Damper on the Party: The Effect of Accounting Conservatism on Life Insurers' Risk Acceptance Leading up to the Financial Crisis

Urooj Khan
University of Texas at Austin

Stephen Ryan
New York University

Abhishek Varma
Illinois State University

September 2024

Abstract: We examine the effect of life insurers' accounting conservatism on their acceptance of the credit risk of commercial mortgages during the 1998−2007 period prior to the 2008–2009 financial crisis. We examine life insurers because their statutory filings disclose loan-level information and their excess asset valuation allowance for mortgages provides a tailored measure of their conservatism. We examine commercial mortgages because they are life insurers' largest type of loan asset. We hypothesize and provide evidence that life insurers' conservatism has a negative association with their acceptance of the credit risk of commercial mortgages during the 2004−2007 credit boom in isolation and relative to the 1998−2003 stable credit extension period. We first examine the association of life insurers' conservatism with the at-origination loan-to-value ratios for their commercial mortgages, the best available measure of ex ante credit risk acceptance on these loans. We then examine the association of life insurers' conservatism with their ex post losses on commercial mortgages during 2008−2013, holding the loan origination year constant to control for loan seasoning and vintage effects.

Keywords: Conservatism; risk acceptance; financial crisis; life insurers; commercial mortgages.

JEL Codes: G22, M41, R3.

*We thank Valeri Nikolaev, Dushyant Vyas, Yong Yu, and seminar participants at New York University for helpful comments.

I. INTRODUCTION

Prior research provides evidence that non-financial firms' accounting conservatism (conservatism), usually measured as timely loss recognition, is positively associated with their investment efficiency and negatively associated with their investment risk (Rowchowdhury, Shroff, and Verdi 2019).[1] It also provides evidence that banks' conservatism is negatively associated with their lending procyclicality and overall risk taking (Beatty and Liao 2011; Bushman and Williams 2012). The research on both non-financial firms and banks posits that conservatism counteracts adverse managerial incentives and thereby leads firms to make better decisions. The research examining non-financial firms does not distinguish the effects of conservatism across economic cycles. The research examining banks generally considers the effects of economic cycles only in the following respect: the application of conservatism in good times leads banks to make prudent economic decisions, such as issuing equity, that cushion banks' loan losses and thereby enhance their ability to originate new loans in bad times.

In this paper, we contribute to these prior literatures by identifying new and broader effects of conservatism on lenders' accrued credit losses and thus credit risk acceptance across the credit cycle, a longstanding and key concern of policymakers and regulators of the financial system and researchers studying financial stability (e.g., Financial Stability Forum 2009; Beatty and Liao 2011; Acharya and Ryan 2016; Wall 2019). As these effects and the mechanisms underlying them have not previously been shown either theoretically or empirically, we first develop and simulate a multi-year numerical example with overlapping vintages of loans that illustrates how the effects

[1] Roychowdhury et al. (2019) survey these literatures. For empirical papers examining the association of conservatism with investment efficiency, see Watts (2003), Ball and Shivakumar (2005), Biddle and Hilary (2006), Francis and Martin (2010), Ahmed and Duellman (2011), and Garcia Lara, Garcia Osma, and Penalva (2016). For empirical papers examining the association between conservatism and investment risk, see Kravet (2014) and Cedergren, Lev, and Zarowin (2018).

of conservatism on accrued credit losses vary across three paradigm phases of the credit cycle: stable credit extension periods, which (probabilistically) lead to credit booms, which lead to credit busts, which lead back to stable credit extension periods.

Under the reasonable assumption that loan origination grows in credit booms, is flat in stable credit extension periods, and declines in credit busts, this numerical example shows that (greater) conservatism (further) increases accrued loan losses in credit booms, (further) decreases accrued loan losses in credit busts, and more modestly (further) decreases accrued credit losses in stable credit extension periods.[2] Assuming that lenders that accrue higher credit losses reduce their credit risk acceptance, all else equal, the numerical example implies that conservatism (1) has modest effects on lenders' credit acceptance in stable credit extension periods, (2) restrains lenders' credit acceptance in credit booms, and (3) increases lenders' credit acceptance in credit busts. Importantly, the example implies that lenders' conservatism has opposite effects on both their accrued credit losses and their credit acceptance in credit booms and credit busts.

Consistent with the first two of these implications of the numerical example, we propose and test two hypotheses.[3] First, the association between life insurers' conservatism in accounting for mortgages and the credit risk of their commercial mortgage originations is negative during the 2004−2007 credit boom. Second, the association between life insurers' conservatism in accounting for mortgages and the credit risk of their commercial mortgage originations is more negative during the 2004−2007 credit boom than during the 1998−2003 stable credit extension period.

[2] As discussed in Appendix B, the last of these findings is sensitive to our numerical assumptions regarding the likelihoods of credit-cycle changes, and we view the example as showing that the effect of conservatism should be relatively modest in either direction in stable credit extension periods.

[3] Later in the introduction, we discuss why we do not test the third implication of the numerical example in our primary tests and describe a supplemental analysis we conduct to provide some evidence regarding this implication.

We test these hypotheses in the context of the effect of life insurers' conservatism in accounting for mortgages on the risk of the commercial mortgages they originated during the ten-year period leading up to the 2008–2009 financial crisis.[4] We examine life insurers rather than banks or other lenders for two primary reasons. First, life insurers' statutory filings include information about each exposure of specified types in each fiscal period that they hold the exposure.[5] This information allows us to measure insurers' ex ante credit risk acceptance (e.g., initial loan-to-value ratios and interest rates) and ex post credit losses for each commercial mortgage they originate. This information also enables us to control for commercial mortgage characteristics and to match similar commercial mortgages originated by insurers that account for mortgages using different levels of conservatism.

Second, a measure of the conservatism of life insurers' statutory accounting for mortgages is available: the excess (above the regulatory reserve objective, which is based on conservative assumptions about credit losses) asset valuation allowance for mortgages.[6] Importantly, this measure is available for all life insurers, including private insurers, which constitute the large majority of our sample. To provide support for the validity of this measure of conservatism, in untabulated analysis using the sample of observations for publicly traded insurers, we find that the measure has highly significantly positive rank correlations with two commonly used firm-year proxies for overall and conditional conservatism, the market-to-book ratio and the C_Score

[4] We refer to the financial crisis as beginning in 2008 because that is the year in which commercial real estate and commercial mortgages were first adversely affected (Meeks 2008; see also our Figure 1). Subprime and Alt-A residential mortgages and certain other types of financial assets were adversely affected in 2007 (Ryan 2008).

[5] Several recent papers exploit this data (e.g., Ellul, Jotikasthira, Lundblad, and Wang 2015; Hanley, Jagolinzer, and Nikolova 2018; Khan, Ryan, and Varma 2019; Hodder and Sheneman 2022).

[6] Life insurers' statutory filings enable us to calculate this measure for all mortgages, not for commercial mortgages specifically. However, commercial mortgages constitute the bulk of insurers' (non-securitized) mortgage portfolios (Wong and Kaminski 2020, p. 4; American Council of Life Insurers (ACLI) 2021, Chapter 2, pp. 13-14). For the average insurer-year observation in our sample, commercial mortgages represented 93.80 percent of all mortgages. Hence, we expect commercial mortgages to dominate the AVR for all mortgages.

measure developed by Khan and Watts (2009), respectively. We use both binary and continuous versions of our conservatism measure in our tests.

We examine commercial mortgages primarily because they are economically significant for life insurers. Commercial mortgages constitute (1) about ten percent of the industry's aggregate cash and invested assets, a magnitude similar to the industry's owners' equity; (2) the industry's largest type of (non-securitized) loan asset; and (3) over half the industry's exposure to commercial real estate (Nissim 2010; National Association of Insurance Commissioners (NAIC) 2012a, pp. 3-4; J.P. Morgan Asset Management 2020).[7]

The ten-year period we examine includes both the relatively stable credit extension period from 1998 to 2003 and the increasingly bubbly credit boom from 2004 to 2007 prior to the onset of the financial crisis.[8] While the financial crisis is now well past, we examine this period because it remains the most recent and salient example of a restrained credit-extension period that leads first to a credit boom and then to a credit bust.

In our primary empirical analysis, we examine how life insurers' conservatism in accounting for mortgages impacts the at-origination loan-to-value ratio—the best measure of the ex ante credit risk of individual commercial mortgages that can be calculated from the information in insurers' statutory filings[9]—in the 1998−2003 stable credit extension period versus the 2004−2007 credit boom. We predict and find a significant negative association between insurers' conservatism and the loan-to-value ratio on their commercial mortgages in the credit boom. In

[7] Life insurers' other primary exposures to commercial real estate are commercial mortgage-backed securities, securities issued by real estate investment trusts, and directly owned commercial real estate (NAIC 2012a,b).

[8] By a credit boom, we mean a period in which lenders accept above-normal levels of credit risk. This does not include all periods of high loan origination. For example, the refinancing boom in (mostly guaranteed) prime conforming residential mortgages that occurred as mortgage interest rates fell from 2000 to 2003 does not constitute a credit boom.

[9] NAIC (2012b, pp. 6-7) states that the "LTV ratio is one of the two primary metrics used to evaluate the credit quality of a commercial mortgage loan…The other primary metric used is…DSCR [the debt service coverage ratio]; however, DSCR information is not included in insurers' statutory filings."

fact, though not predicted (although consistent with the numerical assumptions about the likelihoods of credit-cycle changes in our numerical example), we find these variables are significantly *positively* associated in the stable credit extension period.

To probe the robustness of the results of our primary empirical analysis, we also examine how life insurers' conservatism in accounting for mortgages impacts the ex post credit losses during 2008−2013 on their individual commercial mortgages originated in each year of the stable credit extension period versus in each year of the credit boom. We estimate annual cross-sectional regressions that hold the loan origination year constant to control for the effects of loan seasoning and the well-known finding that loans originated closer to the peak of the credit boom performed worse during the credit bust (e.g., Demyanyk and Van Hemert 2011 for subprime residential mortgages and An and Sanders 2010 for commercial mortgages). We predict a significant negative association between insurers' conservatism and their ex post credit losses on commercial mortgages originated in the credit boom, and find consistent evidence of this for the 2004–2007 origination vintages. We predict an insignificant association for commercial mortgages originated in the prior stable credit extension period, and we mostly find this for the 1998−2002 vintages. Our findings for the 2003 vintage are similar to those for the 2004 vintage, consistent with these years constituting the transition between the stable credit extension period and credit boom. None of our inferences are affected by defining the credit boom as starting in 2003.

We conduct these empirical analyses using two approaches to control for insurer and mortgage characteristics, including the city in which the mortgaged property is located (city) and the year of mortgage origination (year). First, in all models, we include these characteristics as control variables, and we include city-year (city) fixed effects in panel (cross-sectional) regressions. We also show the effects of including firm (i.e., insurer) fixed effects in models in our

primary empirical analysis. Second, in half the models in our primary empirical analysis, we propensity score match commercial mortgages issued by insurers with high versus low conservatism in accounting for mortgages based on the city, year, and mortgage amount. Our results are robust to the use of these two approaches.

We conduct two supplemental empirical analyses. First, a limitation of our primary analysis is that a commercial mortgage with a higher at-origination loan-to-value ratio is not a worse investment if the incremental interest rate charged on the mortgage suffices to cover the incremental credit losses. To address this limitation, we create an indicator for commercial mortgages with both high loan-to-value ratios and low interest rate spreads. We predict a significant negative association between this indicator and insurers' conservatism in accounting for mortgages only in the credit boom. As expected, we find a reliably significant negative association in the credit boom using both the binary and continuous measures of conservatism. In contrast, in the stable credit extension period we typically find an insignificant association.

Second, as noted above, in our primary analyses, we do not examine the third implication of the numerical example, which pertains to life insurers' ex ante credit risk acceptance during the credit bust. This is primarily because the extreme severity of the financial crisis and the centrality of mortgage default during the crisis caused a partial freeze in commercial mortgage lending in which insurers and other lenders sharply reduced their commercial mortgage originations from the crisis through 2010.[10] Thus, we expect insurers' reduced credit risk acceptance in this period to be

[10] This low commercial mortgage origination is reflected in the time-series of commercial mortgages outstanding for various lenders in Federal Reserve Schedule Z1, Table L.220. This schedule shows that commercial mortgages outstanding decreased each quarter from 2008Q4 to 2010Q4 for both life insurers and all lenders combined, with the cumulative decrease over this period being 5.9 percent for life insurers and 9.5 percent for all lenders (https://www.federalreserve.gov/releases/z1/release-dates.htm). This decrease is also evident in the over 50 percent decrease in the number of commercial mortgage originations per year in our sample from the credit boom period to the credit bust in the supplemental analysis reported in Table 7.

evidenced more by insurers reducing the dollar amount of their commercial mortgage originations than by them lowering the loan-to-value ratios on the mortgages they chose to originate, which they likely extended to highly creditworthy or relationship borrowers. In addition, an insurer that wants to accept credit risk during the credit bust likely will have little competition to do so and thus need not offer a higher loan-to-value ratio than other insurers, and loan-to-values might rise, not fall, during credit busts because property valuations fall. For all these reasons, we expect loan amount to be a better indicator of credit risk acceptance than the loan-to-value ratio during the credit bust. Examining insurers' ex ante credit acceptance during the 2008−2010 credit bust, we find that conservatism is associated with lower, not higher, loan-to-value ratios but, as expected, higher initial loan amounts.

Our findings are consistent with insurers' conservatism in accounting for mortgages reducing the procyclicality of their originations of commercial mortgages. In this regard, our study primarily contributes to the small literature on the effects of firms' conservatism on their investment credit risk, and how those effects vary with economic conditions. We discuss this literature and our contribution to it in detail in Section II. In addition, our study further illustrates the usefulness of the data about life insurers' individual exposures available in their statutory filings for research on this and related topics.

Our study is limited in several ways that provide opportunities for future research. First, we do not consider changes in credit spreads across the credit cycle in either the numerical example or empirical analysis, and thus our results do not speak to the economic tradeoffs lenders face in different cycle phases. Second, because we can only observe limited borrower characteristics and extended commercial mortgages, not mortgage applications, our ability to our control for the demand for commercial mortgages is limited. We address this concern as best we can by including

city-year fixed effects and, in our primary analysis, by the use of the matched sample. Third, we do not consider the potential roles of information asymmetry in lenders' choices of conservatism and credit acceptance. Lastly, since our setting does not exhibit exogenous shocks to life insurers' conservatism, we do not provide causal evidence.

The paper is organized as follows. Section II summarizes the relevant prior literature, describes the numerical example presented in Appendix B, and develops our hypotheses based on the literature and numerical example. Section III describes the data sources and sample construction. Section IV reports the empirical results. Section V concludes.

II. PRIOR LITERATURE, NUMERICAL EXAMPLE, AND HYPOTHESES

In this section, we first discuss the two prior literatures most related to our study: (1) the impact of (primarily non-financial) firms' financial reporting, including conservatism, on their investment efficiency and risk, and how this impact varies across economic conditions; and (2) the impact of banks' conservatism on their loan origination procyclicality and overall risk-taking.[11] While the empirical analysis in our paper is closer to the banking literature, we discuss both literatures because the underlying concepts and primary empirical challenges are largely common to these literatures. We then briefly describe the development, simulation, and key implications of a multi-year numerical example with overlapping vintages of loans that illustrates how the effects of conservatism vary across the phases of the credit cycle. Appendix B contains the complete presentation of this example. Lastly, based on this discussion, we propose our hypotheses and highlight our contribution.

