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How (In)Effective was Bank Supervision During the 2022 Monetary Tightening?

Yadav Gopalan, João Granja

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Becker Friedman Institute
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5757 S. University Ave.
Chicago, IL 60637
Main: 773.702.5599
bfi.uchicago.edu

How (in)effective was bank supervision during the 2022 Monetary Tightening?*

Yadav Gopalan* and João Granja**

*Kelley School of Business, Indiana University & St. Louis Fed

**Booth School of Business, University of Chicago

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Abstract

We investigate how effective was bank supervision before, during, and after the monetary tightening of 2022. We find that bank supervisors were aware of the interest rate risks that were emerging in the banking system and began downgrading the ratings of banks with significant exposures to such risks as early as the second quarter of 2022. We do not find that bank supervisors were more likely to downgrade banks whose excessive reliance on uninsured deposits posed liquidity risks. Rating downgrades were associated with subsequent declines in exposures to interest rate risks and with increases in bank liquidity. Overall, our evidence supports the idea that regulators made the banking system safer by limiting the interest rate risk exposures and propping up bank liquidity of many banks as the Federal Reserve began raising interest rates in the second quarter of 2022.

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ygopalan@iu.edu and joao.granja@chicagobooth.edu

1 Introduction

A simple combination of events led to the collapse of Silicon Valley Bank (SVB) and First Republic Corporation (FRC) in the first half of 2023. These banks funded sizable holdings of long-term securities with a substantial amount of uninsured deposits. Their holdings of long-term securities lost significant market value as the Federal Reserve began raising interest rates during 2022. Once concerns came to light that the market value of these banks' assets might not be enough to pay their deposits, a large number of uninsured depositors banking with SVB and FRC swiftly withdrew their money from them and precipitated their demise.

In fact, the events that prompted the failure of these banks were so simple that many commentators subsequently asked how regulators could have let these banks accumulate such large exposures to interest rate and liquidity risks during 2021 and 2022. Were supervisors oblivious of the systemic risks that were so openly and obviously brewing in the banking system? Or is it that bank supervisors were aware of these risks and acted upon them but lacked the supervisory resources to be everywhere at the same time and the discretionary powers to force riskier banks to follow their recommendations? Did supervisors successfully intervene to curb the interest rate risk exposure of some banks but such interventions remained secret due to the confidential nature of supervisory examinations?

To ensure that commercial banks do not pose significant risks for the stability of the banking system, bank supervisors periodically conduct on-site examinations of the financial condition of their regulated entities. The main quantitative output from such examinations is the CAMELS rating, which represents the supervisors' evaluation of a bank in the areas of capital adequacy (C), asset quality (A), management (M), earnings (E), liquidity (L), and sensitivity to risk (S). The CAMELS ratings are the basis for important supervisory interventions such as merger approvals, dividend restrictions, or even deposit insurance assessments fees.

In this paper, we use the near universe of CAMELS ratings assigned to every commercial bank

in the United States to conduct an anatomy of how supervisors assessed interest rate and liquidity risks before, during, and after the monetary tightening of 2022. In particular, we investigate if and when supervisors downgraded banks with large exposures to the interest rate and liquidity risks and if such supervisory actions helped curb these risks at the downgraded banks.

The headline finding of the paper is that bank supervisors incrementally increased the frequency of downgrading of the liquidity (L) and sensitivity to risk (S) ratings of banks that were most exposed to interest rate risks at the same time that the Federal Open Market Committee (FOMC) began raising interest rates in the spring of 2022. We compute measures of the duration of banks' asset portfolios to assess each bank's exposure to interest rate risks and then examine if supervisors incrementally downgraded banks with longer duration portfolios. Our empirical evidence indicates that when the Federal Reserve began raising interest rates in the second quarter of 2022, bank examiners downgraded the "S" rating of approximately 16% of banks in the highest quintile of exposure to interest rate risks but only 8% of banks in the lowest quintile of exposure to such risks. By contrast, prior to the second quarter of 2022, bank supervisors downgraded the S-rating of approximately 6% of all on-site inspected banks irrespective of their exposure to interest rate risks. These differences were even more pronounced when we consider only banks with large holdings of securities as a percentage of their assets. Our findings are consistent with the idea that bank supervisors understood the impact that large exposures to interest rate risks could have on banks' financial health and that they acted accordingly by downgrading banks that were most exposed to these risks once the Federal Reserve began raising interest rates to combat inflation.

Our asset duration-based measures of exposure to interest rate risk might not fully capture banks' exposure to interest rate risks if banks hedge some of these risks using interest rate swaps or other derivative contracts. Jiang et al. [2023a] have shown that the gross notional amount of derivative contracts for purposes other than trading at US banks cover, on average, only a small

portion of banks' assets. Furthermore, McPhail et al. [2023] show that banks' swap positions mostly offset each other and are not economically significant in hedging the interest rate risk of banks. We contribute to this debate by examining whether banks reporting greater use of derivative contracts for purposes other than trading are less likely to be downgraded by bank supervisors during the monetary tightening of 2022. Our findings suggest that, after the second quarter of 2022, supervisors were indeed much less likely to downgrade banks that intensively use derivative contracts for purposes other than trading. This evidence further indicates that supervisors understood the interest rate risks that were emerging as the Federal Reserve began its monetary tightening.

If the relation between interest rate risk exposures and downgrades had been a product of a spurious relation between banks' portfolio duration and the deterioration of their overall financial health, we might expect a positive association between banks' interest rate risk exposure and the frequency of downgrade across all CAMELS subcomponents. Instead, we do not find evidence that supervisors were more likely to downgrade the capital (C), asset quality (A), management (M), and earnings (E) ratings of banks with high interest rate risk exposures. This finding is consistent with the idea that bank supervisors downgraded the liquidity (L) and sensitivity to risk (S) ratings of these banks because they specifically targeted these risk exposures as the FOMC began raising interest rates. Interestingly, the composite CAMELS rating that aggregates the different CAMELS subcomponents was also not significantly affected by exposures to interest rate risks even after the Federal Reserve began raising interest rates in the second quarter of 2022.

Having shown that bank supervisors downgraded the CAMELS ratings of banks with greater exposures to interest rate risks, we next turn our attention to examining whether bank supervisors downgraded banks that relied more heavily on less stable sources of funding and, therefore, were more prone to liquidity risks. Rising interest rates induce losses on the value of a bank's assets but these losses need not imply that its equity also loses economic value as long as the bank is able to

hold constant the rates that it pays on its deposits and claims. Put differently, banks are naturally hedged if the value of their deposit franchise also rises with rising interest rates.

This natural hedge is, however, only effective if banks rely on a depositor base that will not swiftly move funds away from the bank in search of better yields when interest rates rise (e.g., Drechsler et al. [2021]). When a bank relies heavily on uninsured depositors, it will be more exposed to liquidity risks in high-interest rates environments (e.g., Drechsler et al. [2023]) both because uninsured depositors are more flighty and because their withdrawal might prompt insured depositors to also leave the bank, effectively destroying the deposit franchise value and the natural hedge of the bank.

We examine whether bank supervisors understood and acted upon these liquidity risks by downgrading banks that relied more heavily on uninsured deposits for their deposit funding. We find that throughout 2021 and 2022, bank examiners were not statistically more likely to downgrade the "L" and "S" ratings of banks that relied more heavily on uninsured deposits. While this inaction of the supervisors is surprising at some level, it is also consistent with statements made in Barr [2023] suggesting that the current supervisory models did not capture well enough the incremental liquidity risks associated with uninsured deposits. There is some evidence suggesting that bank supervisors are more likely to downgrade banks whose depositor relationships are mostly uninsured and less sticky (e.g., Drechsler et al. [2021]) but this evidence is weak and not statistically significant at conventional levels. Thus, it is possible that the supervisory models do not "fully incorporate the liquidity risk of a bank's uninsured deposit base" but incorporate more broadly the liquidity risk associated with a bank's deposit base.

Next, we move toward trying to understand what factors shaped the timing of the supervisory downgrades of the "S" and "L" components during the recent monetary tightening cycle. Recent studies such as Agarwal et al. [2014], Granja and Leuz [2022], or Kandrac and Schlusche [2021]

have shown that there is significant heterogeneity in how the different banking regulators in the United States enforce banking rules. Most notably, Agarwal et al. [2014] suggested that Federal Regulators were stricter than state regulators in assigning CAMELS ratings to banks during the 1990s and early 2000s. In our study, we extend this literature by analyzing whether Federal banking regulators were also quicker during the 2022 monetary tightening to recognize the emerging risks in the banking system. Unlike prior studies, our findings suggest that state regulatory agencies were just as strict as federal regulators. Both types of agencies downgraded banks with large interest rate risk exposures greater rate but only after the first quarter of 2022. These cross-sectional findings suggest that differences in regulatory attitudes or in supervisory resources are unlikely to explain differences in the intensity and timing of supervisory downgrades.

In our final set of analyses, we examine whether these downgrades of the "S" and "L" ratings had the desired effect of curbing the accumulation of interest rate risks at the downgraded banks. We find that a supervisory downgrade of the "L" or "S" components of a bank's CAMELS rating is associated with a subsequent decline in the share of a bank's securities with long maturities. Moreover, downgraded banks seem to reallocate a significant fraction of their assets from securities to cash. We do not find evidence that banks increased their hedging intensity following a supervisory downgrade, suggesting that banks did not buy interest rate hedges to remediate supervisory concerns about liquidity or interest rate risks. Overall, these results suggest that supervisory downgrades had the intended effect of reining in some of the interest rate and liquidity risks of these banks and have possibly prevented some banks from following the same path as SVB and FRC.

We caution, however, that this last set of empirical analyses comes with a few caveats. First and foremost, we do not yet observe a sufficiently long period following the beginning of the monetary tightening to evaluate the full effects of these supervisory interventions. Many downgrading decisions came in the last quarter of 2022 and first quarter of 2023, which coincides with the end of our sample

period. Our results, therefore may change substantially in the future if downgrades made during this period were less effective in prompting banks to lower the duration of their asset portfolio. Second, our findings may not necessarily reflect the direct intervention of supervisors but could instead be driven by mean reversion whereby banks that were most exposed to these risks were more likely to be downgraded but would have taken actions to contain those risks even in the absence of this supervisory intervention.

How do our findings generalize and what can we learn from them? Most developed economies employ vast amounts of resources to keep their banking systems safe and sound. Collectively, the FDIC and OCC employ approximately 6,000 bank examiners and spend approximately $2 billion every year in their supervision and consumer protection programs but what are the benefits of such investments? Surely, if this large supervisory apparatus is unable to detect basic bank risks such as those associated with the maturity mismatch between a bank's assets and liabilities, then it is fair to question whether the benefits from investing in bank regulation are worth the costs. Our findings indicate that the bank supervisors did identify and contain some, but perhaps not all, of the risks that were emerging in the banking system in the second quarter of 2022. Thus, US bank supervisors possibly prevented some bank failures and near failures that would further deplete the Deposit Insurance Fund. These supervisory successes, however, might go unnoticed given the confidential nature of bank supervision.

Second, an influential paper by Peek et al. [1999] has suggested that the bank supervisory function should not be autonomous from central banking because supervisory information improves the conduct of monetary policy. Our findings indicate that this relation was not a two-way street in the recent episode we study. We find that bank supervisors only started downgrading banks that were most exposed to interest rate risks after the FOMC effectively started raising interest rates. Thus, our paper suggests that bank supervision did not receive insights or private information

from monetary policymakers that might have allowed them to begin containing risks earlier in the monetary tightening cycle. This episode indicates that policies aimed at fostering this type of complementarity between central banks and their supervisory agencies might improve the efficiency of bank supervision.

2 Institutional Background and Descriptive Statistics

2.1 Bank Supervision in the United States

Regulation in the commercial banking industry involves the coordination and rule-making set by three federal bank regulators: The Office of the Comptroller of the Currency (OCC), the Federal Reserve Board of Governors (FRB), and the Federal Deposit Insurance Corporation (FDIC). These agencies produce standardized procedures of how banks should operate in a safe and sound manner and then use a dispersed system of field offices to closely monitor and track bank performance.

Within each field office (or reserve bank), teams of examiners supervise bank performance through two types of monitoring: off-site surveillance and on-site examinations. When monitoring banks offsite, examiners use quarterly financial reporting to track trends in bank conditions. Regardless of bank size or publicly-traded status, all commercial banks must submit quarterly financial reports to their primary federal regulator. These reports contain extensive balance sheet and income statement information and prior research has shown that the market finds these regulatory reports informative [Badertscher et al., 2018]. As conditions worsen, examiners can follow up with bank management to understand changes in underlying conditions.

