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EARNINGS MANAGEMENT, CAPITAL MANAGEMENT, SIGNALLING AND THE COVID-19 PANDEMIC: THE CASE OF LISTED BANKS IN THE UNITED STATES

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ABSTRACT

Purpose- This paper investigates earnings management, capital management, the impact of the Covid-19 pandemic and signalling by United States listed banks of loan loss provisions. This study is particularly important because there is a relative dearth of research in banking on these topics and thus remain considerably under researched.
Methodology- The dataset comprises a pooled cross-sectional and time series data for a sample of 249 U.S. listed banks for the period 2015 to 2020 consisting of 1,494 observations. A panel data analysis is conducted.
Findings- Results overall show no evidence of systematic earnings management, capital management or signaling by the banks. Findings reveal the impact of the Covid-19 pandemic is not significant during this period of economic fragility for listed banks. The elasticity of loan loss provisions with regards to the annual growth in gross domestic product is negative and statistically significant overall. This is evidence that U.S. listed banks' loan loss provisioning exhibits a pro-cyclical nature. Overall, these results provide evidence of the success of restrictions due to tighter bank regulation and supervision that came into effect at the end of 2014. This required U.S. banks to maintain a minimum common equity tier 1 capital ratio of 4 percent, a minimum tier 1 capital ratio of 5.5 percent, a minimum total capital ratio of 8 percent, and a minimum leverage ratio of 4 percent.
Conclusion- This study adds to the literature as it provides evidence that restrictions on bank activities in the form of minimum capital and leverage ratios at the end of 2014, restrictions in the use of bank capital, and extension of financial support via government intervention funding during the Covid-19 pandemic crisis period have reduced incentives to smooth earnings in the United States banking system. It therefore represents a tried and tested model that can be adopted by banking systems in other countries.

Keywords: Banks, capital management, COVID-19 pandemic, earnings management, loan loss provision, signalling.
JEL Codes: M41, G21, C23, G28

1. INTRODUCTION

This study examines the impact of the Covid-19 pandemic on the earnings management and capital management practices of US listed banks and its interaction effects. Healy and Whalen (1999) define earnings management as the obfuscation of a firm's financial statements by insiders with the objective to mislead some stakeholders or to impact certain contractual outcomes that are contingent on numbers in the financial statements.

Roychowdhury (2006) determines that substantial evidence exists that executives engage in earnings management practices using two main methods. One means is to manage earnings by manipulating accruals with no direct cash flow consequences which is also known as accrual manipulation. In addition, managers can be incentivized to engage in the manipulation of real activities during a period to meet certain earnings targets. Thus, bank managers allow themselves the discretion to manage the loan loss provisioning. This has no direct effect on cash and represents a way to manage earnings.

Cohen et al. (2014) find that managers can opportunistically apply their discretion to utilize loan losses to "paint a desired picture of the firm;" (p. 181). The authors note that as losses accumulate over time and there is the eventual reconciliation of the loan loss provision, there would have to be a reversal of the discretionary choices that were previously made. They

conclude that firms engaging in aggressive earnings management are likely to experience a higher chance of going bust in a period of fragility and greatly underperform during the crisis.

The principle of loan loss provisioning is to adjust a bank's loan reserves to capture anticipated future loan portfolio losses. For commercial banks, loan loss provisions represent a relatively large accrual and thus have a significant impact on banks' earnings and regulatory capital according to Ahmed et al. (1999). It is widely documented in literature that bank managers are incentivized to utilize loan loss provisions for the management of earnings and regulatory capital as well as to convey or signal private information regarding future expectations.

In the United States (U.S.), risk-based capital ratios are used to assess the relative strength, security, and safety of lending institutions. As at the end of 2014, U.S. banks need to maintain a minimum common equity tier 1 capital ratio of 4 percent, a minimum tier 1 capital ratio of 5.5 percent, a minimum total capital ratio of 8 percent, and a minimum leverage ratio of 4 percent.

The Covid-19 pandemic hit U.S. listed banks hard for several reasons. First, the Covid-19 pandemic made it increasingly difficult for US listed banks to keep their distribution channels open due to social distancing restrictions. Second, U.S. listed banks are exposed to potential failures in supervisory and compliance processes and procedures that were not created for out-of-office remote work that has been prevalent. Third, the near-zero interests rates and growing pressures on customers placed huge demands on U.S. listed banks to meet revenue and profit targets. These factors are likely to increase the occurrence of banks' earnings management and capital management practices.

Earnings management and capital management in the guise of loan loss provisions (LLPs) are acknowledged problems that adversely impact the users of the financial statements of U.S. listed banks as accounting violations. The occurrence of events like the Covid-19 pandemic creates a period of financial crisis that is likely to exert pressure on a bank's management to manage earnings and capital. This study is therefore important and contributes to the body of knowledge as it is observed that there is a lack of recent relevant research pertaining to earnings management, capital management, signalling and the impact of the Covid-19 pandemic since the institution of the new banking capital requirements commencing at the end of 2014. This gives rise to the following research question – "What is the impact of the Covid-19 pandemic on the earnings management and capital management practices of U.S. listed banks, its interaction effects, and the signalling effects under the new capital regime requirements?"

The paper is structured as follows. After the introduction, section 2 provides the literature review. Section 3 discusses the data. Section 4 furnishes the methodology. Section 5 offers the results, while section 6 presents the findings and conclusions.

