The impact of leverage, liquidity, and cash flows on the performance of Chinese agricultural listed companies during COVID-19

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Abstract

The purpose of this paper is to explore the impact of leverage, liquidity, and operating cash flows on the performance of Chinese agricultural companies during the COVID-19 crisis. This paper uses quarterly data from 34 Chinese agricultural companies during 2020-2021, generating a total of 272 firm-year observations, and multiple regression analysis is used. We observe that the COVID-19 leads to the decrease in company performance measured via return on assets (ROA) and return on equity (ROE). In addition, leverage and liquidity have a negative impact on ROA and ROE during the COVID-19 pandemic, while operating cash flows exhibit a positive impact. Further analysis shows that private-owned companies have a worse impact of leverage and liquidity on both ROA and ROE as compared to state-owned companies during this crisis. In addition, the impact of operating cash flows on company performance in private-owned companies is greater in the era of COVID-19. This study provides fresh evidence on the determinants of agribusiness in the crisis context.

Keywords. Leverage. Liquidity. Cash flows. Company performance. COVID-19 pandemic. Agricultural listed companies.

1. Introduction

The sudden outbreak of the coronavirus disease 2019 (COVID-19) has brought serious adverse effects on business operation and economic development (Shafi *et al.*; 2020; Jin *et al.*,

2022; Xu and Jin, 2022; Naseer *et al*., 2023). It was reported that COVID-19 has created the biggest global recession since the 1930s (Shen *et al*., 2020). China's economy was the first to be hit by COVID-19. Although China's economy began to recover due to the successful control of COVID-19, many companies suffered supply-chain shocks and heavy losses (Tan *et al*., 2022). Therefore, companies need to quickly respond to every crisis in order to survive in the dynamic environment.

Agriculture has a pivotal role in China's national economy (Xu and Wang, 2019). Agriculture has its own characteristics. Specifically, from the industrial perspective, agriculture as a weak industry is more easily affected by both natural and market risks and has low investment returns (Liu *et al*., 2020). From the perspective of production management, agricultural production has the characteristics of dispersed operations and complex production conditions. The development of China's agriculture largely depends on agricultural companies. During COVID-19, the lockdown has changed how companies operate. The decrease in consumer demand led to the decrease in sales, which in turn influences liquidity and operating cash flows. If companies fail to efficiently manage their liquidity and cash flows during COVID-19, they will not sustain themselves in the market. Consequently, their performance will be negatively affected. Therefore, it is important to analyze the influential factors that affect the performance of China's agricultural companies in the face of COVID-19.

A large amount of literature on the relationship between the COVID-19 and company performance has been carried out in manufacturing sector (Sun *et al*., 2021; Dweck *et al*., 2022; Özgüner *et al*., 2023), pharmaceutical sector (Pylaeva *et al*., 2022), and banking sector (Khurana and Sharma, 2022; Shabir *et al*., 2023), while the study in agricultural sector is still minimal (Arumugam *et al*., 2021). This study aims at investigating the impact of leverage, liquidity, and operating cash flows on the performance of agricultural companies during the COVID-19 outbreak. In addition, we explore whether or not these impacts are different in state-owned and private-owned companies. Agricultural companies listed on the Shanghai and Shenzhen stock exchanges are chosen as our sample, and multiple regression analysis is used in this study.

Because the results of previous research may not be generalized to the COVID-19 crisis, it is required to uncover the efficacy of existing theories during COVID-19 (Clampit *et al*., 2021). The contributions of this paper are presented in two aspects. This study is among the first to empirically analyze the determinants of company performance in emerging markets during COVID-19, which enriches the current literature. Another contribution is

practical because it can help agribusinesses make optimal strategies towards recovery in the post-COVID-19 era.

The paper is organized as follows. Section 2 provides the literature review on the impact of leverage, liquidity and operating cash flows, and Section 3 presents the research methodology. Section 4 shows and discusses the empirical results. Finally, Section 5 concludes the paper.

