

Leverage, liquidity, cash flows and company performance of Chinese listed logistics companies during COVID-19 based on multiple linear regression model and data mining

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Abstract. Due to the control policies, company performance is highly affected by the COVID-19 pandemic. This paper aims to examine the impact of leverage, liquidity and cash flows from operations towards company performance of Chinese logistics companies during the COVID-19 crisis. The data are collected from listed logistics companies during 2020-2021, and multiple regression analysis is carried out. Company performance is measured through return on assets and return on equity. The results show that liquidity and cash flows from operations have a positive impact on company performance, while leverage negatively affects company performance. This paper will contribute to the current literature and will aid corporate managers to deal with the COVID-19 crisis.

Keywords: leverage; liquidity; cash flows; company performance; COVID-19; listed logistics companies.

1. Introduction

Since the COVID-19 pandemic ravaged the world in December 2019, the cumulative number of confirmed cases worldwide has exceeded 600 million, with nearly 6.7 million confirmed deaths. The COVID-19 has caused widespread catastrophe in countries around the world, seriously affecting all aspects of human social life and economic development. Companies need to respond positively to higher interest costs and more stringent financing requirements in order to weaken the difficulty and poor performance in a changing economic situation. The economic downturn caused by the COVID-19 pandemic is the most severe since the Great Depression of the 1930s [1]. Meanwhile, many industries and companies in China have not been spared from the adverse effects of the continuing evolution of COVID-19, such as the logistics industry, the tourism industry, the catering industry, and the entertainment industry.

The logistics industry, which is the main artery of the national economy, acts as the backbone of the epidemic prevention. Logistics companies not only support the circulation of epidemic prevention materials, but also assume a pioneering role in the resumption of work and production. Meanwhile, they play a self-explanatory and important role in safeguarding people's livelihoods and serving consumers in their daily lives during COVID-19. Because of the highly contagious nature of the epidemic, people have reduced their unnecessary outings and the demand for online shopping has expanded rapidly. It puts enormous pressure on the logistics industry, which is already understaffed. As the COVID-19 continued to spread, uncertainty about the number of employees returning to work has led to a labor gap, which has directly increased labor costs. Measures such as setting up stations in each region to prevent epidemics on parcels also reduce the efficiency of logistics circulation and increase the time in transit, causing the increase in the company's transportation costs. The economic downturn has dampened investment confidence and made it difficult for companies to raise funds internally, which in part leads to additional debt and increased leverage, poor liquidity and a gradual shortage of cash.

Although many studies have been conducted in China on the impact of COVID-19 on company performance, no detailed studies have been conducted to analyze the impact of COVID-19 on the performance of companies in the logistics industry [1]. The studies have covered the measures taken by the Chinese government to contain the spread of the COVID-19 and analyzed the impact

of this crisis on the stock market and the tourism and entertainment industries[2-4]. To fill this gap, the current study explores the impact of the COVID-19 crisis on company performance by analyzing trends in company leverage, liquidity and cash flow in the logistics industry between 2020 and 2021.

The contributions of this paper can be summarized in two aspects. First, it extends the literature by exploring the impact of leverage, liquidity and cash flows from operations on the performance of logistics companies during COVID-19 in the case of China. Second, the findings could provide insights for company managers to make reasonable policies to enhance company performance and deal with the COVID-19 crisis.

2. Literature Review

2.1 Leverage and company performance

Leverage ratio reflects the ability to pay long-term debt. It is a measure of a company's exposure to debt. Under the impact of COVID-19, companies may find it difficult to sustain their own business. They may choose to take on additional debt, thus increasing financial risk to some extent. The leverage ratio can be used to assess company performance and analyze its financial resilience, security and the stability of its operations. Matthew et al. [5] suggested that long-term debt and return on assets (ROA) have favorable correlation. Chabachib et al. [6] found a positive relationship between leverage and company performance. Since higher debt financing can further incentivize management to capture profits and contribute to positive corporate performance. Furthermore, Ratnam and Sunitha [7] pointed out that debt ratio and interest coverage ratio have a negative effect on earnings per share and are significant in driving the company performance. A study conducted by Hedija and Němec [8] also showed that the financial leverage has a negative impact on company performance. As additional debt is raised, the company's operational risk increases, leading to financial deterioration of the business. However, Santoso [9] found that financial leverage does not affect the company's financial performance. A study conducted by Ali [10] revealed that the degree of financial leverage and combined leverage have no significant impact on financial performance measured by ROA while the degree of operating leverage has a negative and significant impact on ROA. Therefore, there is uncertainty about the relationship between leverage and company performance and it is worth to be investigated.

