Chapter 4

The Impact of the Covid-19 Pandemic on Cash Holding Strategies and Firms' Financial Performance: Example of China, India and South Africa

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Abstract

The aim of this study is to examine the impact of the Covid-19 Pandemic crisis and its aftermath on the cash holding strategies and financial performance of companies in the emerging economies of China, India and South Africa. For this purpose, annual data from the years 2017-2023 of the three largest firms, excluding financial institutions, in the specified countries and from different sectors have been used. For data analysis, the Pooled Ordinary Least Squares method, the Newey–West robust estimator, and the Driscoll-Kraay robust estimator have been utilized. According to the analysis results, it has been determined the cash retention rates of Chinese companies decreased during and after the pandemic, while the cash retention rates of Indian companies increased. It has been determined South African companies' cash retention rates increased during the pandemic and decreased afterward. During and after the pandemic period, among the financial performance indicators of Chinese companies, return on assets (ROA) and return on equity (ROE) have shown an increase, but no significant change has been observed in Tobin's Q. It has been determined Indian companies, ROA increased during the pandemic period, while there was no significant change in ROE and Tobin's Q, and after the pandemic, increases in ROA, ROE, and Tobin's Q were observed. In South African companies, declines in ROA and ROE were observed during the pandemic, while there was no significant change in Tobin's Q; after the pandemic, only a significant increase in ROA was detected, and there were no significant changes in the other variables.

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1. Introduction

The COVID-19 pandemic emerged in December 2019 in the city of Wuhan, Hubei province, China. Shortly after its emergence, it rapidly spread and led to a pandemic worldwide, affecting many countries throughout 2020. The COVID-19 pandemic has caused significant changes in many sectors worldwide, deeply affecting businesses' financial strategies and performance. With the onset of the pandemic, uncertainty and economic fluctuations have caused companies to reassess their approaches to cash management and retention strategies. Especially firms in emerging markets have been significantly affected by this process due to their limited resources and higher risks.

Cash holding is of critical importance in liquidity management for businesses to continue their operations without interruption. Companies are increasing their cash reserves to reduce potential uncertainties, be prepared for emergencies, and ensure their financial stability. The extraordinary conditions created by COVID-19, one of these uncertainties, have made companies' cash retention strategies even more critical. It can be said that especially businesses that were caught unprepared for this extraordinary situation and/or businesses that hold less cash due to other activities affecting cash holding behaviour were more affected. Based on these situations, the aim of this study is to examine the impact of the COVID-19 pandemic on cash holding strategies and its reflections on firms' financial performance.

The aim of this study is to examine the effects of the Covid-19 Pandemic crisis and its aftermath on the cash holding strategies and financial performance of companies in the emerging economies of China, India, and South Africa. The study aims to provide important insights into how businesses should strategize during crisis periods by revealing the effects of COVID-19 on financial performance. In conclusion, this research aims to contribute to the understanding of the relationship between cash management and financial performance, while also providing strategic recommendations specifically for businesses operating in emerging markets.

In line with the purpose of the study, the annual data for the period 2017-2023 of the companies with the highest market value among the sectors other than the financial sector operating in the countries of China, India, Brazil, and South Africa from the emerging markets are included. In the analysis of the data, the Pooled Least Squares method was utilized with the Newey–West robust estimator and the Driscoll-Kraay robust estimator.

The reason we are conducting this study is to understand the profound impacts of the Covid-19 pandemic on businesses, to examine how cash retention strategies have evolved in this context, and to investigate the changes in firms' financial performance. Due to the uncertainties experienced during the pandemic, the necessity for companies in many sectors to increase their financial resilience has come to the forefront. In this study, it is aimed to contribute to the development of strategies suitable for the conditions created by the pandemic by analysing the effects of the pandemic crisis on firms' cash management and financial performance.

The originality of the study lies in examining the impact of Covid-19 on cash holding strategies in emerging markets and contributing to the limited number of studies conducted on this topic. Additionally, the study is unique in that it highlights how the impact of Covid-19 on financial performance has changed during and after the pandemic. Again, using empirical data, its unique aspect is revealing the relationships between financial performance indicators (ROA, ROE, Tobin's Q) and cash holding strategies.

The contribution of the study to the literature emphasizes the importance of cash management in emerging markets during the Covid-19 pandemic crisis and examines the impact of the strategies developed by firms in response to the pandemic on their financial performance. The findings obtained will provide important information for researchers and practitioners, helping to develop new perspectives on how businesses can become more resilient during times of crisis. Additionally, it aims to fill the gaps in the literature by providing recommendations on the processes of reshaping firms' financial strategies in the post-pandemic period.

The most significant limitation of the study is that, especially due to the recency of the post-pandemic periods, it remains constrained in determining whether there have been significant changes in companies' cash holding strategies. However, the analysis results still provide important insights into how companies will develop cash retention strategies post-pandemic.

2. Literature Review

In this research, prior studies have been reviewed to investigate how the COVID-19 pandemic influenced corporate cash holding behaviors and overall financial outcomes. The review covers earlier works addressing firms' policies on liquidity management, resilience against financial shocks, and the maintenance of cash reserves during crisis periods. Within this framework, Cahyono and Ardianto (2024) analyzed the effect of the pandemic on cash holding practices among publicly listed non-financial companies in Indonesia

for the 2013–2020 period, applying multiple linear regression techniques. Their findings indicated that uncertainties stemming from the pandemic had a marked influence on firms' cash flows and disrupted business operations. Similarly, Yılmaz and Samur (2023) evaluated the relationship between cash holdings and financial performance for 536 non-financial companies from 11 MENA region countries, employing panel data methods. Their analysis revealed that both linear and nonlinear models produced significant results for return on assets and return on equity; however, the linear model did not yield significant results for pre-interest and pre-tax profit. Nonlinear models, on the other hand, suggested the existence of an optimal cash holding ratio. Çam (2023) investigated the pandemic's influence on the financial performance of publicly traded non-financial companies in Turkey using panel data analysis. His results suggested a negative effect of COVID-19 on firm performance, while ESG practices appeared to mitigate this adverse impact. Chung et al. (2023) explored how the pandemic crisis affected cash holding decisions in the Korean economy through regression analysis. They observed that in response to heightened uncertainty during 2020, firms increased their cash reserves. Valaskova et al. (2023) assessed the impact of the crisis on the liquidity positions of Slovakian enterprises using data from 2018–2021 and the Friedman test, finding a deterioration in debt levels. Wu et al. (2023), drawing on panel regression analysis with data from 1,775 companies listed on the Taiwan Stock Exchange for the 2019–2020 period, concluded that firms with stronger pre-pandemic cash positions performed better during the crisis and achieved higher returns in terms of both ROE and ROA. In their study, Kaygusuzoğlu et al. (2023) analyzed financial indicators of 12 textile companies based in Gaziantep ranked among Turkey's top 500 industrial firms over the 2018–2020 period through comparative table analysis, concluding that the crisis did not cause significant harm to their financial metrics.

Doruk (2022) studied the food sector firms listed on Borsa Istanbul from 2018Q4 to 2021Q2 using Welch's T-test, identifying no substantial difference in overall performance but noting changes in short-term financial results. Xu and Jin (2022) examined 42 agriculture-food firms listed in Shanghai and Shenzhen between Q1 2016 and Q1 2021 through panel regression analysis, reporting that the pandemic did not significantly influence their financial performance or cash holdings. Zheng (2022) employed a Difference-in-Differences approach with Compustat data from 2018Q4–2020Q4 to test pandemic effects on publicly listed companies, determining that firms with ample pre-pandemic cash reserves fared better against the shocks. Lastly, Gezen and Özcan (2022) analyzed BIST-listed

tourism firms between 2011 and 2020 using the Z-score model, revealing that during 2019–2020, a small number of businesses entered the financially risky category, while most remained in the safe zone.

3. Methodology

3.1. Data Set

The data set of the study consists of the countries China, India, Brazil, and South Africa from the emerging markets. The sample consists of the top three companies with the highest market value among sectors other than the financial sector operating in these countries. The dataset of the study consists of annual data from the period 2017-2023. The data for the dependent, independent, and control variables included in the study were obtained from the year-end tables of the companies, and the data related to Tobin's Q value were obtained from Companies Market Cap. The data related to macroeconomic variables were obtained from Investing.com. Explanatory information regarding this data is presented in Table 1.