Examiners complement off-site monitoring with periodic on-site examinations. Banks with satisfactory performance that are below certain size thresholds receive an on-site examinations every

18 months.[1] Hence, these periodic on-site examinations follow, for the most part, a predetermined schedule and the characteristics of banks that are examined in a given quarter are plausibly orthogonal to current events or shocks affecting the banking system during each period. We illustrate this point by reporting summary statistics of key variables for the banks undergoing examinations before and after the Federal Reserve began raising interest rates in 2022:Q2. Our results in Table 1 suggest that bank supervisors did not systematically target banks with greater exposure to interest rate risks after the beginning monetary tightening and that selective examination of banks most exposed to interest rate risks after the second quarter of 2022 is unlikely to explain our results.

During the examination process, teams of examiners travel from field offices to the headquarters of the commercial bank. They analyze loan files, screening methodology, risk management processes, and other sources of granular information about the bank. Furthermore, examiners often conduct informal discussions with bank personnel who may be in charge of loan origination, asset-liability management, or risk management more broadly. These examinations are labor intensive and can last weeks.[2]

Through their on-site evaluations and discussions, supervisors assess performance and assign ratings based on the soft and hard information that they glean through their inspections. This rating system grades bank performance across several observable dimensions of bank performance: capital adequacy (C), asset quality (A), management (M), earnings (E), liquidity (L), and sensitivity to market risk (S). These ratings are known by their collective acronym, CAMELS, and represent the primary quantitative output from on-site bank examinations. CAMELS ratings are rated from 1 to 5, with 1-rated bank showing the least amount of risk in a particular dimension, while 5-rated banks showing the most amount of risk. For instance, a bank that was assigned a 5 rating for liquidity or

[1] For state-chartered banks that meet this criteria, on-site examinations alternate between state regulatory agencies and either the FRB or FDIC. Please refer to Agarwal et al. [2014] for more details.

[2] Gopalan et al. [2023] find that the average length of bank exams is roughly 35 days. This duration is measured as the time between the date that the exam opens to the report disposition date.

interest rate risk would be deemed by examiners as having severe exposure to potential liquidity or interest rate risk management problems. Prior research has uncovered several features of this rating system. For instance, they are highly subjective and include substantial qualitative information from examination staff. As a result, ratings may be inconsistently applied from one exam, or from one agency, to another [Agarwal et al., 2014, Gopalan et al., 2021]. Furthermore, CAMELS ratings can be used to facilitate governance within the banking organization, by allowing boards of directors to directly monitor management and by also allowing boards to incentivize management to limit excessive risk-taking [Arif et al., 2023, Gopalan, 2022].

Figure 1 provides trends of how the number of supervisory examinations and frequency of CAMELS downgrades evolved during our sample period. Out of any given quarter, examiners engage in approximately 750 on-site supervisory examinations or about 15% of all commercial banks. Thus, only a small fraction of banks are examined at any given quarter. While the number of exams have remained relatively constant, the frequency of CAMELS composite rating downgrades slightly increased over the sample period. During the last quarter of 2020 and first and second quarters of 2021, supervisors downgraded about four percent of banks. The rate of downgrade increased to approximately six percent throughout 2022. When the problems at SVB and FRC unraveled during the first quarter of 2023, supervisors raised this rate up a notch and downgraded approximately ten percent of the banks that they inspected in that quarter.

Figure 2 provides a detailed breakdown of changes in the components of the CAMELS rating over our sample period. Two striking patterns emerge: the rate of downgrade of the capital adequacy (C) rating declines over time whereas the rates of downgrade of the Liquidity (L) and Sensitivity to Risk (S) components increase substantially starting in 2022. These patterns likely reflect both a softening of supervisory concerns about the potential impact of the Covid-19 Pandemic on bank capital and the emergence of supervisory apprehension about the effects that the cycle of monetary tightening

might have on the liquidity positions of banks that were less prepared to deal with interest rate risks.

3 Data

We construct a dataset that contains the universe of commercial banks CAMELS ratings from the fourth quarter of 2020 to the first quarter of 2023 using confidential regulatory information from the National Information Center (NIC) database. The NIC is a confidential data repository maintained by federal banking regulators and contains granular information on examiners' interactions with commercial banks. From this database, we collect the specific dates of each commercial bank's on-site examinations as well as the confidential CAMELS ratings assigned bank bank supervisors following the completion of their on-site examinations. For every examination observation, we match the latest Call Report information. Call Report filings contain quarterly public information about bank financial condition and are more informative and granular than financial information contained in banks' 10-K filings [Badertscher et al., 2018]. We use Call Reports to compute our quarterly measures of interest rate risk exposure, exposure to uninsured deposits, as well as broader measures of bank size, bank capitalization and asset quality. We complement our measures of exposure to uninsured deposits with deposit beta data obtained from Drechsler et al. [2021].

4 What did Bank Supervisors know?

4.1 Interest rate Risk Exposure and "S" and "L" CAMELS downgrades

In this section, we analyze how supervisors assessed interest rate risks before, during, and after the Federal Reserve began tightening monetary policy in early 2022. If supervisors understood that rising interest rates negatively affected the value of banks' assets, one might expect that they responded

by downgrading the banks whose asset portfolios were most vulnerable to increases in interest rates. To examine whether the likelihood of a supervisory downgrade is related to a bank's exposure to these interest rate risks, we compute two measures that capture the maturity composition of banks' securities portfolios. These measures of maturity composition capture interest rate risks because the value of longer-term securities is more sensitive to fluctuations in interest rates than the value of short-term securities. Our first measure is the weighted average maturity of all government securities and MBSs held by each bank.[3] Second, we simply take the share of government securities and mortgage backed securities (MBS) that have a remaining maturity or next repricing date of over 15 years.

We begin by examining the relation between banks' interest rate risk exposures and supervisory downgrades of the liquidity strength (L) and sensitivity to market risk (S) ratings of each examined bank, as these components capture supervisory assessments of a bank's ability to meet short-term funding obligations and of the quality of their risk management, respectively. In Figure 3, we partition all examined banks in five bins according to our measures of interest rate risk exposure and we plot the frequency of downgrades in each bin before and after the Federal Reserve began raising interest rates in the second quarter of 2022. The plots of Figure 3 paint a consistent picture. There is no relation between the frequency of downgrade of both the "S" and "L" rating and banks' interest rate risk exposures prior to the second quarter of 2022. But in the period beginning in the second quarter of 2022, the relation between the frequency of downgrade of both the "S" and "L" rating and banks' interest rate risk exposures turns strongly and monotonically positive. Specifically, bank supervisors downgraded only five percent of the quintile of banks that were least exposed to interest rate risks but downgraded more than fifteen percent of the quintile of banks that were most exposed to such risks. This pattern offers initial evidence that supervisors understood the interest

[3]We compute the duration using the mid-point of the interval for each maturity category in the Call Reports.

rate risks that some banks had accumulated and downgraded these banks at greater rates. However, supervisors' downgrades only started once the Federal Reserve started raising interest rates in the second quarter of 2022.

We further probe the association between interest rate risk exposure and "L" and "S" component downgrades using a differences-in-differences framework. Specifically, we employ the following empirical specification:

$$Downgrade_{it} = \alpha_i + \gamma_t + \beta_0 Int.\ Rate\ Risk_{it} + \beta_1 Int.\ Rate\ Risk_{it} \times Post_t + \Gamma X_{it} + \epsilon_{it} \quad (1)$$

in which *Downgrade* is an indicator variable that takes the value of one if the outcome of the on-site examination was a downgrade of the "L" or "S" rating. The main variable of interest, *Int. Rate Risk* is either the average duration of banks' securities portfolio or the share of long-term securities in their securities portfolio. *Post* is an indicator variable that takes the value of one after the second quarter of 2022. X is a vector of characteristics that includes controls for size, asset quality, and capitalization. Finally, we include quarter fixed effects, γ_t, and in some specifications we include bank fixed effects, α_i. Standard errors are clustered at the level of the state where a bank is headquartered.

In the specifications that do not include bank fixed effects, the regression coefficients capture whether supervisors are more likely to downgrade banks with higher levels of exposure to interest rate risk either before and after the Federal Reserve began raising rates. When we include bank fixed effects, our identifying variation comes from changes in the outcomes of banks that received at least two supervisory on-site examinations during the sample period. These specifications exploit only within-bank variation, which means that our coefficients capture whether supervisors were incrementally more likely to downgrade a bank that experienced a deterioration in their measures of

interest rate risk exposure in the period spanning two consecutive on-site examinations.

We present our regression estimates in Table 2. In the first four columns of Table 2, the outcome of interest is the downgrade of the "L" rating whereas in the last four columns of the Table, the outcome of interest is the downgrade of the "S" rating. Our coefficients in columns (1) and (2) suggest that the likelihood of a downgrade increases approximately nine percentage points when a bank goes from having no long-term securities to a securities portfolio that is entirely composed of long-term securities.[4] In columns (3) and (4), our regression coefficients indicate that increasing the duration of the securities portfolio by one year is associated with an increase in the likelihood of downgrade of the "L" rating between 0.4% and 0.6%. In columns (5)–(8), we examine the relation between our interest rate risk measures and the likelihood of downgrade of the "S" rating and we find economically and statistically similar results.

The specifications that include bank fixed effects produce similar regression coefficients to the specifications without bank fixed effects suggesting that supervisors are also more likely to downgrade after the second quarter of 2022 when a bank's interest rate risk exposure deteriorated relative to the previous exam. The regression coefficients in columns (2), (6), and (8) however, are not statistically significant at conventional levels likely due to a loss of power resulting from the smaller number of observations employed in that specification.

Next, we take into consideration the fact that some banks might have a large share of long-term securities but their holdings of fixed-income securities represent a small fraction of their total assets. As a result, they may not be as exposed to interest rate risks as our measures might suggest. We thus examine if the estimated effects are more pronounced in the subset of banks with above-median holdings of fixed-income securities as a percentage of their assets.

[4]The coefficient in column (1) of Table 2 indicates that a standard deviation increase in the share of long term securities increases the likelihood of downgrade by approximately 0.022. Given that the standard deviation of the share of long-term securities is .23 (Table 1), then going from no long-term securities to only long-term securities implies an expected increase in the probability of downgrade of $\frac{(1-0)}{0.23} \times 0.02 = 0.09$

In Figure 4, we examine if the relation between the frequency of downgrades and our measures of interest rate risk exposure is stronger in the subset of banks with above-median holdings of fixed-income securities as a percentage of their total assets. The plots support the idea that the frequency of downgrades of banks with high interest rate risk exposures is even more pronounced for banks with large holding of securities. For instance, the frequency of "S" rating downgrade following the second quarter of 2022 was more than 20% for the group of banks that was most exposed to interest rate risks but only 12% for the group of banks least exposed to these risks.

In Table 3, we further probe whether the response of bank supervisors to our interest rate risk exposure measures is more pronounced for banks holding a larger amount of securities as a fraction of their total assets. We expand the model of equation (1) by further interacting the model with a variable representing the amount of securities held by the bank as a fraction of their total assets. The results confirm that the relation between the frequency of rating downgrade and the share of long-term securities after the second quarter of 2022 is more pronounced for banks with more holdings of securities.[5]

4.2 When did bank supervisors start downgrading?

The analyses presented in the previous section show that bank supervisors are more likely to downgrade banks with high interest rate risk exposures after the Federal Reserve began raising interest rates in March 2022. These analyses, however, do not clearly discern *when* bank supervisors began downgrading the "S" and "L" ratings of banks in response to rising interest rates. Did supervisors anticipate the rising interest rate environment and began downgrading banks with high interest rates even prior to the beginning of the second quarter of 2022? Or were bank supervisors

[5]In Table A.1, we report a similar analysis showing that the relation between the frequency of rating downgrade and our duration measure after the second quarter of 2022 is more pronounced for banks with more holdings of securities.

tardy and only began downgrading banks with significant interest rate exposures later in 2022?

We plot coefficients and standard errors of quarter-by-quarter regressions of rating downgrades on bank exposure to interest rate risk in Figure 5. The coefficients show that the association between the likelihood of rating downgrade and the measures of exposure to interest rate risk only becomes positive and statistically significant in the second quarter of 2022 and reaches its peak in the fourth quarter of 2022, suggesting that bank supervisors understood the consequences of rising interest rates for the financial health of banks that were most exposed to interest rate risks. Thus, vulnerable banks were downgraded once it became clear that rising interest rates would impact banks' financial conditions. However, the plots do not indicate that bank supervisors *anticipated* the rising interest rate environment, which might have happened if there was close complementarity between the bank supervisory function and the monetary policy function of the Federal Reserve as suggested in Peek et al. [1999].

4.3 Interest Rate Hedging and Supervisory Downgrades

Our measures of duration of a bank's portfolio of assets might not fully reflect its exposure to interest rate risk if losses in the value of its assets from rising interest rates are offset by gains from interest rate derivative positions. Thus, it is possible that some banks with longer-duration securities portfolios hedge some of their exposure to interest rate risks and that supervisors take these positions into account in their downgrading decisions. While this is an interesting possibility, Jiang et al. [2023a] show that the scale of banks' use of derivative contracts for purposes other than trading is, at best, limited. Moreover, McPhail et al. [2023] show that banks' swap positions offset each other and are not economically significant in hedging interest rate risk of banks. Thus, whether the intensity of a bank's use of interest rate derivatives matters for supervisory downgrade decisions is an empirical question.