2. Literature Review

2.1. Leverage and company performance

The indecisive relationship between leverage and firm performance is a hot topic discussed for a long time. Leverage ratio reflects a company's ability to pay long-term debts (Shaharuddin *et al*., 2021). A reasonable debt level can benefit the economy to encourage public consumption and investment, while companies with a high level are easily exposed to high business risks. A large body of literature has reported a negative association between them. For example, González (2013) found that the performance of firms with greater leverage is significantly reduced. Tsuruta (2017) reported a negative relationship between leverage and average firm performance of Japanese small businesses. Using data from small businesses in France, Gharsalli (2019) concluded that highly leveraged firms suffer from poor performance. Recently, the findings of Danso *et al*. (2021) showed that leverage has a negative impact on firm performance, and the 2008 financial crisis has no significant impact on the relationship between them. Taking U.S. fintech firms as the sample, Papadimitri *et al*. (2021) found that leverage has a negative impact on firm profitability. For non-financial companies in Bangladesh, Das *et al*. (2022) concluded that leverage indicators can reduce firm performance measured by return on asset (ROA) and return on equity (ROE). According to Kijkasiwat *et al*. (2022), the board of the company should use low financial leverage to improve firm performance. Ma'in *et al*. (2022) found that leverage indicators have a significant and negative influence on firm performance in Shariah-listed consumer products and services firms. However, Seo (2018) documented an inverted U-shaped relationship between leverage and the performance of U.S. publicly casino firms. A Pakistani study carried out by Akhtar *et al*. (2022) also showed the same results.

2.2. Liquidity and company performance

The impact of liquidity on company performance in empirical studies is inconclusive. The outbreak of COVID-19 led to the decrease in demand, the delay in receivables collection, and the disruption of operation, which seriously affected the company's liquidity position. A recent study conducted by Shaharuddin *et al*. (2021) showed that liquidity has a positive impact on company performance in Malaysia during COVID-19. Adelopo *et al*. (2022) observed a positive association between liquidity and bank profitability in Europe in the post-crisis period. El-Chaarani *et al*. (2023) pointed out that bank liquidity can increase bank profits during the COVID-19 crisis. Nguyen *et al*. (2023) documented a positive relationship between liquidity and both ROA and ROE indicators in Vietnam. Pjanić *et al*. (2023) also argued that liquidity ratio is a positive factor in determining the profitability of life insurance companies in Serbia. However, for Vietnamese firms, Batten and Vo (2019) reported a negative relationship between liquidity and firm value. Ahmad *et al*. (2023) used the fixed effect model and found a negative relationship between liquidity ratio and firms' financial performance measured by Tobin's Q.

2.3. Cash flows and company performance

Cash flows play a pivotal role in the survival of a company (Kroes and Manikas, 2014; Lee *et al*., 2017). Literature suggests that the impact of cash flows on company performance is mixed. For instance, a study by Lee *et al*. (2017) revealed that stock returns are more associated with operating cash flows than earnings during financial distress. Shaharuddin *et al*. (2021) found a significant and positive impact of cash flows from operations on corporate performance during the COVID-19 outbreak. Zheng (2022) found that firms with sufficient cash reserves perform better during the COVID-19 crisis. Azizi *et al*. (2022) concluded that cash flows have a favorable influence on financial performance of cooperatives. A study conducted by Etim *et al*. (2022) in Nigeria revealed that operating cash flow ratio positively affects financial performance measured by ROA. Conversely, Nangih *et al*. (2020) found a negative but insignificant relationship between operating and investing cash flows and firm performance in the oil and gas sector.

3. Research Methodology

3.1. Sample

The original sample includes agricultural companies listed on the Shanghai and Shenzhen stock exchanges from 2020 to 2021. After screening the sample, we exclude companies with missing information on relevant indicators, companies issuing other kinds of shares, companies listed after 2020, and special treatment (ST) companies. Finally, a balanced panel data of 272 observation for 34 companies are left. We collect the quarterly data from the China Stock Market & Accounting Research (CSMAR) database.