2. LITERATURE REVIEW

Banks book provisions for loan losses on the income statement which increases expenses. Using a sample of US commercial banks, Scheiner (1981) concludes that bank managers use loan loss provisions (LLPs) to manage earnings. Banks raise LLPs during periods of high profitability to enable them reduce volatility of reported earnings in the future (Ma, 1988; Greenawalt and Sinkey; 1988). There is a strong positive correlation between poor financial situation of banks and a high occurrence of earnings management (Bhat, 1996). Some U.S. banks utilize LLPs as mechanisms for earnings management for stock market transactions (Ahmed et al., 1999; Beaver and Engel, 1996; Collins et al., 1995; Healy and Wahlen; 1999; Liu et al., 1997; Liu and Ryan; 1995; and Scholes et al., 1990). Research using samples of non-United States banks also arrive at similar conclusions (Anandarajan et al., 2003; 2007; Pérez et al., 2008).

Banks are required to maintain minimum capital bases as defined by the regulations. Studies using samples of U.S. banks test whether LLPs are utilized to manage capital i.e., opportunistically manage the capital adequacy ratio and they confirm evidence of capital management using LLPs (Moyer, 1990; Scholes et al., 1990; Beatty et al., 1995; Collins et al., 1995). The breach of capital ratios can result in regulatory interventions which can be costly for bank managers and the shareholders (Anandarajan et al., 2003).

Curcio and Hasan (2013) examine the relationship between loan loss provisioning and earnings management in respect of the capital adequacy of Euro Area (EA) banks versus non-EA credit institutions. The authors have several findings. First, they find evidence to conclude that loan-loss provisions represent changes in the anticipated quality of a bank's loan portfolio. Second, in contrast to non-EU Banks, capital management is critical for EU banks. Third, earnings management is an important factor impacting both EU and non-EU banks. Fourth, signalling to outsiders is applicable to non-EU banks, but not for EU credit institutions. Fifth, bank LLPs show a pro-cyclical nature. Finally, the authors conclude that restrictions on bank activities, limit incentives to manage earnings in non-EU banking systems, unlike EU ones.

The signalling hypothesis states that there is a positive correlation between discretionary changes in loan-loss provisions and future changes in future earnings. Consequently, it is expected that the coefficient of the variable will have a positive sign. Kanagaretnam et al. (2004) perform joint tests of signalling and income smoothing via loan loss provisions and provide evidence that support the use of loan loss provisions to smooth earnings. Curcio and Hasan (2013) find that as opposed to what was observed during the non-financial crisis period, non-EA banks used LLPs to manage earnings during the financial

crisis period spanning 2007 to 2010, but not for the management of their capital ratios or the signalling of private information to outsiders.

Gombola et al. (2016) investigate the impact of leverage and liquidity on the behaviour of earnings and capital management in US commercial banks for the period 1999 to 2013. They find that the measures of earnings and capital management consistently show a significantly positive correlation with capital ratios and a significant negative correlation with liquidity ratios. These findings indicate that regulators need to be alert to all forms of aggressive earnings and capital management practices by U.S. banks.

Tran (2022) notes that due to the Covid-19 pandemic that adversely affected the global economy, banks all over the world suffered significant reductions in loan growth and increased levels of distressed and non-performing assets that posed a systemic threat to banks' stability. The authors use a quarterly panel of international banks' data spanning the first quarter of 2020 to the first quarter of 2021 to empirically assess the accounting and market-related risks during the Covid-19 pandemic. They find that banks exhibit increased accounting risk and greater return volatility during the Covid-19 pandemic.

This study therefore contributes to the literature as there is an identified gap in the literature on the topics of earnings management, capital management, signalling and the impact of the Covid-19 pandemic with respect to US listed banks. This is because since the end of 2014, US banks are mandated to achieve a minimum common equity tier 1 capital ratio of 4 percent, a minimum tier 1 capital ratio of 5.5 percent, a minimum total capital ratio of 8 percent, and a minimum leverage ratio of 4 percent. And the impact of these capital ratio restrictions is significantly under researched. Hence, this study attempts to bridge this gap in order to help academics and practitioners, regulatory bodies and standard setters have a better understanding of the topic.

3. DATA

The dataset used in this study is annual data from published financial statements of US listed commercial banks. Data are sourced from published annual financial statements of all United States listed banks using the Bloomberg database for the period 2015 to 2020 and listed on the NASDAQ (327 banks) and NYSE (54 banks) stock exchanges as of June 30th, 2021 representing an initial total population of 381 listed banks. The exclusion of banks with missing data, incomplete data, and depositary receipts results in a final sample of 249 US listed banks.

The final sample comprises a balanced panel dataset of 249 US listed commercial banks for the six-year period spanning 2015 to 2020 and consisting of 1,494 observations. The specific timeframe is to achieve consistency because as of the end of 2014, banks need to maintain a minimum common equity tier 1 capital ratio of 4 percent, a minimum tier 1 capital ratio of 5.5 percent, a minimum total capital ratio of 8 percent, and a minimum leverage ratio of 4 percent.

4. METHODOLOGY

4.1. Testing for Capital Management and Earnings Management

For the testing of the capital and earnings management hypotheses, the Models 1 to 4 are used. Models 1 to 4 are based on an adaptation of the model utilized by Ahmed et al. (1999); Anandarajan et al. (2003, 2007); Leventis et al. (2011), and Curcio and Hasan (2013). This model illustrated in Models 1 to 4 tests for earnings management and capital management in the context of the common equity tier 1 capital ratio, tier 1 capital ratio, total capital ratio, and leverage ratio. The main underlying premise of the model is that it relates a bank's loan loss provisioning to the fundamental earnings information contained in published financial statements and to Tier 1 capital and other capital ratios.