[11] As is evident from this list, we are unaware of any prior studies that examine the impact of *insurers'* conservatism on their investment efficiency or risk, or how this impact varies across economic conditions.

Literature on the Impacts of Firms' Conservatism on their Investment Efficiency and Risk

Roychowdhury, Shroff, and Verdi (2019)

Roychowdhury et al. (2019) provide an excellent review of the sizeable literature on the impact of firms' financial reporting requirements and quality, including conservatism, on their investment efficiency. Roychowdhury et al. (2019) also review the related but much smaller literature on the impact of these firms' financial reporting on their investment risk. The latter literature is more directly related to our paper. In their footnote 22, they state that "[d]irect evidence of [the impact of] financial reporting on managerial risk-taking and investment riskiness is limited…the influence of financial reporting on corporate risk-taking behavior remains unresolved."

Roychowdhury et al. (2019) structure their review around the following schema. Financial reporting by firms or their peers can impact firms' investments in two ways. First, financial reporting can mitigate information asymmetries between firms' agents (e.g., managers) and principals (e.g., boards of directors, shareholders, or regulators), thereby reducing adverse selection and moral hazard problems. Second, financial reporting can reduce symmetric uncertainty about the distribution of investment outcomes, thereby improving the information upon which firm managers evaluate and select investments.

Our analysis is primarily related to the discussion of firms' own financial reporting and the reduction of symmetric uncertainty in Section 3.2 of Roychowdhury et al. (2019).[12] In this section, Roychowdhury et al. (2019) raise the key points that firms often use financial report numbers to

[12] We emphasize the prior literature on symmetric uncertainty because nothing in our numerical example and hypothesis development involves or requires information asymmetry. We do not mean to suggest that information asymmetry does not exist or that it might not play some role in our results, and we view it as beyond the scope of this paper to try to determine whether and how information asymmetry plays some role. However, to provide some evidence as to whether information asymmetry plays a role, in untabulated analysis we conducted our primary analysis on the subsamples of public and private (mutual) insurers, and we find that the inferences are the same for the two sets of insurers.

measure their performance for internal decision-making purposes (e.g., Kaplan 1984), and that their managers "believe" those numbers (e.g., McNichols and Stubben 2008). These points imply that a firm's conservatism in accounting for a given type of investment should be reflected in the characteristics of its investments of that type.

Studies examining the impact of conservatism on investment efficiency

As our paper examines the impact of firms' conservatism on their investment risk, we only briefly summarize the literature on the impact of conservatism on investment efficiency. We refer the reader to Roychowdhury et al. (2019) for an extensive review of this literature.

Firms that account more conservatively record losses earlier and/or in larger amounts. Reflecting this fact, Watts (2003) and Ball and Shivakumar (2005) posit that conservatism helps counteract managerial incentives for firms to make negative net present value investments (e.g., to empire build, exploit size-based executive compensation, or diversify), thereby increasing investment efficiency. Considerable prior research provides evidence that conservatism increases investment efficiency (e.g., Biddle and Hilary 2006; Francis and Martin 2010; Ahmed and Duellman 2011; Garcia Lara et al. 2016).

Studies examining the impact of conservatism on investment risk

In his review of Francis and Martin (2010), Roychowdhury (2010, p. 181) states that because conservatism "would recognize bad outcomes on a timely basis while deferring the recognition of good outcomes…[it] is likely to predispose risk-averse managers toward accepting low-risk projects." To our knowledge, only two empirical papers provide evidence consistent with this point. Kravet (2014) provides evidence that non-financial firms that account more conservatively (as measured by more timely loss recognition and more negative cumulative accruals) make less risky corporate acquisitions (as measured by stock return volatility and

skewness and purchase price premia). He further shows that this association is driven by firms with both substantial leverage and accounting-based debt covenants. These covenants are more likely to be violated when debtor firms account more conservatively, all else being equal.

In a similar vein, Cedergren et al. (2018) posit that Statement of Financial Accounting Standards (SFAS) No. 142, *Goodwill and Other Intangible Assets* (2001), subjected purchased goodwill to tightened impairment write-down requirements and thereby increased required conditional conservatism for acquiring firms. Using the change in acquiring firms' share return volatility from before to after acquisitions to measure the risk of acquired firms, Cedergren et al. (2018) provide evidence that these firms acquired less risky firms post SFAS No. 142.

None of the limited research to date examines how the impact of conservatism on investment risk varies with economic conditions. We add to this research by showing that life insurers that account more conservatively for mortgages originated less risky commercial mortgages during the credit boom prior to the financial crisis.

Studies examining how the impact of conservatism on the amount of investment depends on economic conditions

Several studies posit and show that the impact of non-financial firms' conservatism on the amounts of their investments depends on economic conditions. Bushman, Piotroski, and Smith (2011) predict and find that the sensitivity of firms' investment growth to declining investment opportunities (as measured by Tobin's *q*) increases with conservatism (as measured by timely loss recognition). Balakrishnan, Watts, and Zuo (2016) posit and show that firms that account more conservatively experienced smaller declines in investment activity after the onset of the 2008–2009 financial crisis. They show that this effect is stronger for firms with higher financing constraints, financing needs, and information asymmetry. Kim (2018) posits and shows that non-investment grade firms with more conservative accounting experienced smaller declines in

investment activity after the collapse of the junk bond market in the early 1990s. He shows that this effect is stronger for firms with lower asset liquidation values.

Bushman et al. (2011), Balakrishnan et al. (2016), and Kim (2018) focus on how *non-financial firms*' conservatism affects the *amount* of their investments, and how these effects depend on economic conditions. In contrast, we focus on how the conservatism of life insurers, a type of *financial firm*, in accounting for mortgages affects the *risk* of their commercial mortgage originations, and how these effects vary from the stable credit extension period to the credit boom leading up to the financial crisis.

Literature on the Impact of Banks' Loan Loss Provision Timeliness on their Loan Origination Procyclicality and Overall Risk-taking

In the wake of the financial crisis, policymakers became concerned about and accounting academics began to study the procyclicality of banks' loan originations, that is, banks' tendency to originate too many and excessively risky loans during boom periods and the opposite during bust periods. Beginning with Beatty and Liao (2011), researchers have posited and provided evidence that banks that record timelier loan loss provisions, the primary manifestation of conservatism for most banks, exhibit lower loan origination procyclicality. In particular, Beatty and Liao (2011) find that, of banks whose lending is sensitive to the level of their regulatory capital (that exhibit the "capital crunch effect"), those that record timelier loan loss provisions originate more loans during recessions. This finding is explained at least in part by Beatty and Liao's (2011) further finding that these banks issue more capital in both recession and non-recession periods. Similarly, Bushman and Williams (2012) find that banks in countries with timelier loan loss

provisioning reduce their overall risk taking (as measured by financial leverage and actuarially fair deposit insurance premia) in periods with high asset volatility.[13]

This literature focuses on how banks' loan loss provision timeliness affects the volume, not the *risk*, of their loan originations. Further, the literature focuses on recessions, when banks are most likely to become inadequately capitalized, rather than credit booms, when banks are most likely to accept excessive credit risk.[14] We contribute to the literature by focusing on the credit risk of loan originations across the favorable phases of the economic cycle.

Numerical Example

In Appendix B, we develop and simulate a multi-year numerical example with overlapping vintages of loans that illustrates how the effects of conservatism on lenders' accrued credit loss expense vary across three randomly changing phases of the credit cycle: stable credit extension periods, credit booms, and credit busts. In this section, we summarize the key underlying assumptions of and findings from this example. As discussed in Appendix B, these assumptions can all be modified in reasonable ways without qualitatively affecting the example's results.

We make four primary economic assumptions. (1) In each year, the credit-cycle phase has an equal likelihood of remaining unchanged from the prior year and of moving to the next phase of the cycle. We simplify the credit cycle to the following possible moves: stable credit extension periods become credit booms, credit booms become credit busts, and credit busts become stable credit extension periods. (2) Loan growth is positive in credit booms, zero in stable credit extension periods, and negative in credit busts. (3) Holding the year that a loan is originated constant, credit

[13] Further afield from our paper, Kanagaretnam, Lim, and Lobo (2014) find that banks operating in countries with two cultural characteristics positively associated with conservative accounting (low individualism and high uncertainty avoidance) accept less risk (as measured by the volatilities of return on assets and net interest margin and by z-score).

[14] Acharya and Ryan (2016) posit that timelier loan loss provisioning reduces banks' loan origination procyclicality by enhancing their understanding of loan risk. This position is consistent with our hypotheses and findings.

losses on the loan are low in a credit boom, normal in a stable credit extension period, and high in a credit bust. (4) Lenders' credit extension criteria are loose in credit booms, normal in stable credit extension periods, and tight in credit busts.

We make two primary accounting assumptions. (1) An unbiased (i.e., non-conservative) implementation of the incurred loss model—the required approach for loan loss reserving during our sample period—yields an end-of-year allowance for credit losses for each loan-origination vintage equal to the expected realized loss in the following year assuming the credit cycle does not change. (2) Conservative credit loss expense as a percentage of the initial amount lent is higher (lower) than unbiased credit loss expense in the first (last) year of each loan-origination vintage's life by a constant, and it is equal to unbiased credit loss expense in all other years.

All of the remaining assumptions pertain to the timing and life of investments and the amounts of cash flows and realized credit losses. We scale realized credit losses and unbiased and conservative credit loss expense by the sum of the initial (i.e., unamortized) amounts of loans originated for the vintages outstanding in the current year and multiply the ratio by 100, so that these ratio measures reflect credit loss percentages at the lender level.

The primary findings from simulating the numerical example are as follows. Because average loan growth over the life to date of current loans outstanding (average loan growth) is positive in credit booms, (higher) conservatism increases credit loss expense (more) relative to unbiased credit loss expense during these booms, reflecting the greater size of the current loan-origination vintage than of older loan-origination vintages. Because average loan growth is negative in credit busts, (higher) conservatism reduces credit loss expense (more) relative to unbiased credit loss expense during these busts, reflecting the lesser size of the current loan-origination vintage than of older loan-origination vintages. Because average loan growth is close

to zero in stable credit extension periods, conservatism has a modest effect on credit loss expense during these periods. Importantly, conservatism has opposite effects on accrued credit losses in credit booms and credit busts.

Hypothesis Development

We expect that life insurers that account more conservatively for mortgages are more aware of the potential for credit losses on commercial mortgages for two reasons. First, more conservative insurers anticipate that their future credit losses will be higher relative to their current realized losses, all else being equal. Second, Roychowdhury et al. (2019) observe that firms use financial report numbers to measure their performance for internal decision-making purposes and that their managers "believe" those numbers.

Analogous to the findings of Bushman et al. (2011), Balakrishnan et al. (2016), and Kim (2018) for non-financial firms and Beatty and Liao (2011) and Bushman and Williams (2012) for banks, we expect the effects of insurers' conservatism on the credit risk of their commercial mortgages to be different in the stable credit extension period than in the credit boom leading up to the financial crisis. Specifically, as shown in the numerical example in Appendix B for the cases with the assumed positive loan growth during credit booms (which are summarized in the lower two-thirds of Table B.1), in stable credit extension periods, accrued credit losses on loans modestly decline with the level of conservatism, but the direction of this modest association is sensitive to our numerical assumptions about the likelihoods of credit-cycle changes. Hence, we expect a relatively weak association between life insurers' conservatism in accounting for mortgages and the credit risk of their commercial mortgage originations during the 1998−2003 stable credit extension period. In contrast, during credit booms, accrued credit losses on loans strongly increase with the level of conservatism. Hence, we expect a negative association between life insurers'

conservatism in accounting for mortgages and the credit risk of the commercial mortgage originations during the 2004−2007 credit boom.

We formally state these expectations in the following alternative hypotheses:

> [H1] The association between life insurers' conservatism in accounting for mortgages and the credit risk of their commercial mortgage originations is negative during the 2004−2007 credit boom.
>
> [H2] The association between life insurers' conservatism in accounting for mortgages and the credit risk of their commercial mortgage originations is more negative during the 2004−2007 credit boom than during the 1998−2003 stable credit extension period.

As discussed in Section IV, we measure the credit risk of commercial mortgages using both ex ante and ex post measures.

While we do not formally state a hypothesis to this effect, we also expect that life insurers that account more conservatively for mortgages are less likely to underprice the credit risk of the commercial mortgages that they originate. Our additional analysis of an indicator for commercial mortgages with both high loan-to-value ratios and low interest rates tests this expectation.

III. DATA SOURCES, SAMPLE CONSTRUCTION, MEASURE OF CONSERVATISM, AND COMMERCIAL MORTGAGES

Using data from Schedule B of insurers' annual statutory filings as compiled by S&P Global Market Intelligence, we construct a sample of individual commercial mortgages originated by life insurers during 1998–2007. For each commercial mortgage, we collect loan-level data including the location of the mortgaged property, the date of mortgage origination or acquisition (typically origination, as insurers rarely acquire commercial mortgages in the secondary market [NAIC 2012b, p. 5]), the appraised value of the mortgaged property, and the mortgage's carrying value at the end of the acquisition year.

Table 1 summarizes the sample construction. We begin with the universe of 1,486 life insurers in existence during 1998−2007, which originated 88,188 commercial mortgages during

this period, yielding 2,567 originating insurer-years. We impose four filters on life insurers or originated commercial mortgages. First, we exclude 1,054 life insurers that did not originate commercial mortgages during this period. Second, we exclude 17,496 originated mortgages without loan-to-value (LTV) ratios,[15] which yields 412 insurers (a loss of 20), 70,692 originated mortgages, and 2,389 insurer-years (a loss of 178). Third, we exclude 1,408 originated mortgages with LTVs in the top or bottom one percent in the year, which yields 407 insurers (a loss of 5), 69,284 originated mortgages, and 2,368 insurer-years (a loss of 21). Lastly, we exclude 4,533 originated mortgages for which our measure of conservatism or other model variables are not available at the beginning of the year, or for which the city of the mortgaged property cannot be matched, yielding a final sample of 371 life insurers (a loss of 36), 64,751 originated mortgages, and 2,204 originating insurer-years (a loss of 164). Each of these filters increases the mean and median insurer size and the mean and median carrying value of originated commercial mortgages.

Measurement of Life Insurers' Conservatism in Accounting for Commercial Mortgages[16]

Life insurers' asset valuation reserve for credit losses on mortgages (AVR) is their accrued expense for these credit losses for statutory accounting purposes. Life insurers disclose the AVR, its various components, and other relevant information in their statutory filings.[17] A key piece of

[15] The NAIC first required annual loan-level reporting in 1999, so it is the first year that we can calculate LTVs. We include commercial mortgages originated in 1998 in the sample because their LTVs in that year should be similar to their LTVs in 1999, and we assume this is the case. Our inferences are not affected by excluding these mortgages.

[16] This section is based primarily on NAIC (2002), which details life insurers' AVR requirements, and Bennett (2013), who summarizes these requirements.

