CAMELS Ratings and Their Information Content[1]

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CAMELS Ratings and Their Information Content

ABSTRACT

In this paper, we examine CAMELS ratings, their information content, and their determinants over the period from 1984 to 2020. We find composite CAMELS risk ratings and the individual Management component rating have significant predictive power for future bank performance and risk measures relevant to banking regulators and supervisors. We also show that when the proportion of high-risk composite CAMELS ratings in the banking sector increases, this leads to a material contraction in bank loans and an increase in the unemployment rate in subsequent quarters.

I. Introduction

Recently, the Federal Deposit Insurance Corporation (FDIC) and the Board of Governors of the Federal Reserve System (FRB) requested information and comments regarding the "consistency" of CAMELS ratings assigned by banking supervisors to depository institutions.[2] The FDIC and the FRB also requested feedback regarding the use of CAMELS ratings by the bank regulatory agencies "in their bank application and enforcement action processes." In this paper, we aim to provide at least a partial response to the request from the FDIC and the FRB, by assessing the change in the information content of the CAMELS rating system from 1984 to 2020, and by examining how changes in macroeconomic conditions might have affected the information content of CAMELS ratings.

Understanding whether, and to what extent, the information content of the CAMELS rating system is useful in supervising and monitoring banks is important. First, the CAMELS rating system is intended to provide supervisors with a uniform and objective measure of banks' risk[3] that can be used to effectively identify weak, problem banks. At the end of the supervisory cycle, supervisors assign CAMELS ratings to banks on a 1-to-5 scale, where a rating of 1 is the highest rating, which indicates the least degree of supervisory concern; and where a rating of 5 is the lowest rating, which indicates the weakest performance, critically inadequate risk management practices, and therefore, the highest degree of supervisory concern.

Second, understanding the information content of the CAMELS ratings is important because banks that are assigned weak CAMELS ratings confront a number of potentially costly supervisory implications. For example, if a smaller community banking institution receives a weak CAMELS rating of 3 or worse, the institution will likely be subjected to more frequently scheduled examina-

[2] See FDIC and FRB Joint Notice (2019).

[3] The CAMELS ratings are also subjective, in that examiners assess bank management's risk management practices, and this is a substantive portion of the assessment. Some in the banking community have recently argued that CAMELS ratings should be completely objective-based performance measures. Using only financial measures, however, would not allow examiners to address proactively weak or insufficient practices that may lead to financial issues.

tions. In addition, concerns that are reflected in weak CAMELS ratings may need to be remedied before banks are allowed to take certain actions, such as merging with or acquiring other institutions, paying dividends, opening new branches, or engaging in new activities.

Third, supervisors often issue formal enforcement actions to banking institutions to address practices that the supervisors believe to be unlawful, unsafe, or unsound. The initial determination of whether formal action is required usually results from examination findings, and composite and individual component ratings assigned under the CAMELS rating system are significant indicators of the need for heightened supervisory attention, including enforcement actions for more problematic issues. Taken together, the potentially significant negative consequences of a weak CAMELS rating, imply that understanding the information content of CAMELS ratings and how changes in the banking system over time affects the information content of the CAMELS ratings system should be of primary importance to supervisors and relevant stakeholders.

Based on our analysis, we find that CAMELS ratings have significant predictive value for banks' future performance and risk that are important to bank regulators and supervisors, and other stakeholders. Our results indicate that both the CAMELS composite and Management component ratings have significant predictive power for features of the distribution of banks' return on assets (ROA), non-performing loans (NPL), stock returns, stock return volatilities, and market-to-book ratios. In particular, we find that weaker CAMELS ratings forecast significantly lower ROA, higher NPL, higher stock returns, higher stock return volatility, and lower market-to-book ratios.

In quantile regressions, we find that CAMELS ratings have more explanatory power for lower quantiles of ROA, and for higher quantiles of NPL, stock return volatility, and the market-to-book ratio. Overall, these results suggest that CAMELS ratings convey useful and important information about banks' financial conditions and operations for banking regulation and supervision, and that CAMELS ratings appear to contain more information for riskier and poorly-performing banks. These results show that supervisory examination ratings would be particularly useful for forecasting extreme movements in bank's target risk measures relevant to supervisors for purposes similar to

stress tests.

In further results, we find that CAMELS composite ratings have significant forecasting power for future bank failures. We also find, however, that Management ratings have less explanatory power for bank failure and that, the Management component ratings have little or no predictive power for bank failure, after controlling for the CAMELS composite ratings. The results indicate that a weak CAMELS rating leads to a large increase in banks' failure probability. These results suggest that, even after controlling for numerous publicly available factors, supervisors might have a substantial amount of private supervisory information, gathered from on-site examinations, related to bank risks that result in bank failure. Hence, understanding the observed and unobserved information contained in CAMELS ratings that can be used for failure prediction is particularly important to regulators and supervisors, to the extent that failures could result in losses to the deposit insurance fund and instability in the financial system.

We also examine whether CAMELS composite ratings and Management ratings are related to objective and observable risk factors. We examine the extent to which objective public information, such as that found in the Call Reports, can help to forecast CAMELS composite and Management ratings, in an attempt to assess how much private and proprietary information ratings may contain about banks' risk. While it is valuable to understand whether supervisory ratings are related to observable risk factors, supervisory rating systems could be even more valuable if they contain and convey a significant quantity of private supervisory (soft) information and unobserved proprietary information.

Taken together, our results suggest that the current CAMELS supervisory ratings system provides valuable information about the riskiness of banks and the banking system. Moreover, it appears that CAMELS supervisory ratings contain a succinct summary of a wealth of private and unobservable information about banks' risk and banking-system risk that is produced by examiners during an examination. Our results suggest that regulators, and related stakeholders, should be careful when assessing the need to make changes to the CAMELS supervisory rating system, since

the ratings already appear to provide valuable information. As such, regulators, supervisors, and other stakeholders should ensure that any revisions to ratings system should maintain, or attempt to improve upon the current information content of CAMELS ratings that we document in this paper, and that has been documented in previous empirical research.

II. Background and Related Research

Adopted by the Federal Financial Institutions Examination Council (FFIEC) in 1979, and revised in 1996, the United States uses a Uniform Financial Institutions Rating System (UFIRS), whereby each bank is assigned a uniform composite CAMELS rating during a full-scope, on-site safety and soundness examination by the Federal Reserve, the Office of the Comptroller of the Currency (OCC), the FDIC, or state banking supervisors. The composite CAMELS rating is based on the individual ratings of the following key components of a bank's financial condition and operations during an examination: (C) Capital Adequacy; (A) Asset Quality; (M) Management; (E) Earnings; (L) Liquidity; and (S) Sensitivity to Market Risk. Evaluations of the components consider the bank's size and sophistication, the nature and complexity of its activities, and its risk profile. It should be noted that the composite CAMELS ratings are not simply an average of the individual component ratings, but instead reflect examiners' informed judgment as to how the individual components ratings are combined to provide a summary measure of a bank's overall condition.

The composite CAMELS rating, and its component ratings, are expressed through a numerical scale of 1 through 5, with 1 being the highest rating and requiring the least degree of concern, and 5 being the lowest rating and, therefore, requiring the highest degree of supervisory concern, with these institutions displaying the weakest performance and management practices. In accordance with the Uniform Financial Rating System a problem bank is defined as an institution with a 4 or 5 composite rating. Since the 2007-09 financial crisis, problems at banks have typically involved asset quality, liquidity, and/or capital-driven with banks exhibiting elevated concentration (both assets and funding) levels with matching poor risk management practices which lead to capital

erosion. Since the early 2000s, Bank Secrecy Act (BSA) (also known as Anti-Money Laundering (AML)) examination findings in a safety and soundness context are considered when assigning the M component rating.

The primary purpose of the composite CAMELS ratings is not to identify future bank failures but to provide an assessment of a bank's overall condition.[4] CAMELS ratings are not always assigned during targeted examinations, and if they are, the ratings are typically those from the most recent full-scope examination, quarterly monitoring activities, or an interim examination.

From 1979 through 2004, the Federal Reserve used a composite risk rating for BHCs which was referred to as the BOPEC rating. The composite BOPEC rating was based on an assessment of the BHC's (B)Bank subsidiaries,(O) Other nonbank subsidiaries, (P) Parent company, (E) Earnings, and (C) Capital adequacy. Starting in January 2005, the Federal Reserve replaced the BOPEC ratings with a new BHC risk rating that emphasizes the BHC's ability to manage risk and implement sound controls across business lines. The new rating system, known as RFI/C(D), reflects Risk management (R), Financial condition (F), Impact on depositories (I)/Composite (C) (Depository institution rating (D)). Finally, in response to the financial crisis of 2007-09 and the Dodd-Frank Act of 2010, the Federal Reserve significantly changed the rating system in 2018 with the adoption of the new Large Financial Institution (LFI) rating system. The LFI rating system evaluates capital, liquidity, and governance and controls on a firm-wide basis (see Bergin and Stiroh (2020), for a detailed discussion).