Table 1. Variable description and Measurement

Variable	Type of variable	Measurement	Notation	Source
Return on asset	Dependent	Net income/ Total Asset	ROA	Kaya and Özçelik, 2023; Huong et al., 2021; Cheng et al., 2020; Chen et al., 2018
Return on equity	Dependent	Net income/ Total Equity	ROE	Kaya and Özçelik, 2023; Huong et al., 2021; Cheng et al., 2020; Gadzo et al., 2019; Chen et al., 2018
Tobin's Q Ratio	Dependent	Market value of the company / Cost of reproducing its assets	Tobin's Q	Kaya and Özçelik, 2023; Tarkom and Ujah, 2023; Bahteev et al., 2021; Ni et al., 2019; Salehi, 2009
The amount of cash generated from internal operations of the firm	Independent variables	Cash flows/Total Assets	CT	Maponya et al., 2023; Etim et al., 2022; Liman and Mohammed 2018; Nwakaego et al.; 2015

The ratio of firms' short-term assets held in cash according to their liquidity needs	Independent variables	Cash Holding Ratio = Cash and Cash Equivalents / Total Assets	CHR	Kaya and Özçelik, 2023; Ilahi et al., 2014;
Control variables	Firm Size	Total Assets	TA	Liman and Mohammed 2018; Egbunike and Okerekeoti, 2018
	Leverage	Total Debt / Total Assets ratio	L	Liman and Mohammed 2018; Egbunike and Okerekeoti, 2018
	Investment Opportunities	R&D (Research and Development expenditures) / Total Assets ratio	IO	Kabukcuoglu, 2019
	Current Ratio	Current Assets / Current Liabilities	CR	Egbunike and Okerekeoti, 2018
Macroeconomic Variables	Inflation Rate	Percentage change in consumer price index	CPI	Tarkom and Ujah, 2023; Saleh and Alaallah, 2022; Huong et al., 2021; Al-Qudah, 2020; Deger and Anbar, 2011
	Interest Rate	Central bank interest rates (Policy Rate)	IR	Saleh and Alaallah, 2022; Ogege, 2019; Egbunike and Okerekeoti, 2018
	GDP Growth Rate	Gross Domestic Product Growth Rate	GDPGR	Saleh and Alaallah, 2022; Egbunike and Okerekeoti, 2018
Impact of Covid-19	Pandemic Period Dummy Variable	To assess the effects before and after Covid-19 in the model.	For the period to be measured, it is 1; for others, it is 0.	

Note: The natural logarithm of the Total Assets (TA) variable is taken.

3.2. Method

In this research, panel data analysis was employed, enabling the simultaneous consideration of both temporal and cross-sectional dimensions and thereby providing richer insights. The initial step involved conducting the F-test to evaluate the applicability of the classical model for the Chinese economy specifically, to determine the existence of unit and/or time effects. The F-test outcomes indicated that in all models, the classical framework, namely the Pooled Ordinary Least Squares (OLS) method, was appropriate. As with any classical model, certain statistical assumptions must be met,

including the absence of heteroskedasticity, autocorrelation, and cross-sectional dependence (Yerdelen Tatoğlu, 2018). To assess heteroskedasticity, the Breusch–Pagan/Cook–Weisberg test was applied, while autocorrelation was tested using the Wooldridge method. For Models 1 and 3, evidence of autocorrelation was found, prompting the use of the Newey–West estimator, which is robust to such issues. In Model 2, no signs of heteroskedasticity or autocorrelation were detected; therefore, the classical model was retained. In the case of Model 4, the Hausman test suggested the suitability of the random effects model. Assumptions for this model were evaluated using White's Test and the Breusch–Pagan/Cook–Weisberg test for heteroskedasticity, and the Durbin–Watson test for autocorrelation. The results confirmed the presence of autocorrelation, leading to the adoption of the Driscoll–Kraay Robust Estimator, which accounts for heteroskedasticity, autocorrelation, and cross-sectional dependence.

For the Indian economy, a similar process was followed. The F-test confirmed that the Pooled OLS approach was appropriate across all models. Heteroskedasticity was examined using the Breusch–Pagan/Cook–Weisberg test, and autocorrelation was assessed through the Wooldridge test. In Model 3, autocorrelation was detected, and accordingly, the Newey–West robust estimator was implemented. The remaining models were estimated using the classical approach. For Model 4, the Hausman test results indicated that the fixed effects model was more suitable. Its assumptions were checked using White's Test and the Breusch–Pagan/Cook–Weisberg test for heteroskedasticity and the Durbin–Watson test for autocorrelation. Since autocorrelation was observed, the Driscoll–Kraay estimator was once again preferred.

For the South African economy, the F-test similarly validated the use of the Pooled OLS method for all models. The Breusch–Pagan/Cook–Weisberg test was used to assess heteroskedasticity, while the Wooldridge test addressed autocorrelation. In Model 2, heteroskedasticity was present, necessitating the application of the Newey–West estimator. Other models were estimated using the classical approach. In Model 4, the Hausman test pointed to the random effects model as the most suitable. The assumptions for this model were tested using the Breusch–Pagan/Cook–Weisberg test for heteroskedasticity and the Durbin–Watson test for autocorrelation. As both heteroskedasticity and autocorrelation were detected, the Driscoll–Kraay Robust Estimator capable of handling heteroskedasticity, autocorrelation, and cross-sectional dependence was employed.

Models of the Research

$$ROA_{it} = \alpha + \beta_1 CT_{1,it} + \beta_2 CHR_{2,it} + \beta_3 TA_{3,it} + \beta_4 DL_{4,it} + \beta_5 R\&D_{5,it} + \beta_6 CR_{6,it} + \beta_7 IR_{7,it} + \beta_8 CPI_{8,it} + \beta_9 GDPG_{9,it} + \beta_{10} Pandemic_{10,it} + \beta_{11} Post\text{-}Pandemic_{11,it} + \varepsilon_{it} \quad (1)$$

$$ROE_{it} = \alpha + {}_1 CT_{1,it} + \beta_2 CHR_{2,it} + \beta_3 TA_{3,it} + \beta_4 DL_{4,it} + \beta_5 R\&D_{5,it} + \beta_6 CR_{6,it} + \beta_7 IR_{7,it} + \beta_8 CPI_{8,it} + \beta_9 GDPG_{9,it} + \beta_{10} Pandemic_{10,it} + \beta_{11} Post\text{-}Pandemic_{11,it} + \varepsilon_{it} \quad (2)$$

$$Tobin'sQ_{it} = \alpha + \beta_1 CT_{1,it} + \beta_2 CHR_{2,it} + \beta_3 TA_{3,it} + \beta_4 DL_{4,it} + \beta_5 R\&D_{5,it} + \beta_6 CR_{6,it} + \beta_7 IR_{7,it} + \beta_8 CPI_{8,it} + \beta_9 GDPG_{9,it} + \beta_{10} Pandemic_{10,it} + \beta_{11} Post\text{-}Pandemic_{11,it} + \varepsilon_{it} \quad (3)$$

$$CHR_{it} = \alpha + {}_1 CT_{1,it} + \beta_2 CHR_{2,it} + \beta_3 TA_{3,it} + \beta_4 DL_{4,it} + \beta_5 R\&D_{5,it} + \beta_6 CR_{6,it} + \beta_7 IR_{7,it} + \beta_8 CPI_{8,it} + \beta_9 GDPG_{9,it} + \beta_{10} Pandemic_{10,it} + \beta_{11} Post\text{-}Pandemic_{11,it} + \varepsilon_{it} \quad (4)$$

4. Findings

4.1. Descriptive Statistics Information

In this section, the descriptive statistics of the variables used in the study are presented. The mean, minimum, maximum, standard deviation, skewness, kurtosis, and Jarque-Bera values are examined to reveal the general characteristics of the dataset. In this way, a fundamental framework is provided for the subsequent analyses.