[17] The AVR balance for mortgage loans at the end of a year is the sum of the following components: (1) the beginning AVR balance; (2) the basic contribution during the year, which reflects baseline loss assumptions based on historical experience times the carrying value of assets; (3) realized and unrealized credit gains and (minus) credit losses on mortgages each year; (4) an additional required contribution for the year, which equals 20 percent of the deficiency, if any, of the accumulated balance of the AVR (defined as the sum of components 1, 2 and 3) below the reserve objective; (5) a voluntary contribution, if any; and (6) an adjustment to ensure the that the end-of-year AVR does not exceed the maximum reserve. In addition, the AVR balance cannot be negative, but this possibility does not arise in our sample because of the absence of significant credit losses on mortgages during 1998–2007. Given the beginning AVR balance, the most obviously discretionary component of the AVR during a year is the voluntary contribution.

such information is the "reserve objective" for the AVR, which is the amount required to cover the 85th percentile of expected credit losses on mortgages based on standardized actuarial assumptions.[18] The reserve objective thus constitutes a conservative benchmark for the AVR that is comparable across insurers. Another key piece is the "maximum reserve" that the AVR cannot exceed, which equals the 98th percentile of these expected credit losses. Because the maximum reserve constrains insurers' conservatism over the AVR,[19] and we expect that an unconstrained measure of their conservatism better captures their beliefs and thus decisions to originate commercial mortgages, we measure life insurers' conservatism using their AVRs plus any deductions to arrive at the maximum reserve (hereafter, the "unconstrained AVR").

To the best of our knowledge, no prior literature exists that empirically uses the AVR as a measure of conservatism. We measure life insurers' conservatism in accounting for commercial mortgages based on the difference between the unconstrained AVR and the reserve objective times 100 and divided by the carrying value of mortgages, which we refer to as the *Excess AVR*:

$$Excess\ AVR = \frac{(Unconstrained\ AVR - Reserve\ Objective)}{Carrying\ Value\ of\ Mortgages} x100.$$

Consistent with the findings of the large literature documenting banks' exercise of discretion over their loan loss provisions under the incurred loss model (see Ryan 2011 and Beatty and Liao 2014 for surveys of this literature), insurers likely also have considerable discretion over the credit losses recorded on their mortgages during the year.

Additions to the AVR, such as the basic and required contributions, reduce insurers' net income and unassigned surplus. As long as an insurer's AVR for an asset class remains positive and below the specified maximum, the insurer's realized and unrealized gains (losses) add to (subtract from) the AVR for the class, with no immediate effect on the insurer's net income and unassigned surplus. Insurers' total adjusted capital equals their unassigned surplus plus their firm-level AVRs (plus half of any policyholder dividend liability, if any). Since total adjusted capital is the numerator of life insurers' risk-based capital ratio, their realized and unrealized gains (losses) increase (decrease) their risk-based capital ratios.

[18] The 85th percentile was chosen because that percentile is approximately one standard deviation above the mean of the distribution of default losses for the class (American Academy of Actuaries C1 Work Group 2015). This document also details the nature of the actuarial assumptions underlying these distributions for each asset class.

[19] The maximum reserve reflects the NAIC's acknowledgment that SAP "is conservative in some respects but not unreasonably conservative over the span of economic cycles or in recognition of the primary statutory responsibility to regulate for financial solvency" (NAIC, 2002, p. 10).

Higher *ExcessAVR* indicates more conservative accounting for credit losses on mortgages. We measure *ExcessAVR* at the end of the year prior to commercial mortgage origination so that the measure is predetermined at mortgage originations throughout the year and is unaffected by concurrent income and capital management behavior.

To provide support for the validity of *ExcessAVR* as a measure of conservatism, in untabulated analysis we estimate the rank correlations between *ExcessAVR* and firm-year measures of overall and conditional conservatism that are commonly used in the literature, the market-to-book ratio and the C_Score measure developed by Khan and Watts (2009), respectively, for the subsample of observations for publicly traded insurers, which comprise 25.93 percent of our overall sample. Despite the small sample, the correlations are highly significantly positive at 0.14 ($p<0.01$) for the market-to-book ratio and 0.22 ($p<0.01$) for C_Score. We use *ExcessAVR* rather than these alternative measures in our tests both because it is a targeted measure of insurers' conservatism in accounting for mortgages and because it is available for private insurers, the large majority of our sample.

A concern with *ExcessAVR* is that it varies over time based on life insurers' credit loss experience, rising in good times and falling in bad times. Accordingly, we instead use two conservatism measures that are based on the cross-sectional distribution of *ExcessAVR* within a year. *Low_ExcessAVR* is an inverse binary measure of conservatism that takes a value of one if *ExcessAVR* is in the lowest tercile (i.e., the least conservative) of all life insurers that hold mortgages in the year, and 0 otherwise. *Adj_ExcessAVR* equals *ExcessAVR* minus the mean of *ExcessAVR* for all insurers that hold mortgages in the year, and thus is more comparable than *ExcessAVR* across years.

It is possible that our conservatism measures capture incremental loss reserves for mortgages with higher expected credit losses relative to the standard actuarial assumptions. To mitigate this possibility, as discussed in Section IV, we conduct our tests on a sample of commercial mortgages originated by insurers with high versus low *ExcessAVR* that are matched based on the mortgage amount, origination year, and city of the mortgaged property. Regardless, this possibility works against our finding support for hypothesis H1 that conservatism is negatively associated with the risk of commercial mortgage originations during the credit boom.

Characteristics and Performance of Life Insurers' Commercial Mortgages

While both residential and commercial mortgages provide lenders with rights to the mortgaged properties in the event of borrower default, commercial mortgages have three key distinct features. First, commercial mortgages generally are "non-recourse" to the credit of the mortgage borrower; in the event of default, the lender can recover only from foreclosure on the mortgaged property, not from the bankruptcy or other legal proceedings against the borrower (NAIC 2012a, p. 1). This feature increases the credit risk of commercial mortgages, all else equal. Second, the typical maturity of commercial mortgages is ten years, a third of the typical maturity of residential mortgages. This feature reduces the interest rate risk of commercial mortgages, all else equal. Third, commercial mortgages impose significant penalties on prepayment. This feature dramatically reduces the frequency of prepayment (Das and Freybote 2021).

The vast majority of commercial mortgages are originated and held by banks (60 percent) or life insurers (15 percent), or held by commercial mortgage-backed securities (CMBS) vehicles (15 percent) (Glancy, Krainer, Kurtzman, and Nichols 2019). The market is segmented. Banks are more likely to hold smaller commercial mortgages that have less than the typical 10-year maturity, are floating-rate, and have low interest-rates; life insurers are more likely to hold slightly larger

mortgages that have longer-than typical maturity, are fixed-rate, and have somewhat higher interest rates; and CMBS vehicles are more likely to hold much larger mortgages that have the typical maturity, are fixed rate, and have the highest interest rates (Glancy et al. 2019).

Commercial mortgages originated by life insurers tend to be less credit risky than those originated by other lenders. For example, the commercial mortgages originated by life insurers experienced lower delinquency rates during the financial crisis and its aftermath than did the mortgages originated by banks or that underlie commercial mortgage-backed securities (NAIC 2012b, pp. 10-11). An and Sanders (2010) attribute this to life insurers being "long term investors of commercial mortgages…[that] have kept the default risk of their commercial mortgage portfolios under control."

Life insurers typically originate the commercial mortgages they hold, rather than acquiring these mortgages in the relatively illiquid secondary market (NAIC 2012b, p. 5). Insurers typically hold the mortgages to maturity (Davis 2018, p. 15).

To provide a sense for the market conditions affecting the origination and performance of commercial mortgages during the sample period, Figure 1 plots the equal- and value-weighted commercial real estate (CRE) indices from CoStar, a leading CRE information provider,[20] as well as the Federal Housing Finance Authority's Home Price Index (HPI) for the years 1998−2013. We set each of these indices equal to 100 in January 1998. As the indices exhibit similar patterns, we discuss only the value-weighted CRE index. From January 1998 to January 2004, this index rose at a healthy compounded annual rate of 4.4 percent to 129.59, for a cumulative increase of 29.6 percent over this six-year stable credit extension period. The index then rose at an almost four-fold higher compounded annual rate of 16.3 percent to 201.43 in December 2007, for a 55.4 percent

[20] See www.costar.com.

cumulative increase over this four-year boom period. During the financial crisis and its immediate aftermath, the index fell at a compounded annual rate of 15.2 percent to 129.08 in February 2010, for a cumulative decrease of 35.9 percent over this period. Finally, the index recovered at a 14.0 percent compounded annual rate to 184.93 in December 2013, for a 43.3 percent cumulative increase over this period. This increase reversed 77.2 percent of the prior decrease.

The inflection point in the growth rate of commercial real estate indices prior to the financial crisis depicted in Figure 1 occurs in early 2004. This timing comports with Figure 2, Panel A in Ryan (2008), which indicates that high-yield corporate credit spreads began declining in early 2004. Ryan (2008) also cites several sources that show that credit risk extension for subprime mortgages loosened around 2004. However, the precise timing of the beginning of the credit boom is judgmental and may be somewhat earlier. For example, Figure 2 shows that credit spreads on Baa corporate bonds began declining in late 2002. Based on the bulk of the evidence, we treat the years 1998−2003 as the stable credit extension period and the years 2004−2007 as the credit boom. None of our inferences are altered by treating the credit boom as starting in 2003 instead. As discussed in the introduction and Section II, we examine the distinct effects of life insurers' conservatism in accounting for mortgages on the risk of the commercial mortgages they originate during these two periods.

Table 2 reports descriptive statistics for the sample commercial mortgages originated in each year in our 1998−2007 sample period, with (sub)totals provided for the 1998–2003 stable credit extension period, the 2004–2007 credit boom, and the overall sample period. Specifically, the table reports the number of sample commercial mortgages originated in each year (*#Loans*), the total, mean, and median initial amounts of these annual vintages of mortgages in millions of

dollars (*Loan Amount*), and the mean, value-weighted mean, median, and standard deviation of the at-origination loan-to-value ratio (*LTV*).

The overall sample includes 64,751 commercial mortgages with an initial carrying amount of $406.3 billion. Consistent with the origination of commercial mortgages increasing in the 2004−2007 credit boom, an average of 6,000 commercial mortgages with a mean initial carrying amount of $5.83 million, totaling about $35 billion, were originated in each year of the 1998−2003 stable credit extension period, while an average of approximately 7,200 mortgages with mean initial carrying amount of $6.83 billion, totaling about $49 billion, were originated in each year of the credit boom. Perhaps surprisingly, the mean and median at-origination LTV ratios are lower by 0.53 and 0.23 percent, respectively, in the credit boom than in the stable credit extension period; this may be attributable to relatively inflated property valuations in the credit boom period.

IV. EMPIRICAL RESULTS

Visual Evidence of the Impact of Conservatism on Ex Ante Credit Risk Acceptance

Figure 3 plots the distribution of the LTV ratios for the commercial mortgages originated by life insurers with *Low_ExcessAVR*=1 (less conservative) versus *Low_ExcessAVR*=0 (more conservative) at the beginning of the origination year for the 1998−2003 period (Panel A) and the 2004−2007 credit boom (Panel B). Each panel reports the non-parametric Kolmogorov-Smirnov (KS) test of the difference between the cumulative distribution functions for the low and high conservatism insurers.

In Panel A, visual inspection and the significant KS test (8.00, $p<0.01$) indicate that during the stable credit extension period, more conservative insurers originated mortgages with higher LTV ratios. In contrast, in Panel B, visual inspection and the significant KS test (5.03, $p<0.01$) indicate that during the credit boom, less conservative insurers originated mortgages with higher

LTV ratios, consistent with hypothesis H1. The flipped sign of the association between conservatism and LTV ratios from the stable credit extension period to the credit boom is consistent with hypothesis H2 that insurers' conservatism in accounting for mortgages dampens the risk of the commercial mortgages they originate more during the credit boom than during the stable credit extension period.

Primary Tests of the Impact of Conservatism on Ex Ante Credit Risk Acceptance

Table 3 reports initial bivariate evidence of the association of our inverse binary measure of life insurers' conservatism in accounting for mortgages, *Low_ExcessAVR*, and our primary measure of the ex ante credit risk of their commercial mortgage originations, the at-origination LTV ratio,[21] during the 1998−2003 stable credit extension period (Panel A) and the 2004−2007 credit boom (Panel B). Consistent with hypothesis H1 that life insurers' conservatism reduces their credit risk acceptance in credit booms, Panel B reports that during the credit boom the mean LTV is 1.94 percent ($p < 0.01$) higher for the insurers in the *Low_ExcessAVR*=1 group than for those in the *Low_ExcessAVR*=0 group. While we made no hypothesis in this regard, Panel A reports that during the stable credit extension period the mean LTV is 3.25 percent ($p < 0.01$) lower for the *Low_ExcessAVR*=1 group than for the *Low_ExcessAVR*=0 group.

Panel C reports the difference-in-differences test for the two life insurer groups in the credit boom versus the stable credit extension period. Consistent with hypothesis H2 that life insurers' conservatism reduces their credit risk acceptance more in credit booms than in stable credit extension periods, Panel C reports that the difference in the LTV for the *Low_ExcessAVR*=1 group

[21] A higher LTV ratio indicates a credit-riskier mortgage for two primary reasons (Bian, Lin, and Liu 2018). First, it is more likely that the value of the mortgaged property will fall below the outstanding mortgage balance, so that the mortgage borrower has negative equity in the property and is more likely to default. Second, the net proceeds from the foreclosure and sale of the mortgaged property are less likely to cover the mortgage balance.

and the *Low_ExcessAVR*=0 group increases by 5.19 percent ($p < 0.01$) from the stable credit extension period to the credit boom.

We emphasize that these bivariate tests are limited due to differences between the two conservatism groups that are apparent in Table 3. For example, in both the stable credit extension and credit boom periods, the *Low_ExcessAVR*=1 group originates fewer commercial mortgages per year with a lower mean amount per loan, but these originations constitute a higher percentage of the insurer's assets. To capture such differences, our multivariate tests control for six insurer characteristics and loan size, and they include firm fixed effects in some model specifications.

We investigate the association between life insurers' conservatism in accounting for mortgages and the ex ante credit risk of the commercial mortgages they originate using the model:

$$LTV_{i,j,t} = \alpha_0 + \beta_1 Cons\_AVR_{i,t-1} + \beta_2 Cons\_AVR_{i,t-1} \times Boom_t + \sum_{k=1}^{6} \omega_k Control_{k,i,t-1} + \omega_7 Loan\ Size_{i,j,t} + \varepsilon_{i,j,t}. \quad (1)$$

The dependent variable $LTV_{i,j,t}$ denotes the LTV ratio of commercial mortgage *j* at its origination by insurer *i* in year *t*. $Cons\_AVR_{i,t-1}$ is a stand-in for our binary and continuous measures of life insurers' conservatism, $Low\_ExcessAVR_{i,t-1}$ and $Adj\_ExcessAVR_{i,t-1}$, respectively. $Boom_t$ denotes an indicator for commercial mortgages originated during the 2004–2007 credit boom rather than during the 1998–2003 stable credit extension period. The equation includes controls for six insurer characteristics that might influence the credit risk of their commercial mortgages: $Size_{i,t-1}$, $AdqIncRatio_{i,t-1}$, $ChgSurplus_{i,t-1}$, $REExposure_{i,t-1}$, $RBCRatio_{i,t-1}$, and $ROE_{i,t-1}$. We subscript the stand-in for these control variables, *Control*, by *k*, and measure all the variables at the end of year *t-1* prior to mortgage origination to mitigate the potential for confounding effects. The equation also includes a control for the natural logarithm of the initial mortgage amount, *Loan Size*, a

mortgage characteristic that is positively associated with the LTV ratio, as discussed below. Appendix A provides the definitions of all model variables.

