Bank Opacity, Loan Growth and Stock Return

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ABSTRACT

Post the 2008 financial crisis, one of the most widely discussed issues in banking regulation and research is excessive lending. The evidence suggests that stocks of banks with excessive credit growth tend to underperform in the future. In this context, the role of uncertainty has not been considered. We argue that excessive credit growth should exhibit its strongest effects on the performance of bank stocks when uncertainty is high; valuations are most subjective. Accordingly, we show that an increase in uncertainty (as measured by financial reporting opacity) amplifies the predictive ability of credit growth for market returns. For instance, a one-standard-deviation increase in uncertainty is associated with a 1.5 to 2 times larger predictive ability of past credit growth relative to the mean level of uncertainty. The evidence is consistent with investors' sentiments being more effective during periods of high uncertainty.

JEL Codes: G12, G21, M40

Keywords: Bank Opacity, Loan Growth, Stock return predictability

1. Introduction

According to the theory put forth by Minsky (1977) and later developed in Bordalo et al. (2018), credit growth could occur because expectations fail to take risks into account correctly. Therefore, banks can become too optimistic about the risks of new lending opportunities. While overoptimism might have caused banks to neglect credit risks, is this true for shareholders? If shareholders recognize the risks, they could demand higher expected returns by immediately lowering share prices and thus earn higher future average returns from holding bank stocks. The stock price should correctly reflect the expectation of higher loan losses so that credit growth should not predict lower performance. However, analyzing 20 developed economies over 1920–2012, Baron and Xiong (2017) finds that bank credit growth predicts lower bank equity returns in the subsequent one to three years. Similarly, Fahlenbrach et al. (2017) analyzes a panel of U.S. banks between 1972 and 2014 and finds that banks with excessive credit growth have significantly lower one-, two-, and three-year ahead returns. These findings demonstrate the clear presence of over-optimism by bank shareholders. Bank shareholders fail to recognize the risks of loans that banks make during periods of accelerated credit growth.

Shareholders' failure to anticipate the predictably poor performance of bank stocks does not reconcile with rational expectations theory. Rather, it underscores the importance of shareholders' sentiments or the beliefs shareholders have about the quality of bank loans that are not fully justified by fundamentals. When the ignored risks are revealed, shareholders reassess the quality of the loans. At that time, the correction of sentiment-induced mispricing happens. Bank stocks underperform, thus generating lower returns.

In this paper, we argue that shareholders' sentiments should exhibit stronger effects at times when there is high uncertainty about the quality of bank credit. For instance, Birru and Young (2020) shows the predictive ability of sentiment for assets is substantially larger in times of higher uncertainty. In the absence of uncertainty, prices should be based on fundamentals, and sentiment should have no effect. In contrast, the presence of uncertainty paves the way for sentiment to take hold. This intuition is also supported in the cross-section by a host of evidence showing sentiment most affects the pricing of stocks that are difficult to value and have high subjectivity involved (Baker and

Wurgler, 2006).

Extending this argument for banks, the predictability of stock performance following credit growth should be stronger for banks with higher uncertainty about the quality of the loans, leading to relatively larger future corrections of sentiment-induced mispricing. We test this hypothesis by examining the predictive ability of credit growth when conditioning on measures of uncertainty about the quality of bank loans.

As a starting point, we need a measure of uncertainty about the quality of bank loans. We construct such a measure to reflect the failure of banks' disclosures to explain expected realizations of loan defaults. In particular, uncertainty is the absolute residual from a regression of bank loan loss provision on the components that are shown in prior research to predict loan loss provision. We create this measure for every bank in every quarter based on the recent history of disclosures and realizations. We refer to this measure as *bank opacity* (Jiang et al., 2016; Zheng, 2020) and relegate a detailed description of its construction to Section 2. Banks with higher absolute residuals are more opaque; there exists more uncertainty surrounding the quality of their loan portfolios.

Our study is based on a large sample of U.S. bank holding companies over the period 1992–2018. Our main result is a highly statistically significant negative relation between future equity returns and the interaction of bank opacity with credit growth. In other words, the predictive ability of credit growth for future equity returns is stronger for banks that are more opaque. The economic magnitude is also significant: a one standard deviation increase in bank opacity is associated with a 1.5 to 2 times larger predictive ability of past credit growth for equity returns. These findings suggest the presence of the moderating effect of uncertainty on sentiment in the banking sector.

Our findings shed light on two important issues. First, in the aftermath of the recent crisis, an influential view argues that shareholders do not recognize the risk taken by bankers and may even encourage them. Baron and Xiong (2017) and Fahlenbrach et al. (2017) demonstrate that bank credit growth predicts poor equity returns. Our study focuses on the moderating effect of uncertainty (as measured by bank opacity) on this result. We document that the predictive ability of credit growth for equity return is sensitive to bank opacity. This result is entirely novel and particularly important given the central role of opacity in banking theories (Holmstrom, 2015; Dang et al., 2017; Chen et al., 2022) and in banking regulations (**jones2012**; Huizinga and Laeven, 2012; Flannery et al.,

2013; Acharya and Ryan, 2016).

Second, our paper is related to the literature on the implications of market uncertainty on the predictive ability of sentiment for equity returns. In the cross-section, the literature (Baker and Wurgler, 2006; Kumar, 2009) finds that sentiment most affects stocks that have subjective valuations or stocks with more uncertain fundamentals. In recent work, Birru and Young (2020) shows that the effect of sentiment shows up most strongly during uncertain periods. We are interested in the uncertainty associated with banks, measured by banks' financial reporting opacity which is a direct and clean measure of uncertainty and is motivated by a theoretical framework of information asymmetry.

The paper proceeds as follows. Section 2 discusses the data and empirical methodology. Section 3 presents the main results for the market and the cross-section. ?? examines additional predictions. Section 4 provides robustness analyses, and Section 6 concludes.

2. Data and Variable Construction

We use FR Y-9C reports for quarterly financial statements of bank holding companies[1] spanning the period 1992:1-2018:4. We obtain stock price information from CRSP. We use the link table from the regulatory identification numbers (RSSD ID) to CRSP's permanent company numbers (PERMCO) provided by the New York Fed to link the quarterly financial data from FR Y-9C with the CRSP data. Our final sample consists of an unbalanced panel of 41,959 bank-quarter observations containing only publicly traded bank holding companies. We winsorize all bank-level variables at the top and bottom 1%-ile to limit the influence of outliers.

The data set primarily consists of three types of variables: bank opacity, credit expansion, equity returns. The construction of the data is outlined below.