Banks' CAMELS ratings are typically known by most of banks senior management and board of directors in addition to appropriate supervisory staff at the relevant supervisory agencies. Individual ratings are never made publicly available, even on a lagged basis. As such, the CAMELS rating reflects the private supervisory (soft) information gathered during a bank examination, as well as whatever public and regulatory information is available about the bank's condition. See, e.g., Eisenbach et al. (2015) and Lopez (1999), for a description of how supervisory ratings are used as

[4]CAMELS ratings and other tools, such as MRAs and EAs, are used to provide an incentive to management and the board to change their behavior before severe financial conditions are experienced.

part of the supervisory process.

Previous research has examined the information content, or predictive power, of CAMELS ratings for a variety of bank-specific market, performance, and regulatory variables, including stock returns, bond prices, ROA, future CAMELS ratings, and bank failure. Key questions addressed in the literature include the timeliness, accuracy, and private supervisory information decay rate of CAMELS ratings. Here, we discuss the empirical evidence from a representative sample of this extensive academic literature. It should be noted that most of the empirical work has been conducted on pre-1997 ratings data, and therefore, examined the information content of CAMEL ratings, instead of CAMELS ratings.[5]

Hirschhorn (1987) uses a one-factor quarterly market model for the 15 largest U.S. banks over the period 1978-1987 and finds that changes in the CAMEL rating were accompanied by stock market return changes in the predicted direction in the same quarter. Berger and Davies (1998) examine the information content of CAMEL ratings by testing for stock market reactions when new ratings are assigned. Despite the fact that CAMEL ratings are confidential, they find that CAMEL rating downgrades lead to negative excess stock returns. This result is interpreted as evidence that rating downgrades reveal negative private supervisory information about bank conditions. The evidence also suggests that the negative information may reach the market in part through loan quality data released in banks' quarterly financial statements.

Berger, Davies, and Flannery (2000) find that very recent BOPEC ratings contain information about bank conditions that goes beyond market data information, such as bond-rating downgrades. The evidence shows that the ratings information appears to become much less useful or stale over time. Deyoung, Flannery, Lang, and Sorescu (2001) find that CAMEL ratings have information content that is useful for predicting changes in the price of subordinated BHC debt. Cole, Gunther, and Cornyn (1995) and Cole and Gunther (1998) find that information contained in CAMEL ratings decays quickly when predicting bank failure from 1986 to 1992. They find that an early warning

[5]The sixth component (S), reflecting a bank's sensitivity to market risk, was added and used starting in 1997.

model using publicly available data is a better predictor of bank failure than the previous CAMEL rating is, once the rating is more than one or two quarters old. Hirtle and Lopez (1999) find evidence that suggests that CAMEL ratings cease to provide any useful information about the current condition of a bank after about six to twelve quarters. The results indicate that private supervisory information decays more rapidly for banks with weaker CAMEL ratings of 3, 4, or 5.

Kupiec and Lee (2012) find that banks with a high-risk composite CAMELS rating (3, 4 or 5) have significantly lower ROAs than those banks assigned a 1 or a 2 composite rating. Finally, Peek, Rosengren, and Tootell (1999) find that the proportion of U.S. banking assets in banks with composite CAMEL ratings of 5 improved the forecasts of future unemployment and inflation beyond what was incorporated in the predictions of private-sector forecasts.

III. Data

For our analysis, we use data from several sources. We gather data on banks' CAMELS and CAMELS component ratings from confidential and proprietary data sources located in the OCC's internal data library. Commercial bank financial data are obtained from the FFIEC 031 data filings and financial data for BHCs come from the FR-Y9C data set.

The OCC maintains data on active composite CAMELS and component supervisory ratings, as of the final Call Report data filing date. This database provides the current composite CAMELS ratings and the individual component ratings on the scales from 1 to 5. For our analysis, we calculate two sets of measures of the CAMELS composite rating and the Management component rating that we use in the analysis. We calculate dummy variables for the values of 2 and 3 and a dummy variable for the combined level of 4 and 5 for both the CAMELS composite and Management rating. We also calculate separate dummy variables equal to one for banks with a 3, 4, or 5 rating for either the composite CAMELS rating or the Management component rating.

We calculate several variables that we use as either predictor variables or dependent variables in our analysis from the FFIEC 031 database. The first set we calculate directly from several

balance-sheet variables. We calculate a measure of bank size which is the log of RCFD2170. We calculate a measure of a bank's balance sheet equity capital ratio which is RCFD3210/RCFD2170. We calculate total loans to assets as RCFD2122/RCFD2170 and total loan growth as the time-series change in the log of RCFD2122. We construct two balance-sheet measures based on deposits as brokered deposits to assets as RCON2365/RCFD2170 and total deposits to assets as RCON2200/RCFD2170. We include subordinated notes and debentures as a share of total assets as RCON3200/RCFD2170. We measure NPL ratio as the sum of RCFD1403 + RCFD1406 + RCFD1407 divided by RCFD2170. We calculate a measure of non-core deposit funding as RCFD2170 minus RCFD3210 minus RCON2200 all divided by RCFD2170.

The next set of variables are derived, at least in part, from the FFIEC 031 income-statement data. Because the income-statement data are presented cumulatively over the four quarters of banks' fiscal years in the FFIEC 031 filings, we derive quarterly values of all income-statement variables by calculating the time-series difference of income-statement variables for the second, third, and fourth quarters. We calculate a measure of the ROA as RIAD4340/RCFD2170. We calculate loan loss provisions to assets as RIAD4230 divided by RCFD2170. We construct a measure of net interest margins as RAID4074 divided by RIAD4073. We also include salaries and employee benefits as a share of total assets as RIAD4135 divided by RCFD2170. Finally, we calculate non-interest expense to income as RIAD4093 divided by RIAD4340.

We also calculate a measure of bank failure and assistance transactions for failure and assistance forecast models. We use the FDIC's bank failure and assistance database to identify the effective date and quarter listed for failures and assistance transactions. We first calculate a dummy variable equal to one for the quarter in which a bank has an effective date listed for a failure and assistance transaction. We then calculate a second dummy variable which is equal to one at quarter dated t if a bank fails during quarter $t+1$, $t+2$, $t+3$, or $t+4$.

We calculate four stock market valuation based measures of risk for the direct bank holding company of a bank. First, we gather data on publicly traded companies' stock price data from the

Center for Research in Security Prices (CRSP) database. We calculate stock price based measures for the (highest) bank holding holding company for each commercial bank where stock market valuation data are available for the bank holding company. Data on bank holding companies and commercial banks from the internal OCC data system are linked based on links we identify between bank holding company regulatory RSSDIDS and CRSP PERMCO IDs from the Federal Reserve Bank of New York website.

From the CRSP database, we first use daily prices to calculate the daily market value of equity which is the CRSP share price, PRC, multiplied by shares outstanding, SHROUT. We use the market value of equity to calculate a bank's market-to-book ratio, which is the CRSP equity market value divided by holding company book equity, BHCK3210, from the FR-Y9C database.

We calculate daily stock returns as the date t stock price divided by the date $t-1$ stock price, and we calculate quarterly stock returns with the quarter-end stock price using the last available closing stock price for each calendar quarter for the bank in the CRSP database. We use the quarterly stock return directly as a dependent variable in our analysis. We use the daily stock prices to calculate equity betas and stock return volatility estimates for each bank. We calculate equity betas for each bank as the regression coefficient estimate on the CRSP value-weighted index daily excess stock return, in a market model regression of banks' daily excess stock return on the CRSP value-weighted index excess return. And, finally, we calculate stock return volatility as the standard deviation of a bank's daily stock returns calculated separately for non-overlapping calendar quarters. We annualize the stock return volatility measures by multiplying the standard deviation of stock returns by 100 times the square root of 252.

IV. Results

To start our analysis, we examine the partial correlations between the CAMELS composite ratings and the individual CAMELS component ratings over the entire sample period from 1984:Q1 to 2020:Q3. These partial correlations are presented in table II. The partial correlation matrix

shows that the Management component rating has, by far, the largest partial correlation with the CAMELS composite rating of about 0.65; and that the capital adequacy, asset quality, and earnings ratings each have partial correlations of 0.27, 0.32, and 0.24, respectively.

The partial correlations suggest that the Management component might be the most informative sub-component of the CAMELS supervisory ratings system. Therefore, this result provides motivation for our analysis that focuses largely on examining the information content of both the CAMELS composite and Management component ratings separately.

Table I presents CAMELS ratings transition matrices for three separate time periods, 1984-2006, 2007-2009, and 2010-2020. The ratings transitions provide information on the characteristics of ratings changes over time. The three panels show that CAMELS composite ratings appear slightly more stable during the non-crisis periods of 1984-2006 and 2010-2020, in comparison to the crisis period of 2007-2009. The main result that stands out is that, for the 2007 to 2009 crisis period, there appears to be more transitions from the 4-rating category to the 5-rating category, and few transitions out of the 5-rating. Otherwise, in the non-stress periods, there appears to be more transitions from the 3-rating to less risky 1- and 2-ratings.

A. Fixed-Effects Regression Analysis

The first set of regression results, presented in table IV, show the ability of CAMELS ratings to forecast one quarter ahead ROA and NPL. In columns (1) through (4), the regression specifications only include composite CAMELS ratings and time- and bank-fixed effects. The results indicate that weaker (i.e., higher values) CAMELS ratings forecast both lower ROA and higher NPL. Similarly, when we also control for our full set of control variables in columns (5) through (8), we still find that weaker CAMELS ratings forecast lower ROA and higher NP. However, in columns (5) through (8), we see that controlling for other observable factors only slightly weakens the ability of CAMELS ratings to forecast ROA and NPL. Taken together, these results suggest that much of the information in CAMELS ratings is unobservable relative to the set of core forecasting control

variables, which capture the vast majority of key variables that are thought to determine bank risk. This result suggests that it is possible that supervisors incorporate a substantial amount of important unobserved information in CAMELS ratings during bank examinations which forecasts ROA and NPL.

