# Who Neglects Risk?
# Investor Experience and the Credit Boom*

Sergey Chernenko
sergey.chernenko@fisher.osu.edu
The Ohio State University

Samuel G. Hanson
shanson@hbs.edu
Harvard University and NBER

Adi Sunderam
asunderam@hbs.edu
Harvard University and NBER

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**Abstract**

Many have argued that overoptimistic thinking on the part of lenders helps fuel credit booms. We use new micro-data on mutual funds' holdings of securitizations to examine which investors are susceptible to such boom-time thinking. We show that firsthand experience plays a key role in shaping investors' beliefs. During the 2003-2007 mortgage boom, inexperienced fund managers loaded up on securitizations linked to nonprime mortgages, and by 2007 accumulate twice the holdings of more seasoned managers. Moreover, inexperienced managers who *personally* experienced severe or recent adverse investment outcomes behaved more like seasoned managers. Training and institutional memory can serve as partial substitutes for personal experience.

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## I. Introduction

Many observers, including Kindleberger (1978), Minsky (1986), Reinhart and Rogoff (2009), and Geithner (2014), have argued that overly optimistic thinking on the part of lenders helps to fuel credit booms and sow the seeds of financial crises. In this paper, we draw on the growing literature in economics on belief formation (e.g., Malmendier and Nagel, 2011, 2014) to examine the recent financial crisis in the context of this narrative of credit cycles. In particular, we use a key idea from the belief-formation literature to put structure on this view of credit booms, asking whether firsthand investment experiences affected investors' beliefs about the attractiveness of securitizations tied to nonprime mortgages.

A distinguishing feature of credit markets is that investment payoffs are highly asymmetric. Because of the skewed nature of bond payoffs, normal market conditions are often uninformative. Over-optimism in credit markets therefore takes the form of neglecting downside risks: investors believe that serious adverse outcomes are highly unlikely, making risky credit assets attractive (Genniaoli, Shleifer, and Vishny [2012, 2015], Greenwood and Hanson [2013]). Following this logic, we focus on firsthand investment outcomes, especially extreme outcomes, as determinants of investor attitudes towards securitizations.

We examine the effects of personal experience using new micro-data on mutual funds' holdings of securitizations from 2003 to 2010. Mutual funds are a good laboratory for exploring the role of firsthand experience on boom-time investment decisions because we can accurately measure the tenure of individual managers as well as their past investment experiences and outcomes (Greenwood and Nagel [2009]). While mutual funds are unique from a measurement standpoint, it nonetheless seems natural to generalize any findings about the role of fund managers' firsthand experience to investment managers in other types of financial intermediaries. Our analysis focuses on private-label mortgage-backed securities (MBS) backed by nonprime home mortgages and collateralized debt obligations (CDOs). As Figure 1 Panel A shows, the surge in securitization issuance during the 2003 to 2007 boom was concentrated in these relatively new instruments, which we refer to as "nontraditional" securitizations.

Looking across bond mutual funds, we first show that as of 2007 inexperienced fund managers held far more nontraditional securitizations (NTS) than more seasoned managers. Consistent with the idea that inexperienced managers were more susceptible to optimistic thinking, at the height of the boom they invested roughly 8.5% of their portfolios in NTS

compared to just 4.5% for more seasoned managers. Put differently, by 2007 inexperienced managers had almost twice the subprime exposure of seasoned managers. This finding complements Greenwood and Nagel (2009), who show that inexperienced equity fund managers bought more tech stocks during the late 1990s tech stock boom. Moreover, we find that inexperienced managers owned riskier NTS than seasoned managers, holding higher-yielding, lower-rated tranches. The difference between inexperienced and seasoned managers widened over the course of the subprime mortgage boom. Both inexperienced and seasoned managers held roughly 3% of their portfolios in NTS in 2003. Inexperienced managers then bought significantly more NTS between 2003 and 2007.

What explains the different behavior of inexperienced and seasoned fund managers? Our data suggest that personal experiences with house price appreciation played a role. Inexperienced managers in areas where local house price appreciation was high bought more NTS than both seasoned managers and inexperienced managers in areas where house price appreciation was low. This suggests that firsthand experiences with local house prices shaped beliefs about national house prices and thus the attractiveness of NTS backed by subprime mortgages.

We then ask whether all time on the job as a fund manager is the same and show that it is not. Instead, the accumulation of experience seems to be highly path-dependent: manager's perceptions appear to be heavily shaped by past personal experiences and performance outcomes. In particular, we find that managers who happened to avoid severe negative performance in the past bought more NTS, as did managers whose worst personal performance was further in the past. Thus, managers who had not been burned severely or in the recent past were more likely to buy into optimistic thinking during the boom.

We next link these cross-sectional results back to the time-series idea that market tranquility breeds optimistic thinking. Specifically, periods of broad credit market turmoil are likely to be times when many managers simultaneously gain important experience. Consistent with this idea, we find a discrete shift between managers who were active during 1998—when Russia's default and the failure of Long-term Capital Management led to a spike in credit spreads and sudden credit market turmoil—and those who did not. Bond managers who were active in 1998 held significantly less NTS than those who were not. Again, manager's personal experiences have an outsized effect. Among managers who were active in 1998, we find that those who personally suffered adverse investment outcomes in 1998 invested significantly less in

NTS in 2007. Though 1998 and 2007 were relatively close in time, high turnover among fund managers amplifies the collective effects of recent experience. In our data, only 31% of managers active in 2007 had the experience of managing through 1998, suggesting that the process of "collectively forgetting" past crises happens swiftly.

We also consider two possible substitutes for firsthand experience: "institutional memory" within fund families and manager training. We find that the performance of a fund's family in 1998 has an effect on its 2007 NTS holdings that is independent of the fund manager's 1998 performance. Specifically, inexperienced managers running funds in families that experienced adverse outcomes in 1998 had lower NTS exposure in 2007. We also find that fund managers with more training—those holding a Chartered Financial Analyst designation—held less NTS in 2007, and that the effect of training is stronger for inexperienced managers.

Finally, we explore the behavior of inexperienced managers during the financial crisis. We find that during the crisis inexperienced managers sold more NTS than seasoned managers. These sales do not appear to be forced by outflows—even controlling for the greater outflows that their funds suffered, inexperienced managers sold more NTS. In addition, the securitized bonds held by inexperienced managers were written down more substantially than those held by seasoned managers, suggesting that inexperienced managers held NTS that were riskier *ex post*. These results are consistent with the idea that the greater optimism of inexperienced investors made risky NTS particularly attractive. Once these overoptimistic beliefs were challenged in the crisis, these investors aggressively sold their holdings.

We also consider and rule out several alternative explanations for our findings based on incentives and manager characteristics. For instance, inexperienced mutual fund managers could have faced incentives that were more misaligned with those of their shareholders, leading them to take greater risk. However, we find little evidence of this: inexperienced and seasoned managers faced similar performance-flow relationships, a common proxy for the strength of the risk-taking incentives faced by mutual managers. Alternatively, managers could differ in their risk aversion, with more conservative managers surviving longer and thus being more experienced on average. While differential survival rates might explain our basic finding that inexperienced managers owned more NTS in 2007, it cannot explain our results about the effects of firsthand experience within the set of inexperienced or seasoned managers. Similarly, if persistent difference in managerial skill might explain our results if more seasoned managers are

more skilled. However, this alternative would not explain why seasoned managers with good past performance purchased more NTS. Overall, our results are most consistent with the idea that beliefs, shaped by personal experiences, were an important determinant of investments in NTS.

Our paper is related to several strands of the literature. Recent work on credit cycles, including Gennaioli, Shleifer, and Vishny (2012, 2015), Greenwood and Hanson (2013), Foote, Gerardi, and Willen (2012), Baron and Xiong (2015), and Cheng, Raina, and Xiong (2014), has highlighted the role of beliefs. Cheng, Raina, and Xiong (2014) show that finance professionals working in securitization aggressively purchased larger homes in their personal accounts, suggesting they were more optimistic about house prices. These results complement our finding that inexperienced fund managers bought more securitizations in their professional accounts. The literature on belief formation, including Vissing-Jorgensen (2003), Guiso, Sapienza, and Zingales (2004), and Malmandier and Nagel (2014), has documented that prior experience influences individuals' beliefs about inflation, asset prices, and the broader financial system. For instance, Malmandier and Nagel (2014) show that individuals' past first-hand experiences with inflation influence their expectations of future inflation. In addition, there is a growing literature, including Greenwood and Nagel (2009), Malmendier and Nagel (2010), Malmendier, Tate, and Yan (2011), Chiang, Hirshleifer, Qian, and Sherman (2011), and Campbell, Piazzesi and Schneider (2012), Ramadorai, and Ranish (2014), showing that prior firsthand experiences affect the behavior of households, institutional investors, and corporate managers, presumably by altering their beliefs. Malmendier and Nagel (2010) show that households who have experienced poor stock market returns in their lifetimes take less financial risk, while Malmendier, Tate, and Yan (2011) show that CEOs raised in the Great Depression take less financial risk. Similarly, we show that fund managers' past investment outcomes affect their holdings of securitizations. In summary, we build on several strands of the literature to provide novel empirical evidence that optimistic thinking brought on by a period of market tranquility played an important role in fueling the mortgage credit boom, setting the stage for the recent financial crisis.

The plan for the paper is as follows. Section II provides background on securitizations and develops our main cross-sectional hypotheses about the factors that increase investors' susceptibility to boom-time thinking. Section III explains the data sources we use, and Section IV presents our main findings. Section V offers some concluding remarks.

## II. Background on Securitization and Hypothesis Development

### *A. Background on securitization*

Securitizations are created by assembling a pool of financial assets such as loans or debt securities and then tranching the cash flows from these assets into claims of various priorities. In the United States, securitization dates to the late 1960s and early 1970s when various Government Sponsored Enterprises (GSEs), corporations that were implicitly or explicitly guaranteed by the U.S. government, began securitizing home mortgages. Only "conforming" mortgages, which meet certain requirements for loan size, borrower credit scores, loan-to-value ratios, and loan documentation, are eligible to be included in GSE mortgage securitizations. The GSEs guarantee the payment of principal and interest on the underlying loans, so investors in *GSE-guaranteed mortgage-backed securities* (*GSE MBS*) bear little credit risk.

The late 1970s and 1980s saw the advent of several types of private securitizations that were not guaranteed by the U.S. government, thus exposing investors to credit risk. We refer to these as "traditional securitizations" and they include:

- *Commercial Mortgage Backed Securities (CMBS)*: Securitizations backed by commercial mortgage loans.
- *Consumer Asset-Backed Securities (Consumer ABS)*: Securitizations collateralized by non-mortgage consumer debt, including credit card, automotive, and student loans.
- *Prime Residential Mortgage-Backed Securities* (*Prime RMBS*)**:** Securitizations of prime "jumbo" mortgages that conformed to all GSE criteria other than the size limit.

The boom in private securitization from 2003 to 2007 prominently featured two new types of private securitizations, which developed much later than these traditional securitizations. We label this second generation of private securitizations as "nontraditional." They include:

- *Nonprime Residential Mortgage-Backed Securities* (*Nonprime RMBS*): Securitizations of subprime and Alt-A home mortgages, which do not conform to the GSEs standards due to high loan-to-value ratios, insufficient documentation, or low borrower credit scores.[1]
- *Collateralized Debt Obligations (CDOs)*: CDOs are securitizations backed by a portfolio of fixed income assets, which can include corporate bonds, loans, or other

[1] See Fabozzi (2005), Gorton (2008), and Ashcraft and Schuermann (2008) for background on nonprime RMBS.

securitizations. During the boom, a large fraction of CDOs were collateralized by nonprime RMBS.[2]

As shown in Figure 1 Panel A, the boom in securitization between 2003 and 2007 was concentrated in NTS. Quarterly issuance of traditional securitizations roughly doubled from $103 billion in 2002Q4 to $200 billion at its peak in 2007Q2. However, quarterly issuance of NTS more than quadrupled from $98 billion in 2002Q4 to $420 billion at the peak in 2006Q4.

Consistent with an outward shift in investor demand for NTS, Panel B of Figure 1 shows that spreads on NTS fell during this surge in issuance. The figure plots new-issue spreads for traditional and nontraditional securitizations from 2003 to 2007. The figure also shows that spreads on AAA-rated NTS were noticeably wider than those on other AAA-rated assets at the beginning of the boom. The wider spreads on NTS are consistent with the differences in behavior between inexperienced and seasoned investors we document below. If inexperienced and seasoned managers disagreed about the downside risk of NTS during the boom, the wider spreads on NTS relative to comparably-rated assets would have led inexperienced managers to overweight NTS relative to seasoned managers. The figure shows that spreads on nontraditional securitizations converge towards spreads on traditional securitizations at the height of the boom in 2007, consistent with the idea that optimistic thinking was spreading among investors during the boom.

