Crisis Management Policy and Financial Performance- The Mediating Effect of Government Assistance and Cash Holding: Evidence from Italy

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Received October 2, 2021; Revised January 4, 2022; Accepted February 8, 2022

Cite This Paper in the following Citation Styles

(a): [1] Nayera Abdeldayem Eltamboly, Maysa Ali M. Abdallah, "Crisis Management Policy and Financial Performance- The Mediating Effect of Government Assistance and Cash Holding: Evidence from Italy," *Universal Journal of Accounting and Finance*, Vol. 10, No. 2, pp. 387 - 398, 2022. DOI: 10.13189/ujaf.2022.100203.

(b): Nayera Abdeldayem Eltamboly, Maysa Ali M. Abdallah (2022). *Crisis Management Policy and Financial Performance- The Mediating Effect of Government Assistance and Cash Holding: Evidence from Italy*. *Universal Journal of Accounting and Finance*, 10(2), 387 - 398. DOI: 10.13189/ujaf.2022.100203.

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Abstract This research aims to investigate the main drivers of financial performance during the COVID-19 outbreak, particularly the role of national government and firm policy in relation to the negative economic effects of the COVID-19 outbreak on firms' performance. A generalized linear model (GLM) has been conducted to test the influence of government assistance and cash holding on the financial performance of 79 firms listed in FTSE Italia over 2020. Likewise, our research adopts the Second Stage Least Squares Method (2SLS) and Generalized Method of Moments (GMM) to examine the moderating effect of cash held on the association between COVID-19 outbreak and firms' performance. Our results suggest that the Italian government aids their firms during the COVID-19 outbreak to support their financial performance, and firms themselves increase the level of cash holding to continue their operations as a crisis management policy to face the COVID-19 outbreak. Moreover, cash holding as a moderator weakens the negative impact of the COVID-19 outbreak on the financial firms' performance. Therefore, during the COVID-19 outbreak, national governments and firms should consider a crisis management policy to reduce the negative effects on the firms' performance, mainly government financial assistance and cash holdings to sustain firms' operations during the outbreak.

Keywords COVID-19 Outbreak, Government Assistance, Cash Holding, Financial Performance, Crisis

Management Policy

1. Introduction

COVID-19 crisis has had an extraordinary impact on firms all over the world. In addition to its severe danger to public health, COVID-19 brought fast-moving and unexpected economic impacts among firms worldwide, since the quarantine significantly impacts the economic activity of firms, driving a spike in poverty and food insecurity. However, there is little evidence available in the literature on addressing the economic impact of the COVID-19 outbreak [27],[30]. Therefore, it is vital to investigate the various government policies rolled out to support Italian businesses during the COVID-19 outbreak.

In the current research, we attempt to take a step on that path and present the different theoretical arguments and empirical evidence that test the endogenous effect of cash holding on the relationship between COVID-19 and the financial performance of Italian listed firms for the year 2020. We go beyond the earlier studies that ignore endogeneity and propose a new approach to study the interactive effect of cash holding on the relationship between COVID-19 and the financial performance of Italian-listed firms.

So, this research addresses three central challenging objectives. First, it aims to examine the role of government policies in supporting Italian firms. Second, it investigates the relationship between cash holdings and the financial performance of Italian listed firms. Third and last, it tests the potential moderating effect of cash holdings on the relationship between COVID-19 and the financial performance of listed firms.

To the best of our knowledge, this research presents the first empirical research that adopts the Generalized Linear Model (GLM), Second Stage Least Squares Method (2SLS), and Generalized Method of Moments (GMM) to investigate the relationships among government assistance, cash holding, and the financial performance of Italian listed firms. Our key findings in this research are that government assistance enables many Italian firms to survive and continue their operations. However, firms have to search for other paths to leverage their bottom-line. For example, they can expand their business through E-commerce and online channels that enables them to continue their operations and attract many customers to deal with them. In addition, there is a positive relationship between cash holdings and the financial performance of firms. Moreover, after the introduction of cash holding as a moderator, we realize that cash holding weakens the negative impact of the COVID-19 outbreak on the financial performance of Italian-listed firms in different industries.

The rest of the research is organized as follows. The next pattern section 2 frames our theoretical framework and hypothesis development. Section 3 shows the research method and model specification. Section 4 presents data and research sample. Section 5 analyses the endogeneity effects. Section 6 explains the main empirical results and implications drawn from statistical analysis. Finally, we conclude in section 7, with spotlights over the practical implications, research limitations, and future research.

2. Theoretical Framework and Hypothesis Development

2.1. Government Assistance and the Financial Performance during the COVID-19 Outbreak

During the COVID-19 outbreak, many businesses have been forced to close for some time. While others have difficulties working at full capacity due to the need for social distancing, they also suffer from the decline in demand for goods and services, and finally the health and economic fears. Hence, governments respond to these challenges by rolling out various policies to support businesses. Early studies discuss the unprecedented importance of government initiatives undertaken by different countries during the COVID-19 outbreak [12],[15]. For example, many governments act to delay tax payments, provide businesses with many grants, and make

sure that firms have access to credit.