We compute a measure of the scale of a bank's hedging activities following the work of Jiang et al. [2023a]. We then examine if supervisors' decisions to downgrade a bank around the monetary tightening cycle of 2022 is associated with a bank's hedging intensity. An association between the rating downgrades and hedging activities would again suggest that supervisors were aware of the interest rate risks emerging in the system and that they understood the role that banks' hedging activities would play in shaping these risks.

In Panels A and B of Figure 6, we partition the sample into six bins. The first bucket is comprised of banks that do not use interest rate derivatives. The remaining bins split the subsample of banks that use interest rate derivatives for purposes other than trading according to how intensively they use those derivatives. Our descriptive findings in panel A of Figure 6 do not indicate a strong association between the intensity of hedging and the frequency of a "L" rating downgrade after the second quarter of 2022. By contrast, the empirical evidence in Panel B suggests a stronger association between the intensity of hedging and the frequency of a "S" rating downgrade in the period after the FOMC began raising interest rates. For instance, the plot shows that bank supervisors downgrade only 5% of the banks in the quintile of banks that most use interest rate derivatives but downgrade approximately 12% of all banks that use no interest rate derivatives.

In Table 4, we provide further evidence supporting the negative relation between use of interest rate hedging and the frequency of downgrades of the "L" and "S" sub-components. The coefficients in columns (1) and (3) suggest that there is a strong negative relation between a bank's hedging intensity *level* and the likelihood of a CAMELS downgrade after the second quarter of 2022. This relation is still negative but not statistically significant at conventional levels as we include bank fixed effects in columns (2) and (4). This lack of statistical significance suggests that regulators are not significantly more likely to downgrade a bank that *reduced* their hedging intensity after the second quarter of 2022 relative to the level that they were using in that bank's prior on-site examination.

In Panels C and D of Figure 6, we further investigate the dynamic aspect of the relation between hedging intensity and the likelihood of a downgrade. The results suggest that the negative relation between the "L" rating downgrade and hedging intensity is only negative and pronounced in the first quarter of 2023, whereas the negative relation between the "S" rating downgrade and hedging intensity emerges in the second quarter of 2022.

Overall, these findings provide further evidence that supervisors understood the interest rate risks that were emerging as the Federal Reserve began its monetary tightening and that they were less likely to downgrade banks that had some protection against these risks in the form of derivative contracts for purposes other than trading.

4.4 Interest rate Risk Exposure, Other CAMELS components, and Composite CAMELS rating

Our measures of exposure to interest rate risks might also capture broader changes in the financial health of banks that affect their capital, earnings capacity, and quality of the management function. Thus, the high frequency of downgrades of the "L" and "S" ratings that we documented for banks that are more exposed to interest rate risks might reflect supervisory concerns about a broader deterioration of these banks' financial health rather than the targeted efforts of bank supervisors to curb excessive interest rate risk exposures at these banks.

The CAMELS rating consists of four other components. The capital (C) rating measures the adequacy of the capital position of a bank, the asset quality (A) rating measures the overall performance of banks' assets and the quality of their credit administration policies, the management (M) rating broadly measures the quality of managerial input in the business, and the earnings component (E) measures the adequacy of current and expected earnings of the bank. If the interest rate risk exposure measures were capturing a broader deterioration of banks' financial health during

2022, then we might also expect a strong positive association between the frequency of downgrade of these other components and the interest rate risk exposure measures that we use in our empirical analysis. If, on the other hand, our findings of the previous sections reflect bank supervisors' direct attempts to contain the interest rate and liquidity risks that were emerging in the banking system, then it is not clear that these interest rate risk exposure measures and the likelihood of downgrade of these other components should be related. After all, these interest rate risk exposures should play, at best, an indirect role in supervisors' qualitative evaluation of the (C), (A), (M), and (E) sub-components of the CAMELS rating.

In Figure 7, we repeat the analysis of Figure 5 for the (C), (A), (M), and (E) components of the CAMELS rating. The results indicate that our main measures of exposure to interest rate risk do not bear any statistically significant positive relation with the likelihood of downgrade of these ratings throughout the entire sample period. We consider that these results support our assertion that the positive relation between (L) and (S) downgrades and our interest rate risk measures are not confounded by other correlated omitted factors and that they represent bank supervisors' targeted efforts to rein in the overexposure of some banks to interest rate and liquidity risks.[6]

Finally, we also investigate the relation between interest rate risk exposure and the aggregate composite CAMELS rating. Up until now, we have shown that our measures of interest rate risk exposure have a positive relation with the "L" and "S" rating and a weak or insignificant relation with all other components of the CAMELS rating. The aggregate CAMELS rating, however, is more than the average of its parts and also depends on the examiners' subjective assessment of the examined bank's overall condition. Moreover, the composite rating is also a key input to many important regulatory and supervisory decisions such as merger approvals and dividend restrictions, which are often based on the aggregate CAMELS rating rather than on the individual components

[6]In the Internet Appendix, we further provide these results using our other measure of interest rate risk exposure.

themselves.

This begs the question of whether the positive relation between the banks' interest rate risk exposures and the "L" and "S" rating after the second quarter of 2022 carried through to the composite CAMELS rating. In Panel E of Figure 7, we use the downgrade of the composite CAMELS rating as the main outcome variable. We find that the frequency of downgrade of the composite CAMELS rating is not significantly associated with our measures of interest rate risk exposure throughout the entire sample period. This weak relationship between the composite CAMELS downgrade and interest rate risks might hurt the efficacy of the (L) and (S) downgrades. A downgrade of the composite CAMELS ratings carry greater restrictions to banks' actions, which might be the supervisory "stick" that banks need to put greater effort into resolving existing deficiencies and unwinding specific risks.

4.5 Deposit Funding Fragility and Downgrades

The second key element contributing to bank fragility during the recent regional banks crisis was the excessive reliance of some banks on uninsured depositors (e.g., Jiang et al. [2023a]) or, more broadly, on a deposit base that is unstable and that quickly walks away from a bank if offered better interest rates elsewhere. When their deposit base is unstable, banks are more exposed to interest rate risks during periods of monetary tightening. Their assets lose value as interest rates rise and so does their equity because they cannot count on their depositors to naturally hedge the bank by providing funding at the low rates that they were practicing prior to the monetary tightening (e.g., Drechsler et al. [2021] and Drechsler et al. [2023]). If the deposit outflows are too strong, banks might be forced to sell securities at a loss thus exposing hidden frailties in their capital positions (e.g., Granja [2023]) that could further exacerbate their woes and accelerate the path to their demise. In this section, we investigate if bank supervisors understood these risks and incrementally downgraded

banks that over relied on unstable sources of funding.

We obtain two measures of deposit instability. The first measure is the share of uninsured deposits measured as the fraction of deposit and retirement deposit accounts with balances above the deposit insurance limit. The second measure is the deposit franchise beta taken from the work of Drechsler et al. [2021]. This variable measures the strength of a bank's deposit franchise. The deposit beta indicates how much a bank raises its deposit rate for a given increase in the Fed funds rate. A bank with a high beta has a deposit base that is less likely to tolerate low rates in rising interest rate environments. These banks are therefore more exposed to liquidity risks if they hold fixed-income long-term securities but their deposit base demands greater yield to stay around in periods of rising interest rate environments. This measure is purely cross-sectional, which means that we cannot employ bank fixed effect in this analysis.

We examine the association between banks' reliance on unstable sources of funding and the likelihood of downgrade of the "L" and "S" ratings using a differences-in-differences similar to that of equation (1). We report the results in Table 5. We find no statistically or economically significant relationship between the measures of deposit instability and the likelihood of a downgrade of the "L" and "S" ratings both before and after the Federal Reserve began raising rates in March 2022.

We provide graphical evidence of the relation between banks' reliance on unstable sources of funding and the likelihood of downgrade of the "L" and "S" rating in Figure 8. The figure repeats the quarter-by-quarter regression analysis of Figure 5, replacing the measures of interest rate risk with our measures of deposit instability. The regression coefficients again show no statistically significant relation between banks' share of uninsured deposit or the deposit beta measure and the likelihood of downgrades of the "L" and "S" Ratings. The exception is the statistically positive coefficient associated with the regression of the likelihood of "L" downgrade on the deposit beta measure in the last quarter of 2022. This result could indicate that supervisors started to react to the potential

liquidity issues of banks with more flighty deposit funding sources in the last quarter of 2022.

Overall these results suggest that supervisors mostly failed to downgrade banks that were reliant on unstable sources of funding that in turn left them exposed to bank runs. This is consistent with the findings of the Silicon Valley Bank failure report (Barr [2023]) which stated that: "Liquidity requirements and models used by both banks and supervisors should better capture the liquidity risk of a firm's uninsured deposit base. For instance, we should re-evaluate the stability of uninsured deposits and the treatment of held to maturity securities in our standardized liquidity rules and in a firm's internal liquidity stress tests."

4.6 Heterogeneity across Regulatory Agencies

A number of recent studies such as Agarwal et al. [2014], Granja [2023], or Kandrac and Schlusche [2021] have shown that there is significant heterogeneity in how the different banking regulators in the United States enforce banking rules. Most notably, Agarwal et al. [2014] suggested that Federal Regulators were stricter than state regulators in assigning CAMELS ratings to banks during the 1990s and early 2000s. Thus, it is possible that the results that we presented in prior sections conceal significant heterogeneity across banking regulators in how they assessed interest rate risks at banks around the monetary tightening of 2022. For instance, Federal Regulators such as the FDIC, OCC, and Federal Reserve might have had closer access to policymakers involved in monetary policy decisions and were more aware of the interest rate risks that would emerge during 2022. It is also possible that Federal Regulators had more and better supervisory resources to identify the risks that were brewing in the banking system and acted earlier to curb those risks. These organizational differences across regulatory agencies might have shaped the timing of the supervisory downgrades of the "S" and "L" components during the recent monetary tightening cycle.

We examine this possibility in Figure 9. We repeat the analysis of Figure 5 but now plot

coefficients of regressions that are estimated separately for bank examinations conducted by state regulatory agencies and federal regulatory agencies. Our findings suggest that there are no significant differences in how Federal and State banking regulatory agencies downgraded banks with large exposures to interest rate risks. Both types of agencies downgraded banks that were more exposed to interest rate risks at a greater rate than other banks but only after the first quarter of 2022. These cross-sectional findings suggest that differences in regulatory attitudes or in supervisory resources are unlikely to explain differences in the intensity and timing of supervisory downgrades.

5 Did Supervisory Downgrades rein in risks?

In the last section of our paper, we ask if these supervisory downgrades successfully induced banks to limit their interest rate risk exposures. Put differently, in prior sections we showed that supervisors were able to detect and downgrade banks with large interest rate risk exposures and, in this section, we investigate if these downgrades were effective in containing the exposures of downgraded banks to interest rate risks.

To examine this question, we implement a differences-in-differences specification that compares the evolution of key variables and ratios of banks that received a downgrade of their "L" or "S" rating during 2021 and 2022 with the evolution of banks with similar characteristics that did not receive a downgrade of these rating components during the sample period. Specifically, we use the Callaway and Sant'Anna (2021) estimator assuming that when a bank is downgraded during a period it remains treated until the end of our sample. Our empirical specification is:

$$Y_{it} = \alpha_i + \gamma_t + \sum_{t=-4}^{t=4} (\beta_t Downgrade_i \times \gamma_t) + \Gamma X_{it} + \epsilon_{it} \tag{2}$$

in which Y_{it} represents the dependent variables in the analysis, namely our asset-based duration

measures, a measure of hedging intensity, the ratio of securities to assets and the ratio of cash to assets. $Downgrade_i \times Post_t$ is a dummy variable that takes the value of one for all quarters following a downgrade of the "L" and "S" components of the bank and X_{it} is a vector of bank characteristics including measures of bank size, profitability, asset quality, and capitalization. α_i and γ_t are bank and quarter fixed effects and ensure that we exploit variation within a bank around the time of the downgrade after controlling for common shocks that affected bank's balance sheets during each quarter. We cluster standard errors at the level of a bank's state headquarters.

We present the results of this analysis in Figure 10. We find that a supervisory downgrade of the "L" or "S" components of a bank's CAMELS rating is associated with a subsequent decline in the share of a bank's securities with long maturities. In Panel A, we show that following a downgrade of the "L" or "S" rating, the share of securities with a remaining maturity or next repricing date of over 15 years immediately begins to decline and three quarters following the downgrade it is, on average, one percentage point lower.[7] This is an economically meaningful decline since long-term securities account on average for about 20% of a bank's securities portfolios. Panel B shows economically similar results with a decline in our securities portfolio-based measure of duration, albeit the results are not statistically significant at conventional levels. In Panel C, we find that a downgrade does not have a statistically significant impact on banks' hedging intensity. Following the downgrade the confidence intervals on our estimates widen considerably but, if anything, banks seem to lower their hedging intensity following a downgrade. This result likely suggest that while regulators seem to consider a bank's hedging intensity as an important factor in their downgrading decisions of the "S" rating, banks themselves do not turn to hedging to lower their interest rate risk exposures following a downgrade.