### *B. Hypothesis development*

What drove the surge in investor demand for nontraditional securitizations from 2003 to 2007? Many observers have argued that overly optimistic thinking on the part of lenders helps to fuel credit booms. As lenders buy into the boom-time belief that good times will last, they increasingly neglect downside risk and extend credit to less creditworthy borrowers.[3] Eventually,

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[2] CDOs are classified as collateralized bond obligations (CBOs), collateralized loan obligations (CLOs), or ABS CDOs. CBOs are collateralized by corporate bonds and were the most common type of CDO until the early 2000s. CLOs invest in senior secured loans to highly leveraged firms. ABS CDOs were backed by bonds from other securitizations, mainly nonprime RMBS. ABS CDO issuance exploded during the boom and accounted for many of the largest losses incurred by financial intermediaries in 2007 and 2008. See Barnett-Hart (2009), Cordell, Huang, and Williams (2012), and Shivdasani and Wang (2013) for further details on CDOs.

[3] As in the case of securitizations linked to subprime, boom-time lending is often concentrated in a set of new instruments that have a positive, but brief, performance history (Gennaioli, Shleifer, and Vishny [2012]). Investors have no memories of losses on these instruments, potentially making it easier to sustain boom-time optimism.

however, defaults escalate and a credit crisis arrives when investors are predictably surprised by the realization of risks they were previously neglecting.

Anecdotal evidence abounds that overoptimistic beliefs may have played a critical role in driving investor demand for nontraditional securitizations. For instance, writing in 2005, Robert Shiller noted "the popular notion that real estate prices always go up is very strong." Similarly, Haldane (2009) summarizes the boom-time mindset that allegedly prevailed from 2003 to 2007 as a belief that "a new era had dawned, one with simultaneously higher return and lower risk." Gerardi, Lehnert, Sherlund, and Willen (2008) show that during the credit boom most Wall Street analysts believed that a sizable drop in nationwide home prices was nearly impossible, even though prices had risen by nearly 75% over the previous decade.

How do such overly optimistic beliefs arise? And are all investors equally susceptible to this kind of boom-time thinking? We now flesh out the cross-sectional implications of the view that optimistic beliefs arise in part from the personal experiences of market participants.

This view is supported by a growing literature in economics, both theoretical and empirical, suggesting that individuals' firsthand experiences play a crucial role in belief formation. Much of this literature is motivated by work in psychology, particularly Kahnemahn and Tversky (1972, 1974), which highlights two crucial deviations from Bayesian belief formation: the representativeness heuristic and the availability heuristic. The representativeness heuristic refers to the tendency to assess the probability of a hypothesis by assessing the extent to which the data at hand are representative of that hypothesis.[4] This heuristic leads subjects to neglect base rates and to be insensitive to sample sizes: people seem to believe in a "law of small numbers, which asserts that the law of large applies to small numbers" (Tversky and Kahneman [1971]). As a result, people overestimate the extent to which their firsthand experiences (a small sample) are informative about the population of potential experiences. The availability heuristic refers to the tendency to estimate probabilities by the ease with which certain events come to mind. Certain experiences are more salient and come to mind more readily. In particular, recent experiences and extreme firsthand experiences are more accessible, leading people to

[4] Loosely speaking, the representative heuristic refers to the widespread tendency to evaluate a hypothesis by assessing Pr(*Data* | *Hypothesis*) as opposed to Pr(*Hypothesis* | *Data*).

overestimate the likelihood that extreme or recent experiences will recur.[5] In addition to these heuristics, a large literature in psychology, including Nisbett and Ross (1980) and Hertwig et al (2004), also argues that personal experiences exert a strong direct influence on decision-making. The literature on reinforcement learning, argues that people's chosen actions depend on the payoffs they have personally obtained from taking various actions in the past (Erev and Roth [1998], Camerer and Ho [1999]), also generates similar predictions.

In our setting, the idea that firsthand experience matters suggests that NTS should have been particularly attractive to inexperienced investors, who participated in credit markets only in the years immediately preceding the financial crisis. These investors would have taken the tranquility of those years as representative of the set of possible outcomes, leading them to neglect the risk of serious credit market disruptions relative to more seasoned investors. Moreover, inexperienced managers would have found riskier NTS more attractive.

***Hypothesis 1: Inexperienced bond fund managers buy more NTS than seasoned managers. Within NTS, inexperienced managers buy riskier securities.***

Representativeness further suggests that the optimism of inexperienced investors would have increased over time as their small sample of good years grew. In addition, the availability heuristic suggests that personal experiences with local house prices in those years should have encouraged this growing optimism about NTS, which were largely backed by housing collateral. While all managers experienced the nationwide surge in home prices, the availability heuristic suggests that investors who were exposed to high local house price appreciation should have been most optimistic about NTS. This should be especially true for inexperienced investors, who had not seen other house price appreciation regimes.

***Hypothesis 2: Inexperienced managers become more bullish on NTS over the course of the boom. Inexperienced investors in areas with high local house price appreciation are especially bullish on NTS.***

[5] For formal models of belief formation inspired by the representativeness and availability heuristics, see Barberis, Shleifer, and Vishny (1998), Rabin (2002), Fuster, Laibson, and Mendel (2010), Fuster, Hebert, and Laibson (2011), Gennaioli and Shleifer (2010), Bordalo, Gennaioli, and Shleifer (2014).

What might make seasoned investors less susceptible to optimistic beliefs? Seasoned investors are likely to have accumulated a larger set of firsthand experiences than inexperienced investors. Both representativeness and availability suggest that the personal investment outcomes of these managers should play a key role in shaping their beliefs.

***Hypothesis 3: Personal investment outcomes affect managers' demand for NTS.***

This hypothesis generates three predictions. First, across managers, the availability heuristic suggests that not all firsthand experiences receive the same weight. In other words, an investor with a long tenure is not necessarily an experienced investor: what happened during the investor's tenure matters. Extreme experiences and recent experiences are likely to have a larger impact on investors' beliefs. In our context, this suggests that investors who happened to avoid extreme negative shocks or recent poor performance would be less likely to recognize the possibility of adverse outcomes. These investors would have been most eager to buy NTS.

Second, periods of broad credit market turmoil are likely to be particularly important for shaping managers' beliefs. The last severe credit market disruption prior to the securitization boom took place in 1998. The Russian default in 1998, combined with uncertainty surrounding the collapse of Long-Term Capital Management, caused credit spreads to rise sharply. Thus, the availability heuristic suggests that managers who started their careers in, say, 1997 or 1998 would have been far less likely to neglect tail risk than those who started in 1999 or 2000.

Third, within the group of investors who managed through 1998, representativeness and availability suggest that firsthand experiences should have an even greater effect than broad market experiences. Thus, a sharper prediction of the narrative is that investors who had good investment outcomes in 1998 should have more willing to buy NTS later on than those who suffered adverse outcomes in 1998.

Next, we turn to substitutes for firsthand experience. We study two avenues for transmitting experience across individual managers: "institutional memory" within fund families and formal investment training. Since fund families share research and operation resources, they may be avenues through which experiences can be shared more effectively. Such memories of past experiences could be transmitted informally. For example, cautionary tales from prior boom-bust cycles may be passed down from senior managers to their junior counterparts. Alternatively, in response to past failures, fund families may establish formal investment policies

and risk-management procedures designed to prevent the erosion in investment standards during booms. In our context, this suggests that inexperienced managers working in fund families that did well in 1998 should have bought more securitizations. These managers had neither the personal experience nor the institutional memory to make the possibility of adverse outcomes salient or available.

Like institutional memory, formal investment training—e.g., completing the Certified Financial Analyst program—may also serve as a partial substitute for first-hand experience. Investors who have studied the mistakes of the past may not be doomed to repeat them. Formal training is again likely to be particularly important for inexperienced investors, who lack personal experience that would make the possibility of severe negative outcomes more salient.[6]

***Hypothesis 4: Institutional memory and formal investment training are partial substitutes for first-hand experience.***

Finally, we turn to investor behavior in the crisis. If inexperienced investors did have more optimistic beliefs about NTS before the crisis, they would have revised their beliefs more dramatically than seasoned managers with the onset of the crisis. This suggests that they would be more likely to sell their NTS holdings in the crisis.

***Hypothesis 5: Inexperienced investors sell NTS more aggressively in the crisis.***

## III. Data

### *A. Mutual fund holdings*

We combine new data on mutual funds' holdings of securitizations with several standard mutual fund data sets. Our holdings data is from Thomson Reuters eMAXX and contains quarterly CUSIP-level holdings of securitizations by U.S.-domiciled mutual funds. Thomson Reuters obtains par value holdings data from funds' regulatory filings, Forms N-CSR(S) and N-

[6] Several studies have asked whether there is a relationship between manager education and fund performance. Shukla and Singh (1994) and Switzer and Huang (2007) find that CFAs outperform and Golec (1996) argues that MBAs outperform. Chevalier and Ellison (1999) find that managers who attended more selective colleges outperform. Dincer, Gregory-Allen, and Shawky (2010) find that more experienced managers and CFAs take less risk, while MBAs take greater risk.

Q, as well as directly from funds. Our sample period runs from 2003Q1 to 2010Q4 from the start of the securitization boom through the bust. Our sample of fund-quarter observations from eMAXX conditions on having at least one securitization in their portfolio, including GSE MBS. Thus, the funds missing from our eMAXX sample are those that by regulation, charter, or choice do not hold securitizations of any sort.

*B. Securities*

We supplement our holdings data by collecting detailed security-level data from the three major credit rating agencies—Fitch, Moody's, and S&P—and Bloomberg. Combining these data sources, we classify securitizations into the six broad collateral types discussed in Section II: GSE MBS, CMBS, consumer ABS, prime RMBS, nonprime RMBS, and CDOs. Our focus is on explaining funds' demand for the nontraditional securitizations that were at the heart of the credit boom and bust. Therefore our main dependent variable is the *nontraditional share*:

$$NTS\ share = NTS\ par\ holdings \div Fixed\text{-}income\ par\ holdings, \quad (1)$$

the share of nonprime RMBS and CDOs in a fund's overall fixed-income portfolio. We also collect data on each security's spread at issuance from Moody's and Bloomberg, the initial rating assigned by Moody's, and the time series of outstanding par amount from Bloomberg.

*C. Characteristics of mutual funds and their portfolio managers*

A key reason to use mutual funds as a laboratory is that we can observe the personal experiences of fund managers in terms of tenure, training, exposure to local house price appreciation, and investment outcomes such as returns and fund flows. We obtain mutual fund investment objectives, location, net assets, returns, and flows from the CRSP Mutual Fund Database. We restrict attention to domestic taxable bond funds and hybrid stock/bond funds using Lipper objective codes. We exclude money market funds, index bond funds, and Treasury-only government bonds funds. Thus, our sample of bond funds consists primarily of balanced hybrid funds, investment grade bond funds, high yield bond funds, and government bond funds that can buy securities other than Treasuries.

We obtain biographic data on fund portfolio managers from Morningstar, including their start and end dates managing different mutual funds. We measure each manager's experience as the number of years since the first time we observe them managing a fund in Morningstar. We

also have data on whether each manager is a Chartered Financial Analyst. For team-managed funds, the fund characteristics are averages of individual portfolio manager characteristics.

We follow Greenwood and Nagel (2009) and hold fixed the measure of each fund's experience at its pre-boom level. Specifically, our experience variable is based on the fund's team of managers as of December 31, 2004. We then label management teams as inexperienced if they were below the 2004 median level of experience across funds. This introduces some measurement error into our key explanatory variable, which may bias us against finding an effect of manager experience. However, fixing the definition of experience guards against the possibility that funds that wished to invest in securitizations endogenously chose younger managers during the boom. Nonetheless, as we show below, we obtain nearly identical results if we update the measure of experience over time in response to manager turnover.

### *D. Summary statistics and aggregate holdings*

In most of our cross-sectional analyses we collapse our data to fund-year observations by averaging the quarterly observations within each fund-year. Table I provides summary statistics for our 2003 to 2010 annual panel of mutual funds. We have 5,983 fund-year observations, representing 987 unique funds. The median fund in our data is managed by two portfolio managers who average roughly eight years of experience. The median fund invested roughly 1% of its fixed-income portfolio in nontraditional securitizations. However, the distribution of *NTS Share* is highly right-skewed with 20% of the mutual funds having an *NTS share* above 10% in 2007. As of 2007Q4, the funds in our sample held $52 billion of NTS in aggregate, constituting a value-weighted NTS share of 5.7%. At the time, NTS constituted roughly 10% of the long-term bond market, so mutual funds as a whole were modestly underweight NTS.[7]

## IV. Results

### *A. The impact of investor experience on 2007 NTS holdings*

This section presents our main results. We start by showing that inexperienced managers

[7] Based on the Flow of Funds, the rough size of the long-term U.S. bond market as of 2007Q4 was $23.8 trillion. Of this, roughly $2.4 trillion was subprime RMBS and CDOs (netting out CDO holdings of subprime RMBS).

bought more NTS than seasoned managers during the boom. We then turn to the role of personal investment outcomes in determining demand for NTS before turning to substitutes for personal experiences. Finally, we examine trading before in the crisis.

Figure 2 tests Hypothesis 1 and illustrates our main finding: at the height of the securitization boom in 2007, inexperienced fund managers held significantly more NTS than seasoned managers. The figure shows the fraction of managers with experience in each 4-year bucket—i.e., 0 to 4 years, 4 to 8 years, and so on—alongside the average NTS share for managers in each bucket. The figure shows that *NTS share* was strongly declining in manager experience. Managers with less than eight years of experience had an *NTS* share of roughly 8%, those with between eight and 20 years of experience had an *NTS* share of roughly 4.5%, and those with more than 20 years of experience had minimal NTS exposure.

