The 2008 Mortgage Crisis as a Failure of Analogical Reasoning

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Abstract

Managers’ mental models play an important role in shaping a firm’s competitive advantage. This paper suggests that persistent mental models or cognitive frames can have negative consequences at the individual, organizational, and industry levels. Specifically, the paper proposes a mechanism by which cognitive frames generated with the help of analogical reasoning persist by inducing analogical blindness, forcing decision-makers to disregard information at odds with the analogy. To date, analogical reasoning has been studied mostly in cross-sectional experimental settings. Consequently, little is known about the performance of analogical reasoning over time. The contribution of this paper is to document the persistence of mental models generated by analogical reasoning over time with decision-makers discarding data from the external environment to preserve their belief in the analogy in question. The paper uses a longitudinal case study of the market for mortgage-backed securities in the U.S. between 1968 and 2008 to trace the role of ‘mortgage-backed securities as bonds’ analogy in the development of the market from its inception to its demise. The paper argues that in evaluating an analogy, the decision-makers should consider the possible long-term consequences of the analogy’s acceptance.


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Understanding managers’ mental models and how these mental models shape how organizations perceive their environments is fundamental to the field of strategy (Gavetti [38, 2012], Karnøe & Garud [36, 2003], Daft & Weick [15, 1984]). Managers’ mental models shape how managers frame a given problem and this framing, in turn, shapes organizational action. Managerial framing is subject of a growing vibrant literature (e.g., Benner & Tripsas [8, 2012], Kaplan [67, 2008b], Lounsbury, Ventresca & Hirsch [76, 2003]).

The questions of what happens when managerial cognitive maps become obsolete and what effect such obsolescence has on the firm’s performance have received less attention in the literature. Kaplan [66, 2008a] models the managerial framing process as dynamic and contestable. But a growing body of evidence suggests that cognitive frames remain stable over time. For instance, Tripsas [110, 2009] argues that organizational identity contributes to the stability of organizational beliefs. Moreover, this stability can lead to negative outcomes for the firms in question. Tripsas and Gavetti [111, 2000] document the role of persistent managerial beliefs in Polaroid’s failure to respond to changes in its environment.

This paper focuses on analogical reasoning as one source of persistent cognitive frames. The paper’s contribution is to build on the current knowledge about the cognitive processes underlying analogical reasoning and lay out a theoretical framework that explains why cognitive frames generated by analogical reasoning may persist over time and how this persistence may blind decision-makers to changes in their environments.

The empirical setting of this paper is the evolution of the market for mortgage-backed securities (MBS) in the U.S. from the market’s inception in 1968 to the 2008 contraction of the market in which more than 3 million families faced the risk of foreclosure. I used a combination of interviews and archival sources to construct a 40-year analytical history of the ‘mortgage-backed securities as bonds’ analogy which shaped the introduction of MBS and played a key role in the development of the market. By showing that an analogy laid out consistently with the best recommendations for static decision-making can lead the decision-makers astray, this paper offers a boundary condition to the current understanding of analogical reasoning in organizations.
Analogical reasoning is one of the cognitive processes that help managers form mental models and frame problems. An analogy involves the mapping of a set of relationships from one domain (the source) to another (the target). Managers can use analogical reasoning to map information from a domain they know well, for instance from an industry in which they worked in the past, to help chart a course of action in a novel setting. When making a career move from retail to finance, Charlie Merrill famously used his background as a supermarket executive to envision Merrill Lynch as a ‘financial supermarket’, a Wall Street firm that would offer its clients a full range of services (Gavetti, Levinthal & Rivkin [39, 2005]).

Reasoning by analogy is a powerful tool because it enables the decision-maker to map a set of relationships from one domain to another. Such mapping provides a cognitive structure into which further information about the new domain can be incorporated. This paper offers both a theoretical argument and empirical evidence that cognitive frames developed with the help of analogical reasoning persist even when decision-makers are faced with facts, that are at odds with the underlying analogy. The empirical evidence presented in this paper suggests that once an analogy has been accepted, the decision-makers faced with facts contradicting the analogy hold on to the analogy and disregard the facts.

Prior research in organizational learning and cognitive psychology has established that analogical reasoning can lead the decision-makers astray if they fail to expend cognitive effort (rely on heuristic rather than systematic processing) or focus on surface rather than structural features of the source and target objects underlying the analogy (Gavetti, Levinthal, & Rivkin [39, 2005]). Beyond academic discourse, these findings have also shaped the advice to practicing managers to be mindful of pitfalls of heuristic processing or being distracted by shallow similarities (Gavetti & Rivkin [40, 2005]).

The contribution of this paper is to show that even when the decision-makers expend cognitive effort and focus on the structural features of the problem in building the analogy, analogical reasoning may still lead to suboptimal decision-making in the long run. One feature of analogical reasoning that makes it so powerful is that an analogy empowers the decision-maker to leverage
existing knowledge in navigating a novel environment. However, if left unchecked, this empowerment can translate into imperviousness of mental models constructed with the help of analogical reasoning to new facts. The proposed mechanism is that an analogy, accepted by a decision-maker, becomes part of the decision-maker’s cognitive architecture, acting as a filter for information received subsequently.

The persistence of cognitive frames generated by analogical reasoning does not pose a problem for the decision-maker if the environment remains stable. However, if the environment changes, rendering the analogy out of sync with the facts on the ground, the decision-maker may be stuck with a case of analogy-induced blindness. While much of the research about analogical reasoning is done on the individual level, analogical blindness also has implications for organizational and industry-level outcomes. If the acceptance of an out-of-date analogy is wide-spread enough in an organization or an industry, the questioning of the analogy by any individual industry participant would likely fall on deaf ears.

