisted throughout early 2009. Equity prices continued their slide until March 2009, while risky bond yields fell and hit their pre-crisis levels by summer 2009.

Still, regulators' interventions could not prevent the broader fall in market confidence and credit contraction from affecting the real economy. America's unemployment rate increased to above 10% as firms shed jobs to cut costs given rising macroeconomic uncertainty. From September 2008 to April 2009, the U.S. economy lost roughly 680,000 jobs per month.

³³⁸ (The Financial Crisis Inquiry Commission 2011, 353-382)

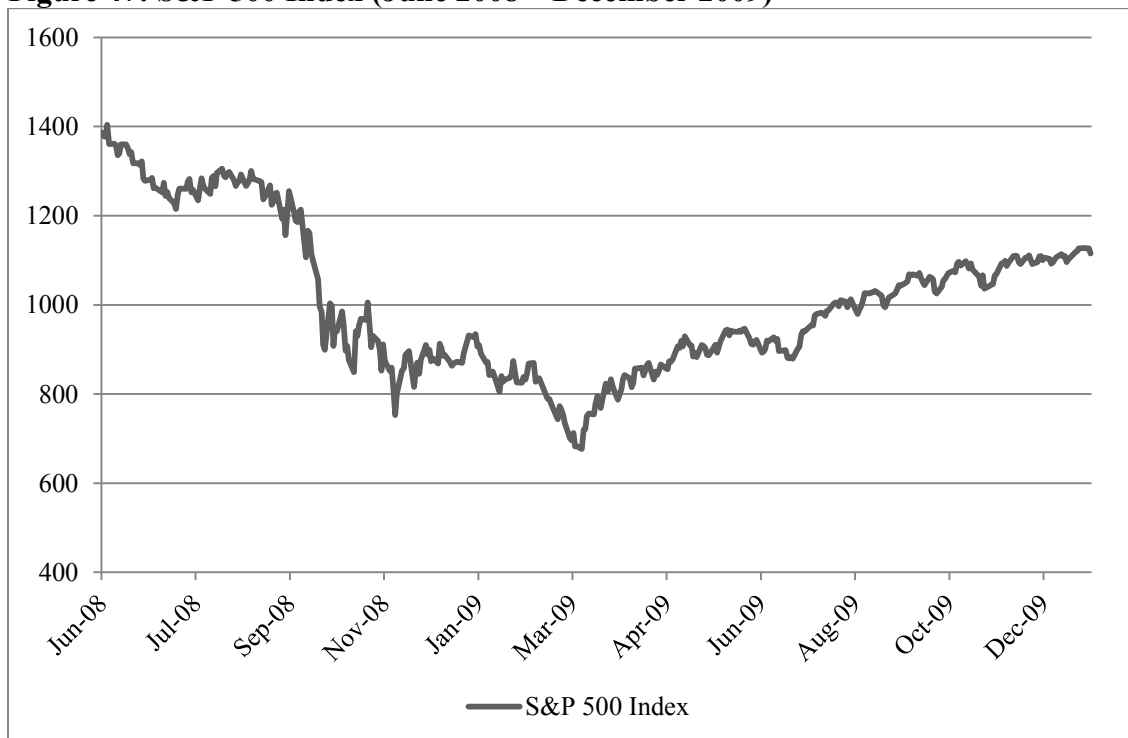
³³⁹ See charts in Chapter 6.

Figure 46: Bank of America and Citigroup's CDS Spread



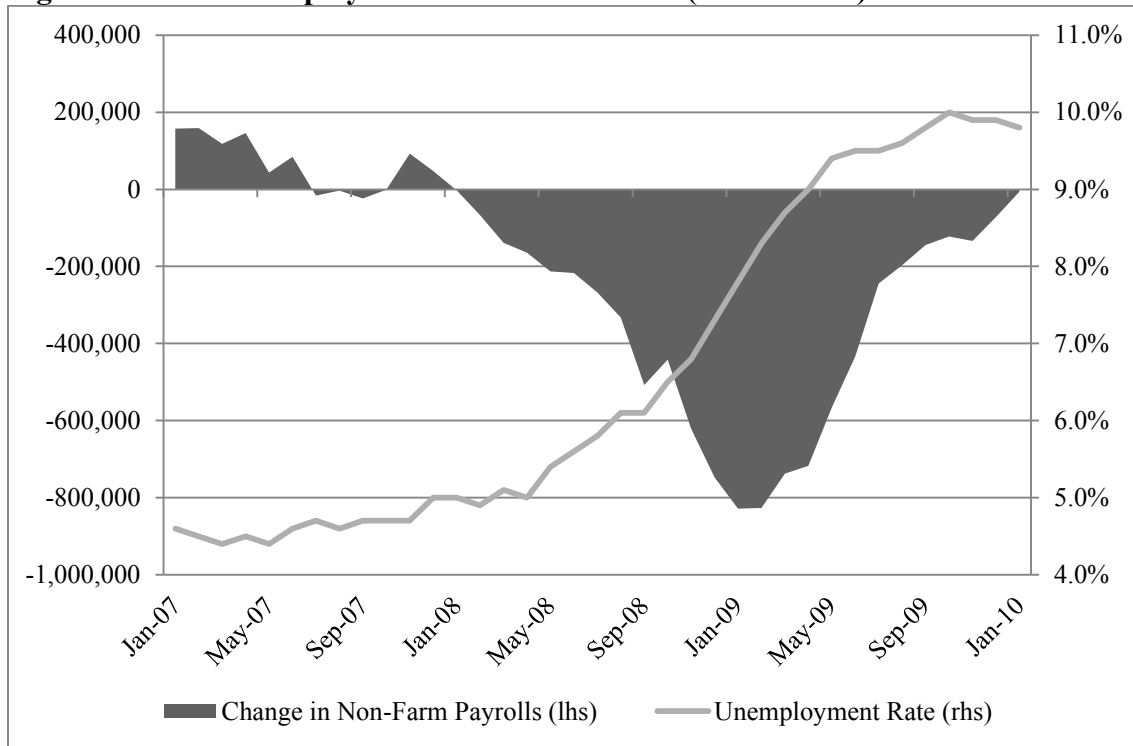
Source: Bloomberg

Figure 47: S&P 500 Index (June 2008 – December 2009)



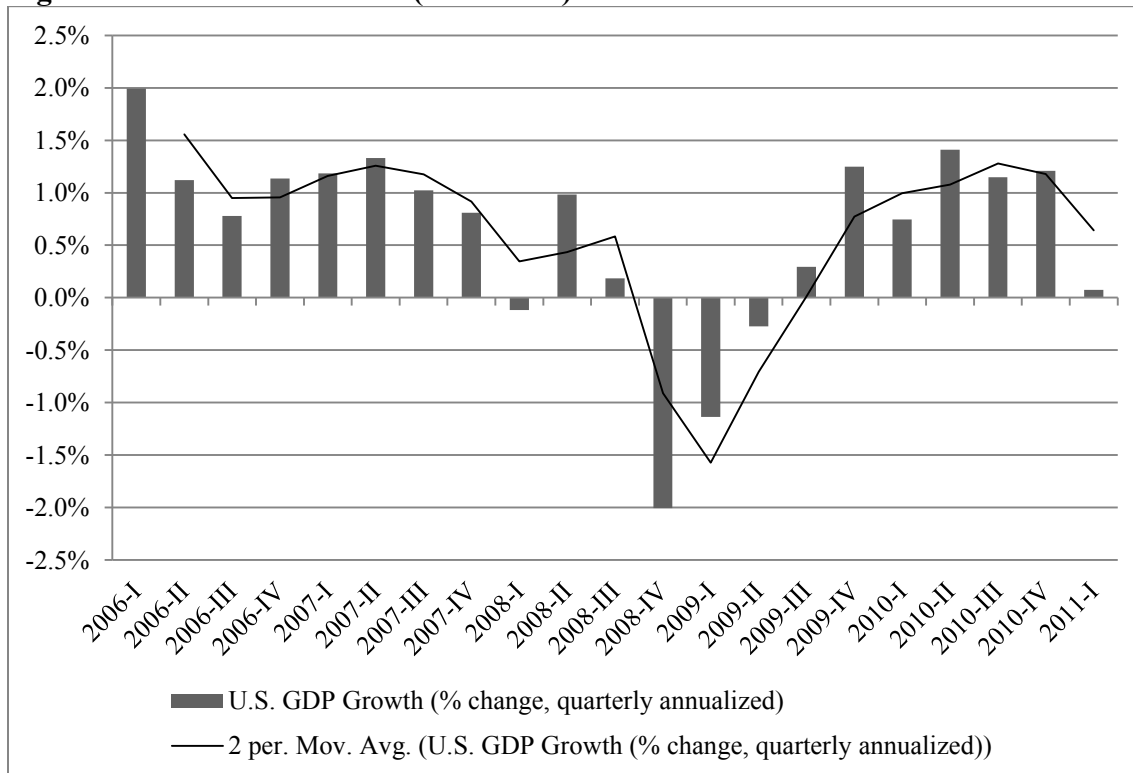
Source: Yahoo™ Finance

Figure 48: U.S. Unemployment and Job Creation (2008 – 2010)



Source: U.S. Bureau of Labor Statistics

Figure 49: U.S. GDP Growth (2006-2011)



Source: U.S. Bureau of Economic Analysis

Having described regulators' response to the crisis, this chapter now explains how this dissertation's conventions-based theoretical framework can shed light onto several aspects of their response. There are two key takeaways.

First, the bank bailouts illustrate the causal role of economic conventions held by regulators during crisis periods. Matthias Matthijs defines a crisis as “a moment of decisive intervention in the process of institutional change when contradictions in the system are generally acknowledged.”³⁴⁰ Mark Blyth identifies a crisis as a moment of “Knightian” or “type-three” uncertainty, in which agents have to cope with the fact that the past does not provide a guide to the future. In the case of the global economy (and markets more specifically), “not only can one not see the generator [of outcomes] directly, but also agents can sample the past until doomsday and become steadily more wrong about the future in doing so.”³⁴¹ As Abdelal et al. put it, “highly complex, unobservable generators produce patterns that shift in unexpected directions.”³⁴² According to Matthijs economic ideas “will play a decisive role by explaining what went wrong and how to fix it” during a crisis.³⁴³ To Matthijs, Blyth, and Abdelal et al., economic ideas (or in the case of this dissertation, economic conventions) mitigate uncertainty by providing agents behavior blueprints of navigating an unforeseen material and ideational terrain.

Regulators' response to the crisis can be understood as an example of ergodicity conventions informing regulators' response to a crisis, specifically their *fears of*

³⁴⁰ (Matthijs 2011, 25)

³⁴¹ (Blyth 2006, 496)

³⁴² (Abdelal, Blyth and Parsons 2010, 12)

³⁴³ (Matthijs 2011, 29)

repeating the Great Depression. Immediately after the failure of Lehman Brothers, regulators realized that bank runs in the ABCP and repo markets, interbank funding pressures, collapsing asset prices, and rising stock market volatility, were untenable in the long-run, and posed a tremendous risk to the overall health of the U.S. economy. Allowing the market to clear on its own led regulators to fear that they might have to endure the bankruptcy of the entire global financial system and drastic fall in economic activity, well below the economy's productive potential.