2.2 Liquidity and company performance

Liquidity reflects its short-term solvency and a company's liquidity ratio can be used to reveal whether a company is financially secure. During the COVID-19 period, depressed consumer demand led to the difficulties in company operations. This correspondingly delays the collection of accounts receivable or even reduces them, negatively affecting the company's performance. Ali et al. [11] pointed out that liquidity ratios are positively correlated with company performance. In particular, Blanca and Velasco [12] suggested that costs and expenses are increasing at an accelerated rate along with sales growth. When accounts receivable increase, the company's liquidity decreases. This has a direct impact on the company's financial sustainability and corporate performance. Baafi et al. [13] observed a weak positive and significant relationship between ROA and measures of liquidity and a weak negative and insignificant relationship between return on capital employed and measures of liquidity. A study conducted by Larissa [14] showed that the current ratio and quick ratio have a significantly impact on company performance measured by ROA, gross margin ratio, operating margin ratio, and a more liquid company during COVID-19 would be more conducive to maintaining operations and promoting company growth. In addition, Zhang and Lee [15] also found that increased investment can lead to higher liquidity, ultimately contributing to better company performance. However, Li et al. [16] argued that higher liquidity may suggest that assets are not being used effectively to generate profits. Therefore, the impact of liquidity on company performance is inconclusive.

2.3 Cash flows and company performance

Cash flow can reflect changes in the increase or decrease of cash in financing activities, investing activities and operating activities, and can be used to correctly evaluate the quality of the profits made by the company in the current period as well as its current and future ability to pay. Previous literature showed a positive relationship between cash flow and company performance. For example, a study conducted by Afrifa and Tingbani [17] revealed that cash flow availability plays an important role in company performance and working capital needs of small and medium-sized enterprises (SMEs). Bhushan [18] argued that if a company can earn enough cash from its activities, it will be better able to meet its expenses and have enough surplus funds to pay off its debts and expand the company's business. Cash flow management is a determinant of a company's performance. Zhou et al. [19] suggested that free cash flow is the results of business activities. In addition, Nassafi [20] found that cash flow variation has a significant positive effect on company performance. Nevertheless, a study conducted by Santoso [9] showed that cash flows negatively affect the company's financial performance. In addition, Zhang et al. [21] argued that a company may perform better if it maintains a low level of cash flow. This is because having high levels of cash may indicate low utilization of cash management, which is detrimental to the future growth of the company. Therefore, more supporting materials are needed for the impact of cash flow on the company's performance.

3. Research Methodology

3.1 Sample description

The sample in the current study is drawn from logistics companies listed on the Shanghai and Shenzhen stock exchanges over the period 2020Q1–2021Q4. Companies listed after the first quarter of 2020 and companies with missing information are excluded from the original sample. Excluding these companies yields a final sample of 5 companies in total. The financial data are retrieved from the CSMAR database.

3.2 Variable measurement

(1) Company performance. Guided by Wijewardana and Munasinghe [22] and Shen et al. [1], ROA and return on equity (ROE) are used to measure company performance. ROA measures how profitable a company is in relation to its total assets, and ROE is an indicator of financial performance calculated by dividing net income by shareholders' equity [23].

(2) Leverage. Referring to Wijewardana and Munasinghe [22] and Liang et al. [24], the debt-to-equity ratio is used to measure leverage.

(3) Liquidity. The ratio of current assets less inventory to current liabilities is applied to measure liquidity, which is consistent with Liang et al. [24].

(4) Cash flows. The ratio of cash flow from operating activities to total assets is employed to measure cash flow, which is in line with Wijewardana and Munasinghe [22].

(5) Firm size. Firm size is measured by the natural logarithm of total assets at year-end, which is in line with previous studies [25-27].

Table 1 shows the definition of variables.

