CORPORATE CASH HOLDINGS AND GLOBAL CRISIS: EVIDENCE FROM INDIA

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Abstract

The purpose of the paper is to examine how corporate cash holdings are sensitive to the global crisis such as financial and global pandemic apart from testing the determinants of corporate cash holdings in the Indian context. The sample consisted of 38 non-financial companies listed in Nifty 50, the benchmark index of India's National Stock Exchange (NSE) for 15 years from 2007 to 2021. Panel data analysis was conducted for the study. Fixed effect regression models were run by considering variables such as cash to total assets and change in cash to total assets, global crisis (financial crisis and global pandemic), interaction variable between cash flows and crisis, cash flows, leverage, dividend payment status, size, Tobin's Q, net working capital and capital expenditure. The findings indicate that cash holdings are sensitive to the global crisis. Cash holdings are determined by cash flows, and leverage positively but negatively associated with dividend payment status, capital expenditure, and networking capital. Size and Tobin's Q do not determine corporate cash holdings in the Indian context. Based on the Kaplan-Zingales (KZ) index classification, it was found that financially unconstrained companies tend to consume more cash than financially constrained companies during a global crisis due to higher flexibility in liquidity management.

Keywords: Cash Holdings, Global Crisis, KZ Index, Leverage, Capital Expenditure, Networking Capital, Tobin's Q, Fixed Effects, Panel Data

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1. INTRODUCTION

In the recent past, there has been a large amount of cash reported in the financial statements of companies across the world (Dao & Maggi, 2018). Research studies in the past have examined the reasons behind companies accumulating larger sums of cash and found that cash reserves resulted in both costs as well as benefits. In general, cash holdings refer to the sum of cash as well as marketable securities reported on the balance sheet (Opler et al., 1999). Corporate goals are attained through operational and strategic decisions which are greatly influenced by the availability of cash, and

hence cash is considered an essence of the business. In a stable environment, optimum cash holding can be determined by using various cash flow models developed by Baumol (1952), Tobin (1956), and Miller and Orr (1966). Companies with a high cost of financing hold a higher level of cash (Miller & Orr, 1996; Magerakis, 2020). However, Jensen (1986) found that companies holding large cash balances incur inefficient liquidity management as well as agency costs. Even then, companies tend to hold cash for two significant reasons as observed by Ozkan and Ozkan (2004), that is for transaction purposes and precautionary purposes. Precautionary motives denote that the companies must utilize emerging profitable opportunities and unpredictable contingencies (Bates et al, 2009). Likewise, transaction motives denote companies' intention to use cash for investment purposes without depending on external financing in which the cost of financing is relatively higher due to transaction costs (Myers & Majluf, 1984). Likewise, Ivashina and Scharfstein (2010) and Campello et al. (2010) found that companies are prone to forgo investment projects due to the inadequacy of cash.

The recent global financial crisis has posed renewed interest in the focus on cash holdings since economic or financial crises impact the access to external financing for businesses (Almeida et al., 2014). Since the economic crisis results in disrupted capital markets and dried-up banking systems for funding, companies tend to hold cash for precautionary motives (Lian et al., 2011). Hence holding cash during uncertain financial situations is essential for companies. Research studies by Arslan et al. (2006) and Lian et al. (2011) prove the positive aspects of cash holdings and found that cash holdings are impacted by both cash saving and consumption. As per the pecking order theory, companies depend on more internal financing by consuming more and holding less cash during crisis periods since the cost of external financing is high (Myers & Majluf, 1984).

The relevance of the present study gains momentum in the backdrop of the global pandemic disrupting the functioning of companies and more than half of the companies listed on the National Stock Exchange (NSE) is likely to face a cash crunch in meeting their fixed obligations. Among the top listed NSE companies in India (excluding banks), 55% of them have less than 100% cushion for bearing fixed and debt servicing costs. In other words, companies need additional funds through debt/equity to maintain their existing operations. (Mishra, 2020). Figure A.1 in the Appendix shows the cash holdings of companies during the period of study. The trend in cash holdings indicates mixed results as it can be seen that cash holdings were steady during a particular phase (2007–2013) and in the subsequent phase (2014–2021) the cash holding pattern was volatile. This mixed trend provides the rationale for the study which was to investigate how global crises including the financial crisis (2008–2009) and global pandemic (FY 2019–2020 onwards) affect cash savings and cash consumption by the top 50 companies listed on the NSE of India. This study will examine how a global crisis (financial crisis and global pandemic) impacts the cash holding of Indian companies.

The research question is whether there is any significant relationship that exists between global crisis and corporate cash holdings after controlling for other factors. The study found that the global crisis negatively affects cash holdings and companies consume more cash than they save during times of crisis i.e., companies earn cash and spend more on account of uncertainties simmering out of a crisis. The present study brings in a couple of novelties in this area of research. First, the study incorporates the global pandemic as a crisis apart from the financial crisis to investigate the impact on corporate cash holdings. Secondly, there are rarely any studies in the Indian context that focus on the association between global crisis and corporate cash holdings. The results of the study will help practice managers, analysts, and researchers working in corporate cash management. The following are the objectives of the study:

1) To investigate whether companies tend to hold more cash during the crisis period.

2) To explore the factors determining the cash holdings of the companies under study.

3) To analyze whether financially unconstrained companies are likely to consume more cash than financially constrained companies during the crisis period.

The rest of the paper is organized as follows. Section 2 provides a theoretical framework relating to cash management. Section 3 provides a detailed review of existing literature, and the hypotheses framed for the study. Section 4 provides details about the research methodology. Section 5 provides the research results. Section 6 relates to discussion based on the results, and Section 7 provides conclusion and scope for future research.

2. THEORETICAL FRAMEWORK

The M&M theorem propounded by Modigliani and Miller (1985) intended a perfect capital market with no taxes, agency costs, and asymmetric information. Despite being unrealistic about the perfect capital market, the theory was the basis of modern corporate finance. The assumptions of a perfect capital market state that cash holdings are immaterial since companies can raise funds with no intricacies. However, market limitations suggest that cash holdings are pertinent and play a decisive role in corporate financial policy. The continuing demolishing of these hypotheses has led to trade-off theory (TOT), pecking order theory (POT), and free cash flow theory (FCF) (Magerakis, 2020).