Model 1 represented by equation (1) examines capital management and earnings management by modelling the relationship between loan loss provision as the dependent variable and the Common Equity Tier 1 Capital ratio and the other variables as the explanatory variables.

Model 1

$$\mathrm{LLPR_{it}} = \alpha_0 + \beta_1 \mathrm{COM\_CAP_{it}} + \beta_2 \mathrm{EBTP_{it}} + \beta_3 \mathrm{NPL\_CHNG_{it}} + \beta_4 \mathrm{LOAN\_CHNG_{it}} + \beta_5 \mathrm{CHARGE\_OFF\_CHNG_{it}} + \beta_6 \mathrm{COVID_{it}} + \beta_7 \mathrm{COVID_{it}} * \mathrm{EBTP_{it}} + \beta_8 \mathrm{LN\_ASSETS_{it}} + \beta_9 \mathrm{GDP\_GR_{it}} + \mathrm{e_{it}} \quad (1)$$

Model 2 represented by equation (2) examines capital management and earnings management by modelling the relationship between loan loss provision as the dependent variable and the Tier 1 Risk-Based Capital ratio and the other variables as the explanatory variables.

Model 2

$$\mathrm{LLPR_{it}} = \alpha_0 + \beta_1 \mathrm{TIER1\_CAP_{it}} + \beta_2 \mathrm{EBTP_{it}} + \beta_3 \mathrm{NPL\_CHNG_{it}} + \beta_4 \mathrm{LOAN\_CHNG_{it}} + \beta_5 \mathrm{CHARGE\_OFF\_CHNG_{it}} + \beta_6 \mathrm{COVID_{it}} + \beta_7 \mathrm{COVID_{it}} * \mathrm{EBTP_{it}} + \beta_8 \mathrm{LN\_ASSETS_{it}} + \beta_9 \mathrm{GDP\_GR_{it}} + \mathrm{e_{it}} \quad (2)$$

Model 3 represented by equation (3) examines capital management and earnings management by modelling the relationship between loan loss provision as the dependent variable and the Total Risk-Based Capital ratio and the other variables as the explanatory variables.

Model 3

$$\mathrm{LLPR_{it}} = \alpha_0 + \beta_1 \mathrm{TOTAL\_CAP_{it}} + \beta_2 \mathrm{EBTP_{it}} + \beta_3 \mathrm{NPL\_CHNG_{it}} + \beta_4 \mathrm{LOAN\_CHNG_{it}} + \beta_5 \mathrm{CHARGE\_OFF\_CHNG_{it}} + \beta_6 \mathrm{COVID_{it}} + \beta_7 \mathrm{COVID_{it}} * \mathrm{EBTP_{it}} + \beta_8 \mathrm{LN\_ASSETS_{it}} + \beta_9 \mathrm{GDP\_GR_{it}} + \mathrm{e_{it}} \quad (3)$$

Model 4 represented by equation (4) examines capital management and earnings management by modelling the relationship between loan loss provision as the dependent variable and the Leverage Capital ratio and the other variables as the explanatory variables.

Model 4

$$\mathrm{LLPR_{it}} = \alpha_0 + \beta_1 \mathrm{LEV\_CAP_{it}} + \beta_2 \mathrm{EBTP_{it}} + \beta_3 \mathrm{NPL\_CHNG_{it}} + \beta_4 \mathrm{LOAN\_CHNG_{it}} + \beta_5 \mathrm{CHARGE\_OFF\_CHNG_{it}} + \beta_6 \mathrm{COVID_{it}} + \beta_7 \mathrm{COVID_{it}} * \mathrm{EBTP_{it}} + \beta_8 \mathrm{LN\_ASSETS_{it}} + \beta_9 \mathrm{GDP\_GR_{it}} + \mathrm{e_{it}} \quad (4)$$

Where;

$\mathrm{LLPR_{i,t}}$ is the ratio of loan loss provisions to average loans outstanding of bank *i* at time *t*.

$\mathrm{COM\_CAP_{i,t}}$ is the common equity tier 1 capital ratio of bank *i* at time *t*,. As of the end of 2014, commercial banks need to maintain a minimum common equity tier 1 capital ratio of 4 percent.

$\mathrm{TIER1\_CAP_{i,t}}$ is the Tier 1 Risk-Based Capital Ratio of bank *i* at time *t*. The first tier is composed of capital is used to withstand loss without requiring a bank to cease operations. Tier 1 capital includes items such as common stock, disclosed reserves, retained earnings and certain types of preferred stock. As at the end of 2014, the required minimum tier 1 capital ratio is 5.5 percent.

$\mathrm{TOTAL\_CAP_{i,t}}$ is the Total Risk-Based Capital Ratio of bank *i* at time *t*. It adds both the first and second tiers, and the figure is divided by the bank's risk-weighted assets. As of the end of 2014, the required minimum total capital ratio is 8 percent. Tier 2 represents the second layer of a bank's capital and consists of items such as revaluation reserves, hybrid instruments, and subordinated term debt.

$\mathrm{LEV\_CAP_{i,t}}$ is the Leverage Capital Ratio of bank *i* at time *t*. As of the end of 2014, the minimum leverage ratio is 4 percent.

$\mathrm{EBTP_{i,t}}$ is the ratio of earnings before taxes and LLPs to total assets of bank *i* at time *t*.

$\mathrm{NPL\_CHNG_{i,t}}$ is the change in the ratio of non-performing loans to average loans that occurred at the bank *i* at time t with respect to *t-1*.