Table 2. Descriptive Statistics Information

	Variables	Obs	Mean	Std. dev.	Min	Max	Skewn.	Kurtosis	Jarque-Bera	Prob.
Chinese	ROA	21	.0724	.0499	.0001	.1412	-.2403	1.418	2.391	.3026
	ROE	21	.1392	.1019	.0002	.2830	-.1202	1.387	2.324	.3128
	TobinsQ	21	2.473	1.717	.2966	6.048	.2909	2.082	1.033	.5966
	CT	21	.1592	.0814	.0476	.4018	1.720	6.130	18.94	7.7e-0*
	CHR	21	.1405	.0781	.0163	.2836	.2594	2.187	.8138	.6657
	TA	21	13.87	1.041	10.19	14.82	-2.242	8.516	44.22	2.5e-1*
	DL	21	.4264	.2345	.0988	1.012	.9752	4.510	5.325	.0698
	R&D	21	-.019	.0141	-.040	-.0032	-.0246	1.210	2.806	.2459
	CR	21	1.217	.4695	.5043	1.943	.0893	1.816	1.254	.5342
	IR	21	.0402	.0027	.0365	.0431	-.1771	1.337	2.529	.2824
	CPI	21	.0079	.0072	-.005	.021	.0577	3.253	.0678	.9667
	GDPG	21	5.503	2.106	2.238	8.448	-.3311	1.884	1.473	.4788

India	ROA	21	.1619	.0970	.0261	.2944	-.3126	1.572	2.126	.3454
	ROE	21	.2345	.1325	.0488	.4638	-.0760	1.812	1.254	.5342
	TobinsQ	21	38.64	23.56	7.155	81.45	.1667	1.784	1.391	.4989
	CT	21	.1561	.0996	.0042	.2967	-.2363	1.862	1.327	.515
	CHR	21	.0849	.0843	.0032	.2714	1.085	2.797	4.158	.125
	TA	21	12.26	.9686	11.28	13.78	.6687	1.617	3.239	.198
	DL	21	.3436	.1210	.1614	.6043	.2462	2.252	.7009	.7044
	R&D	21	-.003	.0011	-.005	-.0019	-.5930	1.711	2.683	.2614
	CR	21	2.319	1.456	.6254	5.534	.5902	2.279	1.673	.4332
	IR	21	.0532	.0096	.04	.065	-.2443	1.286	2.779	.2492
	CPI	21	.0496	.0142	.0257	.0658	-.3700	1.831	1.674	.433
	GDPG	21	5.086	4.827	-5.77	9.689	-1.580	4.190	9.98	.0068*
South Africa	ROA	21	.0706	.0940	-.193	.2599	-.4451	4.663	3.114	.2108
	ROE	21	.1240	.1918	-.589	.3698	-2.484	10.28	68.02	1.7e-1*
	TobinsQ	21	4.506	2.801	.5851	11.21	.6283	2.901	1.39	.499
	CT	21	.0677	.0557	-.004	.2065	.5780	2.943	1.172	.5565
	CHR	21	.1155	.0596	.0340	.3206	1.866	7.775	32.15	1.0e-0*
	TA	21	11.26	1.102	9.234	13.070	.4339	2.324	1.058	.5892
	DL	21	.4896	.1958	.1648	.7583	-.1915	1.778	1.434	.4881
	R&D	21	-.004	.0099	-.034	0	-2.675	8.327	49.89	1.5e-1*
	CR	21	2.142	1.532	1.048	6.674	1.775	5.139	15.04	5.4e-0*
	IR	21	.0582	.0152	.035	.078	-.3856	1.681	2.042	.3602
	CPI	21	.0511	.0140	.029	.07	-.0229	1.875	1.109	.5745
	GDPG	21	.6037	3.073	-5.96	4.703	-1.117	3.788	4.917	.0856

Note: (*) indicates significance at the 1% significance level.

Table 2 provides descriptive statistics for the variables related to China, India, and South Africa included in the research. When examining Table 2, it is observed for the Chinese economy, the variable with the highest average is total assets (13.87), while the variable with the highest standard deviation is the GDP growth rate (2.106). It is observed variable with the lowest average is investment opportunities (R&D) with (-.019), and the variable with the lowest standard deviation is the interest rate (IR) with (.0027). Within the scope of the research, it is observed TobinsQ, CT, CHR, DL, CR, and CPI variables are positively skewed, while the other variables are negatively skewed. To test whether the series exhibit a normal distribution, the Jarque-Bera test results, which show the statistical results of the error terms, were examined. Since the probability values of all variables except for CT and TA were greater than the critical value of 0.05, the null hypothesis

(H0) stating the error terms follow a normal distribution was not rejected, and thus it was concluded that the series exhibit a normal distribution.

In the case of the Indian economy, Tobin's Q stands out as the variable with the highest average (38.64) and variability (standard deviation: 23.56). Conversely, the investment opportunities measure (R&D) records the lowest mean at –0.003 and the smallest standard deviation at 0.0011. The analysis further reveals that Tobin's Q, CHR, DL, TA, and CR exhibit a right-skewed distribution, whereas the remaining variables display left-skewness. According to the Jarque–Bera test results, for all variables except GDPG, the probability values exceed the 0.05 threshold. This indicates that the null hypothesis (H_0), which assumes normally distributed error terms, cannot be rejected, suggesting that these series conform to a normal distribution.

For the South African economy, total assets emerge as the variable with the highest mean value (11.26), whereas the GDP growth rate shows the greatest variability, with a standard deviation of 3.073. In contrast, investment opportunities (R&D) record both the lowest mean (–0.004) and the smallest standard deviation (0.0099). The findings indicate that Tobin's Q, CT, CHR, TA, and CR are positively skewed, while the remaining variables exhibit negative skewness. Based on the Jarque–Bera test results, the null hypothesis (H_0) of normally distributed error terms could not be rejected for all variables except ROE, CHR, R&D, and CR, as their probability values exceeded the 0.05 threshold. Consequently, it was determined that these series follow a normal distribution.

4.2. Panel Regression Results for the Chinese National Economy

In this part of the study, the panel regression results for the three Chinese companies included in the research (Alibaba Group Holding Limited, Tencent Holdings Limited, and PetroChina Company Limited) are presented in Table 3.

Table 3. Panel Regression Estimation Results

Variables	Newey–West				Pooled OLS	
	ROA		Tobin's Q		ROE	
	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.
CT	.3735363	0.009***	-.087789	0.992	-.424411	0.145
CHR	-.158340	0.463	-11.2006	0.461	-.131719	0.732
TA	-.005596	0.513	.7422197	0.262	-.021941	0.036**
DL	.1080971	0.183	6.107971	0.078*	.097441	0.416
R&D	-3.20449	0.001***	2.056313	0.005***	-7.44082	0.000***
CR	.0594267	0.253	3.799196	0.327	.0665707	0.463
IR	1.62175	0.043**	2.558432	0.578	1.99624	0.000***
CPI	1.12134	0.391	4.062641	0.482	3.274984	0.016**
GDPG	.0361426	0.070*	.6114793	0.681	.0919321	0.000***
Pandemic	.5102435	0.066*	7.889834	0.617	1.100254	0.072*
Post-pan.	.759548	0.074*	14.29806	0.618	1.946598	0.000***
_cons	-6.08180	0.049**	-1.26037	0.523	-1.24553	0.000***
F(11, 9)	60.70		9.76		24.44	
Prob > F	0.0000		0.0010		0.0000	
R-squared					0.9280	
Breusch–Pagan/Cook–Weisberg test	0.07 (0.7845)		0.86 (0.3530)		0.01 (0.9224)	
Wooldridge test	469.058 (0.0021)		110.250 (0.0089)		14.150 (0.0640)	
F test	3.77; Prob > F = 0.0772		2.24; Prob > F = 0.1773		2.96; Prob > F = 0.1169	

Note: (,**,*) indicate significance levels of 1%, 5%, and 10%, respectively.***

Table 3 summarizes the results of the regression analysis conducted using the pooled ordinary least squares (OLS) method, the Newey–West robust estimator results, and various statistical tests of the model. When examining the Newey–West robust estimator results provided in the table, it has been concluded the effect of the cash amount obtained from intra-firm operations (CT) on ROA is statistically significant and positively effective at the 1% significance level. This result shows one-unit increase in CT increases ROA by 37.35%. Again, it has been concluded the effect of R&D expenditures on ROA is statistically significant and negatively impactful at the 1% significance level. This result shows one-unit increase in R&D significantly decreases ROA by 320.4%. Among the macroeconomic variables, it has been concluded the effect of the interest rate (IR) on ROA is statistically significant and has a positive impact at the 5% significance level. This result shows one-unit increase in interest rates increases ROA by approximately 162%. The effect of GDP growth rate on ROA has been found to be statistically significant and positively impactful at the 10% significance level. This result shows one-unit increase in GDPG increases ROA by 3.6%. The coefficients for the pandemic and post-pandemic periods are statistically

significant and positive at the 10% significance level, respectively (β = 0.5102, p = 0.066) and (β = 0.759548, p = 0.074). According to this result, it can be said pandemic period had a positive effect on the profitability of companies. The constant term being statistically significant and negative at the 5% significance level indicates ROA is negative when all variables in the model are zero. However, no statistically significant relationship has been found between ROA and the other variables.