The TOT pretends that companies have an optimum level of debt, which maximizes the company's value. Tax benefits could provide a shield for the company from possible bankruptcy costs. The decision to maintain an optimum level of debt leads to ideal levels of cash holdings, which is consistent with the value maximization approach (Magerakis, 2020).

The POT model suggests a hierarchical model wherein retained earnings are used as the major source of financing the company's operations and establishing new capital projects. Given that there is no optimal level of borrowing to maximize value for stakeholders, managers would rather finance their activities using cash and liquid assets instead of accessing external sources of financing (Amponsah-Kwatiah & Asiamah, 2021).

The FCF theory devised by Jensen (1986) highlights the managers' inclination to accrue cash to finance upcoming projects or investments instead of paying dividends to shareholders. The dispute of interest between the shareholders and the management of the firms generally occurs in firms that produce sizable cash flows (Magerakis, 2020).

3. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

3.1. Crisis period

Numerous studies have examined cash holdings and their determinants. Jensen (1986) found that high cash holdings result in inefficient liquid asset management and create agency problems. However, companies hold excess cash with transaction motive and precautionary motive (Ozkan & Ozkan, 2004). Opler et al. (1999) found that transaction motives help companies avoid liquidating assets, issuing new securities, and withholding dividend payments. Likewise, Bates et al. (2009) and Poloz (1986) argue that new profitable projects and unexpected contingencies shall be met when holding cash for a precautionary motive. Like normal business conditions, research studies have examined the impact of cash holdings during crisis periods (Ferreira & Vilela, 2004; Kim et al., 1998). A financial crisis makes the capital markets less efficient and bank funding in short supply, which is an opportunity to examine how corporate cash holdings react to internal and external factors during shocks (Bates et al., 2009). Lian et al. (2011) claim that the precautionary motive of cash holding was found predominant in companies during crisis times. Further, a firm that is financially constrained tends to have high cash holding (Almeida et al., 2004; Arslan et al., 2006).

Tran (2019) argues that the financial crisis impacts corporate cash holdings not only by cash saving mechanism but also by cash consuming mechanism. Companies during a financial crisis tend to face external financial constraints and hence consume more cash for their investments and operating activities. Hence, we hypothesize company's cash-saving approach has a positive impact on cash holdings and the cash-consuming approach has a negative impact on cash holdings.

H1a: Crisis positively affects the corporate cash holdings.

H1b: Crisis negatively affects the corporate cash holdings.

Based on the findings of the past literature, the determinants of cash holdings and their impact are discussed further.

3.2. Cash flows

Changes in the cash flow impact companies' investment opportunities and the cost of illiquidity. Research studies by Ferriera and Vilela (2004), and Ozkan and Ozkan (2004) found the significance of cash flows. Han and Qiu (2007) and Maheswari and Rao (2017) also found a positive relationship between cash flow volatility and cash holdings.

H2: Cash flows positively impact corporate cash holdings.

3.3. Crisis and cash flow: Interaction effects

In addition to the main effects of the crisis period and cash flow, the interaction between the two variables is expected to cause a significant negative impact on the cash holdings of companies (Batuman et al., 2022). However, Mishra et al. (2014) argue that the negative effect did not hold true for companies in certain countries due to macroeconomic and monetary policy changes during the global crisis period (e.g., Turkey).

H3a: Cash flow along with crisis positively impact cash holdings.

H3b: Cash flow along with crisis negatively impact cash holdings.

3.4. Determinants of cash holdings

3.4.1. Leverage

Drobetz and Grüninger (2007) argue that highly leveraged firms have lower cash holdings due to high monitoring by lenders. Debt is considered a substitute for holding cash and companies with high leverage are less able to pile cash (Ferreira & Vilela, 2004; Ozkan & Ozkan, 2004; Opler et al., 1999). In contrast to this Baskinn (1987) found leveraged firms hold more cash due to high financial distress. However, the study argues that high leverage causes under-investment, and holding cash reduces agency problems arising out of more debt. Hence a growing company has investment opportunities and holds a higher level of cash. In contrast, bank debt adds disciplinary pressure on companies and demands pressure on holding liquid assets. Likewise, Ozkan and Ozkan (2004) argue that companies with high bank debt have a strong relationship with banks and are less likely to save cash. Guizani (2017) also found a positive impact of leverage.

3.4.2. Size

Research studies have found a negative relationship between the size of the business and cash holdings. Bigger companies have added access to capital markets and therefore they do not essentially hold cash for precautionary and transaction motives (Al-Najjar & Belghitar, 2011; Drobetz & Grüninger, 2007; Dittmar et al., 2003; Almeida et al., 2004; Faulkender & Wang, 2006; Guizani, 2017; Wasuizzaman, 2018).

3.4.3. Networking capital

Liquid assets act as a replacement for holding cash. Because, working capital financing such as a line of credit, or current assets can be quickly converted to cash. For instance, receivables can be factored in or in case of a larger firm's securitization process to help convert into cash (Demiroglu & James, 2011; Bigelli & Sánchez-Vidal, 2012; Al-Najjar & Belghitar, 2011; Riyazahmed & Saravanaraj, 2012; D'Mello et al., 2008; García-Teruel & Martínez-Solano, 2007; Ozkan & Ozkan, 2004; Guizani, 2017). Hence, the availability of liquid assets makes companies less dependent on external sources for cash. Networking capital (excluding cash) indicates the excess of current assets over current liabilities, which reduces the dependence on holding cash.

3.4.4. Tobin's Q

The cash holding of a firm depends on a company's investment opportunities. Tobin's Q is a market-based performance measure used as a proxy for a firm's investment opportunities (Craswell et al., 1997). Gao and Yun (2009) found that companies without liquid funds reduced their investments and companies with liquid funds maintained their investments, particularly during the crisis period.

3.4.5. Dividend payment

Yeo (2018), Mirza and Afza (2014), and Maheswari and Rao (2017) found the significance between cash flow and dividend payments. Likewise, Campello et al. (2010) claim that companies paying dividends are not financially constrained and hence hold greater cash reserves. However, when companies consume cash for dividend payments there will be a negative impact of dividends on cash holdings.

3.4.6. CAPEX

Companies reduce capital expenditures (CAPEX) during a crisis with a precautionary motive of preserving more cash during an uncertainty. Guizani (2017) found the significance of capital expenditures on cash holdings. Likewise, Lian et al. (2011) found a negative relationship between capital expenditures and cash holdings during the crisis.