TABLE I. Variable definition

Variable	Symbol	Measurement
Return on assets	ROA	Profit after tax / Total assets
Return on equity	ROE	Profit after tax / Total equity
Leverage	LEV	Total debt / Total equity
Liquidity	LIQ	(Current assets – inventory) / Current liabilities
Cash flow	CF	Cash flows from operating activities / Total assets

Firm size	SIZE	Natural logarithm of total assets
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3.3 Models

This study uses regression models in order to determine the impact of leverage, liquidity and cash flows from operations on company performance. The regression models used in this study are as follows:

$$ROA = \beta_0 + \beta_1 LEV_{it} + \beta_2 LIQ_{it} + \beta_3 CF_{it} + \beta_4 SIZE_{it} + \epsilon_{it} \quad (1)$$

$$ROE = \beta_0 + \beta_1 LEV_{it} + \beta_2 LIQ_{it} + \beta_3 CF_{it} + \beta_4 SIZE_{it} + \epsilon_{it} \quad (2)$$

where $i=1, \dots, n$ and $t=1, \dots, t$ represent firm and year, respectively; ϵ denotes the disturbance.

4. Findings and Discussion

4.1 Descriptive Statistics

The results in Table 2 show that the dependent variables ROA and ROE have mean values of 0.0188 and 0.0341, respectively. Generally, it can be concluded that for every yuan more asset held by companies, there will be a corresponding increase in profit of 0.0188 yuan, and for every yuan more equity held by companies, there will be a corresponding increase in profit of 0.0341 yuan. It indicates that companies generally face difficulty in making profits. Regarding the independent variables, on average, leverage (LEV), liquidity (LIQ), and cash flows from operation (CF) are 1.0027, 1.1153 and 0.0493, respectively. In terms of leverage, RMB 1.0027 debts will cover RMB 1 equity. Due to factors such as increased costs, logistics companies experienced a reduction in profitability during COVID-19. As a result, the amount of additional debt raised by them has increased to a greater extent in recent years. For liquidity, it appears that the company's liquid assets are able to cover its current liabilities in the era of COVID-19. For every RMB 1 of current liabilities, there are RMB 1.1153 of quick assets with good liquidity to repay. Therefore, the company's short-term solvency can be ensured to a certain extent. In addition, it seems that RMB 0.0493 cash flows from operating activities generate from every RMB 1 of total assets.

TABLE II. Descriptive Statistics

Variable	Mean	Standard Deviation	Minimum	Maximum
ROA	0.0188	0.0248	-0.0485	0.0700
ROE	0.0341	0.0476	-0.1157	0.1222
LEV	1.0027	0.3560	0.3273	1.7663
LIQ	1.1153	0.2208	0.6900	1.6100
CF	0.0493	0.0549	-0.0479	0.1738
SIZE	24.0847	0.8361	22.9384	26.0699

4.2 Pearson Correlation Analysis

Table 3 shows the results of correlation analysis. LIQ and CF are positively correlated with ROA and ROE. LEV is negatively correlated with ROA, and is not correlated with ROE. SIZE is not correlated with ROA and ROE.

TABLE III. Correlation matrix

Variable	ROA	ROE	LEV	LIQ	CF	SIZE
ROA	1					
ROE	0.976***	1				
LEV	-0.391**	-0.26	1			
LIQ	0.301*	0.299*	-0.469***	1		
CF	0.428***	0.43***	0.353**	-0.418***	1	
SIZE	0.193	0.211	0.123	0.213	-0.039	1

*, ** and *** indicate significance at the level of 10%, 5%, and 1%, respectively.

4.3 Regression results

TABLE IV. Regression Results

Variable	ROA		ROE	
	Coefficient	t-value	Coefficient	t-value
Constant	-0.1579	-2.2814**	-0.3176	-2.0695**
LEV	-0.0373	-4.6516***	-0.0479	-2.6947**
LIQ	0.0360	2.6708**	0.0849	2.8401***
CF	0.3432	7.0197***	0.6330	5.8375***
SIZE	0.0065	2.1517**	0.0114	1.6930*
Adjusted R ²	0.6368		0.5172	
F	18.0983***		11.4466***	

*, ** and *** indicate significance at the level of 10%, 5%, and 1%, respectively.

