

## Full Length Article

# Corporate cash holdings in emerging markets

Alassane Diaw\*

*Department of Finance and Investment, Jouf University, Sakaka, Saudi Arabia*

Received 5 March 2020; revised 4 August 2020; accepted 15 September 2020

Available online 22 September 2020

## Abstract

This paper contributes to studies on corporate liquidity management. It explores the determinants of cash holdings of firms in emerging countries using panel data models. The results indicate that highly liquid firms in emerging countries show one or more of the following characteristics. They have larger size, lower capital expenditure, R&D, net working capital, leverage, and intangible assets. In addition, there is an inverse relationship between growth opportunities and cash holdings, suggesting the presence of a moral hazard problem. Moreover, using the system Generalized Method of Moments (GMM) estimator for dynamic panel data shows that the adjustment speed to the cash target level is not fast. The model also shows the impact of the dependent variable past realizations on corporate cash holdings.

Copyright © 2020, Borsa İstanbul Anonim Şirketi. Production and hosting by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

*JEL classification:* G30; G31; G32

*Keywords:* Cash holdings; Emerging markets; Intangibles; Cash target level; System GMM

## 1. Introduction

Recently, corporate cash holding issues have attracted the attention of researchers and stakeholders. After the 2008 financial crisis, many firms have accumulated significant levels of cash, raising questions about the rationale behind this strategy. If we account for the overseas cash hoarding of multinational firms, the reported amounts of cash are lower than in reality. Why is money sitting on firms' balance sheets instead of being redistributed or reinvested? One can argue about the financial power of these firms or the waste of investment opportunities. Indeed, the framework of the trade-off theory asserts that firms balance between the opportunity costs of holding too much cash and the financial distress costs caused by shortages in liquid assets. According to Keynesian economics, there are three main motives for holding cash: transaction, speculation, and precaution. The first motive assumes that economic agents must have sufficient funds to meet

daily expenses. The propensity to spend on the transaction motive is higher when agents have substantial income. The speculative motive allows firms to maintain cash to bet on possible opportunities. Finally, the precautionary motive aims to protect firms against unexpected situations that would require significant disbursements.

Myers and Majluf's (1984) pecking order theory and Jensen's (1986) free cash flow theory attempt to give more insights. The first theory poses the problem of financing in the presence of adverse selection and argues that firms use expensive external financing only when internal resources are exhausted. The second theory is based on the moral hazard where free cash flows at the discretion of managers offers them incentives to act for their own interests. In practice, the determinants of cash holdings are mostly based on firm-specific variables. The role of financing constraints is also emphasized as a driving factor for cash holdings (Almeida, Campello, & Weisbach, 2004; Denis & Sibilkov, 2009).

Studies on cash holdings' determinants in emerging markets were most often carried out on individual countries or samples comprising of a limited number of countries (Al-Najjar, 2013; Guizani, 2017; Joe & Oh, 2018; Koo &

\* P.O Box 2595, Sakaka, 42421.

E-mail address: [aalassane.diaw@gmail.com](mailto:aalassane.diaw@gmail.com).

Peer review under responsibility of Borsa İstanbul Anonim Şirketi.

Maeng, 2019; Lim & Lee, 2019; Uyar & Kuzey, 2014). According to many authors (Feng, Lo, & Chan, 2019; Shiau, Chang, & Yang, 2018), a financial crisis or an economic uncertainty is the origin of this “cash mania”, accrediting the precautionary motive. Thakur and Kannadhasan (2019) link corruption and cash holdings for a sample of firms from 16 emerging countries. Hall, Mateus, and Mateus (2014) compare the cash levels of firms in the emerging Central and Eastern European markets.

The objective of this paper is to study the determinants of corporate cash holdings in emerging countries by focusing on the importance of intangible capital. Due to accounting practices and the reluctance of firms to disclose it, intangible capital is difficult to pinpoint. Recently, a more integrated approach of intangible capital was proposed (Falato, Kadyrzhanova, Sim, & Steri, 2020; Peters & Taylor, 2017). Our models include internally created intangible capital (R&D) and purchased intangible capital. We are aware that the organizational capital, which accounts for high percentage of intangible capital, is not included in the analysis. We found that the prevalence of the positive association between intangibles and cash holdings in firms of developed markets does not hold for emerging economies. For firms which are not at the cutting edge of technology the market generally undervalues investments in intangibles, thus rising firm's cost of capital. If we take into account information asymmetry and adverse selection, it is very likely that investments (capex, intangibles) are funded by at least part of the cash already accumulated. The study of growth opportunities, which are intangible in their nature, helps to complete the picture. Further, we investigate how quickly emerging markets firms adjust to cash target level compared to firms in advanced economies.