Table 4 reports descriptive statistics (Panel A) and correlations (Panel B) for the variables in equation (1). Panel A reports that only 25 percent (i.e., less than one third) of the insurer-year observations in the final sample have low *Low_ExcessAVR*=1, reflecting our sample selection filters tending to remove smaller and thus less conservative insurers, as reported in Table 1. Panel B reports that *LTV* is significantly positively associated with *Adj_ExcessAVR*, *Firm Size*, *ROE*, and *Loan Size*, and it is significantly negatively associated with *Low_ExcessAVR*, *ChgSurplus*, *REExposure*, and *RBCRatio*. *Adj_ExcessAVR* is significantly positively associated with *Firm Size*, *AdqIncRatio*, *RBCRatio*, *ROE*, and *Loan Size*, and it is significantly negatively associated with *ChgSurplus*. Other notable correlations include the very high positive correlations of *Firm Size* with *Loan Size* (0.59) and of *AdqIncRatio* with *RBCRatio* (0.79).

Table 5 reports eight OLS estimations of equation (1). The first four columns report estimations for the full sample. The last four columns report estimations for a sample in which each commercial mortgage originated by a (less conservative) life insurer with *Low_ExcessAVR*=1 is propensity score matched to another commercial mortgage originated by a (more conservative) life insurer with *Low_ExcessAVR*=0 during the same year. The matching is conducted with replacement based on the mortgage amount, the year of mortgage origination (to capture vintage effects on commercial mortgage default documented by Corcoran 2009 and An and Sanders 2010), and the city of the mortgaged property (to capture local effects on commercial mortgage default documented by An, Deng, Nichols, and Sanders 2013). This approach yields an equal number of observations in the two conservatism groups and controls for differences in their propensity to originate commercial mortgages of given sizes in given city-years. For the estimations reported in

odd (even) numbered columns, the conservatism measure is *Low_ExcessAVR* (*Adj_ExcessAVR*). All estimations include fixed effects for the product of the city of the mortgaged property and year. The estimations in columns (3), (4), (7), and (8) also include firm fixed effects. Since we expect both the credit risk acceptance and conservatism of a life insurer to be reasonably persistent over time, we expect the firm effects to capture appreciable portions of the hypothesized effects. Standard errors are calculated clustering observations by the city of the mortgaged property.

Consistent with hypothesis H1 that life insurers' conservatism reduces their credit risk acceptance in credit booms, the sum of the coefficients on *Low_ExcessAVR* and on *Low_ExcessAVR*×*Boom* is highly significantly positive in all four odd-numbered columns of Table 5, and the sum of the coefficients on *Adj_ExcessAVR* and on *Adj_ExcessAVR*×*Boom* is highly (weakly) significantly negative in three (one) of the four even-numbered columns of the table. As expected given the persistence of life insurers' credit risk acceptance and conservatism, the inclusion of firm fixed effects reduces the absolute magnitude of these coefficient sums but they remain significant.

Consistent with hypothesis H2 that life insurers' conservatism reduces their credit risk acceptance more in credit booms than in stable credit extension periods, the coefficient on *Low_ExcessAVR*×*Boom* and coefficient on *Adj_ExcessAVR*×*Boom* are highly significantly positive and negative, respectively, in all eight columns of Table 5. The inclusion of firm fixed effects again reduces the absolute magnitude of these coefficients. While we made no hypothesis in this regard, the coefficients on $Low\_ExcessAVR_{i,t-1}$ ($Adj\_ExcessAVR_{i,t-1}$) are significantly negative (positive) in all four odd-numbered (even-numbered) columns, indicating a positive association between life insurers' conservatism and ex ante credit risk acceptance in the stable credit extension period. This positive association is consistent with our numerical example given

the numerical assumptions about the likelihoods of credit-cycle changes, but it is inconsistent with other reasonable numerical assumptions, and so we do not interpret the direction of the association.

Of the control variables, only *Loan Size* is significantly associated with *LTV* in the same direction as the bivariate correlation reported in Table 4, Panel B regardless of the sample or inclusion of firm fixed effects. In contrast, the coefficient on *Firm Size* is significantly negative in all eight columns, unlike the positive correlation reported in Table 4, Panel B, likely due to its high positive correlation with *Loan Size*. The coefficients on the other control variables typically lose significance when firm fixed effects are included and, for *REExposure*, in the matched sample.

In summary, the results reported in Table 5 provide support for hypothesis H1 (H2) that life insurers' conservatism in accounting for mortgages is (more) negatively associated with their ex ante credit risk acceptance through commercial mortgage originations during the 2004–2007 credit boom than during the 1999–2003 stable credit extension period).[22]

Alternative Measure of Ex Ante Credit Risk Acceptance

In this section, we address two issues that may arise with the use of the LTV ratio as a measure of the ex ante credit risk of commercial mortgages. First, a commercial mortgage with a higher LTV ratio that is accompanied by a sufficiently higher interest rate spread does not indicate a worse risk-return trade-off. Second, location- and time-varying factors (e.g., hot commercial property and related financial markets) influence the level of the LTV ratio. To address these issues, we first construct an indicator, *Risky Loan*, that equals one if a commercial mortgage's at-

[22] In untabulated analysis, we find the association between life insurers' conservatism in accounting for mortgages and the ex ante credit risk of the commercial mortgages they originate is more negative and significant during the credit boom in cities with worse (e.g., lowest decile rather than lowest tercile) cumulative home price performance from 2004 to 2011. As depicted in Figure 1 at the national level, house price depreciation and commercial property price depreciation are highly positively correlated at the regional level. We also determine that our findings on the effect of insurers' conservatism on their ex ante credit risk acceptance during the credit boom obtain across regions segmented based on home price depreciation.

origination LTV ratio is in the highest quartile and interest rate spread is in the lowest quartile of all commercial mortgages originated in the same city in the same year.[23] To reduce noise in this classification, we restrict the sample to city-years in which at least five mortgages are originated. Out of 41,011 commercial mortgages that meet this filter, 1,940 (4.73 percent) are classified as a *Risky Loan*.[24] We then estimate the logistic model:

$$Logit\ \rho\_RL_{i,j,t} = \alpha_0 + \beta_1 Cons\_AVR_{i,t-1} + \beta_2 Cons\_AVR_{i,t-1} * Boom_t + \sum_{j=1}^{6} \omega_j\ Control_{i,t-1} + \omega_7 Loan\ Size_{i,j,t}, \quad (2)$$

where $\rho\_RL_{i,j,t}$ is the probability that commercial mortgage j originated by insurer i in year t in 1998–2007 is classified as a *Risky Loan*. All explanatory variables are the same as in equation (1).

Table 6 reports estimations of equation (2) with the conservatism measure being *Low_ExcessAVR* in columns (1) and (3) and *Adj_ExcessAVR* in columns (2) and (4). The estimations in columns (1) and (2) are logistic while the estimations in columns (3) and (4) are conditional logistic, conditioning on the product of the city of the mortgaged property and the mortgage origination year. This conditioning is akin to the inclusion of city-year fixed effects but requires multiple observations for a firm-city-year for it to be included in the sample.[25] In all estimations, we calculate standard errors clustering observations by city.

The results reported in Table 6 are quite similar to those reported in Table 5. Hence, for

[23] The initial maturity of commercial mortgages is not reported in life insurers' statutory filings. Because commercial mortgages typically have a maturity around ten years (Davis 2018), we calculate the at-origination interest rate spread as the contractual interest rate of a commercial mortgage minus the yield on 10-year U.S. Treasury notes.

[24] Our inferences are robust to individually and collectively (1) broadening the definition of *Risky Loan* to include commercial mortgages with LTV ratios above the median and interest spreads below the median of all mortgages originated in the same city in the same year, and (2) restricting the sample to cities in which at least ten commercial mortgages are originated in a year. By itself, modification (1) approximately quintuples the number of commercial mortgages classified as a *Risky Loan* to 10,135 (24.71 percent). By itself, modification (2) reduces the number of commercial mortgages in the sample to 28,470 and increases the percentage of these mortgages classified as a *Risky Loan* to 5.39 percent (1,534 mortgages). Collectively, the two modifications increase the number of commercial mortgages classified as a *Risky Loan* to 7,126 (25.03 percent of the restricted sample).

[25] Unlike in Table 5, it is infeasible to also condition on firm in the conditional logistic estimations, because even when a firm-city-year includes multiple observations, there is often no variation in the dependent variable (i.e. *Risky Loan*); when this is the case, all observations for the firm-city-year are dropped.

brevity, we summarize the results briefly, pointing out the one main difference and suppressing the coefficients on the control variables. Again consistent with hypothesis H2, the coefficient on $Low\_ExcessAVR_{i,t-1}*Boom_t$ is significantly positive in odd-numbered columns and the coefficient on $Adj\_ExcessAVR_{i,t-1}*Boom_t$ is highly significantly negative in even-numbered columns. These coefficients indicate that less conservative insurers were more likely to originate commercial mortgages in the *Risky Loan* classification during the credit boom than during the stable credit extension period. In contrast, the coefficients on $Low\_ExcessAVR_{i,t-1}$ [$Adj\_ExcessAVR_{i,t-1}$] are insignificant in columns (1) [(2) and (4)], indicating no association between conservatism and ex ante credit risk in the stable credit extension period. This insignificance differs from the significantly negative coefficient on $Low\_ExcessAVR_{i,t-1}$ and the significantly positive coefficient on $Adj\_ExcessAVR_{i,t-1}$ reported in Table 5. However, the coefficient on $Low\_ExcessAVR_{i,t-1}$ is negative and weakly significant in column (3).

The magnitude and significance of the sum of the coefficients on $Low\_ExcessAVR_{i,t-1}$ and $Low\_ExcessAVR_{i,t-1}*Boom_t$ ($Adj\_ExcessAVR_{i,t-1}$ and $Adj\_ExcessAVR_{i,t-1}*Boom_t$) in odd-numbered (even-numbered) columns are reported at the bottom of Table 6. Driven by the coefficients on the interaction terms, these sums are significantly positive (negative) in odd-numbered (even-numbered) columns, indicating that less conservative insurers were more likely than other insurers to originate commercial mortgages in the *Risky Loan* classification during the credit boom, consistent with hypothesis H1.

Ex Ante Credit Risk Acceptance during the Credit Bust

For the reasons discussed in the introduction, we do not develop a hypothesis based on or test the third implication of our numerical example regarding the effect of conservatism on life insurers' ex ante credit risk acceptance during the financial crisis and its aftermath (the "credit

bust") in our primary tests. To provide some evidence regarding this implication, each panel of Table 7 reports the estimations of six nested versions of equation (1). These versions omit the interaction between the conservatism measure and the credit cycle phase, and instead partition the sample into the 1998−2003 stable credit extension period (columns [1]-[2]), the 2004−2007 credit boom (columns [3]-[4]), and the 2008−2010 credit bust (columns [5]-[6]). The dependent variable is the at-origination loan-to-value ratio in Panel A and the natural logarithm of the initial loan carrying amount (in $ thousands) in Panel B; as discussed in the introduction, we expect insurers' reduced credit risk acceptance during the credit boom to be evidenced more by insurers reducing the volume of their commercial mortgage originations than by them lowering the loan-to-value ratios on the mortgages they chose to originate. The measure of conservatism is *Low_ExcessAVR* in odd-numbered columns and *Adj_ExcessAVR* in even-numbered columns. These conservatism measures are measured as of the end of the previous year for the stable credit extension period and credit boom but are fixed at the end of 2007 for the 2008−2010 credit bust, so that the sizeable losses recorded on mortgages during the bust do not influence the measures. The table reports the coefficients on the conservatism measures *Low_ExcessAVR* and *Adj_ExcessAVR* and, for brevity, suppresses the coefficients on the control variables. Naturally, *Loan Size* is omitted as a control in Panel B. All regressions include fixed effects for the product of the city of the mortgaged property and the mortgage origination year and calculate standard errors clustering by the city of the mortgaged property.

With the loan-to-value ratio as the dependent variable in Panel A, the results for the stable credit extension period and credit boom reported are consistent with the results reported in Tables 5 and 6. The results for the credit bust are similar to the results during the credit boom, with more conservative insurers originating commercial mortgages with lower loan-to-value ratios. In

particular, Panel A provides no evidence that more conservative life insurers are willing and able to accept more ex ante credit risk during the credit bust.

In contrast, with the natural logarithm of the initial loan amount as the dependent variable in Panel B, the weight of the evidence is that more conservative insurers originate commercial mortgages with larger initial loan amounts in all three periods, with this association being weakest in the stable credit extension period, stronger in the boom period, and strongest in the credit bust period. In particular, the coefficient on *Low_ExcessAVR* is insignificant in column (1) for the stable credit extension period, significantly negative in column (3) for the credit boom (-0.20, t = -8.3), and more negative and significant in column (5) for the credit bust (-1.12, t = -17.9). Similarly, the coefficient on *Adj_ExcessAVR* is significantly positive in column (2) for the stable credit extension period (0.30, t = 2.7), more positive and significant in column (3) for the credit boom (0.69, t = 7.9), and less positive (than in column (3)) but more significant in column (5) for the credit bust (0.38, t = 10.6). Collectively, the results report in Panels A and B of Table 7 suggest that a primary way that more conservative life insurers are willing and able to accept more ex ante credit risk during the credit bust is by originating larger loans.

Tests of the Impact of Conservatism on Ex Post Credit Losses

Table 8 reports tests of the association between life insurers' conservatism in accounting for mortgages and the ex post occurrence of credit losses recorded during 2008–2013 (i.e., the financial crisis and its aftermath) on commercial mortgages originated in each year during 1998–2007 and held by the insurer at the end of 2007.[26] We measure cumulative credit losses on each

[26] Commercial mortgages originated before 1998 are unlikely to be outstanding at any time during 2008–2013. This is partly because most of these mortgages have an original maturity of ten years or less. For example, in 2014, the first year for which insurers were required to report the maturity of their loans, 53.3 percent of commercial mortgages originated had an initial maturity of ten years or less. It is also partly because insurers sometimes sell and borrowers sometimes prepay these mortgages prior to maturity.

vintage of commercial mortgages originated by a life insurer as the sum of impairments, unrealized losses (less gains), and realized losses (less gains) for the vintage during 2008–2013.[27] We separately examine mortgage origination years to control for loan seasoning and vintage effects. Because we examine origination years separately, Table 8 reports significance tests of hypothesis H1, but evidence regarding hypothesis H2 is limited to qualitative comparisons across years (columns of the table).

To provide initial descriptive evidence of this association, Panel A reports the number of originated commercial mortgages in each year during 1998−2007, the percentages of those mortgages for which ex post credit losses were recorded during 2008–2013, and *Z* statistics for the differences of these percentages for insurers with *Low_ExcessAVR*=1 (i.e., low conservatism) versus *Low_ExcessAVR*=0 (i.e., higher conservatism) at the beginning of each origination year.[28] From 2001 to 2007 (2000 to 2005) for insurers with *Low_ExcessAVR*=1 (*Low_ExcessAVR*=0), the number of originated mortgages rises with the origination year, mostly due to the movement from the stable credit extension period to the credit boom, and perhaps also due to maturities and prepayments for the older vintages of commercial mortgages (given our requirement that insurers hold mortgages in 2007).

