Quantitative Analysis of Value Investment in Listed Chinese Banks during the COVID-19 Epidemic

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Abstract

This research was conducted in order to explore the nexus between return on investment (ROI) from listed Chinese banks and proposed fundamental indicators documented in financial statements during the COVID-19 epidemic period. Hierarchical analysis was employed to test the hypotheses established by the dependent variable ROI and other independent factors including the attribute of enterprise (State-owned or not), price/earnings ratios (PE), earning per share (EPS) as well as the non-performing loan ratio (NPL). The results show that the nature of enterprise has no impact on ROI. However, PE and NPL are negatively associated with ROI, and EPS is positively related to ROI. The results are tested and analyzed for robustness.

Keywords: *banks, Chinese listed companies, COVID-19 epidemic，quantitative analysis, value investment*

1. Introduction

1.1. Status of Return on Investment in Listed Chinese Banking Enterprises during the COVID-19 Epidemic

The global economy is suffering as a result of the COVID-19 pandemic. To some degree, this crisis is more extensive than the financial catastrophe of 2008. Almost every aspect of life is going through a difficult period. The purpose of this study is to investigate the current state of affairs and the elements that influence return on investment (ROI) from listed firms in China's banking industry during the COVID-19 outbreak. According to the most recent official sector categorization provided by the China Securities Regulatory Commission in 2021, there are 43 listed businesses in China's banking industry that represent the foundations of the Chinese financial market. One of the listed banking firms has delisted from the Chinese A-share stock market and five others have been listed for less than one year. As a result, these six listed firms were removed from this study due to a lack of appropriate statistics and comparability. Since the pandemic broke out towards the end of 2019, this study analyzes the ROI from the end of December in 2019 to the 31st of December in 2021. The ROI can be written as a formula: [EPS(2020-21) + CI(2019-21)] /P(2019), where EPS(2020-21) is the average of profits per share in 2020 and 2021, CI is the capital increase from the end of 2019 to the end of 2021

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and P is the end-of-year price.

The ROI of the 37 listed firms in the sample is as follows:

Table 1. *ROI Frequencies;* **source:** *Original Research*

Items	Categories	N	Percent (%)
ROI	negative	7	18.92
	positive	30	81.08
Total		37	100.0

Table 2. *Descriptive Analysis of ROI;* **source:** *Original Research*

N	Min	Max	Mean	Std. Deviation	Median	Kurtosis	Skewness
37	-0.25	0.93	0.22	0.26	0.21	0.67	0.6

According to the sample of 37 listed businesses in the Chinese banking sector, 18.92% of ROI are negative while 81.08% are positive. The ROI ranges from -25% to 93% with a mean value of 22.2%. The standard deviation of the sample is 0.263, which indicates that the volatility of ROI of listed firms is quite low. The ROI is far from having a normal distribution, as shown by the fact that the kurtosis is only 0.67. Additionally, the skewness is 0.60, indicating a fairly positive skew in the ROI distribution.

1.2. Research Objectives and Questions

The ROI of listed Chinese banks stood out as positive more during the COVID-19 outbreak since the ROI in other sectors was relatively low. The intrinsic value of stocks may always be identified, according to the value investing concept put forward by Graham (2003), and as such, investigating the variables that would affect ROI during COVID-19 from 2019 to 21 is important for confirming the efficacy of the hypothesis. Consequently, the goals of this study are to:

(i) determine the elements affecting ROI in the listed firms in China's banking sector;
(ii) investigate the strength of the relationship between ROI and the factors affecting it;
(iii) identify how influencing elements are related to one another and the reasons why they change.