$\mathrm{LOAN\_CHNG_{i,t}}$ is the change in lending activity volumes of bank *i* at time *t*, measured by the change in total amounts relative to time *t-1*.

$\mathrm{CHARGE\_OFF\_CHNG_{i,t}}$ is the change in the ratio of annualized net charge-offs to average total loans of bank *i* at time *t*, measured by the change in total amounts relative to time *t-1*.

COVID is the dummy variable (1) for observations lying within the Covid regime (i.e., the 2020 calendar years) and (0) otherwise.

$\mathrm{LN\_ASSETS_{i,t}}$ is the natural logarithm of total assets of bank *i* at time *t*.

$\mathrm{GDP\_GR_{i,t}}$ is the annual growth in gross domestic product at constant prices at time *t* with respect to *t-1*.

$\mathrm{e_t}$ is the error term.

Loan loss provisions consist of two components: the first is the discretionary or the unexpected part which is subject to the manager's control. The second is the non-discretionary or expected component that is due to changes in default risk as a result of the ordinary growth of loan portfolios (Curcio and Hasan, 2013). To control for the non-discretionary component, the $\mathrm{NPL\_CHNG_{i,t}}$ variable (the change in the ratio of non-performing loans to average loans that occurred at the bank *i* at time *t* with respect to *t-1*) and the $\mathrm{LOAN\_CHNG_{i,t}}$ variable (the change in lending activity volumes of bank *i* at time *t*, measured by the change in total amounts relative to time *t-1*) variables are used.

With respect to the $\mathrm{NPL\_CHNG_{i,t}}$, it is expected that loan-loss provisions are positively associated with changes in non-performing loans. The non-performing loans model parameter has widely been regarded as an indicator of banking problems and financial stability as several studies emphasize the dynamic behavior of non-performing loans before banking or other period of instability (Hoggarth et al., 2002; and Domac and Peria., 2003). There was a persistent increase in non-performing loans of US and non-US banks during the Covid-19 pandemic that hit the global economy (Tran et al., 2022).

With regards to the $LOAN\_CHNG_{i,t}$ variable, this model parameter can be considered a proxy to reflect general provisions (Curcio and Hasan, 2013). However, the impact of this variable on loan loss provisions primarily depends on the quality of incremental loans. This is because although the change in total loans outstanding should influence the choice of LLPs by bank management. Beaver and Engle (1996) note that a lot of attention focused on non-performing assets after the mid-80s in the attempt to achieve more sustainable long-term stability of the banking system most likely led to bank managers being prevented from lending to less creditworthy customers (Lobo and Yang, 2001).

Following previous studies such as Moyer (1990); Beatty et al. (1995); Ahmed et al. (1999); Anandarajan et al. (2007), Curcio and Hasan (2013), the models 1, 2, 3 and 4 representing the Common equity tier 1, Tier 1 Risk-Based, Total Risk-Based, Leverage Capital Ratios support capital earnings management hypothesis if the signs of the capital ratios are negative. This is consistent with the notion that the banks with the lower capital ratios will reduce their loan loss provisions to enhance their capital ratios by increasing the numerators of the regulatory ratios. The existence of a negative association between primary quality capital and loan loss provisions is the main theory of the traditional capital management hypothesis. A negative sign is therefore expected for the Common equity tier 1 (COM_CAP), Tier 1 Risk-Based (TIER1_CAP), Total Risk-Based (TOTAL_CAP), Leverage Capital (LEV_CAP) regulatory ratio variables.

The $EBTP_{i,t}$ variable representing the ratio of earnings before taxes and loan loss provisions to total assets of bank *i* at time *t*, is the variable used to test for earnings management in the form of the income smoothing hypothesis. There is support for the existence of this hypothesis if the coefficient of the EBTP variable is positive. This means that banks with earnings lower (higher) than their target value will likely reduce (increase) loan loss provisions. As listed banks raise funds from the stock market, a positive sign is expected for the EBTP variable as US listed banks will have an incentive to manage earnings (Anandarajan et al., 2007; Curcio and Hasan, 2013).

The $CHARGE\_OFF\_CHNG_{i,t}$ variable representing the change in the ratio of annualized net charge-offs to average total loans of bank *i* at time *t*, measured by the change in total amounts relative to time *t-1* is modelled. This is because failure to do so yields excessive false rejections against the null of no earnings management in various settings (Basu et al. (2020). A positive sign is expected because a higher charge-off indicates a lower credit quality of the loan portfolio that will positively relate to a higher loan loss provision.

The dichotomous Covid variable is binary variable to control for the impact of the Covid-19 pandemic. The interaction variable COVID*EBTP is included to detect whether U.S. listed banks are likely to engage in opportunistic earnings management in the event of a period of fragility such as the Covid-19 pandemic that adversely impacted the earnings before taxes and loan-loss provisions of banks and their stock market share prices. A negative sign is expected since listed banks obtain financing from the stock market, the banks will have an increased incentive to smooth earnings (Anandarajan et al. (2007); Curcio and Hasan (2013) during the Covid-19 period when stock market prices are depressed. Additionally, this is supported by Cohen et al. (2014) who conclude that firms practising aggressive earnings management are likely to experience a higher probability of going under during a period of fragility such as the Covid-19 pandemic and exhibit dramatic degrees of poor performance during the crisis.