This paper is structured as follows. Part 1 reviews the existing literature on analogical reasoning. Part 2 constructs the theoretical case for the persistence of cognitive frames arrived at with the help of analogical reasoning. Part 3 marshals the empirical evidence from a longitudinal case study of the last U.S. market for mortgage-backed securities on the possible consequences of obsolete analogical reasoning in the long-term.

**Analogical reasoning**

Cognitive psychologists have credited analogical reasoning with facilitating the human capacity for problem solving (Gick & Holyoak [48, 1980]), abstract thinking (Gentner [43, 2003], Spearman [106, 1923]), and scientific discovery (Hadamard [54, 1945], Hesse [56, 1966], Dunbar [19, 1995], [20, 1999]). In the management literature, reasoning by analogy has been linked to questions of making sense of novel and complex landscapes (Gavetti, Levinthal & Rivkin [39, 2005]); accurately perceiving the environment (Gary & Wood [37, 2011]); reducing perceived environmental
uncertainty (Schwenk, [97, 1984]); and recognizing entrepreneurial opportunity (Felin & Zenger [33, 2009], Santos & Eisenhardt [96, 2009], Cornelissen & Clarke [14, 2010]).

In organizational learning as a field, little is known about the consequences of using a flawed or faulty analogy. Anecdotal evidence from political science and military strategy—e.g. (Neustadt & May [83, 1986])—suggests that the use of the wrong analogy can lead to bad decisions. However, other anecdotal evidence from the same domain, as in the Holub’s ([58, 1977]) poetic account of a military brigade stranded in the Alps, popularized by Weick (e.g., Weick [118, 1995]), suggests that reasoning by analogy—even an erroneous one—is better than using no analogy at all.

Even among psychologists who have studied erroneous analogies, there is disagreement over the consequences of the errors and whether an analogy can ever lead the decision-maker astray. Some authors in this line of research have argued that heuristic processing of analogies can have dangerous consequences—e.g., Gilovich [50, 1981]. Others have suggested that the similarity heuristic (one source of erroneous analogies), while imperfect, can be a useful decision-making tool because the similarity of the surface features that the similarity heuristic works with is constrained by the structural features of the objects being compared (Medin & Ortony [80, 1989]).

Existing field research has suggested that U.S. foreign-policy decision-making is shaped by the specters of either WWII or Vietnam (Spellman & Holyoak [107, 1992], Petraeus [89, 1987]), and these comparisons may be triggered by information irrelevant to the decision-making situation at hand (Gilovich [50, 1981]). If these findings hold, the question of what makes analogy apt rather than dangerous seems well worth investigating, especially if erroneous analogies tend to persist at both individual (Kempton [68, 1986]) and organizational levels (Tripsas and Gavetti [111, 2000]).

Understanding the negative consequences of analogical reasoning is valuable from both theoretical and empirical perspectives. From a theoretical perspective, if an analogy is a powerful tool, it should be powerful in yielding both good and bad outcomes. Scholars of analogical reasoning have noted the potential for such reasoning to yield negative outcomes. For example, Loewenstein

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1 According to the latter line of reasoning, an analogy, even if it is based on irrelevant information, can improve a decision-maker’s performance. This argument also finds some support in simulation research (Gavetti, Levinthal & Rivkin [39, 2005]).
et al. write: “But analogy is a two-edged sword: Any new learning powerful enough to yield cor-
rect solutions in appropriate contexts could potentially lead to incorrect solutions if misapplied”
(Loewenstein, Thompson & Gentner [74, 1999]).

Similarly, Holyoak and Thagard suggest that “identifying appropriate mapping is crucial in al-
lowing useful transfer of knowledge” ([61, 1989]). This leaves open the question of what happens
when the mapping is inappropriate. One possibility is that the transfer of knowledge proceeds
regardless of the quality of either the mapping or the knowledge. Thus, the same tool that is good
at disseminating useful knowledge may be just as good at disseminating less useful, irrelevant or,
perhaps, even hazardous information.

From an empirical perspective, analogical reasoning may act as a substitute for more reli-
able decision-making processes such as systematic data collection and evaluation. Thus, an un-
derstanding of the costs and benefits of analogical reasoning is essential for both scholars and
decision-makers.

One attribute of analogical reasoning that makes it a powerful cognitive tool is that analogies
may serve as substitutes for a rich body of knowledge in decision-making (Day & Gentner [16,
2007]). Such substitution enables the decision-makers to sidestep a deeper analysis to avoid (what
could be seen as) reinventing the wheel. As a result of this substitution, decision-makers may
rely on their knowledge about the source of the analogy (the object with which they are already
familiar) instead of investing in developing new knowledge about the target (the unfamiliar object
they are trying to learn about).

Relying on information about the source of the analogy at the expense of developing new
knowledge about the target can yield undesirable outcomes (Schwenk [97, 1984]). Cognitive
psychologists have documented cases of analogical substitution occurring without the decision-
maker’s awareness (Day & Gentner [16, 2007]) and even against the decision-maker’s previously
held attitudes (Perrott, Gentner & Bodenhausen [87, 2005])—two scenarios that may make unde-
sirable outcomes especially likely.

Taken together, these papers suggest that the use of an inappropriate analogy may result in both
the arrival at and the diffusion of the incorrect solution to the problem. Furthermore, the decision-maker may not be sufficiently aware of the cognitive processes involved to stop and question the decision these processes generate. This automaticity is particularly troublesome because experimental research suggests that seemingly extraneous features may affect the outcomes of analogical reasoning. For instance, individuals’ judgment of the similarity of two items may depend on which item is listed as the target and which is listed as the source of the analogy (Tversky & Gati [116, 1978], Mussweiler & Gentner [82, 2007]).