3.5. Important literature on cash holdings of companies

Arslan et al. (2006) examined the cash flow scenario of companies in Turkey from 1998 to 2002. The study considered short-term book debt, market-to-book value, investment size, age, dividend, and the business group as independent variables. The study found that short-term book debt and size negatively influence cash flow. However, the market-to-book value was found to have a significant positive impact on cash-to-total assets.

Likewise, Lian et al. (2011) examined 8663 observations belonging to companies in China for the period from 1999 to 2009 focusing on the cash holdings on total assets. The study considered Tobin's Q, size, cash flow, networking capital, capital expense, leverage, industry, dividend, and financial crisis as independent variables. The results of the study found that only, Tobin's Q, cash flow, and dividend had a positive impact. Likewise, size, networking capital, capital expense, and leverage were found to have a negative impact on the cash holdings of the companies.

In a similar study, Horioka and Terada-Hagiwara (2013) examined the cash holdings of companies belonging to 11 Asian economies. They examined 28435 observations belonging to the period of 2002 to 2011. Cash flow to total assets, Tobin's Q, and the size of the firm were the variables considered for the study. The results showed that all three variables i.e., cash flow to total assets, Tobin's Q, and size have a significant positive impact on the cash holdings of companies. In a recent study, Yang et al. (2016) analyzed companies in China based on financial constraints using the Kaplan-Zingales (KZ) index. With 13766 observations collected from 2003 to 2013, the study found that cash holdings were positive for financially constrained companies with a high KZ index.

4. RESEARCH METHODOLOGY

4.1. Source of data and sample

For the research, financial data have been collected for the companies listed on the NSE index, Nifty 50. Nifty 50 consists of the 50 largest companies listed on the NSE, India, and represents 66.8% of the free-float market capitalization of stocks listed. Nifty 50 covers thirteen core sectors of the Indian economy. In line with previous studies, we have excluded the financial and banking companies for the analysis since the financial data of the companies are different in reporting due to business and regulatory factors. The companies for which the data are not available for all the 15 years have been dropped. A total of 38 companies for the period starting from 2007 to 2021 (15 years) were considered for the study. The reason for selecting the Nifty 50 companies was the availability of data covering all factors examined in the study. Also, Nifty is one of the leading indices in the country which represents top companies drawn from various industries and is used as a benchmark by many portfolio managers in measuring the performance of portfolios. The present study has analyzed the performance of 38 companies over 15 years thus employing 570 firm-year observations. By comparing some of the existing studies, the sample size for the current research was adequate and justified. The financial data were retrieved from Capitaline, a subscription-based database that consists of financial information of all listed companies in India.

4.2. Model

In line with Lian et al. (2011) and Tran (2019) to determine the impact of the crisis on cash holdings, the study examined the impact of various company-specific parameters that are directly and indirectly related to cash holdings. To establish the relationships, the following models are tested.

Model 1a

$$CTA = \beta_i + \beta_1 CR_{it} + \beta_2 CF_{it} + \beta_3 LV_{it} + \beta_4 SIZ_{it} + \beta_5 INV_{it} + \beta_6 CAPEX_{it} + \beta_7 DIV_{it} + \beta_8 NWC_{it} + \\ + \beta_9 CR * CF_{it} + Ind_{dummy} + \mu_{it} \quad (1)$$

Model 1b

$$\Delta CTA = \beta_i + \beta_1 CR_{it} + \beta_2 CF_{it} + \beta_3 LV_{it} + \beta_4 SIZ_{it} + \beta_5 INV_{it} + \beta_6 CAPEX_{it} + \beta_7 DIV_{it} + \beta_8 NWC_{it} + \\ + \beta_9 CR * CF_{it} + Ind_{dummy} + \mu_{it} \quad (2)$$

The description of the variables used in the models along with the expected sign of impact is discussed in Table 1. We analyze the models using fixed effects and random effects to investigate the significance of the relationship among variables.

Table 1. Variable definition

Variables	*Name of the variable*	*Method*	*Expected effect*
Dependent variables			
CTA	Cash to total assets	(Cash + Cash equivalents + Short-term investments) / (Total assets-cash and cash equivalents)	
ΔCTA	Change in CTA	Cash to total assets ratio in year *t* minus cash to total assets ratio *t-1*	
Independent variables			
CR	Global crisis	Dummy variable (0 — normal i.e., 2010–2018, 1 — crisis i.e., 2008–2009 and 2019–2021)	+
CF	Cash flow	Operating profit to total assets	+
*CR*CF*	Interaction of cash flow and crisis		+/-
Control variables			
LV	Leverage	Total debt to total assets	+
SIZ	Size of the company	Log of total assets	-
NWC	Networking capital	Net current assets to total assets	-
Tobin's Q	Tobin's Q	Tobin's Q score i.e. (Market value of equity + book value of debt) / Total assets	+
DIV	Dividend payment	Dummy variable, the dividend paid 1, otherwise 0.	+/-
CAPEX	Capital expenditures	Consolidated cash flow from investing activities to total assets	-
Ind_{dummy}	Industry classification	1 — manufacturing and 0 — services industry	

4.3. Additional analysis

In addition to examining the impact of various parameters on the cash flow, cash flow sensitivity, and cash holdings, we have analyzed the significant difference in the relationships between financially constrained and non-constrained companies. Yang et al. (2017) and Tran (2019) found that firms with low financial constraints tend to consume more cash than companies with extreme financial constraints. The study groups the companies into financially constrained and unconstrained based on the KZ index (Kaplan & Zingales, 1997). In a year *t*, if the KZ index is lower than the sample median, then the company is classified as financially unconstrained and vice versa. KZ index is estimated through the following equation:

$$KZ\ index = (-1.00909 * Cash\ flow) + (0.283 * Tobin's\ Q) + (3.139 * Leverage) - (39.368 * Dividend) - (1.315 * Cash) \quad (3)$$

where *Cash flow* is estimated as operating profit plus depreciation to total assets. *Tobin's Q* is estimated through the market value of equity plus the book value of debt in proportion to total assets. *Leverage* is calculated through debt divided by total assets. The *Dividend* ratio is calculated as the dividend amount in a particular year divided by total assets. The *Cash* ratio is estimated as cash balance to total assets.