2.1. Bank Opacity (Uncertainty)

Accounting disclosures are the key source of information for outside investors, particularly for bank shareholders. Unlike other firms, banks' assets primarily consist of loans that are considered more illiquid and informationally opaque. The theories maintain that bank insiders may possess

[1] Bank holding companies need to be included in this definition because banks that belong to a holding company are not traded themselves. Since our analysis involves stock returns, we conduct our analysis on publicly traded bank holding companies.

valuable private information about the credit condition of loan customers or the bank's monitoring efforts. Thus accounting disclosures are major sources that provide outsiders with information about the true quality of bank assets. Accordingly, we measure opacity by the failure of accounting disclosures to reveal information about banks' asset quality.

The main accounting disclosure we focus on is loan loss provision, which is a key measure that reflects the quality of a bank's loan portfolio. It is an item set aside for loan payments that the bank expects to lose. We measure disclosure quality by estimating a model of loan loss provision and use the absolute values of the residuals to construct the measure of bank opacity. We run a regression of loan loss provision on a set of bank-specific and macro variables to separate the component of loan loss provision accounted for by bank characteristics and economic conditions, from the part of provisions (residuals) that are unaccounted for by these fundamental factors. These residuals are considered bank opacity. The question then is why the residuals from this model specification can be justified to capture the degree of opacity. Beatty and Liao (2014) assess nine different models of loan loss provision proposed in the banking literature. They find that residuals from one model perform particularly well in predicting earning restatements and comment letters from the SEC caused by loan loss provisioning related issues. We use Beatty and Liao (2014)'s "preferred" model and confirm that the results are robust to using alternative models. Specifically, we estimate the following:

$$llp_{it} = \alpha_0 + \alpha_1 \Delta npa_{it+1} + \alpha_2 \Delta npa_{it} + \alpha_3 \Delta npa_{it-1} + \alpha_4 \Delta npa_{it-2} + \alpha_5 Size_{it-1} + \alpha_6 \Delta Credit_{it} + \alpha_7 \Delta GDP_t + \alpha_8 \Delta UNEMP_t + \alpha_9 \Delta CSRET_t + \delta_t + \zeta_i + \eta_{it} \quad (1)$$

where, $llp_{it} = \frac{Loan\ Loss\ Provision_{it}}{Loan_{it-1}}$, $npa_{it} = \frac{Loans\ past\ due\ 90\ days_{it} + Non-accrual\ Loans_{it}}{Loan_{it-1}}$ $Size_{it} = Log(Assets_{it-1})$, $\Delta Credit_{it} = \frac{Credit_{it} - Credit_{it-1}}{Credit_{it-1}}$, $\Delta GDP_t = \frac{GDP_t - GDP_{t-1}}{GDP_t}$ $\Delta UNEMP_t = \frac{Unemployment_t - Unemployment_{t-1}}{Unemployment_t}$,and $\Delta CSRET_t = \frac{CSRET_t - CSRET_{t-1}}{CSRET_t}$, $CSRET$ denotes Case-Shiller Real Estate Index. δ_t and ζ_i are time and bank fixed effects respectively. η_{it} denotes residuals.

In line with the prior literature (Jiang et al., 2016; Zheng, 2020), bank opacity is defined as the absolute value of residuals from estimating the above regression. We construct bank opacity for the last one, two, and three years by averaging $Opacity_{it}$ estimated quarterly. For bank i with quarterly

$Opacity_{it}$,

$$Opacity_{it-k,t} = \frac{1}{k} \sum_{j=t-k}^{j=t} Opacity_{ij}$$

where $k = 3,\ 7,\ 11$ for the last one, two, and three years respectively. The above specification measures opacity over the last year by averaging quarterly opacity for the last four periods including the current period, i.e. from quarter $t-3$ to t. Similarly, it measures opacity over the last two years by averaging quarterly opacity for the last eight periods including the current period, i.e. from quarter $t-7$ to t, and opacity over the last three years by averaging quarterly opacity for the last twelve periods including the current period, i.e. from quarter $t-11$ to t.

2.2. Credit Growth

We consider total loans and leases reported by bank holding companies as our measure of bank credit. Credit growth is constructed for the last one, two, and three years from the change in credit during these periods. Mathematically it can be expressed as,

$$\Delta credit_{it-k,t} = \left(\frac{Credit_{it}}{Credit_{it-k}} - 1 \right)$$

where $k = 4,\ 8,\ 12$ for the last one, two, and three years respectively.

2.3. Equity Return $(r_{it,t+j})$

We construct equity returns by taking price returns and adding in dividend yield. For estimation purposes, we construct one-, two-, and three-year ahead returns by taking the price return during these periods and summing the consecutive quarterly dividends.

Table I provides a detailed description and source of the variables used in the paper for analysis.

Table I: Variables Definition and Source

	Source & Frequency	Definition
llp_{it}	FR Y-9C; quarterly	Loan loss provisions scaled by total loan balance at the beginning of the quarter
$Credit_{it}$	FR Y-9C; quarterly	Total loan balance (dollar amounts in thousands)
npa_{it}	FR Y-9C; quarterly	Loans past due for 90 days or more and Non-accrual loans scaled by total loan balance at the beginning of the quarter
$Size_{it}$	FR Y-9C; quarterly	Log of assets (dollar amounts in thousands) at the beginning of the quarter
ΔGDP_t	Fred Economic Data; quarterly	Real GDP growth rate
$\Delta CSRET_t$	Fred Economic Data; quarterly	Return on Case-Shiller Real estate index
$\Delta UNEMP_t$	Fred Economic Data; quarterly	Change in unemployment rate
$\Delta Credit_{it-k,t}$	FR Y-9C; quarterly	Credit growth over the last k quarters
$r_{it,t+j}$	CRSP	j quarter ahead return on bank equity
$Opacity_{it}$	Estimated	Opacity of bank i measured in quarter t
$Opacity_{it-k,t}$	Estimated	Average Opacity of bank i from quarter $t-k$ to quarter t