In addition, this outbreak forced the operational activities of firms to cease, leading to irregular or deteriorating levels of income. The study of Ramachandra [28] described this outbreak as hardly impacted the social order of the globe in a way that compares with no other pandemic the world has experienced in living memory. Further evidence by Routledge [29] and Zharfpeykan & Ng [34] confirmed the serious impacts of the outbreak on financial performance. Moreover, the studies of Fu & Shen [8], Hu & Zhang [17], and Shen et al. [30] scrutinize the impact of COVID-19 on corporate performance and reached approximately the same conclusion that corporate performance declines during the COVID-19 outbreak.

Nevertheless, the study of Zimon & Tarighi [36] indicates that there is no impact of the COVID-19 outbreak on firms' financial performance. However, Guragai & Hutchison [13] claimed that the financial performance of a firm improves after the firm discontinues its operations.

Based on the previous literature, we argue that the COVID-19 outbreak may affect the operational activities of firms negatively, and we need to shed light on government assistance as an appropriate policy for crisis management that may help firms continue their operations during this hard situation. So, the current research aims to investigate the impact of government assistance on the financial performance of Italian-listed firms in different industries during the COVID-19 outbreak. So, our research hypothesis is thus proposed:

H_{1b}: Government assistance significantly impacts the financial performance of Italian-listed firms during the COVID-19 outbreak.

2.2. Cash Holding and the Financial Performance during the COVID-19 Outbreak

In the context of this research, cash holding can be defined as cash held by the firm to run the various activities and to meet routine expenditure or available for investment in fixed assets or distribution to investors [11], [17]. In addition, cash on hand is used by firms to fulfil their instantaneous requirements [20]. On the other hand, any firm must intelligently decide the amount of cash holding to maintain a strategic distance from the negative impacts of holding an excessive amount of cash [23]. There are various pioneering studies that first consider cash holding topic, for example [7], [10], [19], [26]. They mainly focus on the antecedents of cash holding and assume a certain target level of cash exists [22].

There are various studies available in the literature that advocate the impact of cash holding on corporate performance, the first group of studies showed that cash holding had a positive effect on corporate performance [1], [24], [25]. While the second group of studies reached a different conclusion that cash holding hurts corporate performance [3],[23].

Despite the increasing number of studies that focus on corporate cash holdings. As far as we know, none of these

studies focus on the direct link of the effect of cash holdings on the financial performance of listed firms, with a specific focus on the year 2020. Hence, this year covers the period of the COVID-19 outbreak. So, our second research hypothesis is proposed:

H₂: Cash holding level has a significant impact on the financial performance of Italian listed firms.

2.3. The Moderating Effect of Cash Holding on the Association between COVID-19 Outbreak and Financial Performance

The COVID-19 outbreak severely impacts the performance of listed firms, leading to significant fluctuations and reduction in their income levels. This situation reduces their ability to meet the various emerging obligations. However, if firms hold enough cash to cover the different expenses, they will be able to survive and sustain themselves during this uncertain risky environment.

According to the crisis management theory, it implies that firms work in insecure and unpredictable environments should take steps toward mitigating the negative consequences of the crisis, COVID-19 outbreak not only causes loss of profit but also, negatively affect business confidence [12],[21]. Regarding COVID-19 outbreak, investors tend to defer investment opportunities to deal with uncertainty when external risks escalate [8]. The research presented by Song & Lee [31], supported the same idea by acknowledging that, the Asian outbreak

forced Asian firms to hold more cash by decreasing the level of their investment. So, this outbreak changes the policies of Asian firms regarding the amount of cash they hold. Recently, Zhou et al. [35] confirmed the defensive motivation of cash holdings by declaring that under higher economic uncertainty, CEOs tend to increase the level of cash holdings to avoid financial distress problems. So, these studies provide shreds of empirical evidence that match the theory's lens.

Hence, this theory matches the current COVID-19 situation that places huge pressure on governments to impose additional restrictions on firms' operations, to reduce the negative impacts of the outbreak on the public. Regarding this theory, investment opportunities stop during the COVID-19 outbreak, hence, firms must hold cash to face the superior financial constraints generated by the outbreak. Therefore, firms will be able to protect themselves against the danger of shutdown.

Based on the above analysis, our third research hypothesis is proposed:

H₃: Cash holding moderates the relationship between the COVID-19 outbreak and the financial performance of Italian-listed firms.