The second set of results, presented in tables V and VI, include regression specifications with the Management rating along with the CAMELS composite ratings in several of the specifications. The results in table V include time- and bank-fixed effects but do not include bank-level control variables. The results in table VI, include both bank- and time-fixed effects, as well as bank-level control variables. Overall, the results show that, in specifications without the CAMELS composite rating, the Management component ratings have statistically significant forecast power for both ROA and NPL in specifications with and without bank-level control variables. In addition, as with the composite rating, it appears that including bank-level control variables only slightly reduces the magnitude of the coefficient estimates on the Management rating variables. Therefore, as with the CAMELS composite rating, it appears that there could possibly be a significant amount of unobserved information in the Management component rating.

However, the results in tables V and VI show that the Management component rating loses significant explanatory power for predicting ROA and NPL, when controlling for the composite rating. Therefore, it appears that the CAMELS composite rating contains significantly more information, either public or private, than the Management component alone.

In the next set of results, we examine whether CAMELS ratings forecast important stock-market-based measures of banks' risk factors. As we stated earlier, since several authors have found that stock market values have significant predictive power for bank distress, especially during economic downturns, it is important to understand whether CAMELS ratings might anticipate or contain some of the information contained in stock market prices.

In tables VII through IX, we include results for regression models in which we forecast stock-market variables with either the CAMELS composite rating or the Management rating. In table

VII, we include forecast results where we include the supervisory ratings and bank- and time-fixed effects, but omit bank-level control variables.

Overall, the results show that both the Management and composite CAMELS ratings forecast lower stock returns and market-to-book equity ratios and higher stock return volatility. In particular, it appears that CAMELS ratings have particularly strong predictive power for stock return volatility and market-to-book ratios. Interestingly, in contrast to the previous results, the Management rating has slightly more predictive power for stock returns and equity betas. However, we note that the results for average stock returns and equity betas do not appear to be robust, or as consistent, as the stock return volatility and market-to-book ratio results.

B. Quantile Regression Analysis

The results in the previous section described how ratings predict the mean of ROA, NLP, and the stock market variables. However, ex-ante, we have no specific reason to expect that CAMELS ratings would only forecast changes in the mean of ROA, NLP, and the stock market factors. We could also expect that supervisory risk ratings could forecast changes in different quantiles of the distribution of these variables. For example, if supervisors gather more information, or more precise information about poorly performing banks, we might expect that CAMELS ratings could forecast weaker performance for more poorly-performing banks. For example, we might expect that ratings could have more predictive power for ROA for those banks on the lower end of the ROA distribution, or more predictive power for NPL for those banks on the higher end of the NPL distribution.

Therefore, to understand whether the predictive value of supervisory risk ratings varies over the distribution of the dependent variables that we forecast, we re-estimate bank-level fixed-effects quantile regressions for each decile of the dependent variables' distribution from the first through the ninth deciles. In addition, in each quantile regression, we include the full set of bank- specific control variables and year fixed-effects.

Because of the large number of potential estimates that we need to present, we only present results for our individual dummy variables for each level of the CAMELS composite and Management ratings dummy variables. To efficiently present these results, we present plots of the coefficient estimates for each rating-level dummy variable for each decile of each dependent variable. We present these plots in figures 1 through 6.

In the first results for ROA, presented in figures 1 and 2, we see that CAMELS ratings and Management ratings have significantly larger predictive power for lower deciles of the ROA distribution, and that the CAMELS composite rating has larger coefficient estimates in absolute value than those associated with the Management rating. These results suggest that regulatory ratings have more information for the low end of the earnings distribution and that the average relation we observed in the fixed-effects mean regressions, understated the fuller extent of the information that ratings have for the distribution of banks' ROA.

In figures 3 and 4, we see that ratings have larger coefficient estimates for the upper deciles of the NPL distributions. Also, again, as with the ROA results, we see that the CAMELS composite ratings have larger coefficient estimates than the Management component ratings. This again suggests that mean regressions mask that regulatory ratings have more predictive power and information for banks in the upper end of the loan loss distribution.

In the next set of plots presented in figures 3 through 6, we present the quantile regression results for the stock-market variables. The results for stock returns and CRSP value-weighted equity betas have an interesting pattern relative to the other results that are presented in figures 3 and 4. These results indicate that the highest risk supervisory ratings in levels 4 and 5 have the most pronounced relation with quantiles of stock returns and CRSP equity betas. These figures show that ratings are associated with lower stock returns and betas at lower quantiles, and higher betas and returns at higher quantiles.

One interpretation of these results is that, they suggest weaker ratings forecast a greater spread or variance in future return and equity beta distributions. This suggests that weaker ratings forecast

an increase in the riskiness of banks' stock price distributions, which could be a useful insight for assessing the likelihood of losses for weak, problem banks.

The next set of quantile regression results are for stock return volatility, presented in figure 5. The figure shows that weaker CAMELS composite ratings and Management ratings forecast higher stock return volatility. The figure also shows that weaker ratings forecast greater increases in volatility at the upper end of the volatility distribution. Again, as in the ROA and NPL quantile regression results, CAMELS ratings contain more information for banks at the riskier end of the distribution.

The results for the quantile regressions for the market-to-book ratio are presented in figure 6. Similar to the other quantile regression results, CAMELS composite ratings and Management ratings appear to have a negative impact on the market-to-book ratio. Also, the CAMELS composite rating has a more negative impact on the market-to-book ratio at higher deciles of the distribution. Typically, it is thought that high market-to-book banks are those that have high growth options and expected future profitability. While these higher market-to-book-ratio banks could be riskier, unlike for low ROA and high NPL quantile banks, higher market-to-book banks would not probably be considered to be poorly performing. It appears that weaker CAMELS ratings tend to forecast larger decreases in market-to-book ratios for banks that had better, rather than worse, expected growth and future expected profitability.

C. Bank Failure Predictions

Next, we present results regarding the ability of CAMELS ratings to predict our indicator for bank failure and assistance transactions, which we generically refer to as failures. In these models, we use a binary Logit model to forecast whether a bank fails over the coming year, or four quarters. For example, we would have used data from the fourth quarter of 2019 to forecast whether a bank failed over the period from the first through the fourth quarter of 2020. In the results we present, the coefficient estimates are interpreted as the change in the log of the odds ratio for the probability

of failure relative to a CAMELS composite rating equal to 1 or a Management rating equal to 1.

These results show that both CAMELS composite and Management ratings have significant predictive power for future bank failures. Overall, high-risk CAMELS composite ratings are associated with significantly higher failure probabilities. For example, the coefficient estimate for a CAMELS composite rating of 3, 4, or 5 suggests that high-risk CAMELS ratings increase the odds ratio for failure by about 2.10 to 2.20, which implies a failure probability that is greater by about 0.68 or 0.69 on a 0 to 1 scale. The coefficient estimates on the CAMELS rating dummy variables for ratings of 3 or 4 and 5 suggest even larger forecast effects of weaker CAMELS ratings relative to low-risk CAMELS ratings equal to 1.

These estimates imply that the majority of high-risk CAMELS rated banks fail, and that these banks have severe problems by the time they receive low CAMELS ratings. Moreover, given that we control for a wide range of observable variables, this implies that observable information gathered by supervisors during bank examinations could potentially contain a significant amount of information for bank-failure forecasts.

Finally, the Management rating has much less information for bank failure than the composite CAMELS rating, and that the information that the Management ratings has for failure largely overlaps with the information in the CAMELS composite ratings.

D. Determinants of CAMELS Ratings

The next set of results examines the observable determinants of CAMELS composite and Management ratings. These results are included in table XI. Overall, the results show that CAMELS composite and Management ratings are explained by numerous factors that are commonly thought to capture bank risk. Better supervisory ratings are forecasted by lower ROA, higher equity to assets, loan loss provisions, net interest margins, loan growth, sales to assets, and total assets, salaries to assets. Worse CAMELS ratings are forecasted by higher NPL, loans to assets, subordinated debt to assets, brokered deposits to assets, and non-interest expense to assets. We also see

that greater subordinated debt forecasts better Management ratings overall and better CAMELS ratings, once we control for lagged CAMELS ratings. Finally, we see that lagged CAMELS ratings forecast an odds ratio of a future high-risk CAMELS almost equal to one, which suggests that conditional on lagged information, that CAMELS ratings are extremely persistent and that banks have an extremely low probability of improving their composite rating.

E. Aggregate analysis

In this section, we examine whether banks' supervisory information contained in the CAMELS composite ratings has predictive power for future changes in real macroeconomic variables. The private (soft) information contained in the CAMELS ratings about problems in the U.S. banking sector produced by supervisors during examinations may serve as an early warning indicator of deteriorating conditions in the real economy.