In Panels D and E of Figure 10, we examine the allocation of a bank's portfolio between securities

[7]The share of long-term securities variable is standardized such that a β coefficient of -0.05 implies a decline of $0.05 \times 0.23 \approx 0.01$

and cash following a downgrade of the "S" and "L" components of the CAMELS rating. There seems to be a reallocation of a downgraded bank's portfolio from securities to cash with total securities declining by approximately .5% of a bank's total assets and cash increasing by a similar magnitude. Yet, this reallocation begins one quarter prior to the downgrade itself.

There are two possibilities to explain these significant effects prior to the downgrade. First, it is possible that in the course of their off-site preparation for an on-site inspection occurring during the following quarter, supervisors forewarn banks if certain ratios and risks are too high and request that such deficiencies are addressed prior to the exam. Such communications between supervisors and banks occur frequently and may explain why we empirically find that banks began containing these risks during the quarter prior to the exam. Moreover, we find that the reallocation accelerates following the exam quarter, which may suggest that the supervisors were not content with the measures that had been taken, and nevertheless downgrade the bank. Another possibility, however, is that these results reflect mean reversion. The downgraded banks understand that their portfolio allocation is unbalanced and would have taken measures to reallocate between securities and cash even in the absence of a downgrade. In this alternative explanation, the downgrades are a symptom of high exposure to liquidity and interest rate risks but were not the direct cause of the subsequent reduction in these exposures at downgraded banks.

We caution that our last set of empirical analyses comes with an important caveat. We do not yet observe a sufficiently long period following the beginning of the monetary tightening to evaluate the full effects of these supervisory decisions. As seen in Figure 2 most downgrades of the "S" and "L" components came in the last quarter of 2022 and first quarter of 2023, which is when our sample ends at the moment. Thus, our results may change substantially in the future as we extend our sample especially if the downgrade decisions made in the last quarter of 2022 and first quarter of 2023 were less effective in prompting banks to lower the duration of their asset portfolio.

6 Conclusion

Many commentators were quick to point fingers at bank regulators for failing to prevent the failures of Silicon Valley Bank and First Republic Corporation. However, a complete assessment of the merits and failures of bank regulators and bank regulation is made difficult by the secrecy that shrouds the supervisory process. The CAMELS ratings that bank examiners assign to banks have long been kept confidential due to concerns that their disclosure might precipitate panic-based bank runs (e.g., Goldstein and Sapra [2013]). But this secrecy also means that it is difficult to evaluate the performance of bank supervisors. In some cases, regulators may receive the blame for some very public failures but no glory for the bank failures that they prevented from happening. In other cases, this secrecy may mean that regulators are left unaccountable for failing to properly regulate and supervise banks.

In this paper, we use confidential information from banks' supervisory reports to examine the (in)effectiveness of bank regulation during the 2022 monetary tightening. In doing so, we contribute to a long literature that attempts to examine the role that bank regulation and supervision plays in shaping bank performance and banking crises (e.g., Agarwal et al., 2014; Hirtle et al., 2020; Kandrac and Schlusche, 2021; Bonfim et al., 2023; Eisenbach et al. [2022]; Granja and Leuz [2022]).

There are two main differences between our empirical setting and those of other papers in this literature. Most past studies do not directly observe supervisory actions and rely on indirect sources of variation in supervisory resources or supervisory effort in their analysis. Instead, we directly observe supervisors' confidential assessments of their regulated entities and use this information to evaluate how promptly bank supervisors responded to a well-identified change in interest rate environment that suddenly originated important imbalances in the banking system.

The other notable and related difference between our study and other studies in this literature is that, most often, past studies have examined how bank supervisors manage significant credit

risks and losses in the economy. Yet, the emergence of such credit risks is often insidious and difficult to identify in real time. In our setting, a well-defined event, the Federal Reserve's decision to raise interest rates, triggered a sudden shock to the value of equity of banks with significant maturity mismatches and unstable deposits. We exploit this setting to evaluate the preparedness and timeliness of the supervisory responses to this challenge. This aspect is something that is often hard to do as it is difficult to pinpoint the moment in which credit or other risks are formed in the banking system.

This setting also offers an opportunity to better understand the coordination and collaboration between central bankers and bank supervisors in the US economy. Given the crucial role that banks play in the pass-through of monetary policy, close collaboration between central bankers and supervisors could be important in guaranteeing that the fight against inflation does not result in substantial convulsions in the banking system. We provide evidence that during the recent crisis, bank supervisors did not anticipate the cycle of monetary tightening that began in the second quarter of 2022.

Finally, we also contribute to an emerging literature that examines the 2023 U.S. regional banks' crisis. Drechsler et al. [2023] and Jiang et al. [2023b] characterize the sources of banking instability during the recent period of monetary tightening. McPhail et al. [2023] and Jiang et al. [2023a] look at banks' use (or lack thereof) of hedging to limit interest rate risks. Cookson et al. [2023], Choi et al. [2023], and Caglio et al. [2023] analyze the dynamics of depositor runs around the Silicon Valley Bank run. Granja [2023] and Kim et al. [2023] examine how fragile banks used accounting to make their financial position more opaque. Our unique contribution is to provide initial evidence about the role that bank regulators played in the events that led to the demise of SVB and FRC.

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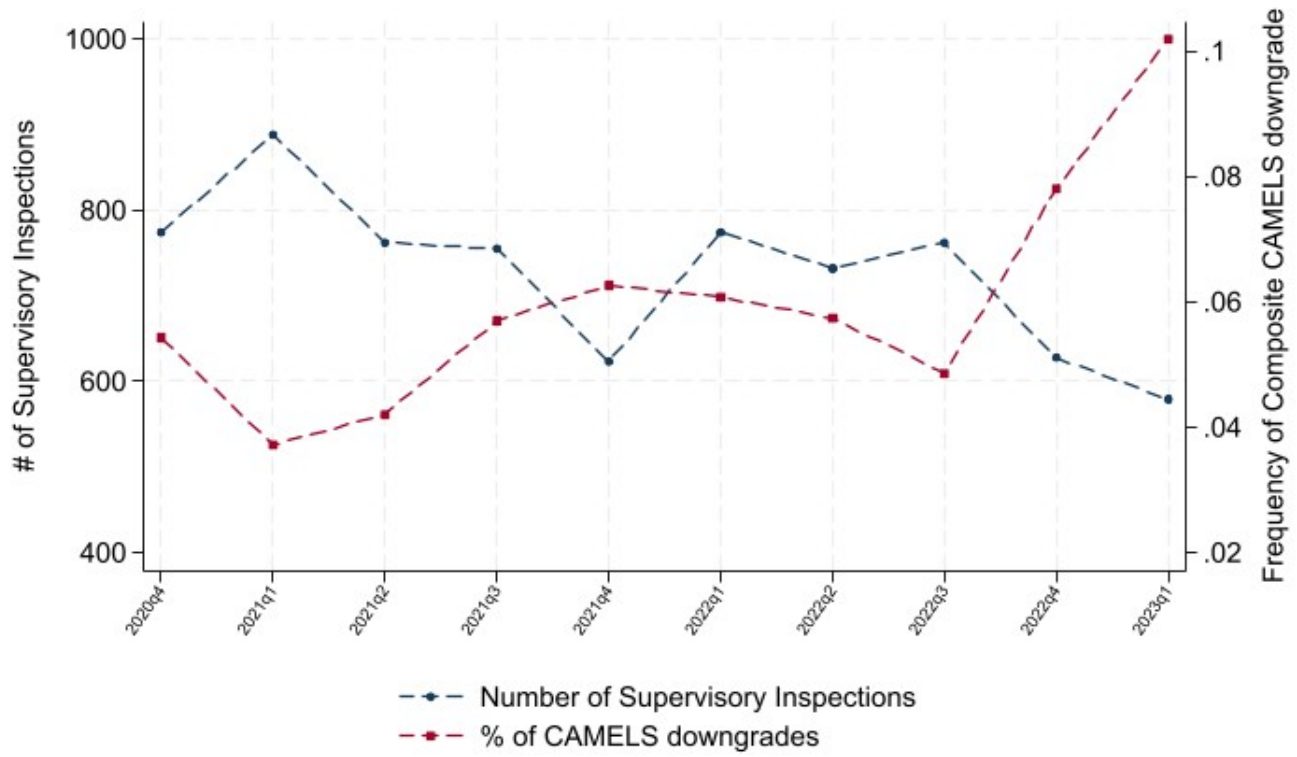


Figure 1: **Number of Exams and Downgrade Rate of the Composite CAMELS rating by Quarter.** This figure shows the total number of supervisory inspections on the left axis and the frequency of composite CAMELS downgrade on the right axis. This figure is computed using the CAMELS rating data from National Information Center (NIC) and the sample period runs from the fourth quarter of 2020 to the first quarter of 2023.

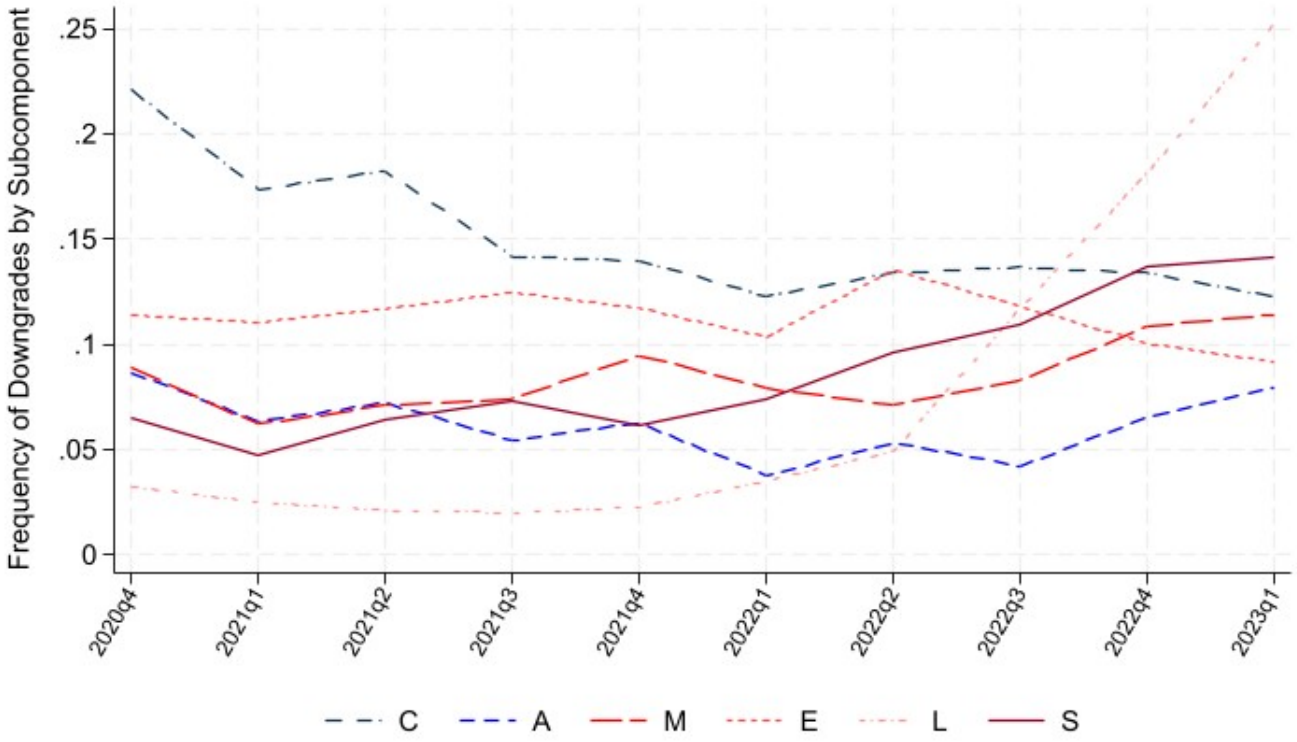
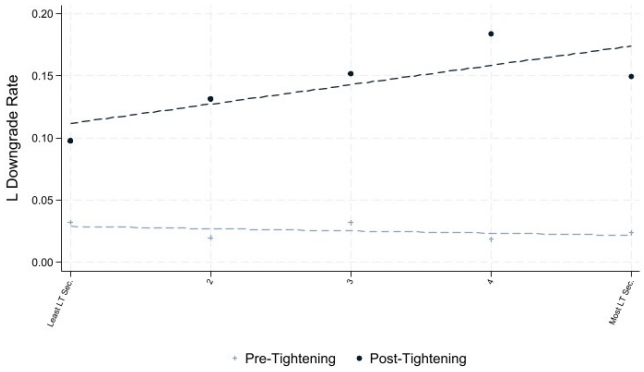


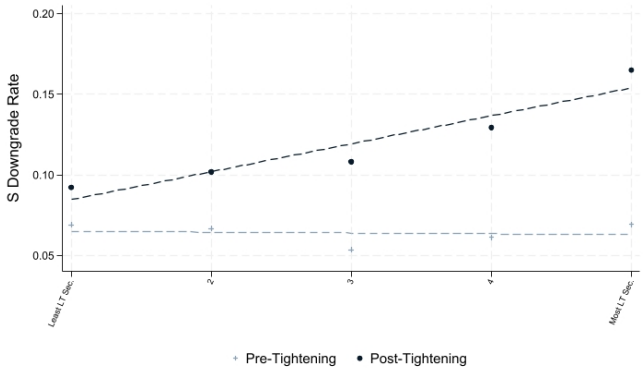
Figure 2: **Downgrade Rate Across CAMELS Components**. This figure shows the frequency of downgrades by the six components of CAMELS – capital adequacy (C), asset quality (A), management (M), earnings (E), liquidity (L), and sensitivity to risk (S) from the fourth quarter of 2020 to the first quarter of 2023. This figure is computed using CAMELS rating data from National Information Center (NIC).