3.2. Variables

In terms of dependent variables, two accounting measures (ROA and ROE) are used in this study to measure company performance, which is in line with the findings of Xu and Wang (2019), Shaharuddin *et al*. (2021), Jin *et al*. (2022), and Xu and Jin (2022).

Regarding independent variables, firm leverage (LEV) is measured by debt-to-equity ratio, firm liquidity (LIQ) is measured by quick ratio, and cash flows (CF) are measured by the ratio of cash flows from operating activities to total assets, which accords with previous literature (Zulkipli *et al*., 2019; Shaharuddin *et al*., 2021).

Concerning control variable, firm size (SIZE) is included in this study, which is consistent with Zulkipli *et al*. (2019) and Shaharuddin *et al*. (2021).

Table 1 shows the definition of variables used in this study.

Table 1: Variable definition

Variable	Symbol	Measurement
Return on assets	ROA	Net income/total assets
Return on equity	ROE	Net income/total equity
Leverage	LEV	Total liabilities/total equity
Liquidity	LIQ	(Current assets − inventory)/current liabilities
Cash flows	CF	Cash flows from operating activities/total assets
Firm size	SIZE	Natural logarithm of total assets

Source: Authors' illustration

3.3. Models

Models (1) and (2) are used in this study to examine the impact of leverage, liquidity, and cash flows on company performance.

$$ROA_{i,t} = \beta_0 + \beta_1 LEV_{i,t} + \beta_2 LIQ_{i,t} + \beta_3 CF_{i,t} + \beta_4 SIZE_{i,t} + \varepsilon_{i,t} \quad (1)$$

$$ROE_{i,t} = \beta_0 + \beta_1 LEV_{i,t} + \beta_2 LIQ_{i,t} + \beta_3 CF_{i,t} + \beta_4 SIZE_{i,t} + \varepsilon_{i,t} \quad (2)$$

where i is the firm; t is the year; $ß$ represents the presumed parameter; ε denotes the error term.

4. Results

4.1. Descriptive statistics

Table 2 shows the descriptive statistics of all variables. ROA has a mean value of 0.0140 and ROE has a mean value of -0.0015, indicating that agricultural listed companies have a relatively bad performance during the COVID-19 era. The mean LEV (0.9450) suggests that the debt ratio of such companies increases to 50% because they need more cash to maintain business operation and prevent pandemic spread. However, Xu and Wang (2019), Liu *et al*. (2020), and Xu *et al*. (2021) found that the debt ratio of Chinese agricultural companies is around 40% before COVID-19. LIQ has a mean value of 1.2076, which means that these companies possess sufficient liquid assets to cover current liabilities. The mean CF of 0.0284 implies that operating cash flows might be worse because of the disruption in operations during COVID-19. As for SIZE, its mean value is 22.3315 with maximum value of 25.9009 and minimum value of 20.3480.

Table 2: Descriptive statistics

Variable	N	Mean	Max	Min	SD
ROA	272	0.0140	0.2477	-0.4105	0.0592
ROE	272	-0.0015	0.4595	-5.5476	0.3613
LEV	272	0.9450	12.5150	0.0462	0.9609
LIQ	272	1.2076	5.8835	0.1469	1.0356
CF	272	0.0284	0.2873	-0.2695	0.0737
SIZE	272	22.3315	25.9009	20.3480	1.2007

Source: Authors' calculation

Figure 1 shows the changes in ROA and ROE during the COVID-19 crisis. In 2020, company performance remained stable, but it showed a sharp declining trend from the third quarter of 2021, which also suggests that the COVID-19 has a serious effect on company performance. This is in line with Chen and Yang (2021) who found that the sales of agri-food products decrease because of the COVID-19 outbreak, and large companies experience a greater decrease.