Figure (1) summarizes the proposed structural relationships between government assistance, cash holdings, and the financial firms' performance during the COVID-19 outbreak, either directly and this is described with the solid lines or via the moderating effect of cash holding, and this is shown with the dotted lines.

Figure 1. The proposed structural relationships in the empirical model

3. Research Method and Model Specification

Since the current research aims at investigating the economic impact of the COVID-19 outbreak on the financial performance of Italian firms, we employ a GLM method in the process of obtaining a sufficient and unprejudiced estimator, specifically, to scrutinize the effect of the government assistance and the percent of cash and cash equivalents to total assets (cash-holding) during the COVID-19 outbreak on the financial performance of firms. Therefore, the considered Regression Model is adopted to test H_1 and H_2 and presented as follows:

$$\begin{aligned} EBITDA(c)_{it} = & \beta_0 + \beta_1 COVID_Outbreak \\ & + \beta_2 Treat + \beta_3 GOV_Assis \\ & + \beta_4 CH_{it} + \beta_5 BrdSIZE_{it} \\ & + \beta_6 BrdMET_{it} + \beta_7 BrdGDiv_{it} \\ & + \beta_8 FirSIZE_{it} + \beta_9 FirAGE_{it} \\ & + \beta_{10} LEV_{it} + \varepsilon_{it}. \text{ (Model 1)} \end{aligned}$$

Where, $EBITDA(c)$ represents the earnings before interest, tax, depreciation, and amortization, and is measured annually based on the earnings from operating activities. The $COVID_Outbreak$ and $Treat$ variables are the operational indicators of the COVID-19 outbreak, $COVID_Outbreak$ is the percent of firms that have been overdue on their obligations to creditors, $TREAT$ is the number of weeks that the firm will be able to remain open if its sales ended as of today, GOV_Assis is the percent of firms that received national or local government assistance divided by small, medium and large firms. CH_{it} is the ratio of cash and cash equivalents to total assets of firm i in period t . Table 1, similarly, presents a full description of the pooled independent variables that capture the

determinants of firms' performance. Prior research provided practical pieces of evidence that corporate governance and firm characteristics were deliberated as substantial indicators for firms' performance [4], [6], [30]. So, we recommend the control of firm size, firm age, and financial leverage, since the debt financing firms follow strict strategies to mitigate the potential risks [4], [27], [33]. Also, boardroom characteristics might be attributed to EBITDA particularly during the COVID-19 outbreak, thus we endorse control $BrdSize$ - number of directors in the boardroom, $BrdMET$ - number of boardroom meetings, and $BrdGDiv$ - percent of women in the boardroom [18]. Finally, in model 1, we control industry effects that might affect the firms' performance [4],[5], [30].

To get further evidence, we adopt an alternative measurement of cash holding to perform additional precise analysis to H_2 . While, Model (2) examines whether holding more or less cash has a significant impact on firms' performance and is measured by $EBITDA(c)$, as follows:

$$\begin{aligned} EBITDA(c)_{it} = & \beta_0 + \beta_1 COVID_Outbreak \\ & + \beta_2 Treat + \beta_3 GOV_Assis \\ & + \beta_4 CH_{Ebt_{it}} + \beta_5 BrdSIZE_{it} \\ & + \beta_6 BrdMET_{it} + \beta_7 BrdGDiv_{it} \\ & + \beta_8 FirSIZE_{it} + \beta_9 FirAGE_{it} \\ & + \beta_{10} LEV_{it} + \varepsilon_{it}. \text{ (Model 2)} \end{aligned}$$

Where: $CH_{Ebt_{it}}$ represents the cash holding, is measured as a percentage of cash and cash equivalent to EBIT (the earnings before interest and tax), other control variables are explained in table 1.

The assumptions of multi-collinearity and normality were tested using correlation and Jarque-Bera analysis respectively to confirm the main assumption of GLM.

Table 1. Summary of variables descriptions and measurement

Symbol	Variables Definition- Measurement
Independent variables	
$COVID_Outbreak$	Firms that have been overdue on their obligations to creditors: 1-overdue, and 0- no overdue
$Treat$	The number of weeks that this firm remains open whether its sales fluctuated or not.
GOV_Assis	Firms that received national or local government assistance assign take the value (0,1): 0 – no support; 1– received support
CH_{it}	Cash holding is the ratio of cash and cash equivalents to total assets of firm i in period t .
CH_Ebt_{it}	An alternative measure of cash holding is the ratio of cash and cash equivalents to the current operating income of firm i in period t .
Control Variables (Firm characteristics and boardroom characteristics)	
$FirSIZE_{it}$	Firm size is measured using the natural logarithm of total assets.
$FirAGE_{it}$	Firm age is the number of years the firm is listed in the security market.
$NWCgrowth_{it}$	Networking capital growth is the percent of change in net assets in period t to period $t-1 = NWC_t / NWC_{t-1}$.
LEV_{it}	Financial leverage for firm i at period t and is measured by the percent of total liabilities to total assets.
$BrdSIZ_{it}$	Board size is measured by the number of board members in firm i during the period t .
$BrdMEET_{it}$	Board meetings are measured by the number of board meetings held by firm i during the period t .
$Gnd-DIV_{it}$	Gender diversity is measured by % of women in the boardroom of firm i during the period t .