[27] To measure cumulative credit losses for an insurer-vintage, we require credit loss data to be available for 2008, raising concerns about survivorship bias. This concern appears minor, for two reasons. First, of the 291 insurers and 45,037 originated commercial mortgages during 1998–2007 in the sample, only 10 insurers that originated 1,775 commercial mortgages during 1998–2007 do not have data available during 2008 (two because they failed or closed, eight because they were acquired). Second, we do not require the remaining insurers to survive until 2013; moreover, only 23 insurers do not have data available during any portion of 2009–2013 (four because they failed or closed, 19 because they were acquired). Of these 23 insurers, eight held commercial mortgages during some portion of the period. For these reasons, our sample of 266 insurers and 41,861 originated commercial mortgages during 1998–2007 represents that vast majorities of the insurers and originated commercial mortgages during 1998–2007.

[28] We expect our hypotheses to hold more strongly when comparing life insurers with lower conservatism to other insurers. Consistent with this expectation, in untabulated analysis we find the results reported in Table 8 strengthen if we compare insurers in the lowest quintile of *ExcessAVR* to insurers in the other four quintiles.

Consistent with prior research showing that commercial mortgages originated closer to the financial crisis exhibited riskier underwriting characteristics and performed worse during the crisis (Corcoran 2009; An and Sanders 2010), Panel A reports that the percentage of mortgages with ex post credit losses tends to rise strongly with the origination year for both conservatism groups. More importantly, the percentage of ex post credit losses is significantly higher in the low conservatism group than in the high conservatism group for the origination years 2003, 2004, 2006, and 2007, consistent with hypothesis H1 that conservatism reduces credit risk acceptance in these credit boom (adjacent, in the case of 2003) years. Unexpectedly, the percentage of ex post credit losses is insignificantly different for the two conservatism groups in 2005; this result is attributable to the substantially below-trend percentage of ex post credit losses for the low conservatism group in this year. As discussed below, the inclusion of control variables in Panels B and C and the additional inclusion of fixed effects for the city of mortgage origination in Panel C both yield the expected negative association between life insurers' conservatism and ex post credit losses in 2005, indicating the importance of controlling for firm characteristics and city. Consistent with hypothesis H2, there is no significant difference in the percentage of ex post credit losses in the years 1999−2002, though this difference is significantly negative in 1998. The latter result is unexpected, but this difference is insignificant in the multivariate logistic models reported in Panels B and C.

Panels B and C of Table 8 report estimations of annual cross-sectional models similar to the pooled model in equation (2) but in which the dependent variable is an indicator that takes a value of 1 if the commercial mortgage experiences an ex post credit loss during 2008−2013 and 0 otherwise. Panel B presents logistic estimations, while Panel C presents conditional logistic estimations conditioning on the city of the mortgaged property. In Panel C, the number of

observations declines even more sharply for earlier years than in Panels A and B, because city-years for which all commercial mortgages experience the same credit loss outcome (in particular, no credit loss) are lost. For brevity, we tabulate only the coefficients and associated *Z* statistics using *Low_ExcessAVR* as the conservatism measure; untabulated results using *Adj_ExcessAVR* yield essentially the same inferences. We also suppress the coefficients on the control variables. In both panels, standard errors are calculated clustering by the city of the mortgaged property

The results reported in Panels B and C are similar to the results reported in Panel A and yield essentially the same inferences. Regarding hypothesis H1, the main differences are that the coefficient on *Low_ExcessAVR* is positive and significant in 2005 in both Panels B and C, consistent with the hypothesis, but only weakly significant in 2004 in Panel C. Overall, these results are consistent with hypothesis H1 that life insurers' conservatism reduces their credit risk acceptance in the credit boom. Regarding hypothesis H2, the coefficient on *Low_ExcessAVR* is insignificant in five (four) of the six years between 1998−2003 in Panel B (C) and it is weakly significantly negative in 1999 in Panel C, consistent with the hypothesis that insurers' conservatism reduces their credit risk acceptance less in the stable credit extension period than in the credit boom. However, this coefficient is highly (weakly) significantly positive in 2003 in Panel B (C), similar to the results reported in Panel A and consistent with 2003 being a transition year between the stable credit extension period and the credit boom.[29]

We acknowledge that an alternative explanation for the results reported in Table 8 is that the power of the test weakens for vintages more distant from the 2008-2013 credit bust. However, such declining power would suggest coefficients that gradually diminish in magnitude and

[29] In untabulated analysis, we examined the occurrence of ex post credit losses during 2008–2013 using a panel data approach analogous to that used in the analysis of ex ante credit risk in Table 5. The results of this analysis, which do not control for loan seasoning and vintage effects, are also consistent with hypotheses H1 and H2.

significance for more distant vintages, rather than the abrupt shift from insignificance to significance from before 2003 to afterwards that we observe. Moreover, these results are consistent with the evidence using ex ante credit risk reported in Tables 5−7. Hence, we conclude that more conservative insurers originated commercial mortgages that experienced lower ex post credit losses during the credit boom but not during the stable credit extension period.

V. CONCLUSION

In this paper, we examine the effect of life insurers' conservatism in accounting for mortgages on the credit risk of their commercial mortgage originations during the ten-year period leading up to the 2008–2009 financial crisis. This period includes both the stable credit extension period from 1998 to 2003 and the increasingly bubbly credit boom from 2004 to 2007 prior to the crisis. We hypothesize that insurers' conservatism in accounting for mortgages increases their loan loss accruals and thus restrains the risk of the commercial mortgages they originate during the credit boom both in isolation and relative to the stable credit extension period.

We examine the life insurance setting because it exhibits three primary advantages in demonstrating the relationships between firms' conservatism and investment risk that we exploit empirically. First, life insurers' statutory filings include data for each of their commercial mortgages that allow us to measure insurers' ex ante credit risk acceptance (e.g., initial loan-to-value ratios) and ex post credit losses for each mortgage. We examine commercial mortgages primarily because they are life insurers' most significant (non-securitized) loan type. Second, the statutory data allow us to control for the characteristics of commercial mortgages and to match similar commercial mortgages originated by insurers that account for mortgages using different levels of conservatism. Third, a tailored measure of the conservatism of life insurers' accounting

for mortgages is available: the excess (above the regulatory reserve objective) of the asset valuation allowance for mortgages. We use both binary and continuous versions of this measure in our tests.

We conduct two empirical analyses. In our primary analysis, we examine how life insurers' conservatism in accounting for mortgages impacts the at-origination loan-to-value ratio (the best measure of the ex ante credit risk of a commercial mortgage that can be calculated from information in insurers' statutory filings) in the stable credit extension period versus the credit boom. We predict and find a significant negative association between insurers' conservatism and the loan-to-value ratio on their commercial mortgages in the 2004−2007 credit boom. In fact, though not predicted, we find these variables are significantly *positively* associated in the 1998−2003 stable credit extension period. To probe the robustness of the results of our primary analysis, we also examine how life insurers' conservatism in accounting for mortgages impacts the ex post credit losses on their individual commercial mortgages originated in the stable credit extension period versus the credit boom. We hold the loan origination year constant to control for loan seasoning and vintage effects. We predict and find a significant negative association between insurers' conservatism and their ex post credit losses on commercial mortgages originated in the credit boom, but an insignificant association for mortgages originated in the stable credit extension period. We conduct both analyses controlling for insurer and mortgage characteristics, including the city of the mortgaged property. We also conduct our primary analysis on a matched sample.

Our findings are consistent with insurers' conservatism in accounting for mortgages reducing the procyclicality of their commercial mortgage originations. Lending procyclicality is a longstanding and key concern of policymakers and regulators of the financial system and researchers studying financial stability. In this regard, our study contributes to the banking literature that examines the effect of timely loan loss provisioning on the amounts of banks'

lending, capital issuance, and overall risk-taking prior to and during recessions. Our study also contributes to the small literature on the impacts of firms' conservatism on their investment risk, and how those impacts vary with economic conditions. This literature generally examines non-financial firms, and our study demonstrates that the conceptual underpinnings of the literature readily extend to financial institutions.

A natural avenue for future research is to examine the effects of the recent current expected credit loss (CECL) standard—Accounting Standards Codification 326, which governs accruals for credit losses on financial instruments measured at amortized cost—on banks' investment levels, efficiency, and credit risk. While the CECL standard is on average highly conservative, the degree of conservatism varies across loan types based on their expected lives and other factors (Ryan 2019; Ryan, Drum, and Carter 2020; Chen, Dou, Ryan, and Zou 2024). Comparison of different banks' transition effects suggests that banks have applied the standard using very different levels of conservatism. As noted in the introduction, our study is limited in several ways that also provide opportunities for future research.

REFERENCES

Acharya, V., and Ryan, S. 2016. Banks' financial reporting and financial system stability. *Journal of Accounting Research* 54 (2): 277–340.

Ahmed, A., and Duellman, S. 2011. Evidence on the role of accounting conservatism in monitoring managers' investment decisions. *Accounting and Finance* 51: 609–633.

American Academy of Actuaries C1 Work Group. 2015. Model construction and development of RBC factors for fixed-income securities for the NAIC's life risk-based capital formula. August. www.actuary.org/sites/default/files/files/imce/Academy%20C1WG%20Documentation%20Corp%20Bond%20Factors%20%20Aug%203%202015%20Final.pdf

American Council of Life Insurer (ACLI). 2021. Life insurers fact book 2020. Available at: https://www.acli.com/-/media/acli/files/fact-books-public/2020lifeinsurersfactbook.pdf (downloaded on December 1 2021).

An, X., Y. Deng, J. Nichols, and A. Sanders. 2013. Local traits and securitized commercial mortgage default. *The Journal of Real Estate Finance and Economics* 47: 787−813.

An, X., and A. Sanders. 2010. Default of commercial mortgage loans during the crisis. 46th Annual American Real Estate and Urban Economics Conference Paper. Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1717062.

Balakrishnan, K., Watts, R., and Zuo, L. 2016. The effect of accounting conservatism on corporate investment during the global financial crisis. *Journal of Business, Finance, and Accounting* 43 (5–6): 513–542.

Ball, R., and Shivakumar, L. 2005. Earnings quality in U.K. private firms: comparative loss recognition timeliness. *Journal of Accounting and Economics*, 39 (1–3): 83–128.

Beaver, W., and S. Ryan. 2000. Biases and lags in book value and their effects on the ability of the book-to-market Ratio to Predict Book Return on Equity." *Journal of Accounting Research* 38 (1): 127−148.

Beatty, A., and Liao, S. 2011. Do delays in expected loss recognition affect banks' willingness to lend? *Journal of Accounting and Economics* 52 (2011): 1-20.

Beatty A., and S. Liao. 2014. Financial accounting in the banking industry: A review of the empirical literature, *Journal of Accounting and Economics*, 58: 339-383.

Bennett, N. 2013. Life risk-based capital and the asset valuation reserve. Presentation to the NAIC's IRBC Working Group. December 5. Available at: https://www.actuary.org/sites/default/files/files/RBC_AVR_Presentation_to_NAIC_IRBCWG_12-5-13.pdf (downloaded on October 1 2021).

Bian, X., Z. Lin, and Y. Liu. 2018. House price, loan-to-value ratio and credit risk. *Journal of Banking and Finance* 92: 1–12.

Biddle, G., and Hilary, G. 2006. Accounting quality and firm-level capital investment. *The Accounting Review* 81 (5), 963–982.

Bushman, R., Piotroski, J., Smith, A. 2011. Capital allocation and timely accounting recognition of economic losses. *Journal of Business, Finance, and Accounting* 38 (1–2): 1–33.

Bushman, R., and Williams, C. 2012. Accounting discretion, loan loss provisioning, and discipline of banks' risk-taking. *Journal of Accounting and Economics* 54 (2012): 1-18.

Cedergren, M., Lev, B., and Zarowin, P. 2018. SFAS 142, conditional conservatism, and acquisition profitability and risk. Working paper, New York University.

Chen, J., Y. Dou, S. Ryan, and Y. Zou. 2024. The effect of the current expected credit loss approach on banks' lending during stress periods: Evidence from the COVID-19 recession. *The Accounting Review* forthcoming.

Corcoran, P. 2009. Commercial mortgage default and refinancing risk: A primer. *The Journal of Portfolio Management* 35 (5): 70-79.

Das, P., and J. Freybote. 2021. Investor sentiment and prepayment hazard: The case of multifamily MBS loans. *Journal of Real Estate Research* 43 (4): 383-401.

Davis, S. 2018. Role of insurance companies in the financing of commercial and multifamily real estate in America. Mortgage Bankers Association Commercial/Multifamily Finance report. Available at: https://www.mba.org/Documents/CREF/MBA%20Paper%20on%20Role%20of%20Insurance%20Companies%20in%20CRE%20-%20April%202018.pdf (downloaded on October 1 2021).

Demyanyk, Y., and O. Van Hemert. 2011. Understanding the subprime mortgage crisis. *The Review of Financial Studies* 24 (6): 1848−1880.

Ellul, A., C. Jotikasthira, C. T. Lundblad, and Y. Wang. 2015. Is historical cost accounting a panacea? Market stress, incentive distortions, and gains trading. *Journal of Finance* 70: 2489–2538.

Farboodi, M., and P. Kondor. 2023. Cleansing by tight credit: Rational cycles and endogenous lending standards. *Journal of Financial Economics* 150 (1): 46-67.

Financial Stability Forum. 2009. Report of the Financial Stability Forum on addressing procyclicality in the financial system. April. www.fsb.org/wp-content/uploads/r_0904a.pdf

Francis, J.R., and Martin, X. 2010. Acquisition profitability and timely loss recognition. *Journal of Accounting and Economics* 49 (1–2): 161–178.

Garcia Lara, J., Garcia Osma, B., and Penalva, F. 2016. Accounting conservatism and firm investment efficiency. *Journal of Accounting and Economics* 61 (1): 221–238.

Glancy, D., J. Krainer, R. Kurtzman, and J. Nichols. 2019. Intermediary segmentation in the commercial real estate market. Finance and Economics Discussion Series 2019-079. Washington: Board of Governors of the Federal Reserve System. https://doi.org/10.17016/FEDS.2019.079.

Greenball, M. 1969. Appraising alternative methods of accounting for accelerated tax depreciation: A relative accuracy approach. *Journal of Accounting Research* : 262−289.

Hanley, K., Jagolinzer, A., and Nikolova, S. 2018. Strategic estimation of asset fair values. *Journal of Accounting and Economics* 66 (1): 25–45.

Hodder, L., and Sheneman, A. 2022. Fair value measurement discretion and opportunistic avoidance of impairment loss recognition. *The Accounting Review* 97 (7): 243-268.

J.P. Morgan Asset Management. 2020. Looking under the hood at US life insurers' CML portfolios. August. Available at: https://am.jpmorgan.com/content/dam/jpm-am-aem/global/en/institutional/investment-strategies-/insurance/looking-under-the-hood-at-us-life-insurers-cml-portfolios.pdf (downloaded August 2021).

Kanagaretnam, K., Lim, C., and Lobo, G. 2014. Influence of national culture on accounting conservatism and risk-taking in the banking industry. *The Accounting Review* 89 (3): 1115–1149.

Kaplan, R. 1984. The evolution of management accounting. *The Accounting Review* 56 (3): 390-418.

Khan, U., Ryan, S., and Varma, A. 2019. Fair value versus amortized cost measurement and the timeliness of other-than-temporary impairments: Evidence from the insurance industry. *The Accounting Review* 94 (6): 285–307.

Khan, M., and Watts, R. 2009. Estimation and Empirical Properties of a Firm-Year Measure of Accounting Conservatism. *Journal of Accounting and Economics* 48: 132-150.