Table II: Summary Statistics

	Obs.	Mean	SD	1st perc.	25th perc.	Median	75th perc.	99th perc.
llp_{it}	41,955	0.0033	0.0055	-0.0018	0.0006	0.0016	0.0036	0.0348
npa_{it}	41,955	0.0151	0.0182	0	0.0047	0.0089	0.0176	0.1061
$size_{it}$	41,959	14.54	1.62	12.10	13.37	14.21	15.42	19.52
$\Delta credit_{it-4,t}$	40,474	0.1269	0.2056	-0.2143	0.0232	0.0901	0.1842	0.9331
$\Delta credit_{it-8,t}$	38,503	0.2811	0.3755	-0.3317	0.0692	0.2084	0.4087	1.7022
$\Delta credit_{it-12,t}$	36,614	0.4580	0.5603	-0.3893	0.1283	0.3402	0.6483	2.6903
$r_{it,t+4}$	36,833	0.1366	0.3242	-0.6273	-0.0567	0.1236	0.3123	1.2104
$r_{it,t+8}$	32,274	0.2795	0.4943	-0.7039	-0.0364	0.2428	0.5305	2.1807
$r_{it,t+12}$	28,274	0.4204	0.6661	-0.7261	-0.0141	0.3455	0.7073	3.4373
$Opacity_{it}$	38,487	0.0029	0.0048	0	0.0007	0.0017	0.0032	0.0241
$Opacity_{it-3,t}$	34,966	0.0029	0.0035	0.0003	0.0011	0.0018	0.0032	0.0194
$Opacity_{it-7,t}$	30,702	0.0029	0.0030	0.0004	0.0012	0.0019	0.0033	0.0168
$Opacity_{it-11,t}$	27,000	0.0029	0.0028	0.0005	0.0012	0.0019	0.0034	0.0153

2.4. Summary Statistics

Table II presents summary statistics for all main variables. The table shows that with a mean of 0.003 and a standard deviation of 0.005, the opacity measure exhibits substantial variation. Figure 1 plots the bank opacity across all banks and for subsamples of banks by asset sizes over our sample period. We use $500 million as the cutoff for small banks (Beatty and Liao, 2011; Chen et al., 2022) as this is the cutoff FDICIA uses for independent audit requirements. We classify banks with assets

above $3 billion as large banks (Berger and Bouwman, 2009; Chen et al., 2022) and those with assets between $500 million and $3 billion as medium banks (Chen et al., 2022). All cutoffs are in real 2000 dollars. The figures across panels show that opacity is relatively stable over time except for a sharp increase following the 2007-08 Financial Crisis. We later examine if our results are concentrated on the financial crisis and do not find this to be the case.

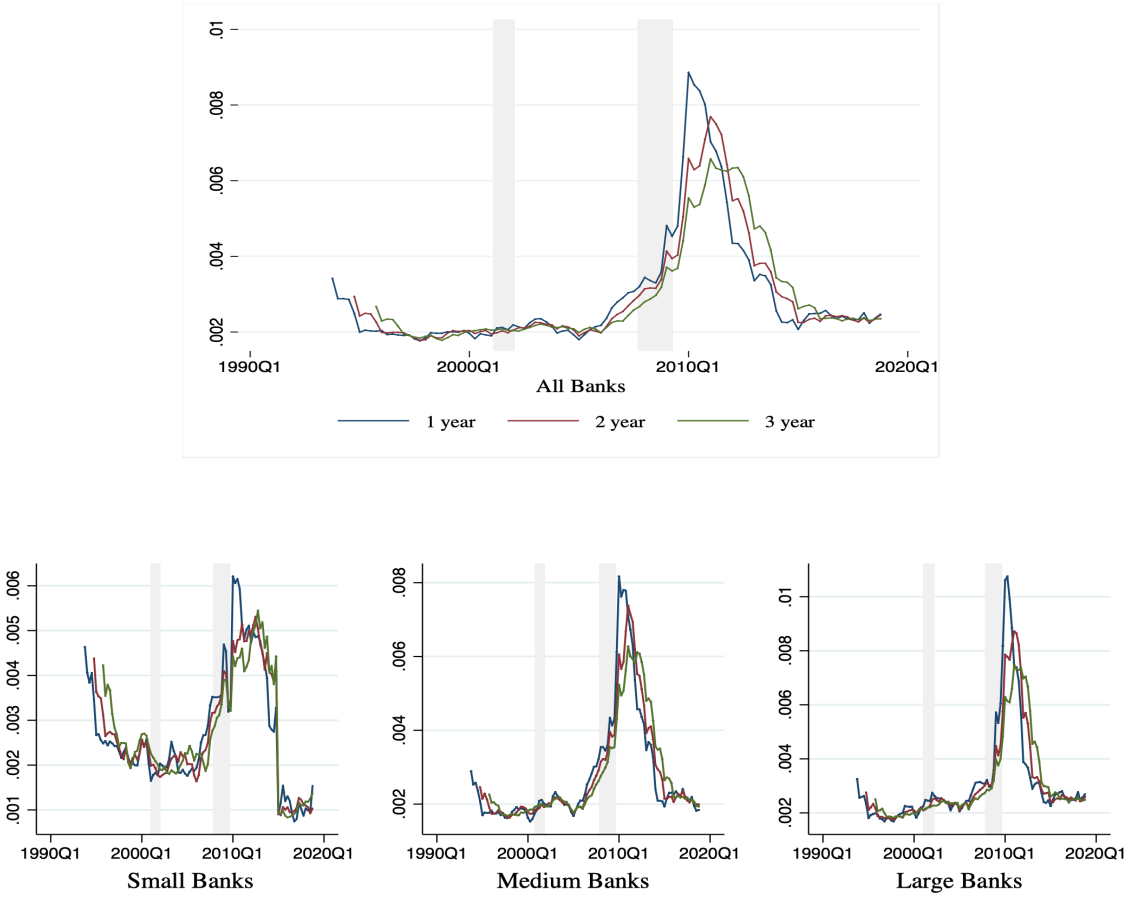


Figure 1

Opacity over Time: The figure plots opacity across banks in the sample over time. The blue, red, and green lines denote opacity over the last one, two, and three years respectively. Opacity is the absolute value of residuals estimated from Equation (1). We measure opacity over the last one, two, and three years as described in Section 2.1. The bottom panel plots the average opacity for three groups of banks over time. Small banks have assets below $500 million, large banks have assets above $3 billion, and medium banks have assets between $500 million and $3 billion (measured in the year 2000 real dollars).

Table III explores the association between opacity and a vector of variables that capture the bank's size and asset composition with different combinations of bank and quarter fixed effects (Chen et al., 2022). It can be seen that the heterogeneity in bank-level opacity cannot be captured by observable bank characteristics such as size and asset composition: the regression R-square without

any fixed effects in column (1) is less than 5%. Time-invariant bank-specific factors account for the largest proportion of variation in opacity, at about 40% (column (3)). These results suggest that banks that appear similar based on aggregate asset composition can still differ significantly in the inherent opacity of their loan portfolio.