4. Data and Research Sample

To attain the main objectives of this research, we used the annual financial data for one of the most affected countries by the COVID-19 outbreak in Europe, namely Italy. World Bank enterprise survey (WBES)¹, annual reports, and Datastream were used to gather the data for non-financial firms listed in Borsa Italian. Our sample excludes three cases, first, the non-English financial reports; second, the financial institutions, because they rely on different standards and policies; third and last, the unpublished annual reports of some firms, especially for the last year of 2020. These criteria give a final sample of 79 non-financial firms.

5. The Endogeneity Effects

Consistent with Opler et al.[25] and Gao et al. [9], the main business functions are doing a transaction, prevention, and speculation that are generally correlated with liquidity. However, possessing more cash during crises might increase firms' stability and enhance their ability to meet their short term liabilities, in particular salaries, rents, interest and taxes which will result in firms' survival [2],[27]. In addition, Ashhari & Faizal [2], and Han & Qiu [14] stated that holding more cash is normally sensitive to higher levels of threats. Due to the existing quarantine procedures imposed by governments to tackle the spread of the COVID-19 virus, firms' main economic activities were forced to cease and leading to a cash shortage. So, this situation negatively increases the prevalence of business disruption.

Consequently, this section investigates the endogenous effect of cash holdings on the correlation between the COVID-19 outbreak and firms' performance through employing the 2SLS and GMM to address the interactive effect of cash holdings on the relationship between the COVID-19 outbreak and firms' performance, by using instrumental variables and controlling of unobservable heterogeneity [6], [16] To test H₃, Model 3 adopts the approach used by Opler et al. [25] and Ashhari & Faizal [2] to estimate the determinants of cash holding using the First Stage Ordinary Least Square Method (1SLS), as follows:

$$CH_{it} = \beta_0 + \beta_1 COVID_Outbreak + \beta_2 FirSIZE_{it} + \beta_3 FirAGE_{it} + \beta_4 LEV_{it} + \beta_5 Sales_growth_{it} + \beta_6 NWCgrowth_{it} + \beta_7 Sector_{jt} + \varepsilon_{jt} \text{ (Model 3)}$$

Where *CH* is a dependent variable and is measured by the percent of cash and cash equivalent to total assets. While, the *COVID_Outbreak* measured by, (0.1) variable for overdue on obligations to creditors: 1-overdue, and 0-no overdue, and finally firms' economic characteristics, e.g. size, age, leverage, sector, and networking capital growth

(*NWCgrowth_{it}*) were used to forecast the effect of the COVID-19 outbreak on cash holding level. This research adopted the estimated cash holding (*CH_F*) resulted from the 1SLS (model 3) as an input in the 2SLS (model4) to investigate the interactive effect of cash holdings on the relationship between the COVID-19 outbreak and firms' performance. The instrumental variables of corporate governance indicators are boardroom characteristics, e.g. board size, number of board meetings, and the percent of gender diversity in the boardroom. Also, other instrumental variables were adopted, for example, industry type and return on assets.

$$EBITDA(c)_{it} = \beta_0 + \beta_1 CH_F_{it} + \beta_2 COVID_Outbreak + \beta_3 Treat + \beta_4 GOV_Assis + \beta_5 FirSIZE_{it} + \beta_6 LEV_{it} + \varepsilon_{jt} \text{ (Model 4)}$$

Where *CH_F* is the estimated 1SLS cash holding affected with *TREAT* as a moderate indicator of the relationship between the COVID outbreak and *EBITDA(c)*, while, the other variables were shown in Table 1.

6. Empirical Results and Discussion

6.1. Descriptive Statistics and Multicollinearity Test

Table 2 shows the descriptive statistics for the tested variables, which demonstrate that the mean value of the financial performance of listed firms measured by *COVID_Outbreak* is 12.896414 during the outbreak, these results suggest that the financial performance of the European listed firms was severely affected by the outbreak. Hence, both firms and government tailor various policies to face COVID-19 outbreak, resulting in an average of 18.3% of firms stay open with a maximum value of 7.2% and governmental financial assistance by 27.4% with a maximum value of 69.4. In addition, the average value of cash holding to total assets (*CH*) is almost 845.6231 during the outbreak, while the other measure of cash holding is (*CH_Ebt*) records 276.3716 during the outbreak. These results align with the prior studies which suggest that firms located in COVID-19 impacted regions might reserve additional cash to meet their business obligations, while they suffer from the decline in their business activities [2], [14], [27].