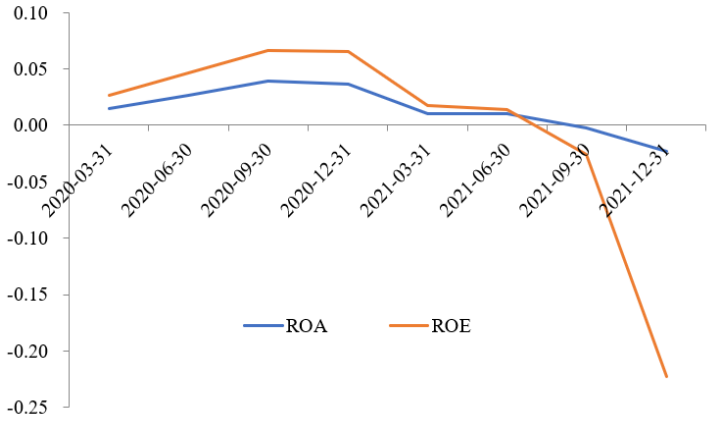

Figure 1: Changes in ROA and ROE from 2020Q1 to 2021Q4
Source: Authors' illustration

4.2. Correlation analysis

Table 3 presents the results of correlation analysis. LEV is found to be negatively related to both ROA and ROE indicators, while CF is positively related to them. LIQ is not related to ROA and ROE. The variance inflation factors (VIFs) are calculated with all values less than 2, which suggests that there exists no serious multi-collinearity in the current study.

Table 3: Correlation matrix

Variable	ROA	ROE	LEV	LIQ	CF	SIZE
ROA	1					
ROE	0.698***	1				
LEV	-0.507***	-0.773***	1			
LIQ	0.076	0.071	-0.377***	1		
CF	0.495***	0.209***	-0.207***	0.052	1	
SIZE	0.096*	-0.079*	0.205***	-0.278***	0.137**	1

Notes: *, ** and *** indicate significance at the 10%, 5% and 1% level, respectively.
Source: Authors' calculation

4.3. Regression results

Table 4 shows the regression results of Models (1) and (2). The coefficients of LEV in Models (1) and (2) are negative and significant, which suggests that leverage has a negative impact on company performance during this crisis. During the COVID-19 period, companies had difficulty in maintaining their operation, and they turned to additional debts as alternative sources in their financing activities. For Brazilian agribusiness companies, Leite *et al*. (2017) documented a significant relationship between leverage and financial performance. However, this is inconsistent with Shaharuddin *et al*. (2021) who found that leverage does not influence

company performance during the COVID-19 pandemic.

Similarly, LIQ has a significant and negative impact on ROA and ROE, which is not aligned with Shaharuddin *et al*. (2021) who found a positive relationship between them in Malaysia during COVID-19. This could be explained by the fact that most companies are not able to effectively manage working capital during this crisis. Nerantzidis *et al*. (2023) also confirmed that about 10 percent of Greek firms become illiquid within one or two years. Abbas and Nainggolan (2022) found that firms with higher liquidity experience a less adverse impact of COVID-19 than other firms. For agricultural firm in Malaysia, Zulkipli *et al*. (2019) documented a positive relationship between debt-to-equity ratio and firm profitability and a negative relationship between quick ratio and firm profitability.

Consistent with Shaharuddin *et al*. (2021), CF shows a positive and significant impact on only the ROA indicator. Cash flows from operations are the contributing factor of company performance. It suggests that agricultural companies can effectively use their assets to collect cash from sales and customers. The findings of Xu and Jin (2022) also revealed that cash holding level of agri-food companies in China does not change significantly in the era of COVID-19.

In addition, firm size (SIZE) has a positive impact on ROA, consistent with Xu and Wang (2019), Liu *et al*. (2020), and Shaharuddin *et al*. (2021).