Although there was heterogeneity of beliefs among regulators regarding the structural causes of the crisis, there was a near universal consensus among the Treasury and the Federal Reserve that it was imperative to prevent further bankruptcies of systemically important financial institutions after Lehman's failure, lest the U.S. economy experience another Great Depression. For instance, Bernanke claimed that the lessons of the U.S. economy in the 1930s had "been learned" and that during the global financial crisis, regulators' repeated financial market interventions spared the global economy "an even worse cataclysm that could have rivaled or surpassed the Great Depression." Bernanke went on to claim that the Great Depression occurred because of bad policy choices on behalf of regulators, arguing that their responses "ran the gamut from passivity to timidity." In contrast, he and his fellow policymakers "acted sooner and with greater force than in the 1930s." The biggest lesson Bernanke took from the Great Depression was that a greater sense of urgency by regulators to stem bank runs could have avoided a domino effect of cascading defaults across the global financial system. Bernanke, like Gorton, described shadow banking as banking per se, and found that the U.S. financial system "experienced the equivalent of runs on the network of nonbank

financial institutions that has come to be called the shadow banking system.” It was imperative to Bernanke to stop these shadow banking bank runs, since he knew that they could spiral out of control and cause a steep contraction of credit with disastrous real economy consequences.³⁴⁴ No doubt, Bernanke’s academic background as a scholar of the Great Depression influenced his thinking and predisposed him to responding to the threat of bank runs and contagion. However, his decisions were by no means pre-ordained or historically path dependent. Rather, Bernanke’s socialization, both as an academic and policymaker, made him more likely to buy into the Great Depression as a salient narrative about the consequences of not responding forcefully to the crisis.³⁴⁵

Second, the success of regulators’ response to the shadow banking bank runs reveals much about the market’s conventions about regulators. As argued earlier in this chapter, one of the reasons why ABCP and repo counterparties ran on shadow banking conduits was because the failure of Lehman Brothers revealed that regulators were willing to go all the way and allow some financial institutions to fail while bailing out others, and the Reserve Primary Fund’s “breaking the buck” further exacerbated the market’s waning confidence. In response to the shadow banking runs, regulators sought to re-establish conventional expectations that regulators would serve as liquidity providers of last resort in financial markets. Regulators were successful in restoring confidence to the banks because they effectively guaranteed the face value of all money market instruments, thus extending *de facto* deposit insurance to the shadow banking market. By directing the FDIC to backstop bank and non-bank short-term borrowing, the

³⁴⁴ (Bernanke 2010b)

³⁴⁵ To understand Bernanke’s pre-global financial crisis thinking on the Great Depression, see: (Bernanke 2004)

federal government extended its public creditworthiness to the financial system's private liabilities. Because the market deemed regulators' commitment credible, and because the market held America's sovereign credit in high esteem, regulators were able to halt the run on shadow banking conduits.

This credibility transfer of sovereign credit to private liabilities reflects many conventional processes at play in the market. As Jonathan Kirshner writes, capital market liberalization introduced new constraints on national regulators, wherein policies deemed illegitimate by the market were punished by capital outflows, while legitimate policies were rewarded with capital inflows and lower borrowing costs. Kirshner finds that "ideas...can profoundly shape policy in ways divorced from the economic logic or merits of those ideas."³⁴⁶ In this case, whether or not banks were really insolvent was beside the point – what mattered was the market's perceptions of bank solvency, which in turn had implications for bank solvency in self-fulfilling ways: those financial institutions that the market deemed creditworthy gained access to cheap credit, thus improving the material profitability of those banks and justifying the market's initial belief.

The question, then, is why did the market view regulators as particularly creditworthy? The answer to this question exceeds the scope of this dissertation, though scholars point out that America's relative creditworthiness relates to the fact that America has never defaulted on its debt and that the dollar was the global reserve asset (and thus faced structurally higher demand and thus lower interest rates than other currencies).³⁴⁷ Together, these factors explain why regulators had tremendous intervention capacity to

³⁴⁶ (Kirshner 2003, 665)

³⁴⁷ See, for example: (Eichengreen 2011) and (Calleo 1992).

restore confidence to America's financial system, and were able to engage in credibility transfer of public creditworthiness to the shadow banking system's private liabilities.

Conclusion

The purpose of this chapter was three-fold: first, it explained how the failure of Lehman Brothers catalyzed convention uncertainty in financial markets, triggering bank runs on shadow banking conduits, and stressing financing conditions in interbank lending markets and leading to broader market instability via falling asset prices and rising volatility. Second, it explained how regulators' reaction to the shadow banking bank runs could be understood via the conventions-based theoretical framework advanced in Chapter 2. It argued that regulators' response to the crisis is best understood as a function of their conventions of ergodicity, specifically their fears of repeating the Great Depression. The salience of this historical data point predisposed regulators to pushing for *carte blanche* bailouts of the entire financial system. These bailouts succeeded because regulators were able to convince the market of their credible commitment to the shadow banking system qua their capacity of serving as liquidity providers of last resort in wholesale funding markets. This chapter argued that America's sovereign creditworthiness enhanced U.S. regulators' intervention capacity to extend public credit guarantees to private liabilities, thus alleviating funding pressures in shadow banking markets, allowing regulators to re-establish conventional equilibrium in markets.

The following chapter concludes the dissertation. It summarizes the dissertation's main theoretical and empirical findings, responds to potential critiques and limitations of its research design and conclusions, suggests several avenues of future research.

**CHAPTER 7:
CONCLUSION**

Based on this study's findings, what conclusions can we draw about the role of economic ideas, and in particular economic conventions, in financial markets? This chapter summarizes the dissertation's ontological and theoretical implications and main empirical findings. It then discusses the limitations of the study and highlights avenues of further research. The final section of this chapter concludes the dissertation, and emphasizes the importance of further study of financial stability.

Theoretical Implications

Primarily, this dissertation sought to understand the relationship between economic ideas and financial market instability. This dissertation studied a subset of economic ideas, known as economic conventions, of which there are three types: ergodicity, expert opinion, and conventional expectations. This dissertation situated economic conventions in the Post-Keynesian model of financial crises. It argued that incorporating a thorough understanding of economic conventions into the Post-Keynesian model lends itself to more theoretically robust and empirically valid theory. What are the primary theoretical conclusions one can draw from this study? This dissertation finds four broad theoretical take-aways.

First, this dissertation supports the argument, often made by international relations and political economy constructivists, that ideational scholarship occupies a unique ontological niche of investigating outcomes in complex social systems. This dissertation advanced a *strongly constitutive* standard of causality, rejecting Humean linear causality in favor of a more probabilistic or emergent causal standard. Linear causality (i.e. 'X' produces 'Y') is problematic in financial markets because the variables under

investigation, X and Y, are mutually constituted and deeply recursive.³⁴⁸ Of course, adopting a strongly constitutively standard of causality might open the present study to criticism for a lack of rigor and parsimony, but what this study lacks in theoretical elegance, it compensates for in external validity. As Mark Blyth points out, most mainstream accounts of complex social systems tend to be static, linear, treat change as exogenous, and see outcomes as normally distributed.³⁴⁹ This dissertation challenges each of these contentions on a theoretical level, and showed that misplaced belief in the above four assumptions actually generates the very fragility that culminates in systemic crises. Risk models built on the assumption of asset price distribution normality, central bankers who believed that the greater risk to the U.S. economy was a Japanese-style deflation (rather than a debt-fuelled real estate and equity binge), and bond ratings that ignored the possibility of home prices decreasing nationally all show that agents' tendency to think of the world as a stable and linear place can sow the very fragility and epistemic blindness that culminates in non-routine change in financial markets. This dissertation corroborates Blyth's view that the narratives that agents invent to guide their behavior generate the very stability that they end up taking for granted, while also ensuring that we are surprised when outcomes belie our convention-given expectations.³⁵⁰ Standard linear models do not account for the two-way, reflexive relationship between economic conventions and material outcomes. As this dissertation showed, asset markets are dynamic and non-linear, and also generate change endogenously with outcomes adhering to so-called "fat-tailed" distributions.

³⁴⁸ (Lebow 2009, 4-6)

³⁴⁹ (Blyth 2011, 84-86)

³⁵⁰ (Blyth 2010)

Second, this dissertation's theoretical framework comports with many of the foundational tenets of neoclassical financial economics. This dissertation does not reject notions of market efficiency (or the belief that market prices reflect all publicly known information).³⁵¹ Rather, it augments the efficient markets hypothesis by positing that publicly known information must first be intermediated by agents' animating economic conventions, such that market prices are informationally efficient with regard to agents' dominant social constructs. Yet it is impossible to know exactly when and how these constructs change, which explains why agents are occasionally surprised by discrete shifts in their economic conventions. A greater point of departure between this dissertation and neoclassical finance is in this study's treatment of bubbles and crises as endogenous, rather than exogenous, features of markets. The global financial crisis was not the financial equivalent of a meteor from space. Rather, it resulted from many complex factors, including the structure of the global economy and agency of policy elites and market participants. By accepting instability as an unpleasant fact in complex social environments, this dissertation advances a more theoretically realistic and empirically robust approach to understanding continuity and change in financial markets.

Third, this dissertation showed how incorporating economic conventions into the Post-Keynesian model of financial crises could lead to a better model of financial crises. This dissertation problematized and identified the sources of stability in the Post-Keynesian model, argued that "displacements" are endogenous, rather than exogenous, features of financial markets, provided a framework of understanding how stable (but fragile) systems erupt into crisis, and described the ideational constraints of elite

³⁵¹ (E. Fama 1970). For more on neoclassical finance, see (Ross 2005).

intervention in the economy during crisis periods. This dissertation argued that while Charles Kindleberger and Hyman Minsky provide a plausible heuristic model of financial instability, their model suffers from the fact that it understates the causal importance of economic ideas, and specifically economic conventions such as credit ratings and expectations of regulators' behavior, as drivers of stability and instability in asset markets. By drawing on insights from J.M. Keynes, Charles Doran, and economic constructivists, this dissertation brought economic conventions "back into" the Post-Keynesian model of financial crises.

Fourth, this dissertation shows how cross-discipline collaboration can lead to better theories. The guiding premise of this dissertation was that insights about crises in the international system could be used to explain the timing and nature of crises in other domains. For this reason, this dissertation borrowed from Charles Doran's work on power cycle theory, which is an apt framework of understanding continuity and change in the international system. Doran's "single dynamic" of expectations and material power trends provides a useful analog for understanding both how agents form their expectations based on linear extrapolations from past trends (i.e. via conventions of ergodicity) and how non-ergodic deviations from conventions of ergodicity trigger structural uncertainty in complex social systems. This dissertation illustrates how insights from one domain, international relations theory, can be applied to other domains such as asset markets. Further scholarship should continue in this tradition, attempting to break down institutional barriers to cross-discipline collaboration.

Empirical Implications

Empirically, this dissertation used its conventions-based theoretical framework to explain America's monetary policy prior to the global financial crisis. Chapter 3 described how economic conventions of ergodicity, expert opinion, and conventional expectations led the FOMC to cut short-term interest rates and keep them "too low for too long," thus inducing an unsustainable increase in housing prices and the proliferation of fragile, adjustable-rate mortgage structures.³⁵² This chapter used process-tracing techniques and counter-factual analysis to illustrate how Japan's historical experience with deflation, the Greenspan Doctrine ideology that held that it was better to "clean up" after a bubble burst rather than to "lean against" its inflation, and the construction of the Fed's inflation metrics via the CPI and PCE deflator explain the Fed's rationale for keeping interest rates low in the early 2000s. The chapter concluded that different economic conventions could have led to different monetary policy outcomes in the U.S. economy, potentially averting the housing bubble and credit boom that culminated in the global financial crisis. The key take-away from this chapter is that central bankers are not Turing programmable, black box automatons processing material inputs and translating them into monetary policy in discernable ways. Rather, central bankers' decisions follow from their economic ideas. Monetary policy can therefore be understood as both historically contingent and agency-driven. This is not to damn central bankers and blame the entire crisis on the Fed. Instead, this dissertation uses the Fed as a laboratory for

³⁵² Of course, there is no way to know for certain whether the Fed raising interest rates would have necessarily "popped" the housing bubble, and whether the benefits of popping the housing bubble exceeded the risks of prematurely cutting off a broad-based economic expansion. But as this dissertation's second proposition argues, Fed monetary policy likely contributed to both the *amplitude* and *periodicity* of the housing bubble, such that different monetary policy choices might have diminished the momentum of rising prices.

demonstrating the political power of central bankers' ideas, showing how central bankers' conventions need to be taken seriously as causal drivers of monetary policy and economic outcomes.