On the other hand, our results confirmed that boardroom members met (*Brd MEET*) on average 10 times during the COVID-19 outbreak, and the online board meetings held during 2020 motivated firms to revise their tactics to lessen the negative threat of the COVID-19 outbreak. Meanwhile, the average number of directors (*Brd SIZ*) was 10 members during the outbreak, and women were about 36.94% (*Gnd-DIV*), instead of 32.38% of the board composition in 2020. These findings are consistent with [18] who

concluded that the financial firm performance seems to be a function of women's participation in the boardroom during the outbreak period. The average firm size (*FirSize*) is 5.861286 during COVID-19, and networking capital growth (*NWCgrowth*) is 32.36940 during the outbreak. These results are in parallel with the previous studies which confirmed that COVID-19 as an environmental outbreak harshly affected the overall operational and financial performance of firms [18], [27].

Concerning the multicollinearity assumption, the correlation matrix reported in Table (3) spotlights the determinants of *EBITDA(c)* and the multicollinearity among them. Initially, the tested model is free of multicollinearity problems, whereas the investigated correlation among tested variables is relatively small. We concluded that *COVID* looked to be negatively associated with *EBITDA(c)*.

These findings provide a shred of practical evidence that supports crisis management theory, since the uncertainty associated with COVID-19 enhances the risk-averse investment strategy which in turn generates shortage in the

inflows and leads to a significant drop in firms' financial performance [8]. Equally, national and international governments and institutions undertake different policies to minimize the negative economic impact of the outbreak, including financial assistance to pay deferral expenses, delayed taxes, or wage subsidies. This policy, as shown from Table (3) positively affects the financial performance during the COVID-19 outbreak and the outbreak treat, also reduces the negative impact of the outbreak.

Furthermore, *CH_Ebt_{it}* decreases the negative impact of the COVID-19 outbreak on *EBITDA(c)*, this, in turn, enables Italian-listed firms to sustain. Our findings also suggested that boardroom characteristics, e.g. *Brd SIZ*, *Brd MEET*, and *Gnd-DIV* are more likely to increase the firms' performance during uncertainties. This result is consistent with Khatib & Nour [18] who claimed that during crises, boardroom effectiveness can improve the firms' financial performance. Also the study of Kusumawardani et al. [20] suggests that board size as a corporate governance mechanism has a positive impact on the level of cash holdings.

Table 2. Descriptive statistics

Var.	Mean	Min	Max	Std. Dev.
<i>EBITDA (c)</i>	3.896414	0.00000	8.468429	1.504387
<i>COVID_Outbreak</i>	12.9	7.2	16.1	0.109593
<i>TREAT</i>	18.3	7.2	36.1	.393269
<i>GOV_Assis</i>	27.4	0.0000	69.4	.80
<i>CH_{it}</i>	845.6231	0.00000	131773.1	10550.22
<i>CH_Ebt_{it}</i>	276.3716	-2444.9	45553.00	3653.727
<i>FirSIZE_{it}</i>	5.861286	1.44623	52.06139	4.214058
<i>FirAGE_{it}</i>	28.39506	0.00000	85.00000	17.66681
<i>NWCgrowth_{it}</i>	32.36940	0.00000	21.14316	2604.228
<i>LEV_{it}</i>	54.14796	0.30760	95.65160	21.14316
<i>Brd SIZ_{it}</i>	10.44099	2.00000	16.00000	2.410510
<i>Brd MEET_{it}</i>	9.987578	4.00000	42.00000	4.884910
<i>Gnd-DIV_{it}</i>	0.369407	0.11110	0.833300	0.101582