**Theoretical framework**

**Current knowledge**

While some organization scholars have looked at negative consequences of analogical reasoning directly, (e.g., Tripsas and Gavetti [111, 2000]), most have closely followed the literature in cognitive psychology (e.g., Tsoukas [112, 1991], Levinthal & Rerup [71, 2006], Zollo & Reuer [123, 2010]), Grégoire, Barr & Shepherd [53, 2010]). The cognitive psychologists studying analogical reasoning have identified two sources of flawed analogies:

1. Heuristic rather than systematic processing of analogies.
2. Reliance on surface rather than structural features when building an analogical comparison of the source and the target.

While the two sources of error may overlap empirically, the theoretical distinction is still useful. Scholars who primarily study heuristics and look at heuristic processing of analogies[^2] make reference to the distinction between surface and structural features in the analogies they study. However, cognitive psychologists who primarily study analogies and focus on the distinction between surface and structural features do not specify whether they are looking at heuristic or systematic

[^2]: These researchers label the phenomenon they study “similarity heuristic” and view it as a subset of the representativeness heuristic (Schwenk, [97] 1984), Kahneman & Frederick [64, 2002], Locken et al. [75, 2008], Read & Grushka-Cockayne [91, 2011]).
processing of analogies.

If we think of the type of processing people engage in (systematic vs. heuristic) and the features of the analogy they focus on (surface vs. structural) as two distinct vectors, existing research, as Figure 1 on page 29 indicates, has shown limits of analogical reasoning in three out of four scenarios:

1. In drawing the analogy, individuals rely on heuristic rather than systematic processing.
2. In drawing the analogy, individuals focus on the surface rather than structural similarities between the two objects.
3. Both scenarios one and two hold: the reliance on heuristic processing leads individuals to focus on the surface rather than structural similarities between the two objects.

Thus, there is one scenario in which the use of analogical reasoning is expected to be the most effective in improving decision-making: when applying systematic processing to structural features of the source and the target objects, a scenario captured in the upper right-hand quadrant of Figure 1 on page 29.

In order to show that the persistence of cognitive frames generated by analogical reasoning is a problem independent of the three scenarios already identified in the literature, I will need to examine a longitudinal example which does not suffer from problems along the first two dimensions. The remainder of this paper will document a failure of analogical reasoning in precisely that setting: when analogical reasoning is performed by individuals who are engaged in systematic processing of information and focused on comparing structural rather than surface features of the source and target objects.

**Analogical blindness** I define analogical blindness as decision-makers’ willingness to disregard facts contradicting the analogy once the analogy has been accepted.

**Structural features** Scholars studying analogies based on surface rather than structural features draw the distinction between surface and structural similarity based on the features’ relevance to a
successful search for a solution and, consequently, dependent on the analyst’s goals (Holyoak [59], 1985, p. 81). In this paper, I define structural features as the features the decision-makers express concern about in considering whether or not to adopt an innovation.

**Systematic processing** In the research on analogical reasoning, there exists no clear definition of systematic processing of analogies. However, in the related literature on persuasion, cognitive psychologists work with the following definition:

According to a systematic view, recipients exert considerable cognitive effort in performing this task. They actively attempt to comprehend and evaluate the message’s arguments as well as to assess their validity in relation to the message’s conclusion. In contrast, according to a heuristic view of persuasion, recipients exert comparatively little effort in judging message validity. Rather than processing argumentation, recipients may rely on (typically) more accessible information such as the source’s identity or other non-content cues in deciding to accept a message’s conclusion (Chaiken [13], 1980).

In keeping with this approach, for the purposes of this paper, I define systematic processing as a type of decision-making requiring the decision-makers to expend cognitive effort.

*Proposition 1: The analogical blindness following the acceptance of an analogy formulated using systematic processing and evaluated using structural features of the source and target objects.*

**Mechanism**

The proposed mechanism for how analogical blindness works is as follows. Once an analogy is accepted, the existence of an analogy serves as an informational filter, categorizing all new facts as relevant to decision-making if they are consistent with the analogy in question, and irrelevant if they are not. Facts that point to a discrepancy between the analogy and reality would be categorized as irrelevant to decision-making or attributed to error.
Such sorting results in all new information confirming the validity of the accepted analogy, thus, perpetuating analogical blindness. This unquestioning reinforcement of existing beliefs can occur even in settings with high value placed on precision. For instance, Dunbar in his study of scientific laboratories finds that: “When the researcher believes that the findings are due to error, no amount of challenging, or suggestion of other explanations will result in conceptual change” (Dunbar 1995).

Thus, the difference between cognitive frames generated by analogical reasoning and tools managers use to guide their actions such as technical analyses is twofold. One, unlike, say, an NPV spreadsheet, the analogy may not have room for updating with new information. It is possible that as a cognitive structure, an analogy can only be replaced by another cognitive structure. Furthermore, if the numbers generated by the technical analyses are at odds with the accepted analogy, these numbers can be discarded or disregarded once the analogy has been accepted.

*Proposition 2: Individuals who were able to critically evaluate information prior to an analogy’s acceptance will disregard similar types of information once an analogy has been accepted.*

**Consequences of analogical blindness**

In a benign or unchanging environment, analogical blindness would have limited consequences. Indeed if the environment does not change, there is no reason for an initially accurate analogy to become inaccurate. However, if the environment does change in ways that are not favorable to decision-makers, analogical blindness can have negative consequences.