Table III: Opacity and Bank Asset Characteristics

	Dependent Variable			
	(1)	(2)	(3)	(4)
	$Opacity_{it}$	$Opacity_{it}$	$Opacity_{it}$	$Opacity_{it}$
$Ln(Assets)_{it}$	-0.00007^{**}	-0.00005^{*}	0.00007	0.0002
	(-2.55)	(-1.84)	(0.57)	(1.14)
$Real\ Estate\ Loan_{it}$	-0.0014^{***}	-0.0011^{***}	-0.0008	-0.0002
	(-5.53)	(-4.53)	(-0.93)	(-0.24)
$Commercial\ Loan_{it}$	-0.00001	0.0001	-0.0028^{**}	-0.0012
	(-0.05)	(0.628)	(-2.39)	(-1.02)
$Other\ Loan_{it}$	0.0054^{***}	0.0056^{***}	-0.0066^{***}	-0.0053^{***}
	(12.47)	(13.10)	(-3.32)	(-2.71)
Bank Fixed Effects	No	No	Yes	Yes
Time Fixed Effects	No	Yes	No	Yes
R^2	0.0472	0.0942	0.4016	0.4411
$Adj\ R^2$	0.0466	0.0906	0.3649	0.4047
Observations	6478	6,478	6,471	6,471

The table presents the association between Opacity and banks' asset side characteristics. The dependent variable is bank opacity, the absolute value of residuals estimated from Equation (1). *RealEstateLoan* is the ratio of real estate loans to total assets. *CommercialLoan* is the ratio of commercial and industrial loans to total assets. $Ln(Assets)$ is the log of total assets. t-statistics in parenthesis. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

3. Bank Opacity and Predictability of Equity returns from Credit Growth

3.1. Motivation

We explore the predictability of equity returns from credit growth and test whether it is affected by bank opacity. If shareholders are optimistic about the banks with high credit growth and over-

value the stocks, we would expect equity returns to become more predictable from credit growth as bank opacity increases.

Our conjecture on the predictability of returns from past credit growth and its relationship with bank opacity is motivated by two leading streams of theories. In the emerging banking literature, it has been shown that credit growth predicts lower bank equity returns in subsequent one to three years (Baron and Xiong, 2017; Fahlenbrach et al., 2017). Credit growth could occur because expectations fail to take risks into account correctly so that banks become too optimistic about the risks of new lending opportunities Minsky (1977). Bordalo et al. (2018) develops a model of credit cycles using "diagnostic expectations" according to which "agents overweight future outcomes that have become more likely in light of incoming data." After periods of economic boom, banks tend to become too optimistic and fail to rationally evaluate credit risks. Do bank shareholders recognize the risks banks have taken? If they do, they could demand higher expected returns by immediately lowering share prices and thus earn higher future average returns from holding bank stocks. Instead, the literature finds the opposite; returns from bank stocks with high credit growth tend to decline in the future.

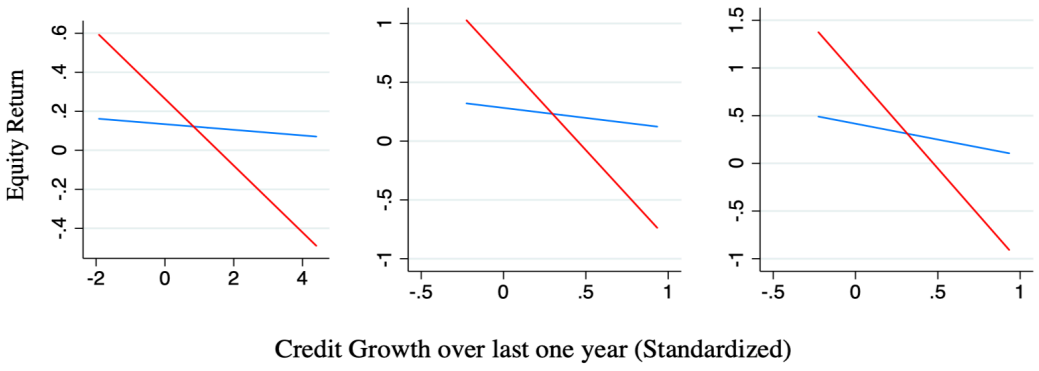
The finding suggests shareholders fail to recognize the risks banks have taken and anticipate the predictably lower returns following credit growth. It is difficult to reconcile with the rational expectations theory. When shareholders assess bank-level credit growth, their expectations might have become too optimistic. As suggested by Fahlenbrach et al. (2017), shareholders can become too optimistic time after time because each episode has its own narrative, and hence, they can view each episode as different(Reinhart and Rogoff, 2009). At the bank level, good performance is associated with high credit growth as high credit growth can be attributed to new unique factors each time: better risk management approach, better training for loan officers, new types of mortgages, greater economic prospects, and so on. These findings highlight the importance of sentiments in the valuation of bank stocks. High credit growth makes shareholders optimistic and this optimism or positive sentiment leads to overvaluation of stocks.

The role of sentiment becomes more prominent in times of high uncertainty; investors become most susceptible to entertaining wild valuations, as their current sentiment suits (Birru and Young, 2020). Combining both sets of theories, we hypothesize that the positive sentiments (optimism) of

shareholders associated with high credit growth will have a larger predictive ability for future equity returns if banks are more opaque. We argue that shareholders will find a bank to be more uncertain if it is more opaque, i.e., the bank's accounting disclosure fails to explain the loan loss provision or the expected realizations of loan defaults.

To understand the predictability of equity returns from credit growth and its sensitivity to bank opacity, it is useful to plot the dynamics. Figure 2 graphically depicts the predictive ability of credit growth for equity returns when conditioning on opacity. Every period, we sort banks into quartiles based on past opacity. In the top, middle, and bottom rows, opacity is measured over the last one, two, and three years respectively. Then we plot equity return against past credit growth separately for banks belonging to the low opacity (quartile 1) and high opacity (quartile 4) groups. The blue and red lines represent low opacity and high opacity banks respectively. In every row, we plot one-, two-, and three-year ahead equity returns in this order.

We observe that an increase in credit growth predicts a decline in returns. As we have argued above, high values of credit growth are associated with an improvement in shareholders' sentiments. More importantly, conditioning on opacity, we find that the negative relationship between credit growth and equity return is substantially stronger for high-opacity banks compared to low-opacity banks.