Table 3. Correlation matrix for multicollinearity test

Probability	EBITDA(c) _{it}	COVID	TREAT	CH _{it}	CH_Ebt _{it}	FirSIZE _{it}	FirAGE _{it}	LEV _{it}	Brd SIZ _{it}	BrdMET _{it}	Gnd_DIV
<i>EBITDA (c)_{it}</i>	1.000000 -----										
<i>COVID_Outbreak</i>	-0.000867 0.9858	1.000000 -----									
<i>TREAT</i>	0.250447 0.0000***	0.120481 0.0133***	1.000000 -----								
<i>GOV_Assis</i>	0.235759 0.0000***	-0.013916 0.7756	0.082206 0.0917*	1.000000 -----							
<i>CH_Ebt_{it}</i>	-0.106268 0.0291***	-0.047408 0.3313	-0.005713 0.9069	0.417438 0.0000***	1.000000 -----						
<i>FirSIZE_{it}</i>	0.031652 0.5167	-0.045513 0.3510	0.060704 0.2133	-0.110305 0.0234***	-0.009815 0.8407	1.000000 -----					
<i>FirAGE_{it}</i>	-0.230552 0.0000***	0.031813 0.5146	-0.049852 0.3069	-0.108710 0.0255***	-0.060538 0.2146	0.069025 0.1569	1.000000 -----				
<i>LEV_{it}</i>	0.135693 0.0052***	-0.056009 0.2509	-0.007932 0.8709	0.017701 0.7169	-0.006500 0.8941	-0.054876 0.2607	-0.049495 0.3104	1.000000 -----			
<i>Brd SIZ_{it}</i>	0.171872 0.0004***	0.130666 0.0072***	0.088048 0.0708*	-0.027174 0.5778	-0.055993 0.2511	0.074925 0.1244	-0.024154 0.6208	-0.036533 0.4542	1.000000 -----		
<i>Brd MEET_{it}</i>	0.139623 0.0041***	0.019280 0.6929	-0.021176 0.6645	-0.078042 0.1094	-0.072984 0.1344	0.100904 0.0383***	0.056902 0.2435	-0.075784 0.1201	0.207358 0.0000***	1.000000 -----	
<i>Gnd-DIV_{it}</i>	0.102417 0.0354***	0.226041 0.0000***	0.104253 0.0323***	0.003598 0.9412	0.065995 0.1760	0.048883 0.3164	0.027657 0.5710	-0.035855 0.4626	0.120642 0.0131***	0.079668 0.1022	1.000000 -----

6.2. Multilevel Analysis for the Determinants of the Financial Performance during COVID-19 Outbreak

Table 4 clearly explains the empirical results of Model (1) and Model (2) using GLM regressor on *EBITDA* (*c1*) and *EBITDA* (*c2*). We develop different indicators for firms' performance, these indicators drive about 27.9782% of the changes in *EBITDA* (*c1*) and approximately 38.85% in *EBITDA* (*c2*). The *COVID_Outbreak*, *TREAT*, *GOV_Assis*, and cash holding represent the top of these indicators. Our findings show that the *COVID_Outbreak* is negatively associated with *EBITDA* (*c1*) and *EBITDA* (*c2*) with a coefficient of -0.548388 and -0.589100, and P-value of 0.0012 and 0.0005 respectively. These results are consistent with previous arguments which claimed that government strict quarantine procedures limit companies' operations and sales due to the different financial constraints faced by them [8], [18], [27], [30].

Table 4. The determinants of the financial performance during COVID-19 outbreak using GLM

Variable	GLM	
	<i>EBITDA(c1)</i>	<i>EBITDA(c2)</i>
<i>Constant</i>	3.838253 0.0000***	3.68791 0.0000***
<i>COVID_Outbreak</i>	-0.782193 0.0000***	-0.834160 0.0000***
<i>TREAT</i>	0.171555 0.0000***	0.184182 0.0000***
<i>GOV_Assis</i>	0.000130 0.0005**	0.000133 0.0004**
<i>CH_{it}</i>	0.000518 0.9051	
<i>CH_Ebt_{it}</i>		0.004652 0.0112**
<i>FirSIZE_{it}</i>	-0.004820 0.6144	-0.004677 0.6217
<i>FirAGE_{it}</i>	-0.016660 0.0001**	-0.015999 0.0002**
<i>LEV_{it}</i>	-0.0014620 .3066	-0.001676 0.2370
<i>BrdSIZ_{it}</i>	0.033557 0.0876*	0.035499 0.0679*
<i>BrdMEET_{it}</i>	0.012637 0.2034	0.015136 0.1271
<i>Gnd_DIV_{it}</i>	0.260545 0.39	0.275813 0.3660
Adj R2	27.9782%	38.85%
VIF	1.38846	1.63532
Durbin-Watson Stat	1.169619	1.158744
Prob(F-statistic)	0.000003**	0.000001***

Whereas, *TREAT* and *GOV_Assis*, as firm and national government policy, are positively associated with *EBITDA* (*c1*) at β of 0.171555 and 0.000130 respectively and P-value of 0.0000 and 0.0005 respectively. Also, *TREAT* and *GOV_Assis* associated positively with *EBITDA* (*c2*) at β of 0.184182 and 0.000133 respectively and p-value < 0.05. These results confirm that both the *TREAT* and *GOV_Assis* significantly controlled the negative effect of

the COVID-19 on the financial firms' performance. These findings are consistent with the recent studies which acknowledge that an increase in government financial assistance and firms that remain open during the outbreak will weaken the potential negative impact of the COVID-19 on the financial performance [30].

While *CH_{it}* is significantly positively associated with *EBITDA* (*c1*), based on Fixed Effects for model 1 with β of 0.068673 and P-value of 0.0478. This result provides an answer to our second test hypothesis which suggests that the higher level of cash holding, the better the firms' financial performance. These results match the prior arguments which propose that firms hold an optimal level of money regularly in uncertain periods, as it enables them to overcome the various financial constraints [2],[30],[32]. On the other hand, according to the results of the VIF under models 1 and 2, there are no multi-collinearity problems among the observed variables.