When examining the model performance and test results, the F-statistic probability value is less than the critical value of 0.05 stated in the literature (Prob > F=0.0000), indicating the model is generally statistically significant and independent variables collectively explain ROA effectively. Since the p-value of the Breusch-Pagan/Cook-Weisberg test is greater than the critical value of 0.05 (p=0.7845), it can be said there is no heteroscedasticity. When examining the Wooldridge test results test for the presence of autocorrelation in the models, it can be said there is autocorrelation in the model as the probability value of the test is less than the critical value of 0.05 (p=0.0021). Therefore, the Newey-West estimator has been used to correct the standard error estimates. Since the p-value of the F-test, which tests the necessity of fixed effects, is greater than the critical value of 0.05 (p=0.0772), it can be said fixed effects are not significant for the model, and the pooled data set approach is appropriate.

When examining the Newey–West robust estimator results in the table where Tobin's Q is the dependent variable, it is observed only the debt level (DL) and R&D expenditure have a statistically significant effect on Tobin's Q, while the effects of other variables on Tobin's Q are not statistically significant. According to these results, it can be said one-unit increase in DL increases Tobin's Q by approximately 611%. It can be said one-unit increase in R&D expenditures reduces Tobin's Q by approximately 206%. Since the coefficients are not significant for both the pandemic and the post-pandemic period, it can be said the pandemic did not have a lasting impact on the company's value.

When examining the model performance and test results, the F-statistic probability value is less than the critical value of 0.05 expressed in the literature (Prob > F=0.0010), indicating model is generally statistically significant and the independent variables collectively explain Tobin's Q effectively. Since the p-value of the Breusch-Pagan/Cook-Weisberg test is greater than the critical value of 0.05 (p=0.3530), it can be said there is no heteroscedasticity. When examining the Wooldridge test results test for the presence of autocorrelation in the models, it can be said there is

autocorrelation in the model as the probability value of the test is less than the critical value of 0.05 (p=0.0089). Therefore, the Newey-West estimator has been used to correct the standard error estimates. Since the p-value of the F-test, which tests the necessity of fixed effects, is greater than the critical value of 0.05 (p=0.1773), it can be said that fixed effects are not significant for the model, and the pooled data set approach is appropriate.

When examining the results of the Pooled Ordinary Least Squares estimator with ROE as the dependent variable, as shown in the table, it is observed asset size (TA) has a statistically significant and negative effect on ROE. This result shows one-unit increase in TA decreases ROE by 2.19%. Similarly, the effect of R&D expenditures on ROE is statistically significant and negatively impactful at the 1% significance level. This result shows one-unit increase in R&D significantly decreases ROE by 744%. From the macroeconomic variables, it is observed interest rate (IR), inflation rate (CPI), and GDP growth rate (GDPG) positively affect ROE. This result shows one-unit increase in interest rates raises ROE by approximately 199.6%, an increase in inflation by approximately 327%, and an increase in GDPG by approximately 9.19%. The coefficients for the pandemic and post-pandemic periods are statistically significant and positive at the 10% and 1% significance levels, respectively ($\beta = 1.100$, $p = 0.072$) and ($\beta = 1.947$, $p = 0.000$). According to this result, it can be said pandemic period had a positive effect on the companies' return on equity. Especially in the post-pandemic period, the increase in ROE is quite significant.

When examining the model performance and test results, the R2 value was observed to be 0.9280. This indicates that the independent variables explain a significant portion of the variation in ROE. Since the probability value of the F statistic is less than the critical value of 0.05 expressed in the literature (Prob > F=0.0000), it indicates the model is generally statistically significant and independent variables collectively explain ROE effectively. Since the p-value of the Breusch-Pagan/Cook-Weisberg test is greater than the critical value of 0.05 (p=0.9224), it can be said there is no heteroscedasticity. When examining the Wooldridge test results, which test for the presence of autocorrelation in the models, it can be said there is no autocorrelation in the model because the probability value of the test is greater than the critical value of 0.05 (p=0.00640). Since the p-value of the F-test, which tests the necessity of fixed effects, is greater than the critical value of 0.05 (p=0.1169), it can be said fixed effects are not significant for the model, and the pooled data set approach is appropriate.

4.3. Panel Regression Results for the Indian Country Economy

In this section, the econometric tests conducted on three Indian companies (Reliance Industries, Tata Consultancy Services (TCS), and Infosys) and the findings obtained from these tests are presented in detail. The analysis process begins with the F-test, which was applied to examine the presence of unit and/or time effects in the models. In panel data analysis, testing whether unit or time effects exist is a critical step in determining the appropriate estimation method. In particular, the F-test allows for the comparison between the classical model (pooled model) and the fixed effects model, thereby providing statistical evidence regarding the validity of the models. The test results revealed that there were no significant unit or time effects in the models used in the study. This finding supports the validity of the classical model (Pooled OLS) and indicates that the use of this method in the analyses is statistically appropriate. The choice of the classical model also offers significant advantages to the study by providing computational simplicity and enhancing interpretability.

In line with these findings, the Pooled Ordinary Least Squares (Pooled OLS) method was employed to conduct the analyses, and the test results are reported in detail in Table 4. Thus, a solid methodological framework has been established, providing a reliable basis for subsequent estimations and analyses. Furthermore, this process reinforces the validity of the econometric approach adopted in the study and enhances the scientific reliability of the results obtained.

Table 4. Panel Regression Estimation Results

Variables	Pooled OLS (Ordinary Least Squares)				Newey–West	
	(ROA)		(ROE)		(Tobin's Q)	
	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.
CT	.2953475	0.031**	.4633575	0.103	2.269953	0.211
CHR	-.132739	0.149	-.179919	0.317	7.588031	0.459
TA	-.082621	0.012**	-.144943	0.028**	1.409288	0.689
DL	.1782546	0.086*	.4334437	0.049**	3.544271	0.529
R&D	14.81723	0.161	.0373662	0.145	-5795.18	0.652
CR	.0178343	0.093*	.0075591	0.702	9.852447	0.225
IR	.5053182	0.592	.929716	0.613	-8.27360	0.051*
CPI	-1.45018	0.034**	-1.89862	0.186	-5.99575	0.133
GDPG	-.001470	0.111	-.001336	0.413	.1425883	0.761
Pandemic	.0407444	0.091*	.0602235	0.198	1.807236	0.129
Post-pan.	.0652442	0.008***	.0983243	0.043**	6.219889	0.037**
_cons	1.108183	0.022**	1.894734	0.050**	-1.68019	0.740
F(11, 9)	304.05		86.85		34.92	
Prob > F	0.0000		0.0000		0.0000	
R-squared	0.9187		0.8768		0.9187	
Breusch–Pagan/ Cook–Weisberg t	0.04 (0.8405)		0.01 (0.9797)		0.13 (0.7140)	
Wooldridge test	4.203 (0.1769)		10.215 (0.0855)		120.664 (0.0082)	
F test	1.91 Prob > F = 0.2179		2.98 Prob > F = 0.1156		1.93 Prob > F = 0.2144	

Note: (,**,*) indicate significance levels of 1%, 5%, and 10%, respectively.***

Table 4 presents the pooled ordinary least squares (OLS) regression outcomes, along with the Newey–West robust estimates and the results of several model diagnostics. When ROA is taken as the dependent variable, the findings reveal a statistically significant and positive association between cash generated from internal operations (CT) and ROA at the 5% significance level. Specifically, a 1% rise in CT corresponds to roughly a 30% increase in ROA. Firm size (TA) exhibits a significant negative relationship with ROA at the 5% level, indicating that a 1% expansion in TA is associated with an approximate 8.3% decline in ROA. Debt level (DB) is positively linked to ROA at the 10% significance level, where a 1% increase in DB is associated with about an 18% rise in ROA. The current ratio (CR) also demonstrates a positive and significant impact on ROA at the 10% level, with a 1% increase in CR translating to nearly a 1.8% improvement in ROA. Conversely, the consumer price index (CPI) has a statistically significant negative effect at the 5% level, where a 1% rise in CPI corresponds to an estimated 145% drop in ROA. During the pandemic, a marginally positive and statistically significant influence on ROA was observed at the 10% level. In the post-pandemic period, the effect turned distinctly positive and significant at the 1% level. The positive and significant constant term at the 5% level implies

that ROA remains positive when all explanatory variables are set to zero. No other variables in the model showed statistically significant associations with ROA.

When examining the model performance and test results, the F-statistic probability value is less than the critical value of 0.05 stated in the literature (Prob > F=0.0000), indicating that the model is generally statistically significant and independent variables collectively explain ROA effectively. The R2 value (0.9187) indicates model explains 91.87% of the variance in the dependent variable (ROA). This is a quite high explanatory power and indicates model fits well. Since the p-value of the Breusch-Pagan/Cook-Weisberg test is greater than the critical value of 0.05 (p=0.8405), it can be said there is no heteroscedasticity. When examining the Wooldridge test results test for the presence of autocorrelation in the models, it can be said there is no autocorrelation in the model because the probability value of the test is greater than the critical value of 0.05 (p=0.1769). Since the p-value of the F-test, which tests the necessity of fixed effects, is greater than the critical value of 0.05 (p=0.2179), it can be said fixed effects are not significant for the model, and the pooled data set approach is appropriate.