4.4. Diagnostic tests and robustness check

Before estimation, we have done a diagnostic test to reduce the biases in the model estimates. Variation inflation factor (VIF) values have been estimated for every independent variable to ensure no multicollinearity between the variables. The VIF values for all the variables were below 10, which ensures no multicollinearity. Further, to check for the stationarity of variables, the Levin-Lin-Chu panel unit root test and lm-Pesaran-Shin test (for unbalanced panel data) were conducted. The results on a few select variables are provided in Table A.1 in the Appendix. The variables were found to be stationary. Likewise, the results of the Breusch-Pagan test show the presence of heteroskedasticity. Robust standard errors are used for estimation to deal with biases in standard errors due to heteroskedasticity (Sawarni et al., 2021). An additional robustness test (not shown for brevity) was conducted. The sample was split into two sub-periods (2007–2014 and 2015–2021) and the results remained similar with most of the variables having similar signs.

5. RESEARCH RESULTS

Table 2 shows the descriptive statistics of key variables during the period of study. To address the influence of extreme outliers, the key variables are winsorized at the 5th and 95th percentile in line with existing literature (Lian et al., 2011). Cash holdings to total assets ratio range from 0.01 to 0.50, respectively. On average, 12.7% of the total assets of the companies under study are in the form of cash and cash equivalents. The cash flow ranges from -0.103 to 1.83, respectively. Cash flows in the proportion of total assets average 29%. Long-term borrowings measured by leverage range from 0.007 to 0.61, respectively. This indicates that there were companies with low (less than 1%) long-term borrowings during the period of study. On average, debt holdings as a percentage of total assets were 26.2%. Indian companies have the higher mean and median values of Tobin's Q with 4.49 and 2.61, respectively unlike other emerging markets. More than 75% of the listed firms had Tobin's Q around 1 in the Vietnamese market (Tran, 2019). On average, the proportion of capital expenditure to total assets was 8.4% during the period of study.

Table 2. Descriptive statistics of key variables

Variables	*Mean*	*Median*	*S.D.*	*Min*	*Max*
CTA	0.127	0.0773	0.131	0.01	0.50
CF	0.289	0.234	0.227	-0.0103	1.83
LV	0.262	0.232	0.149	0.007	0.61
SIZ	4.38	4.39	0.650	3.61	5.27
Tobin's Q	4.49	2.61	4.66	0.68	17.9
NWC	0.062	0.0741	0.184	-0.32	0.369
CAPEX	0.084	0.0754	0.063	0	0.239

Note: S.D. — standard deviation. This table presents summary statistics of the key variables used in the paper. Detailed definitions of the variables are provided in Table 1.

Table 3 provides whether the variables considered for the study are statistically different between the global crisis (financial crisis, global pandemic — 2008–2009, 2019–2021) and non-crisis periods (2009–2010 to 2018–2019). The results indicate that there was a significant difference in the average values between the financial crisis, global pandemic, and non-crisis periods. The average cash holdings were lower in the crisis time when compared to the non-crisis period. All the variables excluding *CAPEX* and *Tobin's Q* were found to be statistically significant in terms of mean value between the financial crisis, global pandemic, and non-crisis period.

Table 3. Test for differences in key variables

Variables	*Global crisis (1)*	*Non-crisis period (2)*	*(1)-(2)*	*Mean test*	
	Mean	*Mean*	*Difference*	*t-value*	*p*
CTA	0.109	0.139	-0.03	-2.81	0.002*
CF	0.289	0.3	-0.011	-1.92	0.027*
LV	0.244	0.276	-0.032	-2.25	0.001*
CAPEX	0.084	0.09	-0.006	-0.0124	0.495
SIZ	4.29	4.54	-0.25	3.35	0.004*
Tobins Q	5.12	5.15	-0.03	-0.05	0.479
NWC	0.081	0.036	0.045	1.81	0.07**

*Note: * Significant at 5%, ** significant at 10%.*

Table 4 shows the correlation matrix of the variables considered for the study. VIF indicates whether the variables are serially correlated or not. A VIF value of more than 10 indicates (Wooldridge, 2013; Sriram, 2020; Magerakis, 2020), the presence of a multicollinearity problem. VIF of all the variables in the present study is less than 10 and there is no multicollinearity issue, and all the variables are considered for further analysis in the study.

Table 4. Correlation matrix

Variables	*CR*	*CF*	*LV*	*SIZ*	*DIV*	*Tobin's Q*	*NWC*	*CAPEX*
CR	1							
CF	-0.08**	1.00						
LV	0.01	-0.49*	1.00					
SIZ	0.14*	-0.53*	0.40*	1.00				
DIV	-0.58*	0.15*	-0.06*	-0.26*	1.00			
Tobin's Q	0.002	0.82*	-0.45*	-0.52*	0.07	1.00		
NWC	0.08**	-0.57*	0.12*	0.03	-0.06	-0.45*	1.00	
CAPEX	0.001	0.31*	0.12	-0.21*	0.04	0.25*	-0.33*	1.00
VIF	**1.55**	**4.84**	**1.59**	**1.91***	**1.63**	**3.29**	**1.99**	**1.32**

*Note: This table presents the correlation among the variables along with the VIF. * Correlation significant at 1%, ** correlation significant at 5%.*

Table 5 shows the cash holding sensitivity during the financial crisis and global pandemic using the fixed-effects and random-effects model. The dependent variable is the change in the cash holdings measured on a year-on-year basis. The dependent variable measures the savings of cash from cash flow every year (Almeida et al., 2004). The variable *CF* (0.1821) is positive and statistically significant at 5% which indicates that companies with higher cash flows contribute more to the change in the cash holdings on a year-on-year basis. In other words, companies with higher cash flows tend to save more during the period of study. The results are in line with previous studies viz., Lian et al. (2011) and Tran (2019). However, the interactive term of cash flows and global crisis (financial and global pandemic) is negative which shows that the sensitivity of cash holdings is high during the crisis when compared to the normal times in India. This shows that companies consume more cash during crisis time and the result is contrary to the previous studies by Bates (2009), Lian et al. (2011), and Tran (2019).

The signs of *NWC*, *CAPEX* is negative as expected since working capital is a substitute for cash to build cash reserves and capital expenditure requires companies to draw more cash to make necessary investments. The results are similar to the findings of Al-Najjar and Belghitar (2011). It also suggests that companies are less dependable on capital markets and other external sources for obtaining cash. Similarly, the sign of *DIV* (dividend payment) is negative. Dividend-paying companies draw cash to make dividend payments to their shareholders. The sign of the variable *LV* was positive like the study of Tran (2019). *Tobin's Q* and *SIZ* were found to be insignificant during the period of study.