In light of the foregoing, the following research questions can be deduced from the objectives:

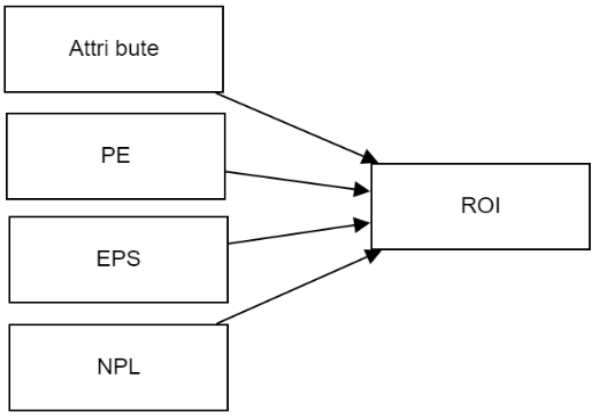
(i) What variables affect ROI in the listed businesses of China's banking industry?
(ii) How and to what degree are there relationships between ROI and the elements that influence it?
(iii) How are the variables affecting ROI impacted by themselves, and how do they interact with one another?

1.3. Conceptual Framework

Numerous studies on value investing theory have shown that factors such as profitability, ability to manage financial risk, price at acquisition, size of listed companies, and others have had an impact on

ROI in a variety of industry sectors to varying degrees throughout the course of decades of research by previous academics. This paper builds the conceptual framework for value investment on the basis of the contributions made by earlier studies and takes the epidemic situation into account (see below).

Figure 1. *Conceptual Framework;* **source:** *Original Research* (see Appendix for further details)



1.4. Research Hypotheses

Based on the conceptual framework above, the research hypotheses can be proposed as follows:

H1: ROI is associated with the attribute of the listed Chinese banks (Attribute).
H2: ROI is associated with price position (PE).
H3: ROI is associated with profitability (EPS).
H4: ROI is associated with financial risk control capability (NPL).

The proposed hypotheses will be tested in null format with a 95% level of confidence.

2. Literature Review

Benjamin Graham has been advocating the value investing idea for over 90 years, and a wealth of scholarly publications have demonstrated the theory's validity across a wide range of businesses. In Graham (2003), for example, he emphasized the need for a thorough examination of the financial statements as well as the nature of the businesses conducted by the listed firms. However, this approach has not been universally accepted. On the basis of original value investment, its adherents have created various analytical techniques. To support or refute the original value investing idea, other accounting-based indicators have been investigated. Piotroski, (2000) demonstrated that choosing high book-to-market (BM) value firms with strong financial standing can increase returns by at least 7% annually. The small and medium size of these high BM firms can also benefit from financial statement analysis, but this superior result is independent of stock purchases made at bargain prices. The findings of Piotroski (2000) are in line with Graham's partial views, according to which listed firms with a high BM and a modest size are more valued. Further, Basu (1977) provided additional evidence to show that stocks with low PE subsequently tend to gain higher average rewards than stocks with high PE. Graham (2003), however, also provided evidence that larger businesses, such as those in the

manufacturing sector, were more resilient and valued on the stock market, particularly during times of financial crisis.

Piotroski's (2000) work featured the use of nine signals and these were taken further by Almas (2008) who adjusted them to measure three aspects of the listed companies' financial condition, thereby enabling them to choose companies from a high BM quintile. They then created a portfolio from the intersection of the high BM portfolio with the low accruals portfolios, and finally combined the high BM and low probability of bankruptcy to evaluate the performance of the portfolios chosen using the three modified BM strategy versions applied to the market. Research by Banerjee and Deb (2017) also used the nine signals to test the historical performance of a value strategy that relied on the strong performance of a few firms while "… tolerating the poor performance of many deteriorating companies …" within the broad value group. The findings revealed that firms with strong fundamentals within the value group outperform their less robust counterparts, based on absolute as well as risk adjusted measures.

Piotroski (2000) calculated F-scores ranging from 0-9 to indicate the relative financial strength of different countries. However. the results of the F-score based on conventional signals contradicted his own conclusions, according to Sharma and Sharma (2009). They claimed that the difference between the returns of high and low group enterprises is statistically irrelevant. Furthermore, Woodley, Jones & Reburn (2011) concluded that the financial statement variables identified by Piotrioki (2000) no longer separate future winners from future losers among those stocks with high BM ratios, while confirming that Piotroski's findings for the 1976-1996 window used for his study were, in fact, reversed over the subsequent 12 years. By most metrics, the stocks of "High F Score" firms provide worse returns than those of "Low F Score" firms and below those of the group of value stocks as a whole. Daniel and Titman (2001) argue that while the future return of a stock is independent of a company's past accounting-based performance, it is closely related to the 'intangible' return, i.e., the portion of the return that is orthogonal to the company's past performance.