We employ a structural vector autoregression (VAR) model, which explicitly accounts for the endogenous feedback between the macro-economy and the credit system. The VAR model traces out the dynamic responses of aggregate bank balance sheets (log levels of deposits, loans, and securities) as well as macroeconomic variables (the unemployment rate and log CPI) to innovations in the high-risk U.S. banking sector (measured as the proportion of high-risk CAMELS composite rating).

The structural VAR is identified with the following Choleski recursive ordering: the unemployment rate, the log of CPI, and log levels of the three bank balance sheet variables (deposits, loans, securities), all deflated by the CPI, the share of high-risk CAMELS ratings, and the Fed Funds Rate.[6] We calculate an asset weighted-average of the high-risk CAMELS composite ratings (measured as rating 5; ratings 4 and 5; ratings 3, 4 and 5) within a given quarter to capture the bank supervisory information regarding problems in the banking sector. In the recursive ordering, the

[6]The data on the unemployment rate, CPI, and Fed Funds Rate are obtained from the St. Louis Fed's FRED database. The bank balance sheet variables are aggregated using the Call Report data for the banks that have a CAMELS rating.

macroeconomic variables are ordered first and the Fed Funds Rate is ordered last because the funds rate is expected to respond to these variables contemporaneously at a quarterly frequency. The VAR is estimated over the period 1988:Q1 to 2020:Q3, with two quarterly lags which are consistent with the six monthly lags that were used in previous empirical work using the same approach ((Bernanke and Blinder, 1992)).

The impulse response functions (IRFs) presented in Figure 7 trace out the dynamic responses of the variables to innovations in the share of high-risk CAMELS ratings. There is a significant lending response to a high-risk CAMELS shock, with a decline in bank loans, despite an accommodative monetary policy. We also find a significant increase in the unemployment rate; the impact starts gradually and reaches its peak after about four quarters.

Table XII presents the forecast error variance decompositions (FEVD) for various horizons. The FEVD provides the share of forecast error variance explained by a given shock. In this case, we examine a shock to the proportion of high-risk ratings, where the proportion of high-risk CAMELS ratings is defined as a share of composite ratings 3, 4, and 5 in total ratings.[7]

After four quarters, a shock to the proportion of high-risk composite CAMELS ratings explains about 8 percent of the variation in the unemployment rate and 10 percent of the variation in loans. After a period of three years, almost 20 percent of the variation in the unemployment rate and 25 percent of the variation in loans is explained by this shock.

V. Conclusion

In this paper, we examine CAMELS ratings, their information content, and their determinants over the period from 1984 to 2020. We find composite CAMELS risk ratings, and the individual Management component rating, have significant predictive power for future bank performance and risk measures relevant to banking regulators and supervisors. We also find that CAMELS ratings have significant predictive power for aggregate variables in the economy, including the

[7]The results are qualitatively similar when the high-risk rating groups are defined as 5, or 4 and 5.

unemployment rate and bank lending in the economy.

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Figure 1. ROA Quantile Regression Coefficients