Additionally, this dissertation described how economic conventions drove the rise of America's fragile financial system that emerged in tandem with the inflating housing bubble from 2001-2006. Chapter 4 spelled out the mechanics of shadow banking, or off-balance sheet financial intermediation, in which various wholesale "depositors" made loans to "borrowers" via ABCP and repo conduits. Building on the work of Gary Gorton, Viral Acharya, and others, this dissertation found that institutionalized conventions of *expert opinion* via bond ratings had a pro-cyclical effect on capital flows into risky asset classes. The CRAs were important cogs in the machine in which banks manufactured "information-insensitive" ABS for shadow banking purposes. Chapter 4 explained how banks' pre-crisis capital inadequacy was a function of their economic conventions of *ergodicity* vis-à-vis their risk models and regulatory rules at the time. Bank risk models such as value-at-risk institutionalized ergodic conventions regarding market volatility, correlation risk, and Gaussian normality, and thus made banks vulnerable to large shocks, such as moments in which realized market outcomes deviate from convention-given expectations of the future. Together, bond ratings and banks' internal risk models illustrate how economic conventions can be causal drivers of stability and fragility in the financial system, since banks' stability depended on the continued truth-value of their economic conventions. When conventions changed (e.g. via bond downgrades), this initiated non-stochastic changes in market outcomes.

Chapters 5 and 6 studied the role of *conventional expectations* in shadow banking markets, and demonstrated how the most acute phase of the global financial crisis can be understood as a generalized, shadow banking bank run catalyzed by the failure of Lehman Brothers. Chapter 5 drew on findings from interviews with market participants and other primary source material to show that regulators' repeated interventions in financial markets from LTCM in 1998, Bear Stearns in March 2008, and the GSEs in September 2008, created a *conventional expectation* that regulators would serve as *liquidity providers of last resort* in shadow banking conduits. This convention explains why bank runs prior to Lehman were idiosyncratic, or isolated to specific firms, rather than generalized, or across all shadow banking conduits. Chapter 6 explained how the failure of Lehman Brothers eviscerated this convention and initiated a generalized bank run against all ABCP and repo markets. It cited market data to show how Lehman's failure precipitated a *flight to quality* in financial markets, just as Keynes would have predicted, as agents coped with the stress of convention uncertainty. This chapter also explained how conventions held by regulators shaped their response to the crisis. Regulators' fears of initiating a "second Great Depression" colored their thinking and made them much more likely to issue unconditional bailouts to the entire financial system, thereby offering *de facto* deposit insurance to shadow banking markets and stemming the ABCP and repo bank runs after Lehman. Together, Chapters 5 and 6 illustrate the importance of economic conventions during crisis periods, showing that conventions held by elites shape their behavior during crises.

Limitations

There is no perfect theory. Despite this dissertation's central belief that economic conventions explain America's pre-crisis monetary policy and shadow banking fragility, the present study is not without its limitations. The subsequent paragraphs respond to some of the potential critiques of the dissertation's ontology, theoretical insights, and empirical conclusions. Effort is made to be as charitable as possible to potential critiques, while responding to them in turn.

Central to any theory of the social sciences is an epistemological, ontological, and methodological posture about the role of agency in complex systems. One of the most contested issues in the social sciences is the "agency and structure" debate.³⁵³ On one end of the spectrum, pure agency-based approaches elevate the decision-making of specific actors as important causal determinants of outcomes. Agency-based accounts of financial crises tend to focus on the decisions of elites in shaping financial institutions' risk tolerance, monetary policy, and political preferences for deregulation, to name a few examples. Implicit in such agency-based views is that actors make certain choices over others based on their own volition. On the other end of the spectrum are purely structural arguments. Rather than focusing on the idiosyncratic cognition of specific agents in explaining outcomes in complex systems, structural theories treat the existence of self-interested, rational agents as ontologically given, and study the constraints and incentives that shape agent behavior. According to a purely structural account of the global financial crisis, the economic conventions held by the market, policymakers, central bankers, and financial institutions were *epiphenomenal* to structural factors like factor endowments,

³⁵³ See, for example: (Dessler 1989) and (A. E. Wendt 1987).

global imbalances, banks' institutionally determined mono-focus on bottom-line profits, politicians' goal-oriented electioneering, and central bankers' goals of maintaining their independence, among many others. The specific features of such structural arguments are not important to the present study. Rather, it is worth reiterating that structural arguments tend to elevate non-agency based explanations of outcomes over alternatives.

Where does this dissertation fit into the agency and structure debate? At first appraisal, this dissertation seems to confirm the argument, often made by ideational scholarship, that ideas matter because structures do not come with "instruction sheets" that tell agents how to act in complex environments.³⁵⁴ This dissertation's strongly constitutive causal standard posits that economic conventions give factor endowments, market prices, interest rates, and asset classes with meaning to agents. Economic conventions provide the researcher with a lens to understand agent behavior that "would make little sense without them," as Abdelal et al. argue.³⁵⁵ In addition, an honest reading of the facts surrounding agent behavior during the crisis should prompt even the staunchest structuralist to accept that during crisis periods, agency matters.³⁵⁶ There was nothing structurally pre-ordained about Bear Stearns' bailout and Lehman's bankruptcy, other than the unique inter-subjective constructs guiding regulators' behavior. Can one say for certain that different central bankers, each with their own unique socialization distinct from Alan Greenspan and Ben Bernanke would have made the *exact same*

³⁵⁴ (Blyth 2003)

³⁵⁵ (Abdelal, Blyth and Parsons 2010, 17)

³⁵⁶ Indeed, one can be a structuralist *ad absurdum* and claim that conventions too are structurally determined, and not just epiphenomenal, but this alone does not rebut the core theory presented by this dissertation. After all, this dissertation argued that economic conventions need to be taken seriously as causal drivers of displacements, stability, fragility, and crises in asset markets. Even if economic conventions are mere reflections of structural forces, this does not imply that conventions do not matter, just that they are intervening variables between structural factors and market outcomes.

decisions in comparable circumstances? Perhaps an anti-bailout central banker might have refrained from extending sovereign credit to America's financial system after Lehman Brothers. Of course, we do not have the luxury of running a controlled experiment to test this proposition and provide a definitive answer. Nevertheless, the author hopes that the empirical work presented in Chapters 3-6 convinced the reader that central bankers, regulators, politicians, and the market exhibited agency qua their economic conventions, such that different economic conventions would have led to different outcomes in the U.S. economy.

A second potential limitation of the study is that it did not address the conventions behind other material causes of the crisis. These other causes include populist credit expansion on behalf of Fannie Mae and Freddie Mac and global imbalances fueled by surplus saving countries such as China, Japan, Germany, and commodity exporting states, which might have depressed long-term real interest rates in the United States. Certainly, Fannie Mae and Freddie Mac added *incremental* demand to the housing market, using their quasi-government status to purchase and securitize mortgages.³⁵⁷ Nevertheless, there are reasons to believe that the GSEs were not decisive factors in the inflation of the housing bubble, including the fact that numerous countries experienced housing bubbles during the 2000s without government sponsored housing finance. Global imbalances could have been important *co-determinants* of the housing bubble, but America's current account deficit of 6.5%, while a symptom of fragility, was not large enough to account for the surge in demand for housing assets in the U.S. economy pre-

³⁵⁷ (V. V. Acharya, et al. 2011) and the Dissent of the *Final Report of the Financial Crisis Inquiry Commission* (The Financial Crisis Inquiry Commission 2011). For a particularly interesting volume on the political economy *symbiosis* that developed between savers in China and current account deficit countries like the United States, see: (Schwartz 2009).

crisis.³⁵⁸ After all, the U.S. had run a current account deficit from the early 1980s onward, so it is hard to see how the current account deficit suddenly became a problem in the early 2000s. More broadly, even if these explanations do shed some light onto the causes of the housing bubble, this dissertation was as much about fragility as it was about the unsustainable increase in housing prices that accompanied it. Therefore, even if one accepts that Fed policy, along with global imbalances and Federally-sponsored housing finance, contributed to the housing bubble, these factors alone do not explain the sources of fragility in America's financial sector that transmitted the deflating housing bubble to broader financial instability.

A third potential limitation of the present study was the amount of evidence it brought to bear when trying to demonstrate its causal propositions. This dissertation marshalled a variety of qualitative and quantitative data to make its argument that economic conventions must be taken seriously as important causal drivers of financial stability. Nevertheless, more work could be done. With adequate research access, it would be possible to analyze the specific shadow banking mechanisms within specific financial institutions to understand how and why banks' capital commitment committees agreed to adopt such structures prior to the global financial crisis. Granted, there is only so much one can do when completing a doctoral dissertation, and banks are reluctant to allow researchers into their institutions to ask the tough questions about their own incompetence. Luckily, numerous other actors had access to such data, which is why this dissertation borrowed from the findings of the Financial Crisis Inquiry Commission, the Federal Reserve, and the U.S. Department of the Treasury. Still, more evidence could be

³⁵⁸ (Shin 2012)

gathered with proper institutional access, and subsequent work can build upon the empirical work and evidence presented by this dissertation.

Avenues for Further Research

It is this author's hope that this dissertation is not the only post-global financial crisis study to take a serious look at economic ideas as important causal drivers of financial market outcomes. Indeed, numerous authors, such as Rawi Abdelal, Craig Parsons, Mark Blyth, Matthias Matthijs, and others have made important contributions using ideational political economy to explain economic crises. Still, more work can be done. Below are five avenues of further research that can build on the insights put forth by the present study. While by no means exhaustive, these five suggested avenues could prove fruitful for scholars interested in the links between economic ideas and financial stability.

First, future work can apply this dissertation's conventions-based theoretical framework to different cases of financial market instability. This dissertation focused on a "single-n" case study of the global financial crisis. While its core theoretical propositions are generalizable and non-case specific, further scholarship can test its applicability to novel cases. One could apply this conventions-based theoretical framework to the Asian financial crisis of 1997-1998, and focus on the inter-subjective, conventions-based drivers of fragility in Southeast Asian economies. One might begin by studying the epistemic consensus of capital account liberalization among economic technocrats in the 1990s as an endogenous "displacement" that induced pro-cyclical portfolio flows into risky assets in Southeast Asian nations, creating a "double mismatch" of both currency and maturity of financial institutions' liabilities. As a result, many

Southeast Asian states accumulated large, foreign exchange-denominated, short-term debt, which made them vulnerable to both *rollover risk* in global capital markets and *credit risk* if the value of their assets fell. This underlying fragility was exposed with the devaluation of the Thai baht in 1997, which triggered capital flight out of Southeast Asian economies. This crisis trigger can be conceptualized as a non-routine deviation from agents' convention-given expectations, in turn catalyzing convention uncertainty and causing a flight to quality out of risky developing country capital markets and into perceived safe havens like U.S. Treasuries. The IMF and U.S. Treasury-led bailouts can be understood as a manifestation of regulators' attempt to restore convention certainty to financial markets in exchange for painful (and in hindsight, counterproductive) structural reforms.³⁵⁹ Other potential crises worth investigating using this framework could include the European sovereign debt crisis, various emerging market crises in Mexico and Latin America, and historic cases ranging from the Great Depression to the Dutch tulip bubble.