Table II formalizes this result in a regression setting. Specifically, Table II reports the results of cross-sectional regressions of funds' 2007 nontraditional securitization holdings on portfolio manager's experience and various fund characteristics:

$$y_i = \alpha_{objective(i)} + \beta \cdot Inexperienced_i + \boldsymbol{\gamma}'\mathbf{x}_i + \varepsilon_i. \quad (2)$$

Consider column (1) of Panel A. The dependent variable is the nontraditional share in percentage points ($y_i$ =*NTS share*$_i$). Our measure of inexperience is a dummy indicating managers with below median experience as of 2004. Fixing the definition of experience in this way ensures our results are not driven by a tendency for funds that wished to invest in securitizations to hire younger managers during the boom. Below we show that we obtain nearly identical results if we update the measure of experience over time in response to manager turnover.

The estimate of $\beta$ = 3.9 ($t$ = 4.8) says that the *NTS share* of inexperienced managers exceeded that of seasoned managers by roughly four percentage points in 2007.[8] Economically, this is a large effect relative to the average *NTS share* of 4.6%.

In column (2) we include controls for other fund characteristics that might help explain NTS holdings: the fraction of managers that are Chartered Financial Analysts (*CFA*), an

[8] In untabulated results, we find that it is experience and not age that matters. Although younger managers tend to have higher nontraditional shares around the peak of the credit boom, the difference is smaller (about 1%).

indicator for team-managed funds (*Team*), log(*Fund TNA*), log(*Family TNA*), log(*Fund age*), log(*Family age*), and the fraction of the fund family's assets under management that are in taxable bond funds (*Family taxable bond share*).

The addition of these controls has almost no effect on estimated effect of experience. Nonetheless, they are of some independent interest. As we discuss further below, funds whose managers had CFAs held less NTS than funds whose managers did not. In addition, funds managed by multiple portfolio managers had larger NTS holdings. This likely reflects the fact that NTS are complex instruments (Coval, Jurek, and Stafford [2009], Arora, Barak, Brunnermeier, and Ge [2009], Hanson and Sunderam [2013]) and therefore require a larger management team. To further control for scale economies in investment management, we add as controls the total net assets of both the fund and its fund family. They have little effect on the level of NTS holdings. We also add fund and family age as proxies for reputational capital, but these controls are not significant. Finally, we control for the fraction of a family's assets in taxable bond funds. This control is both statistically and economically significant: a fund whose family was all fixed-income funds had an *NTS share* that was 7.5 percentage points higher than a fund whose family was all equity funds. This is consistent with the idea that some fund families have greater fixed-income expertise than others.

The next two columns show that we obtain nearly identical results if we add fixed effects for different Lipper investment objectives. Adding objective effects boosts the R-squared because there are systematic differences in NTS holdings across objectives. For example, mortgage-related funds held 15.3% of NTS on average, compared to 10.1% for broad investment grade funds, and 3.1% for U.S. government funds.[9] Nonetheless, the fixed effects have little effect on our estimates of $\beta$ because there is almost no systematic variation in manager experience across investment objectives. When we include both objective fixed effects and controls in column (4), we obtain $\beta = 3.4$ ($t = 4.7$).

Columns (5) to (8) of Panel A show analogous specifications where the dependent variable is an indicator equal to one if the fund holds any NTS ($y_i$ = *Has NTS*$_i$). The estimates

[9] It is interesting that some "U.S. government funds" held meaningful amounts of NTS. Of course, "Treasury-only" funds are prohibited from holding NTS and are excluded from our sample. However, government funds can and do hold limited amounts of non-government-related securities, including private securitizations and corporate bonds.

show that inexperienced managers were 10 percentage points more likely to hold any NTS than seasoned managers. The unconditional probability that a manager in our sample held any NTS is roughly 64%, so this is an economically significant effect. Thus, manager experience had a powerful impact on both the extensive and intensive margins of NTS holdings.[10]

Panel B repeats the same eight specifications using a continuous measure of manager inexperience: $-1 \times$ years of experience. Again, we see that experience has a strong effect on both the intensive and extensive margins of NTS holdings.

Table III reports a battery of robustness exercises for our main finding that inexperienced managers held more NTS at the height of the mortgage boom in 2007. Each row of the table shows four results: measuring inexperience as a dummy or a continuous variable, and measuring NTS holdings as dummy for any holdings or a continuous variable. All specifications include the full suite of controls from Table II as well as fund objective fixed effects. Row (1) replicates our baseline results from columns (4) and (8) of Table II.

Rows (2) and (3) show that the results in Table II are not driven by very small bond funds. Row (2) estimates regressions that weight each fund by its total net assets. Row (3) shows that we obtain similar results focusing on the 250 largest funds, which account for 90% of assets.

Rows (4) to (8) show that our results are robust to modifying the dependent variable. In row (4), we use holdings of nontraditional securitizations scaled by total net assets. Rows (5) and (6) show that inexperienced managers both bought more AAA NTS and more non-AAA NTS.[11] Similarly, rows (7) and (8) shows that inexperienced investors held both more nonprime RMBS and more CDOs than seasoned managers.

Rows (9) and (10) show that inexperienced managers only favored NTS, not all types of securitizations. Specifically, row (9) shows that inexperienced managers had a similar portfolio weight in traditional securitizations as seasoned managers. (However, inexperienced managers were somewhat more likely to hold positive amounts of traditional securitizations). Row (10)

[10] We obtain results virtually identical to those in Table II Panel A if we condition on having non-zero NTS share.

[11] Note that when the dependent variable is measured continuously, the sum of the coefficients in rows (5) and (6) equals the coefficient in row (1). Specifically, inexperienced managers hold 3.4% more NTS overall, of which 2.5% is AAA and 0.9% is non-AAA. Thus, about 75% of our baseline effect is explained by the greater AAA-rated NTS holdings of inexperienced managers, roughly the fraction of nontraditional securitizations that were AAA-rated.

shows that inexperienced managers actually held less GSE MBS than seasoned managers.[12]

Finally, row (11) shows that we obtain broadly similar results if we measure manager experience as of 2007 as opposed to 2004.

*B. The impact of experience on the riskiness of NTS holdings*

Hypothesis 1 also posited that greater optimism should have led inexperienced managers to buy riskier NTS. Table IV shows that inexperienced managers held NTS that were issued at wider spreads. To avoid benchmarking issues, we restrict attention to spreads on floating rate NTS indexed to LIBOR and compute the par-weighted spread at issue on all NTS held by each fund as of 2007.[13]

Panel A shows the result for the average raw NTS spread at issue. As shown in column (1), seasoned managers held NTS with an average spread of 39 bps and inexperienced managers held NTS that offered 17 bps of additional spread. Thus, inexperienced managers were buying NTS that were ex ante riskier. However, the difference in spreads vanishes in Panel B once we adjust for both vintage and initial rating. The way inexperienced managers were taking more risk was by buying NTS with slightly lower initial ratings. Consistent with the idea that they were more optimistic than seasoned managers, inexperienced managers found the more junior tranches of NTS to be attractive.

*C. Investor experience and the evolution of NTS holdings from 2003 to 2010*

When did the difference in NTS holdings between seasoned versus inexperienced managers develop? One possibility is that inexperienced managers were always more optimistic about NTS. Alternatively, as highlighted by Hypothesis 2, they may have become more bullish as the mortgage boom grew.

Figure 3 plots the average NTS holdings by seasoned and inexperienced managers each quarter from 2003Q1 to 2010Q4. Funds with inexperienced managers are those with below-median experience as of 2004Q4 and, as above, this classification does not vary over time for a

[12] Unlike private RMBS, the prices of GSE-guaranteed MBS are not sensitive to home prices: the GSEs—and not investors—bear the default risk on the underlying mortgages. Thus, investors who were overly optimistic about home prices would naturally overweight nonprime RMBS, but would have little reason to overweight GSE MBS.
[13] We can compute this spread measure for 350 funds out of the 508 who held NTS as of 2007.

given fund. The figure shows that inexperienced managers became more bullish on NTS relative to seasoned managers over the course of the boom. Both seasoned and inexperienced managers started with a 3% portfolio weight in nontraditional securitizations in 2003. Beginning in 2004, all managers increased their nontraditional share as subprime-related issuance boomed, but inexperienced managers increased their nontraditional securitization holdings by far more. By 2007Q2, just before the collapse of the market for nontraditional securitizations, inexperienced managers had nearly double the *NTS share* of seasoned managers.

Table V Panel A shows this result more formally using cross-sectional regressions. For each year from 2003 to 2010, we estimate a separate cross-sectional regression of *NTS share* on our dummy indicator for inexperienced managers. The regressions include investment objective fixed effects and the same set of controls as in Table II. Consistent with Figure 3, the table shows that in 2003 inexperienced managers had a *NTS share* that was statistically indistinguishable from seasoned managers. The difference between inexperienced and seasoned managers rose gradually between 2004 and 2007, peaking in 2007.

What explains the timing documented in Table V Panel A? Why did the NTS holdings of inexperienced managers begin to diverge from the holdings of seasoned managers in 2003? Hypothesis 2 highlights the role of local home price appreciation (HPA). Since the vast majority of NTS were backed by housing collateral, manager beliefs about future house price appreciation were likely a key determinant of their attitudes towards NTS. The availability heuristic suggests that local home price appreciation may have exerted a stronger effect on beliefs about national house prices, especially for inexperienced managers.

Table V Panel B offers evidence supporting this idea, reporting regressions of the form:

$$\begin{aligned} NTS\ share_i = \alpha_{objective(i)} &+ \beta_1 \cdot Inexperienced_i + \beta_2 \cdot High\ local\ HPA_i \\ &+ \beta_3 \cdot Inexperienced_i \times High\ local\ HPA_i + \boldsymbol{\gamma}'\mathbf{x}_i + \varepsilon_i. \end{aligned} \tag{3}$$

*High local HPA* is a dummy indicator for funds that are headquartered in MSAs that experienced home price appreciation in the top tercile from 2003 to 2006.[14] Thus, equation (3) asks whether

[14] We obtain similar results using a continuous measure of local HPA.

managers located in MSAs that witnessed high home price appreciation held more NTS in 2007 than others and whether inexperienced managers were particularly sensitive to local HPA.

The results show that inexperienced managers were more influenced by local house prices. Consider columns (3) and (4) of Table V Panel B, which include our suite of controls and objective fixed effects. Column (3) shows that managers based in a high HPA MSAs had a higher *NTS share* than those in a low HPA MSAs. Column (4) adds the interaction between our inexperienced manager indicator and the high HPA indicator. The interaction is positive and significant while the direct effects of inexperience and high HPA are insignificant. Thus only inexperienced fund managers in MSAs with high HPA held more NTS. Inexperienced managers in MSAs with low HPA acted similarly to seasoned managers, who were not swayed by local housing market conditions.

*D. The role of personal investment experiences*

Having established that seasoned investors bought less NTS in the boom, we next ask what makes them less susceptible to boom-time thinking. Hypothesis 3 emphasized the importance of personal investment outcomes. Across managers, the availability heuristic predicts that managers who happened to avoid poor performance would underweight the likelihood of adverse outcomes and buy more NTS. In other words, seasoned managers who have happened to avoid poor performance are like inexperienced managers.

Table VI offers evidence that supports this idea, reporting regressions of the form:

$$\begin{aligned} NTS\ share_i = \alpha_{objective(i)} &+ \beta_1 \cdot Inexperienced_i + \beta_2 \cdot HighAvgReturn_i \\ &+ \beta_3 \cdot HighMinReturn_i + \beta_4 \cdot DistantMinReturn_i + \boldsymbol{\gamma}'\mathbf{x}_i + \varepsilon_i. \end{aligned} \tag{4}$$

Equation (4) asks whether managers whose average or minimum past returns were high held more NTS in 2007. Managers with high minimum returns are those who happened to have avoided poor performance over their careers up to 2007. Equation (4) also asks whether managers whose minimum return is further in the past held more NTS in 2007.

In equation (4), we compute each manager's minimum return from 1995 to 2005, and *HighMinReturn* is an indicator for managers with minimum returns in the top two terciles. We compute each manager's average return from 1995 to 2005, *HighAvgReturn* is an indicator for managers with average returns in the top two terciles. *DistantMinReturn* is a measure of how far

in the past the manager's minimum return was.

Consistent with the idea that extreme experiences are more salient, column (6) of Table VI shows that high average returns have no effect on NTS holdings but high minimum returns have a strong positive effect. Column (6) also shows that managers whose own worst return is further in the past hold significantly more NTS. This finding is consistent with the idea that recent experiences are more accessible.

*E. Personal experiences during prior credit market disruptions*

Our results up until now have highlighted how cross-sectional differences in manager experience affected attitudes towards NTS in 2007. A time series prediction that emerges from Hypothesis 3 is that periods of credit market turmoil may be particularly important in shaping market-wide attitudes because they are times when many managers simultaneously have salient personal experiences. Thus, the further in the past the last serious episode of turmoil, the more optimistic the average manager is likely to be.