The LN_ASSETS variable representing the natural logarithm of total assets as a measure of bank size is included as a control variable. Consistent with Liu and Ryan (1995), Anandarajan et al. (2007), Curcio and Hasan (2013), it is expected that the coefficient of this variable will be positive. This is because it is expected that as a result of higher volume of lending business, big banks should have larger loan loss provision's relative to smaller banks. In addition, the "political cost" theory postulated by Watts and Zimmerman suggests a positive sign as well. Political Costs Theory states that large profitable firms are subject to relatively higher effective tax rates and regulatory costs. Thus, there is a positive relationship between firm size and the use of earnings management practices via income-reducing accounting methods. Additionally, Mansfield (1962) concludes that higher earnings and the resulting increased political visibility are likely to attract potential rivals, thus increasing competition.

The GDP_GR variable is included as another control variable to control for the pro-cyclical effect of loan loss provisions, in line with the risk management hypothesis (Fonseca and Gonzále, 2008). Consistent with Curcio and Hasan (2013), the 6-year cycle sample period of this study does not afford the authors to consider the full economic cycle, meaning that the results of the analysis need to be interpreted cautiously.

4.2. Testing for Signalling Theory

To test the signalling hypothesis, the one-year ahead change in earnings before loan-loss provisions and taxes to assets is included in the right side of the regression equation (5). Consistent with Curcio and Hasan (2013), the regression model represented by equation (5) is made more parsimonious by dropping the change in the ratio of non-performing loans to average loans (NPL_CHNG) and the change in volumes of lending activity (LOAN_CHNG) variables. The signalling hypothesis states that there is a positive association between discretionary changes in loan-loss provisions and future changes in future earnings. As a result, a positive sign for the coefficient of the variable is expected as in Wahlen (1994), Ahmed et al. (1999), Anandarajan et al. (2007) and in Curcio and Hasan (2013). The model used to test the signalling hypothesis which is Model 5:

Model 5

$$\mathrm{LLPR_{it}} = \alpha_0 + \beta_1 \mathrm{EBTP_{it}} + \beta_2 \mathrm{EBTP\_CHNG_{i,t+1}} + \beta_3 \mathrm{TIER1\_CAP_{it}} + \beta_4 \mathrm{GDP\_GR_{it}} + \mathrm{e_{it}} \quad (5)$$

Where;

$LLPR_{i,t}$ is the ratio of loan loss provisions to average loans outstanding of bank *i* at time *t*.

TIER1_CAPi,t is the Tier 1 Risk-Based Capital Ratio of bank i at time t. The first tier is composed of capital is used to withstand loss without requiring a bank to cease operations. Tier 1 capital includes items such as common stock, disclosed reserves, retained earnings and certain types of preferred stock. As at the end of 2014, the required minimum tier 1 capital ratio is 5.5 percent.$EBTP_{i,t}$ is the ratio of earnings before taxes and LLPs to total assets of bank *i* at time *t*.

$EBTP\_CHNG_{i,t+1}$ is the change in the ratio of earnings before taxes and LLPs to total assets of bank i at time t, measured by the change in total amounts relative to time t+1.

$GDP\_GR_{i,t}$ is the annual growth in gross domestic product at constant prices at time *t* with respect to *t-1*.

e_t is the error term.

The dataset consists of a pooled cross-sectional and time series data. As the t-statistics could be overstated, a panel data modelling estimation technique is utilized where the Hausman test is used to determine if fixed effects or a random effects model is appropriate. This methodology is used to estimate all the models.

5. RESULTS AND ANALYSIS

The descriptive statistics for the full sample estimation are presented in Table 1. The full sample estimation comprising 1,494 observations across 249 U.S. listed banks represent a balanced panel. The mean and median value of LLPR is 0.004 and ranges from a minimum of -0.013 to a maximum of 1.500 with a standard deviation of 0.040. This implies a wide variation that includes negative amounts representing instances where provisions are credits in the income statement and thus are reductions in provision. Likewise, wider dispersions are noted in the control size variable LN_ASSETS and the LOAN_CHNG to a lesser extent. The $CHARGE\_OFF\_CHNG_{i,t}$ variable exhibits highly significant variation with an average value of 0.075, a median value of -0.002 and ranges from a minimum of -41.330 to a maximum of 153.20 and with a standard deviation of 4.11 indicating that considerable randomness in the change in the ratio of annualized net charge-offs to average total loans of bank *i* at time *t*, measured by the change in total amounts relative to time *t-1*. These observed statistics indicate the sample characteristics to be distributed across US listed banks from small to medium to large firms in terms of relative size and lending volume activity.

Table 1: Descriptive Statistics

Variables/Statistics	Observations	Mean	Median	Maximum	Minimum	Std. Dev.
CHARGE_OFF_CHNG	1,494	0.075	-0.002	153.290	-41.330	4.111
COM_CAP	1,494	0.127	0.120	0.506	0.045	0.036
EBTP	1,494	0.014	0.014	0.052	-0.047	0.006
LEV_CAP	1,494	0.102	0.099	0.258	0.040	0.020
LLPR	1,494	0.004	0.002	1.500	-0.013	0.040
LN_ASSETS	1,494	8.610	8.422	15.035	5.862	1.677
LOAN_CHNG	1,494	0.136	0.089	1.250	-0.225	0.167
NPL__CHNG	1,494	0.004	-0.001	1.977	-0.010	0.056
TIER1_CAP	1,494	0.133	0.125	0.506	0.060	0.035
TOTAL_CAP	1,494	0.148	0.139	0.520	0.080	0.035

Table 2 provides pairwise Pearson correlation coefficients of the variables that are used in the regression models for the sample of U.S. listed banks. Among the independent variables, the natural logarithm of total assets (LN_ASSETS) is the only explanatory variable that is positively and statistically significantly associated with the loan loss provisions dependent variable at the 5% level of significance. This result is consistent with the finding of Curcio and Hasan (2013). The Total Risk-Based Capital Ratio (TOTAL_CAP), the change in the ratio of non-performing loans to average loans (NPL_CHNG), are positively, but not statistically significantly, associated with loan-loss provisions.