Table 4: Regression results of Models (1) and (2)

Variable	Model (1)		Model (2)	
	Coefficient	***t*-value**	**Coefficient**	***t*-value**
Constant	-0.089	-1.640	0.247	0.952
LEV	-0.030***	-9.550	-0.325***	-21.569
LIQ	-0.005*	-1.869	-0.087***	-6.294
CF	0.308***	8.053	0.199	1.087
SIZE	0.006**	2.402	0.007	0.614
F	52.652***		127.277***	
Adj. R^2	0.433		0.651	
N	272		272	

Notes: * and *** indicate significance at the 10% and 1% level, respectively.
Source: Authors' calculation

4.4. Further analysis

We divide our sample into state-owned companies and private-owned companies, and further analyze the impact of leverage, liquidity, and cash flows in different types of companies during COVID-19. As shown in Table 5, LEV has no significant impact on company performance in state-owned companies, while it exerts a negative impact in private-

owned companies. There is a positive relationship between LIQ and company performance in state-owned companies and a negative relationship in private-owned counterparts. This could be explained by the fact that state-owned companies establish close ties with the government and have easy access to financial supports in the Chinese context (Jin *et al*., 2018). CF has a positive and significant impact on ROA and ROE in both sub-samples. It is noticeable that the impact of cash flows from operations in private-owned companies is greater than that in state-owned companies. Additionally, firm size (SIZE) has a positive impact on company performance only in private-owned companies. It is evidenced that the development of private companies relies on reasonable scale expansion (Bernard *et al*., 2018). Table 6 shows the great differences in LEV, LIQ, and SIZE. Specifically, private companies have better capital structure, more current assets, and greater firm scale.

Table 5: Regression results of Models (1) and (2) by company ownership

Variable	State-owned companies				Private-owned companies			
	Model (1)		Model (2)		Model (1)		Model (2)	
	Coefficient	*t*-value	Coefficient	*t*-value	Coefficient	*t*-value	Coefficient	*t*-value
Constant	0.008	0.106	0.074	0.492	-0.189**	-2.482	-1.275***	-4.130
LEV	0.002	0.452	-0.001	-0.096	-0.037***	-10.168	-0.423***	-28.767
LIQ	0.024***	3.429	0.028**	2.089	-0.003	-0.987	-0.056***	-4/190
CF	0.174***	4.929	0.346***	5.036	0.573***	8.985	0.593**	2.298
SIZE	-0.001	-0.371	-0.004	-0.631	0.010***	2.964	0.074***	5.492
F	14.055***		11.215***		61.207***		231.446***	
Adj. R^2	0.305		0.256		0.615		0.859	
N	120		120		152		152	

Notes: ** and *** indicate significance at the 5% and 1% level, respectively.
Source: Authors' calculation

4.5. Robustness check

We use net profit ratio instead of ROA and ROE to measure company performance, and re-estimate Models (1) and (2). The results are similar to the results in Table 4, which suggests the robustness of our conclusion.

5. Conclusions

The purpose of this study is to investigate the impact of leverage, liquidity, and cash flows from operations on company performance in China's agricultural sector during the COVID-19 outbreak. In addition, we explore whether or not these impacts are different in state-owned and private-owned companies. The main conclusions are summarized as follows. First, the COVID-19 pandemic leads to the decrease in company performance. Second,

leverage and liquidity have a negative impact on ROA and ROE during this crisis, while cash flows from operations exhibit a positive impact. Third, private-owned companies have a worse impact of leverage and liquidity on both ROA and ROE as compared to state-owned companies in the era of COVID-19, while the impact of operating cash flows on company performance in private-owned companies is greater.

This study proposes the following practical implications for Chinese agricultural companies to tackle the crisis. First, agricultural listed companies need to reasonably arrange their capital structure and strengthen current asset management to maintain company operations during crisis, especially for private-owned companies. Second, these companies should pay attention to cash management and make efforts to sustain the smooth operation in times of crisis. State-owned companies should develop new business models to tackle the crisis. Finally, the government should implement favorable policies to help agricultural companies recover from the COVID-19 pandemic.

The limitations of this study are listed as follows. First, this study only takes agricultural companies as our sample, and future research could extend the sample to other industries. Also, scholars can make a comparison with other countries across the world. Second, future research could include other variables such as corporate governance to systematically explore the influencing mechanism of company performance.