The final sample is made up of by 21 emerging countries over the period 2010–2018. To be included, each country must report at least 10 unique firms after applying the filters on the relevant variables. To the best of our knowledge, this is the first study to include such a large sample of emerging countries covering the period after the 2008 financial crisis. This allows us to grasp implicitly whether corporate liquidity dynamics have strengthened or diminished over the past decade. The results show that intangibles, broadly defined, have a negative impact on liquidity levels, thus exacerbating agency problems and information asymmetry. More specifically, a decrease in cash holdings in response to an increase in intangibles and R&D expenses is more pronounced for large firms. Such negative relation of cash holdings with the variables capital expenditures and leverage exists, but the effect is also moderated by small firms. The low degree of multinationalization and the constraints to access capital markets are possible explanations. Finally, the results report that emerging market firms use the partial adjustment model by setting a target level of cash holdings. However, the speed of adjustment is low compared to that found in similar studies carried out in developed countries. The remainder of the paper

is as follows. Section 2 reviews the literature and undertakes hypotheses development. Section 3 presents data. Section 4 presents methods. Section 5 reports and discusses the results. Section 6 presents the conclusions of this paper.

## 2. Literature review and hypotheses

Numerous studies investigate a firm's behavior regarding cash reserves. The Keynesian theory of demand for liquidity (Keynes, 1936) and the agency theory (Jensen, 1986) are the few theories that provide a structured framework for understanding the mechanisms governing a firm's cash holding. The basic premise is that markets have frictions and information asymmetries. Maintaining high levels of assets that do not generate returns is not advisable.

Firm-specific variables and financing constraints are the most explored determinants of cash holdings. Opler, Pinkowitz, Stulz, and Williamson (1999) study cash holdings' determinants for US firms. The authors' results support the trade-off theory which contends that firms compare the marginal costs and benefits of cash holdings. Almeida et al. (2004) analyze the problem regarding financial constraints on liquidity demand. They found that financially constrained firms should have sufficient cash to cover unexpected expenses, and finance future investments. Denis and Sibilkov (2009) find that financially constrained firms increase their cash holdings as an alternative to costly external financing. Ozkan and Ozkan (2004) investigate the impact of ownership and board structure on corporate cash holdings. Ferreira and Vilela (2004) examine the relationship of cash holdings with investor protection and ownership structure. Pinkowitz, Stulz, and Williamson (2006) hypothesize an association between investor protection and cash holdings, which indicates why minority investors in developing countries' firms value dividends more than cash holdings. Bates, Kahle, and Stulz (2009) argue that firms accumulate cash not only for the sake of precaution, but also to generate surplus for future investments. Alvarez, Sagner, and Valdivia (2012) find that liquidity shocks negatively impact Chilean firms' cash holdings. Empirical evidence in the cash holdings literature emphasizes the role of firm-specific variables. The following are the determinants of cash holdings in relation to our variables.

### 2.1. Size

Firm size is one of the most explored determinant of a firm's cash holdings. Large firms have fewer financial barriers, and therefore, are less dependent on their internal resources. These firms can generate cash through their sustained cash flows. Therefore, liquidity and firm size are expected to be negatively related. This relationship, which draws its explanation from the trade-off theory, is advocated by an important section of the literature (Almeida et al., 2004; Bates et al., 2009; Bigelli & Sánchez-Vidal, 2012; Drobetz & Grüninger, 2007; Opler et al., 1999). On the contrary, one can assume

that large firms are more likely to have significant cash in hand. This positive relationship is validated by another strand of literature (Al-Najjar, 2013; Ferreira & Vilela, 2004; Opler et al., 1999).

**H1.** There is a positive/negative relationship between a firm's cash holdings and its size.

## 2.2. Capital expenditures and leverage

Firms with large capital expenditures draw on their liquidity reserves (Opler et al., 1999) and these investments are valued by creditors as collateral (Bates et al., 2009). Therefore, the level of cash and capital expenditures would be negatively linked. For instance, Guizani (2017) and Shiau et al. (2018) report a negative relationship of cash holdings with financial leverage and capital expenditure. Guney, Ozkan, and Ozkan (2007) note that the relationship between cash holdings and leverage can be positive (precautionary motive) or negative (substitution motive), varying according to country-specific factors. However, Kahle and Stulz (2013) argue that the association between leverage and capital expenditures is not always justified economically. They affirm that in the context of a financial crisis, a decrease in capital expenditure may be independent of the firm's financial characteristics. For emerging countries, cash accumulation following a financial crisis is presumably oriented to capital expenditures. Therefore, one can expect a negative relationship of cash holdings with capital expenditures and leverage.