In subsequent work, Mohanram (2003, 2004) created an index, G-SCORE, by analysing financial statements and combining traditional fundamentals such as earnings stability, growth stability and R&D intensity, capital expenditure and advertising to distinguish winners and losers in the low BM stock market. The results are robust in the partitioning of size, analyst focus and liquidity and remain constant after controlling for momentum, book value, accruals and size. Meanwhile, Abarbanell and Bushee (1997a) investigated whether applying the basic concepts of fundamental analysis can produce significant abnormal returns. The results show that fundamental signals provide information on future returns associated with future return news. Furthermore, a large proportion of abnormal returns are generated around subsequent earnings announcements. In addition, the authors point out that many fundamental signals are related to future earnings and forecast revisions in the same way as earnings, although there are some notable exceptions.

Based on these foundations, Beneish, Lee and Tarpley (2001) employed a two-stage method to predict firms that are about to experience an extreme (up or down) price movement in the next quarter. The results suggested that forecasting power of accounting-based indices with respect to future earnings enhanced while controlling for many market-based attributes. Griffin and Lemmon (2002) examined the relationship between BM equity, distress risk and stock returns and found that the BM effect was

largest in small firms with low analyst coverage. Lev and Thiagarajan (1993) explored the intrinsic value of listed companies on fundamental basis by such as earnings, risk, growth, and competitive position. The findings supported the incremental value-relevance of most of the identified fundamentals. A two-stage approach was also used to predict firms that are about to experience extreme (up or down) price movements in the next quarter (Beneish, Lee & Tarpley, 2001). The results show that accounting-based indices have enhanced predictive power for future returns, controlling for many market attributes. Griffin and Lemmon (2002) explored the nexus between BM, distress risk and stock returns. The paper noted that the BM effect was greatest among small firms with low analyst coverage. Previously, Lev and Thiagarajan (1993) had explored the intrinsic value of listed companies through fundamental factors such as earnings, risk, growth and competitive position. The findings support the incremental value relevance of most of the identified fundamentals. In the same vein, Nguyen (2003) analysed the relationship between financial statement information and stock returns for companies listed on the Tokyo Stock Exchange. The findings suggest that a score-based portfolio strategy can generate significant excess returns over a 10-year sample period. Fama and French (2006) further show that given BM and expected profitability, a higher expected investment rate implies lower expected returns. However, controlling for the other two variables, more profitable firms have higher expected returns, as do firms with higher BM.

In this research, listed banks were chosen as the scope of the study. It therefore follows in the footsteps of Chen (2016), who established an input-output model on this basis, selects four input indicators (number of employees, total fixed assets, operating expenditure, customer deposits) and two output indicators (non-performing loans ratio, net interest income), applies the data envelopment analysis (DEA) method to measure the credit asset efficiency of 16 listed banks from 2010 to 2016, and compares between joint-stock commercial banks and city commercial banks. The paper also uses the multiple linear regression method to analyse the impact of these six factors on the efficiency of credit assets, and proposes relevant policy recommendations. The paper concludes that: (1) the credit asset efficiency of the banking industry has shown a slight increase and then a significant decrease over the past six years; (2) the credit asset efficiency of state-owned commercial banks is low overall, and it is inferior to that of some joint-stock banks and city commercial banks; (3) large state-owned banks have lost their scale advantage under the new situation of economic transformation, and their internal management level needs to be strengthened and (4) the quality of credit assets and human resources have a very important impact on the efficiency of credit assets, while the blindly high cost of deposit-taking will also reduce the efficiency of credit assets (Wei, 2012). Based on the research on bank efficiency conducted by domestic and foreign scholars, this paper firstly defines the relevant concepts and analyses and compares the main methods of studying bank efficiency; then selects the data of 13 listed banks from 2017 to 2019 and applies the factor analysis method to measure the current situation of bank efficiency in China. Based on the results of the factor analysis, the DEA method was then applied to decompose the efficiency of banks and analyse the reasons for the differences in efficiency of listed banks in three aspects: allocation efficiency, pure technical efficiency and scale efficiency. The study concludes that: (1) emerging commercial banks are relatively more efficient than the four state-owned banks, while the listing reform of state-owned banks in recent years has to a certain extent promoted their efficiency; (2) the allocation efficiency and scale efficiency of Chinese commercial banks are the main reasons affecting their overall efficiency. On this basis, this paper proposes countermeasures for commercial banks to improve their