Kim, J. 2018. Asymmetric timely loss recognition, adverse shocks to external capital, and underinvestment: Evidence from the collapse of the junk bond market. *Journal of Accounting and Economics*. 65 (1): 148–168.

Kravet, T. 2014. Accounting conservatism and managerial risk-taking: corporate acquisitions. *Journal of Accounting and Economics* 57: 218–240.

Lev, B., B. Sarath, and T. Sougiannis. 2005. R&D reporting biases and their consequences. *Contemporary Accounting Research* 22 (4): 977-1026.

McNichols, M., and Stubben, S. 2008. Does earnings management affect firms' investment decisions? *The Accounting Review* 83 (6), 1571–1603.

Meeks, R. 2008. Financial crisis casts shadow over commercial real estate. *Economic Letter: Insights from the Federal Reserve Bank of Dallas* 3(12): 1-8.

National Association of Insurance Commissioners (NAIC). 2002. Asset Valuation Reserves and Interest Maintenance Reserves Blue Book (December 2002). *Report to the NAIC Financial Condition (E Committee)*.

National Association of Insurance Commissioners (NAIC). 2012a. The insurance industry's exposure to commercial mortgage lending and commercial real estate investments: An overview (Part I). *NAIC & the Center for Insurance Policy and Research Capital Markets Special Report*.

National Association of Insurance Commissioners (NAIC). 2012b. The insurance industry's exposure to commercial mortgage lending and commercial real estate investments: An overview (Part II). *NAIC & the Center for Insurance Policy and Research Capital Markets Special Report*.

Nissim, D. 2010. Analysis and valuation of insurance companies. Center for Excellence in Accounting & Security Analysis Industry Study Number Two. November.

Roychowdhury, S. 2010. Discussion of: "Acquisition profitability and timely loss recognition" by J. Francis and X. Martin. *Journal of Accounting and Economics* 49 (1–2): 179–183.

Roychowdhury, S., Shroff, N., and Verdi, R. 2019. The effects of financial reporting and disclosure on corporate investment: A review. *Journal of Accounting and Economics* 68 (1-3): 101246.

Ryan, S. 2008. Accounting in and for the subprime crisis. *The Accounting Review* 83 (6): 1605–1638.

Ryan, S. 2011. Financial reporting for financial instruments, *Foundations and Trends in Accounting* 6: 3-4: 187-354.

Ryan, S. 2019. The current expected credit loss approach is a good idea that will yield procyclicality. *Banking Perspectives*. March 12.

Ryan, S., J. Drum, and E. Carter. 2020. Allowances for loan losses under the transition to CECL during the pandemic. *The Banking Law Journal* 137: 539-553.

Wall, L. 2019. Procyclicality: CECL versus incurred loss model. *Federal Reserve Bank of Atlanta Center for Financial Innovation and Stability Notes from the Vault*, October. https://www.atlantafed.org/cenfis/publications/notesfromthevault/10-procyclicality-cecl-versus-incurred-loss-model-2019-10-31

Watts, R. 2003. Conservatism in accounting – part I: Explanations and implications. *Accounting Horizons* 17 (3): 207–221.

Wong, M., and K. Kaminski. 2020. U.S. insurers' cash and invested assets reach almost $7 trillion at year end 2019." NAIC & The Center for Insurance Policy and Research Capital Markets Special Report. July 1. Available at: https://content.naic.org/sites/default/files/capital-markets-special-report-cash-invested-assets-2019.pdf (downloaded on December 1 2021).

APPENDIX A
Variable Definitions

Variable	Definition
Adj_ExcessAVR	*ExcessAVR* for the life insurer-year minus the mean of *ExcessAVR* for all life insurers holding mortgage loans in the year.
AdqIncRatio	Net investment income divided by the interest required on policy liabilities (reserves) for the life insurer-year (IRIS Ratio 4). This ratio, which typically ranges from 125% to 900%, indicates the adequacy of insurers' investment income to meet the interest requirements of their reserves.
Boom	Indicator variable that takes a value of 1 during the 2004–2007 credit boom and 0 during the 1998–2003 stable credit extension period.
ChgSurplus	Change in surplus (i.e., total assets minus total liabilities) for the life insurer-year.
ExcessAVR	The unconstrained AVR for credit losses on mortgages at year-end minus the corresponding reserve objective times 100 and divided by the carrying value of mortgages for the life insurer-year. The unconstrained AVR is calculated as the year-end AVR balance plus any deduction made to ensure that the AVR does not exceed the maximum reserve.
Firm_Size	Natural logarithm of total assets for the life insurer-year.
Loan_Size	Natural logarithm of the carrying value of a commercial mortgage at origination or acquisition.
Loan-to-value (LTV)	Carrying value of a commercial mortgage divided by the appraised property value at origination or acquisition times 100.
Loss_Dummy	Indicator variable that takes a value of 1 if the life insurer records a loss on a commercial mortgage during 2008–2013, and 0 otherwise.
Loss_Per	Cumulative loss recorded on a commercial mortgage during 2008–2013 divided by the carrying value of the mortgage at origination or acquisition.
Low_ExcessAVR	Indicator variable that takes a value of 1 for life insurer-years with *ExcessAVR* in the lowest tercile of all life insurers that hold mortgages that year, and 0 otherwise.
RBCRatio	Total adjusted capital divided by risk-based capital for the life insurer-year. This ratio measures life insurers' solvency. Low levels can trigger regulatory action.
REExposure	Total investments in real estate and mortgages as a percentage of cash and invested Assets (net of payables for securities) for the life insurer-year.
ROE	Net income divided by average equity (i.e., capital and surplus) for the life insurer-year.

Appendix B
Simulations Illustrating the Effects of Conservatism Across Credit Cycle

In this appendix, we develop and simulate a multi-year numerical example with overlapping vintages of loans that illustrates how the effects of conservatism on lenders' accrued credit loss expense vary across three randomly changing phases of the credit cycle: stable credit extension periods, credit booms, and credit busts. We assume in each year the credit-cycle phase has an equal likelihood of remaining unchanged from the prior year and of moving to the next phase of the cycle. We simplify the credit cycle to the following possible moves: stable credit extension periods become credit booms, credit booms become credit busts, and credit busts become stable credit extension periods. Our qualitative results regarding the effects of conservatism are not affected by more general specifications of the credit cycle, provided that these three possible moves dominate.

The example incorporates annual loan-origination vintages to capture the effects of conservatism at the lender level. For each loan-origination vintage during each year of its life, credit loss expense equals realized credit losses (i.e., charge-offs) for the vintage plus the change in the allowance for credit losses for the vintage.

We base the accounting assumptions in the example on the incurred loss model (ILM), which governed loan loss reserving during our sample period. Consistent with the ILM incorporating expected credit losses over a relatively short loss emergence period, we assume an unbiased (non-conservative) implementation of the incurred loss model yields an end-of-year allowance for credit losses for each loan-origination vintage equal to the expected realized loss in the following year assuming the credit cycle does not change. Our qualitative results are not affected by assuming instead that the end-of-year allowance for credit losses for each loan-origination vintage equals the expected realized loss in the following year (or even over the entire life of the vintage, consistent with the current expected loss model that now governs loan loss reserving) incorporating the probability that the credit cycle changes. We assume that conservative credit loss expense as a percentage of the initial amount lent is higher (lower) than unbiased credit loss expense as a percentage of the initial amount lent in the first (last) year of each loan-origination vintage's life by a constant, and that the two percentages are equal in all other years in the vintage's life. Our qualitative results are not sensitive to the way that conservatism front-loads credit loss expense. These assumptions imply that both unbiased and conservative credit loss expense are "tidy," i.e., the sum of the credit loss expense across the three-year life of each vintage equals the sum of realized credit losses over this life. Both unbiased and conservative credit loss expense for the lender in a year equals the sum of these expense measures across the lender's loan-origination vintages outstanding during the year.

The example incorporates three key features related to the credit cycle. First, we assume the annual growth rate in new loan originations is greater than (equal to) [less than] zero during credit boom (stable credit extension) [credit bust] periods. For comparison purposes, in the final section of this appendix we show how the results obtained based on this assumption differ from the results based on the assumption that the loan origination growth rate is independent of the credit-cycle phase. This alternative assumption relates the example to the longstanding literature on the interactive effects of individual exposure-level conservatism and firm growth (e.g.,

Greenball 1969; Beaver and Ryan 2000; Lev, Sarath, and Sougiannis 2005), which does not consider any form of economic cycle.

Second, for each outstanding loan-origination vintage, we assume realized credit losses in a year are highest (intermediate) [lowest] when that year is a credit bust (stable credit extension period) [credit boom]. This assumption is consistent with banks' credit loss experience across essentially every credit cycle.

Third, consistent with extensive theoretical and empirical research in finance and banking (e.g., see Farboodi and Kondor 2023 for a recent theoretical treatment with cites to the broad literature), we assume the lender originates loans using looser credit extension criteria in years during more favorable credit-cycle phases. Hence, realized credit losses for a loan-origination vintage of loans during the current year are higher the more favorable the credit-cycle phase in the loan-origination year. This assumption is consistent with the well-documented higher credit losses during the financial crisis on loan-origination vintages closer to the 2006 peak of the pre-financial crisis boom.

For simplicity, we consider only credit losses, not interest revenue, on loans. To eliminate the need to incorporate the time value of money, we assume all relevant interest rates are zero.

Timing and Numerical Assumptions

We assume loans have a three-year life, though any life of two years or longer would not affect our qualitative results. We assume the lender originates loans at the beginning of each year, and that credit losses on each annual vintage are realized in discrete chunks at the ends of that year and the following two years. We assume that each loan-origination vintage is sufficiently diversified so that the realized credit losses for the vintage depend only on the credit-cycle phases in the loan origination year and the current year. We assume the realized credit loss percentages are:

Realized Credit Loss Percentages

		Credit-cycle phase in current year (during life of originated loan)		
		Boom	*Stable*	*Bust*
Credit-cycle phase in loan origination year	*Boom*	0.5%	2%	5%
	Stable	0.3%	1%	3%
	Bust	0.1%	0.5%	2%

We intend these realized credit loss percentages to capture two features; the percentages are (1) lower in the current year when the credit-cycle phase in that year is more favorable and (2) higher in the current year when the credit-cycle phase in the loan origination year is more favorable. We calibrated these percentages roughly to banks' annual net loan charge-offs on U.S. commercial banks' commercial real estate mortgages during the boom preceding the financial

crisis and the financial crisis and its aftermath.[30] Our qualitative results are not sensitive to the assumed percentages provided they exhibit these two features. These percentages imply that realized losses are flat over a loan-origination vintage's life if the credit-cycle phase does not change over that life.

We assume the annual growth rate in new loan originations depends on the credit-cycle phase during the year. We assume the annual growth rate of new loan origination during credit booms takes one of three possible values: 0, 5, or 10 percent. We expect positive loan growth during credit booms, so the zero growth rate is included for comparison purposes only. In these low, medium, and high growth scenarios, we assume the annual growth rate of new loan originations equals 0 percent during stable credit extension periods and equals minus the growth rate during credit booms during credit busts, that is:

Loan Growth Rate in Current Year

		Loan Growth Scenario		
		Low	*Medium*	*High*
Credit-cycle phase in current year	*Boom*	0%	5%	10%
	Stable	0%	0%	0%
	Bust	0%	−5%	−10%

We assume any credit-cycle phase change in a year occurs at the beginning of the year just prior to the origination of loans. We assume the evolution of the credit-cycle phase from one year to the next reflects the following binomial probabilities:

Credit-cycle Phase Transition Probabilities

		Next-year credit-cycle phase		
		Boom	*Stable*	*Bust*
Current-year credit-cycle phase	*Boom*	50%	0	50%
	Stable	50%	50%	0
	Bust	0	50%	50%

We intend these probabilities to capture the typical progression from stable credit extension periods to credit booms and then to credit busts. These probabilities yield a 75 percent likelihood of at least one cycle change during the three-year life of each loan-origination vintage.

We specify unbiased credit loss expense for each loan-origination vintage during each year of its life above. We assume conservative credit loss expense as a percentage of the initial amount lent exceeds percentage unbiased credit loss expense in the first year of each loan-origination

[30] For example, U.S. commercial banks recorded annualized net loan charge-offs on commercial real estate mortgages from 0.02 to 0.13 percent (median 0.05 percent) during the quarters of 2004−2006, a credit boom, and from 0.46 to 3.27 percent (median 2.25 percent) during the quarters of 2008−2010, a credit bust (see https://www.federalreserve.gov/releases/chargeoff/chgallnsa.htm). Since commercial mortgages typically have a ten-year maturity (i.e., considerably longer than the three-year loan life assumed in the numerical example) and are not prepayable, on average outstanding commercial mortgages are about five years old. Hence, the credit-cycle phases in the origination years for the commercial mortgages outstanding during 2004−2006 and 2008−2010 likely are not credit booms and credit busts, respectively.

vintage's life by a constant, is equal to unbiased credit loss expense in the second year of that life, and is less than unbiased credit loss expense in the third year of the life by the same constant. We assume this constant takes one of three possible values: 0.5 percent, 1 percent, and 2 percent. We selected these values to be reasonable applications of conservatism given the annual realized credit loss rate percentages assumed above, which range from 0.1 percent to 5 percent.

The lender's realized credit losses and unbiased and conservative credit loss expenses in year *t* reflect the sum of the corresponding amounts for the loan-origination vintages originated in years *t-2*, *t-1*, and *t*.

Simulation of Credit Loss Measures Assuming State-dependent Loan-origination Growth

We programmed the above assumptions using the open-source R package; the code is available from the authors. For year 1, we set the value of new loan originations to $1 and the credit-cycle phase to stable credit extension; these initial settings do not appreciably affect our quantitative results. Using R's binomial distribution function, we generated random credit-cycle phase changes for the next 1,000 years. All the credit loss measures tabulated below reflect the averages of the measures from year 3, the first year with a full complement of three loan-origination vintages outstanding, to year 1,001. Our quantitative results are not sensitive to changes in the number of years that maintain sufficient years to diversify away most of the randomness. We scale all credit loss measures by the sum of the initial (i.e., unamortized) amounts of loans originated for the three vintages outstanding in the current year and multiply the ratio by 100, so that these ratio measures reflect credit loss percentages. The use of this scalar implies that variation in the ratio measures with conservatism is solely attributable to the effect of conservatism on the numerators, not the denominators, of the measures. If we instead scaled the credit loss measures by net loans outstanding during the year, then the effects of conservatism on the ratio measures would be in the same direction but larger, reflecting the smaller denominators under conservatism.

Table B.1 presents the simulation results. Realized credit losses are lower the more favorable the current credit-cycle phase, reflecting the assumed realized credit loss percentages. Realized credit losses are not sensitive to the loan-origination growth rate assumption, reflecting our scaling of this and other credit loss measures. Unbiased credit loss expense is lower than realized credit losses in both the boom and stable credit extension credit-cycle phases, due to downward revisions of credit loss allowances during these phases. Unbiased credit loss expense is higher than realized losses in credit busts, due to upward revisions of credit loss allowances. These differences between realized credit losses and unbiased credit loss expense reflect our assumption that the latter does not incorporate the probabilities of credit cycle changes; were unbiased credit loss expense instead to incorporate these probabilities, the differences between realized credit losses and unbiased credit loss expense would have the opposite signs.