Second, future work can study the relationship between antecedent crisis resolutions and subsequent market displacements. For instance, the primary policy response of many Southeast Asian states after the Asian financial crisis was a *de facto* policy of dollar accumulation to buffer their economies in case of capital flight. Countries such as Vietnam, South Korea, Thailand, Indonesia, Malaysia, Hong Kong, Singapore, and the People's Republic of China undervalued their nominal exchange rates to spur export-led growth and accumulate foreign exchange reserves. These countries subsequently re-invested their foreign exchange into U.S. capital markets, thus depressing long-term interest rates and fueling the housing bubble. Excess savings from

³⁵⁹ For some background on the Asian financial crisis from which this section was adapted, see: (Jackson 1999), (Woo, Sachs and Schwab 2000), and (Stiglitz 2003).

North and Southeast Asia lowered interest rates and caused an increase in demand for risky assets by financial institutions.³⁶⁰ Several empirical studies demonstrate that foreign capital flows did indeed affect borrowing costs in the U.S. economy, which summarily impacted borrowing decisions in the U.S. housing market. Economists estimate that foreign capital inflows accounted for a roughly fifty to one hundred basis point fall in U.S. Treasury bond yields from 2004 and 2006.³⁶¹ Considering that many of the riskiest mortgages issued during the housing bubble were “adjustable rate,” it is conceivable that falling interest rates did have a disproportionate effect on the incentives facing prospective homeowners in the U.S., encouraging home construction and fueling the housing bubble. William Miles argued that long-term interest rates – those most likely to be influenced by global imbalances – had independent predictive power over housing prices.³⁶² Maurice Obstfeld and Kenneth Rogoff find that low interest rates, touched off by the acceleration in dollar recycling from abroad, “fed into a powerful multiplier mechanism” that entrenched “unrealistic expectations” and “asset-market distortions” in the U.S. housing finance market.³⁶³ This is not to argue that all financial crises are path dependent and follow from prior crisis resolutions, or that foreign savings and investment

³⁶⁰ Raghuram Rajan refers to this tendency of market participants to purchase riskier assets when benchmark interest rates fall as “risk shifting.” Most investment managers, including insurance companies, mutual funds, and pension funds, face fixed liability structures and floating asset bases. To see why risk shifting is a rational response for investors in an environment of falling benchmark interest rates, consider the example of an insurance company that guarantees policyholders a return of six percent per annum in an environment of falling interest rates. Faced with this differential between promised returns and investment income, fund managers will tend to prefer riskier assets (and get compensated for doing so via higher yields) to match asset returns with liability promises. If enough actors engage in risk shifting, interest rates on risky assets will fall, thus boosting pro-cyclical asset market conditions in risky asset classes. For more on risk shifting, (Rajan 2006)

³⁶¹ (Warnock and Warnock 2009)

³⁶² (Miles 2012)

³⁶³ (Obstfeld and Rogoff 2009, 25)

decisions *caused* the housing bubble. Rather, researchers should consider that the policy responses to today's problems might induce future displacements. More work should be done to identify the causal links between antecedent crisis resolutions and subsequent displacements.³⁶⁴

A third avenue of research opened by this dissertation is studying the role of *ideational transfer among borrowers* during crisis periods. In particular, this line of research tends to support this dissertation's ontology of strongly constitutive causality that problematizes the false dichotomy between ideational and material factors in asset markets. For instance, during the height of the global financial crisis, South Korea experienced acute net capital outflows, likely due to the flight to quality in asset markets after Lehman's failure. South Korean markets stabilized when the United States struck a \$30 billion notional currency swap arrangement with the Bank of Korea, which in turn stemmed the capital flight and stabilized Korean markets. Korea also signed a number of other currency swap arrangements with other foreign central banks. Yet Korea drew less than 10% of their swap line with the United States, with comparable levels for other swap agreements. Thus, the real impact of the currency swap arrangements was that they provided a form of *ideational transfer* between the sovereign creditworthiness of the United States and third parties. As this episode shows, during crisis moments, the distinction between material and ideational factors is moot, since conventions are so in flux and subject to considerable uncertainty that *notions* of fundamental value *become*

³⁶⁴ Several prominent authors advance this thesis, albeit without the language of economic ideas. These include: (Schwartz 2009), (Wolf 2007), and (Eichengreen 2011).

fundamental value in a self-fulfilling manner. Future work should study in-crisis credibility transfer dynamic.³⁶⁵

Fourth, another related but distinct avenue of research opened by this dissertation is a broader discussion of other economic ideas and market outcomes, particularly the role of norms. Finnemore and Sikkink define a norm as “a standard of appropriate behavior for actors with a given identity.”³⁶⁶ To all market participants, it is clear that the economy is dominated by many normative frameworks that imbue agent behavior with meaning. For instance, the norm of homeownership could be used to explain the rise of government-sponsored housing finance in the United States. Notions of “housing as the American dream” and the “ownership society” are understudied as causal drivers of populist credit expansion in the United States from 1930-2008. Nevertheless, the U.S. economy experienced a bipartisan push to expand homeownership from the Great Depression onward, culminating in the nationalization of Fannie Mae and Freddie Mac in September 2008. Therefore, the norm of homeownership might be to blame for the housing bubble. Usually, such norms are relegated as epiphenomenal to material interests, though further should challenge this assumption to show that ideas, along with interests and institutions, should be considered when explaining outcomes like populist credit expansion in the U.S. economy.

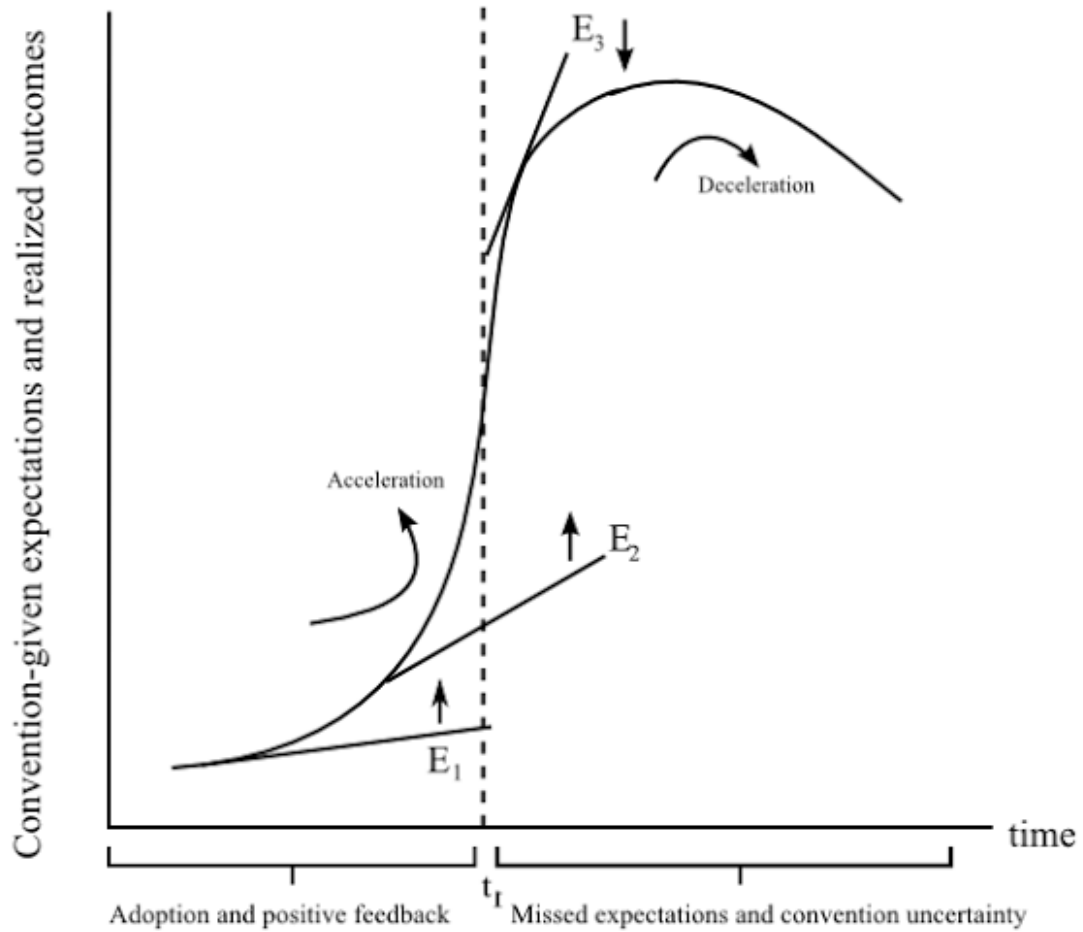
Fifth, this dissertation provides a predictive framework of anticipating future financial instability. For if we accept that the systematic failure of agents’ taken-for-granted conventions catalyzes convention uncertainty and thus financial market

³⁶⁵ (Shenai 2009)

³⁶⁶ (Finnemore and Sikkink 1998, 891)

instability, then it is possible to appraise the vulnerability of our most taken-for-granted conventions when judging the likelihood of financial market instability. For instance, in today's post-crisis environment in early 2014, market concerns over the Fed's tapering of its bond-buying program, lingering fears about sovereign credit risk in Europe, political uncertainty in the U.S. Congress, among many others, dominate the market's headlines. Yet there are other, far subtler but more substantial risks to the global recovery, including the risk of America ceasing to provide its litany of global public goods that guarantee a liberal trade and monetary order, a potential hard economic landing in the People's Republic of China, and the looming threat of inflation. While this dissertation's primary goal is not to speculate about future economic events for which the author is unprepared to foresee, this dissertation's theoretical framework can at least tell us that if we want to understand the nature of future systemic crises, it helps to examine the potential fragility of our most taken-for-granted beliefs that stand as the premises for other, second and third-order investment hypotheses.

APPENDIX I: Non-Routine Change Triggering Convention Uncertainty³⁶⁷



Above is a visualization of expectations formation in non-ergodic systems. Note how expectations are formed by linear projections of current trends. For all $t < t_1$, market outcomes and expectations are congruent and self-stabilizing, such that the perceived truth-value of agents' conventions increases with market confirmatory data. For all $t > t_1$, however, non-ergodic deviations from agents' convention-given expectations engenders a “shock” that causes agents to reappraise their taken-for-granted convention set. Non-

³⁶⁷ Adapted from (Doran 1991) and (Doran 1999)

routine change reveals to agents the bankruptcy of their linear projections of past trends into the future (i.e. conventions of ergodicity), thus catalyzing a period of convention uncertainty in financial markets. Provided a sufficient number of agents must cope with the shock of missed expectations at the same time, and given the pre-existence of a fragile financial system, the likelihood of systemic crisis rises.