**H2.** There is a negative relationship of firm's cash holdings with both capital expenditures and leverage.

## 2.3. Net working capital

The static trade-off theory predicts a negative relation between cash holdings and net working capital. Bigelli and Sánchez-Vidal (2012) argue that net working capital is a perfect alternative to cash for some Italian firms. Firms with high levels of net working capital substitute cash by other liquid assets. Lian, Sepehri, and Foley (2011), and Trejo-Pech, Noguera, and Gunderson (2016, pp. 111–133) find similar evidence in China and Mexico, respectively. However, Al-Najjar (2013) suggests that, except for India, there is a little evidence of this relationship for the other BRIC countries.

**H3.** There is a negative relationship between a firm's cash holdings and its net working capital.

## 2.4. Cash flow

A firm generates cash surplus through its activities. This surplus is used for investments and to meet financial commitments. Therefore, cash flow and cash holdings are linked. Firms that manage to build large cash reserves from sustained cash flows can make less financially risky investments. Opler

et al. (1999) and Ferreira and Vilela (2004) document a positive relationship between cash flow and cash holdings. Investigating corporate cash holdings behavior in eleven South East Asian countries, Horioka and Terada-Hagiwara (2014) support this view, particularly for small and constrained firms.

**H4.** The relationship between a firm's cash holdings and its cash flow is positive.

## 2.5. Cash flows volatility

The volatility of cash flows exposes firms to uncertainty. Hence, it is important to have enough liquid assets to support investment opportunities and minimize illiquidity costs (Ferreira & Vilela, 2004; Opler et al., 1999; Ozkan & Ozkan, 2004). The positive relationship between cash flow volatility and cash holdings is also reported by Han and Qiu (2007) for constrained firms.

**H5.** There is a positive relationship between a firm's cash holdings and its cash flow volatility.

## 2.6. Growth opportunities

Firms may have to give up projects with positive net present value (NPV) if they cannot raise funds on time. Therefore, building cash reserves is a pledge to seize investment opportunities even in the presence of financial constraints. Opler et al. (1999) and Ozkan and Ozkan (2004) report a significant positive relationship of growth opportunities with cash holdings. Similar results are found in Uyar and Kuzey (2014). Ahrends, Drobotz, and Puhan (2018) conjecture that business cycles determine the relation growth opportunities-cash holdings. There is a convergence between the pecking order theory and the trade-off theory regarding the positive association between cash holdings and growth opportunities which respond to precautionary and transactional motives. In contrast, agency theory predicts a negative relationship between the two variables if self-interested managers of low-growth opportunities firms accumulate cash and dissipate it in unprofitable projects (Bates et al., 2009; Ferreira & Vilela, 2004). Therefore, low-growth opportunities firms with an entrenched management are likely to hoard more cash.

**H6.** There is a positive/negative relationship between a firm's cash holdings and its growth opportunities.

## 2.7. Intangibles

Increasing intangible capital can expose firms to funding problems by reducing collateralizable assets, which can increase the amount of cash assets. Marwick, Hasan, and Luo (2020) find a link between cash holdings and organization capital. This relationship is more noticeable for financially constrained firms. Studying the cash holdings in the context of multinational firms, Gu (2017) notes that the firms which plan to deploy overseas have

higher levels of intangibles than local firms and mobilize, ex-ante, higher levels of cash. Therefore, a positive relationship between cash holdings and intangibles is expected.

**H7.** The relationship between a firm's cash holdings and its intangible capital is positive.

## 2.8. Research and development

Many studies report that R&D intensive firms hold more cash (Bates et al., 2009; He & Wintoki, 2016; Levitas & McFadyen, 2009; Opler et al., 1999). However, Brown and Petersen (2011) find that financially constrained firms can free up cash to increase R&D expenses, while unconstrained firms smooth R&D expenses to avoid cash holding costs. Baum, Caglayan, and Talavera (2013) report a positive relationship between cash holdings and R&D expenses for a sample of firms from Germany, UK and USA. In the same vein, Chung (2017) shows that after the 2008 financial crisis, Korean firms used liquidity reserves to smooth R&D spending.