Figure 3: **"L" and "S" rating downgrades by Interest Rate Exposure Bin**. This figure examines the relation between "L" and "S" rating downgrades and interest rate exposures for both the pre- and post-tightening periods. We partition all banks into five interest rate exposure bins using the share of banks' long-term securities in Panel A and B and the duration of banks' securities portfolio in Panel C and D. Interest rate exposure bins in Panel A and B range from the lowest share of long-term securities to the highest share of long-term securities, while the bins in Panel C and D range from the shortest securities portfolio duration to the longest duration. We also present best-fit lines to show the relation between "L" and "S" rating downgrades and interest rate exposure more clearly. This figure is computed using CAMELS rating data from National Information Center (NIC) and the Call Reports.

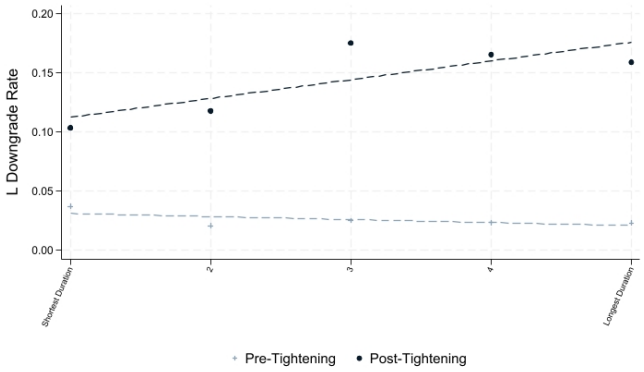
Panel A. "L" Rating and Share of LT Sec.



Panel B. "S" Rating and Share of of LT Sec



Panel C. "L" Rating and Duration



Panel D. "S" Rating and Duration

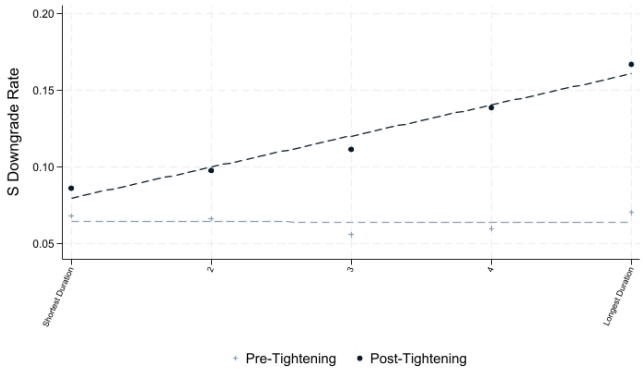
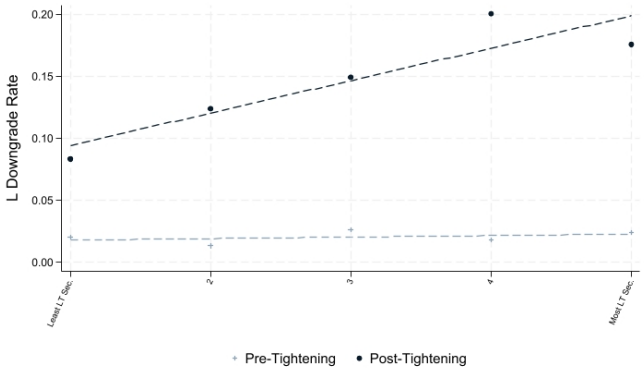
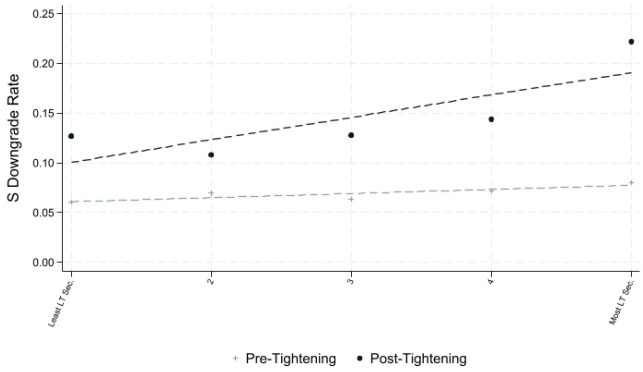


Figure 4: **"L" and "S" rating downgrades by Interest Rate Exposure Bin: Above-median Holdings of Securities**. This figure examines the relation between "L" and "S" rating downgrades and interest rate exposures for the sub-sample of banks with above-median holdings of securities. We partition all banks into five interest rate exposure bins using the share of banks' long-term securities in Panel A and B and the duration of banks' securities portfolio in Panel C and D. Interest rate exposure bins in Panel A and B range from the lowest share of long-term securities to the highest share of long-term securities, while the bins in Panel C and D range from the shortest securities portfolio duration to the longest duration. We also present best-fit lines to show the relation between "L" and "S" rating downgrades and interest rate exposure more clearly. This figure is computed using CAMELS rating data from National Information Center (NIC) and the Call Reports.

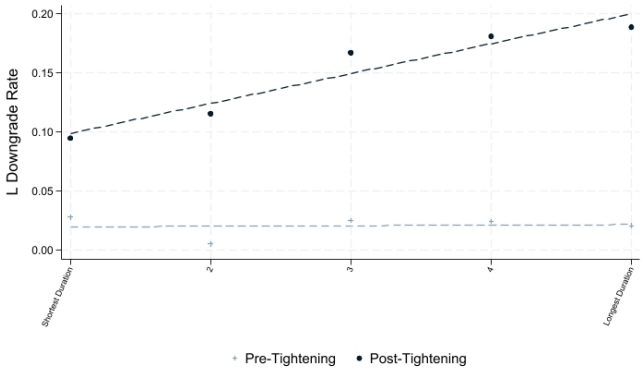
Panel A. "L" Rating and Share of LT Sec.



Panel B. "S" Rating and Share of of LT Sec



Panel C. "L" Rating and Duration



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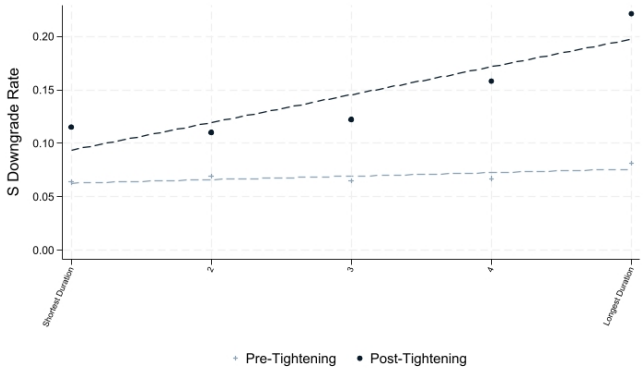
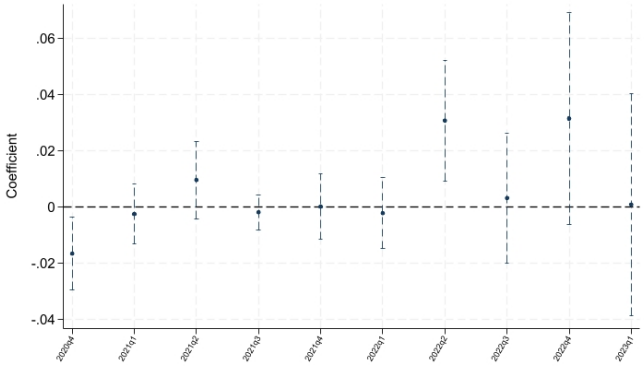
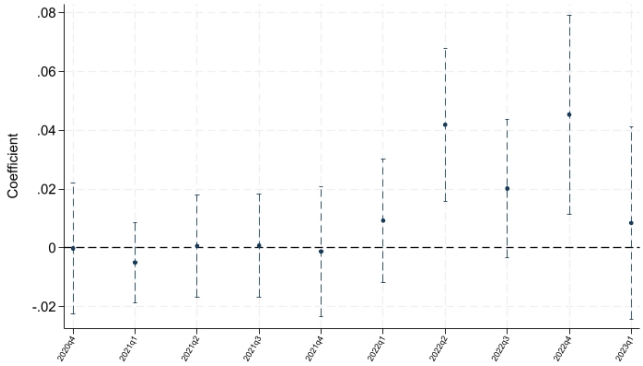


Figure 5: **Interest Rate Risk Exposures and "L" and "S" rating downgrades over time**. This figure plots the coefficients of the regression of "L" and "S" rating downgrades on interest risk exposure for each quarter and presents the results in a time series manner. In each quarterly regression, we include controls for bank size, loan to asset ratio, ROA, loan loss reserve to asset ratio, non-performing loan to asset ratio, equity to asset ratio, and banks' asset decile fixed effects. Bank sizes are defined as the natural logarithm of banks' total assets. In all other control variables, we divide the first term by banks' total assets to obtain the ratio. 95% confidence interval of each coefficient is also presented. In Panel A and B, we use banks' share of long-term securities as the proxy for interest rate exposure; in Panel C and D, banks' securities portfolio duration is used instead. We use CAMELS rating data from National Information Center (NIC) and banks' quarterly Call Reports to compute this figure.

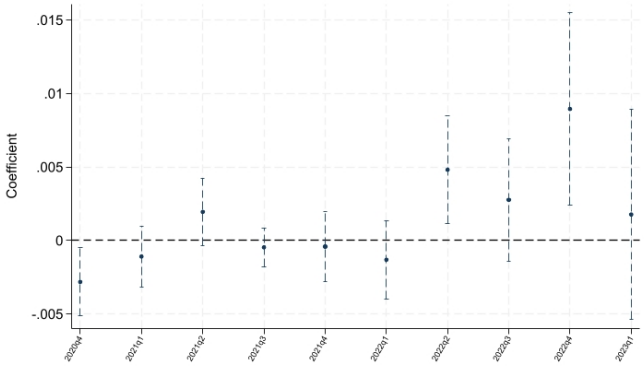
Panel A. "L" Rating and Share of LT Sec.



Panel B. "S" Rating and Share of of LT Sec



Panel C. "L" Rating and Duration



Panel D. "S" Rating and Duration

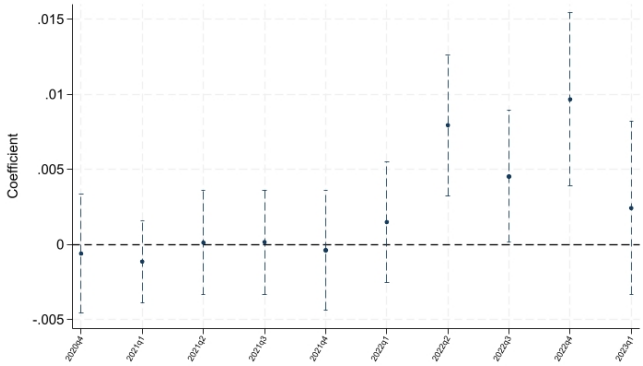
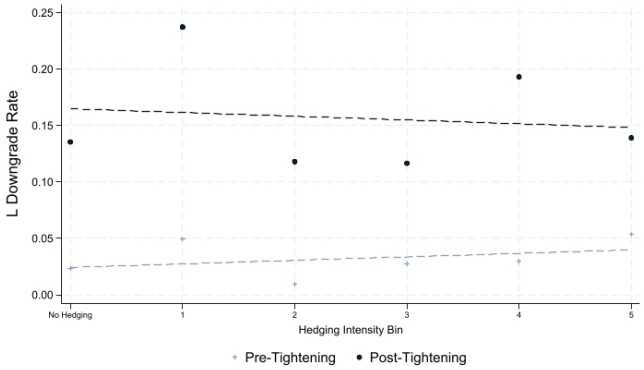
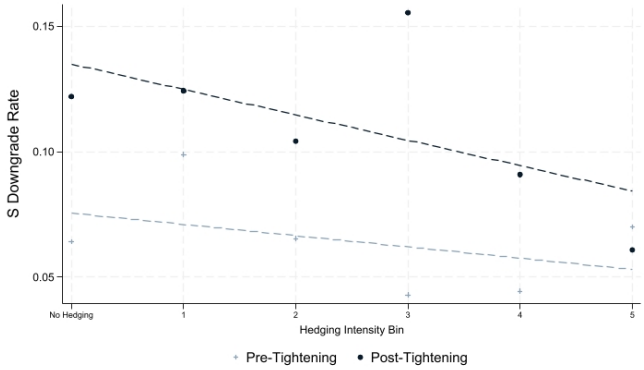


Figure 6: **Hedging Intensity and "L" and "S" rating downgrades over time**. This figure plots the relation between "L" and "S" rating downgrades and a measure of the intensity of hedging of interest rate risks. In Panels A and B, we repeat the exercise of Figure 3 after splitting the sample into bins according to their measure of hedging intensity. In Panels C and D, we repeat the exercise of Figure 5 using the measure of hedging intensity. We use CAMELS rating data from National Information Center (NIC) and banks' quarterly Call Reports to compute this figure.