efficiency and enhance their competitiveness in terms of product innovation, internal management and the introduction of strategic investors.

To sum up, the majority of academic studies on value investing confirmed that fundamental analysis of financial indices supported by financial statements is more likely to perform better than other techniques for forecasting the stock trends of the stocks. Rarely, however, have studies demonstrated the inefficiency of value investing strategies derived from Benjamin Graham's adherents, such as Piotroski (2000). As statistical knoweldge in financial research has advanced, a large number of academics have favoured using the entire stock market as the study population rather than Graham's (2009) division of the stock market into industries. In fact, variance exists across a wide range of industries, as noted by Graham (2003), Zhu, Walsh and Ampornstira (2020) and Xi and Zhu (2022). This paper, therefore, seeks to make a further academic contribution to the existing literature by examining the factors influencing the return on investment of listed companies in the banking sector in China by studying specific industries in an epidemic context. It uses a quantitative method to do so, involving the use of hypotheses. Rejection of null hypotheses will provide further evidence to support the sectoral idea.

3. Research Methodology

3.1. Definition of Population

According to the most recent official categorization of industries provided by the China Securities Regulatory Commission in 2021, which comprises 43 firms, the research population in this study is defined as the total of listed companies in China's banking industry. Six listed banks were removed from the study's scope owing to the short listing period and warnings to delist and, therefore, the sample for this study consisted of 37 listed firms.

3.2 Data Analysis

All necessary information is taken from the financial statements of the 37 listed companies, and the relationship between ROI (the dependent variable) and other indices (the independent variables) is investigated using both fundamental analysis and inferential statistics. These variables are listed below:

Attribute (Dummy variable): This variable is employed to classify the nature of the listed Chinese banks. In this research, the sample is divided into two groups: state-owned or non state-owned.

EPS: Average earnings per share in 2020 and 2021;

NPL: Non-performing loans (2019);

PE: Price-to-earning per share ratio (2019);

ROI: The ROI can be expressed as a formula: [ESP(2020-2021)+CI(2019-21)]/P(2019), where: ESP(2020-21) = Average earnings per share in 2020 and 2021, CI = Capital increase from the end of 2019 to the 31st December in 2021 and P = the price at the end of 2019.

Except for NPL, which symbolizes risk control competence, particularly in the banking industry, the factors indicated above have been created and tested by extensive research addressed in the literature review above. In order to offer fresh support for the value investing theory, we presented NPL as an unexplored component to examine the probable causes of ROI in this study. Consequently, the degree and connection between ROI and other suggested independent variables will be assessed using the statistical approach of hierarchical regression analysis. And the following is an expression for the regression model:

$$ROI=\theta*Attribute+\beta*PE+\gamma*EPS+\lambda*NPL+\alpha$$

4. Results

Table 3. *Descriptive Analysis of Independent Variables;* **source:** *Original Research*

Items	N	Min	Max	Mean	Std. Deviation	Median	Kurtosis	Skewness	Coefficient of variation (CV)
Attribute	37	0.000	1.000	0.189	0.397	0.000	0.778	1.655	209.875%
PE	37	5.150	15.660	8.567	3.126	7.380	-0.707	0.779	36.496%
EPS	37	0.370	3.180	1.033	0.655	0.890	3.295	1.752	63.423%
NPL	37	0.008	0.024	0.014	0.003	0.014	1.391	0.443	23.084%

According to Table 3, the attribute of Chinese listed businesses in the banking sector is significantly more variable from minimum to maximum value, although the CV of PE, EPS, and NPL of the 37 listed firms is comparatively lower. Apart from the PE, the kurtosis of the other three variables is positive; moreover, the EPS distribution is highly steep and distant from normality due to its high kurtosis of larger than 3.0. The preceding results reveal that all four variables are positively skewed.