Table 5. Cash holdings sensitivity under global crisis (financial crisis and global pandemic)

Variables	*Fixed effects*[a]	*Random effects*[a]
Intercept	0.0285 (0.336)	0.0394 (0.740)
CR	0.0239 (1.97)*	0.010 (0.578)
*CR*CF*	-0.089 (-4.017)**	-0.0391 (-0.8665)
CF	0.182 (2.721)*	0.108 (2.598)*
LV	0.0523 (2.126)*	0.0456 (2.224)*
SIZ	-0.0212 (-1.259)	-0.011 (-1.321)
Tobin's Q	0.0029 (1.133)	-0.005 (0.726)
CAPEX	-0.210 (-2.22)*	-0.091 (-1.603)
DIV	-0.0287 (-1.985)**	-0.021 (-1.828)**
NWC	-0.112 (-2.663)*	-0.057 (1.963)**
Industry dummy	No	Yes
F-statistics	3.95*	----
Wald χ^2	----	25.39*
Hausman test	34.866*	-----
No. of observations[b]	527	527

Note: Dependent variable: ΔCTA.
a. This table contains the regression results of the fixed-effects and random-effects model for cash holding sensitivity, along with the results of the Wald χ^2 and Hausman test.
*b. Unbalanced panel data. Values in the parentheses indicate t-statistic. All tests are carried out with HAC robust standard errors. * Significant at 5%, ** significant at 10%.*

Table 6 reports how the cash holdings of companies are affected by the financial crisis and global pandemic of both fixed and random-effects models. The coefficient of the variable *CR* is negative and statistically significant at 5%. It indicates that the cash holdings of the companies come down during the crisis period and therefore companies consume more cash than they save during the financial crisis and global pandemic. The result is contrary to the findings of Magerakis (2020) and Lian et al. (2011). The estimate of *CF* is positive and significant at 5%. This shows that companies in India prefer internal financing apart from accessing through external sources. Therefore, companies with higher cash flows tend to increase their cash holdings and the result is similar to the studies by Opler et al. (1999), Lian et al. (2011), and Magerakis (2020). Further, *LV* has a positive and significant relationship with cash holdings. This shows that firms with high leverage tend to hold more cash. The result conforms with the explanation given by Myers (1977). Financial leverage is a measure of financial distress and companies with a higher possibility of financial distress tend to hold large cash to reduce any unforeseen events. The studies by Wasiuzzaman (2014), Mohd-Ashhari and Faizal (2018), and Batuman et al. (2022) confirm the evidence of a positive relationship between leverage and cash holdings.

There is an inverse relationship between *DIV* and cash holdings. The coefficient of *DIV* is statistically significant at 5%. This indicates that dividend-paying companies tend to hold less cash than non-dividend-paying companies. In other words, financially unconstrained companies as measured by the status of the dividend payment tend to hold less cash than financially constrained companies. The results are contrary to the findings of Magerakis (2020) wherein *DIV* was found to be positive and statistically significant. Cash holdings are negatively related to *NWC* and *CAPEX*. This indicates that companies that rely on internal financing for working capital and capital expenditure tend to hold less cash when compared to others. The results are similar to Lian et al. (2011) and Tran (2019). *Tobin's Q* and *SIZ* were found to be insignificant during the period of study.

Table 6. Cash holdings under global crisis (financial crisis and global pandemic)

Variables	*Fixed effects*[a]	*Random effects*[a]
Intercept	0.082 (0.636)	0.0294 (0.209)
CR	-0.039 (-2.636)*	-0.036 (-2.578)*
CF	0.449 (5.721)*	0.461 (5.598)*
LV	0.289 (2.156)*	0.274 (1.858)**
SIZ	-0.0212 (-0.833)	-0.004 (-0.208)
Tobin's Q	0.0019 (-0.8256)	-0.0016 (1.026)
CAPEX	-0.172 (-1.859)**	-0.109 (-1.603)
DIV	-0.044 (-2.253)*	-0.021 (-1.828)**
NWC	-0.187 (-4.663)*	-0.188 (-4.875)*
F-statistics	7.745*	----
Wald χ^2	----	65.39*
Hausman Test	18.10*	-----
No. of observations[b]	527	527

Note: Dependent variable: CTA.
a. This table contains the regression results of fixed-effects and random-effects models for the cash holdings during the crisis period along with the independent variables.
*b. Unbalanced panel data. Values in the parentheses indicate t-statistic. All tests are carried out with HAC robust standard errors. * Significant at 5%, ** significant at 10%.*

Table 7 shows the relationship between financial crisis, global pandemic, and firm-specific constraints for the companies under study. The initial analysis indicates that cash consumption dominates corporate cash holdings in times of crisis. The results fall in line with the POT (Myres & Majluf, 1984). The cash to total assets ratio is the dependent variable and *CR* is the independent variable. *CR* is a crisis dummy and assigned 1 if the observations belong to the crisis period (2008–2009, 2019–2020, 2020–2021) and 0 otherwise. The argument based on the analysis is that companies with low company-specific financial constraints are more flexible to consume cash than those with high company-specific financial constraints. For this purpose, the entire data/observations were classified into two groups viz., financially constrained, and financially unconstrained companies. Observations are defined as financially constrained (unconstrained) in year '*t*' if a) the KZ index (Kaplan & Zingales, 1997) is higher (lower) than the sample median, b) the financial leverage is higher (lower) than the sample median, c) the dividend payout ratio is lower (higher) than the sample median. The results show that there is a negative relationship between crisis dummy and corporate cash holdings for financially unconstrained companies. This implies that financially unconstrained companies tend to consume more cash than financially constrained companies during times of crisis. Similarly, companies with low leverage have more flexibility in consuming cash during the crisis than companies with relatively high financial leverage. The results in terms of dividend payout ratio indicate that companies with low dividend payout ratio tend to consume more cash in crisis times than companies with high dividend payout ratio and the results were contrary to the findings of Tran (2019), Ahiadorme et al. (2018), and Mouline and Sadok (2021).