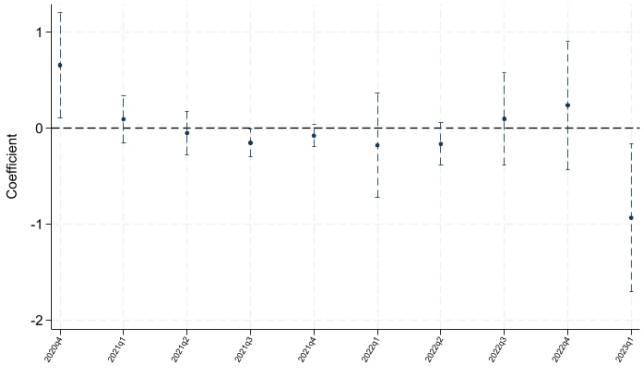
Panel A. "L" Rating and Hedging Intensity



Panel B. "S" Rating and Hedging Intensity



Panel C. "L" Rating and Hedge Intensity (Coef)



Panel D. "S" Rating and Hedge Intensity (Coef.)

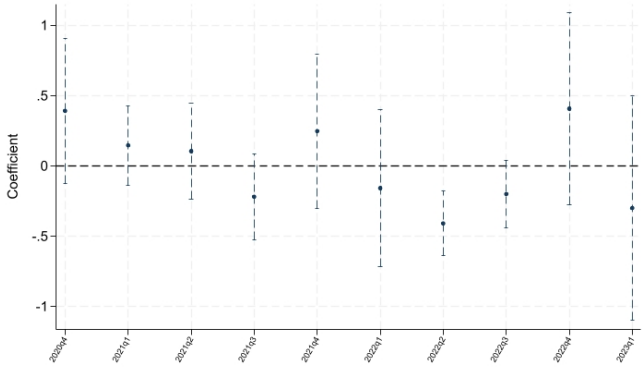


Figure 7: **Interest Rate Risk Exposures and Downgrades of other CAMELS Components over time**. This figure plots the coefficients of the regression of "C", "A", "M", "E", and Composite CAMELS rating downgrades on interest risk exposure for each quarter and presents the results in a time series manner. All variables are defined as in Figure 5. We use CAMELS rating data from National Information Center (NIC) and banks' quarterly Call Reports to compute this figure.

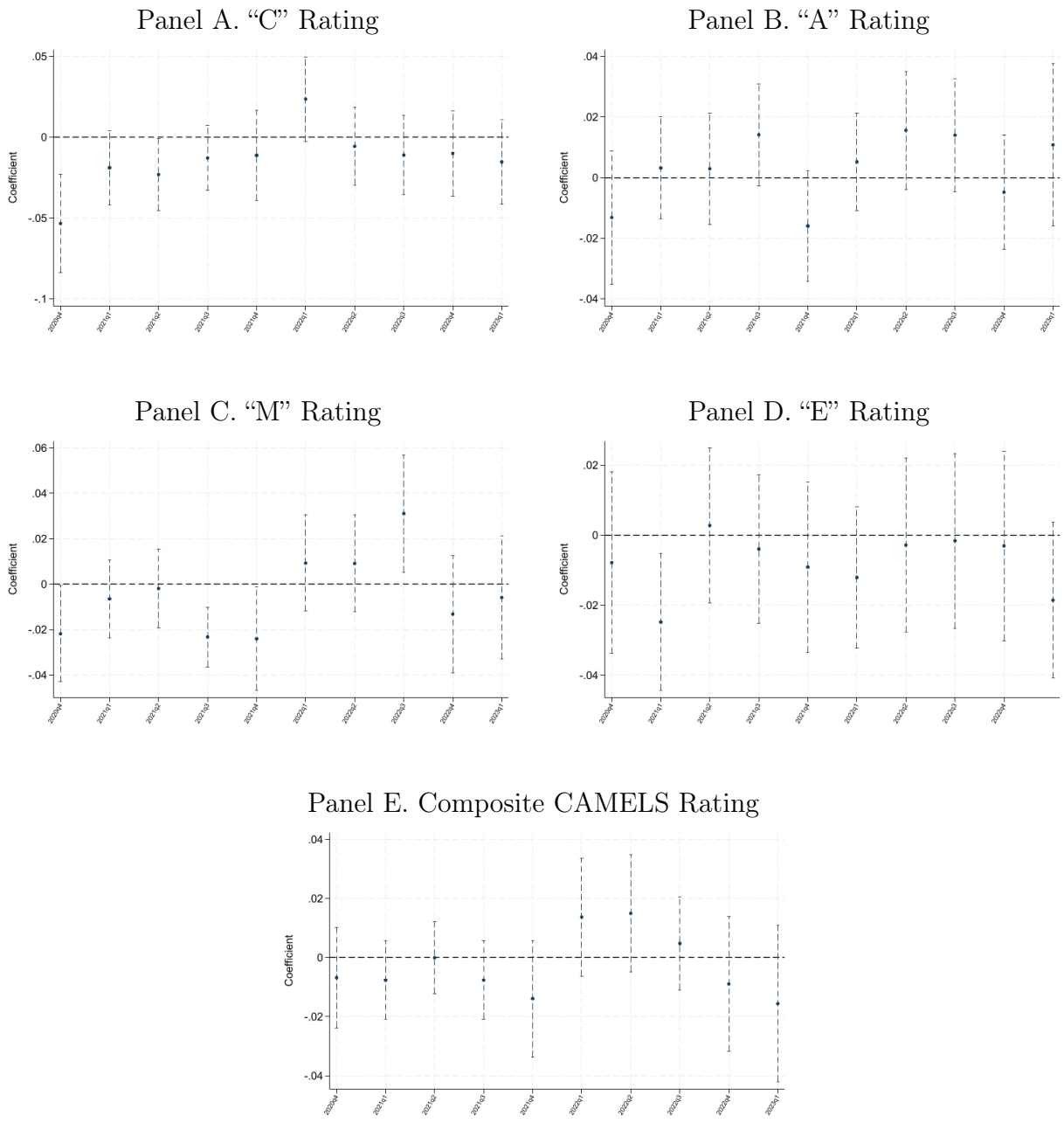
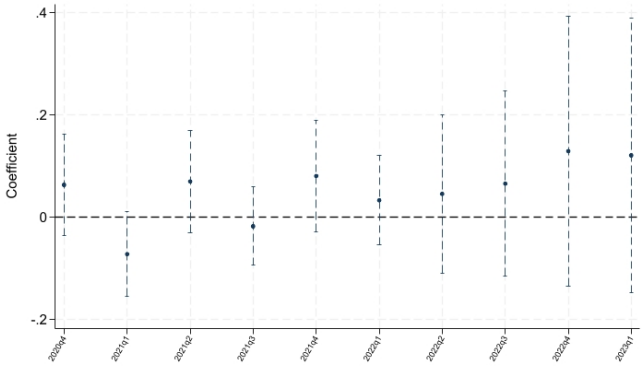
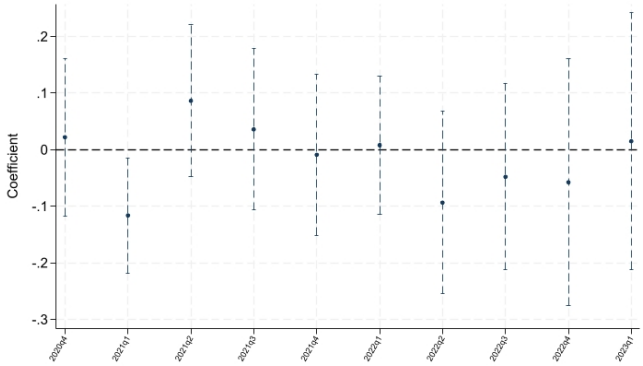


Figure 8: **Unstable Sources of Funding and "L" and "S" rating downgrades over time**. This figure plots the coefficients of the regression of "L" and "S" rating downgrades on measures of deposit instability for each quarter and presents the results in a time series manner. In each quarterly regression, we include controls for bank size, loan to asset ratio, ROA, loan loss reserve to asset ratio, non-performing loan to asset ratio, equity to asset ratio, and banks' asset decile fixed effects. Bank sizes are defined as the natural logarithm of banks' total assets. In all other control variables, we divide the first term by banks' total assets to obtain the ratio. We also provide the 95% confidence interval. In Panel A and B, we use banks' total share of uninsured deposits as the proxy for deposit instability; in Panel C and D, banks' deposit beta is used instead. We utilize CAMELS rating data from National Information Center (NIC) and banks' quarterly Call Reports to compute this figure.

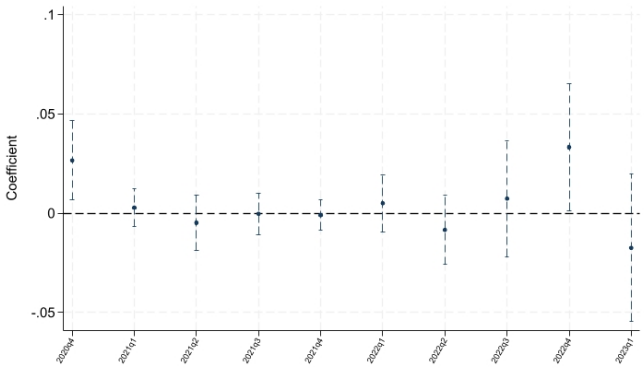
Panel A. % Uninsured and "L" Downgrade



Panel B. % Uninsured and "S" Downgrade



Panel C. Deposit Beta and "L" Downgrade



Panel D. Deposit Beta and "S" Downgrade

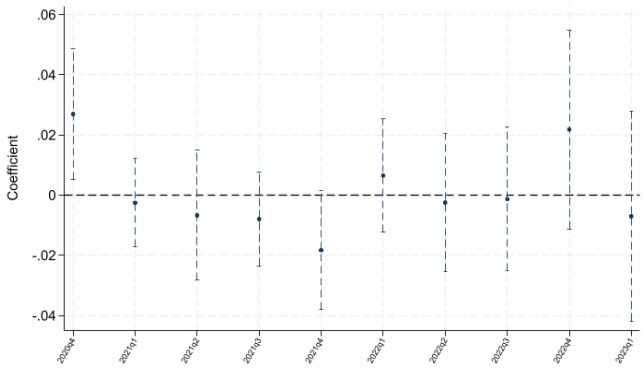


Figure 9: **Heterogeneity in Supervisory Downgrades of "S" and "L" Ratings Across Regulatory Agencies.** This figure plots the coefficients of the regression of "L" or "S" rating downgrades a regulatory agency lead dummy variable. The outcome variable is a dummy variable that equals 1, if at time t, regulator j downgrades bank i's "L" or "S" rating. Red bars represent downgrades of bank examinations led by state regulatory agencies. Blue bars represent represent downgrades of bank examinations led by federal agencies. We include controls for bank size, loan to asset ratio, ROA, loan loss reserve to asset ratio, non-performing loan to asset ratio, equity to asset ratio, and banks' asset decile fixed effects. Bank sizes are defined as the natural logarithm of banks' total assets. In all other control variables, we divide the first term by banks' total assets to obtain the ratio. 95% confidence interval of each coefficient is also presented. We utilize CAMELS rating data from National Information Center (NIC) and banks' quarterly Call Reports to compute this figure.