6. References

ABBAS, Y.; NAINGGOLAN, Y.A. Profit, cash flow, and leverage: the case of ASEAN stock market performance during the COVID-19 pandemic. *Journal of Accounting in Emerging Economies*, 2022.

ADELOPO, I.; VICHOU, N.; CHEUNG, K.Y. Capital, liquidity, and profitability in European banks. *Journal of Corporate Accounting and Finance*, v. 33, n. 1, p. 23-35, 2022.

AHMAD, N.; SHAH, F.N.; IJAZ, F.; GHOURI, M.N. Corporate income tax, asset turnover and Tobin's Q as firm performance in Pakistan: Moderating role of liquidity ratio. *Cogent Business & Management*, v. 10, n. 1, p. 2167287, 2023.

AKHTAR, M.; YUSHENG, K.; HARIS, M.; UI AIN, Q.; JAVAID, H.M. Impact of financial leverage on sustainable growth, market performance, and profitability. *Economic Change and*

Restructuring, v. 55, n. 2, p. 737-774, 2022.

ARUMUGAM, S.; ÖZKAN, B.; JAYARAMAN, A.; MOCKAISAMY, P. Impacts of Covid-19 pandemic on global agriculture, livelihoods and food systems. *Journal of Agricultural Sciences-Tarim Bilimleri Dergisi*, v. 27, n. 3, p. 239-246, 2021.

AZIZI, E.; NURHIKMAT, M.; YULAIKAH, Y.; FAJARWATI, N.K. Does cash flow optimize financial performance of cooperative? *International Journal of Business, Economics & Management*, v. 5, n. 4, p. 280-286, 2022.

BATTEN, J.; VO, X.V. Liquidity and firm value in an emerging market. *Singapore Economic Review*, v. 64, n. 2, p. 365-376, 2019.

BERNARD, D.; BURGSTAHLER, D.; KAYA, D. Size management by European private firms to minimize proprietary costs of disclosure. *Journal of Accounting & Economics*, v. 66, n. 1, p. 94-122, 2018.

CHEN, J.; YANG, C.-C. How COVID-19 affects agricultural food sales: Based on the perspective of China's agricultural listed companies' financial statements. *Agriculture*, v. 11, n. 12, p. 1285, 2021.

CLAMPIT, J.; HASIJA, D.; DUGAN, M.; GAMBLE, J. The effect of risk, R&D intensity, liquidity, and inventory on firm performance during COVID-19: Evidence from US manufacturing industry. *Journal of Risk and Financial Management*, v. 14, n. 10, p. 499, 2021.

DANSO, A.; LARTEY, T.A.; GYIMAH, D.; ADU-AMEYAW, E. Leverage and performance: do size and crisis matter? *Managerial Finance*, v. 47, n. 5, p. 635-655, 2021.

DAS, N.C.; CHOWDHURY, M.A.F.; ISLAM, M.N. The heterogeneous impact of leverage on firm performance: empirical evidence from Bangladesh. *South Asian Journal of Business Studies*, v. 11, n. 2, p. 235-252, 2022.

DWECK, E.; MARCATO, M.B.; TORRACCA, J.; MIGUEZ, T. COVID-19 and the Brazilian manufacturing sector: Roads to reindustrialization within societal purposes. *Structural Change and Economic Dynamics*, v. 61, p. 278-293, 2022.

EL-CHAARANI, H.; ABRAHAM, R.; AZZI, G. The role of liquidity creation in managing the COVID-19 banking crisis in selected Mena countries. *International Journal of Financial Studies*, v. 11, n. 1, p. 39, 2023.

ETIM, E.O.; DAFERIGHE, E.E.; ENANG, E.R.; NYONG, M.B. Cash flow management and financial performance of selected listed companies in Nigeria. *Indo-Asian Journal of Finance and Accounting*, v. 3, n. 1, p. 27-46, 2022.

GHARSALLI, M. High leverage and variance of SMEs performance. *Journal of Risk Finance*, v. 20, n. 2, p. 155-175, 2019.