Consistent with the longstanding literature on the interactive effects of individual exposure-level conservatism with firm growth, in the scenario with zero loan-origination growth rate during credit booms (and thus during stable credit extension periods and credit busts as well), which we include for comparison purposes only, conservative credit loss expense equals unbiased credit loss expense. Intuitively, with zero loan origination growth, conservatism yields an increase in credit loss expense for the current loan-origination vintage that is perfectly offset by a decrease in credit

loss expense for the identically sized two-year-old loan-origination vintage. For the scenarios with the expected positive loan growth during credit booms, (higher) conservatism increases credit loss expense (more) relative to unbiased credit loss expense during credit booms, reflecting the greater size of the current loan-origination vintage than the two-year-old loan-origination vintage. In these scenarios, the loan-origination growth rates during credit busts are negative, so (higher) conservatism reduces credit loss expense (more) relative to unbiased credit loss expense during credit busts, reflecting the lesser size of the current loan-origination vintage than the two-year-old loan-origination vintage. Conservatism also has a more modest negative effect on credit loss expense during stable credit extension periods; this result obtains because of the negative loan growth in any prior credit busts that occurred during the life to date of loans outstanding.[31]

To summarize, the results presented in Table B.1 indicate that (higher) conservatism increases credit loss expense (more) in credit booms and decreases credit loss expense (more) in credit busts.

Table B.1
Simulated Credit Loss Measures Assuming
Cycle-Phase-Dependent Loan-Origination Growth

Loan origination growth rate during credit booms	*Credit-cycle phase*	*Realized credit losses*	*Unbiased credit loss expense*	*Conservative credit loss expense given front-loading parameter*		
				0.5%	*1%*	*2%*
0%	Boom	0.399	0.253	0.253	0.253	0.253
	Stable	0.932	0.285	0.285	0.285	0.285
	Bust	3.176	4.067	4.067	4.067	4.067
5%	Boom	0.402	0.269	0.281	0.294	0.318
	Stable	0.935	0.269	0.264	0.260	0.252
	Bust	3.201	4.072	4.065	4.057	4.041
10%	Boom	0.404	0.284	0.308	0.332	0.380
	Stable	0.939	0.251	0.242	0.234	0.216
	Bust	3.228	4.076	4.060	4.044	4.011

Simulation of Credit Loss Measures Assuming State-independent Loan-origination Growth

For comparison purposes, we compare the simulation results based on the assumption of state-dependent loan-origination growth reported in Table B.1 with simulation results assuming state-independent loan-origination growth rates of 0, 5, or 10 percent. All other assumptions are

[31] This direction of this modest association is sensitive to our numerical assumptions regarding the likelihoods of credit-cycle changes. Specifically, two of the four equally likely paths for the credit cycle to move to a stable credit extension phase over the three-year life of a loan-origination vintage start in a credit bust, whereas only one path starts in each of a stable credit extension period and a credit boom. Thus, the average loan-origination growth rate over the two years leading up to a stable credit extension phase is slightly negative under our assumptions. Under alternative reasonable numerical assumptions, the likeliest path could start in a credit boom, yielding a slightly positive average loan growth rate, so that a mild version of the result for credit booms would obtain in stable credit extension phases. Generalizing, under any reasonable numerical assumptions, conservatism should have a relatively modest effect on credit loss expense during stable credit extension periods.

unchanged, but these alternative results are based on separately generated random credit-cycle changes for 1,000 years.

Table B.2 presents the simulation results. The amounts for realized credit losses and unbiased credit loss expense are essentially identical to those in Table B.1. However, conservatism increases credit loss expense (more) for (higher) loan-origination growth, regardless of the credit-cycle phase. This finding is consistent with that in the longstanding literature on the interactive effects of conservatism and firm growth.

Comparison of Tables B.1 and B.2 shows that, relative to the assumption of cycle-phase-dependent loan growth, the assumption of cycle-phase-independent loan origination growth strengthens the effects of conservatism in credit booms for a given positive loan-origination growth rate. This is because the positive loan-origination growth rate holds over the entire life of the firm's loans outstanding under this assumption.

Table B.2
Simulated Credit Loss Measures Assuming
Cycle-Phase-Independent Loan-Origination Growth

Loan-origination growth rate	***Credit-cycle phase***	***Realized credit losses***	***Unbiased credit loss expense***	***Conservative credit loss expense given front-loading parameter***		
				0.5%	***1%***	***2%***
0%	Boom	0.396	0.254	0.254	0.254	0.254
	Stable	0.936	0.303	0.303	0.303	0.303
	Bust	3.142	4.001	4.001	4.001	4.001
5%	Boom	0.400	0.275	0.291	0.307	0.340
	Stable	0.935	0.354	0.370	0.387	0.419
	Bust	3.113	4.034	4.050	4.066	4.099
10%	Boom	0.403	0.295	0.326	0.358	0.422
	Stable	0.934	0.403	0.434	0.466	0.530
	Bust	3.084	4.063	4.095	4.127	4.190

Table 1
Sample Construction

This table present the effects of sequentially imposing various filters to arrive at our final sample of life insurers, originated commercial mortgages with loan-to-value (LTV) ratios at origination, our primary measure of ex ante credit risk, and originating insurer-years from 1998 to 2007. The table reports the effects of the filters on the sample size and the means and medians of descriptive variables. *#Insurers* denotes the number of life insurers remaining after each filter. *Mean Firm Size* (*Median Firm Size*) denotes the mean (median) of the insurers' total assets during 1998-2007 (including years in which a given insurer did not originate commercial mortgages). *#Loans* denotes the number of commercial mortgages originated by the insurers. *#Originating Insurer-Years* denotes the number of insurer-years with originated commercial mortgages. *Mean Loan CV* (*Median Loan CV*) denotes the mean (median) carrying value of the originated commercial mortgages.

		Firm Size ($ millions)		Loan Originations			
					#Originating	CV ($ millions)	
Filters	#Insurers	Mean	Median	#Loans	Insurer-Years	Mean	Median
All life insurers in existence during 1998−2007	1,486	3,428.88	72.15	88,188	2,567	5.95	2.27
Exclude life insurers with no commercial mortgage originations during 1998−2007	432	8,190.65	920.70	88,188	2,567	5.95	2.27
Exclude commercial mortgages without LTV in origination year	412	8,405.84	948.91	70,692	2,389	6.12	2.38
Exclude commercial mortgages with LTV in top or bottom 1 percent in year	407	8,494.09	967.88	69,284	2,368	6.15	2.40
Exclude commercial mortgages without ExcessAVR or other financial variables at the beginning of year or for which city cannot be matched	371	9,146.00	1,218.77	64,751	2,204	6.27	2.48

Table 2
Summary of Life Insurers' Commercial Mortgage Originations during 1998–2007

This table presents descriptive statistics for the sample commercial mortgages originated in each year from 1998 to 2007, with (sub)totals for the 1998–2003 stable credit origination period, the 2004–2007 credit boom, and the overall sample period. The table reports the numbers of commercial mortgages originated (*#Loans*), the totals, means, and medians of the initial mortgage amounts (*Loan Amount*), and the equally weighted means, standard deviations, medians, and value-weighted means (VWMean) of the loan-to-value ratio (*LTV*) at origination.

Origination		Loan Amount ($ millions)			LTV (at Origination)			
Year/Period	#Loans	Total	Mean	Median	Mean	Std Dev	Median	VWMean
1998	6,565	32,272	4.92	1.96	59.39	15.25	63.80	62.65
1999	6,339	37,389	5.90	2.21	61.90	14.52	65.99	63.96
2000	6,399	38,137	5.96	2.55	61.16	15.33	65.98	63.23
2001	5,137	31,558	6.14	2.73	60.93	15.74	66.10	63.68
2002	4,963	31,421	6.33	2.73	60.96	14.97	65.34	63.79
2003	6,616	39,296	5.94	2.57	61.34	14.54	65.60	62.66
Stable Credit Extension Period Subtotal	36,019	210,073	5.83	2.42	60.94	15.06	65.45	63.32
2004	6,294	43,065	6.84	2.79	61.59	15.22	66.21	62.96
2005	7,596	51,338	6.76	2.68	59.77	16.50	64.61	61.16
2006	7,160	51,845	7.24	2.94	59.66	15.87	64.80	61.33
2007	7,682	49,943	6.50	2.00	60.76	15.23	65.56	61.06
Credit Boom Period Subtotal	28,732	196,192	6.83	2.57	60.41	15.75	65.22	61.57
Total	64,751	406,264	6.27	2.48	60.70	15.37	65.35	62.47

Table 3
Bivariate Evidence of Life Insurers' Conservatism and the at-Origination Loan-to-value (LTV) Ratios of Commercial Mortgages

This table presents bivariate evidence of the association between life insurers' conservatism and the at-origination loan-to-value (LTV) ratios of their commercial mortgages originated during 1998−2007. We measure life insurers' conservatism as their *ExcessAVR* at the beginning of each year. The conservatism category *Low_ExcessAVR*=1 (*Low_ExcessAVR*=0) includes life insurers in the lowest tercile (top two terciles) of *ExcessAVR* in a year. For each conservatism group in each of the stable credit extension period 1998−2003 (Panel A) and credit boom 2004−2007 (Panel B), the table reports the number of commercial mortgages originated (*#Loans*), total commercial mortgages originated in dollars (*Loan Amount*) and as a percentage of the average sum of cash and invested assets during the year (*Mean Firm Loan Amount as % Inv Assets*), and the mean LTV for originated commercial mortgages (*Mean Loan LTV*). These panels also report *t* tests of the difference of *Mean Loan LTV* for the two conservatism groups. Panel C reports a *t* test of the difference in differences of *Mean Loan LTV* for the two conservatism groups for the credit boom versus the stable credit extension period. *t*-statistics are presented in square brackets. *** denotes statistical significance at the 1 percent level.

	# Loans	*Loan Amount ($ millions)*	*Mean Firm Loan Amount as % of Inv Assets*	*Mean Loan LTV*
Panel A: Stable Credit Extension Period Originations (1998–2003)				
Low_ExcessAVR=1	9,551	46,458.35	3.16	58.55
Low_ExcessAVR=0	26,468	163,614.20	2.44	61.80
t Test of Difference: 1 – 0				-3.25***
				[-18.15]
Panel B: Credit Boom Originations (2004–2007)				
Low_ExcessAVR=1	6,713	35,068.00	2.76	61.89
Low_ExcessAVR=0	22,019	161,123.55	2.40	59.95
t Test of Difference: 1 – 0				1.94***
				[8.82]
Panel C: Credit Boom Minus Stable Credit Extension Period				
t Test of Difference in Differences				5.19***
				[18.16]

Table 4
Descriptive Statistics for Variables in Ex Ante Credit Risk Analysis

This table reports summary statistics and correlations for the variables in the loan-level multivariate model of the relation between life insurers' conservatism in accounting for mortgages during 1998–2007 and the loan-to-value ratios of their 64,751 originated commercial mortgages during 2008–2013 (equation (1)). Panel A presents the means, standard deviations, and medians of the variables. Panel B presents the Pearson correlations of the variables. Appendix A provides the definitions of all variables. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

Panel A: Summary Statistics

Variable	Mean	Std Dev	Median
LTV	60.70	15.37	65.35
Low_ExcessAVR	0.25	0.43	0.00
Adj_ExcessAVR	-0.09	0.29	-0.10
Firm Size	16.15	1.79	16.22
AdqIncRatio	1.99	5.47	1.60
ChgSurplus	5.03	44.96	4.83
REExposure	18.03	12.22	15.37
RBCRatio	7.05	5.05	6.35
ROE	10.71	13.73	11.29
Loan Size	7.77	1.47	7.82

Panel B: Correlations

	LTV	*Low_Excess AVR*	*Adj_Excess AVR*	*FirmSize*	*AdqInc Ratio*	*Chg Surplus*	*RE Exposure*	*RBC Ratio*	*ROE*
Low_ExcessAVR	-0.03***								
Adj_ExcessAVR	0.01***	-0.40***							
Firm Size	0.06***	-0.17***	0.09***						
AdqIncRatio	0	0.04***	0.02***	-0.13***					
ChgSurplus	-0.03***	0.06***	-0.03***	0.02***	0.01*				
REExposure	-0.01**	-0.09***	-0.01	-0.18***	0.04***	0.02***			
RBCRatio	-0.02***	-0.04***	0.04***	-0.14***	0.79***	0.02***	-0.07***		
ROE	0.01***	-0.10***	0.03***	0.17***	0.01	0.13***	0.15***	-0.01	
Loan Size	0.15***	-0.13***	0.17***	0.59***	-0.06***	0.01***	-0.26***	-0.05***	0.10***

Table 5
Impact of Conservatism on the Ex Ante Credit Risk of Originated Commercial Mortgages

This table examines the impact of life insurers' conservatism in accounting for mortgages on the at-origination loan-to-value ratios of the commercial mortgages they originate during the stable credit extension period 1998–2003 and the credit boom 2004–2007. The table reports OLS estimations of various versions of equation (1), in which the dependent variable is the at-origination loan-to-value ratio for the sample commercial mortgages. The measure of conservatism is *Low_ExcessAVR* in odd-numbered columns and *Adj_ExcessAVR* in even-numbered columns. The estimations reported in columns [1]-[4] are based on the full sample of originated commercial mortgages. The estimations reported in columns [5]-[8] are based on a matched sample in which each commercial mortgage originated by a life insurer in the lowest tercile of *ExcessAVR* is matched to another commercial mortgage originated by a more conservative life insurer during the same year. The commercial mortgages are propensity score matched with replacement based on the mortgage amount, year of mortgage origination, and the city of the mortgaged property. All estimations include fixed effects for the product of the city of the mortgaged property (city) and year of mortgage origination (year). The estimations in columns (3), (4), (7), and (8) also include fixed firm effects. Standard errors are clustered by the city of the mortgaged property. Appendix A provides the definitions of all variables. *t*-statistics are presented in square brackets. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

	Full Sample				Matched Sample			
Variables	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Low_ExcessAVR	-2.57***		-0.74**		-2.86***		-1.90***	
[β1]	[-9.63]		[-2.57]		[-7.93]		[-4.33]	
Low_ExcessAVR*Boom	4.96***		2.31***		4.43***		3.14***	
[β2]	[13.29]		[5.32]		[9.20]		[4.78]	
Adj_ExcessAVR		3.16***		1.08**		4.46**		3.77***
[γ1]		[3.97]		[2.04]		[2.09]		[2.74]
Adj_ExcessAVR*Boom		-6.73***		-1.98***		-7.20***		-5.32***
[γ2]		[-8.44]		[-2.98]		[-3.25]		[-3.77]
Firm Size	-0.35***	-0.37***	-1.38***	-1.27***	-0.30**	-0.31***	-1.72**	-1.48**
	[-3.82]	[-4.07]	[-3.63]	[-3.28]	[-2.56]	[-2.68]	[-2.28]	[-1.96]
AdqIncRatio	0.14***	0.14***	0.06	0.06	0.22***	0.22***	0.09	0.08
	[4.75]	[4.81]	[1.48]	[1.57]	[4.85]	[5.09]	[1.33]	[1.21]
ChgSurplus	-0.01***	-0.01***	0.00	0.00	-0.01***	-0.01***	0.00	0.00
	[-4.84]	[-4.51]	[-1.19]	[-1.08]	[-3.68]	[-3.64]	[-1.16]	[-1.13]
REExposure	0.08***	0.08***	0.00	0.01	0.01	0.02	0.02	0.03
	[4.51]	[4.96]	[-0.16]	[0.27]	[0.54]	[0.95]	[0.38]	[0.63]
RBCRatio	-0.16***	-0.17***	-0.05	-0.07	-0.26***	-0.27***	-0.11	-0.1
	[-3.23]	[-3.59]	[-1.07]	[-1.29]	[-3.88]	[-4.27]	[-1.17]	[-1.11]
ROE	0	0.01	-0.01**	-0.01	-0.01	-0.01	-0.01	0.00