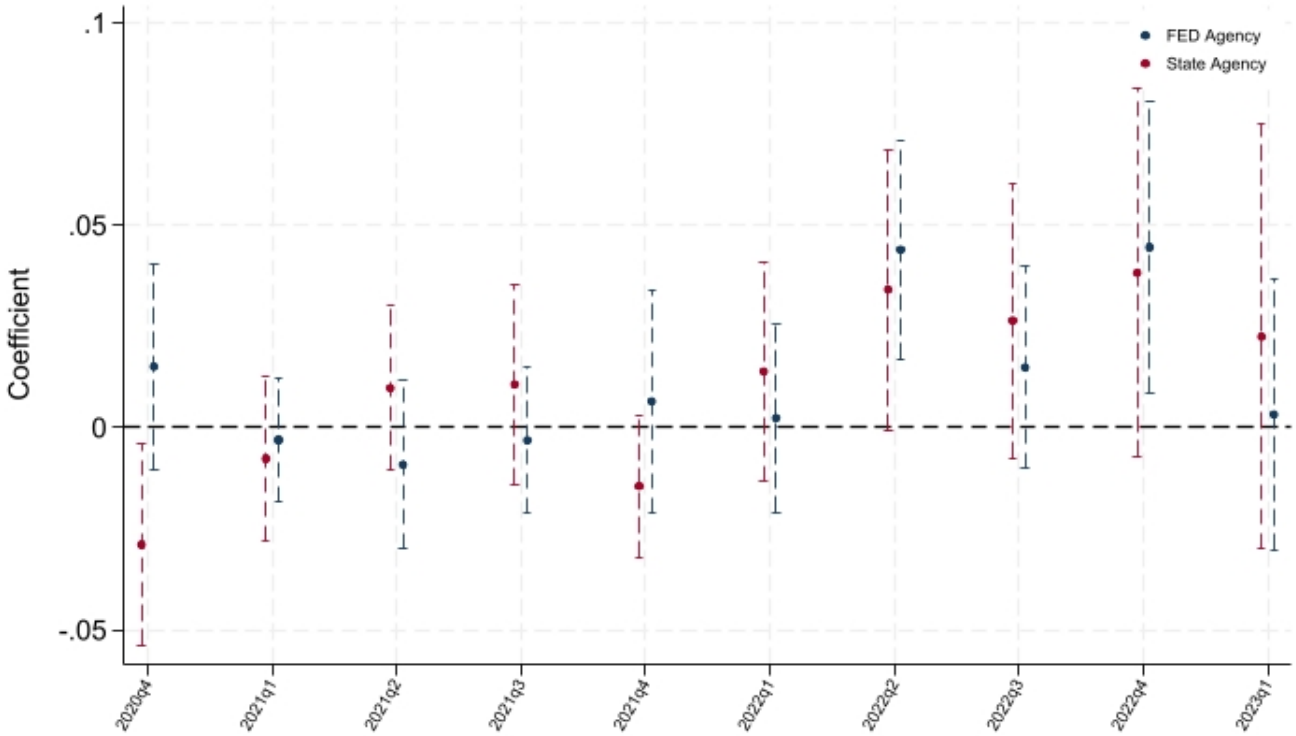
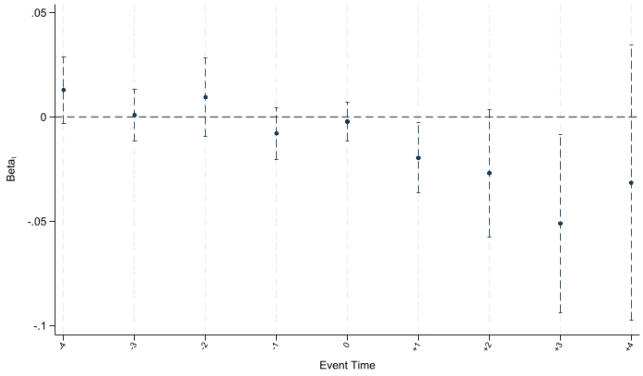
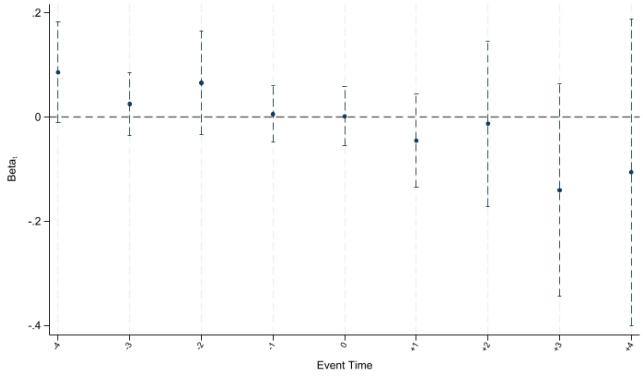


Figure 10: **Evolution of Interest rate risk exposure measures following a "S" or "L" downgrade**. We use CAMELS rating data from National Information Center (NIC) and banks' quarterly Call Reports to compute this figure.

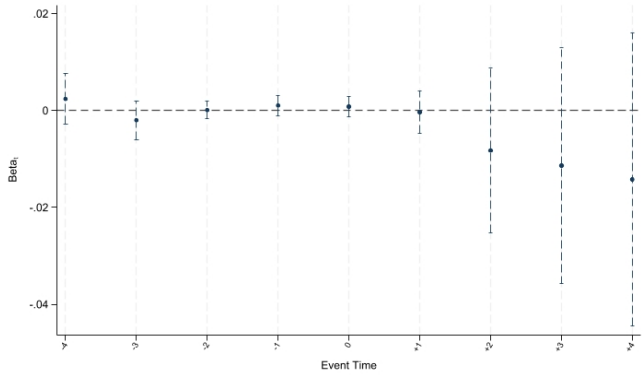
Panel A. Share of LT Sec.



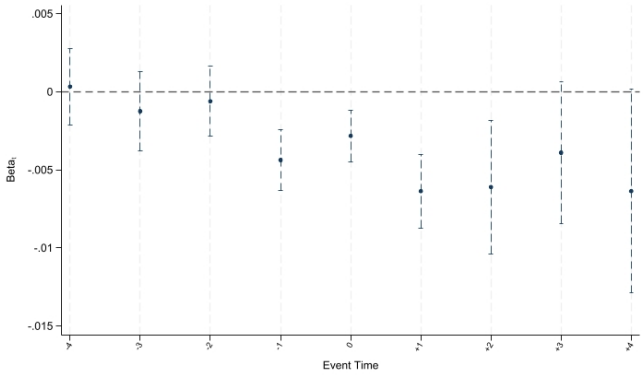
Panel B. Duration



Panel C. Hedging Intensity



Panel D. Total Securities (% Assets)



Panel E. Total Cash (% Assets)

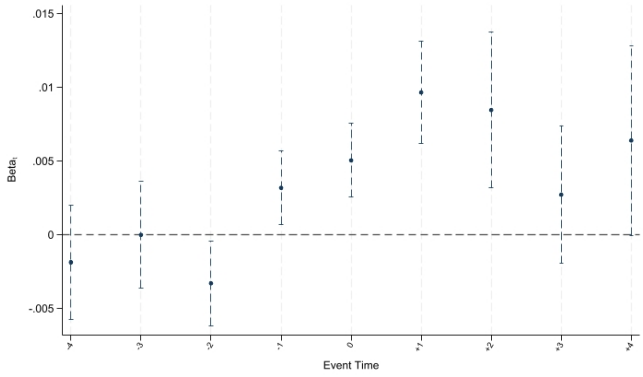


Table 1: Summary Statistics

Table 1 reports the summary statistics for our main sample. The unit of observation is at the examination level. Duration is defined as the sum of 0.25x(RCFDA549 +RCFDA555), 0.75x(RCFDA550+RCFDA556), 2.0x(RCFDA551+RCFDA557), 4.0x(RCFDA552+RCFDA558), 10.0x(RCFDA553+RCFDA559), and 25x(RCFDA554+RCFDA560) divided by the sum of RCFDA549, RCFDA550, RCFDA551, RCFDA552, RCFDA553, RCFDA554, RCFDA555, RCFDA556, RCFDA557, RCFDA558, RCFDA559, and RCFDA560. Share of LT Sec is defined as (RCFDA554+RCFDA560) divided by the sum of RCFDA549, RCFDA550, RCFDA551, RCFDA552, RCFDA553, RCFDA554, RCFDA555, RCFDA556, RCFDA557, RCFDA558, RCFDA559, RCFDA560. Hedging Intensity is defined as RCFD8725 divided by RCFD2170. If RCFD8725 is missing then we set Hedging Intensity to equal zero. Share Uninsured is defined as (RCONF047+RCONF045) divided by (RCONF045+RCONF047+RCONF049+RCONF051). If (RCONF045+RCONF047+RCONF049+RCONF051) is greater than zero, otherwise Share Uninsured is set to missing. Dep. Beta is the deposit expense beta as discussed in Drechsler et al. [2021]; Dep. Beta data are downloaded from Phillip Schnabl's webpage. Ln(Assets) is defined as ln(1+RCFD2170). Loans as % Total Assets is defined as RCFD2122 divided by RCFD2170. ROA is defined as RIAD4340 (annualized) divided by RCFD2170. LLR as a % Total Assets is defined as RCFD3123 divided by RCFD2170. NPL as a % Total Assets is defined as RCFD1403 divided by RCFD2170. Equity as % Total Assets is defined as RCFD3210 divided by RCFD2170.

	Pre-Tightening Exams			Post-Tightening Exams				
	Mean	St. Dev.	N	Mean	St. Dev.	N	Diff	t-stat
Duration	10.26	5.340	4445	9.760	5.360	2657	-0.500	-1.540
Share of LT Sec	0.220	0.230	4445	0.210	0.230	2657	-0.0100	-0.610
Hedging Intensity	0.0200	0.0500	4576	0.0100	0.0500	2701	0	-2.580
Share Uninsured	0.400	0.160	4576	0.430	0.150	2701	0.0300	4.030
Dep. Beta	0.320	0.0900	4576	0.320	0.0900	2701	0	-0.0900
Ln(Assets)	12.77	1.580	4576	12.88	1.570	2701	0.100	1.640
Loans as % Total Assets	59.06	16	4576	57.90	16.97	2701	-1.160	-0.850
ROA	0.0200	0.0200	4576	0.0100	0.0200	2701	-0.0100	-0.500
LLR as % Total Assets	0.850	0.400	4576	0.810	0.380	2701	-0.0400	-4.010
NPL as % Total Assets	0.440	0.650	4576	0.310	0.540	2701	-0.120	-4.850
Equity as % Total Assets	10.98	3.200	4576	9.250	3.730	2701	-1.730	-8.690

Table 2: Rating Downgrade and Interest Rate Risk Exposure

Table 2 reports the coefficients of OLS regressions examining the relation between CAMELS rating downgrade and interest rate risk exposure. *I(S-Downgrade)=1* and *I(L-Downgrade)=1* are indicator variables for whether there is a downgrade for S or L aspect of the CAMELS rating for a given bank. *Post* is the indicator variable that equals to one after the monetary tightening in the first quarter of 2022. We include controls for bank size, loan to asset ratio, ROA, loan loss reserve to asset ratio, non-performing loan to asset ratio, and equity to asset ratio. Bank sizes are defined as the natural logarithm of banks' total assets. In all other control variables, we divide the first term by banks' total assets to obtain the ratio. For each specification, we include quarter and banks' asset decile fixed effects. We also include bank fixed effects in Columns (2), (4), (6), and (8). CAMELS ratings data are from NIC database, share of long-term securities and portfolio duration are computed from banks' Call Reports. Call Report variable definitions can be found in the description of Table 1. Standard errors are presented in parentheses, and are clustered at the state level. ***, **, and *, represent statistical significance at 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	I(L-Downgrade)=1				I(S-Downgrade)=1			
Share of LT Sec	-0.003	-0.009			0.001	0.015		
	(0.002)	(0.018)			(0.004)	(0.013)		
Share of LT Sec × Post	0.022***	0.016			0.028***	0.018		
	(0.008)	(0.013)			(0.010)	(0.014)		
Duration			-0.001*	0.000			-0.000	0.004
			(0.000)	(0.003)			(0.001)	(0.003)
Duration × Post			0.006***	0.004**			0.006***	0.004
			(0.001)	(0.002)			(0.002)	(0.002)
Observations	7102	5620	7102	5620	7102	5620	7102	5620
Adjusted R^2	0.087	0.074	0.090	0.075	0.022	-0.006	0.024	-0.006
Other Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes

Table 3: Rating Downgrade and Interest Rate Risk Exposure

Table 3 reports the coefficients of OLS regressions examining the relation between CAMELS rating downgrade and interest rate risk exposure. *I(S-Downgrade)=1* and *I(L-Downgrade)=1* are indicator variables for whether there is a downgrade for S or L aspect of the CAMELS rating for a given bank. *Post* is the indicator variable that equals to one after the monetary tightening in the first quarter of 2022. We include controls for bank size, loan to asset ratio, ROA, loan loss reserve to asset ratio, non-performing loan to asset ratio, and equity to asset ratio. Bank sizes are defined as the natural logarithm of banks' total assets. In all other control variables, we divide the first term by banks' total assets to obtain the ratio. For each specification, we include quarter and banks' asset decile fixed effects. We also include bank fixed effects in Columns (2), (4), (6), and (8). CAMELS ratings data are from NIC database, share of long-term securities and portfolio duration are computed from banks' Call Reports. Call Report variable definitions can be found in the description of Table 1. Standard errors are presented in parentheses, and are clustered at the state level. ***, **, and *, represent statistical significance at 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	I(L-Downgrade)=1				I(S-Downgrade)=1			
Share of LT Sec	-0.010*	-0.002	-0.010*	-0.002	-0.010	0.029	-0.010	0.029
	(0.005)	(0.029)	(0.005)	(0.029)	(0.008)	(0.018)	(0.008)	(0.018)
Share of LT Sec × Post	-0.005	-0.019	-0.005	-0.019	-0.007	-0.008	-0.007	-0.008
	(0.013)	(0.019)	(0.013)	(0.019)	(0.008)	(0.015)	(0.008)	(0.015)
Pct Sec	0.132***	-0.073	0.132***	-0.073	0.012	0.038	0.012	0.038
	(0.032)	(0.212)	(0.032)	(0.212)	(0.033)	(0.204)	(0.033)	(0.204)
Share of LT Sec × Pct Sec	0.021	-0.040	0.021	-0.040	0.051	-0.087	0.051	-0.087
	(0.019)	(0.115)	(0.019)	(0.115)	(0.041)	(0.094)	(0.041)	(0.094)
Post × Pct Sec	0.116**	0.192*	0.116**	0.192*	0.200***	0.150	0.200***	0.150
	(0.046)	(0.103)	(0.046)	(0.103)	(0.048)	(0.112)	(0.048)	(0.112)
Share of LT Sec × Post × Pct Sec	0.092**	0.138*	0.092**	0.138*	0.105*	0.114	0.105*	0.114
	(0.041)	(0.072)	(0.041)	(0.072)	(0.055)	(0.080)	(0.055)	(0.080)
Observations	6963	5492	6963	5492	6963	5492	6963	5492
Adjusted R^2	0.098	0.081	0.098	0.081	0.030	-0.005	0.030	-0.005
Other Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes

Table 4: Rating Downgrade and Hedging

Table 4 reports the coefficients of OLS regressions examining the relation between CAMELS rating downgrade and hedging. *I(S-Downgrade)=1* and *I(L-Downgrade)=1* are indicator variables for whether there is a downgrade for S or L aspect of the CAMELS rating for a given bank. *Post* is the indicator variable that equals to one after the monetary tightening in the first quarter of 2022. *Hedging Intensity* is the ratio between the gross notional amount of interest rate derivatives for purposes other than trading and total assets. In each specification, we include controls for bank size, loan to asset ratio, ROA, loan loss reserve to asset ratio, non-performing loan to asset ratio, and equity to asset ratio. Bank sizes are defined as the natural logarithm of banks' total assets. In all other control variables, we divide the first term by banks' total assets to obtain the ratio. For each specification, we include quarter and banks' asset decile fixed effects. we also include bank fixed effects in Columns (2) and (4). CAMELS ratings data are from NIC database, share of uninsured deposits are from banks' quarterly Call Reports. Call Report variable definitions can be found in the description of Table 1. Standard errors are presented in parentheses, and are clustered at the state level. ***, **, and *, represent statistical significance at 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
	I(L-Downgrade)=1		I(S-Downgrade)=1	
Hedging Intensity	0.086	0.224	0.102	0.153
	(0.079)	(0.258)	(0.092)	(0.253)
Hedging Intensity × Post	-0.218*	-0.155	-0.209*	-0.059
	(0.128)	(0.174)	(0.120)	(0.175)
Observations	7277	5781	7277	5781
Adjusted R^2	0.084	0.070	0.018	-0.009
Other Controls	Yes	Yes	Yes	Yes
Quarter Fixed Effects	Yes	Yes	Yes	Yes
Bank Fixed Effects	No	Yes	No	Yes

Table 5: Rating Downgrade and Deposit Instability

Table 5 reports the coefficients of OLS regressions examining the relation between CAMELS rating downgrade and deposit instability. *I(S-Downgrade)=1* and *I(L-Downgrade)=1* are indicator variables for whether there is a downgrade for S or L aspect of the CAMELS rating for a given bank. *Post* is the indicator variable that equals to one after the monetary tightening in the first quarter of 2022. In Columns (1)-(4), *Share Uninsured* is the share of uninsured deposits of a given bank. In Columns (5) and (6), *Dep. Beta* is retail deposit beta computed by Drechsler et al. [2021]. In each specification, we include controls for bank size, loan to asset ratio, ROA, loan loss reserve to asset ratio, non-performing loan to asset ratio, and equity to asset ratio. Bank sizes are defined as the natural logarithm of banks' total assets. In all other control variables, we divide the first term by banks' total assets to obtain the ratio. For each specification, we include quarter and banks' asset decile fixed effects. we also include bank fixed effects in Columns (2) and (4). CAMELS ratings data are from NIC database, share of uninsured deposits are from banks' quarterly Call Reports. Call Report variable definitions can be found in the description of Table 1. Standard errors are presented in parentheses, and are clustered at the state level. ***, **, and *, represent statistical significance at 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	I(L-Downgrade)=1		I(S-Downgrade)=1		I(L-Downgrade)=1	I(S-Downgrade)=1
Share Uninsured	0.022	-0.052	-0.014	-0.181		
	(0.019)	(0.210)	(0.024)	(0.146)		
Share Uninsured × Post	0.057	0.073	-0.015	0.009		
	(0.043)	(0.077)	(0.037)	(0.060)		
Dep. Beta					0.004	-0.000
					(0.003)	(0.004)
Dep. Beta × Post					-0.001	-0.000
					(0.007)	(0.007)
Observations	7277	5781	7277	5781	7277	7277
Adjusted R^2	0.084	0.070	0.018	-0.009	0.084	0.018
Other Controls	Yes	Yes	Yes	Yes	Yes	Yes
Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	No	Yes	No	Yes	No	No

Internet Appendix for "How (in)effective was bank supervision during the 2022 Monetary Tightening?"

A Additional Results

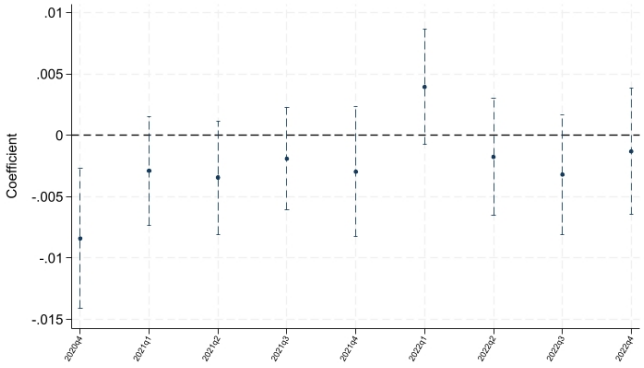
Table A.1: Rating Downgrade and Interest Rate Risk Exposure: Duration Measure

Table A.1 reports the coefficients of OLS regressions examining the relation between CAMELS rating downgrade and interest rate risk exposure. *I(S-Downgrade)=1* and *I(L-Downgrade)=1* are indicator variables for whether there is a downgrade for S or L aspect of the CAMELS rating for a given bank. *Post* is the indicator variable that equals to one after the monetary tightening in the first quarter of 2022. We include controls for bank size, loan to asset ratio, ROA, loan loss reserve to asset ratio, non-performing loan to asset ratio, and equity to asset ratio. Bank sizes are defined as the natural logarithm of banks' total assets. In all other control variables, we divide the first term by banks' total assets to obtain the ratio. For each specification, we include quarter and banks' asset decile fixed effects. We also include bank fixed effects in Columns (2), (4), (6), and (8). CAMELS ratings data are from NIC database, share of long-term securities and portfolio duration are computed from banks' Call Reports. Call Report variable definitions can be found in the description of Table 1. Standard errors are presented in parentheses, and are clustered at the state level. ***, **, and *, represent statistical significance at 1%, 5%, and 10% levels, respectively.

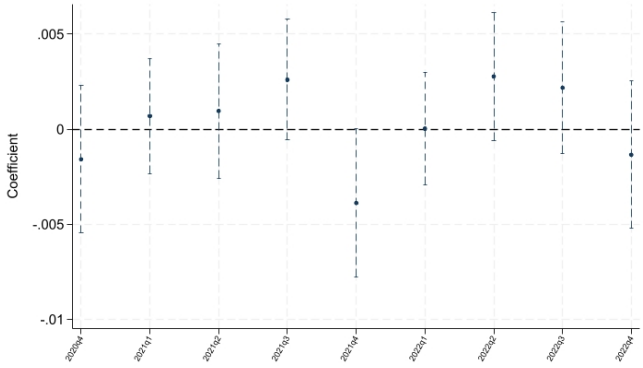
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	I(L-Downgrade)=1				I(S-Downgrade)=1			
Duration	-0.003***	0.002	-0.003***	0.002	-0.002	0.006	-0.002	0.006
	(0.001)	(0.004)	(0.001)	(0.004)	(0.001)	(0.004)	(0.001)	(0.004)
Duration × Post	0.001	-0.002	0.001	-0.002	-0.000	-0.001	-0.000	-0.001
	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)
Pct. Sec.	0.074	0.053	0.074	0.053	-0.101	0.221	-0.101	0.221
	(0.046)	(0.229)	(0.046)	(0.229)	(0.074)	(0.256)	(0.074)	(0.256)
Duration × Pct. Sec.	0.006	-0.011	0.006	-0.011	0.011	-0.017	0.011	-0.017
	(0.004)	(0.020)	(0.004)	(0.020)	(0.007)	(0.019)	(0.007)	(0.019)
Post × Pct. Sec.	-0.061	-0.087	-0.061	-0.087	0.010	-0.060	0.010	-0.060
	(0.090)	(0.159)	(0.090)	(0.159)	(0.145)	(0.222)	(0.145)	(0.222)
Duration × Post × Pct. Sec.	0.017**	0.028**	0.017**	0.028**	0.019	0.020	0.019	0.020
	(0.007)	(0.012)	(0.007)	(0.012)	(0.011)	(0.016)	(0.011)	(0.016)
Observations	6963	5492	6963	5492	6963	5492	6963	5492
Adjusted R^2	0.100	0.083	0.100	0.083	0.031	-0.004	0.031	-0.004
Other Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes

Figure A.1: "C", "A", "M", and "E" rating downgrades by Interest Rate Exposure Bin: Duration Measure

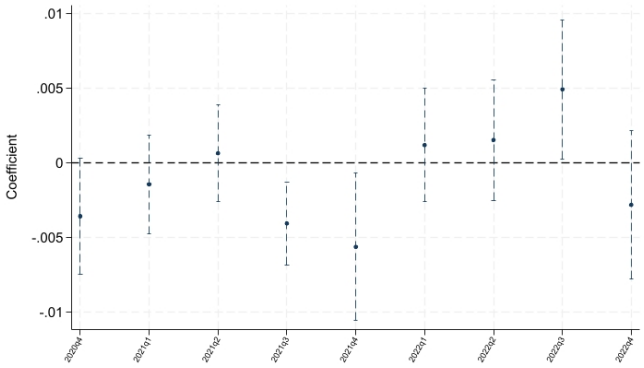
Panel A. "C" Rating



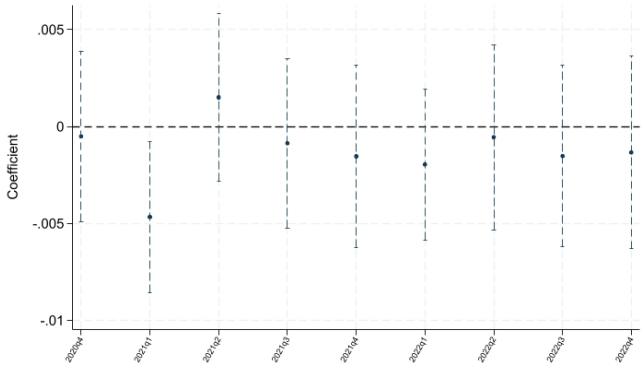
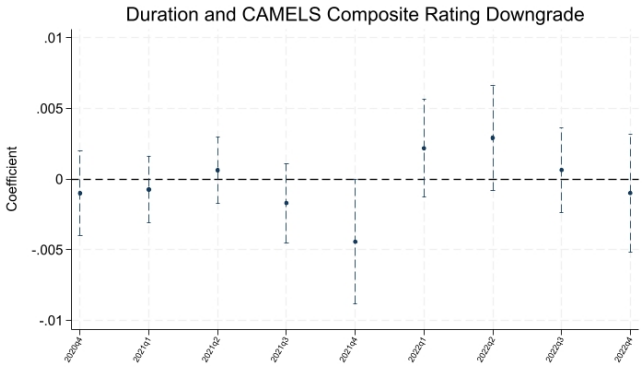
Panel B. "A" Rating



Panel C. "M" Rating



Panel D. "E" Rating



Panel E. Composite CAMELS Rating