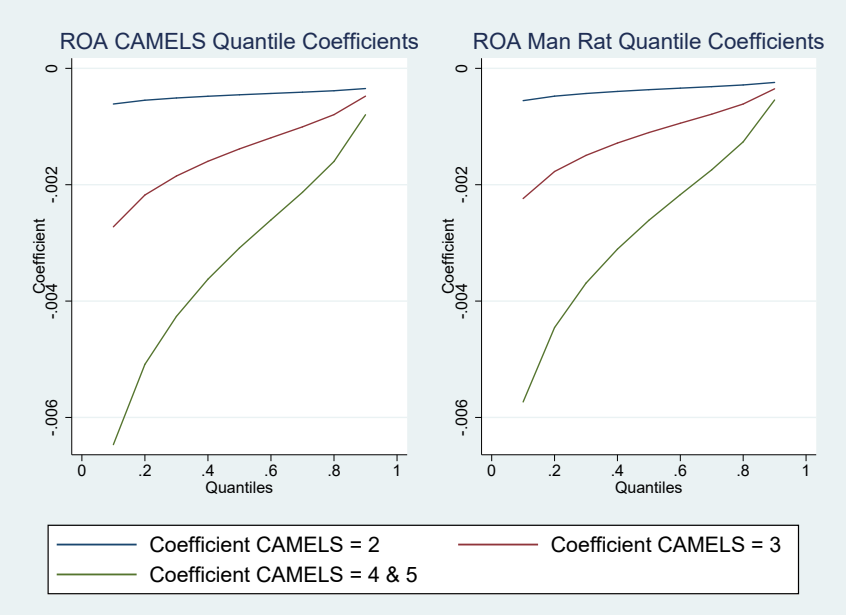

Figure 2. NPL Quantile Regression Coefficients

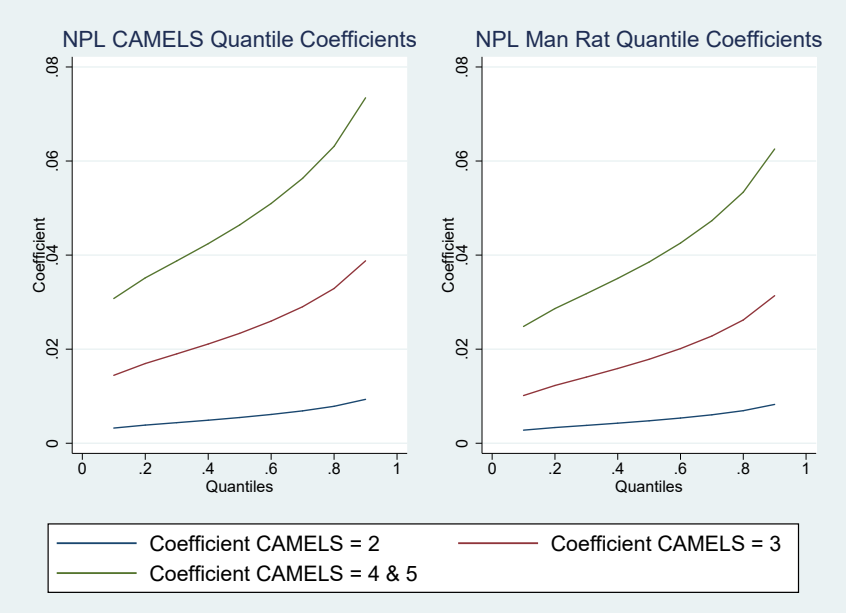

Figure 3. Stock Return Quantile Regression Coefficients

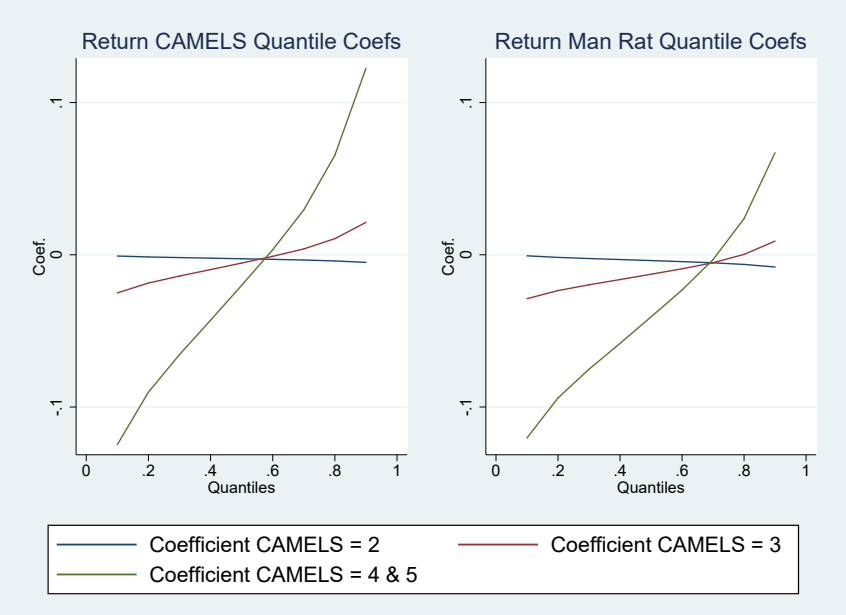

Figure 4. Beta Quantile Regression Coefficients

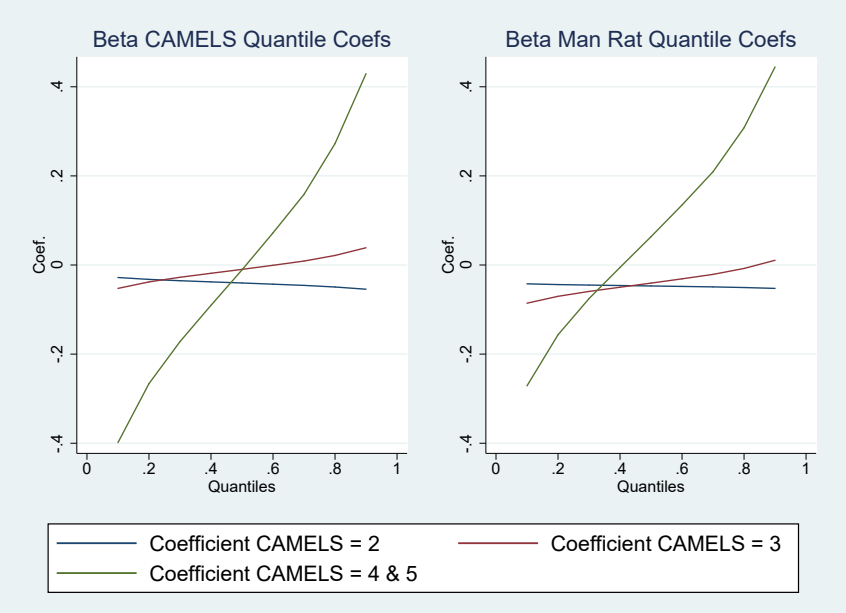

Figure 5. Stock Vol Quantile Regression Coefficients

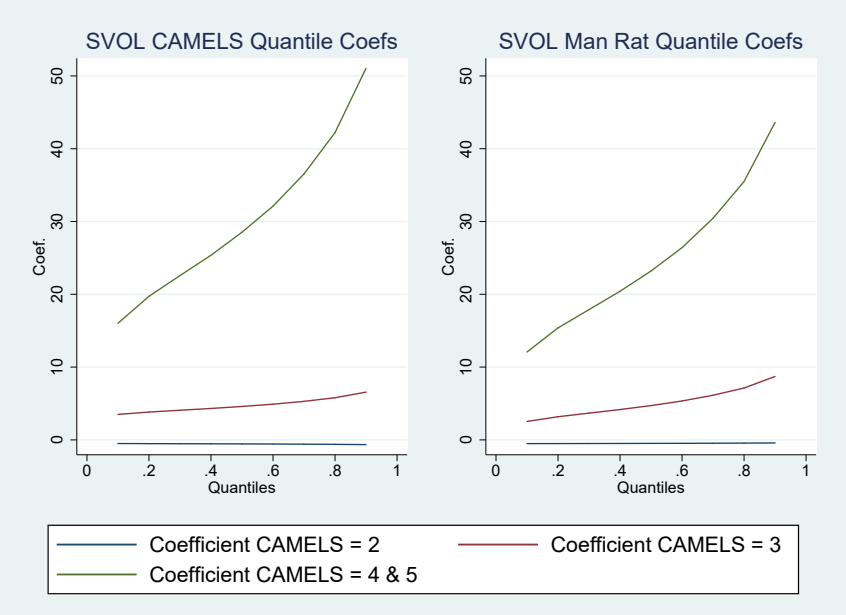

Figure 6. MB Ratio Quantile Regression Coefficients

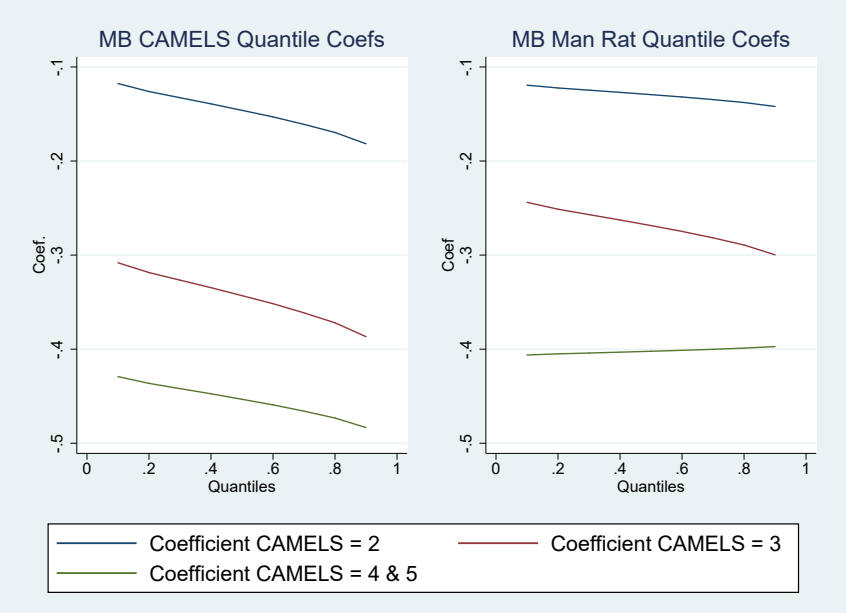

Figure 7. VAR Analysis

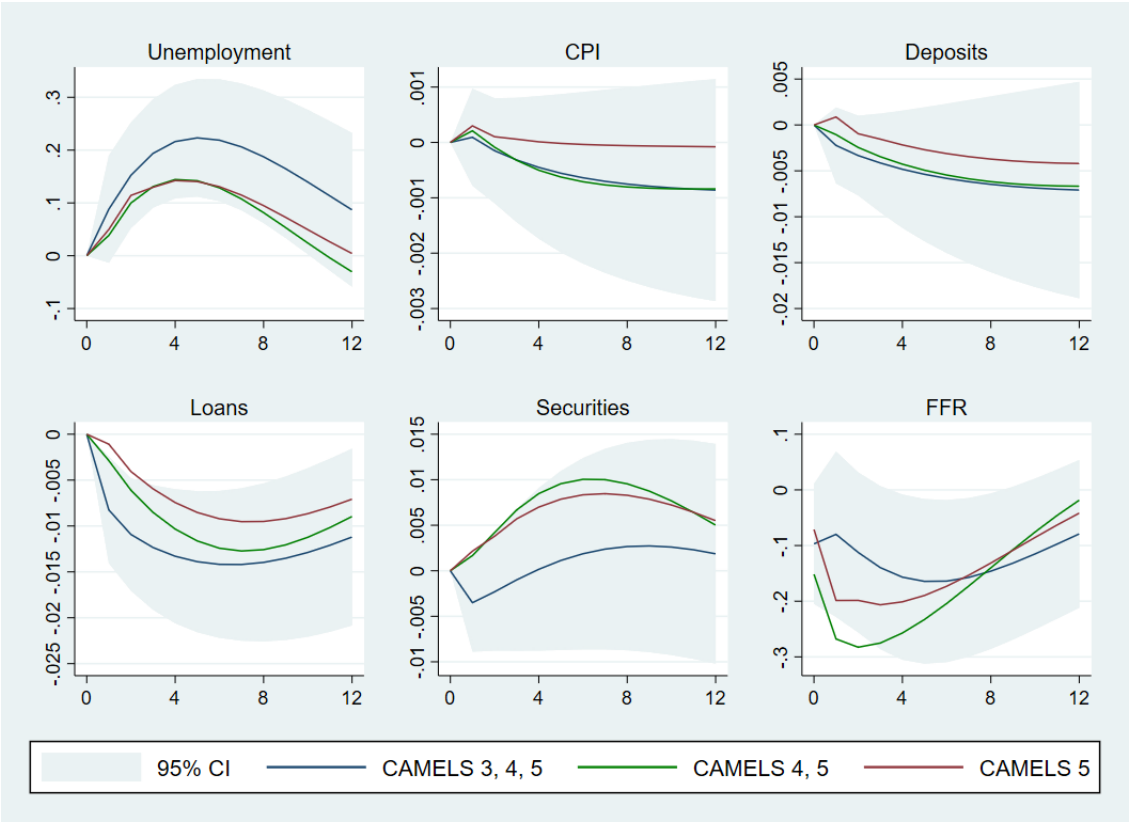

Table I. Transition Matrices

Panel A. Transitions 1984-2006

CAMELS_{t-1} \ CAMELS_t	1	2	3	4	5
1	0.97	0.03	0.00	0.00	0.00
2	0.02	0.97	0.01	0.00	0.00
3	0.00	0.09	0.87	0.03	0.01
4	0.00	0.01	0.09	0.85	0.05
5	0.00	0.00	0.02	0.07	0.91

Panel B. Transitions 2007-2009

CAMELS_{t-1} \ CAMELS_t	1	2	3	4	5
1	0.95	0.05	0.00	0.00	0.00
2	0.01	0.97	0.02	0.00	0.00
3	0.00	0.05	0.89	0.05	0.01
4	0.00	0.01	0.04	0.79	0.15
5	0.00	0.00	0.00	0.03	0.97

Panel C. Transitions 2010-2020

CAMELS_{t-1} \ CAMELS_t	1	2	3	4	5
1	0.97	0.03	0.00	0.00	0.00
2	0.01	0.99	0.01	0.00	0.00
3	0.00	0.10	0.88	0.02	0.00
4	0.00	0.00	0.09	0.87	0.04
5	0.00	0.00	0.01	0.05	0.94

Table II. Partial Correlation Matrix CAMELS and CAMELS Component Ratings

	CAMELS	Cap	AQ	Man	Earn	Liq	Sens
CAMELS	1.00						
Cap	0.27	1.00					
AQ	0.32	0.18	1.00				
Man	0.65	-0.07	0.07	1.00			
Earn	0.24	0.18	-0.01	0.04	1.00		
Liq	0.09	0.24	0.07	0.02	0.02	1.00	
Sens	0.11	0.01	-0.05	0.08	0.12	0.16	1.00