6.3. Tests of Endogeneity Effect

Based on the outcomes of Table 5, the endogeneity effect of cash holding level on the relationship between the COVID-19 outbreak and firms' performance was treated through conducting both the 2SLS and GMM methods. The estimated *CH_{it}* in the 1SLS regressions is used as an input in the 2SLS model to test the potential moderating effect of cash holdings on the relationship between the COVID-19 and firms' financial performance. We noticed that the estimated *CH_{2SLS}* in the 2SLS model has a positive impact on *EBITDA* (*c1*) at a coefficient of 0.263437 and a P-value of 0.0926. For a further investigation of our results, we adopt the GMM method as the suitable robustness test because of its ability to solve the endogeneity effects. Table 6, likewise, shows the empirical results of the GMM method for measuring the moderating effect of cash holding on the relationship between the COVID-19 outbreak and the financial performance of listed firms. Concerning the GMM method, its results confirm the previous one that *CH_{2SL}* favorably impact the firms' financial performance at a coefficient of 0.203529 and a P-value of 0.0318, which support our third test hypothesis which indicates that the estimated cash holding level significantly positively enhance the financial performance of listed firms during the COVID-19 outbreak.

Since, COVID-19 significantly and negatively impacts *EBITDA(C)* under the 1SLS, 2SLS, and GMM models with β of -13.99717, -6.973099 and -9.026175 and P-value of 0.0002, 0.0926, and 0.0002 respectively. Therefore, the *CH_{2SLS}*, *GOV_Assis*, and *TREAT* are likely to reduce the negative impact of the COVID-19 outbreak on the financial performance of listed firms. These findings are consistent with the crisis management theory argument and the prior literature which claim that holding money, of course within a certain limit, during the periods of uncertainty might improve the ability of firms to face their

financial obligations, while the investment and operational activities may cease due to risk avoidance strategy followed by them during the periods of uncertainties [2], [8], [32].

Table 5. Summary of 2SLS and GMM endogeneity tests

Variable	1SLS: <i>CH</i>	2SLS: <i>EBITDA(C)</i>	GMM: <i>EBITDA(C)</i>
Intercept	5.853051 0.0132**	-1.559035 0.5287	-0.255770 0.8579
<i>CH</i> _{2SLS}		0.263437 0.0926*	0.203529 0.0318**
<i>COVID</i>	-13.99717 0.0002**	-6.973099 0.0926*	-9.026175 0.0002**
<i>TREAT</i>	2.938450 0.0001***	1.198827 0.0991*	1.609046 0.0001***
<i>GOV_Assis</i>		0.3284** 0.000577	5.55E-05* 0.08429
<i>FirSIZE_{it}</i>	-0.388685 0.0715*	0.706862 0.0820*	0.497648 0.0353**
<i>FirAGE_{it}</i>	-0.050207 0.1113		
<i>LEV_{it}</i>	-0.019831 0.4195	0.025601 0.3251	0.029683 0.0697*
<i>Sales_growth_{it}</i>	1.67E-05 0.9862		
<i>NWCgrowth_{it}</i>	-8.60E-10 0.4713		
<i>Sector</i>	0.279377 0.3302		
<i>Adj.R²</i>	17.7% 0.000000***	-50.89% 0.002550**	-98.18% 0.000121**
<i>VIF</i>	5.641	1.965	1.085

Table 6. Summary of the robustness test results

GLS		
Variable	<i>REV(1)</i>	(2)
<i>C</i>	4.071317 0.0000***	4.193537 0.0000***
<i>COVID</i>	-1.650597 0.0000***	-1.702620 0.0000***
<i>TREAT</i>	0.339750*** 0.0000	0.351129*** 0.0000
<i>GOV_Assis</i>	0.000421 0.0000***	0.000420 0.0000***
<i>CH_{it}</i>	0.032058 0.0000***	
<i>CH_Ebt_{it}</i>		0.007980 0.0000***
<i>FirSIZE_{it}</i>	0.007988 0.2916	0.002806 0.7098
<i>FirAGE_{it}</i>	-0.014285 0.0000***	-0.015860 0.0000***
<i>LEV_{it}</i>	-0.000204 0.8445	-0.000698 0.5045
<i>Brd SIZ_{it}</i>	0.058686 0.0000***	0.054756 0.0000***
<i>Brd MEET_{it}</i>	0.017879 0.0028**	0.019255 0.0015**
<i>Gnd_DIV_{it}</i>	0.443681 0.0467**	0.604611 0.0069*
Adj R2	34.59%	25.73%
VIF	2.813	3.885
Durbin-Watson Stat	0.749058	0.669347

7. Robustness Test

To further robust our results, we re-perform the regression analysis of models 1 and 2. Table 6 presents the results gathered from the further analysis, using *revenue* as an alternative measure of the dependent variable (firm performance) instead of *EBITDA* (*c*). The results reported in table 6 are likely to parallel the results of the main analysis presented in table 4, so these results confirm our earlier results.