	[0.01]	[0.84]	[-2.08]	[-1.55]	[-1.10]	[-0.77]	[-0.48]	[0.05]
Loan Size	2.50***	2.54***	3.60***	3.61***	2.27***	2.31***	3.43***	3.44***
	[24.74]	[24.25]	[30.92]	[30.92]	[15.47]	[15.33]	[18.71]	[18.77]
Intercept	46.50***	46.29***	55.41***	53.40***	49.67***	49.05***	62.37***	58.03***
	[40.17]	[39.12]	[8.64]	[8.22]	[27.92]	[27.65]	[5.04]	[4.72]
Test: $\beta_1+\beta_2$ Or $\gamma_1+\gamma_2$	2.39***	-3.57***	1.57***	-0.89**	1.56***	-2.74***	1.24**	-1.56*
	[8.31]	[-10.39]	[4.30]	[-1.98]	[4.16]	[-4.56]	[2.09]	[-1.87]
Cluster:	City	City	City	City	City	City	City	City
FEs:	City x Year	City x Year	City x Year, Firm	City x Year, Firm	City x Year	City x Year	City x Year, Firm	City x Year, Firm
#Observations	57,334	57,334	57,301	57,301	27,862	27,862	27,842	27,842
R^2	0.32	0.32	0.40	0.40	0.44	0.44	0.51	0.51

Table 6
Alternative Measure of Ex Ante Credit Risk

This table examines the impact of life insurers' conservatism in accounting for mortgages on an alternative measure of ex ante credit risk of originated commercial mortgages. *Risky Loan* is an indicator variable that takes the value of one if the at-origination loan-to-value ratio of a commercial mortgage is the highest quartile and the interest spread of the mortgage is the lowest quartile of all commercial mortgages originated in the same city during the same year, and zero otherwise. The table reports logistic estimations of four versions of equation (2), in which the dependent variable is *Risky Loan*. The equation distinguishes the effect of conservatism on *Risky Loan* in the stable credit extension period 1998–2003 and the credit boom 2004–2007. The conservatism measure is *Low_ExcessAVR* in odd-numbered columns and *ExcessAVR* in even-numbered columns. The sample includes commercial mortgages originated in cities with at least five such originations during the year. Columns [1] and [2] present logistic estimations, while columns [3] and [4] present conditional logistic estimations that condition on the city of the mortgaged property (similar to city fixed effects). The number of observations is much lower in columns [3] and [4] than in columns [1] and [2] because the inclusion of city-year fixed effects in a conditional logit model leads to the loss of all the observations in a firm-city-year for which the value of the outcome variable *Risky Loan* is the same. The coefficients on the control variables are suppressed. In all columns, standard errors are calculated clustering observations by the city of the mortgaged property. Appendix A provides variable definitions. *t* statistics are presented in square brackets. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

Variables	[1]	[2]	[3]	[4]
Low_ExcessAVR [β_1]	-0.11		-0.19*	
	[-1.19]		[-1.93]	
Low_ExcessAVR * Boom [β_2]	0.30**		0.41***	
	[2.45]		[3.02]	
Adj_ExcessAVR [γ_1]		0.14		0.19
		[0.76]		[1.06]
Adj_ExcessAVR * Boom [γ_2]		-0.76***		-0.82***
		[-3.13]		[-3.15]
Boom	-0.22***	-0.22***		
	[-3.01]	[-3.21]		
$\beta_1+\beta_2$ Or $\gamma_1+\gamma_2$	0.20**	-0.62***	0.22**	-0.63***
	[2.14]	[-4.16]	[2.17]	[-3.56]
Cluster:	City	City	City	City
FE:			City x Year	City x Year
#Observations	41,011	41,011	23,453	23,453
Psuedo R^2	0.040	0.041	0.087	0.088

Table 7
Life Insurers' Conservatism and the Characteristics of their Commercial Mortgage Originations during the 2008−2010 Credit Bust versus the 2004−2007 Credit Boom and the 1998−2003 Stable Credit Extension Period

This table examines cross-sectional differences in the loan-to-value ratio and initial amount lent for commercial mortgages originated by life insurers with different level of conservatism during the 1998−2003 stable credit extension period, the 2004−2007 credit boom, and the 2008−2010 credit bust. Panel A (Panel B) reports the estimations of regressions with the at-origination loan-to-value ratio (natural logarithm of the initial amount lent in $ thousands) for a commercial mortgage as the dependent variable. The measure of conservatism is *Low_ExcessAVR* in odd-numbered columns and *Adj_ExcessAVR* in even-numbered columns. These conservatism measures are measured as of the end of the previous year for the stable credit extension period and credit boom but are fixed at the end of 2007 for the 2008−2010 credit bust, so that the sizeable losses recorded on mortgages during the credit bust do not influence the conservatism measures. The table reports the coefficients on the conservatism measures *Low_ExcessAVR* and *Adj_ExcessAVR*. The regression models also include the control variables *Firm Size*, *AdqIncRatio*, *ChgSurplus*, *REExposure*, *RBCRatio*, *ROE*, and, in Panel A only, *Loan Size*. Appendix A provides the definitions of all variables. All regressions include fixed effects for the product of the city of the mortgaged property and year and calculate standard errors clustering by the city of the mortgaged property. *t* statistics are presented in square brackets. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

Panel A: LTV

	Stable (1998−2003)		Boom (2004−2007)		Bust (2008−2010)	
Variables	[1]	[2]	[3]	[4]	[5]	[6]
Low_ExcessAVR	-0.60*		1.75***		1.81***	
	[-1.82]		[3.69]		[3.28]	
Adj_ExcessAVR		1.33***		-0.93*		-0.73*
		[2.98]		[-1.86]		[-1.91]
#Observations	31,655	31,655	25,624	25,624	8,936	8,936
R^2	0.42	0.42	0.41	0.41	0.40	0.40

Panel B: Loan Size

	Stable (1998−2003)		Boom (2004−2007)		Bust (2008−2010)	
Variables	[1]	[2]	[3]	[4]	[5]	[6]
Low_ExcessAVR	-0.01		-0.20***		-1.12***	
	[-0.02]		[-8.30]		[-17.89]	
Adj_ExcessAVR		0.30***		0.69***		0.38***
		[2.71]		[7.93]		[10.58]
#Observations	31,686	31,686	25,648	25,648	8,936	8,936
R^2	0.58	0.59	0.58	0.59	0.62	0.60

Table 8
Life Insurers' Conservatism and Ex post Credit Losses on Commercial Mortgages

This table presents the relationship between conservatism in accounting for mortgages and the occurrence of ex post credit losses recorded during 2008–2013 on individual commercial mortgages originated in 1998−2007 and held by the insurer at the end of 2007. In Panel A, for each year in the stable credit extension period (1998−2003) and credit boom (2004−2007), we summarize the number of commercial mortgages originated (*# Loans*) and the percentage of these mortgages for which credit losses are recorded during the year (*% Loans with Losses*) for groups of life insurers with less conservative accounting for mortgages (*Low ExcessAVR*=1) versus more conservative (*Low ExcessAVR*=0). *Z* statistics testing the equality of *% Loans with Losses* across the two conservatism groups are presented in square brackets. Panels B and C present the estimations of cross-sectional logistic regressions with the dependent variable being an indicator variable that takes a value of 1 if the commercial mortgage experiences an ex post credit loss during 2008−2013 and 0 otherwise. We tabulate only the coefficients for *Low_ExcessAVR*, our dichotomous measure of conservatism. Results are similar for the continuous conservatism measure *Adj_ExcessAVR*. The coefficients on the following control variables are suppressed to conserve space: *Firm Size*, *AdqIncRatio, ChgSurplus*, *REExposure*, *RBCRatio, ROE,* and *Loan Size*. Panel B presents logistic estimations, while Panel C presents conditional logistic estimations that condition on the city of the mortgaged property (similar to the inclusion of city fixed effects). The number of observations declines for earlier years, because commercial mortgages in city-years for which all mortgage experience the same credit loss outcome are lost, and relatively few commercial mortgages originated in the stable credit period experienced credit losses during 2008–2013. Standard errors are calculated clustering by the city of the mortgaged property. The *Z* statistics for the coefficients on *Low_ExcessAVR* are presented in square brackets. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

	Stable Credit Extension Period						Credit Boom			
Variable	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Panel A: Summary										
# Loans:										
Low_ExcessAVR=1	878	496	388	342	497	866	919	1,386	1,396	2,178
Low_ExcessAVR=0	1,342	1,910	1,508	2,075	2,393	3,568	4,131	5,291	5,214	5,083
% of Loans with Losses:										
Low_ExcessAVR=1	1.48	1.61	2.32	1.46	3.22	4.27	5.88	4.55	9.74	9.46
Low_ExcessAVR=0	2.68	2.41	3.32	2.55	2.09	2.07	2.74	4.08	5.26	5.76
Difference: 1 − 0	-1.20**	-0.8	-1	-1.09	1.13	2.20***	3.14***	0.47	4.49***	3.70***
	[-2.03]	[-1.20]	[-1.12]	[-1.48]	[1.34]	[3.02]	[3.85]	[0.74]	[5.27]	[5.22]

	Stable Credit Extension Period						Credit Boom			
Variable	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Panel B: Logistic Regressions with clustering by City										
Low_ExcessAVR	-0.21	-0.01	-0.16	-0.53	0.14	0.96***	0.72***	0.44**	0.59***	0.85***
	[-0.60]	[-0.03]	[-0.47]	[-1.07]	[0.38]	[3.47]	[3.49]	[2.49]	[4.89]	[7.20]
Observations	2,220	2,406	1,896	2,417	2,890	4,434	5,050	6,677	6,610	7,261
Psuedo R^2	0.14	0.11	0.07	0.04	0.02	0.04	0.03	0.03	0.02	0.02
Panel C: Logistic Regressions with fixed effects for and clustering by City										
Low_ExcessAVR	0.29	-1.64*	0.28	-0.82	-0.23	0.74*	0.55*	0.66***	0.67***	1.03***
	[0.49]	[-1.81]	[0.45]	[-1.14]	[-0.35]	[1.95]	[1.90]	[2.73]	[4.55]	[5.64]
Observations	214	226	265	253	351	699	1,243	1,753	2,424	2,670
Psuedo R^2	0.31	0.29	0.16	0.15	0.07	0.09	0.06	0.06	0.03	0.05

Figure 1: Real Estate Indices 1998-2013

The original indices are set to a base of 100 at the beginning of 1998. The indices present the performance of the broad US real estate market. The equal and value weighted commercial real estate (CRE) indices have been obtained from CoStar. The Home Price Index (HPI) has been obtained from Federal Housing Finance Authority (FHFA).

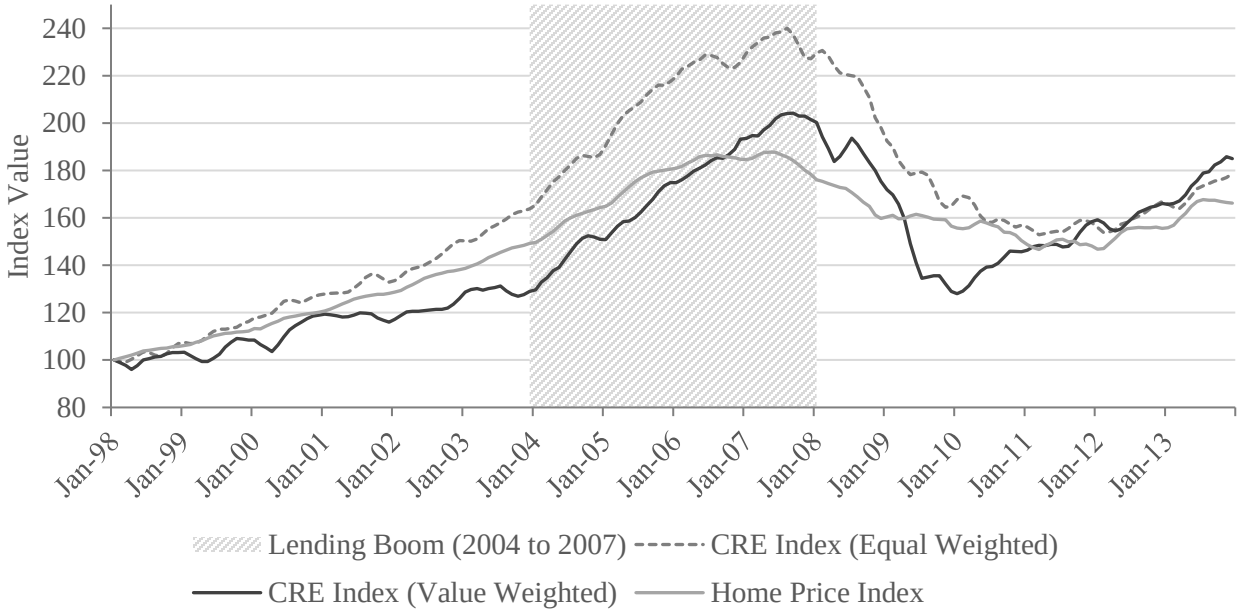

Figure 2: Credit Spreads on Baa Corporate Bonds over 10-year U.S. Treasuries, 1998-2009

Figure 3: Distribution of Loan-To-Value (LTV) at Origination

The below figures present histograms and smoothed density functions of the loan-to-value ratios (LTVs) for the sample commercial mortgages. Each figure contrasts the LTVs for life insurers with *Low_ExcessAVR*=1 (less conservative) versus *Low_ExcessAVR*=0 (more conservative) and during the stable credit extension period (Figure 3a) and credit boom (Figure 3b). The Kolmogorov-Smirnov (KS) statistic tests for the difference in the cumulative distribution functions for the insurers with *Low_ExcessAVR=1* versus *Low_ExcessAVR*=0.

Figure 3[a): Stable period (1998 – 2003)

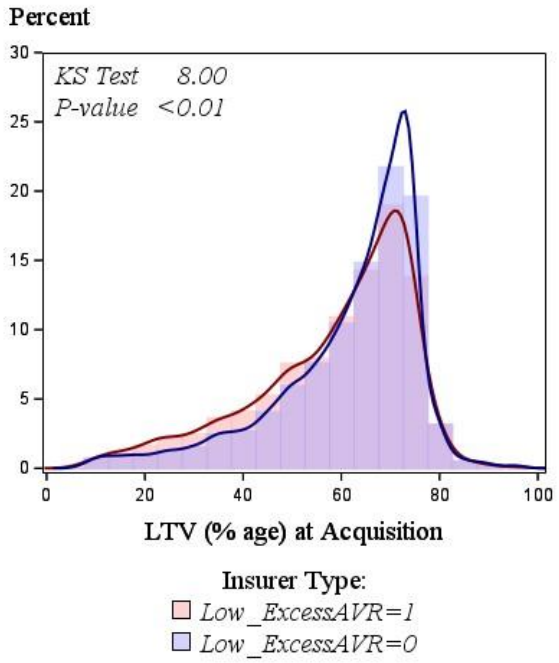

Figure 3[b): Credit Boom (2004 – 2007)