Table 4. *Variance Inflation Factor (VIF);* **source:** *Original Research*

Items	Model 1	Model 2	Model 3	Model 4
Attribute	1.000	1.121	1.231	1.261
PE	-	1.121	1.278	1.347
EPS	-	-	1.181	1.211
NPL	-	-	-	1.064

The table above shows the VIF values for the diagnostic indicators of covariance at hierarchical regression. The results show that the VIF values for all models are less than 5.0, which means that there is no covariance between the four independent variables. It also means that the validity of the models is proven.

Table 5. *Parameter Estimates;* **source:** *Original Research*

	Model 1	Model 2	Model 3	Model 4
Constant	0.216**	0.537**	0.248	0.683*
	(4.444)	(3.985)	(1.471)	(2.643)
Attribute	0.031	-0.061	0.021	-0.013
	(0.275)	(-0.549)	(0.195)	(-0.129)
PE		-0.035*	-0.023	-0.030*
		(-2.527)	(-1.659)	(-2.189)
EPS			0.162*	0.141*
			(2.538)	(2.302)
NPL				-24.859*
				(-2.145)
N of Samples	37	37	37	37
R 2	0.002	0.160	0.297	0.385
Adj R 2	-0.026	0.110	0.233	0.309
F Value	F (1.35) = 0.076,	F (2.34) = 3.236	F (3,33) = 4.649	F (4,32) = 5.018
	P = 0.785	P = 0.052	P = 0.008	P = 0.003
△R 2	0.002	0.158	0.137	0.088
△F Value	F (1.35) = 0.076,	F (1.34) = 6.384	F (1.33) = 6.441	F (1 32) = 4.602
	P = 0.785	P = 0.016	P = 0.016	P = 0.040

Dependent Variable: ROI;

*p<0.05 ** p<0.01; t statistics in parentheses

Hierarchical regressions are adopted to investigate changes in the model when the independent variable (X) is increased, and are often employed for model robustness tests, mediating or moderating effects research. As can be seen from the table above, there are four models involved in this hierarchical regression analysis. The independent variable in model 1 is Attribute, model 2 adds PE into model 1, model 3 adds EPS to model 2, model 4 adds NPL to model 3 and the dependent variable of the model is ROI.

The table above shows that linear regression analysis was conducted with Attribute as the independent variable and ROI as the dependent variable. The R-squared value of the model is 0.002, indicating that Attribute can explain 0.2% of the cause for the change in ROI. The model failed the F-test (F = 0.076, p >0.05), revealing that Attribute has no impact on the link between ROI and the dependent variable, thus the analysis cannot be properly examined for the influence of the independent variable on the dependent variable.

Model 2's change in F-value after adding PE to model 1 was significant ($p < 0.05$), indicating that the inclusion of PE provides explanatory power for the model. Furthermore, the R-squared value improved from 0.002 to 0.160, showing that PE has a 15.8% explanatory power for ROI. PE's regression coefficient value is -0.035 and is significant (t =-2.527, p = 0.016 <0.05), showing that PE has a substantial negative effect on ROI.

The inclusion of EPS to model 3 results in a significant change in F-value ($p < 0.05$), showing that the addition of EPS has explanatory effect on the model. Furthermore, the R-squared value improved from 0.160 to 0.297, showing that EPS has a 13.7% explanatory power for ROI. The regression coefficient value for EPS is 0.162 and significant ($t = 2.538$, $p = 0.016<0.05$), showing that EPS has a strong positive impact on ROI.