**Negative consequences** In my analysis, I define negative outcomes as the outcomes the decision-makers were hoping to avoid. This definition makes for a higher standard of proof since outcomes that run contrary to the decision-makers’ intentions are, presumably, harder to come by than the negative outcomes decision-makers had not considered.

*Proposition 3: Analogical blindness in a changing environment can have negative consequences.*
Methods

Research setting

A longitudinal case study of the rise and fall of the market for mortgage-backed securities (MBS) in the United States from 1968 to 2008 is an ideal setting for tracking the evolution of industry-level decision-making over time. Mortgage-backed securities were created by mortgage market participants by analogy to bonds. For the first 15 years of the market’s existence, the analogy failed to gain acceptance of the bond market participants. Once accepted around 1983, the idea that mortgage-backed securities are bonds and the tools implemented to put the idea into practice survived both the market contraction of 1994 and the mortgage crisis of 2008.

The financial crisis of 2008 has already prompted numerous investigations within the academic fields of finance, economics, and law. My work is closest in spirit and complementary to MacKenzie’s account of the evaluative cultures of traders who worked with asset-backed-securities (ABS) and collateralized debt obligations (CDO) (MacKenzie [77, 2011]). While MacKenzie starts his account in 2000s, my work traces the evolution of the industry tools, used by the traders he studies along with other system participants back to the inception of the tool use.

In structuring this project, I have made the following choices:

1. Level of analysis — in my research I look at the decision processes at the level of a whole system, which I define as not just the industry players across the mortgage value chain, but also consumers, and regulators.

2. Study timeline — disasters do not happen overnight. Potential disasters need time to accumulate resources and energy in order to become disasters (Turner [113, 1978], Turner & Pidgeon [114, 1997]). I trace the roots of the 2008 crisis to the 1960s.

3. Focus on process — my focus is on the process of the evolution of the system, and my analysis methods are historical and discursive. Specifically, relying on a combination of interviews, primary sources, and archival sources, I construct an analytical history of the 40 years immediately preceding the crisis.
The narrative that emerges from my research is that the unquestioned use of a flawed *analogy* by the industry players who built the market for mortgage-backed securities in the U.S., by the regulators of this market, and by the U.S. Congress, was a central cause of the market’s eventual collapse and the ensuing broader crisis.

In brief, the analogy in question is that mortgage-backed securities were originally constructed by analogy to bonds—marketed as ‘bond-like’ and increasingly designed to incorporate bond-like features (such as seemingly predictable prepayment patterns)—and, eventually, were treated by the regulators and other market participants as bonds. The danger here lay not in assuming that bonds are safer than mortgage-backed securities or stocks, but, rather, in thinking that we can understand and predict the behavior of mortgage-backed securities by understanding and predicting the behavior of bonds.

To believe this analogy, one would have to view mortgage-backed securities as a new breed of costless financial innovation that provided benefits to, but imposed no costs on, the society at large. The market for new securities provided the end-borrowers with greater availability of mortgage credit and lower mortgage interest rates. At the same time, once mortgage-backed securities were perceived to be sufficiently bond-like, they were assumed to be as safe as, and to need as little regulatory monitoring as, conventional bonds.

This safety assumption played out on two levels: safety from the financial-market regulator’s perspective — as in inability to cause a crisis — and safety from the end-borrower’s or mortgage-credit consumer’s perspective. From the financial regulator’s perspective, once the bond analogy was fully accepted, the task of monitoring new securities was effectively passed down from mortgage lending, banking, and securities regulators to private ratings agencies. From a consumer’s perspective, prior to the unraveling of the 2008 mortgage crisis, few anticipated that liquidity problems in fixed-income security trading could result in people losing their homes.
Data collection

In studying how cognitive frames evolve (or fail to evolve) over time, I use qualitative methods of inquiry because these methods are most suitable for answering questions about processes and documenting nuanced causality patterns (Ragin [90, 1989]). There are four overlapping but distinct traditions within qualitative methods used in organizational studies: ethnography (Van Maanen [117, 1988], Barley [5, 1990]), grounded theory (Glaser & Strauss [51, 1967], Eisenhardt [22, 1989]), case study (Burgelman [10, 1983], Siggelkow [99, 2002], Szulanski [108, 2006], Yin [121, 2008]), and historical analysis (Kieser [70, 1994], Hargadon & Douglas [55, 2001]).

The tradition I draw on most heavily in my research is historical analysis. The methods of historical analysis enable me to systematically analyze secondary sources to build a narrative of the development of the market for mortgage-backed securities from 1968 to 2008. Since my focus is on the events of recent history, I am able to enrich my understanding of the secondary sources by conducting ethnographic interviews with industry participants. I use a combination of interviews and archival data to construct an analytical history of the mortgage-backed securities market in the United States between 1968 and 2008.

My first step in this undertaking was to understand what the mortgage-backed securities system looked like in 2008. Between 2008 and 2010, I conducted 21 unstructured interviews with 19 current and former industry participants. In keeping with the system perspective, my goal was to speak to an individual involved in each step of the mortgage-backed securities system. In choosing the people I interviewed and the organizations they represented, I relied on theoretical sampling and continued to recruit interviewees until I spoke to at least one individual involved in each step of the mortgage-backed securities value chain (Glaser & Strauss [51, 1967]).