Table III. Summary Statistics

Variable	Mean	St. Dev.	Acronym	Definition
CAMELS Composite Rating	1.953	0.77	CAMELS	
MANAGEMENT Rating	2.012	0.752	Man. Rat.	
Return on Assets	0.002	0.004	ROA	RIAD4340/RCFD2170
NPL to Assets	0.036	0.034	NPL	(RCFD1403 + RCFD1406 + RCFD1407) / RCFD2170
Log of Assets	11.535	1.464	Size	log(RCFD2170)
Equity to Assets	0.11	0.08	Equity	RCFD3210/RCFD2170
Subordinated Debt to Assets	0.001	0.003	SubDebt	RCFD3200/RCFD2170
Total Loans to Assets	0.554	0.182	Loans	RCFD2122/RCFD2170
Brokered Deposits to Assets	0.008	0.031	Brok. Dep.	RCON2365/RCFD2170
Total Deposits to Assets	0.828	0.158	Tot. Dep.	RCON2200/RCFD2170
Cash to Assets	0.078	0.069	Cash	RCFD0010/RCFD2170
Loan Loss Provisions	0.001	0.002	LLP	RIAD4230/RCFD2170
Net Interest Margin	2.529	3.693	NIM	RAID4074/RIAD4073
Loan Growth	0.021	0.071	Loan Growth	$\log(\text{RCFD2122})_t$-log of RCFD2122_{t-1}
Non-core Liabilities	0.052	0.073	Non-core Liab.	(RCFD2170 - RCFD3210 - RCON2200) / RCFD2170
Salaries to Assets	1.658	4.317	Salaries	RIAD4135/RCFD2170
Non-interest Expense to Income	3.345	9.088	L.L.Non-int. Exp.	RIAD4093/RIAD4340
Observations	375,982			

Table IV. CAMELS Forecasts of One-Quarter-Ahead ROA and NPL

	(1) ROA	(2) NPL	(3) ROA	(4) NPL	(5) ROA	(6) NPL	(7) ROA	(8) NPL
L.CAMELS = 2	-0.001***	0.007***			-0.000***	0.006***		
	(-20.02)	(21.85)			(-18.93)	(19.86)		
L.CAMELS = 3	-0.002***	0.030***			-0.001***	0.025***		
	(-38.19)	(52.09)			(-36.54)	(45.79)		
L.CAMELS = 4/5	-0.004***	0.059***			-0.003***	0.049***		
	(-38.79)	(51.80)			(-38.73)	(45.70)		
L.CAMELS = 3/4/5			-0.002***	0.031***			-0.001***	0.025***
			(-40.08)	(55.35)			(-39.81)	(48.94)
L.Size					0.000***	0.003***	0.000***	0.002***
					(8.72)	(6.49)	(9.81)	(4.41)
L.Equity					-0.004***	0.020	-0.003*	-0.003
					(-3.57)	(1.90)	(-2.26)	(-0.23)
L.SubDebt					0.004	0.154*	0.005	0.133
					(0.58)	(2.28)	(0.68)	(1.86)
L.Loans					0.001***	0.007***	0.001***	0.006***
					(4.06)	(4.26)	(4.29)	(3.74)
L.Brok. Dep.					-0.002***	0.034***	-0.003***	0.039***
					(-3.69)	(5.01)	(-4.09)	(5.42)
L.Total Dep.					0.000	0.012	0.001	0.010
					(0.40)	(1.29)	(0.62)	(0.95)
L.Cash					-0.001***	-0.008**	-0.002***	-0.007*
					(-5.56)	(-2.59)	(-5.71)	(-2.26)
L.LLP					-0.203***	2.811***	-0.216***	2.981***
					(-28.24)	(50.65)	(-29.54)	(52.29)
L.NIM					0.000***	-0.000***	0.000***	-0.000***
					(10.09)	(-3.30)	(10.40)	(-3.92)
L.Loan Growth					0.000	-0.056***	0.001***	-0.060***
					(1.75)	(-46.00)	(3.82)	(-47.17)
L.Non-core Liab.					-0.000	0.009	0.000	0.008
					(-0.10)	(0.92)	(0.07)	(0.71)
L.Salaries					-0.000	0.000	-0.000	-0.000
					(-1.70)	(0.10)	(-1.49)	(-0.28)
L.L.L.Non-int. Exp.					0.000	-0.000	0.000	-0.000
					(1.94)	(-0.28)	(1.80)	(-0.02)
Observations	334440	322167	334440	322167	331102	321278	331102	321278
R^2 within	0.091	0.260	0.076	0.227	0.121	0.329	0.108	0.305

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table V. Management Rating and CAMELS Component Rating Forecasts of One-Quarter-Ahead ROA and NPL without Controls

	(1) ROA	(2) NPL	(3) ROA	(4) NPL	(5) ROA	(6) NPL	(7) ROA	(8) NPL
L.Man Rat = 2	-0.000***	0.006***	-0.000***	0.002***				
	(-17.42)	(19.35)	(-4.81)	(4.83)				
L.Man Rat = 3	-0.001***	0.024***	-0.000***	0.007***				
	(-33.28)	(43.01)	(-9.26)	(10.99)				
L.Man Rat = 4/5	-0.003***	0.051***	-0.001***	0.013***				
	(-37.37)	(45.66)	(-10.22)	(9.96)				
L.CAMELS = 2			-0.000***	0.005***				
			(-12.37)	(13.89)				
L.CAMELS = 3			-0.001***	0.025***				
			(-22.07)	(34.21)				
L.CAMELS = 4/5			-0.003***	0.048***				
			(-22.49)	(34.00)				
L.Man Rat = 3/4/5					-0.001***	0.024***	-0.001***	0.008***
					(-37.63)	(47.31)	(-13.82)	(15.90)
L.CAMELS = 3/4/5							-0.001***	0.025***
							(-26.13)	(39.87)
Observations	334429	322156	334420	322147	334429	322156	334420	322147
R^2 within	0.082	0.224	0.093	0.263	0.068	0.192	0.078	0.231

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table VI. Management Rating and CAMELS Component Rating Forecasts of One-Quarter-Ahead ROA and NPL with Controls

	(1) ROA	(2) NPL	(3) ROA	(4) NPL	(5) ROA	(6) NPL	(7) ROA	(8) NPL
L.Man Rat = 2	-0.000***	0.005***	-0.000**	0.001***				
	(-15.80)	(17.31)	(-3.13)	(4.02)				
L.Man Rat = 3	-0.001***	0.019***	-0.000***	0.005***				
	(-30.51)	(38.15)	(-7.32)	(8.73)				
L.Man Rat = 4/5	-0.003***	0.041***	-0.001***	0.009***				
	(-35.64)	(39.59)	(-8.72)	(7.83)				
L.CAMELS = 2			-0.000***	0.005***				
			(-13.24)	(12.94)				
L.CAMELS = 3			-0.001***	0.021***				
			(-23.05)	(30.72)				
L.CAMELS = 4/5			-0.003***	0.042***				
			(-23.90)	(31.54)				
L.Man Rat = 3/4/5					-0.001***	0.019***	-0.000***	0.006***
					(-35.47)	(42.11)	(-12.12)	(13.08)
L.CAMELS = 3/4/5							-0.001***	0.021***
							(-26.22)	(35.32)
L.Size	0.000***	0.002***	0.000***	0.003***	0.000***	0.001**	0.000***	0.002***
	(9.55)	(4.52)	(8.76)	(6.42)	(10.21)	(3.15)	(9.84)	(4.39)
L.Equity	-0.003*	-0.007	-0.004***	0.019	-0.002	-0.020	-0.003*	-0.004
	(-2.31)	(-0.56)	(-3.46)	(1.71)	(-1.48)	(-1.62)	(-2.19)	(-0.31)
L.SubDebt	0.004	0.177*	0.004	0.155*	0.003	0.176*	0.005	0.135
	(0.52)	(2.44)	(0.58)	(2.29)	(0.45)	(2.34)	(0.65)	(1.89)
L.Loans	0.001***	0.007***	0.001***	0.007***	0.001***	0.006***	0.001***	0.006***
	(3.83)	(4.12)	(3.90)	(4.45)	(4.31)	(3.41)	(4.17)	(3.89)
L.Brok. Dep.	-0.002***	0.033***	-0.002***	0.034***	-0.002***	0.036***	-0.002***	0.038***
	(-3.54)	(4.68)	(-3.64)	(4.96)	(-3.83)	(4.99)	(-4.05)	(5.40)
L.Total Dep.	0.001	0.009	0.000	0.012	0.001	0.008	0.001	0.009
	(0.57)	(0.86)	(0.45)	(1.19)	(0.74)	(0.74)	(0.70)	(0.85)
L.Cash	-0.001***	-0.009**	-0.001***	-0.008**	-0.001***	-0.008*	-0.001***	-0.008*
	(-5.38)	(-2.63)	(-5.47)	(-2.69)	(-5.41)	(-2.43)	(-5.60)	(-2.42)
L.LLP	-0.211***	2.958***	-0.201***	2.781***	-0.224***	3.132***	-0.214***	2.944***
	(-29.01)	(52.06)	(-27.93)	(50.39)	(-30.44)	(53.69)	(-29.23)	(52.04)
L.NIM	0.000***	-0.000***	0.000***	-0.000**	0.000***	-0.000***	0.000***	-0.000***
	(10.06)	(-3.70)	(9.97)	(-3.21)	(10.44)	(-4.39)	(10.31)	(-3.86)
L.Loan Growth	0.000***	-0.061***	0.000	-0.056***	0.001***	-0.065***	0.000***	-0.060***
	(3.52)	(-47.78)	(1.42)	(-45.74)	(5.71)	(-48.78)	(3.51)	(-46.93)
L.Non-core Liab.	0.000	0.005	-0.000	0.009	0.000	0.004	0.000	0.007
	(0.13)	(0.42)	(-0.05)	(0.82)	(0.31)	(0.31)	(0.15)	(0.60)
L.Salaries	-0.000	-0.000	-0.000	0.000	-0.000	-0.000	-0.000	-0.000
	(-1.54)	(-0.37)	(-1.76)	(0.18)	(-1.27)	(-0.80)	(-1.54)	(-0.19)
L.L.Non-int. Exp.	0.000	0.000	0.000*	-0.000	0.000	0.000	0.000	-0.000
	(1.74)	(0.27)	(1.98)	(-0.33)	(1.54)	(0.59)	(1.84)	(-0.08)
Observations	331091	321267	331082	321258	331091	321267	331082	321258
R^2 within	0.113	0.303	0.123	0.331	0.102	0.282	0.110	0.307