Model 4's change in F value after adding NPL to model 3 was significant ($p <0.05$), indicating that the inclusion of NPL had explanatory power on the model. Furthermore, the R-squared value improved from 0.297 to 0.385, indicating that NPL has an explanatory power of 8.8% for ROI. NPL's regression coefficient value was -24.859 and demonstrated significance ($t = -2.145$, $p =0.040 <0.05$), showing that NPL has a substantial negative association with ROI.

4. Discussion

The reasons of the ROI in Chinese banking listed businesses were proposed to be explained by four factors in this study, namely Attribute, PE, EPS, and NPL, which were all designated as independent variables. Based on the findings examined above, we determine that PE has a significant negative effect on ROI, which is consistent with the findings of previous research on the low-price effect (see, e.g., Abarbanell and Bushee, 1997a; Almas, 2008; Basu, 1977; Banerjee and Deb, 2017; Beneish, Lee and Tarpley, 2001; Graham, 2003; Graham and Dodd, 2009). Additionally, the outcome shows that profitability (EPS) and ROI have a positive relationship, which is consistent with other studies (see, e.g., Abarbanell and Bushee, 1997b; Almas, 2008; Banerjee and Deb, 2017; Fama and French, 2006; Graham, 2003; Griffin and Lemmon, 2002; Lev and Thiagarajan 1993; Mohanram, 2003; Piotroski, 2000). Moreover, this study shows that NPL is inversely correlated with ROI, demonstrating the necessity of financial risk management for investors buying banking stocks during the COVID-19 pandemic. Finally, the attribute of the listed enterprises does not have an impact on ROI in Chinese Banking sector, which is not consistent with Chen (2016) and Wei (2012).

In this research, accounting-based fundamental analysis was utilized to test the relationship between ROI in Chinese listed companies of banking industry and other financial indices documented in past financial statements, and the paper aims to contribute the existing literature by providing new evidence to value investing theory through analyzing Chinese listed banking industry during the COVID-19 epidemic.

5. Conclusion

In this study, four hypothesized influencing variables of ROI were examined and analyzed: profitability (EPS), financial risk control (NPL), the attribute of the banking listed businesses (Attribute), and pricing position (PE). During the COVID-19 pandemic, it was shown that 18.92% of cases of ROI are negative, while 81.08% are positive in a sample of 37 listed businesses in China's banking industry, indicating that the banking industry in China does not experience profound depression in comparison to the rest of the real economy. Furthermore, the EPS of 37 listed businesses in China's banking industry are positive and largely consistent during the pandemic period, and their NPLs are quite low, meeting the Central Bank of China's fundamental standards. According to the findings shown above, the majority of the listed firms analyzed in this study are not overvalued in the

range of 0.45 to 1.63. Consequently, the attribute of listed firms in this article exhibits a wide range in the sample studied.

According to hierarchical regression, average three-year earnings per share (EPS) have a significant positive influence on ROI, while PE as well as NPL ratios have a significant adverse effect on ROI; nevertheless, the bank's attribute has no impact on ROI.

This paper would have benefited from more extensive data, including a wider range of firms and of time but it is necessarily limited by the research questions identified above. Comparative research in other industries or other geographical locations might also be instructive. Consequently, it is concluded that there is a need for further research in areas which extend the research reported on here, with the intention of deepening and broadening the basis of knowledge from which recommendations may be made.

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Appendix A: Data Definition

Variable	Definition
Attribute	This variable is employed to classify the nature of the Chinese banking listed companies, and in this research, we just take the banking listed companies into two groups: state-owned or non state-owned.
PE	Price-to-earning per share ratio (2019)
EPS	Average earnings per share in 2020 and 2021
NPL	Non-performing loans (2019)
ROI	The ROI can be expressed as a formula: [ESP(2020-2021)+CI(2019-21)]/P(2019), where: ESP(2020-21) = Average earnings per share in 2020 and 2021, CI = Capital increase from the end of 2019 to the 31st December in 2021, P = the price at the end of 2019.