APPENDIX II: Modified CPI Calculations

Item	Description	Weights	1995	1996	1997	1998	1999
All items	Original Data ³⁶⁸	100.0%	152.4	156.9	160.5	163.0	166.6
Housing (Owners' Equivalent Rent)	Original Data	42.7%	148.5	152.8	156.8	160.4	163.9
Transportation	Original Data	17.2%	139.1	143.0	144.3	141.6	144.4
Food and beverages	Original Data	15.0%	148.9	153.7	157.7	161.1	164.6
Medical care	Original Data	6.3%	220.5	228.2	234.6	242.1	250.6
Education and communication	Original Data	6.0%	92.2	95.3	98.4	100.3	101.2
Recreation	Original Data	5.6%	94.5	97.4	99.6	101.1	102.0
Apparel	Original Data	3.7%	132.0	131.7	132.9	133.0	131.3
Other goods and services	Original Data	3.5%	206.9	215.4	224.8	237.7	258.3
Case-Shiller Index ³⁶⁹	Original Data		76.7	78.1	82.3	89.8	99.5
Scaled Case-Shiller	Author Calculation ³⁷⁰		148.5	151.3	159.4	173.9	192.7
Homeownership Rates	Original Data		64.4%	65.3%	65.5%	66.0%	66.7%
Weighted Average Housing Component	Author Calculation ³⁷¹		148.5	151.8	158.5	169.3	183.1
Composite Counter-Factual CPI	Author Calculation ³⁷²		146.5	150.4	155.2	161.0	169.1
Scaling Factor ³⁷³	1.94						

³⁶⁸ Original data accessed via the Bureau of Labor Statistics website, available here: <http://www.bls.gov/cpi/>; for full citation, see: (U.S. Bureau of Labor Statistics n.d.)

³⁶⁹ Data retrieved from Standard & Poor's; for full citation, see: (McGraw Hill Financial n.d.)

³⁷⁰ Actual value of the Case-Shiller index times the scaling factor

³⁷¹ Found by taking a weighted average of housing based on percent of homeownership and percent renters (i.e. (1-homeownership rate)*Owners' equivalent rent + (homeownership rate)*scaled Case-Shiller)

³⁷² Based off of original values of CPI, substituting the Weighted Average Housing Component for Owners' Equivalent Rent

³⁷³ Based off of the proportion of the Case-Shiller to Owners' Equivalent Rent in 1995 (e.g. 148.5/76.7)

Item	2000	2001	2002	2003	2004	2005
All items	172.2	177.1	179.9	184.0	188.9	195.3
Housing (Owners' Equivalent Rent)	169.6	176.4	180.3	184.8	189.5	195.7
Transportation	153.3	154.3	152.9	157.6	163.1	173.9
Food and beverages	168.4	173.6	176.8	180.5	186.6	191.2
Medical care	260.8	272.8	285.6	297.1	310.1	323.2
Education and communication	102.5	105.2	107.9	109.8	111.6	113.7
Recreation	103.3	104.9	106.2	107.5	108.6	109.4
Apparel	129.6	127.3	124.0	120.9	120.4	119.5
Other goods and services	271.1	282.6	293.2	298.7	304.7	313.4
Case-Shiller Index	113.6	123.6	142.2	161.3	191.4	221.9
Scaled Case-Shiller	219.9	239.4	275.3	312.3	370.7	429.8
Homeownership Rates	67.1%	67.6%	67.9%	68.1%	68.7%	69.2%
Weighted Average Housing Component	203.4	219.0	244.8	271.6	314.0	357.7
Composite Counter-Factual CPI	181.1	190.0	202.6	216.4	237.5	259.9

Item	2006	2007	2008	2009	2010	2011
All items	201.6	207.3	215.3	214.5	218.1	224.9
Housing (Owners' Equivalent Rent)	203.2	209.6	216.3	217.1	216.3	219.1
Transportation	180.9	184.7	195.5	179.3	193.4	212.4
Food and beverages	195.7	203.3	214.2	218.2	220.0	227.9
Medical care	336.2	351.1	364.1	375.6	388.4	400.3
Education and communication	116.8	119.6	123.6	127.4	129.9	131.5
Recreation	110.9	111.4	113.3	114.3	113.3	113.4
Apparel	119.5	119.0	118.9	120.1	119.5	122.1
Other goods and services	321.7	333.3	345.4	368.6	381.3	387.2
Case-Shiller Index	222.4	200.7	162.1	158.2	156.0	149.6
Scaled Case-Shiller	430.7	388.6	313.9	306.3	302.2	289.7
Homeownership Rates	68.6%	68.5%	67.9%	67.4%	67.2%	66.5%
Weighted Average Housing Component	359.3	332.2	282.6	277.2	274.0	266.0
Composite Counter-Factual CPI	263.9	255.6	239.5	236.9	239.5	241.7

APPENDIX III: AIG's Payments to Counterparties

	Country	Total³⁷⁴	Securities Lending	CDS - Maiden Lane III	CDS - Collateral Payments
Goldman Sachs	USA	18.8	4.8	5.6	8.4
Société Générale	France	17.4	0.9	6.9	9.6
Deutsche Bank	Germany	14.9	6.4	2.8	5.7
Barclays	UK	8.5	7	0.6	0.9
Merrill Lynch	USA	8.1	1.9	3.1	3.1
UBS	Switzerland	5.5	1.7	2.5	1.3
Bank of America	USA	5.3	4.5	0.5	0.3
BNP Paribas	France	4.9	4.9	0	0
Calyon	France	4.3	0	1.2	3.1
HSBC	UK	3.5	3.3	0	0.2
Citigroup	USA	2.3	2.3	0	0
Dresdner Kleinwort	UK	2.2	2.2	0	0
Deutsche Zentral-Genossenschaftsbank	Germany	1.8	0	1	0.8
ING	Holland	1.5	1.5	0	0
Bank of Montreal	Canada	1.4	0	0.9	0.5
Royal Bank of Scotland	UK	1.1	0	0.5	0.6
Morgan Stanley	USA	1	1	0	0
Wachovia	USA	1	0	0.8	0.2
AIG International	USA	0.6	0.6	0	0
Rabobank	Holland	0.6	0	0.3	0.3
Credit Suisse	Switzerland	0.4	0.4	0	0
Dresdner Bank AG	Germany	0.4	0	0.4	0
Paloma Securities	USA	0.2	0.2	0	0
Citadel	USA	0.2	0.2	0	0
Landesbank Baden-Wuerttemberg	Germany	0.1	0	0.1	0

Source: The Financial Crisis Inquiry Commission³⁷⁵

³⁷⁴ All figures in USD Billions.

³⁷⁵ (The Financial Crisis Inquiry Commission 2011, 377)

APPENDIX IV: Econometric Evidence of Convention Uncertainty Catalyzing Parameter Instability in Financial Markets

Introduction

While Chapter 6 presented anecdotal and qualitative evidence that the failure of Lehman Brothers catalyzed convention uncertainty and the subsequent financial market instability, it is possible to test this proposition empirically using publicly available financial market data. The purpose of this Appendix is to test whether Lehman Brothers' bankruptcy constituted a break in agents' convention-given expectations, which manifested in market prices. Specifically, this section completes two types of econometric tests, including a Chow test for parameter stability in interbank lending markets with a hypothesized break date of September 15, 2008, along with the computation of a Quandt likelihood ratio test that tests for breaks in time series data with unknown break points.³⁷⁶ The results of both tests corroborate this dissertation's hypothesis that the failure of Lehman Brothers constituted a structural break in financial markets and was the proximate trigger of financial instability, intermediated by convention uncertainty.

The purpose of this Appendix is to show how the bankruptcy of Lehman Brothers and bailout of AIG created a break in agents' economic conventions that regulators would serve as *liquidity providers of last resort* in shadow banking markets. According to this dissertation's conventions-based theoretical framework, systemic crises occur when a majority of financial market participants re-appraises their most ontologically taken-for-granted ontological beliefs simultaneously within a fragile financial structure. This re-

³⁷⁶ (Chow 1960) and (Quandt 1960)

appraisal is initiated when events belie agents' convention-given expectations, thus invalidating their *conventional anchors* of behavior and causing them to revert to first principles of survival in financial markets.³⁷⁷ If the shock is sufficiently large and widespread, markets can enter a period of acute panic as all investors are forced to cope with the fact that their most taken-for-granted economic conventions no longer apply to their given situation. Convention instability causes theretofore-stable (but fragile) financial systems to tip into instability by delegitimizing taken-for-granted conventions, thus eroding financial market participants' faith in their value anchors and, by extension, one another. As a result, trading can become choppy as market actors return to first principles of survival, hoarding capital and liquidating portfolios *en masse*.

In the case of the global financial crisis, Chapter 6 argued that the failure of Lehman Brothers caused a generalized bank run in ABCP and repo markets. This is because Lehman's failure *invalidated* agents' *conventional expectations* that regulators would serve as liquidity providers of last resort in financial markets. As a result, agents simultaneously attempted to "get liquid" at the same time, causing a flight to quality in financial markets and causing interbank funding pressures to surge. When Lehman Brothers went bankrupt, a classic "run on the bank scenario" emerged against all commercial paper and repo market borrowers, including bank and non-bank financial institutions. The market's trust in financial institutions waned as ABCP and repo counterparties were left to divine the intentions of fickle regulators who, while preaching the ills of moral hazard and allowing Lehman Brothers to go bankrupt, also bailed out the comparatively much larger and systemically important insurance giant AIG.

³⁷⁷ See Appendix I for a graphical representation of this, as well as Propositions 4 and 5.

Immediately after Lehman Brothers failed, many money market mutual funds (the principle buyers of ABCP) and repo counterparties boycotted the debt of other financial institutions. The Financial Crisis Inquiry Commission estimates that roughly \$165 billion in funds was pulled out of ABCP markets because of Lehman Brothers' failure. As a result, one of the biggest holders of Lehman Brothers ABCP, the Reserve Primary Fund, announced that it "broke the buck," or could not repay their creditors at face value of their investments. Until that time, money-market mutual funds were considered some of the safest investments available.³⁷⁸ Original losses at the Reserve Primary Fund immediately led to an investor boycott of all money-market mutual funds. The Financial Crisis Inquiry Commission found that "investors pulled out simply because they feared that their fellow investors would run first" – a classic sign of a bank run in the commercial paper market.³⁷⁹

The withdrawal of liquidity from short-term debt markets led to a unidirectional trade across financial markets, wherein market participants sold their risky assets *en masse* and purchased safe dollar assets. This "flight to quality" manifested itself in plunging dollar bond yields for short-term Treasury notes but also reflected the fact that investors had grown fearful of the counter-party solvency of financial institutions. Lehman Brother's bankruptcy made it much more difficult for financial institutions to finance themselves, leading to a credit crunch across the entire U.S. credit market. For instance, the thirty and ninety-day Libor-OIS spread, a common measure of bank counter-party risk, shot up roughly four-fold in the immediate aftermath of Lehman. With

³⁷⁸ (Condon 2006)

³⁷⁹ (The Financial Crisis Inquiry Commission 2011, 357)

rising short-term interest rates, banks found it difficult to finance their operations. The cost of insuring bank debt rose, reflecting heightened investor concern over the solvency of financial institutions.

Chow Test of Known Break

One way of testing for the existence of structural breaks in asset markets is to use a technique developed by Chow (1960), which evaluates the stability of econometric parameters over time. Chow identified that if one has a potential break date in mind (and in this case, we do), then it is possible to execute a Chow test to evaluate whether there exists a meaningful statistical difference between model parameters before and after a hypothesized “break point” in the data. Statistically speaking, the Chow test determines whether separate regressions for different time periods explain more of the variance in the dependent variables than a single, pooled regression that includes both time periods.

Before executing the test, it is helpful to spend some time discussing the variables chosen for the given study. Recall that the purpose of this exercise is to test whether the failure of Lehman Brothers catalyzed convention uncertainty, and thus bank runs and market instability. If the below test shows that there is no statistically significant difference in model parameters before and after the failure of Lehman Brothers, then it follows that the failure of Lehman Brothers did not constitute such a break in convention certainty. If the test does show that there is a statistically significant difference between pre and post-Lehman market data, then it follows that Lehman Brothers did precipitate a structural break in financial markets.