In Section II.B, we highlighted the fall 1998 crisis, the most recent credit market disruption preceding the mortgage boom. Table VII shows that managing through 1998 had an important effect on attitudes towards NTS. Panel A shows the effect of starting in a given year (*YYYY*) on 2007 NTS holdings:

$$NTS\ share_i = \alpha_{objective(i)} + \beta \cdot 1\{Manager\ starts\ after\ 1/1/YYYY\} + \boldsymbol{\gamma}'\mathbf{x}_i + \varepsilon_i. \quad (5)$$

Thus, each column defines the inexperienced dummy based on a different cutoff for the first year that the investor started managing mutual funds. Figure 4 shows the same result graphically.

The effect of experience is highly nonlinear: it only kicks in when a manager has six to seven years of experience, i.e., for the managers who were active during the dislocations of 1998.

Why might 1998 experience exert a strong effect on manager behavior? Many observers argue that the 1998 crisis, like the onset of the subprime crisis in 2007Q3, was remarkable for its swift, unexpected transition from tranquil market conditions to severe turmoil. For instance, in the aftermath of the 1998 crisis, Alan Greenspan (1998) testified that "What is remarkable is not this episode, but the relative absence of such examples over the past five years." Thus, because the 1998 event was different from the gradual, cyclical widening of credit spreads from 2000 to 2002, it may have more greatly influenced manager perceptions of tail risk.

In Panel B, we examine the personal experiences of managers who were active in 1998. We restrict attention to the subset of managers that managed a fund during 1998 and were still active in 2007. To explore whether the investment outcomes that managers experienced in 1998 affected their subsequent behavior, we estimate:

$$\begin{aligned} NTS\ share_i = \alpha_{objective(i)} + \beta_1 \cdot Inexperienced_i^{1998} + \beta_2 \cdot High\ outcome_i^{1998} \\ + \beta_3 \cdot Inexperienced_i^{1998} \times High\ outcome_i^{1998} + \boldsymbol{\gamma}'\mathbf{x}_i + \varepsilon_i. \end{aligned} \quad (6)$$

In equation (6), $Inexperienced_i^{1998}$ is a dummy is equal to one for managers above the median of the distribution of experience amongst those who managed during a fund during 1998. For each manager, we measure the minimum returns and flows across all funds she managed during 1998. $High\ outcome_i^{1998}$ is then an indicator for funds whose 1998 outcome is outside the bottom tercile: these are the managers who happened to avoid the worst outcomes in 1998.

The regressions in Panel B show two interesting results. First, managers who experienced favorable outcomes in terms of 1998 returns (column 3) or 1998 flows (column 7) held significantly more *NTS* in 2007. By contrast, managers who experienced poor returns or heavy outflows in 1998 steered clear of NTS in 2007. Second, the interaction terms in columns (4) and (8) show that the effect of 1998 outcomes is stronger for managers who were relatively inexperienced in 1998. Thus, the behavior of managers who were inexperienced in 1998 was powerfully shaped by their personal experiences during that disruption. Put differently, inexperienced managers who were not burned in 1998 put their hands on the stove in 2007.

The importance of crisis experiences in shaping managers' perceptions of tail risk is particularly noteworthy given the high turnover among investment managers. In our data, only 31% of managers active in 2007 had the experience of managing through 1998. Thus, our findings suggest that the high turnover of managers may help accelerate the collective process of "forgetting" past crises and amplify the collective effects of recent experiences.

### *F. Substitutes for personal experience*

Having established the importance of firsthand experiences, we next turn to factors that may be partial substitutes for them. Hypothesis 4 highlights two such factors: institutional memory and formal investment training. If institutional memory affects investment decisions, inexperienced managers working in fund families that did well in 1998 should buy more NTS.

These managers had neither the personal experience nor the institutional memory to make the possibility of adverse outcomes salient. Similarly, if training substitutes for personal experience, managers with Chartered Financial Analyst credentials should hold less NTS.[15]

Table VIII examines these predictions. In Panel A, using our 2007 cross-section of funds, we estimate the effect of fund family performance:

$$\begin{aligned} NTS\ share_i = {} & \alpha_{objective(i)} + \beta_1 \cdot Inexperienced_i^{1998} + \beta_2 \cdot High\ manager\ outcome_i^{1998} \\ & + \beta_3 \cdot Inexperienced_i^{1998} \times High\ manager\ outcome_i^{1998} \\ & + \delta_2 \cdot High\ family\ outcome_i^{1998} + \delta_3 \cdot Inexperienced_i^{1998} \times High\ family\ outcome_i^{1998} + \boldsymbol{\gamma}'\mathbf{x}_i + \varepsilon_i . \end{aligned} \quad (7)$$

In equation (7), *Inexperienced*$^{1998}$ and *High manager outcome*$^{1998}$ are defined as in equation (6) above. *High family outcome*$^{1998}$ is defined analogously at the family level using the value-weighted average returns and flows for each family's taxable bond funds in 1998.

Column (3) of Table XIII Panel A shows that funds whose families earned higher returns in 1998 have a higher *NTS share* than funds whose families suffered low returns, consistent with the institutional memory hypothesis. Column (4) shows that the effect of institutional memory is particularly strong for inexperienced managers.

As noted above in Table II, CFAs held less NTS at the height of the bubble in 2007 than non-CFAs. This direct effect already suggests that formal training is a partial substitute for on-the-job experience. In Table XIII Panel B, we explore the interaction between formal training and on-the-job experience. The table shows that the interaction term is negative, suggesting that formal training can mitigate the effects of inexperience. However, the estimated coefficient is only marginally significant, so this evidence is just suggestive.

*G. Trading by inexperienced managers during the crisis*

Finally, we turn to manager behavior during the crisis. Hypothesis 5 suggested that inexperienced managers would be more likely to sell NTS during the crisis because they

[15] The CFA credential is a well-regarded qualification in investment management, often thought of as the equivalent of a Master's Degree. CFA candidates must pass tests covering micro- and macro-economics, statistics, fixed-income and equity securities, financial derivatives, portfolio theory, securities law and regulation, and financial accounting. Pass rates for each of the three levels are generally below 50%. In our sample, 48% of portfolio managers have earned a CFA.

significantly revised their beliefs. Consistent with this, Figure 3 shows that during the crisis the average *NTS share* for inexperienced bond managers falls dramatically from 8.5% to 3.5%. By contrast, the average *NTS share* of seasoned managers declines modestly from 4.5% to 3.5%.

*NTS share* could have declined during the crisis for two reasons. First, managers could have sold NTS. Second, losses on the underlying collateral could reduce reported par NTS holdings even in the absence of any active selling. This can happen even though *NTS Share* is based on the par value of NTS holdings, not the market value. The reason is that when securitization trusts suffer losses on the underlying collateral, they go into "early amortization" and write down the par value of their outstanding bonds. Thus, collateral losses result in reductions in the par value of NTS held.

To separate these two forces, we use quarterly data from Bloomberg on the time series of outstanding par amounts for each security. Using this data, we can decompose the total change in par NTS held by each fund into the part due to active selling and the part due to passive reductions in outstanding par. We analyze each component in Table IX, running specifications of the form:

$$y_{it} = \alpha_{objective(i)\times t} + \beta_1 \cdot Inexperienced_i + \beta_2 \cdot Flows_{it} + \beta_3 \cdot NTS\ Share_{it-1} + \boldsymbol{\gamma}'\mathbf{x}_{it} + \varepsilon_{it}. \quad (8)$$

The fund-quarter panel in Table IX covers the crisis period from 2007Q3 to 2009Q2. The first three columns show OLS regressions, and the next three columns add investment-objective-by-quarter fixed effects.

In Panel A, $y_{it}$ is the par value of NTS sold in a quarter scaled by the fund's total par fixed-income holdings. The coefficient in column (5) shows that inexperienced managers sell more NTS per quarter than seasoned managers.

Column (6) adds fund flows, $Flows_{it}$, and lagged NTS holdings, $NTS\ Share_{i,t-1}$, as controls. These controls help to rule out the possibilities that (i) inexperienced managers were forced to sell more NTS because they suffered larger outflows in the crisis[16]; or (ii) that all funds with high initial NTS holdings sold them during the crisis and inexperience is proxying for high

[16] In untabulated results, we find that inexperienced managers suffered worse outflows during the crisis, largely due to higher NTS holdings.

NTS holdings. The independent effect of inexperience is attenuated slightly by the addition of these controls, but remains large and statistically significant at the 10% level.

In Panel B, $y_{it}$ is the decline in par value of NTS due to amortization scaled by the fund's total par fixed-income holdings. Column (5) shows that the NTS holdings of inexperienced managers were written down more quickly than those of seasoned managers. Thus, inexperienced managers purchased NTS that realized larger losses *ex post*. This is consistent with the evidence in Table IV, which shows that inexperienced managers purchased NTS that were higher yielding and presumably riskier *ex ante*.

These results are consistent with the idea that optimistic beliefs drove the NTS holdings of inexperienced managers. Their optimism made riskier NTS attractive, and once their beliefs were invalidated during the crisis they aggressively sold these holdings.

### *H. Alternative explanations*

In this section, we discuss alternative explanations for our findings. These alternatives broadly fall into two categories: (i) explanations based on differences in incentives across managers, and (ii) explanations based on differences in fixed managerial characteristics (e.g., skill, risk tolerance). While some of these alternatives can explain our basic finding that inexperienced managers owned more NTS in 2007, they generally cannot explain our results within the set of inexperienced and seasoned managers. In particular, alternative explanations are hard to square with (i) our finding that managers in areas with high local house price appreciation hold more NTS (Table V), (ii) and our finding that experienced managers with good past performance hold more NTS (Table VI).

#### *H.1. Inexperienced managers face different incentives*

A first alternative interpretation of our results is that they reflect incentive problems. For instance, Chevalier and Ellison (1997) argue that the shape of the relationship between fund flows and past performance determines the risk-taking incentives facing fund managers and show that performance-flow is stronger in younger funds.[17] While such differences in incentives

[17] Chevalier and Ellison (1999) argue that because younger managers are more likely to be terminated for bad performance, they in fact face a more concave payoff function and therefore should take less risk.

might explain our basic finding that inexperienced managers owned more NTS in 2007, they would not explain our results on local house price appreciation.

Furthermore, we can use our data to directly examine whether inexperienced managers faced different incentives than more seasoned managers. Figure 5 shows the performance-flow relationships faced by inexperienced and seasoned managers. The figure shows that inexperienced bond mutual fund managers did not face stronger or more convex performance-flow relationships. We find similar results in untabulated regressions. Specifically, when we estimate monthly regressions of fund flows on lagged fund returns, we find that fund flows respond strongly to past performance, consistent with the prior literature. However, when we interact past fund returns with manager experience, we do not find a stronger performance-flow relationship for inexperienced managers.[18]

Despite the lack of difference in performance-flow relationships, inexperienced managers may still face different incentives in terms of career concerns. For instance, if outperformance is necessary to avoid termination, inexperienced managers may find it optimal to take more risk. However, this story is hard to reconcile with our finding that experienced managers with good past performance also hold more NTS. Experienced managers with good past performance already have the outperformance necessary to avoid termination and therefore would not face strong incentives to take risk under this career concerns story.

A somewhat related alternative explanation is that more risk-loving investors were endogenously matched with inexperienced managers and these investors provided managers with incentives to take risk. In other words, inexperienced managers faced stronger incentives to take risk but there was no agency problem. This would happen most naturally if both inexperienced managers and risk-loving investors gravitated toward funds with riskier investment objectives. However, our results are robust to including fund objective fixed effects, so they are not driven by a tendency for inexperienced managers to run funds with riskier objectives. Moreover, this alternative cannot explain our results on the personal experiences of individual managers (Tables VI to X). Furthermore, the fact that inexperienced managers sold more NTS during the crisis

[18] We have also examined fund tracking error and do not find evidence that inexperienced managers have larger tracking error. Thus, the higher nontraditional share of inexperienced managers does not appear to be part of a broader pattern of deliberate risk taking which would be reflected in a larger tracking error.

(Table XI) suggests that they revised their views on NTS more than seasoned managers.

*H.2. Inexperienced managers have different fixed characteristics*

The second class of alternative explanations involves fixed manager characteristics. For instance suppose that individual fund managers vary in their risk preferences—i.e., there is a manager fixed-effect in risk-aversion—and more risk-loving managers are terminated at a higher rate than risk-averse managers. If the distribution of risk preferences is the same for each cohort of new managers, then the higher termination rate of risk-loving mangers means that the composition of the cohort will change over time: younger manager cohorts will tend to be more risk-loving. Beliefs and personal experience play no role in this story, but less seasoned managers would still hold more NTS than seasoned managers on average. While this kind of differential manager survival can explain our basic finding that inexperienced managers owned more NTS in 2007, it cannot explain our results within inexperienced and seasoned managers. For instance, in the differential survivor story, there is no reason for inexperienced managers in areas with high local house price appreciation to buy more NTS. Similarly, the survivorship story cannot explain the effects of 1998 fund or fund family outcomes on the 2007 NTS holdings of inexperienced managers (Tables VII and VIII).

Alternatively, one might imagine that there are persistent differences in managerial skill. Under this alternative, seasoned managers are more skilled and therefore avoided NTS. But if managerial skill were driving our results, one would expect skilled managers to have outperformed in the past and to hold less NTS in 2007. However, we find the exact opposite: managers who outperformed in the past buy more NTS in 2007.