Table 7. Cash holdings, global crisis (financial crisis, global pandemic), and firm-specific constraint

Variables	*KZ index*		*Leverage*		*Payout ratio*	
	Low	*High*	*Low*	*High*	*Low*	*High*
CR	-0.077	-0.0007	-0.064	-0.0136	-0.041	-0.038
	(-2.601)*	(-0.0106)	(-2.20)**	(-1.406)	(-1.956)***	(-1.526)
N	280	290	287	283	295	275

Note: This table contains regression results of companies classified into high financial constraint, leverage, and dividend payment. A description of the KZ index is provided under "Additional Analysis" in "Data and Models".
** Significant at 1%, ** significant at 5%, *** significant at 10%.*

6. DISCUSSION OF THE RESULTS

The paper has attempted to make an empirical contribution to the present literature concerning corporate cash holdings of companies in India. The paper has focussed on how corporate cash holdings are impacted due to an exogenous shock such as a global crisis using a sample of non-financial Indian companies spanning 15 years. The study found that on average companies hold 12.7% of the total assets in the form of cash and cash equivalents. The average cash holdings of companies during the global crisis (financial crisis and global pandemic) were lower than the normal period. The average cash holding is 10.9%. The result from the analysis suggests that cash holding sensitivity is high during the period of study. The coefficient of the interactive variable (*CR*CF*) is negative and statistically significant. This indicates that companies consume more cash than they save during the period of crisis contrary to the findings from similar studies of other emerging economies where cash savings dominated cash consumption. Based on the KZ index classification, the study found that companies with low company-specific financial constraints tend to consume more cash than highly financially unconstrained companies. Similar results were found for leverage in low-levered companies that spent more cash than high-levered companies during the period of study. The companies were classified based on the low and high dividend payout ratio. The results show that there was not much of a difference between low payout ratio companies and high payout ratio companies in terms of cash consumption during the crisis times as most of the companies considered for the study were dividend-paying companies. But in terms of statistical significance, low dividend-paying companies consumed more cash than high dividend-paying companies during the time of the global crisis.

Corporate cash holdings were positively related to cash flows and leverage. This indicates that companies earning more tend to save more cash and similarly highly leveraged firms save more cash. In contrast, cash holdings were negatively related to CAPEX, networking capital, and dividend payment. The study did not find any evidence that size and Tobin's Q as important factors explaining cash holdings by Indian companies.

7. CONCLUSION

The study concludes that companies are cautious and conservative where cash adjustments are made for precautionary purposes as evident from the association between cash holdings and global crisis. The results of the study indicate that companies in India follow the POT where retained earnings are used as the major source of financing companies' operations and for all contingencies such as global crisis. The finding is supported by the research of Bhama et al. (2017) which states that Indian companies adhere perfectly to the POT due to more long-term borrowings and act conservatively during crisis. The study will be helpful for managers in understanding how companies react to such exogenous shocks (financial crises and global pandemic). It will also be helpful for managers in designing an optimal cash holding ratio in proportion to total assets for maximizing the value of a company.

The present study provides directions for future research which will be useful for academicians and researchers. Future studies may focus on the impact of individualities of managers, and ownership structure on cash holdings policy. Additional control variables such as the age of companies, cash flow volatility, and profitability may be considered while researching corporate cash holdings and the results will add new dimensions to the existing literature.

The study has a few limitations which are highlighted as follows. The present study was carried out on companies that were part of the top 50 in India according to market capitalization. Therefore, the results may not be applicable to other broader indices viz., S&P CNX 500, and sectoral sector-specific industries. The findings of this research are based on samples from Indian companies. As the operation and management styles of companies widely vary from one country to another, the outcome of this research should be applied to companies in other economies after considering the level of similarities that exist between these companies and the sample firms.

REFERENCES

Aftab, U., Javid, A. Y., & Akhter, W. (2018). The determinants of cash holdings around different regions of the world. *Business & Economic Review, 10*(2), 151–182. https://doi.org/10.22547/BER/10.2.7

Ahiadorme, J. W., Gyeke-Dako, A., & Abor, J. Y. (2018). Debt holdings and investment cash flow sensitivity of listed firms. *International Journal of Emerging Markets, 13*(5), 943–958. https://doi.org/10.1108/IJoEM-04-2017-0126

Almeida, H., Campello, M., & Weisbach, M. S. (2004). The cash flow sensitivity of cash. *Journal of Finance, 59*(4), 1777–1804. https://doi.org/10.1111/j.1540-6261.2004.00679.x

Al-Najjar, B., & Belghitar, Y. (2011). Corporate cash holdings and dividend payments: Evidence from simultaneous analysis. *Managerial and Decision Economics, 32*(4), 231–241. https://doi.org/10.1002/mde.1529

Amponsah-Kwatiah, K., & Asiamah, M. (2021). Working capital management and profitability of listed manufacturing firms in Ghana. *International Journal of Productivity and Performance Management, 70*(7), 1751–1771. https://doi.org/10.1108/IJPPM-02-2020-0043

Arslan, Ö., Florackis, C., & Ozkan, A. (2006). The role of cash holdings in reducing investment–cash flow sensitivity: Evidence from a financial crisis period in an emerging market. *Emerging Markets Review, 7*(4), 320–338. https://doi.org/10.1016/j.ememar.2006.09.003

Baskin, J. (1987). Corporate liquidity in games of monopoly power. *The Review of Economics and Statistics, 69*(2), 312–319. https://doi.org/10.2307/1927239

Bates, T., Kahle, K., & Stulz, R. (2009). Why do U.S. firms hold so much more cash than they used to? *Journal of Finance, 64*(5), 1985–2021. https://doi.org/10.1111/j.1540-6261.2009.01492.x

Batuman, B., Yildiz, Y., & Karan, B. M. (2022). The impact of the global financial crisis on corporate cash holdings: Evidence from Eastern European countries. *Borsa Istanbul Review, 22*(4), 678–687. https://doi.org/10.1016/j.bir.2021.10.002

Baumol, W. J. (1952). The transactions demand for cash: An inventory theoretic approach. *The Quarterly Journal of Economics, 66*(4), 545–556. https://doi.org/10.2307/1882104

Bhama, V., Jain, P. K., & Yadav, S. S. (2017). Pecking order among select industries from India and China. *Vision, 21*(1), 63–75. https://doi.org/10.1177/0972262916681255

Bigelli, M., & Sánchez-Vidal, J. (2012). Cash holdings in private firms. *Journal of Banking & Finance, 36*(1), 26–35. https://doi.org/10.1016/j.jbankfin.2011.06.004