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table VII. CAMELS and Management Rating Forecasts of One-Quarter-Ahead Stock Market Variables without Controls

	(1) QRet	(2) SVol	(3) MB	(4) Beta	(5) QRet	(6) SVol	(7) MB	(8) Beta
L.CAMELS = 2	-0.002	-0.256	-0.145***	-0.034*				
	(-1.08)	(-0.60)	(-7.05)	(-2.52)				
L.CAMELS = 3	-0.010*	6.623***	-0.356***	0.010				
	(-2.49)	(6.83)	(-12.05)	(0.50)				
L.CAMELS = 4/5	-0.021	35.497***	-0.472***	0.040				
	(-1.90)	(11.45)	(-11.80)	(0.98)				
L.CAMELS = 3/4/5					-0.010**	12.106***	-0.244***	0.046**
					(-2.67)	(9.81)	(-11.64)	(2.91)
Observations	45101	45104	39579	45104	45101	45104	39579	45104
R^2 within	0.212	0.283	0.498	0.192	0.212	0.257	0.490	0.192
L.Man Rat = 2	-0.004	-0.100	-0.134***	-0.044***				
	(-1.86)	(-0.20)	(-6.41)	(-3.46)				
L.Man Rat = 3	-0.014***	6.968***	-0.288***	-0.028				
	(-3.49)	(6.82)	(-10.69)	(-1.52)				
L.Man Rat = 4/5	-0.045***	30.168***	-0.435***	0.113**				
	(-4.03)	(9.01)	(-9.91)	(2.59)				
L.Man Rat = 3/4/5					-0.015***	10.547***	-0.187***	0.032*
					(-4.27)	(9.55)	(-10.34)	(2.23)
Observations	45090	45093	39568	45093	45090	45093	39568	45093
R^2 within	0.213	0.268	0.493	0.193	0.212	0.253	0.486	0.192

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table VIII. CAMELS Composite Rating Forecasts of One-Quarter-Ahead Stock Market Variables with Controls

	(1) QRet	(2) SVol	(3) MB	(4) Beta	(5) QRet	(6) SVol	(7) MB	(8) Beta
L.CAMELS = 2	-0.000	-0.639	-0.146***	-0.042**				
	(-0.07)	(-1.53)	(-7.01)	(-3.14)				
L.CAMELS = 3	-0.001	4.875***	-0.345***	-0.012				
	(-0.30)	(5.19)	(-11.71)	(-0.62)				
L.CAMELS = 4/5	-0.006	31.594***	-0.453***	-0.003				
	(-0.53)	(10.46)	(-10.98)	(-0.06)				
L.CAMELS = 3/4/5					-0.002	9.890***	-0.228***	0.028
					(-0.50)	(8.70)	(-10.82)	(1.74)
L.Size	-0.005	-2.460***	0.098**	0.070***	-0.005	-2.666***	0.093**	0.068***
	(-1.81)	(-3.97)	(3.24)	(3.93)	(-1.81)	(-4.16)	(3.04)	(3.81)
L.Equity	-0.174**	-25.415*	-0.717	0.450	-0.172**	-38.341***	-0.713	0.436
	(-3.12)	(-2.46)	(-1.26)	(1.39)	(-3.09)	(-3.43)	(-1.25)	(1.33)
L.SubDebt	0.139	115.825	2.126	-0.683	0.143	87.320	1.569	-0.889
	(0.54)	(1.76)	(0.82)	(-0.44)	(0.55)	(1.23)	(0.59)	(-0.58)
L.Loans	-0.045***	-6.886*	-0.088	-0.118	-0.045***	-8.175**	-0.063	-0.113
	(-3.67)	(-2.35)	(-0.84)	(-1.81)	(-3.66)	(-2.60)	(-0.60)	(-1.71)
L.Brok. Dep.	-0.099*	11.233	-0.491	0.239	-0.099**	13.031	-0.540	0.228
	(-2.57)	(1.27)	(-1.36)	(0.86)	(-2.58)	(1.33)	(-1.45)	(0.81)
L.Total Dep.	-0.020	1.183	0.026	0.365*	-0.020	1.542	0.031	0.369*
	(-0.54)	(0.20)	(0.07)	(2.01)	(-0.54)	(0.25)	(0.08)	(2.00)
L.Cash	-0.017	-10.282*	0.422**	-0.338**	-0.017	-10.214	0.472**	-0.324**
	(-0.67)	(-2.08)	(2.71)	(-2.94)	(-0.66)	(-1.82)	(2.94)	(-2.80)
L.LLP	-4.324***	911.492***	-12.761***	13.004***	-4.352***	1062.271***	-14.517***	12.689***
	(-7.69)	(9.72)	(-5.48)	(6.38)	(-7.83)	(10.36)	(-6.09)	(6.25)
L.NIM	0.002**	-0.150	0.001	0.002	0.002**	-0.218	0.002	0.002
	(3.21)	(-1.45)	(0.21)	(0.52)	(3.23)	(-1.94)	(0.31)	(0.55)
L.Loan Growth	0.050***	-3.415*	0.074	-0.048	0.051***	-5.491**	0.086*	-0.047
	(3.83)	(-1.98)	(1.86)	(-1.17)	(3.85)	(-3.07)	(2.14)	(-1.15)
L.Non-core Liab.	-0.047	-6.648	0.032	0.682**	-0.046	-8.049	0.058	0.690**
	(-1.12)	(-0.91)	(0.08)	(3.10)	(-1.12)	(-1.05)	(0.15)	(3.10)
L.Salaries	-0.001	0.065	-0.009**	-0.004	-0.001	0.074	-0.009**	-0.004
	(-0.85)	(0.51)	(-3.25)	(-1.21)	(-0.85)	(0.59)	(-3.09)	(-1.19)
L.L.Non-int. Exp.	0.000	-0.019	0.003*	0.002	0.000	-0.027	0.003*	0.002
	(0.69)	(-0.34)	(2.45)	(1.17)	(0.69)	(-0.49)	(2.17)	(1.11)

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table IX. Management Rating Forecasts of One-Quarter-Ahead Stock Market Variables with Controls

	(1) QRet	(2) SVol	(3) MB	(4) Beta	(5) QRet	(6) SVol	(7) MB	(8) Beta
L.Man Rat = 2	-0.002	-0.508	-0.129***	-0.048***				
	(-0.81)	(-1.03)	(-6.18)	(-3.89)				
L.Man Rat = 3	-0.007	5.210***	-0.269***	-0.042*				
	(-1.72)	(5.45)	(-10.29)	(-2.29)				
L.Man Rat = 4/5	-0.030**	26.145***	-0.402***	0.073				
	(-2.74)	(7.93)	(-9.18)	(1.65)				
L.Man Rat = 3/4/5					-0.009*	8.558***	-0.168***	0.017
					(-2.46)	(8.58)	(-9.61)	(1.17)
L.Size	-0.005	-2.622***	0.093**	0.069***	-0.005	-2.656***	0.091**	0.068***
	(-1.82)	(-4.16)	(3.12)	(3.87)	(-1.82)	(-4.14)	(3.03)	(3.77)
L.Equity	-0.179**	-35.930**	-0.574	0.479	-0.174**	-41.615***	-0.623	0.424
	(-3.22)	(-3.28)	(-1.04)	(1.48)	(-3.13)	(-3.65)	(-1.10)	(1.30)
L.SubDebt	0.129	113.566	2.178	-0.537	0.137	95.202	1.523	-0.879
	(0.50)	(1.71)	(0.82)	(-0.35)	(0.53)	(1.32)	(0.56)	(-0.57)
L.Loans	-0.046***	-8.247**	-0.084	-0.121	-0.045***	-8.581**	-0.055	-0.114
	(-3.77)	(-2.68)	(-0.78)	(-1.88)	(-3.69)	(-2.70)	(-0.51)	(-1.73)
L.Brok. Dep.	-0.097*	14.138	-0.471	0.260	-0.097*	13.142	-0.541	0.231
	(-2.52)	(1.54)	(-1.30)	(0.94)	(-2.53)	(1.34)	(-1.45)	(0.82)
L.Total Dep.	-0.019	1.624	-0.003	0.361*	-0.019	2.045	0.020	0.371*
	(-0.52)	(0.28)	(-0.01)	(1.97)	(-0.52)	(0.33)	(0.05)	(2.01)
L.Cash	-0.014	-11.285*	0.455**	-0.338**	-0.015	-10.022	0.473**	-0.321**
	(-0.54)	(-2.09)	(2.93)	(-2.95)	(-0.57)	(-1.79)	(2.94)	(-2.76)
L.LLP	-4.036***	987.477***	-14.157***	12.701***	-4.197***	1114.217***	-16.039***	12.992***
	(-7.24)	(9.73)	(-5.96)	(6.31)	(-7.54)	(10.62)	(-6.59)	(6.35)
L.NIM	0.002**	-0.162	0.001	0.002	0.002**	-0.196	0.002	0.002
	(3.09)	(-1.44)	(0.15)	(0.58)	(3.18)	(-1.68)	(0.24)	(0.55)
L.Loan Growth	0.047***	-4.979**	0.092*	-0.049	0.049***	-6.395***	0.112**	-0.052
	(3.57)	(-2.84)	(2.34)	(-1.20)	(3.70)	(-3.53)	(2.80)	(-1.27)
L.Non-core Liab.	-0.047	-7.551	0.029	0.683**	-0.047	-7.338	0.052	0.693**
	(-1.15)	(-1.03)	(0.07)	(3.11)	(-1.14)	(-0.96)	(0.13)	(3.11)
L.Salaries	-0.001	0.105	-0.009**	-0.004	-0.001	0.082	-0.009**	-0.004
	(-0.87)	(0.82)	(-3.26)	(-1.15)	(-0.85)	(0.66)	(-3.15)	(-1.17)
L.L.Non-int. Exp.	0.000	-0.036	0.003*	0.002	0.000	-0.029	0.003*	0.002
	(0.72)	(-0.64)	(2.39)	(1.12)	(0.70)	(-0.53)	(2.19)	(1.11)
Observations	44133	44136	38687	44136	44133	44136	38687	44136
R^2 within	0.215	0.279	0.498	0.199	0.214	0.267	0.491	0.198