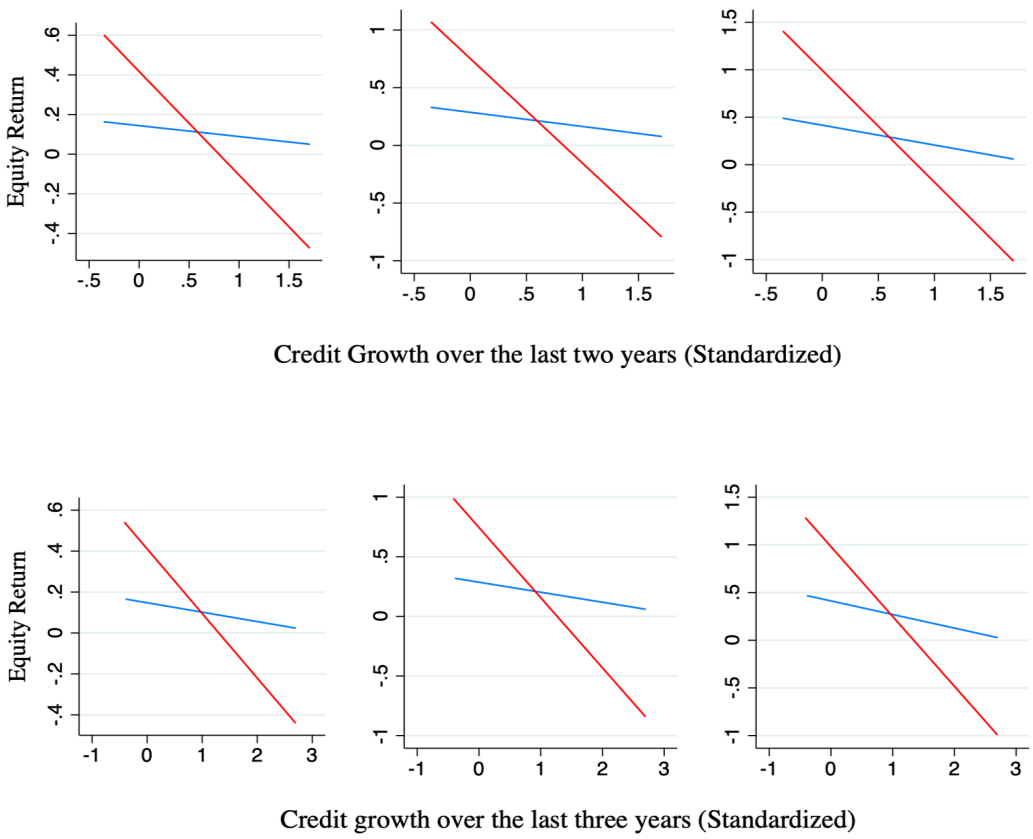


Figure 2

Opacity and Predictability of Equity Return from Credit Growth: The figure plots the fitted values of equity returns against past credit growth for different levels of bank opacity. In the top, middle and bottom rows, banks are sorted into quartiles based on opacity over the last one, two, and three years respectively. We define banks belonging to quartile 1 as low-opacity banks and banks belonging to quartile 4 as high-opacity banks. Then, we plot equity return against past credit growth separately for banks belonging to the low-opacity (blue line) and high-opacity (red line) groups. In each row, the left, middle and right figure plots fitted values of one-, two-, and three years ahead equity returns respectively.

3.2. Empirical Specification and Results

We examine the extent to which opacity affects the predictive ability of past credit growth for future equity returns. In particular, we test whether credit growth-related sentiment causes greater mispricing when opacity is high by examining how the ability of credit growth to predict subsequent corrections of mispricing (or, the negative return that follows) depends on opacity. We use the following regression specification:

$$r_{it,t+j} = \beta_0 + \beta_1 \Delta credit_{it-k,t} + \beta_2 Opacity_{it-k,t} + \beta_3 Opacity_{it-k,t} * \Delta credit_{it-k,t} + \delta_t + \varepsilon_{it} \quad (2)$$

where the dependent variable is $j \in (4, 8, 12)$ quarter ahead (or, 1,2, and 3 years ahead) equity return. We consider returns from buying stock in a quarter to holding it for one, two, and three years.

$\Delta credit_{it-k,t}$ is growth in credit from period $t-k$ to t respectively. $Opacity_{it-k,t}$ is the average opacity from period $t-k$ to t. Staying consistent with the literature [2], we consider credit growth and bank opacity over the past one, two, and three years. The empirical specification includes time-fixed effects; hence any effects we observe are conditional on controlling for the general economic environment for banks. Later, we also include bank fixed effects in the above specification and estimate the regression. Standard errors are dually clustered on bank and time.

The literature has found β_1 to be negative, reflecting subsequent corrections of mispricing induced by shareholder optimism. If shareholders are indeed optimistic and stocks of banks with high credit growth are overvalued earlier due to the positive sentiment of shareholders, the overvaluations as well as the subsequent correction of mispricing will be larger for banks with high opacity. In other words, we expect the negative predictability of equity returns from credit growth to be stronger at high-opacity banks. The coefficient of our interest in the above specification is β_3, which measures the predictability of equity returns from past credit growth varies with bank opacity. Based on the above arguments, we expect β_3 to be negative.

3.3. Result

Table IV reports the results where the explanatory variables - credit growth and opacity are measured over the last $1,\ 2,\ and\ 3$ years respectively. In other words, we vary the explanatory variable, credit growth, $\Delta credit_{it-k,t}$ and bank opacity $Opacity_{it-k,t}$ from last year to further into the past till 3 years. For ease of interpretation, the units of independent variables are in standard deviations with respect to their means.

We first present the results without including bank-fixed effects to fully exploit both cross-sectional and time-series variation. The coefficient estimate on *credit growth* is negative and significant at 1% level, suggesting that, on average, an increase in credit growth predicts a decline in returns in the future. Our main focus, however, is the coefficient for the interaction of *credit growth with bank opacity* which is negative and significant. This finding suggests that the predictability of equity returns from credit growth is stronger at banks with higher opacity. For instance, column (1) in

[2] We choose lag up to three years, not any longer lag. Baron and Xiong (2017) have shown that the greatest predictive power for subsequent equity returns comes from the second and third lags in the one-year change in bank credit to GDP. Schularick and Taylor (2012) also finds similar results for the greatest predictability of future financial crises with the second and third one-year lags of bank credit growth. This finding sheds light on the timing of distress, which generally seems to take place at a one- to three-year horizon after the neglect of risks.

Table IV shows that a one standard deviation increase in credit growth during last year predicts 0.9 *percentage point* (pp) decline in subsequent one-year ahead excess return. The return predictability gets amplified by 177.78% $(= {}^{0.016}/_{0.009})$ as opacity in the last year increases by one standard deviation. The return predictability and its sensitivity to bank opacity retain similar statistical and economic significance when we use two- and three-year ahead returns. For two- and three-year ahead returns, the predictability from credit growth over last year gets amplified by 162% and 109.09% respectively when opacity in the last year increases by one standard deviation.