GONZÁLEZ, V.M. Leverage and corporate performance: International evidence. *International Review of Economics & Finance*, v. 25, p. 169-184, 2013.

JIN, G.; XU, J.; LIU, F.; HARIS, M.; WEQAR, F. Does R&D investment moderate the relationship between the COVID-19 pandemic and firm performance in China's high-tech industries? Based on DuPont components. *Technology Analysis & Strategic Management*, v. 34, n. 12, p. 1464-1478, 2022.

JIN, Z.; SHANG, Y.; XU, J. The impact of government subsidies on private R&D and firm performance: Does ownership matter in China's manufacturing industry? *Sustainability*, v. 10, n. 7, p. 2205, 2018.

KHURANA, A.; SHARMA, P. Impact of COVID-19 on the Indian banking system. *Journal of Information & Optimization Sciences*, v. 43, n. 7, p. 1721-1732, 2022.

KIJKASIWAT, P.; HUSSAIN, A.; MUMTAZ, A. Corporate governance, firm performance and financial leverage across developed and emerging economies. *Risks*, v. 10, n. 10, p. 185, 2022.

KROES, J.R.; MANIKAS, A.S. Cash flow management and manufacturing firm financial performance: A longitudinal perspective. *International Journal of Production Economics*, v. 148, p. 37-50, 2014.

LEE, J.E.; GLASSCOCK, R.; PARK, M.S. Does the ability of operating cash flows to measure firm performance improve during periods of financial distress? *Accounting Horizons*, v. 31, n. 1, p. 23-35, 2017.

LEITE, M.; GUSE, J.C.; HEIN, N. Financial leverage and financial performance: analysis on the brazilian agribusiness. *Custos e Agronegocio On Line*, v. 13, p. 203-226, 2017.

LIU, L.; XU, J.; SHANG, Y. Determining factors of financial performance of agricultural listed companies in China. *Custos e Agronegocio On Line*, v. 16, n. 4, p. 297-314, 2020.

MA'IN, M.; KESHMINDER, J.S.; CHUAH, S.C.; AFINDI, K.S.A. The effects of financial leverage on firm performance in Shariah-listed consumer products and services firms. *Asia-Pacific Management Accounting Journal*, v. 17, n. 1, p. 223-248, 2022.

NANGIH, E.; OFOR, T.N.; VEN. ONUORAH, J.K.J. Cash flow management and financial performance of quoted oil and gas firms in Nigeria. *Journal of Accounting and Financial Management*, v. 6, n. 4, p. 1-11, 2020.

NASEER, S.; KHALID, S.; PARVEEN, S.; ABBASS, K.; SONG, H.; ACHIM, M.V. COVID-19 outbreak: Impact on global economy. *Frontiers in Public Health*, v. 10, p. 1009393, 2023.

NERANTZIDIS, M.; KOUTOUPIS, A.; TZEREMES, P.; DROGALAS, G.; MITSKINIS, D. The effects of COVID-19 on firms' liquidity: Evidence from the Athens Stock Exchange. *Journal of Business Economics and Management*, v. 24, n. 1, p. 155-176, 2023.

NGUYEN, S.L.; PHAM, C.D.; TRUONG, T.V.; PHI, T.V.; LE, L.T.; VU, T.T.T. Relationship between capital structure and firm profitability: Evidence from Vietnamese listed companies. *International Journal of Financial Studies*, v. 11, n. 1, p. 45, 2023.

ÖZGÜNER, Z.; ÖZGÜNER, M.; DURMAZ, Y. The evaluation of the effects of the COVID-

19 pandemic on the Turkish manufacturing sector using AHP-TOPSIS methods. *Journal of Business & Industrial Marketing*, v. 38, n. 7, p. 1562-1573, 2023.

PAPADIMITRI, P.; PASIOURAS, F.; TASIOU, M. Financial leverage and performance: the case of financial technology firms. *Applied Economics*, v. 53, n. 44, p. 5103-5121, 2021.