Empirical evidence of a structural break is a necessary but insufficient condition to explaining the causal link between Lehman Brothers’ bankruptcy and market

outcomes. To specify this link, Chapter 6 summarized this dissertation's findings from interviews with market participants to show that Lehman Brothers' bankruptcy initiated a period of convention uncertainty. Recall from Chapter 5 that financial market participants accepted the notion that any time insolvency and illiquidity threatened a systemically important financial institution, U.S. regulators at the Department of Treasury and Federal Reserve would intervene in financial markets to restore stability in a *liquidity provider of last resort* function in financial markets. The market's conventional expectation that regulators would save troubled counterparties provided some stability in asset markets after the sale of Bear Stearns to J.P. Morgan, ensuring a base level of market confidence in all financial counter-parties. Yet the failure of Lehman Brothers and simultaneous bailout of insurance giant AIG sent mixed signals to financial markets that *some financial institutions would fail while others would receive government assistance*, though markets were left with little guidance about which of their trading partners would live on to see another day. As a result, perceptions about bank counter-party risk surged as financial intermediaries hoarded liquid capital to protect their balance sheets. The core argument of this dissertation is that it was the structural uncertainty engendered by the simultaneous bankruptcy of Lehman Brothers and bailout of AIG that triggered a panic in commercial paper and repo markets and thus catalyzed broader financial instability. Lehman and AIG caused bank counterparties to hoard liquid capital from one another, spreading credit risks among America's biggest financial institutions. This relationship – fears of counterparty risk and credit risk among investment banks – is hypothesized to have shifted after the failure of Lehman Brothers and bailout of AIG

One can measure the market's fears over counter-party solvency via several economic aggregates, including the Libor-OIS spread and TED spread. According to the Federal Reserve Bank of San Francisco and Alan Greenspan, the spread between Libor (the London Inter-bank Offered Rate) and the overnight index swap rate (OIS, or the rate on an interest rate swap for fixed to floating interest rates in the overnight market) provides a proxy for uncertainty about the creditworthiness of financial institutions and their access to liquidity. A high Libor-OIS spread indicates higher levels of counter-party risk in financial markets, whereas a lower Libor-OIS spread indicates diminished fears of counter-party risk.

After the failure of Lehman Brothers, one and three-month Libor-OIS spreads increased, which reflected heightened market fears of financial institution counter-party risk. This surge in perceived counter-party risk after the failure of Lehman Brothers and AIG caused the market generally to speculate against the creditworthiness of systemically important financial institutions that caused the cost of insuring their debt via the CDS market to increase in tandem with higher Libor-OIS spreads.

This dissertation proposes a finite distributed lag model (FDL) of order seven to model the relationship between one-month Libor-OIS spreads (this study's independent variable) and an index of the credit default swap premiums of America's five biggest financial institutions: Citigroup, Bank of America, Goldman Sachs, Morgan Stanley, and J.P. Morgan. The "index" value is the joint cost of insuring equal notional tranches of the senior debt of the above issuers in basis points. The model takes the below functional form, estimated using the robust least squares approach:

$$\text{Index}_t = \beta_0 + \beta_1 \text{LO}_t + \beta_2 \text{LO}_{t-1} + \beta_3 \text{LO}_{t-2} + \beta_4 \text{LO}_{t-3} + \beta_5 \text{LO}_{t-4} \\ + \beta_6 \text{LO}_{t-5} + \beta_7 \text{LO}_{t-6} + \beta_8 \text{LO}_{t-7} + \varepsilon,$$

where “Index” is the joint cost of insuring equal-sized tranches of debt from Citigroup, Bank of America, Goldman Sachs, Morgan Stanley, and J.P. Morgan, and LO is the one-month Libor-OIS spread for a given day. The time periods investigated are 1,107 trading days before Lehman’s failure (i.e. January 2, 2004 through September 12, 2008) and the 819 trading days after Lehman’s failure (i.e. September 15, 2008 through December 30, 2011).

The model’s lag selection depended on the results of Schwartz’s Bayesian information criterion (SBIC), Akaike’s information criterion (AIC), and the Hannan and Quinn information criterion (HQIC). Both the SBIC and HQIC lag criteria confirmed a lag order of seven for the proposed model.³⁸⁰

For a given breakdate t^* (September 15, 2008), given dummy variable d , such that $d=1$ if $t > \text{September 12, 2008}$, there are two potential models:

1. The original model:

$$\text{Index}_t = \beta_0 + \beta_1 \text{LO}_t + \beta_2 \text{LO}_{t-1} + \beta_3 \text{LO}_{t-2} + \beta_4 \text{LO}_{t-3} + \\ \beta_5 \text{LO}_{t-4} + \beta_6 \text{LO}_{t-5} + \beta_7 \text{LO}_{t-6} + \beta_8 \text{LO}_{t-7} + \varepsilon,$$

2. And the model with a structural break at $t = \text{September 15, 2008}$

$$\text{Index}_t = \beta_0 + \beta_1 \text{LO}_t + \beta_2 \text{LO}_{t-1} + \beta_3 \text{LO}_{t-2} + \beta_4 \text{LO}_{t-3} + \beta_5 \text{LO}_{t-4} + \beta_6 \text{LO}_{t-5} \\ + \beta_7 \text{LO}_{t-6} + \beta_8 \text{LO}_{t-7} + \delta d_t + \gamma_1 d_t \text{LO}_t + \gamma_2 d_t \text{LO}_{t-1} + \gamma_3 d_t \text{LO}_{t-2} + \\ \gamma_4 d_t \text{LO}_{t-3} + \gamma_5 d_t \text{LO}_{t-4} + \gamma_6 d_t \text{LO}_{t-5} + \gamma_7 d_t \text{LO}_{t-6} + \gamma_8 d_t \text{LO}_{t-7} + \varepsilon$$

³⁸⁰ Ivanov and Kilian argue that for fine data series (i.e. daily data), SBIC tends to be the most accurate method of lag selection. (Ivanov and Kilian 2001). For more on lag selection, see: (Biernas 2006)

The intuition behind model 2 is that for all $t > \text{September 12, 2008}$, there is a statistically significant difference in the effect that Libor-OIS spreads had on bank CDS after the simultaneous bankruptcy and bailout of Lehman Brothers and AIG.

Based off of this model specification, the dissertation tested the following null hypothesis:

$$H_0: \delta = \gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = \gamma_5 = \gamma_6 = \gamma_7 = 0$$

If, based on the results of the Chow test, we fail to reject the null hypothesis, then it follows that September 15, 2008 did not constitute a structural break point in the relationship between Libor-OIS and the bank CDS spread index.

This study uses five-year credit default swap spread data from five financial institutions. Spread data is presented in basis points. For instance, on January 2, 2007, it cost approximately twenty-one basis points to insure the debt of Goldman Sachs. This implies that a notional amount of \$10,000,000 worth of five-year debt would cost \$21,000 in annual payments. Libor-OIS data is also presented in basis points. Note that most signs of risk in the U.S. financial services sector surged after Lehman's bankruptcy. None of the data is seasonally adjusted. All data was retrieved via Bloomberg™.

Table 6: Chow Test Variable Descriptions

Variable	Description
JPM	J.P. Morgan 5-year CDS value (basis points)
GS	Goldman Sachs 5-year CDS value (basis points)
BAC	Bank of America 5-year CDS value (basis points)
C	Citigroup 5-year CDS value (basis points)
MS	Morgan Stanley 5-year CDS value (basis points)
INDEX	Imputed cost of insuring a basket of debt of JPM, GS, BAC, C, and MS
lois	3-month Libor-OIS spread (basis points)
loisL1	3-month 1-day lag Libor-OIS
loisL2	3-month 2-day lag Libor-OIS
loisL3	3-month 3-day lag Libor-OIS
loisL4	3-month 4-day lag Libor-OIS

loisL5	3-month 5-day lag Libor-OIS
loisL6	3-month 6-day lag Libor-OIS
loisL7	3-month 7-day lag Libor-OIS
break	Dummy variable for all $t >$ September 12, 2008
break_lois	Interaction term between dummy and 3-month Libor-OIS
break_loisL1	Interaction term between dummy and 3-month 1-day lag Libor-OIS
break_loisL2	Interaction term between dummy and 3-month 2-day lag Libor-OIS
break_loisL3	Interaction term between dummy and 3-month 3-day lag Libor-OIS
break_loisL4	Interaction term between dummy and 3-month 4-day lag Libor-OIS
break_loisL5	Interaction term between dummy and 3-month 5-day lag Libor-OIS
break_loisL6	Interaction term between dummy and 3-month 6-day lag Libor-OIS
break_loisL7	Interaction term between dummy and 3-month 7-day lag Libor-OIS

Source: Bloomberg

Table 7: Selected Summary Statistics

	Observations	Mean	St. dev.	Max	Min
JPM	1927	62.9	45.4	232.3	11.5
GS	1927	104.0	94.9	545.1	18.8
BAC	1927	97.1	99.7	483.1	8.0
C	1927	116.6	126.2	665.5	7.4
MS	1927	136.4	147.9	1360.0	17.8
INDEX	1927	517.1	482.6	2552.5	65.7
LO	1927	30.9	45.3	364.4	1.9

Source: Bloomberg

Table 8: Various Indicators (50 days pre and post-Lehman)

	Pre-Lehman (average)	Post-Lehman (average)	Change (percentage)
JPM 5-year CDS	106.2	127.1	20%
GS 5-year CDS	145.6	350.2	140%
BAC 5-year CDS	120.7	143.0	18%
C 5-year CDS	151.7	246.2	62%
MS 5-year CDS	227.3	617.6	172%
INDEX	751.5	1484.1	97%
3-m Libor-OIS Spread	76.4	228.2	197%

Source: Author Calculations

The following table shows the result of the chow test from STATA. The results imply that a structural break occurred on September 15, 2008, the day Lehman Brothers declared bankruptcy.

Table 9: STATA Results for Chow Test

Number of obs = 1920
 F(17, 1902) = 413.48
 Prob > F = 0.0000
 R-squared = 0.8120
 Root MSE = 210.25

	Coeff.	St. Error	t	P>t	95% Confidence Interval	
lois	4.51	2.02	2.23	0.03	0.55	8.47
loisL1	1.87	2.63	0.71	0.48	-3.28	7.01
loisL2	0.02	2.46	0.01	0.99	-4.80	4.85
loisL3	-1.09	2.38	-0.46	0.65	-5.76	3.57
loisL4	-0.75	2.33	-0.32	0.75	-5.33	3.83
loisL5	0.05	2.16	0.02	0.98	-4.19	4.29
loisL6	0.12	2.04	0.06	0.95	-3.88	4.11
loisL7	1.53	1.72	0.89	0.37	-1.83	4.90
break	721.49	13.22	54.59	0.00	695.58	747.41
break_lois	6.75	3.81	1.77	0.08	-0.72	14.21
break_loisL1	-0.54	5.22	-0.10	0.92	-10.77	9.70
break_loisL2	-4.26	5.60	-0.76	0.45	-15.25	6.72
break_loisL3	1.66	5.60	0.30	0.77	-9.31	12.63
break_loisL4	-6.73	6.20	-1.09	0.28	-18.88	5.43
break_loisL5	-0.04	7.47	-0.01	1.00	-14.70	14.62
break_loisL6	1.97	7.27	0.27	0.79	-12.28	16.22
break_loisL7	-1.03	5.08	-0.20	0.84	-10.98	8.93
_cons	60.32	2.96	20.39	0.00	54.52	66.12

Chow test for structural break at observation September 15, 2008

1. break = 0
2. break_lois = 0
3. break_loisL1 = 0
4. break_loisL2 = 0
5. break_loisL3 = 0
6. break_loisL4 = 0
7. break_loisL5 = 0
8. break_loisL6 = 0
9. break_loisL7 = 0

F(9, 1902) = 439.71
 Prob > F = 0.0000

Based on the above test, it follows that we *reject our null hypothesis*, and conclude that there was a structural break in our model parameters after the failure of Lehman Brothers and bailout of AIG.