In terms of regressors 1 and 2, the COVID-19 has a significant negative impact on *REV* at coefficients of -0.594510, -0.652702, and P-values of 0.0000 and 0.0000 respectively. In contrast, *TREAT*, *GOV_Assis*, and *CH_{it}*, are positively associated with *REV* (1) under model (1) at 0.095226, 0.000421, and 0.015748 respectively, and P-value < 0.001. Similarly, under the second model, *TREAT*, *GOV_Assis*, and *CH_Ebt_{it}* at 0.106618, 0.000420, and 0.008059 respectively, and P-values < 0.001. These findings approve our hypothesis H1, H2, and H3 that acknowledges that the COVID-19 outbreak has negative economic effects on firms' performance, also, both firms and the national government develop policies to face and reduce these unfavorable effects on the firms' financial performance.

8. Discussion and Conclusions

So far, the current COVID-19 outbreak is still severe. So, this research serves as a catalyst to a more comprehensive empirical study on the various factors that impact the financial performance of Italian listed firms during the COVID-19 outbreak. In this context, the current research combines both the traditional performance indicators (e.g., revenues and EBITDA) with the relatively novel influences (e.g., firms overdue on debt obligations and business closures during COVID-19) and the crisis management lens for Italian tested firms to respond to the COVID-19 outbreak through adjusting their business liquidity.

This research studies a sample of 79 listed firms in Italy with panel data for 2020. Our research adopted GLM to test H₁ and H₂. Our results imply that the COVID-19 outbreak worsens the financial performance of Italian listed firms, and the government assistance policies contribute positively to mitigate this negative impact. Also, assuming an optimum level of cash holding exists, the increase in cash holding level advances the financial performance of Italian listed firms. To further investigate the relationship between cash holding and the financial performance of Italian listed firms, we adopted different formula to compute cash holding, and the results confirmed our earlier ones. In addition, we performed an additional robustness test to confirm the results of H₁ and H₂, using total revenues as an alternative measure to performance, and the results also confirmed the previous ones.

Our research also offers a new angle to test the potential interactive effect of cash holding on the relationship between the COVID-19 outbreak and the financial performance of Italian-listed firms. So, we established a 1SLS model to identify the determinants of cash holding and to obtain the estimated cash holding level. Then, the outputs of the first SLS model presented in the estimated cash holding represent a crucial input to the 2SLS method, our results acknowledged that the rise in cash holding level and firms' ability to remain open as of today weaken the negative impacts of the COVID-19 outbreak on the financial performance of Italian listed firms. In addition, our findings imply that the firm's ability to remain open as of today as a moderator reduces the unfavorable impact of the COVID-19 outbreak on the financial performance of Italian-listed firms. To further investigate such a relationship, we implemented the GMM method as the suitable robustness test which allowed us to control the potential endogeneity effects. The result confirmed the previous one.

Our findings also suggest that networking capital growth, firm size, and revenue growth tend to decline during the COVID-19 outbreak. These results coincide with the crisis management theory which admits that during periods of uncertainty, investors tend to postpone their investments and switch to more risk-averse strategies, which will result in a shortage of cash inflows and a decline in the firms' financial performance. Therefore, firms that are looking forward to sustaining in this environment that is characterized by fluctuated, reduced levels of income, and a shortage in cash inflows need to hold a sufficient level of cash to survive in such a challenging environment. This research has several practical implications for policymakers and firms' leaderships to face such infectious diseases. Whereas, COVID-19 outbreak contributes to our recognition that financing policies and decisions and their impact on the firms' outcomes need to be revised after the COVID-19 crisis has passed. Moreover, this crisis opens a new avenue for many firms to continue their businesses through the various online channels offered.

Our research admits several limitations that we acknowledge. First, our findings are limited to a sample of 79 listed Italian firms. So, we recommend future research to include more firms in the sample and to be applied in less developed countries. Therefore, the inclusion of more firms in less developed countries could reveal different conclusions. Second, we did not consider the outbreak impact degree. Hence we endorse future studies to add more variables that reflect the outbreak impact degree, through the division of the firms and countries selected for the sample into serious impact regions and fewer impact regions. Third and last, the research sample considers firms from different industries. Thus, we endorse future researchers' focus on certain industries that were harshly impacted by the outbreak.

Acknowledgements

The authors wish to express their gratitude to the editor and the two anonymous reviewers for providing the necessary feedback and comments to improve our work.

Notes

- (1) www.enterprisesurveys.org/en/covid-19

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