These interviews helped me understand the categories of players in the mortgage-backed securities system and the roles played by the organizations in different categories in 2008. Table 1 on page 31 provides a graphical representation of the MBS system in 2008. I then used archival materials to understand how the system and the decision processes of the system participants evolved from 1968 to the present. To ensure that my understanding of the system was accurate I wrote
up my notes from these conversations, circulated draft versions of the history I was constructing among the interviewees, and incorporated their suggestions into the draft.

My next step was to go back in time and trace the evolution of the system from 1960s onward. To this end, I consulted press archives of major newspapers, academic journals, and trade publications. In putting together the history, I was able to exploit an unusual institutional feature of the system—the existence of multiple editions of semi-standardized trade manuals. By consulting all editions of the *Handbook of Mortgage-Backed Securities* from 1985 onwards (Fabozzi [24, 1985], [25, 1988], [26, 1992], [27, 1995], [28, 2001], [29, 2005], Fabozzi et al. [31, 1998]; [30, 2007])

I was able to identify changes in industry practices and trace back the exact timing of these changes to newspaper and trade publications accounts. Following the discussions that accompanied the changes in industry practices enabled me to trace the evolution of the players’ beliefs (Yin [121, 2008], Rötheli, [94, 2009]).

To improve my understanding of the thinking processes of practitioners in the field, I read ethnographies of financial markets (Abolafia [1, 2001]; Zaloom [122, 2006]; Ho [57]), National Public Radio interviews with mortgage-industry players and consumers, published practitioner accounts (Lewis [73, 1990], Tett [109, 2009], Einhorn & Greenblatt [21, 2008]), and attended industry conferences.

To understand how this MBS market fits into the history of MBS trading in the United States and to enrich my work with a sense of historical perspective, I have also studied the failures of prior American MBS markets, including markets of the 1870s and 1930s (Snowden [100, 1987], [101, 1988], [102, 1996a], [103, 1996b], [104, 2003]; Severson et al., [98, 1966]; Levy [72, forthcoming]; White [120, 2009]; Fishback et al. [35, 2001]).
Reasoning by analogy in mortgage-backed securities

The period leading up to the 2008 mortgage crisis can be broadly understood in three phases:
1968-1983 – experimenting with different ways to control the prepayment risk in order to turn mortgages into bonds; 1983-1993 – applying tranching to prepayment risk; and 1993-2008 – introducing default risk into MBS and applying tranching to it.

Phase I: 1968-1983

Prior to 1968, mortgage lenders financed their operation from one of two funding sources: deposits and government purchases of mortgage loans. These sources of funding were viewed by lenders as scarce and fickle. The privatization of Fannie Mae and threats to Ginnie Mae’s funding as the U.S. struggled to finance the war in Vietnam introduced additional uncertainty into mortgage funding.

Mortgage bankers looked to the capital invested by pension funds, insurance companies, and other prudentially-regulated institutional investors in the bond market as a solution to the scarcity of funding for mortgage loans. The bond market was viewed as a stable pool of money that could be used to finance future mortgage lending throughout the business cycle.

Mortgage-backed securities (MBS), authorized by Congress in 1968 and issued by Ginnie Mae in 1970, were viewed by mortgage-lending industry participants as a half-way step in turning mortgages into bonds. Thus, the analogy between mortgages and bonds was originally introduced as a solution to the problem of funding scarcity in the mortgage-lending market.

At the time when MBS were issued, conventional bonds traded in the market had default risk, but not prepayment risk. Table 2 provides a summary of the differences between conventional bonds and MBS. In contrast, MBS, issued by Ginnie Mae and government-sponsored entities such as Fannie Mae and Freddie Mac, were seen as having prepayment risk, but not having default risk, due to the presence of either explicit or implicit government guarantees of the performance of underlying mortgages. The prepayment-risk problem had to be solved in order to address

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3For direct quotes from representative primary sources, see Table 5 on page 35.
4In this section, I refer to tranching and averaging out of risk (what the technique was meant to do) interchangeably.
the original goal of having investors view MBS as bonds.

To make the analogy work, the industry participants had to create tools to make mortgage-backed securities (the target object of the analogy) look more like bonds (the source object of the analogy). MBS traders decided to address the prepayment risk by effectively averaging out prepayment decisions across customers by tranching prepayments. The effort invested in managing prepayment risk suggests that the industry participants knew that mortgage-backed securities did not fit into the bond category.

**Phase II: 1983-1993**

The tranched MBS (also known as a Collateralized Mortgage Obligation or a CMO) were introduced by Freddie Mac in 1983 and accepted by prudentially-regulated institutional investors as bonds. CMOs were constructed to make MBS function more like callable bonds, a type of conventional bond that could be repaid before its maturity date. Table 3 on page 33 provides a detailed comparison of CMOs to callable bonds and the prior generation of MBS.

Once the system participants accepted the tools for managing the mismatch between mortgage-backed securities and bonds as legitimate, they also accepted the analogy of MBS to bonds. Their acceptance of the analogy triggered another round of comparison of MBS to bonds. Their acceptance of the analogy triggered another round of comparison of MBS to bonds.

Bonds still had no prepayment risk, but had default risk, whereas MBS, now CMOs, were viewed as having neither prepayment, nor default risk. The new comparative logic encouraged MBS traders to introduce default risk into MBS. The introduction of default risk into MBS entailed skipping the step that involved acquiring (and paying for) government guarantees of mortgage repayment and replacing the government guarantees with tranching, a tool forged in building the acceptance for the ‘MBS are like bonds’ analogy.

**Phase III: 1993-2008**

Starting in 1993, government guarantees that the mortgages would be repaid were replaced by tranching, a carbon copy of the risk-management tool that the traders used to manage prepay-
ment risk. In the eyes of the market participants, in addition to doing all the things government guarantees were supposed to be doing, the averaging-of-risk tool had the advantage of being free.