Overall, our results seem most parsimoniously explained by the role of firsthand experiences in shaping fund manager beliefs.[19]

[19] We have shown that managers' past firsthand experiences have a strong effect on their future behavior. Of course, past outcomes could affect behavior by altering either managers' beliefs or their attitudes towards risk. For instance, experiencing poor returns in 1998 could reduce 2007 NTS holdings either because it led to more conservative beliefs or more conservative risk attitudes. In general, these two views are very difficult to separate, though we believe our results on local house price appreciation point towards experiences shaping beliefs rather than risk.

## V. Conclusion

Nontraditional securitizations—nonprime RMBS and CDOs—were at the heart of the recent financial crisis. The demand for these securities helped drive the housing boom during the mid-2000s, while rapid declines in their prices during 2007 and 2008 generated large losses for intermediaries, imperiling their soundness and triggering a full-blown crisis. Using micro-data on mutual funds' fixed-income holdings, we find that inexperienced managers were far more likely to acquire nontraditional securitizations during the boom. Furthermore, managers' past first-hand experiences exert a strong effect on their propensity to buy nontraditional securitizations, suggesting that investor belief-formation is highly path-dependent.

Our findings are also consistent with a path-dependent view of financial crises in the spirit of Galbraith (1954), who claims that the "financial memory should be assumed to last, at a maximum, no more than 20 years. This is normally the time it takes for the recollection of one disaster to be erased." As the memories of last crisis fade, investor optimism builds, setting the stage for the next crisis.

This view of financial crises has novel implications for financial stabilization policy. If policymakers smooth out the normal bumps in the road, they may encourage the very types of overoptimistic thinking that generate crises. Just as a series of small forest fires can lower the risk of a larger conflagration by consuming dry underbrush, letting investors suffer the consequences of moderate mistakes may reduce the probability of a larger crisis. In this view, having investors bear losses is beneficial not because it creates appropriate *incentives* to manage risk but instead because it promotes *sensible beliefs* about the trade-off between risk and return.

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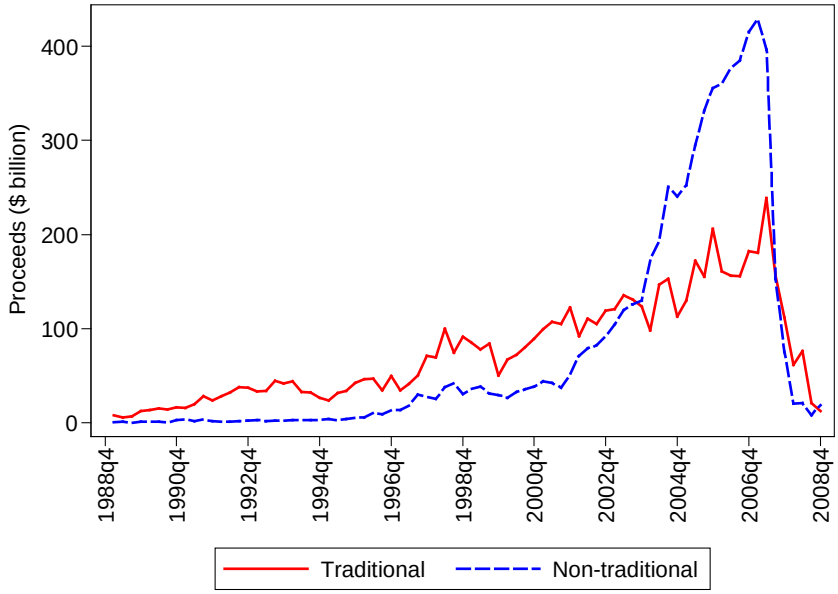
Panel A: Quarterly issuance of traditional and nontraditional securitizations




Panel B: Credit spreads on AAA-rated securitization tranches

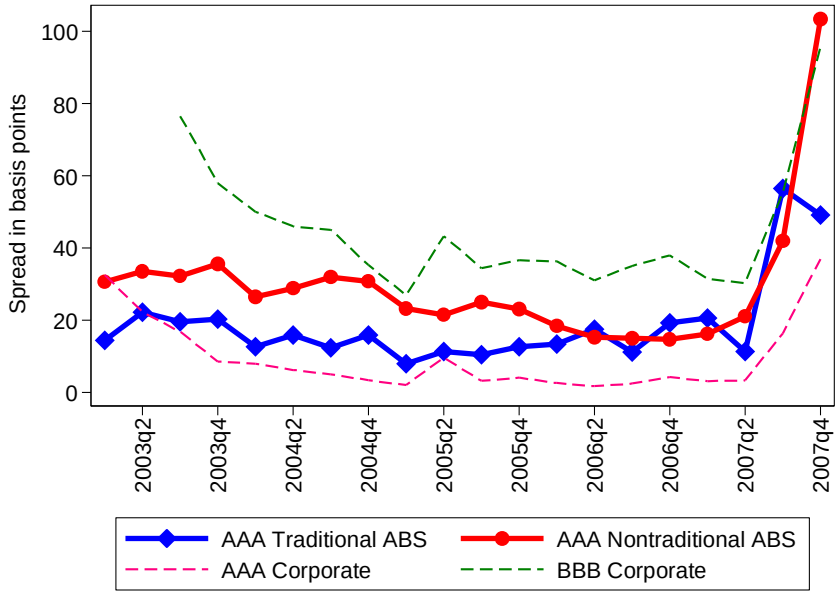



**Figure 1. Issuance and credit spreads on traditional and nontraditional securitizations.** This figure shows quarterly issuance volume and credit spreads on traditional and nontraditional securitizations based on SDC data. Traditional securitizations include CMBS, prime RMBS, consumer ABS, and other ABS. Nontraditional securitizations include non-prime RMBS and CDOs. Panel A plots quarterly issuance of traditional and nontraditional securitizations. Panel B plots the credit spreads on newly issued AAA-rated securitizations. Each quarter we compute the value-weighted average spread on traditional and nontraditional securitizations. To avoid benchmarking issues we restrict attention to the spreads on floating rate notes indexed to LIBOR. For reference we plot the average secondary spreads over LIBOR (based on interest rate swaps) on 3-year AAA and BBB-rated corporate bonds from Barclays.

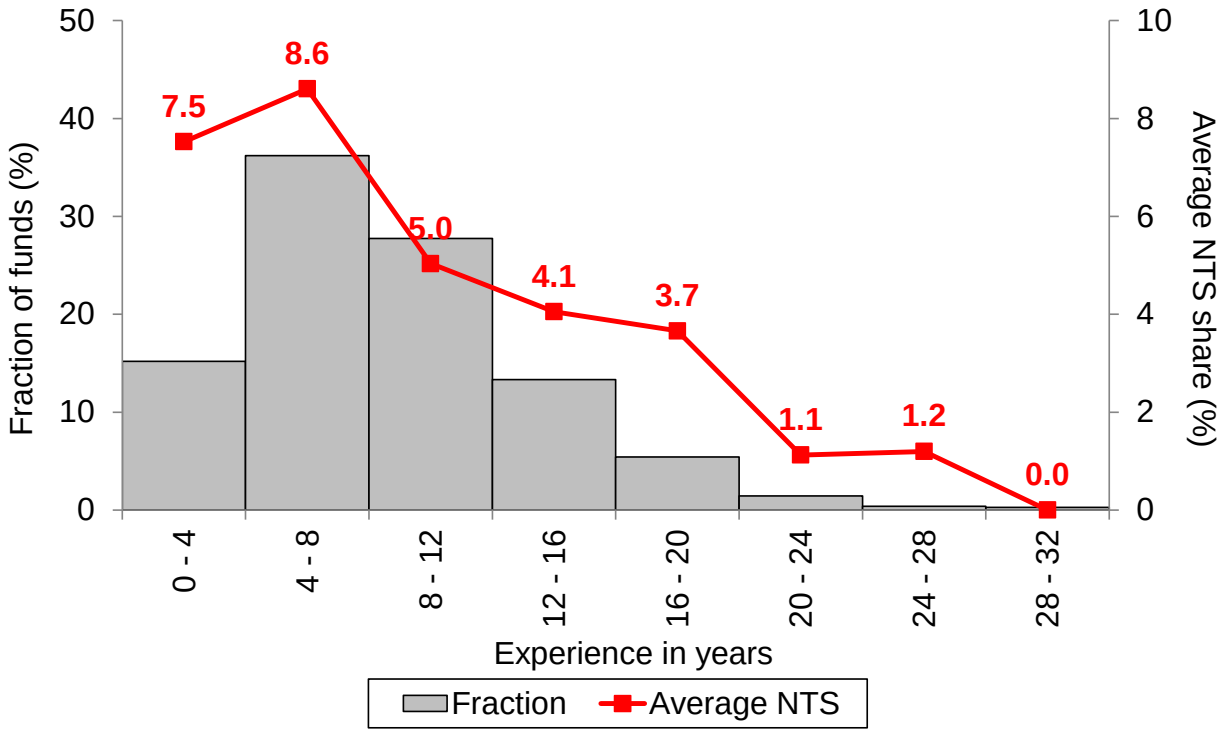



**Figure 2. Bond manager experience in years and 2007 average NTS holdings.** The histogram shows the 2007 distribution of bond manager experience based on 4-year bins. Experience is measured as of 2004Q4. Experience is the number of years an individual has been managing a mutual fund. For team-managed funds we take the average of individual managers' experience in years. For each 4-year bin, we report the average nontraditional securitization share in percentage points as of 2007.

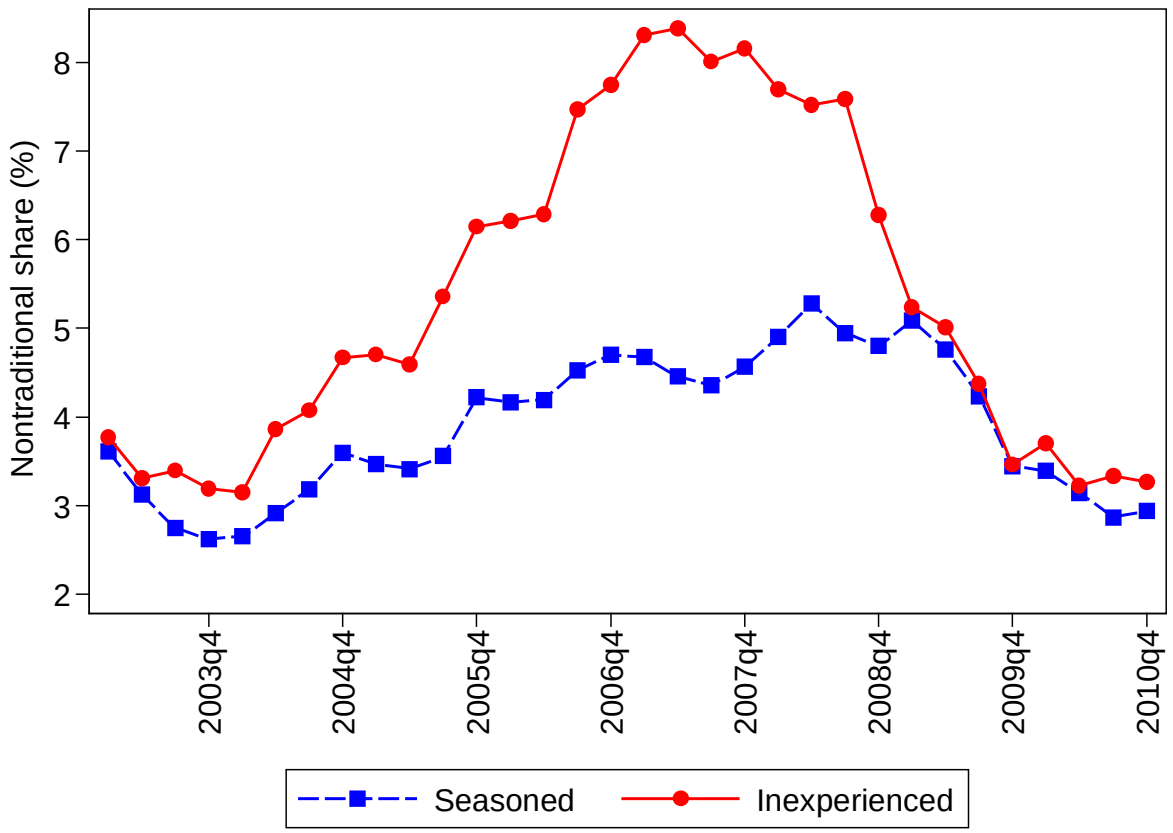



**Figure 3. Quarterly NTS holdings of seasoned and inexperienced bond fund managers.** This figure shows the average nontraditional share of bond mutual funds managed by seasoned and inexperienced portfolio managers from 2003Q1 to 2010Q4. We split bond mutual funds into two groups based on the median value of the fund manager's experience measured as of 2004Q4. For team-managed funds we take the average of individual managers' experience. Nontraditional share is total par holdings of nontraditional securitizations, defined as nonprime RMBS and CDOs, as a fraction of a mutual fund's par fixed-income holdings.