As per column (5) in Table IV, a one standard deviation increase in credit growth in the last two years predicts a $3pp$ decline in subsequent two-year ahead return. With an increase in opacity during the corresponding period by one standard deviation, the return further declines by $2.1pp$, an amplification of 70%. Similarly, in column (9), for one standard deviation improvement in credit growth during the last three years, three-year ahead return declines by $5.1pp$. With an increase in opacity in the last three years by one standard deviation, the return further declines by $5.8pp$ or an amplification of 113.72%. In Table V, we report results after estimating our main regression specification in Equation (2) with both bank and time-fixed effects. We find qualitatively similar results. Next, we explore if the above results are concentrated in a specific size group or during the 2007–2008 Financial Crisis.

Table VI,VII, and VIII present estimates from a specification in which we allow all coefficients to vary by groups of the small, medium, and large banks, as defined earlier. The results manifest across all bank groups except small banks. Table IX presents a similar analysis except we estimate all coefficients excluding the Financial Crisis period (defined as the eight quarters from 2007Q3 to 2009Q2). Our results are not driven by the Financial Crisis and, in fact, they do not manifest during the Crisis periods (results unreported).

Table IV: Opacity and Predictability of Equity Return from Credit Growth

Opacity and Credit Growth	over last one year			over last two years			over last three years		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Equity Return $(r_{it,t+j})$	1 year	2 year	3 year	1 year	2 year	3 year	1 year	2 year	3 year
$\Delta credit_{it-k,t}$	-0.009^{***}	-0.021^{***}	-0.044^{***}	-0.012^{***}	-0.030^{***}	-0.052^{***}	-0.018^{***}	-0.038^{***}	-0.051^{***}
	(-3.06)	(-3.71)	(-5.17)	(-2.98)	(-4.34)	(-5.02)	(-4.22)	(-4.91)	(-4.37)
$Opacity_{it-k,t} * \Delta credit_{it-k,t}$	-0.016^{***}	-0.034^{***}	-0.048^{**}	-0.016^{***}	-0.034^{***}	-0.057^{***}	-0.013^{**}	-0.037^{***}	-0.058^{***}
	(-3.14)	(-3.73)	(-3.96)	(-3.11)	(-3.17)	(-3.92)	(-2.02)	(-3.07)	(-3.41)
$Opacity_{it-k,t}$	0.00	0.022^{**}	0.05^{***}	0.001	0.021^{*}	0.039^{**}	0.005	0.018	0.048^{**}
	(0.07)	(2.10)	(3.05)	(0.22)	(1.86)	(2.29)	(0.70)	(1.45)	(2.57)
R^2	0.3539	0.3982	0.3962	0.3620	0.4063	0.4019	0.3625	0.4067	0.3941
$Adj\ R^2$	0.3518	0.3961	0.3939	0.3599	0.4042	0.3995	0.3602	0.4044	0.3915
No. of Observations	31,405	27,533	24,129	28,481	24,946	21,838	25,731	22,518	19,763
Bank FE	N	N	N	N	N	N	N	N	N
Time FE	Y	Y	Y	Y	Y	Y	Y	Y	Y

The table reports result from the regression model specified in Equation (2). The dependent variable is the return from holding stock of bank i from period t to $t+j$. We calculate one-, two-, and three-year ahead equity returns and regress them on credit growth and opacity from period $t-k$ to t. Opacity $(Opacity_{it-k,t})$ and credit growth $(\Delta credit_{it-k,t})$ are measured over the last one, two, and three years respectively. We interact past credit growth with our measure of bank opacity for the corresponding periods. Explanatory variables are in standard deviation units. A coefficient of -0.021 on credit growth means that a one standard deviation rise in bank credit growth predicts a 2.1pp decline in subsequent return. A coefficient of -0.034 on the interaction term means: when opacity increases by one standard deviation, a one standard deviation rise in bank credit growth predicts a further 3.4pp decline or a total 5.6pp (0.021+0.034) decline in subsequent return. Regressions are estimated using Correia (2016) multilevel panel fixed effect estimator. t-statistics in parentheses are computed from standard errors dually clustered on bank and time. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Table V: Opacity and Predictability of Equity Return from Credit Growth

Opacity and Credit Growth	over last one year			over last two years			over last three years		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Equity Return $(r_{it,t+j})$	1 year	2 year	3 year	1 year	2 year	3 year	1 year	2 year	3 year
$\Delta credit_{it-k,t}$	-0.009^{***}	-0.022^{***}	-0.047^{***}	-0.009^{**}	-0.031^{***}	-0.061^{***}	-0.017^{***}	-0.044^{***}	-0.062^{***}
	(-3.03)	(-3.94)	(-5.79)	(-2.14)	(-4.15)	(-5.29)	(-3.73)	(-4.90)	(-4.47)
$Opacity_{it-k,t} * \Delta credit_{it-k,t}$	-0.014^{**}	-0.028^{***}	-0.037^{***}	-0.012^{**}	-0.022^{*}	-0.035^{**}	-0.005	-0.018	-0.028^{*}
	(-2.59)	(-3.03)	(-2.98)	(-2.03)	(-1.65)	(-2.24)	(-0.67)	(-1.61)	(-1.78)
$Opacity_{it-k,t}$	0.009	0.036^{***}	0.68^{***}	0.017^{**}	0.050^{***}	0.079^{***}	0.031^{***}	0.063^{***}	0.111^{***}
	(1.38)	(2.80)	(3.39)	(2.17)	(3.01)	(3.23)	(3.33)	(3.93)	(4.47)
R^2	0.4156	0.4897	0.5175	0.4202	0.4960	0.5143	0.4239	0.4916	0.5031
$Adj\ R^2$	0.3955	0.4719	0.5002	0.4000	0.4780	0.4970	0.4035	0.4736	0.4862
No. of Observations	31,384	27,509	24,103	28,450	24,923	21,810	25,703	22,495	19,749
Bank FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y	Y	Y	Y

The table reports result from the regression model specified in Equation (2). The dependent variable is the return from holding stock of bank i from period t to $t+j$. We calculate one-, two-, and three-year ahead equity returns and regress them on credit growth and opacity from period $t-k$ to t. Opacity $(Opacity_{it-k,t})$ and credit growth $(\Delta credit_{it-k,t})$ are measured over the last one, two, and three years respectively. We interact past credit growth with our measure of bank opacity for the corresponding periods. Explanatory variables are in standard deviation units. A coefficient of -0.021 on credit growth means that a one standard deviation rise in bank credit growth predicts a 2.1pp decline in subsequent return. A coefficient of -0.034 on the interaction term means: when opacity increases by one standard deviation, a one standard deviation rise in bank credit growth predicts a further 3.4pp decline or a total 5.6pp (0.021+0.034) decline in subsequent return. Regressions are estimated using Correia (2016) multilevel panel fixed effect estimator. t-statistics in parentheses are computed from standard errors dually clustered on bank and time. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Table VI: Opacity and Predictability of Equity Return from Credit Growth: Small Banks only