The GDP growth rate (GDP_GR) is the only independent variable that is negatively and somewhat statistically significantly associated with the loan loss provisions dependent variable albeit at the 10% level of significance. This result is consistent with the studies of Fonseca and González (2008), Laeven and Majnoni (2003),and Bikker and Metzemakers (2015) that find loan loss provisions and GDP growth to be negatively correlated using international samples of banks. This is also inconsistent

with Anandarajan et al. (2007) where the authors find a significant positive correlation coefficient and inconsistent with Curcio and Hasan (2013) that find an insignificant relationship. The ratio of earnings before taxes and LLPs to total assets (EBTP), the common equity tier 1 capital ratio (COM_CAP**),** the Tier 1 Risk-Based Capital Ratio (TIER1_CAP), the Leverage Capital Ratio (LEV_CAP), the change in the ratio of annualized net charge-offs to average total loans (CHARGE_OFF_CHNG), and the change in volumes of lending activity (LOAN_CHNG) variables are negatively, but not significantly associated with loan loss provisions. Even though, the Pearson correlation coefficients analysis has shown associations between the loss provisions and the other variables for U.S. listed banks, a more robust and rigorous econometric analysis is required for further investigation.

Table 2: Pearson Correlation Coefficients of Key Variables

		ln_assets	ebtp	com_cap	tier1_cap	total_cap	lev_cap	charge_off_chng	npl_,chng	loan_chng	llpr	gdp_gr
ln_assets	Pearson Correlation	1	.231**	-.258**	-.205**	-.153**	-.228**	-0.011	-0.040	-0.040	.140**	-.081**
	Sig. (2-tailed)		0.000	0.000	0.000	0.000	0.000	0.678	0.125	0.119	0.000	0.002
Ebtp	Pearson Correlation	.231**	1	-0.011	-0.016	0.005	.121**	-0.019	-0.001	-0.045	-0.009	0.023
	Sig. (2-tailed)	0.000		0.668	0.537	0.856	0.000	0.470	0.964	0.085	0.732	0.375
com_cap	Pearson Correlation	-.258**	-0.011	1	.945**	.890**	.685**	.052*	0.017	-.111**	-0.021	0.002
	Sig. (2-tailed)	0.000	0.668		0.000	0.000	0.000	0.043	0.524	0.000	0.411	0.923
tier1_cap	Pearson Correlation	-.205**	-0.016	.945**	1	.922**	.686**	0.048	-0.021	-.133**	-0.012	0.015
	Sig. (2-tailed)	0.000	0.537	0.000		0.000	0.000	0.064	0.417	0.000	0.641	0.568
total_cap	Pearson Correlation	-.153**	0.005	.890**	.922**	1	.656**	0.042	0.012	-.143**	0.007	-0.029
	Sig. (2-tailed)	0.000	0.856	0.000	0.000		0.000	0.107	0.632	0.000	0.799	0.259
lev_cap	Pearson Correlation	-.228**	.121**	.685**	.686**	.656**	1	0.041	-0.002	-0.016	-0.035	.118**
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000		0.116	0.925	0.537	0.171	0.000
charge_off_chng	Pearson Correlation	-0.011	-0.019	.052*	0.048	0.042	0.041	1	0.006	.055*	-0.001	0.013
	Sig. (2-tailed)	0.678	0.470	0.043	0.064	0.107	0.116		0.827	0.035	0.958	0.606
npl_,chng	Pearson Correlation	-0.040	-0.001	0.017	-0.021	0.012	-0.002	0.006	1	-0.007	0.002	-0.042
	Sig. (2-tailed)	0.125	0.964	0.524	0.417	0.632	0.925	0.827		0.795	0.953	0.104
loan_chng	Pearson Correlation	-0.040	-0.045	-.111**	-.133**	-.143**	-0.016	.055*	-0.007	1	-0.033	0.039
	Sig. (2-tailed)	0.119	0.085	0.000	0.000	0.000	0.537	0.035	0.795		0.200	0.134
Llpr	Pearson Correlation	.140**	-0.009	-0.021	-0.012	0.007	-0.035	-0.001	0.002	-0.033	1	-.062*
	Sig. (2-tailed)	0.000	0.732	0.411	0.641	0.799	0.171	0.958	0.953	0.200		0.016
gdp_gr	Pearson Correlation	-.081**	0.023	0.002	0.015	-0.029	.118**	0.013	-0.042	0.039	-.062*	1
	Sig. (2-tailed)	0.002	0.375	0.923	0.568	0.259	0.000	0.606	0.104	0.134	0.016	
	N	**1494**	**1494**	**1494**	**1494**	**1494**	**1494**	**1494**	**1494**	**1494**	**1494**	**1494**

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

The results of Models 1, 2, 3, 4 and 5 are illustrated in Tables 3, 4, 5, 6 and 7 respectively. The Hausman test is performed for each model to investigate if a fixed effects or a random effects model is appropriate. The Hausman test results show that p-value is not significant for all the models except model 5 in Table 7 which shows that the Hausman test is statistically significant at the 5% level. This means that a random effect model is selected for all the models 1, 2, 3 and 4 while a fixed effects model is determined to be appropriate for model 5. Overall, the results show that there is no evidence of systematic capital management as the Common equity tier 1 capital ratio; the minimum tier 1 capital ratio, the total capital ratio of 8 percent, and the leverage ratio are not significant. Thus, this study provides overall evidence that the restrictions on bank activities in form of minimum capital ratios, restrictions in the use of bank capital both official and private have reduced incentives to smooth earnings in the US banking system (Curcio and Hasan, 2013).