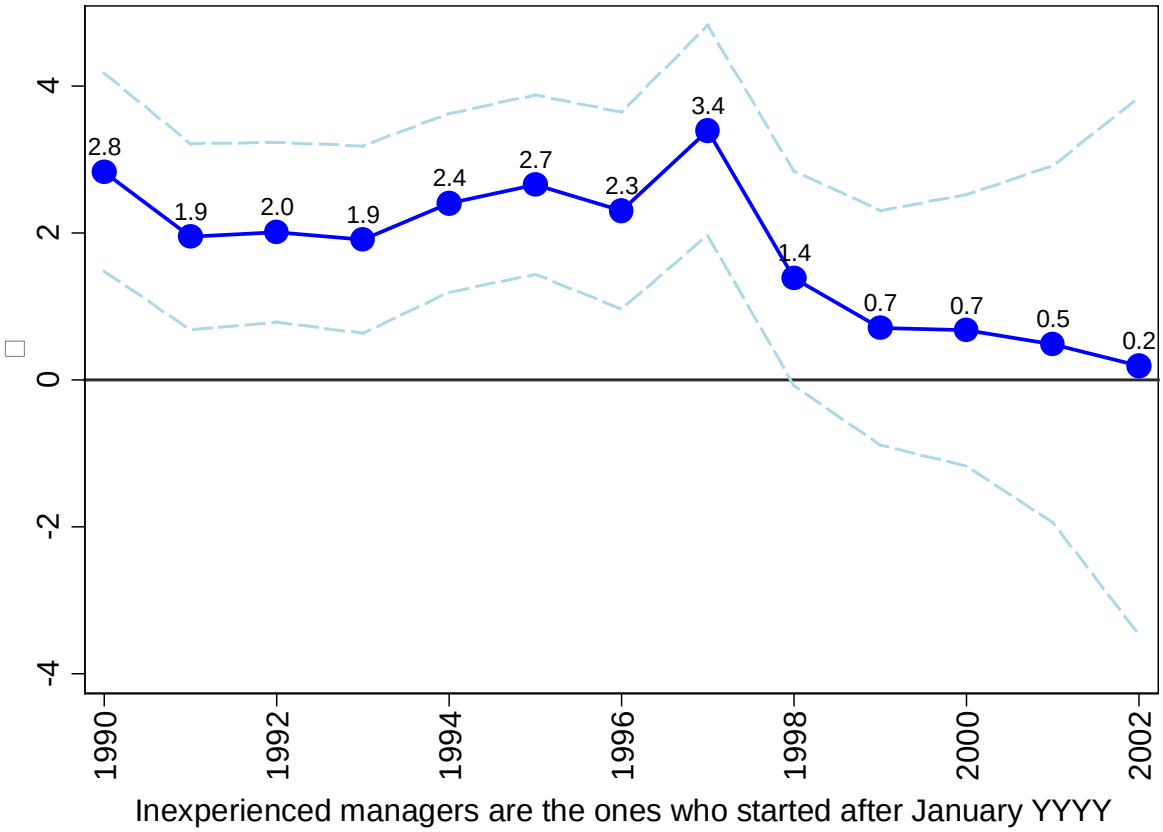



**Figure 4. Manager experience does not accrue linearly over time.** This figure plots the coefficients $\beta$ from estimating cross-sectional regressions of mutual funds' 2007 nontraditional share on fund manager inexperience defined using different cut-off dates as in Panel A of Table VII:

$$NTS\ share_i = \alpha_{objective(i)} + \beta \cdot 1\{Manager\ starts\ after\ 1/1/YYYY\} + \boldsymbol{\gamma}'\mathbf{x}_i + \varepsilon_i.$$

The dash lines shows confidence intervals based on robust standard errors.

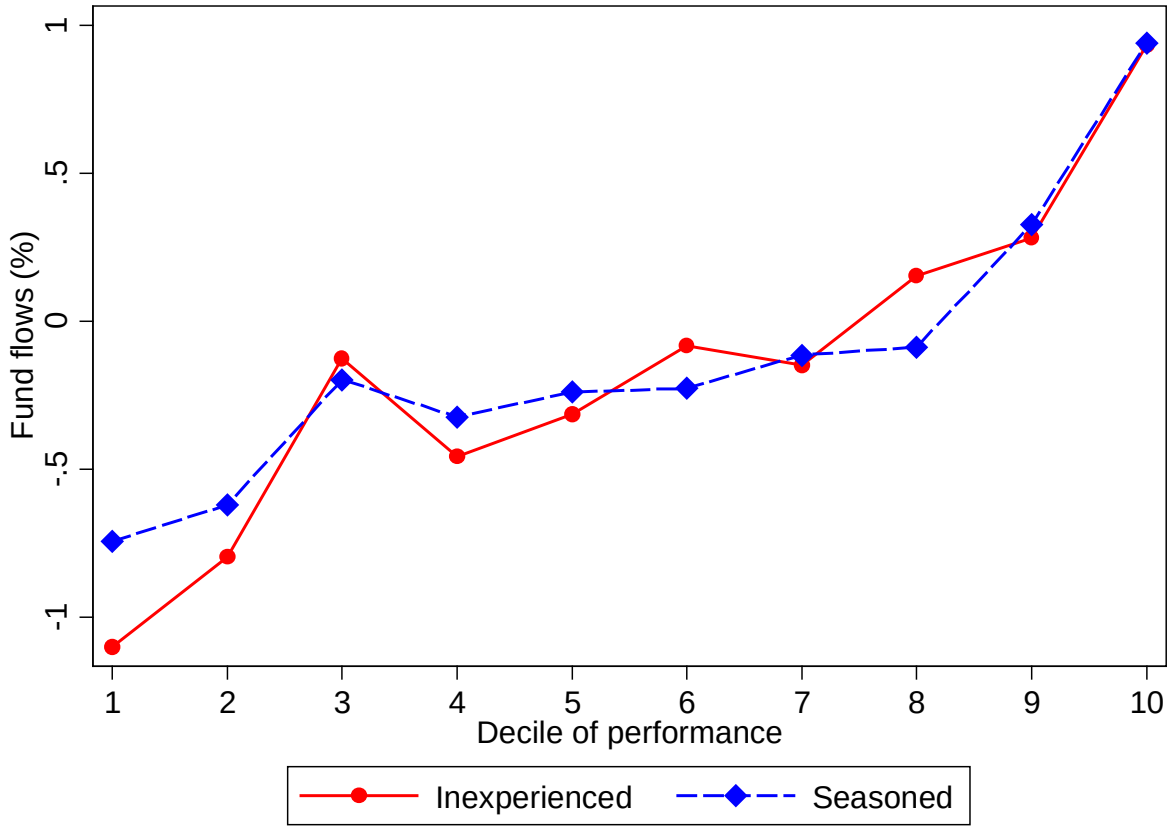



**Figure 5. Performance flow relationship for seasoned and inexperienced bond fund managers.** This figure reports the strength of the performance-flow relationship for bond mutual funds managed by seasoned versus inexperienced managers. Fund flows are winsorized at the first and ninety-ninth percentiles. Using data from 2003 to 2010, we first adjust monthly fund returns and net flows for objective-month fixed effects. The figure then shows the mean of adjusted fund flows by decile of adjusted performance. Each month we define seasoned funds as those with fund managers above the median of experience across all funds at that point time.

## Table I
## Summary Statistics

This table reports summary statics for our 2003 to 2010 annual panel of bond mutual funds. Our sample of mutual funds consists of domestic taxable bond funds and hybrid stock/bond funds, excluding money market funds, index bond funds, and Treasury-only government bonds funds. Specifically, we use funds with the following Lipper investment objective codes in CRSP: "A" (Corporate debt funds A-rated), "ARM" (Adjustable rate mortgage funds), "B" (Balanced funds), "BBB" (Corporate debt funds BBB-rated), "CA" (Capital appreciation funds), "FLX" (Flexible income funds), "FX" (Flexible portfolio funds), "GB" (General bond funds), "GNM" (GNMA funds), "GUS" (General U.S. government funds), "HY" (High yield funds), "I" (Income funds), "IID" (Intermediate investment grade debt funds), "IUG" (Intermediate U.S. government funds), "MSI" (Multi-sector income funds), "SID" (Short investment grade debt funds), "SII" (Short-intermediate investment grade debt funds), "SIU" (Short-intermediate U.S. government funds), "SUS" (Short U.S. government funds), "USM" (U.S. mortgage funds), and "USO" (Ultra-short obligation funds). Our manager-level variables are from Morningstar and are measured as of 2004Q4. For team-managed funds, these variables reflect the average of each of the fund's managers. *Experience* is the number of years since we first observe each manager in Morningstar. *CFA* is the fraction of managers who are Charted Financial Analysts. *Fund TNA*, *Fund age*, *Family TNA*, *Family age*, and *Family taxable bond share* are from the CRSP mutual fund database. *Fund par fixed income assets* is from eMaxx. *NTS share*, *TS* share, and *GSE MBS share* are portfolio shares as a fraction of par fixed-income holdings and are derived from eMAXX.

| Variable | N | Mean | Median | St Dev | Min | Max |
|---|---|---|---|---|---|---|
| Manager-level variables | | | | | | |
| *Experience* (years) | 5,983 | 8.52 | 7.87 | 4.51 | 0.00 | 29.06 |
| *CFA* (fraction) | 5,983 | 0.48 | 0.50 | 0.40 | 0.00 | 1.00 |
| *Number of managers* | 5,983 | 2.77 | 2.00 | 2.47 | 1.00 | 21.00 |
| *Team managed* (indicator) | 5,983 | 0.67 | 1.00 | 0.47 | 0.00 | 1.00 |
| Fund-level variables | | | | | | |
| *Fund TNA* ($ billion) | 5,983 | 1.56 | 0.30 | 7.06 | 0.00 | 236.62 |
| *Fund par fixed income assets* ($ billion) | 5,983 | 1.07 | 0.23 | 4.14 | 0.00 | 175.96 |
| *Fund age* (years) | 5,983 | 15.90 | 13.63 | 11.86 | 0.15 | 83.80 |
| *Nontraditional securitization share* (%) | 5,983 | 4.61 | 0.96 | 9.03 | 0.00 | 100.00 |
| *Traditional securitization share* (%) | 5,983 | 10.04 | 5.15 | 13.34 | 0.00 | 93.89 |
| *GSE MBS share* (%) | 5,983 | 24.66 | 17.27 | 26.14 | 0.00 | 100.00 |
| Family-level variables | | | | | | |
| *Family TNA* ($ billion) | 5,983 | 123.52 | 29.20 | 262.56 | 0.00 | 1,683.2 |
| *Family age* (years) | 5,983 | 42.40 | 34.30 | 25.14 | 0.68 | 86.52 |
| *Family taxable bond share* (%) | 5,983 | 39.43 | 32.45 | 25.83 | 0.00 | 100.00 |

## Table II
## Impact of Experience on 2007 NTS Holdings

This table reports the results of cross-sectional regressions of bond mutual funds' 2007 holdings of nontraditional securitizations on the portfolio manager's experience and various fund characteristics:

$$y_i = \alpha_{objective(i)} + \beta \cdot Inexperienced_i + \boldsymbol{\gamma}'\mathbf{x}_i + \varepsilon_i.$$