When examining the model results where the dependent variable is ROE, it is observed there is a statistically significant and negative relationship at the 5% significance level between firm size (TA) and ROE. This result shows 1% increase in TA leads to an approximately 14.5% decrease in ROE. It is observed there is a statistically significant and positive relationship between the debt level (DB) and ROE at the 5% significance level. This result shows 1% increase in DB leads to an approximately 43% increase in ROE. Especially in the Post-Pandemic period, it has been observed there is a statistically significant and notable positive effect on ROE at the 5% significance level. The constant term being statistically significant and positive at the 5% significance level indicates ROE is positive when all the variables in the model are zero. However, no statistically significant relationship has been found between the other variables and ROE.

When examining the model performance and test results, the F-statistic probability value is less than the critical value of 0.05 stated in the literature (Prob > F=0.0000), indicating that the model is generally statistically significant and independent variables collectively explain ROE effectively. The R2 value (0.8768) indicates model explains 87.68% of the variance of the dependent variable (ROE). This is a high explanatory power and indicates that the model fits well. Since the p-value of the Breusch-Pagan/ Cook-Weisberg test is greater than the critical value of 0.05 (p=0.9797), it

can be said there is no heteroscedasticity. When examining the Wooldridge test results test for the presence of autocorrelation in the models, it can be said there is no autocorrelation in the model because the probability value of the test is greater than the critical value of 0.05 (p=0.0855). Since the p-value of the F-test, which tests the necessity of fixed effects, is greater than the critical value of 0.05 (p=0.1156), it can be said fixed effects are not significant for the model, and the pooled data set approach is appropriate.

In Table 4, the effects of various independent variables on the dependent variable Tobin's Q are shown. Using the Newey-West estimator, standard errors robust to autocorrelation and heteroskedasticity have been obtained. While some independent variables in the model were found to be significant, others did not yield statistically significant results. When examining the Newey-West estimator results presented in Table 7, it is observed that only the interest rate and Post-Pandemic Tobin's Q have statistically significant effects, while the other variables do not have significant effects. Among these, it has been determined there is a statistically significant and negatively oriented relationship at the 10% significance level between the interest rate (IR) and Tobin's Q. This result shows 1% increase in interest rates causes an approximately 827% decrease in Tobin's Q. Post-Pandemic, it is observed there is a statistically significant and distinct positive effect on Tobin's Q at the 5% significance level.

When examining the model performance and test results, the F-statistic probability value is less than the critical value of 0.05 stated in the literature (Prob > F=0.0000), indicating model is generally statistically significant and independent variables collectively explain Tobin's Q effectively. Since the p-value of the Breusch-Pagan/Cook-Weisberg test is greater than the critical value of 0.05 (p=0.7140), it can be said there is no heteroscedasticity. When examining the Wooldridge test results test for the presence of autocorrelation in the models, it can be said there is autocorrelation in the model because the p-value of the test is less than the critical value of 0.05 (p=0.0082). Therefore, the Newey-West estimator has been used to correct the standard error estimates. Since the p-value of the F-test, which tests the necessity of fixed effects, is greater than the critical value of 0.05 (p=0.2144), it can be said fixed effects are not significant for the model, and the pooled data set approach is appropriate.

4.4. Panel Regression Results for the South African Country Economy

In this part of the study, the tests conducted on three South African companies (Naspers, Sasol, and Shoprite Holdings) included in the research are explained. First, to test whether there are unit and/or time effects in the models, in other words, to test the classical model, an F-test was applied, and based on the test results, it was decided the classical model was appropriate. The test results are presented in Table 5 along with the results of the Pooled Ordinary Least Squares method.

Table 5. Panel Regression Estimation Results

Variables	Pooled OLS (Ordinary Least Squares)				Newey–West	
	ROA		Tobin's Q		ROE	
	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.
CT	.6621298	0.138	1.22026	0.506	1.695207	0.145
CHR	.0005479	0.999	.490493	0.789	.4081908	0.644
TA	-.038886	0.016**	-.365779	0.025**	-.094834	0.019**
DL	-.289483	0.035**	-1.64297	0.002**	-.240364	0.000*
R&D	2.536543	0.156	1.417555	0.122	4.015544	0.248
CR	.0079851	0.545	-.690370	0.353	.0209937	0.470
IR	-1.11298	0.454	-1.68960	0.411	-1.82842	0.470
CPI	-3.87794	0.148	-5.56191	0.630	-8.65792	0.245
GDPG	.0010903	0.857	.0180931	0.947	.0095862	0.547
Pandemic	-.084504	0.066*	-2.77706	0.250	-.163120	0.009***
Post-pan.	.1080906	0.080*	-.456693	0.870	.2396495	0.141
_cons	.854196	0.004***	1.752868	0.119	1.640614	0.006***
F(11, 9)	4.25		7.82		2.70	
Prob > F	0.0193		0.0000		0.0736	
R-squared	0.8326		54.597		0.8326	
Breusch–Pagan/ Cook–Weisberg test	1.04 (0.3081)		1.03 (0.3112)		16.75 (0.0000)	
Wooldridge test	3.300 (0.2109)		1.925 (0.2996)		2.253 (0.2722)	
F test	1.85 Prob > F = 0.2267		0.53 Prob > F = 0.6121		2.30 Prob > F = 0.1705	

Note: (,**,*) indicate significance levels of 1%, 5%, and 10%, respectively.***

In Table 5, the results of the regression analysis conducted using the pooled ordinary least squares (OLS) method, the Newey–West robust estimator results, and various statistical tests of the model are summarized. When examining the model results with ROA as the dependent variable, it is observed there is a statistically significant and negative relationship between firm size (TA) and ROA at the 5% significance level. This result indicates one-unit increase in TA leads to an approximately 4% decrease in

ROA. Similarly, it is observed there is a statistically significant and negative relationship between the debt level (DL) and ROA at the 5% significance level. This result indicates one-unit increase in DL causes an approximately 28.9% decrease in ROA. It can be said during the pandemic period, there was a statistically significant and slight negative effect at the 10% significance level. Post-Pandemic, it has been observed there is a statistically significant and slightly positive effect on ROA at the 10% significance level. However, no statistically significant relationship has been found between ROA and the other variables.

When examining the model performance and test results, the F-statistic probability value is less than the critical value of 0.05 stated in the literature (Prob > F=0.0193), indicating that the model is generally statistically significant and independent variables collectively explain ROA effectively. Since the p-value of the Breusch-Pagan/Cook-Weisberg test is greater than the critical value of 0.05 (p=0.3081), it can be said there is no heteroscedasticity. When examining the Wooldridge test results test for the presence of autocorrelation in the models, it can be said there is no autocorrelation in the model because the probability value of the test is greater than the critical value of 0.05 (p=0.2109). Since the p-value of the F-test, which tests the necessity of fixed effects, is greater than the critical value of 0.05 (p=0.2267), it can be said fixed effects are not significant for the model, and the pooled data set approach is appropriate.

When examining the model results where the dependent variable is Tobin's Q, it is observed there is a statistically significant and negative relationship at the 5% significance level between firm size (TA) and Tobin's Q. This result shows one-unit increase in TA causes an approximately 37% decrease in Tobin's Q. It is observed there is a statistically significant and negatively oriented relationship between the debt level (DB) and Tobin's Q at the 1% significance level. This result indicates one-unit increase in DB leads to an approximately 164.3% decrease in Tobin's Q. Overall, the model results indicate firm's total assets and leverage levels have strong and negative effects on Tobin's Q. Other macroeconomic variables and firm characteristics do not have a statistically significant effect on Tobin's Q. Similarly, it can be said pandemic period and the post-pandemic period did not have a significant impact on the market value of companies.

When examining the model performance and test results, the F-statistic probability value is less than the critical value of 0.05 expressed in the literature (Prob > F=0.000), indicating model is generally statistically significant and independent variables collectively explain Tobin's Q effectively. The

R2 (54.597) indicates the model has a good performance in explaining the variation in the dependent variable. Since the p-value of the Breusch-Pagan/ Cook-Weisberg test is greater than the critical value of 0.05 (p=0.3112), it can be said there is no heteroscedasticity. When examining the Wooldridge test results that test for the presence of autocorrelation in the models, it can be said there is no autocorrelation in the model because the probability value of the test is greater than the critical value of 0.05 (p=0.2996). Since the p-value of the F-test, which tests the necessity of fixed effects, is greater than the critical value of 0.05 (p=0.6121), it can be said fixed effects are not significant for the model, and the pooled data set approach is appropriate.