The tabulated results of Models 1, 2, 3 and 4 as detailed in Tables 3, 4, 5, and 6 respectively provide no evidence of systematic earnings management as the EBTP variable (the ratio of earnings before taxes and LLPs to total assets of bank *i* at time *t*) is statistically insignificant. This observation is contrary to the finding of Curcio and Hasan (2013) in their paper that earnings management is an important factor that affects provisioning decisions for both EU and non-EU banks such as U.S. listed banks.

Table 3: Model 1-Modelling Capital Management and Earnings Management with the Common Equity Tier 1 Capital Ratio for the Period 2015 to 2020- Random Effects (Dependent Variable: LLPR)

Variable	Coef.	Robust Std. Err.	z	P>z
COM_CAP	0.012	0.018	0.700	0.484
COVID19	0.005	0.007	0.690	0.490
COVID19_EBTP	-0.142	0.199	-0.720	0.474
EBTP	-0.254	0.356	-0.710	0.476
GDP_GR	-0.038*	0.020	-1.910	0.056
LOAN_CHNG	-0.005	0.006	-0.830	0.404
CHARGE_OFF_CHNG	0.000	0.000	1.230	0.219
NPL_CHNG	0.002	0.002	0.860	0.388
LN_ASSETS	0.003	0.003	1.210	0.228
CONSTANT	-0.023	0.021	-1.100	0.271

*Depicts 10% level of significance
Number of observations = 1,494
Hausman test statistic = 3.97 (0.783)

The tabulated results of Models 1, 2, 3 and 4 provide evidence that the dichotomous Covid-19 pandemic variable and its interaction effect with the ratio of earnings before taxes and LLPs to total assets variable are not statistically significant. A possible reason for this result is that the huge Covid-19 Economic Relief intervention funding provided by the U.S. government helped to limit the effects of Covid-19 pandemic on earnings management and capital management during the crisis period. The effect of the U.S. government's Covid's intervention funding is controlled by the GDP_GR variable that measures the annual growth of the gross domestic product of the U.S. economy.

Table 4: Model 2-Modelling Capital Management and Earnings Management with the Tier 1 Risk-Based Capital Ratio for the Period 2015 to 2020 – Random Effects (Dependent Variable: LLPR)

Variable	Coef.	Robust Std. Err.	Z	P>z
TIER1_CAP	0.015	0.021	0.690	0.489
COVID19	0.005	0.007	0.690	0.490
COVID19_EBTP	-0.145	0.201	-0.720	0.469
EBTP	-0.251	0.352	-0.710	0.476
GDP_GR	-0.038**	0.019	-2.060	0.039
LOAN_CHNG	-0.005	0.006	-0.840	0.402
CHARGE_OFF_CHNG	0.000	0.000	1.280	0.202
NPL_CHNG	0.002	0.002	0.860	0.389
LN_ASSETS	0.003	0.003	1.210	0.228
CONSTANT	-0.023	0.021	-1.090	0.277

** Depicts 5% level of significance
Number of observations = 1,494
Hausman test statistic = 4.00 (0.779)

The elasticity of loan loss provisions with respect to GDP_GR (the annual growth in gross domestic product) is negative for Models 1 2,3, and 4 and statistically significant at the 5% level for Models 2 and 3; whilst statistically significant at the 10% level for Models 1 and 4. This result is consistent overall with Curcio and Hasan (2015) that find the GDP growth rate to be negatively associated with the loan loss provisions for non-European banks and statistically significant at the 5% level only.

This result is also consistent with pro-cyclical behavior of banks (Fonseca and González, 2008; Bikker and Metzemakers, 2015; Laeven and Majnoni, 2003).

Table 5: Model 3-Modelling Capital Management and Earnings Management with the Total 1 Risk-Based Capital Ratio for the Period 2015 to 2020 – Random Effects (Dependent Variable: LLPR)

Variable	Coef.	Robust Std. Err.	z	P>z
TOTAL_CAP	0.022	0.025	0.850	0.395
COVID19	0.005	0.007	0.680	0.495
COVID19_EBTP	-0.150	0.202	-0.740	0.459
EBTP	-0.250	0.351	-0.710	0.476
GDP_GR	-0.041**	0.017	-2.420	0.016
LOAN_CHNG	-0.005	0.006	-0.820	0.410
CHARGE_OFF_CHNG	0.000	0.000	1.090	0.278
NPL_CHNG	0.002	0.002	0.860	0.390
LN_ASSETS	0.003	0.003	1.210	0.225
CONSTANT	-0.024	0.022	-1.100	0.269

** Depicts 5% level of significance
Number of observations = 1,494
Hausman test statistic = 4.39 (0.734)

Bank size measured by the natural logarithm of total assets (LN_ASSETS) is found not to be significant for any of the models. This finding is consistent with that of Curcio and Hasan (2013) who find bank size to be neither statistically nor economically significant for non-European banks.