Opacity and Credit Growth	over last one year			over last two years			over last three years		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Equity Return $(r_{it,t+j})$	1 year	2 year	3 year	1 year	2 year	3 year	1 year	2 year	3 year
$\Delta credit_{it-k,t}$	0.006	0.002	0.009	0.005	0.010	0.025	0.007	0.104	0.052
	(0.81)	(0.13)	(0.30)	(0.52)	(0.48)	(0.49)	(0.60)	(0.29)	(0.62)
$Opacity_{it-k,t} * \Delta credit_{it-k,t}$	−0.006	−0.019	−0.004	−0.015	−0.029	−0.017	−0.001	−0.014	0.042
	(−0.55)	(−0.72)	(−0.09)	(−1.00)	(−0.98)	(−0.26)	(−0.09)	(−0.39)	(0.44)
$Opacity_{it-k,t}$	0.006	0.035	0.068	0.009	0.023	0.040	0.015	0.017	0.100
	(0.54)	(1.36)	(1.54)	(0.56)	(0.74)	(0.52)	(0.71)	(0.36)	(0.80)
R^2	0.5937	0.4446	0.4400	0.3694	0.4488	0.4392	0.3818	0.4447	0.4381
$Adj\ R^2$	0.3634	0.4325	0.4205	0.3844	0.4343	0.4217	0.3647	0.4266	0.4168
No. of Observations	4,838	4,088	3,476	3,805	3,204	2,722	2,943	2,475	2,132
Bank FE	N	N	N	N	N	N	N	N	N
Time FE	Y	Y	Y	Y	Y	Y	Y	Y	Y

The table reports result from the regression model specified in Equation (2). We define banks as small if the asset size is below $500 million (measured in the year 2000 real dollars). The dependent variable is the return from holding stock of bank i from period t to $t+j$. We calculate one-, two-, and three-year ahead equity returns and regress them on credit growth and opacity from period $t-k$ to t. Opacity $(Opacity_{it-k,t})$ and credit growth $(\Delta credit_{it-k,t})$ are measured over the last one, two, and three years respectively. We interact past credit growth with our measure of bank opacity for the corresponding periods. Explanatory variables are in standard deviation units. A coefficient of -0.021 on credit growth means that a one standard deviation rise in bank credit growth predicts a 2.1pp decline in subsequent return. A coefficient of -0.034 on the interaction term means: when opacity increases by one standard deviation, a one standard deviation rise in bank credit growth predicts a further 3.4pp decline or a total 5.6pp (0.021+0.034) decline in subsequent return. Regressions are estimated using Correia (2016) multilevel panel fixed effect estimator. t-statistics in parentheses are computed from standard errors dually clustered on bank and time. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Table VII: Opacity and Predictability of Equity Return from Credit Growth: Medium Banks only

Opacity and Credit Growth	over last one year			over last two years			over last three years		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Equity Return $(r_{it,t+j})$	1 year	2 year	3 year	1 year	2 year	3 year	1 year	2 year	3 year
$\Delta credit_{it-k,t}$	-0.013^{***}	-0.030^{***}	-0.061^{***}	-0.016^{***}	-0.038^{***}	-0.065^{***}	-0.022^{***}	-0.043^{***}	-0.056^{***}
	(-3.00)	(-3.88)	(-5.67)	(-2.61)	(-3.92)	(-5.09)	(-3.29)	(-3.84)	(-3.76)
$Opacity_{it-k,t} * \Delta credit_{it-k,t}$	-0.024^{***}	-0.047^{***}	-0.072^{***}	-0.018^{*}	-0.034^{*}	-0.064^{***}	-0.012	-0.037^{*}	-0.064^{**}
	(-3.37)	(-3.08)	(-3.54)	(-1.93)	(-1.86)	(-2.72)	(-1.10)	(-1.88)	(-2.39)
$Opacity_{it-k,t}$	0.013	0.00	0.017	-0.005	0.012	0.028	-0.00	0.012	0.049^{*}
	(-1.53)	(0.05)	(0.91)	(-0.50)	(0.65)	(1.15)	(-0.04)	(0.63)	(1.80)
R^2	0.36669	0.4217	0.4298	0.3710	0.4281	0.4351	0.3742	0.4310	0.4338
$Adj\ R^2$	0.3630	0.4179	0.4257	0.3671	0.4241	0.4309	0.3701	0.4270	0.4294
No. of Observations	16,293	14,429	12,722	15,080	13,320	11,739	13,841	12,222	10,788
Bank FE	N	N	N	N	N	N	N	N	N
Time FE	Y	Y	Y	Y	Y	Y	Y	Y	Y

The table reports result from the regression model specified in Equation (2). We define banks as medium if the asset size is between $500 million and $3 billion (measured in the year 2000 real dollars). The dependent variable is the return from holding stock of bank i from period t to $t+j$. We calculate one-, two-, and three-year ahead equity returns and regress them on credit growth and opacity from period $t-k$ to t. Opacity $(Opacity_{it-k,t})$ and credit growth $(\Delta credit_{it-k,t})$ are measured over the last one, two, and three years respectively. We interact past credit growth with our measure of bank opacity for the corresponding periods. Explanatory variables are in standard deviation units. A coefficient of -0.021 on credit growth means that a one standard deviation rise in bank credit growth predicts a 2.1pp decline in subsequent return. A coefficient of -0.034 on the interaction term means: when opacity increases by one standard deviation, a one standard deviation rise in bank credit growth predicts a further 3.4pp decline or a total 5.6pp (0.021+0.034) decline in subsequent return. Regressions are estimated using Correia (2016) multilevel panel fixed effect estimator. t-statistics in parentheses are computed from standard errors dually clustered on bank and time. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Table VIII: Opacity and Predictability of Equity Return from Credit Growth: Large Banks only