In Table 5, the effects of various independent variables on the dependent variable ROE are observed. Using the Newey-West estimator, standard errors robust to autocorrelation and heteroskedasticity have been obtained. While some independent variables in the model were found to be significant, others did not yield statistically significant results. When examining the Newey-West estimator results presented in Table 5, it is observed only asset size (TA), debt level (DL), and the pandemic period's return on equity (ROE) have statistically significant effects, while the other variables do not have significant effects. Among these, it has been determined there is a statistically significant and negative relationship between TA and ROE at a 15% significance level. This result shows one-unit increase in TA leads to an approximately 9.5% decrease in ROE. It is observed DL has a statistically significant and distinct negative effect on ROE at the 1% significance level. This result indicates one-unit increase in DL causes approximately 24% decrease in ROE. During the pandemic period, it is observed there is a statistically significant and distinct negative impact on ROE at the 1% significance level. Overall, the model results indicate firm's total assets and debt levels have strong and negative effects on ROE. Other macroeconomic variables and firm characteristics do not have a statistically significant effect on ROE. Especially, one of the questions of the study, whether there was a significant change in companies' profits (ROE) during the pandemic period, has been clearly answered, and it has been observed there were significant negative changes in the financial performance (ROE) of companies during the pandemic period.

When examining the model performance and test results, the F-statistic probability value is greater than the critical value of 0.05 expressed in the literature (Prob > F=0.0736), indicating model is statistically significant at the 10% level overall and that the independent variables collectively have a very low level of effectiveness in explaining ROE. Since the p-value of the Breusch-Pagan/Cook-Weisberg test is less than the critical value of 0.05

(p=0.0000), it can be said heteroscedasticity is present. When examining the Wooldridge test results test for the presence of autocorrelation in the models, it can be said there is no autocorrelation in the model because the probability value of the test is greater than the critical value of 0.05 (p=0.2722). Therefore, the Newey-West estimator has been used to correct the standard error estimates. Since the p-value of the F-test, which tests the necessity of fixed effects, is greater than the critical value of 0.05 (p=0.1705), it can be said fixed effects are not significant for the model, and the pooled data set approach is appropriate.

4.5. The Impact of the COVID-19 Pandemic Crisis and Its Aftermath on Cash Holding Strategies for the Chinese Economy

In this part of the study, the effects of the Covid-19 pandemic crisis and its aftermath on cash holding strategies of Chinese companies were examined using panel regression analysis, and the results are presented in Table 6.

Table 6. Driscoll-Kraay Robust Estimator Results

Variables	CHR			
	Coef.	Std. err.	t	P>|z|
TA	.021323	.0152216	1.40	0.177
DL	.4120971	.1134605	3.63	0.002***
R&D	.1341939	.1344209	1.00	0.330
CR	.2320965	.0204967	11.32	0.000***
IR	-1.73825	1.072994	-1.62	0.122
CPI	-3.746149	1.435279	-2.61	0.017**
GDPG	-.0631745	.0343737	-1.84	0.081*
Pandemic	-.7243089	.4066064	-1.78	0.090*
Post-pan.	-1.362025	.7569032	-1.80	0.087*
_cons	7.378408	4.752063	1.55	0.136
F(9, 20)	47.374			
Prob > chi2	0.0000			
R-squared	0.6851			
Hausman Test	4.01; Prob > chi2 = 0.7783			
White's Test	chi2=21.00, Prob. 0.3971			
Breusch–Pagan/Cook–Weisberg	chi2=0.15, Prob. 0.7006			
Durbin–Watson	1.033483			

Note: (,**,*) indicate significance levels of 1%, 5%, and 10%, respectively.***

When examining the Driscoll-Kraay Robust Estimator results presented in Table 6, it can be said they had a significant impact on companies' cash holding strategies, especially during and after the Covid-19 pandemic period.

Because during the pandemic period, the coefficient value of (-0.7243) and the probability value (p = 0.090) indicate the pandemic period had a negative effect on cash holding strategies, and this effect is statistically significant at the 10% level. This shows pandemic has negatively affected companies' cash retention strategies. The coefficient value of the post-pandemic variable being (-1.3620) and the probability value (p = 0.087) indicates effect of the post-pandemic period is negative and significant at the 10% level. This result shows the pandemic has negatively affected companies' cash retention strategies.

The positive (0.4121) and statistically significant (p = 0.002) relationship between the debt ratio (DL) and the cash holding ratio (CHR) suggests higher debt levels positively affect companies' cash holding strategies, meaning that companies tend to increase their cash reserves when managing their debt. The current ratio (CR) having a high positive coefficient (.2321) on the cash ratio and the probability value (p=0.000) being significant at the 1% significance level indicates an increase in the current ratio suggests companies prefer to hold more cash to ensure financial stability. The negative (-3.746) and statistically significant at the 10% level of the consumer price index (CPI) on the cash holding ratio indicates that companies need to be more careful in managing their costs in situations of high inflation.

When examining the model's statistical results, the probability value associated with the F statistic (Prob > chi2 = 0.0000) is less than the critical value of 0.05 expressed in the literature, so it can be said the model is generally significant. It can be said at least one independent variable has a significant effect on the dependent variable. When the R2 value is examined, it can be said the model explains 68.51% of the dependent variable and this rate represents a good explanatory power. When examining the model validity test results, it can be said the random effects model is appropriate because the p-value of the Hausman test result (0.7783) is greater than the critical value of 0.05. In the random effects model, whether heteroskedasticity, changing variance, exists was examined using White's and Breusch-Pagan tests. Since the probability value in both tests is greater than the critical value of 0.05, it can be said there is no heteroskedasticity. Again, another assumption, autocorrelation, was examined using the Durbin-Watson test, and according to the test result, the Durbin-Watson value is below the critical value of 2 (1.033483), so it can be said there is autocorrelation in the model. In this case, to obtain effective and accurate results, the Driscoll-Kraay Robust Estimator, which takes into account both heteroskedasticity and autocorrelation, has been preferred.

4.6. The Impact of the COVID-19 Pandemic Crisis and Its Aftermath on Cash Holding Strategies for the Indian Economy

This section provides a comprehensive examination of the impact of the Covid-19 pandemic crisis and its aftermath on the cash-holding strategies of Indian companies. The pandemic created a high level of operational and financial uncertainty and risk for firms, necessitating significant adjustments in their cash management strategies. Within the scope of the analysis, companies' behaviors in preserving liquidity, effectively managing financial risks, and ensuring financial flexibility in an uncertain economic environment during the crisis were systematically examined using panel regression analysis.

The findings reveal the changes in firms' cash-holding tendencies and shed light on the strategic adjustments they implemented in the post-pandemic period. Moreover, the results illustrate the diversity in responses among companies operating in different sectors and the effectiveness of the approaches they adopted in liquidity management. These findings provide valuable guidance for managers and policymakers in developing strategies to enhance corporate financial resilience during future periods of similar uncertainty. The detailed results of the analysis are presented in Table 7.

Table 7. Driscoll-Kraay Robust Estimator Results

Variables	CHR			
	Coef.	Std. err.	t	P>|z|
TA	-.4464136	.1304352	-3.42	0.003***
DL	.6513154	.2251717	2.89	0.009***
R&D	.8636421	.3760523	2.30	0.033**
CR	.0666367	.0270882	2.46	0.023**
IR	1.618117	1.454699	1.11	0.279
CPI	-.7419962	.2885401	-2.57	0.018**
GDPG	-.0065948	.0021208	-3.11	0.006***
Pandemic	.2436681	.0998825	2.44	0.024**
Post-pan.	.3227747	.1158101	2.79	0.011**
_cons	5.615863	1.547762	3.63	0.002***
F(9, 20)	12.37			
Prob > chi2	0.0000			
R-squared	0.7168			
Hausman Test	28.09; Prob > chi2 = 0.0005			
White's Test	chi2=21.00, Prob. 0.3971			
Breusch–Pagan/Cook–Weisberg	chi2=2.42, Prob. 0.1199			
Durbin–Watson	1.148737			

Note: (,**) indicate significance levels of 1% and 5% respectively.***

When examining the results of the Driscoll-Kraay Robust Estimator provided in Table 7, it can be said Covid-19 pandemic period and its aftermath had significant impacts on companies' cash holding strategies. Because during the pandemic period, the coefficient value (0.2436) and the probability value (p = 0.024) indicate the pandemic period had a positive effect on cash holding strategies, and this effect is statistically significant at the 5% level. This shows that the pandemic positively affected companies' cash retention strategies. Similarly, the coefficient value of the post-pandemic variable (0.3227) and the probability value (p = 0.0011) indicate the effect of the post-pandemic period is positive and statistically significant at the 5% level. This result shows the pandemic positively affected companies' cash retention strategies.