The introduction of credit risk into MBS and the accompanying second round of tool creation were meant to further the functional similarities between mortgage-backed securities and bonds. Once the prepayment risk was deemed addressed, default risk was introduced to make mortgage-backed securities even more bond-like.

A series of Federal Reserve interest-rate cuts between 1991 and 1993 triggered a correlation in the end-borrowers’ prepayment patterns. The mortgage borrowers refinanced *en masse*, resulting in the evaporation of the mortgage interest held by MBS investors. Lew Ranieri, one of the visionaries behind the averaging out of prepayment risk and erstwhile head of the mortgage department at Salomon Brothers, as well as many less centrally positioned industry players lost money in the event (Carroll & Lappen [11, 1994]). The correlation rendered the tranching tool ineffective at addressing prepayment risk. However, the evidence that prepayment risk in MBS could not be managed by the averaging tool did not force industry players to update the comparisons of MBS to bonds made in 1968 and 1983. The other missed lesson of the 1994 crash was the inefficacy of the averaging-out tool at managing risk in the presence of correlation.

By the time of the 1994 MBS meltdown, the role of the averaging-out tool in enabling the transformation of mortgage-backed securities (and, by extension, of mortgages) into bonds had been forgotten. The failure of the technology meant to realize the transformation of mortgages into bonds had not been incorporated into the system’s memory.

In 2008, a slowdown in the MBS market triggered a correlation in mortgage defaults. The correlation in defaults rendered the averaging-out tool ineffective at managing the default risk, resulting in losses of money for MBS investors and of homes for millions of end-borrowers. Figure [2] on page [30] shows foreclosure numbers from the Great Depression to 2009 to put the events of 2008 into historical perspective.
Analysis

The mortgage industry participants introduced the analogy of ‘mortgage-backed securities as bonds’ to solve the mortgage industry’s funding crisis. The solution was supposed to work by turning mortgages into bonds and attracting financing from the bond market. In order for the solution to work, the mortgage industry participants had to convince the target audience of bond investors that mortgage-backed securities were in fact bonds.

For the first fifteen years of MBS market’s existence, the bond investors refused to accept the analogy pointing to the important differences in how mortgage-backed securities and bonds functioned with respect to prepayment risk.

The fact that the bond market participants spent fifteen years resisting the analogy of MBS to bonds suggests that they were expending cognitive effort and, thus, engaged in systematic rather than heuristic processing of the analogy. The prepayment event of 1994 further suggests that the bond investors were right to worry about the differences between bonds and MBS on the prepayment risk dimension and that prepayment risk was a structural feature of the analogy in question. These findings lend support to Proposition 1—the analogical blindness cannot be attributed to either the type of processing or the features used in constructing and evaluating the analogy.

Once the structure of MBS was modified in 1983 to more closely resemble that of callable bonds, the bond investors accepted the analogy. This acceptance was manifested by pension funds and life insurance companies, bond investors long sought by the mortgage industry, investing in MBS.

Between 1983 and 1994, it appeared that the analogy of ‘mortgage-backed securities as bonds’ worked exactly as advertised. Once accepted by its target audience, the analogy enabled the mortgage bankers who had previously faced funding shortages to attract funding from the bond market.

If the framing of ‘mortgage-backed securities as bonds’ disappeared as soon as it had outlived its original goal, the industry participants could have reaped the benefits of analogical reasoning and rested on their laurels. However, the framing persisted, inviting new comparisons between mortgage-backed securities and bonds and the introduction of credit risk into MBS to make
mortgage-backed securities even more bond-like. The system participants used a copy of the same tranching tools (that were supposed to make the analogy of MBS to bonds work) to manage the newly introduced credit risk.

Even though the acceptance of mortgage-backed securities by bond market participants was contingent on efficacy of tranching as a prepayment-risk management tool, the failure of tranching in managing prepayment risk in 1994 did not dislodge the analogy of MBS as bonds. The same audience that in 1972 rejected MBS on the grounds that the securities did not have protection from prepayment risk, discarded evidence of this lack of protection in 1994. This finding lends support to Proposition 2—analogacl blindness prevents decision-makers from critically evaluating facts at odds with the analogy.

The idea that the introduction of credit risk was also driven by the same analogy has also gone unnoticed and unquestioned by the system participants. Both the analogy and the failed tools its persistence gave rise to survived to the 2008 mortgage crisis.

The events of 2008 were a consequence of the persistence of the ‘mortgage-backed securities as bonds’ analogy on several levels. One, the analogy linked the previously unrelated markets for residential mortgages and fixed-income securities. Two, the tools created to implement the analogy were used to mitigate the default risk of the mortgage-backed securities, leading the system participants to extend loans that were riskier than they would have extended in absence of such mitigation. Three, the imperviousness of the analogy to new facts prevented the system participants from recognizing the fallibility of the tools in 1994 and the implications of the tools’ failure for the viability of the ‘mortgage-backed securities as bonds’ analogy.

Together, these findings lend support to proposition 3—the onset of analogical blindness in a changing environment can have negative consequences for both organizations involved in the mortgage-backed securities system and individual borrowers.
Discussion

This paper explores the negative consequences of persistent cognitive frames generated by analogical reasoning. The paper contributes to the literature on managerial frames by suggesting that the persistence of cognitive frames can have negative consequences. It also contributes to research on analogical reasoning by proposing a theoretical mechanism by which analogical reasoning can blind the decision-makers to changes in their environment.