Campello, M., Graham, J. R., & Harvey, C. R. (2010). The real effects of financial constraints: Evidence from a financial crisis. *Journal of Financial Economics,* 97(3), 470–487. https://doi.org/10.1016/j.jfineco.2010.02.009

Craswell, A. T., Taylor, S. L., & Saywell, R. A. (1997). Ownership structure and corporate performance: Australian evidence. *Pacific-Basin Finance Journal, 5*(3), 301–323. https://doi.org/10.1016/S0927-538X(96)00028-5

D'Mello, R., Krishnaswami, S., & Larkin, P. J. (2008). Determinants of corporate cash holdings: Evidence from spin-offs. *Journal of Banking & Finance, 32*(7), 1209–1220. https://doi.org/10.1016/j.jbankfin.2007.10.005

Dao, M. C., & Maggi, C. (2018). *The rise in corporate saving and cash holding in advanced economies: Aggregate and firm level trends* (IMF Working Paper No. 2018/262). International Monetary Fund. https://www.imf.org/en/Publications/WP/Issues/2018/12/07/The-Rise-in-Corporate-Saving-and-Cash-Holding-in-Advanced-Economies-Aggregate-and-Firm-Level-46369

Demiroglu, C., & James, C. (2011). The use of bank lines of credit in corporate liquidity management: A review of empirical evidence. *Journal of Banking & Finance, 35*(4), 775–782. https://doi.org/10.1016/j.jbankfin.2010.10.020

Dittmar, A., Mahrt-Smith, J., & Servaes, H. (2003). International corporate governance and corporate cash holdings. *Journal of Finance and Quantitative Analysis, 38*(1), 111–120. https://doi.org/10.2307/4126766

Drobetz, W., & Grüninger, M. C. (2007). Corporate cash holding: Evidence from Switzerland. *Financial Markets and Portfolio Management, 21*(1), 293–324. https://doi.org/10.1007/s11408-007-0052-8

Faulkender, M., & Wang, R. (2006). Corporate financial policy and the value of cash. *Journal of Finance, 61*(4), 1957–1990. https://doi.org/10.1111/j.1540-6261.2006.00894.x

Ferreira, M. A., & Vilela, A. S. (2004). Why do firms hold cash? Evidence from EMU countries. *European Financial Management, 10*(2), 295–319. https://doi.org/10.1111/j.1354-7798.2004.00251.x

Gao, P., & Yun, H. (2009). *Commercial paper, lines of credit, and the real effects of the financial crisis of 2008: Firm-level evidence from the manufacturing industry*. https://www.banqueducanada.ca/wp-content/uploads/2010/09/gao.pdf

García-Teruel, P-J., & Martínez-Solano, P. (2007) Short-term debt in Spanish SMEs. *International Small Business Journal, 25*(6), 579–602. https://doi.org/10.1177/0266242607082523

Gill, A., & Shah, C. (2012). Determinants of corporate cash holdings: Evidence from Canada. *International Journal of Economics and Finance, 4*(1), 70–79. https://doi.org/10.5539/ijef.v4n1p70

Guizani, M. (2017). The financial determinants of corporate cash holdings in an oil rich country: Evidence from Kingdom of Saudi Arabia. *Borsa Istanbul Review, 17*(3), 133–143. https://doi.org/10.1016/j.bir.2017.05.003

Han, S., & Qiu, J. (2007). Corporate precautionary cash holdings. *Journal of Corporate Finance, 13*(1), 43–57. https://doi.org/10.1016/j.jcorpfin.2006.05.002

Hausman, J. A. (1978). Specification tests in econometrics. *Econometrica, 46*(6), 1251–1271. https://doi.org/10.2307/1913827

Horioka, C. Y., & Terada-Hagiwara, A. (2013). Corporate cash holding in Asia. *Asian Economic Journal, 28*(4), 323–345. https://doi.org/10.1111/asej.12039

Ivashina, V., & Scharfstein, D. (2010). Bank lending during the financial crisis of 2008. *Journal of Financial Economics, 97*(3), 319–338. https://doi.org/10.1016/j.jfineco.2009.12.001

Jensen, M. C. (1986). Agency costs of free cash flow, corporate finance, and takeovers. *American Economic Review, 76*(2), 323–329. https://www.jstor.org/stable/1818789

Kaplan, S. N., & Zingales, L. (1997). Do investment-cash flow sensitivities provide useful measures of financing constraints?" *The Quarterly Journal of Economics, 112*(1), 169–215. https://doi.org/10.1162/003355397555163

Kim, C.-S., Mauer, D. C., & Sherman, A. E. (1998). The determinants of corporate liquidity: Theory and evidence. *The Journal of Financial and Quantitative Analysis, 33*(3), 335–358. https://doi.org/10.2307/2331099

Lian, Y., Sepehri, M., & Foley, M. (2011). Corporate cash holdings and financial crisis: An empirical study of Chinese companies. *Eurasian Business Review, 1*(2), 112–124. https://doi.org/10.14208/BF03353801

Magerakis, E. (2020). Corporate cash holdings and financial crisis: Evidence from the emerging market of Greece. *International Journal of Managerial and Financial Accounting, 12*(2), 186–215. https://doi.org/10.1504/IJMFA.2020.109139

Maheshwari, Y., & Rao, K. V. (2017). Determinants of corporate cash holdings. *Global Business Review, 18*(2), 416–427. https://doi.org/10.1177/0972150916668610

Miller, M. H., & Orr, D. (1966). A model of the demand for money by firms. *The Quarterly Journal of Economics, 80*(3), 413–435. https://doi.org/10.2307/1880728

Mirza, H. H., & Afza, T. (2014). Impact of corporate cash flow on dividend payouts: Evidence from South Asia. *Middle-East Journal of Scientific Research, 19*(4), 472–478. https://doi.org/10.2139/ssrn.2403513

Mishra, L. (2020, April 18). Over half of top 500 firms could face liquidity crisis. *The Hindu*. https://www.thehindu.com/business/over-half-of-top-500-firms-could-face-liquidity-crisis/article31377417.ece

Mishra, P., Moriyama, K., N'Diaye, P. M., & Nguyen, L. (2014). Impact of Fed tapering announcements on emerging markets. *IMF Working Papers, 2014*(109). https://doi.org/10.5089/9781498361484.001