Table 4 shows that the adjusted R² of 0.6368 describes that 63.68 percent of company performance represented by ROA is affected by all variables tested in this study. Using ROE, the adjusted R² is 0.5172 or 51.72 percent, which is lower compared to ROA.

Leverage shows a negatively significant relationship towards listed logistics companies' performance measured by ROA and ROE during the COVID-19 pandemic. This finding is consistent with Chen [28] who suggested the relationship between financial leverage and company performance is significantly negative. This may be due to the fact that logistics companies often take out more loans to balance out the extra costs incurred during the COVID-19 outbreak. From a debt structure perspective, these companies tend to bear a higher cost of capital for long-term debt. This leads to higher fixed interest costs, which is detrimental to the company's performance. Moreover, long-term liabilities are used over a longer period of time than short-term liabilities, and creditors often have stricter oversight of how logistics companies use this capital, such as setting restrictive terms on the use of funds.

The findings in Table 4 reveal that there is a significant positive impact of liquidity on listed logistics companies' performance for both ROA and ROE being used as dependent variables. This finding is in agreement with Anh and Binh [29] who observed that illiquidity factors can significantly worsen the performance of a company. It could be due to the fact that listed logistics companies' supply chain was blocked during the COVID-19 pandemic, and the capital chain was accordingly disrupted, which interrupted the normal operations of the companies. In the absence of cash, logistics companies usually borrow from banks and other external financial institutions in order to maintain their operations and pay their employees. This leads to an increase in the company's gearing ratio. The higher the gearing ratio, the greater the financial risk. Companies

should proactively adjust their business operations to effectively respond to adverse external factors, such as the COVID-19 pandemic, in order to improve their company performance.

In the case of logistics companies, it is noted that cash flows from operations are found to be significantly and positively associated with company performance measured by ROA and ROE. This is in line with the findings of Frank and James [30], Qu et al. [31] and Shafi et al. [32]. This is probably due to the fact that logistics companies are efficient in the use of their assets to collect cash from sales and customers. Moreover, all risks for logistics companies ultimately boil down to the inability of cash flow to maintain the minimum operating costs of the company. There is no substitute for the role of cash flows from operation in the sustainable development of a company and in the identification and prevention of financial risks. If logistics companies are able to generate positive cash flows from operation during the COVID-19 epidemic, they can contribute to a steady improvement in their operations.

5. Conclusion

The main purpose of this study is to analyze the impact of leverage, liquidity, and cash flows from operation on company performance measured by ROA and ROE during the COVID-19 outbreak, focusing on listed logistics companies. By using the four-quarter financial data in 2020 and 2021, the findings of this study show that leverage is significantly and negatively associated with company performance. Moreover, there is a significant positive impact of the company liquidity and cash flows from operations on listed logistics companies' performance.

There are some practical implications of this study. Firstly, listed logistics companies should control their financial leverage ratio. They need to further optimize their capital structure by borrowing wisely from banks in order to prevent financial risks. It may be necessary for companies to avoid raising large amounts of debt blindly. In addition, companies may be able to reduce costs by increasing productivity during the COVID-19 pandemic. Judging the appropriate timing of loan repayments may also help logistics companies to establish benign debt financing during COVID-19. Secondly, management need to pay attention to liquidity. Logistics companies should invest their capital in projects that can increase their profitability, allowing more capital available for turnover and making timely adjustments to their capital management. Finally, managers should keep a tight rein on cash flows because of the high cash requirements of logistics companies and the difficulty of collecting their accounts receivable during COVID-19. Business management should use credit policies scientifically. Meanwhile, logistics companies need to develop a cash flow management mindset in their business operations in order to help their managers make scientific decisions by conducting feasibility analyses in the project investment decision process. The quality of revenue analysis also needs to be emphasized when conducting project evaluation.

There are several limitations in this paper. First, this study is only conducted in the logistics industry and no other industries are considered. For generalizability, future studies can be designed for other industries. Second, this study only explores the impact of leverage, liquidity and cash flows from operations on company performance. Other factors (e.g. gross domestic product and consumer price index) that might influence company performance should be taken into consideration in future research.

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