Of course, one should be hesitant to put too much stock into the results of one regression, and the mere existence of an empirical structural break in the relationship between interbank lending rates and bank credit indices might suffer from several potential pitfalls. First, there is the potential endogeneity problem associated with assuming that interbank lending issues drove bank credit spreads rather than the other way around. Second, there is the potential for omitted variable bias insofar as Libor-OIS spreads were not the only drivers of rising bank CDS spreads.

Regarding endogeneity, there is reason to believe that banks stopped lending to one another in the inter-bank lending markets because they began to conceive of the possibility of several large trading partners defaulting on their obligations at the same time. Funding stress then forced banks to sell assets en masse, which further depressed banks' asset base and made them appear like risky bets in financial markets. And while there were many other factors that drove bank CDS prices during this period, at its core, the global financial crisis was a *banking crisis*, and as such, other confounding variables like stock prices, mortgage prices, and market volatility are symptomatic of the broader causal relationship tested by this dissertation.

In either event, the tentative conclusion that there was indeed a structural break in the relationship between interbank lending rates and bank CDS spreads forces us to dig deeper into the causal relationship between these variables and ask ourselves “what changed?” after Lehman's failure and AIG's bailout. The earlier parts of this chapter

attempted to put these developments in the theoretical context of convention stability theory, and the above econometric exercise should be considered in concert with other, more qualitative and nebulous, but equally important, modes of inquiry.

Quandt Likelihood-Ratio Test

Another method of testing for structural breaks in time series data is to relax the presumption that the researcher knows the series break date *a priori*. While the results of the above Chow test do corroborate this dissertation's hypothesis that the failure of Lehman Brothers initiated break in financial markets, it is subject to *confirmation bias* because it presupposes the existence of a break at Lehman's bankruptcy and no other dates. For this reason, this dissertation tested for the existence of structural breaks in the above time series data using a technique developed by Richard Quandt (1960). This Quandt Likelihood-Ratio Test computes a series of F tests for various break dates, with the largest F statistic comprising the most logical break date in a series.

The intuition behind this Quandt likelihood-ratio (QLR) is as follows:

$$QLR = \max[F(t_0), F(t_{0+1}), \dots, F(t_1)],$$

Where 'F' is the F statistic of a Chow test for a given break date, t in the following time series:

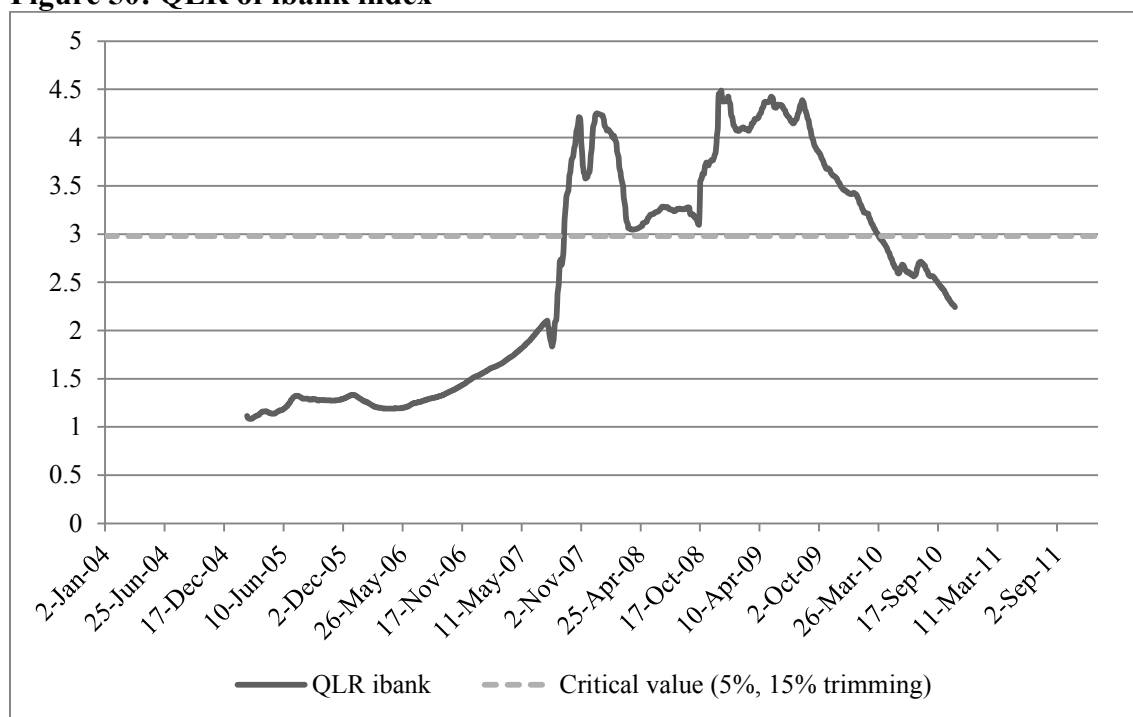
$$CDS\ INDEX_t = \beta_0 + \beta_1 LO_t + \beta_2 LO_{t-1} + \beta_3 LO_{t-2} + \beta_4 LO_{t-3} + \beta_5 LO_{t-4} + \beta_6 LO_{t-5} + \beta_7 LO_{t-6} + \beta_8 LO_{t-7} + \varepsilon,$$

Based on the critical values of the F-test given by Stock & Watson, we can reject the null hypothesis of parameter stability for all $F >$ critical values at times t. Note that in the case

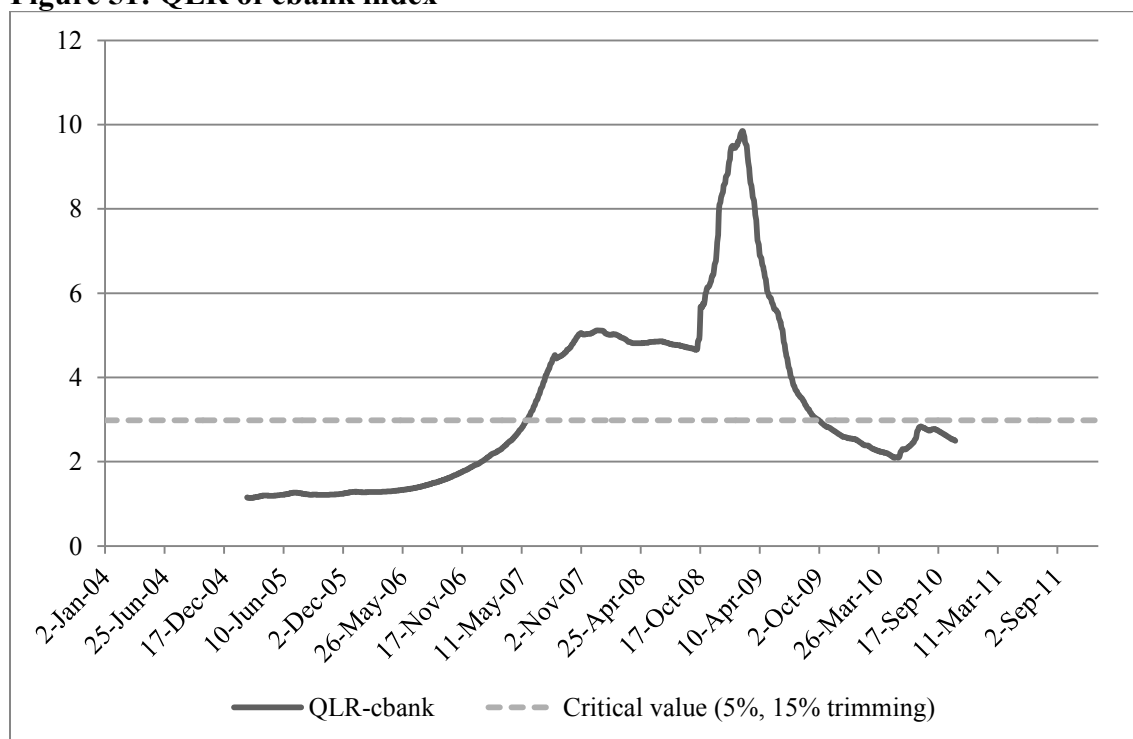
of the QLR test, we must trim the data series (usually omitting the first and last 15% of the time series sample).³⁸¹

This dissertation computed QLR statistics for three dependent variable series, an investment bank index (ibank), comprising the combined CDS spreads of Morgan Stanley and Goldman Sachs, a commercial bank index (cbank), comprising the combined CDS spreads of Citigroup, Bank of America, and J.P. Morgan, and the total index (comprising all five financial institutions, discussed above). The results of this QLR test indicate an existence of a break after Lehman's bankruptcy. However, this test also indicates that the biggest structural break took place mid-February 2009. There are many explanations for these large QLR values, the most logical one being that there were *numerous breaks* in the above time series relationship, of which Lehman Brothers' bankruptcy was one. In either event, the results of this test do provide *prima facie* evidence of a structural break in financial markets after Lehman's bankruptcy.

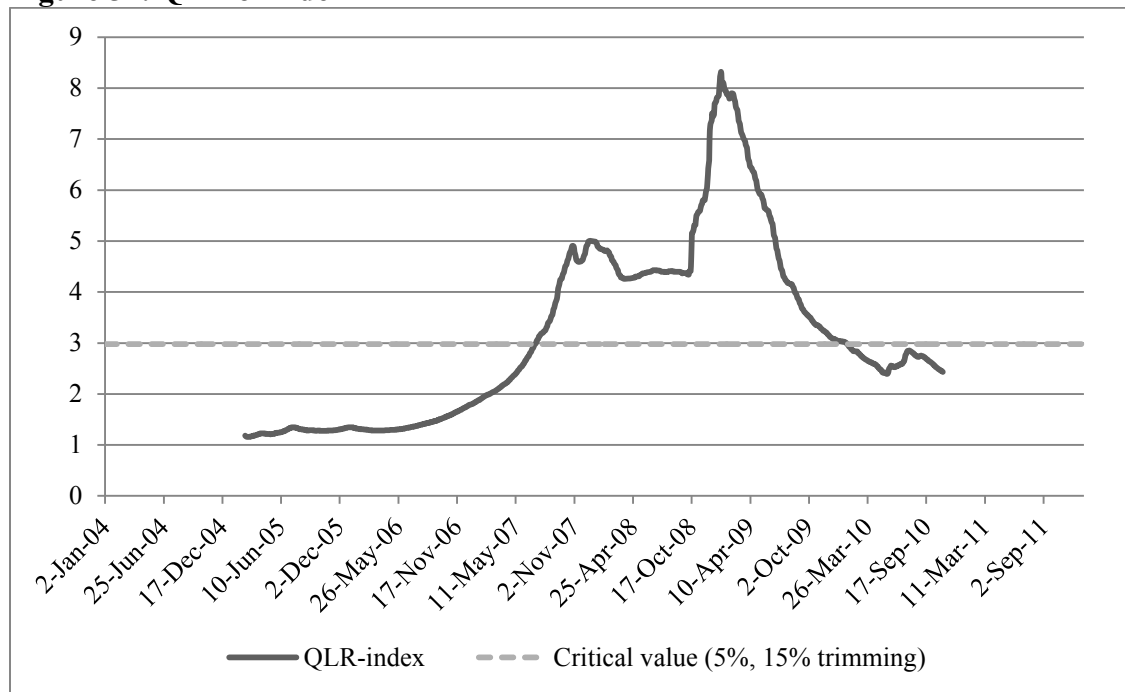
³⁸¹ (Stock and Watson 2006)

Figure 50: QLR of ibank index

Source: Author calculations, STATA output

Figure 51: QLR of cbank index

Source: Author calculations, STATA output

Figure 52: QLR of index

Source: Author calculations, STATA output

The results of the three tests corroborate this dissertation's hypothesis that the failure of Lehman Brothers constituted a break in parameter stability in interbank lending markets.