It is observed cash holding ratio (CHR) of total assets (TA) has a negative (-0.4464) and statistically significant (p = 0.003) effect. This result indicates increase in total assets has reduced the cash holding ratio. It is observed the debt level (DL) has a positive (0.6513) and statistically significant (p=0.009) effect on the cash holding ratio (CHR). This result shows increase in debt levels enhances cash holding behavior. It is observed ratio of Research and Development expenditures to total assets has a positive (0.8636) and statistically significant (p = 0.033) effect on the cash holding ratio (CHR). This result shows when companies increase their R&D investments, the cash retention rate may also increase. It is observed liquidity ratio (CR) has a positive (0.0666) and statistically significant (p = 0.023) effect on the cash holding ratio (CHR). This result indicates increase in the liquidity ratio positively affects cash holding. It is observed consumer price index (CPI) has a negative (-0.7420) and statistically significant (p = 0.018) effect on the cash holding ratio (CHR). This result shows increase in inflation negatively affects the cash holding rate. It is observed GDP growth rate (GDPG) has a negative (-0.0066) and statistically significant (p = 0.006) effect on the cash holding ratio (CHR). This result shows economic growth negatively affects the cash holding ratio. It is observed interest rate (IR) does not have a statistically significant (p = 0.279) effect on the cash holding ratio (CHR).

When examining the model's statistical results, the probability value associated with the F statistic (Prob > chi2 = 0.0000) is less than the critical value of 0.05 expressed in the literature, so it can be said model is generally significant. In other words, it can be said at least one independent variable has a significant effect on the dependent variable. When the R2 value is examined, it can be said model explains 71.68% of the dependent variable and this rate represents a good explanatory power. When examining the

model validity test results, it can be said fixed effects model is appropriate because the p-value of the Hausman test result (0.0005) is less than the critical value of 0.05. In the fixed effects model, whether heteroskedasticity, changing variance, exists was examined using White's and Breusch-Pagan tests. Since the probability value in both tests is greater than the critical value of 0.05, it can be said there is no heteroskedasticity. Again, another assumption, autocorrelation, was examined using the Durbin-Watson test, and according to the test result, the Durbin-Watson value is below the critical value of 2, (1.148737), so it can be said there is autocorrelation in the model. In this case, to obtain effective and accurate results, the Driscoll-Kraay Robust Estimator, which takes into account both heteroskedasticity and autocorrelation, has been preferred.

4.7. The Impact of the COVID-19 Pandemic Crisis and Its Aftermath on Cash Holding Strategies for the South African Economy

In this part of the study, the effects of the Covid-19 pandemic crisis and its aftermath on cash holding strategies of South African companies were examined using panel regression analysis, and the results are presented in Table 8.

Table 8. Driscoll-Kraay Robust Estimator Results

Variables	CHR			
	Coef.	Std. err.	t	P>|z|
TA	-.0119307	.0094762	-1.26	0.223
DL	-.058604	.0140193	-4.18	0.000***
R&D	.3453913	.1671882	2.07	0.052*
CR	.0181064	.0098569	1.83	0.082*
IR	-.8582061	1.00758	-0.85	0.404
CPI	.3542896	.3052391	1.16	0.259
GDPG	.0017986	.0044155	0.41	0.688
Pandemic	.0301666	.0141063	2.14	0.021**
Post-pan.	-.0526925	.024419	-2.16	0.021**
_cons	.1849728	.133905	13.83	0.000***
F(9, 20)	17.60			
Prob > chi2	0.0402			
R-squared	0.5364			
Hausman Test	2.51; Prob > chi2 = 0.9805			
Breusch–Pagan/Cook–Weisberg	chi2=10.03, Prob. 0.0015			
Durbin–Watson	1.9484233			

Note: (,**,*) indicate significance levels of 1%, 5%, and 10%, respectively.***

When examining the Driscoll-Kraay Robust Estimator results presented in Table 8, it can be said they had a significant impact on companies' cash holding strategies, particularly during and after the Covid-19 pandemic period. Because during the pandemic period, the coefficient value was (0.30166) and the probability value (p = 0.021), it indicates pandemic period had a positive effect on cash holding strategies and this effect is statistically significant at the 5% level. This shows pandemic positively affected companies' cash retention strategies. The coefficient value of the post-pandemic variable being (-0.52692) and the probability value (p = 0.021) indicates effect of the post-pandemic period is negative and significant at the 5% level. This result shows pandemic has negatively affected companies' cash retention strategies.

The negative (-0.05860) and statistically significant (p =0.000) impact of the debt ratio (DL) on the cash holding ratio (CHR) suggests higher debt levels adversely affect companies' cash holding strategies; in other words, it can be said companies tend to reduce their cash reserves when managing their debt. The positive coefficient (0.18106) of the current ratio (CR) on the cash ratio and the significance of the probability value (p=0.082) at the 10% significance level indicate an increase in the current ratio suggests companies prefer to hold more cash to ensure financial stability.

When the model statistics results are examined, the probability value associated with the F statistic (Prob > chi2 = 0.0402) is less than the critical value of 0.05 stated in the literature, so it can be said the model is generally significant. It can be said at least one independent variable has a significant effect on the dependent variable. When the R2 value is examined, it can be said model explains 53.64% of the dependent variable, and this rate represents a moderate level of explanatory power. When the model validity test results are examined, it can be said random effects model is appropriate because the p-value of the Hausman test result (0.9805) is greater than the critical value of 0.05. In the random effects model, whether heteroskedasticity, meaning changing variance, exists was examined using Breusch-Pagan tests, and since the probability value in the test result is less than the critical value of 0.05 (p=0.0015), it can be said heteroskedasticity exists. Another assumption, autocorrelation, was examined using the Durbin-Watson test, and according to the test result, the Durbin-Watson value is very close to the critical value of 2 (1.9484233), so it can be said there is no autocorrelation in the model. In this case, to obtain effective and accurate results, the Driscoll-Kraay Robust Estimator, which takes into account both heteroskedasticity and autocorrelation, has been preferred.

5. Results and Discussion

The aim of this study is to analyze the impact of the Covid-19 Pandemic crisis and its aftermath on the cash holding strategies and financial performance of companies in the economies of developing countries, specifically China, India, and South Africa. For this purpose, annual data from the years 2017-2023 of the top three large firms (excluding financial institutions) operating in China (Alibaba, Tencent, and PetroChina), India (Reliance Industries, Tata Consultancy Services (TCS), and Infosys), and South Africa (Naspers, Sasol, and Shoprite Holdings) were used. For data analysis, the Pooled Ordinary Least Squares method, Newey–West robust estimator, and Driscoll-Kraay robust estimator have been utilized. The reasons for selecting these countries and companies are that the chosen companies are among the largest and most influential in their countries, providing an important sample for understanding market dynamics and how firms respond to economic shocks. Large companies generally have higher liquidity and financial flexibility, which allows them to respond differently in their cash-holding strategies in the face of global shocks like the COVID-19 pandemic. China, India, and South Africa, being significant economic actors among the BRICS countries, can provide insights into the general trends of emerging markets through the examination of their largest companies. The study will seek to answer the following questions. How does the Covid-19 pandemic crisis affect companies' cash retention behaviors and financial performance? Have there been changes in companies' cash holding behaviors and financial performance after the Covid-19 pandemic crisis? By answering these questions and revealing the effects of COVID-19 on cash retention strategies and financial performance, it aims to provide important insights into how businesses should strategize during crisis periods.