This paper set out to examine the proposition that analogical blindness can lead the decision-makers to disregard new information about their environment. The empirical section of the paper finds support for the theorized mechanism. Specifically, I argue that the use of a bond analogy in the creation and marketing of MBS led to both the development of the market and to its subsequent collapse. The historical developments of the MBS market between 1968 and 2008 appear to fit the pattern of an analogy that outlived its usefulness and persisted despite negative consequences to both individuals and organizations involved in the mortgage-backed securities system.

The paper is purposeful in ruling out the alternative explanation: namely, that the negative consequences of analogical reasoning described in the paper can be attributed to the decision-makers not following the best recommendations for static decision-making. Fifteen years of resisting an analogy while testing different methods for addressing the gap between the source and the target of the analogy suggests an expenditure of cognitive effort and in other words systematic processing of the analogy by the system participants. Furthermore, the distress over the collapse of the interest segments of the MBS holders’ portfolios in 1994 points to the fact that the differences in prepayment risk behavior between MBS and bonds was an important structural feature of the analogy that the market participants were rightly concerned about.

Despite their best efforts, the decision-makers were unable to anticipate and avoid the consequences of the ‘mortgage-backed securities as bonds’ analogy. This failure of analogical reasoning to enhance decision-making over time had important consequences for the society at large. Analogical reasoning facilitated the adoption of an innovation that linked financial markets with performance of consumer mortgages, while blinding the decision-makers to the consequences of
this linkage. The decision makers’ analogical blindness put more than three million families at risk of losing their homes.

**Conclusion**

The question of what happens when cognitive frames persist is interesting from both theoretical and empirical perspectives. On the one hand, the persistence of cognitive frames may enable managers to credibly commit to a course of action, yielding positive returns for an organization as it interacts with its stakeholders. On the other, persistence of cognitive frames may blind an organization to changes in its environment, thus, yielding negative outcomes.

The decision-making that ultimately culminated in the 2008 mortgage crisis offers an interesting, if extreme, case study of what happens when cognitive frames outlive their usefulness. This study is a first step toward filling the gap in our knowledge about the dark side of analogical reasoning that relies on structural features and uses systematic processing—a contribution to research in both organizational learning and cognitive psychology. In terms of implications for academic research, my work highlights the importance of understanding the role of market participants’ beliefs and the institutional logics in shaping market outcomes.

This paper suggests a number of avenues for further research, specifically, on the relationship between analogical blindness and other phenomena describing a persistence of a course of thought or action documented by scholars of organizations—specifically, confirmatory bias, escalation of commitment, and core rigidities.

The persistence of analogies despite invalidating evidence may work through all three channels. If the facts are filtered by the analogy in question, this may trigger the managers’ confirmation bias. An organization managed by people with such filters may exhibit an escalation of commitment to a given course of action. If the implementation of the analogy necessitates the development of tools and routines, such tools and routines may self-perpetuate leading to the creation of core-rigidities within a given organization or industry.
In addition to contributing to organizational theory, the paper also has implications for practice. To my knowledge, it is the first academic paper to suggest that when evaluating a prospective analogy, the practitioners should be mindful of the analogy’s long-range consequences. In other words, once the analogy sticks, it may take on a life of its own.
References


## Appendix

Features used for comparison

<table>
<thead>
<tr>
<th>Surface</th>
<th>Structural</th>
</tr>
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</table>

### Type of Processing

<table>
<thead>
<tr>
<th>Systematic</th>
<th>Heuristic</th>
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</table>

Figure 1: Research on Faulty Analogies by Type
Figure 2: Foreclosures on Non-Farm Residential Properties in the U.S. between 1926 and 2009
1926-1968 data series is houses surrendered to the lender as % of mortgaged structures, using
data from the Federal Home Loan Bank Board (FHLBB). Source: Snowden ([105], 2006)).
1969-2009 data series is loans in the foreclosure inventory at the year end as % of loans serviced
by the participating companies, using data from the National Delinquency Survey of the Mortgage
Bankers Association of America (MBAA). Source: *Statistical abstract of the United States* for
N.B.: I am indebted to Larry White, Ken Snowden, and Chris Foote for their help in putting
together this data series.
Table 1: Mortgage-Backed Securities System: Players and Roles

<table>
<thead>
<tr>
<th>Players\Roles</th>
<th>Home Sellers</th>
<th>Home Buyers</th>
<th>Mortgage Retailers</th>
<th>Mortgage Servicers</th>
<th>Mortgage Wholesalers</th>
<th>MBS Issuers and Resellers</th>
<th>Investors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individuals</td>
<td></td>
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<tr>
<td>Real estate developers</td>
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<tr>
<td>Commercial banks</td>
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<td>Thrifts</td>
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<tr>
<td>Investment banks</td>
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<td>GSEs</td>
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<td>Pension Funds</td>
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<tr>
<td>Life Insurance Companies</td>
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<tr>
<td>Rating Agencies</td>
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<tr>
<td>Regulators</td>
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</tbody>
</table>

Shaded areas in the table reflect the roles the players take on in the system.
### Table 2: Mortgage-Backed Securities and Bonds