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table X. Failure Forecast Model

	Dependent variable:					
	One-Year-Ahead Failure					
	(1)	(2)	(3)	(4)	(5)	(6)
L.CAMELS = 2	−0.178				−0.010	
	(0.178)				(0.244)	
L.CAMELS = 3	0.379**				0.774***	
	(0.183)				(0.269)	
L.CAMELS = 4/5	0.924***				1.096***	
	(0.187)				(0.281)	
L.CAMELS = 3/4/5		0.757***				0.794***
		(0.093)				(0.121)
L.Man Rat = 2			−0.037		−0.190	
			(0.166)		(0.233)	
L.Man Rat = 3			0.129		−0.572**	
			(0.174)		(0.259)	
L.Man Rat = 4/5			0.763***		−0.079	
			(0.176)		(0.265)	
L.Man Rat = 3/4/5				0.425***		−0.049
				(0.082)		(0.104)
L.ROA	−102.401***	−105.048***	−103.875***	−105.360***	−102.642***	−105.163***
	(7.117)	(7.112)	(7.182)	(7.167)	(7.131)	(7.115)
L.NLP	14.827***	15.645***	15.714***	16.315***	14.821***	15.675***
	(0.647)	(0.634)	(0.641)	(0.633)	(0.650)	(0.637)
L.Size	0.027	0.009	0.038	0.006	0.040	0.008
	(0.028)	(0.028)	(0.028)	(0.028)	(0.028)	(0.028)
L.Equity	−62.980***	−68.220***	−67.101***	−70.534***	−62.856***	−68.277***
	(2.369)	(2.282)	(2.308)	(2.293)	(2.366)	(2.286)
L.SubDebt	−70.073***	−73.995***	−69.724***	−72.822***	−69.904***	−74.218***
	(11.729)	(11.674)	(11.759)	(11.699)	(11.753)	(11.682)
L.Loans	1.881***	1.961***	1.837***	1.933***	1.856***	1.968***
	(0.221)	(0.219)	(0.220)	(0.219)	(0.222)	(0.220)
L.Brok. Dep.	5.869***	5.925***	5.820***	5.928***	5.848***	5.933***
	(0.643)	(0.644)	(0.647)	(0.645)	(0.645)	(0.644)
L.Total Dep.	−3.944***	−4.098***	−3.920***	−3.857***	−4.079***	−4.107***
	(0.783)	(0.781)	(0.774)	(0.776)	(0.781)	(0.781)
L.Cash	1.576***	1.351***	1.627***	1.370***	1.678***	1.353***
	(0.441)	(0.438)	(0.442)	(0.439)	(0.442)	(0.438)
L.LLP	−58.770***	−64.502***	−62.476***	−64.844***	−59.566***	−64.559***
	(8.559)	(8.513)	(8.599)	(8.564)	(8.580)	(8.513)
L.NIM	−0.121***	−0.124***	−0.122***	−0.124***	−0.122***	−0.124***
	(0.035)	(0.035)	(0.035)	(0.035)	(0.035)	(0.035)
L.Loan Growth	−0.425	−0.566	−0.521	−0.705*	−0.363	−0.573
	(0.426)	(0.425)	(0.427)	(0.426)	(0.427)	(0.426)
L.Non-core Liab.	−3.465***	−3.722***	−3.758***	−3.590***	−3.748***	−3.736***
	(1.165)	(1.163)	(1.163)	(1.162)	(1.166)	(1.164)
L.Salaries	0.021	0.019	0.024	0.020	0.022	0.019
	(0.037)	(0.037)	(0.038)	(0.037)	(0.037)	(0.037)
L.L.Non-int. Exp.	−0.016	−0.014	−0.017	−0.015	−0.016	−0.014
	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
Constant	−0.227	0.290	0.010	0.454	−0.224	0.312
	(0.886)	(0.873)	(0.882)	(0.872)	(0.887)	(0.875)
Observations	341,778	341,778	341,761	341,761	341,761	341,761
Log Likelihood	−5,683.884	−5,709.235	−5,686.516	−5,730.258	−5,659.888	−5,709.117
Akaike Inf. Crit.	11,477.770	11,524.470	11,483.030	11,566.520	11,435.780	11,526.230

Note: *p<0.1; **p<0.05; ***p<0.01

Table XI. CAMELS Determinants

	Dependent variable:			
	CAMELS = 3/4/5		Man Rat = 3/4/5	
	(1)	(2)	(3)	(4)
L.CAMELS = 3/4/5		6.789***		
		(0.030)		
L.Man Rat = 3/4/5				6.269***
				(0.023)
L.ROA	−180.847***	−108.846***	−129.686***	−73.637***
	(2.656)	(4.420)	(2.167)	(3.847)
L.NPL	32.088***	20.298***	24.141***	13.854***
	(0.202)	(0.393)	(0.169)	(0.336)
L.Size	−0.219***	−0.137***	−0.272***	−0.151***
	(0.006)	(0.013)	(0.006)	(0.011)
L.Equity	−21.317***	−7.607***	−8.728***	−2.606***
	(0.443)	(0.701)	(0.348)	(0.584)
L.SubDebt	14.433***	−5.789	−6.443**	−15.064***
	(2.664)	(5.812)	(2.624)	(5.172)
L.Loans	2.010***	2.371***	1.021***	1.065***
	(0.047)	(0.098)	(0.039)	(0.078)
L.Brok. Dep.	3.515***	4.026***	4.449***	4.514***
	(0.208)	(0.390)	(0.181)	(0.339)
L.Total Dep.	0.531	0.673	−0.501*	0.469
	(0.339)	(0.527)	(0.282)	(0.470)
L.Cash	2.199***	1.675***	1.652***	0.690***
	(0.102)	(0.220)	(0.089)	(0.184)
L.LLP	−23.467***	70.371***	−2.462	68.911***
	(3.541)	(6.162)	(3.079)	(5.529)
L.NIM	−0.025***	−0.016**	−0.036***	−0.024***
	(0.003)	(0.006)	(0.003)	(0.005)
L.Loan Growth	−4.654***	−1.539***	−2.558***	−0.554***
	(0.109)	(0.195)	(0.087)	(0.159)
L.Non-core Liab.	−0.059	0.476	−1.346***	0.396
	(0.408)	(0.686)	(0.348)	(0.601)
L.Salaries	−0.090***	−0.058***	−0.045***	−0.026*
	(0.007)	(0.015)	(0.007)	(0.013)
L.L.Non-int. Exp.	0.046***	0.025***	0.023***	0.010*
	(0.003)	(0.007)	(0.003)	(0.006)
Observations	346,807	346,807	346,790	346,782
Log Likelihood	−92,244.310	−25,835.180	−119,272.700	−36,951.550
Akaike Inf. Crit.	184,592.600	51,776.370	238,649.300	74,009.110
Note:				*p<0.1; **p<0.05; ***p<0.01

Table XII. Forecast Error Variance Decomposition

Horizon (quarters)	Unemployment	CPI	Deposits	Loans	Securities	High Risk Rating	FFR
1	0.00	0.00	0.00	0.00	0.00	0.94	0.02
2	0.01	0.00	0.00	0.03	0.01	0.87	0.02
3	0.04	0.00	0.01	0.06	0.01	0.84	0.03
4	0.08	0.00	0.01	0.10	0.00	0.80	0.04
8	0.19	0.01	0.03	0.21	0.00	0.64	0.09
12	0.19	0.02	0.04	0.25	0.01	0.49	0.11

Note: The High Risk Rating is CAMELS rating 3, 4, or 5.