Modigliani, F., & Miller, M. H. (1958). The cost of capital, corporation finance and the theory of investment. *The American Economic Review, 48*(3), 261–297. https://www.jstor.org/stable/1809766

Mohd-Ashhari, Z., & Faizal, D.-R. (2018). Determinants of performance of cash holdings: Evidence from small business in Malaysia. *International Journal of Economics, Management and Accounting, 26*(2), 457–473. https://journals.iium.edu.my/enmjournal/index.php/enmj/article/view/636

Mouline, B., & Sadok, H. (2021). Determinants of corporate cash holdings: Evidence from the Moroccan market. *Accounting, 7*, 1231–1240. https://doi.org/10.5267/j.ac.2021.4.017

Myers, S. C. (1977). Determinants of corporate borrowing. *Journal of Financial Economics, 5*(2), 147–175. https://doi.org/10.1016/0304-405X(77)90015-0

Myres, S. C., & Majluf, N. S. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics, 13*(2), 187–221. https://doi.org/10.1016/0304-405X(84)90023-0

Opler, T., Pinkowitz, L., Stulz, R., & Williamson, R. (1999). The determinants and implications of cash holdings. *Journal of Financial Economics, 52*(1), 30–46. https://doi.org/10.1016/S0304-405X(99)00003-3

Ozkan, A., & Ozkan, N. (2004). Corporate cash holdings: An empirical investigation of UK companies. *Journal of Banking and Finance, 28*(9), 2103–2134. https://doi.org/10.1016/j.jbankfin.2003.08.003

Poloz, S. S. (1986). Currency substitution and the precautionary demand for money. *Journal of International Money and Finance, 5*(1), 115–124. https://doi.org/10.1016/0261-5606(86)90054-9

Riyazahmed, K., & Saravanaraj, M. G. (2012). A study on working capital management and its impact on profitability and net worth of CNX FMCG Index companies. *Sona Global Management Review, 6*(3), 47–55.

Sawarni, K. S., Narayanasamy, S., & Ayyalusamy, K. (2021). Working capital management, firm performance and nature of business: An empirical evidence from India. *International Journal of Productivity and Performance Management, 70*(1), 179–200. https://doi.org/10.1108/IJPPM-10-2019-0468

Sriram, M. (2018). Board characteristics and firm performance — A study of S&P BSE Sensex in India. *Afro-Asian Journal of Finance and Accounting, 8*(3), 336–349. https://doi.org/10.1504/AAJFA.2018.10014377

Sriram, M. (2020). Do firm specific characteristics and industry classification corroborate voluntary disclosure of financial ratios: An empirical investigation of S&P CNX 500 companies. *Journal of Management and Governance, 24*(2), 431–448. https://doi.org/10.1007/s10997-018-9414-z

Tobin, J. (1956). The interest-elasticity of the transactions demand for cash. *The Review of Economics and Statistics, 38*(3), 241–247. https://doi.org/10.2307/1925776

Tran, Q. T. (2019). Corporate cash holdings and financial crisis: New evidence from an emerging market. *Eurasian Business Review, 10*(2), 271–285. https://doi.org/10.1007/s40821-019-00134-9

Wasiuzzaman, S. (2014). Analysis of corporate cash holdings of firms in Malaysia. *Journal of Asia Business Studies, 8*(2), 118–135. https://doi.org/10.1108/JABS-10-2012-0048

Wasiuzzaman, S. (2018). Determinants of liquidity in Malaysian SMEs: A quantile regression approach. *International Journal of Productivity and Performance Management, 67*(9), 1566–1584. https://doi.org/10.1108/IJPPM-12-2017-0354

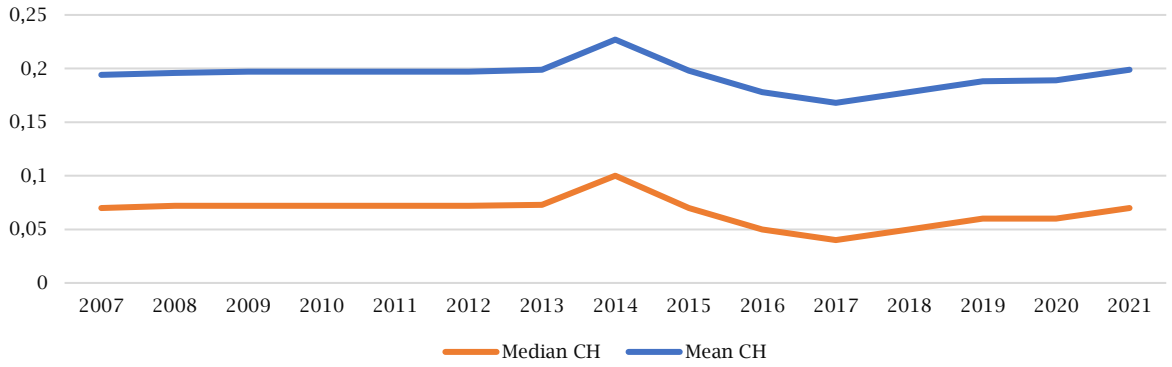
Wooldridge, J. M. (2013). *Introductory econometrics: A modern approach* (5th ed.). South-Western Cengage Learning.

Yang, X. Q., Qi, Y. F., & Wu, H. M. (2016). Does industry growth affect company cash holdings? *Management World, 1*(1), 153–169.

Yeo, H.-J. (2018). Role of free cash flows in making investment and dividend decisions: The case of the shipping industry. *The Asian Journal of Shipping and Logistics, 34*(2), 113–118. https://doi.org/10.1016/j.ajsl.2018.06.007

APPENDIX

Figure A.1. Cash holdings during the period of study



Source: Authors' calculation.

Table A.1. Stationarity test for panel data variables

Variables	*Levin-Lin-Chu panel unit root test*		*lm-Pesaran-Shin test*	
	t-statistic	*Prob**	*t-statistic*	*Prob**
CTA	-2.409	0.008	-1.883	0.029
NWC	-3.982	0.00000	-3.675	0.0001
CF	-9.065	0.00000	-3.119	0.0009
SIZ	-6.755	0.00000	-6.951	0.000
Tobin's Q	-5.755	0.00000	-2.964	0.0008
LV	-7.023	0.00000	-2.11	0.0008
CAPEX	-8.41	0.00000	-3.897	0.0008

*Note: * Significant at 1%.*