Opacity and Credit Growth	over last one year			over last two years			over last three years		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Equity Return $(r_{it,t+j})$	1 year	2 year	3 year	1 year	2 year	3 year	1 year	2 year	3 year
$\Delta credit_{it-k,t}$	-0.011^{***}	-0.020^{***}	-0.041^{***}	-0.011^{**}	-0.027^{***}	-0.049^{***}	-0.016^{***}	-0.034^{***}	-0.051^{***}
	(-2.68)	(-2.74)	(-3.90)	(-2.36)	(-3.11)	(-4.17)	(-3.30)	(-4.02)	(-4.44)
$Opacity_{it-k,t} * \Delta credit_{it-k,t}$	-0.012^{*}	-0.025^{**}	-0.029^{***}	-0.015^{**}	-0.031^{***}	-0.045^{***}	-0.014^{**}	-0.034^{***}	-0.046^{**}
	(-1.93)	(-2.57)	(-2.84)	(-2.58)	(-2.97)	(-3.18)	(-2.30)	(-2.80)	(-2.38)
$Opacity_{it-k,t}$	0.014^{*}	0.046^{***}	0.089^{***}	0.011^{*}	0.042^{***}	0.074^{***}	0.015^{**}	0.041^{***}	0.072^{***}
	(1.98)	(3.38)	(4.18)	(1.79)	(3.48)	(3.65)	(2.48)	(3.62)	(3.61)
R^2	0.4033	0.4196	0.4010	0.4076	0.4274	0.4050	0.4010	0.4216	0.3820
$Adj\ R^2$	0.3974	0.4134	0.3941	0.4017	0.4212	0.3978	0.3948	0.4151	0.3744
No. of Observations	10,263	9,010	7,929	9,584	8,415	7,374	8,935	7,814	6,840
Bank FE	N	N	N	N	N	N	N	N	N
Time FE	Y	Y	Y	Y	Y	Y	Y	Y	Y

The table reports result from the regression model specified in Equation (2). We define banks as large if the asset size is above $3 billion (measured in the year 2000 real dollars). The dependent variable is the return from holding stock of bank i from period t to $t+j$. We calculate one-, two-, and three-year ahead equity returns and regress them on credit growth and opacity from period $t-k$ to t. Opacity $(Opacity_{it-k,t})$ and credit growth $(\Delta credit_{it-k,t})$ are measured over the last one, two, and three years respectively. We interact past credit growth with our measure of bank opacity for the corresponding periods. Explanatory variables are in standard deviation units. A coefficient of -0.021 on credit growth means that a one standard deviation rise in bank credit growth predicts a 2.1pp decline in subsequent return. A coefficient of -0.034 on the interaction term means: when opacity increases by one standard deviation, a one standard deviation rise in bank credit growth predicts a further 3.4pp decline or a total 5.6pp (0.021+0.034) decline in subsequent return. Regressions are estimated using Correia (2016) multilevel panel fixed effect estimator. t-statistics in parentheses are computed from standard errors dually clustered on bank and time. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Table IX: Opacity and Predictability of Equity Return from Credit Growth: Excluding the Financial Crisis periods

Opacity and Credit Growth	over last one year			over last two years			over last three years		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Equity Return $(r_{it,t+j})$	1 year	2 year	3 year	1 year	2 year	3 year	1 year	2 year	3 year
$\Delta credit_{it-k,t}$	-0.008^{***}	-0.020^{***}	-0.043^{***}	-0.009^{**}	-0.028^{***}	-0.051^{***}	-0.014^{***}	-0.034^{***}	-0.050^{***}
	(-2.76)	(-3.43)	(-4.86)	(-2.32)	(-4.01)	(-4.83)	(-3.47)	(-4.52)	(-4.18)
$Opacity_{it-k,t} * \Delta credit_{it-k,t}$	-0.016^{***}	-0.033^{***}	-0.049^{***}	-0.014^{**}	-0.032^{***}	-0.058^{***}	-0.009	-0.034^{***}	-0.058^{***}
	(-3.21)	(-3.66)	(-4.00)	(-2.63)	(-2.93)	(-3.95)	(-1.54)	(-2.96)	(-3.45)
$Opacity_{it-k,t}$	0.005	0.027^{***}	0.05^{***}	0.009^{*}	0.028^{***}	0.040^{**}	0.013^{**}	0.027^{**}	0.051^{**}
	(1.01)	(2.73)	(3.17)	(1.76)	(2.66)	(2.40)	(2.22)	(2.23)	(2.71)
R^2	0.3357	0.3972	0.4036	0.3439	0.4078	0.4125	0.3471	0.4110	0.4073
$Adj\ R^2$	0.3336	0.3951	0.4014	0.3417	0.4056	0.4101	0.3447	0.4087	0.4048
No. of Observations	28,862	25,174	21,946	25,965	22,610	19,678	23,268	20,232	17,647
Bank FE	N	N	N	N	N	N	N	N	N
Time FE	Y	Y	Y	Y	Y	Y	Y	Y	Y

The table reports result from the regression model specified in Equation (2). We exclude the financial crisis period, defined as the eight quarters from 2007Q3 to 2009Q2. The dependent variable is the return from holding stock of bank i from period t to $t+j$. We calculate one-, two-, and three-year ahead equity returns and regress them on credit growth and opacity from period $t-k$ to t. Opacity $(Opacity_{it-k,t})$ and credit growth $(\Delta credit_{it-k,t})$ are measured over the last one, two, and three years respectively. We interact past credit growth with our measure of bank opacity for the corresponding periods. Explanatory variables are in standard deviation units. A coefficient of -0.021 on credit growth means that a one standard deviation rise in bank credit growth predicts a 2.1pp decline in subsequent return. A coefficient of -0.034 on the interaction term means: when opacity increases by one standard deviation, a one standard deviation rise in bank credit growth predicts a further 3.4pp decline or a total 5.6pp (0.021+0.034) decline in subsequent return. Regressions are estimated using Correia (2016) multilevel panel fixed effect estimator. t-statistics in parentheses are computed from standard errors dually clustered on bank and time. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

4. Conclusion

In the aftermath of the recent financial crisis, an influential view argues that credit growth may reflect excessive risk-taking by bankers. Bank shareholders fail to recognize the risks. Stocks of banks with high credit growth are, thus overvalued, indicating the presence of over-optimism. Using a sample of US banks from 1992 to 2018, we find that bank opacity plays an important role in facilitating this mispricing.

Specifically, bank credit growth predicts lower bank equity returns in the subsequent one to three years. When shareholders realize their mistakes in overvaluing stocks of banks with high credit growth, correction of mispricing happens, and returns decline. We show that the equity return predictability of credit growth is strongest for high bank opacity. With a rise in opacity, credit growth predicts a sharper decline in future equity returns.

Our results highlight the need for a more comprehensive understanding of shareholder sentiments as our evidence suggests that the effects of sentiment show up most strongly in times of high bank opacity. Our results also have implications for the many aspects of banks' business, such as decisions related to raising capital, and lending to firms, as well as banking regulations.

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