<table>
<thead>
<tr>
<th></th>
<th>MBS</th>
<th>Bond</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of Issuer</strong></td>
<td>Government sponsored entities, federal government, private issuers (e.g., banks, trusts).</td>
<td>Domestic corporations, municipal governments, federal government.</td>
</tr>
<tr>
<td><strong>Maturity</strong></td>
<td>Corresponds to the length of the underlying mortgage contract.</td>
<td>Non-collateral specific.</td>
</tr>
<tr>
<td><strong>Coupon</strong></td>
<td>Interest rate associated with the security.</td>
<td>Interest rate associated with the security.</td>
</tr>
<tr>
<td><strong>Principal</strong></td>
<td>Payment timing varies depending on the type of the loan.</td>
<td>Paid at maturity date (if applicable).</td>
</tr>
<tr>
<td><strong>Collateral</strong></td>
<td>Mortgages underlying the contract; no explicit recourse to the issuer’s other assets.</td>
<td>In absence of other contractual provisions, assets of the issuer.</td>
</tr>
<tr>
<td><strong>Call and Refunding Provisions</strong></td>
<td>The underlying mortgages can be prepaid at any time. Investors receive the payments pro-rata as they occur.</td>
<td>Callable bond contracts specify restrictions on callability, including when the bonds can be called and the percentage of the principal that can be called.</td>
</tr>
<tr>
<td><strong>Responsibility for Repayment</strong></td>
<td>Rests with the issuing firm or government agency.</td>
<td>Rests with the individual borrowers of the mortgages being packaged.</td>
</tr>
</tbody>
</table>
Table 3: Call and Refunding Provisions Spectrum

<table>
<thead>
<tr>
<th>Pass-Through MBS</th>
<th>Tranch MBS (CMO)</th>
<th>Callable Bond</th>
</tr>
</thead>
<tbody>
<tr>
<td>The underlying mortgages can be prepaid at any time. Investors receive the payments pro-rata as they occur.</td>
<td>The underlying mortgages can be prepaid at any time. Prepayments are divided among tranches in a pre-specified order. More senior tranches are less exposed to prepayments than junior tranches.</td>
<td>Contracts specify restrictions on callability, including time when the bonds cannot be called, percentage of the principal that can be called, etc.</td>
</tr>
</tbody>
</table>

Less bond-like                                                    More bond-like
<table>
<thead>
<tr>
<th>Credit-Risk Structure</th>
<th>Credit-Risk Rating</th>
<th>Credit-Risk Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>MBS</td>
<td>Bond</td>
<td></td>
</tr>
<tr>
<td><strong>Pass-Through</strong></td>
<td>The senior tranches are less exposed to defaults than junior tranches. Each tranche of a CMO can have its own risk profile and a separate rating from a ratings agency. Thus, a single CMO with multiple tranches can have multiple grades assigned by the same agency.</td>
<td>The securities may carry implicit or explicit government guarantees or private insurance.</td>
</tr>
<tr>
<td><strong>CMO</strong></td>
<td>The risk rating is determined by the quality of the underlying mortgages (graded A, B, C, D by the originator), geographic dispersion, and conformance to either Fannie Mae’s or Freddie Mac’s underwriting guidelines.</td>
<td>The securities may carry implicit or explicit government guarantees. Privately issued securities may be structured to allow subordination of risk across tranches and may carry private insurance.</td>
</tr>
<tr>
<td><strong>Bond</strong></td>
<td>Rated by the ratings agencies and assigned grades, AAA, AA, A, BBB, BB, B, etc. The credit rating is determined based on the issuer’s financials and the seniority of the given bond in relation to other outstanding bonds from the same issuer.</td>
<td>Federal and municipal bonds carry pledges of issuer revenue at the relevant level of government. Private bonds may be backed by collateral beyond the assets of the issuer.</td>
</tr>
<tr>
<td>Decision-making phase</td>
<td>Evidence</td>
<td>Interpretation</td>
</tr>
<tr>
<td>----------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Identifying the problem</td>
<td>“Recognizing the serious impediments to investment, housing and lending industry officials pushed for major changes in the mortgage market structure and the types of securities that could be marketed”(Farquhar, [32, 1972]).</td>
<td>Mortgage-backed securities were introduced as a solution to funding shortages in the mortgage market</td>
</tr>
<tr>
<td>Identifying the audience</td>
<td>“The new financing device would aim at capturing larger portion of the investment portfolios of pension and trust funds for housing”(Samuelson, [95, 1969]).</td>
<td>Bond investors with long horizons were the target audience for the analogy.</td>
</tr>
<tr>
<td>Solution by analogy</td>
<td>“What the security does is to transform the mortgage into a bond-type instrument”(Nevins [84, 1972]).</td>
<td>The advocates of the innovation were explicit about the analogy’s primary purpose.</td>
</tr>
<tr>
<td>Analogy acceptance in doubt</td>
<td>“The modified pass-through security is more like a bond than a mortgage, but the holder still has no protection against accelerated payments”(Nevins [84, 1972]).</td>
<td>By 1972, the failure of MBS to attract investments from bond-market investors was viewed as a failing grade for the effort to turn mortgages into bonds. In this grading, prepayment risk represented the core of the problem.</td>
</tr>
<tr>
<td>Copying tools from prepayment to default risk</td>
<td>“The SDA curve relates to defaults just as a PSA curve relates to prepayments”(Fabozzi [28 2001]).</td>
<td>In 1993, the growth in non-government-backed CMOs encouraged the Public Securities Association to introduce the Standard Default Assumption (SDA) curve. This tool was meant to be the mirror image of the association’s Standard Prepayment Model (PSA curve).</td>
</tr>
<tr>
<td>Evidence of tool failure</td>
<td>“Homeowners refinanced at unheard-of rates. Wall Street’s prepayment models, based on the 1985–’87 experience (when interest rates actually fell more steeply), failed to predict the onslaught of prepayments”(Carroll &amp; Lappen [11 1994]).</td>
<td>The tranching models failed to respond to a changing environment.</td>
</tr>
</tbody>
</table>