Table 6: Model 4-Modelling Capital Management and Earnings Management with the Leverage Capital Ratio for the Period 2015 to 2020 – Random Effects (Dependent Variable: LLPR)

Variable	Coef.	Robust Std. Err.	z	P>z
LEV_CAP	0.009	0.018	0.480	0.632
COVID19	0.005	0.007	0.690	0.489
COVID19_EBTP	-0.137	0.194	-0.710	0.479
EBTP	-0.257	0.363	-0.710	0.478
GDP_GR	-0.036*	0.021	-1.750	0.080
LOAN_CHNG	-0.005	0.006	-0.830	0.406
CHARGE_OFF_CHNG	0.000	0.000	1.190	0.232
NPL_CHNG	0.002	0.002	0.850	0.393
LN_ASSETS	0.003	0.003	1.210	0.226
CONSTANT	-0.022	0.019	-1.110	0.269

* Depicts 10% level of significance
Number of observations = 1,494
Hausman test statistic = 4.04 (0.775)

In addition, the tabulated results of Model 5 in Table 7 show no evidence of signalling of private information to outsiders by US listed banks as the coefficient of the one-year ahead change in earnings before loan-loss provisions and taxes to assets (EBTP_CHNG) variable although statistically significant at the 1% level is negative and not positive. Again, this contrasts with the finding that non-EU banks such as U.S. listed banks use LLPs to signal private information of a bank's future profits to outsiders (Curcio and Hasan, 2013).

Table 7: Model 5-Modelling Testing for the Signalling Theory with the Tier 1 Risk-Based Capital Ratio for the Period 2015 to 2019 – Fixed Effects (Dependent Variable: LLPR)

Variable	Coef.	Robust Std. Err.	t	P>t
EBTP	0.064**	0.029	2.25	0.026
EBTP_CHNG	-0.001***	0.001	-2.73	0.007
GDP_GR	-0.029***	0.010	-2.99	0.003
TIER1_CAP	-0.007	0.005	-1.40	0.162
CONSTANT	0.002**	0.008	2.09	0.037

*** Depicts 1% level of significance
** Depicts 5% level of significance
Number of observations = 1,245[1]
Hausman test statistic = 8.90 (0.031)

Further, the dataset comprises a pooled cross-sectional and time series data. This means that the t-statistics could be overstated. A panel data modelling estimation technique is therefore implemented where the Hausman test is used to test if a fixed effects or a random effects model is appropriate. As a test for robustness, a pooled regression analysis was performed. As an additional test for robustness, a dynamic panel data analysis using the Arellano-Bond GMM technique was also performed to control for potential problems relating to possible endogeneity and panel data bias. The results for these tests (not shown) are robust and consistent with the results reported earlier. Another issue relates to survivorship bias. None of the sampled banks filed for bankruptcy during the sample period. It was not possible to identify from the data, cases of mergers and acquisitions during the sample period. Although this does not remove survivorship bias, consistent with Curcio and Hasan (2013), it is not expected that it will influence the results obtained.

6. FINDINGS AND CONCLUSIONS

This study examines earnings and capital management, the impact of the Covid pandemic and signalling by banks of loan loss provisions for U.S. listed banks for the 6-year period 2015 to 2020 consisting of 1,494 observations. As of the end of 2014, banks need to maintain a minimum required capital ratios. Consequently, there is the need to assess the impact of the Covid-19 pandemic on earnings management and capital management as well as to examine the existence of signalling by U.S. listed banks since the inception of these new banking regulatory capital ratios for U.S. banks. The study has several important findings and contributes in several ways.

First, there is no evidence of systematic capital management as there is no statistically significant relationship between loan loss provisions and the Common equity tier 1 capital ratio; the minimum tier 1 capital ratio, the total capital ratio of 8 percent, and the leverage ratio since the new banking regulatory capital ratios came into force the end of 2014.

Second, there is similarly no evidence of systematic earnings management using loan loss provisions by U.S. listed banks. These results provide evidence of the success of restrictions due to tighter bank regulation and supervision that came into effect at the end of 2014.

Third, the dichotomous Covid-19 pandemic variable and its interaction effect with the ratio of earnings before taxes and LLPs to total assets variable are not statistically significant. A plausible explanation for this result is that the massive Covid-19 Economic Relief intervention funding provided by the U.S. government helped to mitigate the effects of Covid-19 pandemic on earnings management and capital management during the crisis period.

Fourth, the elasticity of loan loss provisions with respect to the annual growth in gross domestic product is negative and statistically significant overall. This is evidence that U.S. listed banks loan loss provisions are characterized by a pro-cyclical nature which is consistent with previous empirical evidence that is well documented in the literature.

Finally, in contrast to the documented literature, there is no evidence to support the idea that U.S. listed banks use loan loss provisions to signal a bank's future profits to outsiders. This study will therefore assist regulatory bodies and standard setters not only in the U.S. but also globally. This is because the required maintenance of a minimum common equity tier 1 capital ratio of 4 percent, a minimum tier 1 capital ratio of 5.5 percent, a minimum total capital ratio of 8 percent, and a minimum leverage ratio of 4 percent by U.S. banks as of the end of 2014 presents a model that is recommended be adopted by other

[1] As the most recent data point collected is for the calendar year 2020, it is not possible to calculate the change in the ratio of earnings before taxes and loan loss provisions to total assets of bank *i* at time *t*, measured by the change in total amounts relative to time *t+1* for the 2020 data point. Hence, the total number of observations for the sample estimation reduces by one full year's observations from 1,494 to 1,245 observations to test the signalling hypothesis in Model 5 (Table 7).

bank supervisors and regulators worldwide to limit opportunistic practices of capital management, earnings management, and signalling.

A possible avenue for future research is to extend the analysis to unlisted U.S. banks. Another suggestion is to examine relationship between earnings management, capital management and available corporate governance characteristics for U.S. listed banks since the end of 2014 when US banks are required to maintain new minimum capital ratios.

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