PJANIĆ, M.; MITRAŠEVIĆ, M.; LUKOVIĆ, S. Profitability determinants of life insurance companies in the Republic of Serbia. *Strategic Management*, 2023.

PYLAEVA, I.S.; PODSHIVALOVA, M.V.; PODSHIVALOV, D.V. The impact of the COVID-19 pandemic on the sustainable development of pharmaceutical companies: Evidence from Russia. *Voprosy Ekonomiki*, n. 10, p. 86-112, 2022.

SEO, K. Excessive leverage and firm performance in competitive casino markets. *Tourism and Hospitality Research*, v. 18, n. 4, p. 498-504, 2018.

SHABIR, M.; JIANG, P.; WANG, W.; IŞIK, Ö. COVID-19 pandemic impact on banking sector: A cross-country analysis. *Journal of Multinational Financial Management*, v. 67, p. 100784, 2023.

SHAFI, M.; LIU, J.; REN, W. Impact of COVID-19 pandemic on micro, small, and medium-sized Enterprises operating in Pakistan. *Research in Globalization*, v. 2, p. 100018, 2020.

SHAHARUDDIN, S.N.; MAHMUD, R.; AZHARI, N.K.M.; PERWITASARI, W. Company performance during Covid-19: Impact of leverage, liquidity and cash flows. *Environment-Behaviour Proceedings Journal*, v. 6, n. 17, 11-16, 2021.

SHEN, H.; FU, M.; PAN, H.; YU, Z.; CHEN, Y. The impact of the COVID-19 pandemic on firm performance. *Emerging Markets Finance and Trade*, v. 56, n. 10, p. 2213-2230, 2020.

SUN, J.; LEE, H.; YANG, J. The impact of the COVID-19 pandemic on the global value chain of the manufacturing industry. *Sustainability*, v. 13, n. 22, p.12370, 2021.

TAN, L.; WU, X.; GUO, J.; SANTIBANEZ-GONZALEZ, E.D.R. Assessing the impacts

of COVID-19 on the industrial sectors and economy of China. *Risk Analysis*, v. 42, n. 1, p. 21-39, 2022.

TSURUTA, D. Variance of firm performance and leverage of small businesses. *Journal of Small Business Management*, v. 55, n. 3, p. 404-429, 2017.

XU, J.; JIN, Z. Exploring the impact of the COVID-19 pandemic on firms' financial performance and cash holding: New evidence from China's agri-food sector. *Agronomy*, v. 12, n. 8, p. 1951, 2022.

XU, J.; SUN, Z.; SHANG, Y. Capital structure and financial performance in China's agricultural sector: a panel data analysis. *Custos e Agronegocio On Line*, v. 17, n. 2, p. 445-463, 2021.

XU, J.; WANG, B. Intellectual capital and financial performance of Chinese agricultural listed companies. *Custos e Agronegocio On Line*, v. 15, n. 1, p. 273-290, 2019.

ZHENG, M. Is cash the panacea of the COVID-19 pandemic: Evidence from corporate performance. *Finance Research Letters*, v. 45, p. 102151, 2022.

ZULKIPLI, M.A.; ABDULLAH, N.A.I.N.; KAMALUDDIN, A. The relationship between financial leverage and liquidity, and firms' profitability of the agricultural industry: Evidence from Malaysian listed firms. *Asia-Pacific Management Accounting Journal*, v. 14, n. 3, p. 199-217, 2019.

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Appendix

Table 6: Descriptive statistics by ownership

Variable (Mean)	State-owned companies	Private-owned companies	Difference *t*-statistics
ROA	0.0101	0.0171	-1.034
ROE	0.0135	-0.0133	0.679
LEV	1.0617	0.8529	1.786*
LIQ	1.0284	1.3491	-2.779***
CF	0.0235	0.0323	-0.934
SIZE	21.9264	22.6514	-5.431***

Notes: * and *** indicate significance at the 10% and 1% level, respectively.
Source: Authors' calculation