Panel A uses a dummy indicator equal to 1 for managers with below median experience as of 2004Q4, while Panel B shows the same result for a continuous measure of inexperience: −1 × years of experience. The dependent variable in columns 1 to 4 is the nontraditional share ($y_i$ =*NTS share*$_i$), while the dependent variable in columns 5 to 8 is an indicator equal to 1 if the fund holds NTS, *Has NTS*$_i$ = 1{*NTS share*$_i$ > 0}. Fund objective fixed effects are included in columns 3,4, 7, and 8. Robust *t*-statistics are shown in square brackets below the coefficient estimates.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| | Panel A: Dummy indicator for inexperienced managers | | | | | | | |
| | $y_i$ = *NTS share*$_i$ (%) | | | | $y_i$ = *Has NTS*$_i$ | | | |
| *Inexperienced dummy* | 3.932 | 3.560 | 3.467 | 3.376 | 0.097 | 0.090 | 0.101 | 0.107 |
| | [4.77] | [4.56] | [4.65] | [4.66] | [2.86] | [2.75] | [3.19] | [3.45] |
| *CFA* | | -2.813 | | -2.215 | | -0.058 | | -0.040 |
| | | [-3.10] | | [-2.48] | | [-1.38] | | [-0.99] |
| *Team managed* | | 2.857 | | 2.325 | | 0.165 | | 0.125 |
| | | [3.82] | | [3.41] | | [4.53] | | [3.63] |
| log(*Fund TNA*) | | 0.391 | | 0.473 | | 0.038 | | 0.034 |
| | | [1.23] | | [1.56] | | [2.94] | | [2.89] |
| log(*Family TNA*) | | 0.003 | | -0.186 | | 0.029 | | 0.029 |
| | | [0.01] | | [-0.68] | | [2.54] | | [2.74] |
| log(*Fund age*) | | -1.636 | | -0.662 | | -0.042 | | -0.009 |
| | | [-2.05] | | [-0.89] | | [-1.51] | | [-0.32] |
| log(*Family age*) | | -0.773 | | -0.574 | | -0.021 | | 0.018 |
| | | [-0.91] | | [-0.73] | | [-0.66] | | [0.59] |
| *Family taxable bond share* (%) | | 0.075 | | 0.055 | | 0.002 | | 0.002 |
| | | [4.15] | | [3.18] | | [2.75] | | [2.72] |
| Fund objective fixed effects | No | No | Yes | Yes | No | No | Yes | Yes |
| Observations | 757 | 757 | 757 | 757 | 757 | 757 | 757 | 757 |
| R-squared | 0.03 | 0.11 | 0.19 | 0.23 | 0.01 | 0.11 | 0.19 | 0.27 |
| | Panel B: Continuous measure of inexperience | | | | | | | |
| | $y_i$ = *NTS share* (%) | | | | $y_i$ = *Has NTS* | | | |
| *Inexperience* = −1 × *years* | 0.355 | 0.277 | 0.283 | 0.255 | 0.014 | 0.013 | 0.015 | 0.016 |
| | [4.66] | [3.69] | [4.07] | [3.66] | [3.75] | [3.54] | [4.35] | [4.54] |
| *CFA* | | -2.873 | | -2.307 | | -0.063 | | -0.047 |
| | | [-3.12] | | [-2.52] | | [-1.50] | | [-1.17] |
| *Team managed* | | 2.832 | | 2.337 | | 0.155 | | 0.113 |
| | | [3.62] | | [3.28] | | [4.20] | | [3.23] |
| log(*Fund TNA*) | | 0.366 | | 0.425 | | 0.040 | | 0.036 |
| | | [1.13] | | [1.39] | | [3.09] | | [3.03] |
| log(*Family TNA*) | | 0.042 | | -0.141 | | 0.029 | | 0.029 |
| | | [0.14] | | [-0.51] | | [2.55] | | [2.78] |
| log(*Fund age*) | | -1.590 | | -0.588 | | -0.033 | | 0.003 |
| | | [-2.02] | | [-0.80] | | [-1.18] | | [0.09] |
| log(*Family age*) | | -0.854 | | -0.671 | | -0.024 | | 0.014 |
| | | [-1.00] | | [-0.85] | | [-0.76] | | [0.49] |
| *Family taxable bond share* (%) | | 0.073 | | 0.053 | | 0.002 | | 0.002 |
| | | [3.97] | | [3.01] | | [2.66] | | [2.65] |
| Fund objective fixed effects | No | No | Yes | Yes | No | No | Yes | Yes |
| Observations | 757 | 757 | 757 | 757 | 757 | 757 | 757 | 757 |
| R-squared | 0.02 | 0.10 | 0.18 | 0.22 | 0.02 | 0.12 | 0.19 | 0.28 |

## Table III
## Robustness: Impact of Experience on 2007 NTS Holdings

This table reports a battery of robustness exercises for our main result. Specifically, we report cross-sectional regressions of bond mutual funds' 2007 holdings of nontraditional securitizations on the portfolio manager's experience and various fund characteristics:

$$y_i = \alpha_{objective(i)} + \beta \cdot Inexperienced_i + \boldsymbol{\gamma}'\mathbf{x}_i + \varepsilon_i.$$

For each robustness exercise, we show results measuring inexperience using an indicator for below-median experience and using our continuous measure of experience in years. We also show results for both our continuous holdings measure ($y_i$ = *NTS share*$_i$) and an indicator for funds holding any NTS ($y_i$ = *Has NTS*$_i$). Row (1) repeats our baseline results from Table II. We first modify our sample weighting and subsample. Row (2) shows results weighting each fund by its total net assets (TNA). Row (3) shows results restricting attention to the 250 largest funds in our sample by TNA. We next modify our dependent variable. Row (4) shows results using $y_i = NTS_i/TNA_i$ in place of $y_i = NTS_i/BOND_i$. Rows (5) and (6) decompose NTS holdings into AAA holdings and non-AAA holdings based on Moody's credit ratings. (We classify tranches that receive a rating of "NR" as AAA since these NR are almost always super-senior tranches that were not rated. However, this makes little difference.) Thus, when the dependent variable is measure continuously, the sum of the coefficients in rows (5) and (6) equals the coefficient in row (1). Similarly, rows (7) and (8) decompose NTS holdings into Nonprime RMBS and CDO holdings. In rows (9) and (10) the dependent variable is the fraction of traditional securitization (*TS share*) and GSE-backed MBS (*GSE MBS share*) in each fund's portfolio, respectively. Finally, we modify the independent variable. Specifically, row (11) shows the results when experience is defined as of 2007 instead of 2004. All specifications include the full suite of controls from Table II as well as fund objective fixed effects. Robust *t*-statistics are shown in square brackets.

| | | | *Inexperienced dummy* | | | | | | *Inexperience* = −1 × *years* | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | $y_i$ = *NTS share*$_i$ (%) | | | $y_i$ = *Has NTS*$_i$ | | | $y_i$ = *NTS share*$_i$ (%) | | | $y_i$ = *Has NTS*$_i$ | | |
| | | $N$ | $\beta$ | [$t$] | $R^2$ | $\beta$ | [$t$] | $R^2$ | $\beta$ | [$t$] | $R^2$ | $\beta$ | [$t$] | $R^2$ |
| (1) | Baseline | 757 | 3.376 | [4.66] | 0.23 | 0.107 | [3.45] | 0.27 | 0.255 | [3.66] | 0.22 | 0.016 | [4.54] | 0.28 |
| | Modify weighting/sample | | | | | | | | | | | | | |
| (2) | TNA-weighted | 757 | 3.498 | [3.68] | 0.39 | 0.172 | [3.17] | 0.37 | 0.513 | [6.55] | 0.46 | 0.033 | [4.20] | 0.50 |
| (3) | 250 largest funds | 250 | 2.566 | [2.16] | 0.39 | 0.079 | [1.55] | 0.28 | 0.301 | [3.20] | 0.40 | 0.018 | [3.15] | 0.31 |
| | Modify dependent variable | | | | | | | | | | | | | |
| (4) | *NTS*/*TNA* | 757 | 4.75 | [4.12] | 0.17 | 0.107 | [3.45] | 0.27 | 0.282 | [3.62] | 0.16 | 0.016 | [4.54] | 0.28 |
| (5) | $NTS_{AAA}$ *share* | 757 | 2.46 | [4.04] | 0.23 | 0.089 | [2.91] | 0.34 | 0.125 | [2.77] | 0.21 | 0.011 | [3.24] | 0.34 |
| (6) | $NTS_{Oth}$ *share* | 757 | 0.91 | [3.41] | 0.08 | 0.060 | [1.78] | 0.21 | 0.130 | [2.69] | 0.08 | 0.013 | [3.56] | 0.22 |
| (7) | $NTS_{Nonprime\ RMBS}$ *share* | 757 | 2.86 | [4.11] | 0.24 | 0.071 | [2.34] | 0.34 | 0.180 | [3.32] | 0.23 | 0.010 | [2.90] | 0.34 |
| (8) | $NTS_{CDO}$ *share* | 757 | 0.52 | [2.74] | 0.05 | 0.109 | [3.53] | 0.13 | 0.075 | [1.72] | 0.06 | 0.013 | [3.85] | 0.13 |
| (9) | *TS share* | 757 | 1.22 | [1.31] | 0.32 | 0.078 | [3.19] | 0.31 | 0.197 | [1.59] | 0.32 | 0.009 | [3.06] | 0.31 |
| (10) | *GSE MBS share* | 757 | -2.72 | [-2.09] | 0.57 | 0.006 | [0.37] | 0.65 | -0.164 | [1.08] | 0.57 | 0.000 | [0.20] | 0.65 |
| | Modify independent variable | | | | | | | | | | | | | |
| (11) | 2007 experience | 757 | 1.043 | [1.41] | 0.21 | 0.106 | [3.44] | 0.27 | 0.124 | [2.43] | 0.21 | 0.011 | [3.71] | 0.27 |

## Table IV
## Impact of Experience on the Riskiness of NTS Holdings

This table reports the results of cross-sectional regressions of the new-issue spreads on mutual funds' 2007 nontraditional securitization holdings on manager inexperience and controls:

$$Spread_i = \alpha_{objective(i)} + \beta_1 \cdot Inexperienced_i + \boldsymbol{\gamma}'\mathbf{x}_i + \varepsilon_i.$$

In Panel A, the dependent variable is the par-weighted average new issue spread on funds' 2007 NTS holdings. In panel B, the new issue spreads are deviations from the average spread for nontraditional securitizations with the same initial rating and issued in the same quarter. Fund objective fixed effects and the controls from Table II are included as indicated in the table. Robust *t*-statistics are shown in square brackets.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Panel A: Raw NTS spreads | | | |
| *Inexperienced* | 16.956 | 15.475 | 9.369 | 6.695 |
| | [2.73] | [2.44] | [1.82] | [1.38] |
| *Constant* | 38.751 | 82.394 | 42.74 | 95.959 |
| | [13.55] | [3.15] | [13.25] | [3.71] |
| Controls | No | Yes | No | Yes |
| Fund objective fixed effects | No | No | Yes | Yes |
| Observations | 350 | 350 | 350 | 350 |
| R-squared | 0.02 | 0.05 | 0.29 | 0.33 |
| | Panel B: NTS spreads adjusted for rating and quarter-of-issue | | | |
| *Inexperienced* | 1.25 | 0.097 | 0.205 | -1.382 |
| | [0.49] | [0.04] | [0.09] | [-0.57] |
| *Constant* | 5.003 | 21.951 | 5.552 | 23.673 |
| | [2.82] | [2.11] | [3.06] | [2.04] |
| Controls | No | Yes | No | Yes |
| Fund objective fixed effects | No | No | Yes | Yes |
| Observations | 350 | 350 | 350 | 350 |
| R-squared | 0.00 | 0.07 | 0.10 | 0.15 |

## Table V
## Investor Experience and the Evolution of NTS Holdings Over Time

Panel A reports separate cross-sectional regressions for $t$ = 2003 to 2010 of bond mutual funds' holdings of nontraditional securitizations on the portfolio manager's experience and various fund characteristics:

$$NTS\ share_{it} = \alpha_{objective(i),t} + \beta_t \cdot Inexperienced_i + \boldsymbol{\gamma}_t' \mathbf{x}_{it} + \varepsilon_{it}.$$

The dependent variable in Panel A is the nontraditional share in year *t*. *Inexperienced manager* is a dummy indicator equal to 1 for managers with below median experience as of 2004Q4 and does not vary over time for a given mutual fund. Panel B reports cross-sectional regressions of mutual funds' 2007 nontraditional share on portfolio manager experience and local house price appreciation:

$$NTS\ share_i = \alpha_{objective(i)} + \beta_1 \cdot Inexperienced_i + \beta_2 \cdot High\ local\ HPA_i + \beta_3 \cdot Inexperienced_i \times High\ local\ HPA_i + \boldsymbol{\gamma}' \mathbf{x}_i + \varepsilon_i.$$

Local house price appreciation is the annualized change in house prices from 2003 to 2006 for the MSA in which the investment manager is located, computed using the all-transactions index from the Federal Housing Finance Agency. *High local HPA* is an indicator for managers who experienced local HPA in the top tercile. The same controls as in Table II and objective fixed effects are included as indicated in the table below. *t*-statistics are shown in square brackets. Panel A uses robust *t*-statistics and Panel B uses *t*-statistics that allow for clustering at the MSA level.

| | Panel A: Experience and the Evolution of NTS Holdings from 2003 to 2010 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) 2003 | (2) 2004 | (3) 2005 | (4) 2006 | (5) 2007 | (6) 2008 | (7) 2009 | (8) 2010 |
| *Inexperienced* | 0.325 | 0.703 | 1.035 | 1.794 | 3.376 | 2.169 | -0.166 | 0.221 |
| | [0.77] | [1.80] | [2.40] | [3.10] | [4.66] | [3.01] | [-0.25] | [0.34] |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Fund objective fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 767 | 797 | 818 | 785 | 757 | 743 | 685 | 631 |
| R-squared | 0.28 | 0.34 | 0.34 | 0.31 | 0.23 | 0.21 | 0.14 | 0.10 |
| | Panel B: Local House Price Appreciation and 2007 NTS Holdings | | | |
| | (1) | (2) | (3) | (4) |
| *Inexperienced* | 3.421 | 1.896 | 3.226 | 1.760 |
| | [3.75] | [1.48] | [3.54] | [1.39] |
| *High local HPA* | 1.969 | 0.316 | 2.312 | 0.715 |
| | [2.16] | [0.40] | [2.13] | [0.84] |
| *High local HPA* × *Inexperienced* | | 3.259 | | 3.175 |
| | | [2.05] | | [1.94] |
| Controls | Yes | Yes | Yes | Yes |
| Objective Fixed Effects | No | No | Yes | Yes |
| Observations | 757 | 757 | 757 | 757 |
| R-squared | 0.12 | 0.12 | 0.24 | 0.24 |

## Table VI
## The Impact of Prior Manager Return Experiences on 2007 NTS Holdings

This table reports the results of cross-sectional regressions of mutual funds 2007 nontraditional share on the past investment return outcomes experienced by the fund manager:

$$NTS\ share_i = \alpha_{objective(i)} + \beta_1 \cdot Inexperienced_i + \beta_2 \cdot HighAvgReturn_i + \beta_3 \cdot HighMinReturn_i + \beta_4 \cdot DistantMinReturn_i + \boldsymbol{\gamma}'\mathbf{x}_i + \varepsilon_i.$$