According to the analysis results, it has been found that the cash reserves of companies operating in China were negatively affected both during and after the pandemic. This result indicates that many companies faced difficulties in predicting their future revenues due to the pandemic leading to a global economic recession. This uncertainty increased the tendency for companies to quickly use their existing cash instead of preserving their cash reserves. During the pandemic, society/individuals tended to deplete their savings because they were closed for precautionary reasons. This situation caused companies to face a sudden drop in demand for their products and services. Many companies had to manage their cash flows accordingly to cope with this loss of demand. Similarly, many businesses had to temporarily halt their operations due to the pandemic. This situation led to a loss of income and caused companies to use their cash reserves to survive. China,

considered the starting point of the pandemic, is an important part of the global supply chain. Therefore, the production stoppages that occurred in the country affected the supply processes of many companies worldwide, leading them to reevaluate their cash management strategies. For all these reasons, it can be said that the pandemic period caused a decrease in cash holdings, at least for the companies included in the research. As for the reasons for the decrease in cash holding rates after the pandemic, during the post-pandemic economic recovery process, companies turned to growth opportunities. The increase in investments, particularly in expanding production capacities, transitioning to new technologies, and focusing on capital expenditures to meet market demand, has been emphasized. In this case, it can be said to be a reducing factor in cash reserves. Again, the low interest rates in many countries, including China, after the pandemic led companies to reduce their borrowing costs and opt for low-cost credit instead of holding cash. This situation is thought to have led companies to reduce their cash reserves instead of increasing their liquidity. For all these reasons, it can be said that companies have caused a decrease in their cash reserves even after the pandemic. The results of this study are similar to the works of Chung et al. (2023), Ntantamis and Zhou (2022), and Zhou et al. (2022) in the literature.

The second research question is how the Covid-19 pandemic crisis has affected companies' financial performance. For companies operating in China, it has been found that the Covid-19 pandemic crisis and its aftermath had a significant and positive impact on financial performance indicators such as return on assets (ROA) and return on equity (ROE). The following factors can be cited as the reasons for the positive ROA and ROE during the pandemic period. China relatively quickly brought the spread of COVID-19 under control and resumed economic activities earlier than other countries. This early recovery allowed Chinese companies to quickly resume their operations and increase their profitability. The Chinese government provided extensive incentive and support packages to companies during the pandemic. Tax reductions, low-interest loans, and other financial incentives strengthened the financial structure of companies, positively impacting their profitability rates. China holds a critical position in the global supply chain. Despite the disruptions in the global supply chain during the pandemic, Chinese companies maintained a strong position in production and supply by leveraging these advantages. This situation provided cost advantages and high profit margins. During the pandemic, Chinese companies placed great importance on digitalization and technological investments. The rapid growth of e-commerce and digital platforms contributed to Chinese

companies reducing their costs and increasing their revenues, which positively affected ROA and ROE.

The reasons for the positive ROA and ROE after the pandemic can be attributed to the following factors. After the pandemic was brought under control, China recovered its economy more quickly than many other countries. The rapid recovery process led to an increase in domestic demand and a strengthening of exports, which in turn boosted companies' profitability rates. The pandemic accelerated the digitalization process, and many Chinese companies transitioned to digital platforms. The rapid growth of e-commerce has significantly increased the profitability of companies, especially in the technology and consumer products sectors. This wave of digitalization has had a positive impact on active profitability and return on equity. In the post-pandemic period, disruptions in the global supply chain increased demand for China's manufacturing hubs. China played a key role in the revival of global production and trade, which increased the revenues of export-oriented companies and raised their profitability rates. The results of this study are similar to the works of Xu et al. (2022) and Devi et al. (2020) in the literature. Another financial performance indicator, Tobin's Q, was found to have no significant change during and after the pandemic.

Results when evaluating the Indian national economy, it has been found that there were increases in companies' cash reserves both during and after the pandemic. The following factors can be cited as the reasons for this. Future uncertain income streams and potential closures may have caused companies to adopt a cautious stance and increase their cash reserves. During the pandemic, many companies reduced costs, downsized operations, and increasingly turned to digitalization. Especially the shift to remote work and digital platforms led to a reduction in fixed costs such as office and travel expenses. It can be said that these savings have led to cash accumulations. The Indian government offered large amounts of support packages to alleviate the economic situation caused by the pandemic. Measures such as tax payments, low-interest loan options, and direct subsidies may have allowed them to ease their basic financial burdens and accumulate cash. During and after the pandemic, demand fluctuations were experienced in certain sectors in India. These sectors are those directly affected by the pandemic conditions or those that provided essential products and services during this period. Among these sectors, especially in healthcare services, pharmaceuticals, technology, and manufacturing products, there was an increase in demand, and these sectors grew, emerging from the crisis more advantageously. They must have continued their growth after the pandemic, as there have been increases in their cash reserves. In conclusion, the main reasons for the increase in

cash reserves in India during and after the pandemic are considered to be expenditures, cost reduction systems, government support and incentive packages, the momentum gained in growth due to rising demand in some sectors, the postponement of investments, and risk-averse strategies. The results of this study are similar to the findings of Irwansyah et al. (2024), Chung et al. (2023), and Qin et al. (2020) in the literature.

The answer to the question of how the Covid-19 pandemic crisis affected companies' financial performance is that, for companies operating in India, the financial performance indicator of active profitability (ROA) during and after the Covid-19 pandemic crisis period showed a significant and positive impact, while the post-pandemic crisis period had a significant and positive impact on return on equity (ROE) and Tobin's Q. During and after the COVID-19 pandemic, a significant positive impact on the return on assets (ROA) of companies in India was observed. One of the main reasons for this effect is the companies' efforts to manage their costs effectively; many firms may have taken steps to increase efficiency by reviewing their operational processes, thereby reducing their costs. The results of this study are similar to the findings of Qadri et al. (2023) in the literature. Before the pandemic, no significant impact was observed on the return on equity (ROE) of companies in India, while the post-pandemic period saw this ratio become significant and positive, which can be attributed to several important factors. Firstly, it can be said that many companies, influenced by COVID-19, have aimed to use their resources more effectively, which may have increased their return on equity. Especially in the post-pandemic period, firms being more careful in liquidity management may have helped them use their equity more efficiently. Additionally, the support and incentives provided by the government may have strengthened the financial positions of firms, allowing them to increase their investments and thereby improve their profitability. The results of this study are similar to the findings of Demirhan and Sakin (2020) in the literature. Again, while no significant effect of the pandemic period on Tobin's Q, one of the financial performance indicators, was observed, the significant and positive change in this ratio in the post-pandemic period can be attributed to several important factors. The post-COVID-19 market recovery is believed to have increased companies' market values, leading to a rise in Tobin's Q ratio due to the higher market value. The reduction of uncertainties after the pandemic increased investors' confidence in companies. This situation is believed to have influenced companies' willingness to invest and, consequently, to increase Tobin's Q ratio. The results of this study are similar to the findings of Yang and Zhang (2022) in the literature.

When the results are evaluated for the South African economy, it has been found that the cash retention rate increased during the pandemic period, but decreased after the pandemic. The positive and significant cash retention rates of companies during the pandemic can be explained by their urgent measures to reduce costs, government incentives, and increased liquidity. However, post-pandemic uncertainties in the economic recovery process, decreasing demand, and increasing financial obligations may have led to the cash retention ratio becoming negative and significant. This situation can be said to cause companies to hesitate in terms of growth and investment, thereby negatively affecting the cash retention ratio. The study results are similar to the findings of Irwansyah et al., (2024) and Chung et al., (2023) in the literature. It has been found that the Covid-19 pandemic crisis negatively affected the financial performance indicators of companies operating in South Africa, such as ROA and ROE ratios, while ROA was positively affected post-pandemic, and the changes in ROE and Tobin's Q were not significant. It is believed that there are several key reasons for the negative ROA and ROE ratios of companies in South Africa during the pandemic. The first reason is that the profitability of many sectors may have decreased due to the significant reduction in their revenues as a result of the lockdowns and business restrictions imposed during the pandemic. Secondly, firms may have had to incur more debt to cover their operational costs, which could have negatively impacted their return on equity. The decline in demand, supply chain issues, and economic uncertainties may have also contributed to the weakening of financial performance. This result is similar to the findings of Muthu and Wesson (2023) and Takyi and Bentum-Ennin (2020) in the literature. It is believed that the positive ROA post-pandemic may be due to companies' efforts to improve cost management and operational efficiency. Companies may have taken the path of reducing unnecessary expenses and optimizing their operational processes in order to preserve their cash flow by acting cautiously.

Policy implications: For the economies of developing countries, it is recommended firms implement long-term economic stability programs to ensure they are prepared for pandemics and other unexpected crises. It can be suggested digital financial tools (mobile payment systems, fintech solutions, blockchain technologies) be encouraged and promoted so companies can manage their cash flows more effectively and efficiently. Because it is important in terms of helping companies optimize their liquidity management. Each country should develop different strategies according to its own economic and sectoral dynamics. Especially during times of crisis, it is recommended to establish support mechanisms for sector-specific liquidity needs.

Suggestions for Future Studies: By comparing the Covid-19 pandemic crisis with other different crises, clearer strategies can be developed. The effects of digital financial tools on firms' cash management and liquidity strategies can be examined in future studies. The effects of the Covid-19 pandemic on cash holding behaviours by sector can be examined. Regional differences in cash holding strategies of firms in emerging markets can be examined.

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