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Curriculum Vitae

NEIL K. SHENAI, PH.D.

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Washington, DC 20016

PROFILE

International political economist, highly trained in both qualitative and quantitative economic and political analysis. Extensive professional writing experience at top outlets, including *Foreign Affairs*, *CNN*, and *The Huffington Post*. Top teaching experience at American University's School of International Service, the Johns Hopkins University School of Advanced International Studies, and RAND Corporation. Rigorous academic training in international and interdisciplinary Ph.D. program, with regional expertise on East Asia and Europe.

WORK EXPERIENCE

American University – School of International Service (SIS). Washington, DC Professorial Lecturer, August 2013-present

- Full-time faculty appointment at American University's graduate school of international affairs
- Teaching five graduate-level courses, including *Theories of Comparative and International Studies* and *Comparative Political Economy* in the Comparative and Regional Studies program and *the Economics of Violence and Peace* in the International Peace and Conflict Resolution program
- Designed and developed new class on "The Rise of China," taught to advanced American University undergraduates
- Designed and taught a not-for-credit international economics "crash course" to American University graduate students

Johns Hopkins University – School of Advanced International Studies (SAIS). Washington, DC

Professorial Lecturer, June 2011-current

- Teaching Introduction to Economic Development and Macroeconomics
- Received top reviews for clarity, enthusiasm, subject area expertise, and reliability

Teaching Assistant, August 2006-December 2012

- Served as a teaching assistant in both International Relations and International Economics for twenty-four semester-long courses, including Microeconomics (6 semesters), Macroeconomics (7 semesters), Theories of International Relations (4 semesters), International Monetary Theory (2 semesters), Comparative Political Economy (1 semester), International Political Economy (1 semester), Economic Development (2 semesters), International Trade Theory (1 semester)

Research Assistant for Dr. Matthias Matthijs, Summer 2009-current

- Performed data analysis of global income distribution for Dr. Matthijs' paper "Crying Wolf Again? The Decline of Western Economic Influence after the Great Recession," *The International Spectator: Italian Journal of International Affairs* 47, no. 3 (2012), 37-52.

- Analyzed and synthesized data on national income accounts and global macroeconomic balances for Dr. Matthijs' Max M. Fisher Excellence in Teaching award lecture entitled "After the Crisis, the Compromise: The Politics of Economic Adjustment" (November 2011)
- Provided extensive research for Dr. Matthijs' book *Ideas and Economic Crises in Britain from Attlee to Blair (1945-2005)* (London: Routledge, 2011)

Case-writer for Dr. Francis Fukuyama and Dr. Roger Leeds, April 2010-October 2010

- Research and published a case study on the Philippines' FDI attraction strategies for the Bernard Schwartz Forum on Constructive Capitalism at SAIS
- Completed independent field research in the Philippines
- Case currently used as a part of a curriculum of executive training on strategies to promote private sector growth

Johns Hopkins University, SAIS Bologna Center. Bologna, Italy

George H. Abernethy Fellow, August 2012-May 2013

- Pre-doctoral researcher at SAIS Bologna Center
- Completed field research for doctoral dissertation

RAND Corporation. Washington, DC and Tbilisi, Georgia

Consultant, September 2012-October 2012

- Designed, developed, and taught intensive course in international economics to senior Georgian technocrats in Tbilisi, Georgia
- Consulted with the Georgian Foundation for Strategic and International Studies (GFSIS)

Nanjing University, Hopkins-Nanjing Center. Nanjing, China

Visiting Scholar, January 2012-May 2012

- Designed, developed, and co-taught course on international finance to over fifty students
- Lectured on Sino-U.S. monetary relations
- Co-authored series of articles on Chinese domestic politics (see Selected Publications)

Citigroup Global Markets, New York, NY

Structured Credit Trader, June 2006-December 2008

- Traded fixed income securities during the global financial crisis
- Presented research findings on counterparty credit risk to senior management following the default of Lehman Brothers
- Created innovative tools for Citigroup traders using VBA/Microsoft Excel to assess risk

EDUCATION

Johns Hopkins University, SAIS. Washington, DC, Bologna, Italy, and Nanjing, China

Ph.D. in Global Theory & History and International Economics, 2009-2014

- Fields of Specialization: International Political Economy (Passed with Honors), International Relations Theory (Passed with Honors), Comparative Politics
- Doctoral Thesis: “Feckless and Fickle: Central and Shadow Banking During the Global Financial Crisis” – Primary Readers: Dr. Charles Doran (SAIS), Dr. Gordon Bodnar (SAIS), Dr. Matthias Matthijs (SAIS), Dr. Roger Leeds (SAIS), Dr. Mark Blyth (Brown University)
- Successfully defended doctoral dissertation on May 8, 2014 unconditionally and without revision
- GPA: 3.78/4.00

M.A. in International Relations & International Economics, 2006-2008

- Concentrations in IR (Global Theory & History) and International Finance
- Graduated with Distinction on M.A. oral examination defense
- GPA: 3.58/4.00

Johns Hopkins University, Krieger School of Arts and Sciences. Baltimore, MD

B.A. in Economics and International Relations, 2003-2007

- Vice President – Woodrow Wilson Debate Council, nationally-ranked parliamentary debater
- Earned department honors for graduate-level paper on private military firms and civil conflict
- GPA: 3.79/4.00

SELECTED PROFESSIONAL PUBLICATIONS

- “What U.S. should do about Islamic State group” *Newsday* (July 17, 2014)
- “The Rupee Dilemma” *Foreign Affairs* (April 30, 2014)
- “Challenging the Dollar’s Dominance: Is China’s RMB the Next Global Reserve Currency?” *SAISPHERE* (January 2014)
- “China: Europe’s White Knight or Economic Blank Swan?” *Business brief for European Union Center of North Carolina* (July 2012)
- “Chinese succession and Chinese foreign policy” *CNN* (April 19, 2012)
- “Bo Xilai and the politics of Chinese succession” *CNN* (March 28, 2012)
- “Why Chinese succession matters” *CNN* (March 14, 2012)
- “The real power behind North Korea” *CNN* (January 13, 2012)
- “The infection of French markets” *CNN* (November 23, 2011)
- “Why the G-20 matters” *CNN* (October 31, 2011)
- “Global rebalancing act at the G-20” *CNN* (October 24, 2011)
- “A grim economic reality” *CNN* (August 9, 2011)
- “How to save the Eurozone” *CNN* (July 21, 2011)
- “3 fault lines running through China’s economy” *CNN* (April 21, 2011)
- “Flight Risk” *SAISPHERE* (January 3, 2011)

- “U.S.-ROK Economic Relationship: The 2008 Crisis and Beyond” *USKI 2008 Yearbook* (Fall 2010)
- “Dynamic Balances: U.S. Power in the Age of Innovation” *SAIS Review* (Summer-Fall 2010)
- “Leave Lebron Alone!” *The Huffington Post* (July 11, 2010)
- “The G-20’s Dead Ideas: Why Fiscal Retrenchment is the Wrong Response to the Crisis” *Foreign Affairs* (July 9, 2010)
- “Selling the Deficit: When Austerity Matters” *The Huffington Post* (June 3, 2010)
- “Europe’s Reckoning” *The Huffington Post* (May 6, 2010)
- “Free Fraudin’ at Goldman” *The Huffington Post* (April 16, 2010)
- “A Revalued People’s Currency? Be Careful What You Wish For” *The Huffington Post* (April 5, 2010)
- “Plato’s Bankrupt Republic” *The Huffington Post* (February 15, 2010)
- “Ben Bernanke Deserved Confirmation” *The Huffington Post* (February 3, 2010)
- “Obama’s Plan Finally Attacks ‘Too Big to Fail’” *The Huffington Post* (January 21, 2010)
- “Why Taxing Wall Street Makes Sense” *The Huffington Post* (January 14, 2010)

PUBLIC LECTURES, MEDIA APPEARANCES, AND PAPER PRESENTATIONS

- “Is Ukraine’s economy on the brink of disaster?” *Fox News*. Interviewed by KT McFarland as an in-studio expert discussing Ukraine’s economy for a segment featured on FoxNews.com’s *Defcon 3* program (July 15, 2014)
- “The Shangri-La Dialogue” *CCTV America*. Interviewed as an in-studio, live, prime-time expert discussing Shinzo Abe’s speech at the Shangri-La Dialogue (May 30, 2014)
- “Expats play key role in Indian elections” *CCTV America*. Interviewed for prime-time news segment on the Indian elections (May 14, 2014)
- “The Waiting Game” *Arabian Business*. Interviewed for opinion on the Indian elections for *Arabian Business* news magazine (May 2014)
- “Challenges in American Foreign Policy,” lecture given for the *University of Antwerp – Georgetown University Exchange Program* at Washington, DC. Lectured on economic and international political challenges to the United States (July 18, 2013)
- “Market Anarchy: The Theory of Convention Stability,” paper accepted and presented at *Cambridge University*, Cambridge, United Kingdom. Delivered at conference on ‘The Economics of Structural Change: Theory, Institutions, Policy’; paper based off of theory chapter of doctoral dissertation. (September 13, 2012)
- “American Foreign Policy,” lecture given for the *University of Antwerp – Georgetown University Exchange Program* at Washington, DC. Lectured on American foreign policy since 1945 (July 20, 2012)
- “Rebalancing Acts: China and the Global Financial Crisis,” guest lecture at *Nanjing University*, Nanjing, China. Delivered original lecture on U.S. economic imbalances and the inflation of the housing bubble. (April 25, 2012)
- “Will the Greek government survive the debt crisis?” *CNN Europe*. Quoted in article about the future of the Papandreou government (November 3, 2011)

- “Greece in the Eurozone” *BBC World Service Radio – World Have Your Say* program. Appeared as live radio guest discussing the future of Greece in the Eurozone (November 3, 2011)
- “Irish Debt Crisis” *BBC TV – World Have Your Say* program. Appeared as live TV participant discussing Ireland’s austerity measures (November 19, 2010)
- “Future of the G-20 and Financial Regulation” *Couchiching Institute on Public Affairs* panel discussion. Served as co-panelist with former Canadian Prime Minister RH Paul Martin, covered across international media outlets.
- “To Cut or Spend?” *BBC World Service Radio – World Have Your Say* program. Appeared as live radio guest discussing austerity politics in the G-20 (June 22, 2010)
- “Eurozone Crisis” *BBC World Service Radio – World Have Your Say* program. Appeared as live radio guest discussing the future of the Eurozone (May 12, 2010)

ADDITIONAL INFORMATION

Technical Skills: STATA, VBA, Microsoft Office, LaTeX, Bloomberg, FINRA Series 7/63

Honors: Selected as one of twenty-five promising Young Scholars for the Institute for New Economic Thinking's third plenary session in Berlin (March 2012); Starr Grant Award Recipient for travel to the People's Republic of China (March 2011)

Languages: **English:** mother tongue, **Marathi:** fluent, **Italian, French, Spanish:** advanced, **Mandarin Chinese:** conversational

GRE Scores: math: 780/800, analytical: 800/800, verbal: 680/800

Interests: fitness, coffee, cooking, spades and bridge card games, and the Buffalo Bills