The dependent variable is the nontraditional share in 2007. *Inexperienced manager* is a dummy indicator equal to 1 for managers with below median experience as of 2004Q4. We first compute each manager's average return from 1995 to 2005 (average across managers for team-managed funds). *HighAvgReturn* is an indicator for managers with average returns in the top two terciles. Similarly, we compute each manager's minimum return from 1995 to 2005 (average across managers for team-managed funds). *HighMinReturn* is an indicator for managers with minimum returns in the top two terciles. *DistantMinReturn* is a continuous measure that equals 1 if a manager's minimum return from 1995 to 2005 was in 1995, that equals 0 if the minimum was in 2005, and so on. Formally, *DistantMinReturn* = (2005 – *YearMin* – 1995)/ (2005 –1995). Fund objective fixed effects and the controls from Table II are included as indicated in the table. Robust *t*-statistics are shown in square brackets.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| *Inexperienced* | 3.576 | 3.093 | 3.745 | 3.431 | 3.087 | 3.698 |
| | [4.58] | [3.92] | [4.46] | [4.73] | [4.12] | [4.56] |
| *High average return* | 0.389 | -0.808 | -1.26 | 0.525 | -0.29 | -0.762 |
| | [0.45] | [-0.79] | [-1.27] | [0.59] | [-0.27] | [-0.73] |
| *High min return* | | 2.696 | 2.815 | | 1.908 | 2.191 |
| | | [2.94] | [3.05] | | [1.84] | [2.12] |
| *Distant min return* | | | 5.932 | | | 5.712 |
| | | | [2.73] | | | [2.82] |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Objective Fixed Effects | No | No | No | Yes | Yes | Yes |
| Observations | 755 | 755 | 755 | 755 | 755 | 755 |
| R-squared | 0.11 | 0.12 | 0.13 | 0.23 | 0.23 | 0.24 |

## Table VII
## Personal Experiences during Prior Market Disruptions: The Impact of 1998 Manager Experiences on 2007 NTS Holdings

Panel A reports the results of cross-sectional regressions of mutual funds' 2007 nontraditional share on fund manager inexperience defined using different cut-off dates:

$$NTS\ share_i = \alpha_{objective(i)} + \beta \cdot 1\{Manager\ starts\ after\ 1/1/YYYY\} + \boldsymbol{\gamma}'\mathbf{x}_i + \varepsilon_i.$$

Panel B reports the results of cross-sectional regressions of mutual funds 2007 nontraditional share on the 1998 investment outcome experienced by the manager:

$$NTS\ share_i = \alpha_{objective(i)} + \beta_1 \cdot Inexperienced_i^{1998} + \beta_2 \cdot High\ outcome_i^{1998} + \beta_3 \cdot Inexperienced_i^{1998} \times High\ outcome_i^{1998} + \boldsymbol{\gamma}'\mathbf{x}_i + \varepsilon_i.$$

The sample of funds in Panel B consists of funds with at least one portfolio manager who managed a mutual fund during 1998. Fund manager's identity is fixed as of the end of 2004. $Inexperienced_i^{1998}$ is a dummy equal to one for managers above the median of the distribution of experience within the sample of managers who managed a fund during 1998. For each manager, we measure the minimum returns and fund flows she experienced across all funds she managed during 1998. For team managed funds we then take the average across all managers with 1998 experience. $High\ outcome_i^{1998}$ is an indicator for funds whose 1998 outcome is in the top two terciles. All regressions include the same controls as the specifications reported in Table II. Fund objective fixed effects are included as indicated in the table. Robust *t*-statistics are shown in square brackets.

| | Panel A: Manager experience does not accrue linearly over time | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
| *Manager starts after* 1/1/*YYYY* | 2.656 | 2.306 | 3.397 | 1.381 | 0.711 | 0.674 | 0.490 | 0.192 |
| | [4.27] | [3.37] | [4.66] | [1.86] | [0.87] | [0.71] | [0.40] | [0.10] |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Objective Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 757 | 757 | 757 | 757 | 757 | 757 | 757 | 757 |
| R-squared | 0.22 | 0.22 | 0.23 | 0.21 | 0.21 | 0.21 | 0.21 | 0.21 |
| | Panel B: Impact of personal 1998 investment outcomes | | | | | | | |
| | $Outcome^{1998} = Returns^{1998}$ | | | | $Outcome^{1998} = Flows^{1998}$ | | | |
| $Inexperienced^{1998}$ | 2.840 | -0.449 | 2.882 | -0.289 | 2.915 | 2.719 | 3.036 | 1.918 |
| | [2.96] | [-0.37] | [3.08] | [-0.22] | [3.00] | [2.01] | [3.19] | [1.41] |
| $High\ outcome^{1998}$ | 2.666 | 0.204 | 2.595 | 0.249 | 3.368 | 3.227 | 3.340 | 2.522 |
| | [3.12] | [0.20] | [2.48] | [0.23] | [3.71] | [3.44] | [3.74] | [2.80] |
| $High\ outcome^{1998} \times Inexperienced^{1998}$ | | 5.016 | | 4.809 | | 0.294 | | 1.687 |
| | | [2.79] | | [2.72] | | [0.16] | | [0.95] |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Objective Fixed Effects | No | No | Yes | Yes | No | No | Yes | Yes |
| Observations | 493 | 493 | 493 | 493 | 487 | 487 | 487 | 487 |
| R-squared | 0.16 | 0.17 | 0.29 | 0.30 | 0.16 | 0.16 | 0.29 | 0.30 |

## Table VIII
## Substitutes for Firsthand Experience and 2007 NTS Holdings: The Roles of Institutional Memory and Manager Training

Panel A reports cross-sectional regressions of mutual funds 2007 nontraditional share on the 1998 investment outcome experienced by the fund manager and the investment outcome experienced by their fund family:

$$NTS\ share_i = \alpha_{objective(i)} + \beta_1 \cdot Inexperienced_i^{1998} + \beta_2 \cdot High\ manager\ outcome_i^{1998} + \beta_3 \cdot Inexperienced_i^{1998} \times High\ manager\ outcome_i^{1998} + \delta_2 \cdot High\ family\ outcome_i^{1998} + \delta_3 \cdot Inexperienced_i^{1998} \times High\ family\ outcome_i^{1998} + \boldsymbol{\gamma}'\mathbf{x}_i + \varepsilon_i.$$

The sample in Panel A consists of funds with at least one manager who ran a mutual fund during 1998. Fund manager's identity is fixed as of the end of 2004. $Inexperienced_i^{1998}$ is a dummy is equal to one for managers above the median of the distribution of experience among managers who managed a fund during 1998. As in Table VII, $High\ manager\ outcome_i^{1998}$ is an indicator for managers whose own 1998 outcome (returns or flows) is in the top two terciles. We compute the value-weighted outcome for all of the taxable bond funds in each family in 1998. $High\ family\ outcome_i^{1998}$ is an indicator for families whose 1998 outcome is in the top two terciles. Panel B reports cross-sectional regressions of mutual funds 2007 nontraditional share on manager experience and CFA status

$$NTS\ share_i = \alpha_{objective(i)} + \beta_1 \cdot Inexperienced_i + \beta_2 \cdot CFA_i + \beta_3 \cdot CFA_i \times Inexperienced_i + \boldsymbol{\gamma}'\mathbf{x}_i + \varepsilon_i.$$

*Inexperienced manager* is a dummy indicator equal to 1 for managers with below median experience as of 2004Q4. *CFA* indicates whether the portfolio manager is a Chartered Financial Analyst (it is the fraction of CFA-chartered managers for a team-managed fund). Fund objective fixed effects and the controls from Table II are included as indicated in the table. Robust *t*-statistics are shown in square brackets.

| | Panel A: Institutional Memory | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | $Outcome^{1998} = Returns^{1998}$ | | | | $Outcome^{1998} = Flows^{1998}$ | | | |
| $Inexperienced^{1998}$ | 3.185 | -3.252 | 3.303 | -3.354 | 2.656 | 0.966 | 2.894 | -0.871 |
| | [2.74] | [-1.77] | [2.96] | [-1.83] | [2.37] | [0.39] | [2.68] | [-0.36] |
| $High\ manager\ outcome^{1998}$ | 2.855 | 1.347 | 2.812 | 1.222 | 3.332 | 3.440 | 2.933 | 1.920 |
| | [2.66] | [1.05] | [2.26] | [1.00] | [3.21] | [3.30] | [2.87] | [1.98] |
| $High\ manager\ outcome^{1998} \times Inexperienced^{1998}$ | | 3.203 | | 3.302 | | -0.210 | | 2.169 |
| | | [1.48] | | [1.52] | | [-0.10] | | [1.05] |
| $High\ family\ outcome^{1998}$ | 1.609 | -1.840 | 1.847 | -1.730 | -0.259 | -1.664 | -0.186 | -1.952 |
| | [1.55] | [-1.42] | [1.78] | [-1.52] | [-0.23] | [-1.23] | [-0.17] | [-1.51] |
| $High\ family\ outcome^{1998} \times Inexperienced^{1998}$ | | 6.831 | | 7.039 | | 2.615 | | 3.421 |
| | | [3.03] | | [3.34] | | [1.06] | | [1.44] |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Objective Fixed Effects | No | No | Yes | Yes | No | No | Yes | Yes |
| Observations | 383 | 383 | 383 | 383 | 412 | 412 | 412 | 412 |
| R-squared | 0.17 | 0.19 | 0.31 | 0.34 | 0.15 | 0.15 | 0.30 | 0.31 |
| | Panel B: Manager Training | | | | | | | |
| *Inexperienced manager* | | 5.385 | | 5.084 | | 4.497 | | 4.491 |
| | | [3.63] | | [3.65] | | [3.08] | | [3.25] |
| *CFA* | | -1.604 | | -1.242 | | -1.237 | | -1.087 |
| | | [-2.47] | | [-1.89] | | [-1.92] | | [-1.70] |
| *CFA* × *Inexperienced* | | -2.913 | | -3.164 | | -2.056 | | -2.287 |
| | | [-1.54] | | [-1.71] | | [-1.09] | | [-1.25] |
| Controls | | No | | Yes | | No | | Yes |
| Fund objective fixed effects | | No | | No | | Yes | | Yes |
| Observations | | 757 | | 757 | | 757 | | 757 |
| R-squared | | 0.11 | | 0.11 | | 0.23 | | 0.23 |

## Table IX
## Trading by Inexperienced Managers During the Crisis: 2007Q3–2009Q2

This table reports the results of regressions of mutual funds' quarterly trading behavior from 2007Q3 to 2009Q2 on manager inexperience, fund flows, and the lagged NTS share:

$$y_{it} = \alpha_{objective(i)\times t} + \beta_1 \cdot Inexperienced_i + \beta_2 \cdot Flows_{it} + \beta_3 \cdot NTS\ Share_{it-1} + \boldsymbol{\gamma}'\mathbf{x}_{it} + \varepsilon_{it}.$$

In Panel A, the dependent variable is a measure of active NTS trading in each quarter: $y_{it}$ = *Par NTS sold ÷ Par fixed-income holdings*. In Panel B, the dependent variable is a measure of passive NTS amortization in each quarter: $y_{it}$ = *Decline in par NTS due to amortization ÷ Par fixed-income holdings*. As above, *Inexperienced manager* is a dummy indicator equal to 1 for managers with below median experience as of 2004Q4. Fund objective fixed effects and the controls from Table II are included as indicated in the table. *t*-statistics that are robust to clustering at the fund level and are shown in square brackets.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Panel A: $y_{it}$ = *Par NTS sold ÷ Par fixed-income holdings* | | | | | |
| *Inexperienced* | 0.484 | 0.418 | 0.253 | 0.477 | 0.422 | 0.237 |
| | [3.14] | [2.83] | [1.98] | [3.11] | [2.82] | [1.82] |
| *Fund outflows* | | | 0.079 | | | 0.084 |
| | | | [4.24] | | | [4.18] |
| *Lagged NTS share* | | | 0.063 | | | 0.068 |
| | | | [2.52] | | | [2.69] |
| Controls | No | Yes | Yes | No | Yes | Yes |
| Objective Fixed Effects | No | No | No | Yes | Yes | Yes |
| Observations | 5,314 | 5,314 | 5,314 | 5,314 | 5,314 | 5,314 |
| R-squared | 0.00 | 0.01 | 0.04 | 0.04 | 0.05 | 0.08 |
| | Panel B: $y_{it}$ = *Decline in par NTS due to amortization ÷ Par fixed-income holdings* | | | | | |
| *Inexperienced manager* | 0.273 | 0.252 | 0.095 | 0.252 | 0.242 | 0.085 |
| | [3.45] | [3.05] | [2.15] | [3.40] | [3.14] | [2.00] |
| *Fund outflows* | | | 0.010 | | | 0.006 |
| | | | [1.63] | | | [1.07] |
| *Lagged NTS share* | | | 0.074 | | | 0.073 |
| | | | [7.83] | | | [7.08] |
| Controls | No | Yes | Yes | No | Yes | Yes |
| Objective × Quarter Fixed Effects | No | No | No | Yes | Yes | Yes |
| Observations | 5,314 | 5,314 | 5,314 | 5,314 | 5,314 | 5,314 |
| R-squared | 0.01 | 0.02 | 0.20 | 0.06 | 0.07 | 0.23 |