**H8.** The relationship between a firm's cash holdings and its R&D expenses is positive or negative.

## 2.9. Target cash level

According to the trade-off theory, firms compare the marginal benefits and costs of holding cash. Thus, there would be an implicitly targeted cash level. However, adjustment costs cause delays in moving back towards the target. Due to market imperfections, the delay is almost never completely filled, as found in the partial adjustment model with several empirical validations (Baum et al., 2013; Opler et al., 1999; Ozkan & Ozkan, 2004). Therefore, one can assume that there is a firm's target cash level in emerging countries, and the speed of adjustment is slow due to market imperfections (e.g. moral hazard, and adverse selection).

**H9.** There is slow partial adjustment to the target cash level.

## 3. Data and descriptive statistics

The objective of this paper is to study corporate cash holding in emerging economies for which we have data for the period 2010–2018. Our sample constitutes 21 emerging markets (United Arab Emirates, Argentina, Brazil, Chile, Colombia, Croatia, Indonesia, South Korea, Mexico, Malaysia, Pakistan, Peru, Philippines, Poland, Qatar, Russia, Saudi Arabia, Thailand, Turkey, Taiwan, and South Africa). The data are provided by Compustat Global. Utilities (SIC: 4900–4999) and financial firms (SIC: 6000–6999) are excluded. Firms with negative or missing cash values are also dropped. If R&D expenses are not reported, the missing values are set to zero. The same process is followed for other intangibles. After removing firms with negative sales, we are left

with 4107 unique observations or 36,963 firm-year observations. Table 1 gives the country distribution of firms-year.

The cash ratio has decreased by 12% from 13.24% in 2010 to 11.79% in 2018. This decline hides some disparities between countries and geographical areas. The highest cash ratios are observed in Taiwan (19%), Malaysia (17%), Philippines (13%), South Africa (12%), Qatar (11%), Indonesia (10.6%), and Brazil (10.27%). Descriptive statistics for the variables are reported in Appendix A. By region, East Asian countries exhibit an average of 14.44%. Latin America, MENA, and Europe regions follow with 8.23%, 8.33%, and 8.5% respectively. The only African country in the sample, South Africa, reports a cash ratio of 12%.

Table 2 shows the descriptive statistics for the firm-specific variables. The average cash, leverage, and net working capital ratios are 13%, 45%, and 21%, respectively. The variable yearly sales growth is calculated as the natural logarithm difference of the changes in revenues. Cash flow volatility is the absolute value of cash flow changes minus average cash flow changes. The distribution is right skewed as the mean is higher than the median.

Table 3 shows that the variables are weakly correlated but most of coefficients are significant. Variables LEV and RD exhibit the highest correlation (0.3) with cash holdings, followed by the correlations between LEV and SIZE (0.24), CF and LEV (0.18), and CF and CAPEX (0.17). The weak correlation between the independent variables guarantees the absence of collinearity.

Table 1  
Country firm-year observations.

S. No	Country	No. Firms	Firm-year	Weights
1	UAE	20	180	0.49%
2	Argentina	28	252	0.68%
3	Brazil	128	1152	3.11%
4	Chile	84	756	2.04%
5	Colombia	19	171	0.46%
6	Croatia	37	333	0.90%
7	Indonesia	225	2025	5.48%
8	South Korea	565	5085	13.75%
9	Mexico	69	621	1.68%
10	Malaysia	436	3924	10.61%
11	Pakistan	98	882	2.38%
12	Peru	50	450	1.22%
13	Philippines	91	819	2.21%
14	Poland	224	2016	5.45%
15	Qatar	14	126	0.34%
16	Russia	63	567	1.53%
17	Saudi Arabia	88	792	2.14%
18	Thailand	345	3105	8.40%
19	Turkey	114	1026	2.77%
20	Taiwan	1335	12,015	32.50%
21	South Africa	74	666	1.80%
Total		4107	36,963	

The sample comprises six countries from Americas (Argentina, Brazil, Chile, Colombia, Mexico, Peru), seven East Asian countries (Indonesia, South Korea, Malaysia, Pakistan, Philippines, Thailand, Taiwan), three countries from the MENA Region (UAE, Saudi Arabia, Qatar), four European countries (Croatia, Poland, Russia, Turkey), and one African country (South Africa).

Table 2  
Descriptive statistics for the full sample.

	N	Mean	Median	STD	Min	Max
Cash/Assets	36,963	0.13	0.09	0.42	0.00	77.99
Cash Flows/Assets	36,963	0.07	0.07	0.11	-4.23	5.58
Capital expenditures/Assets	36,963	0.05	0.03	0.05	0.00	1.17
Leverage/Assets	36,963	0.21	0.19	0.17	0.00	0.90
Net Working Capital/Assets	36,963	0.08	0.07	0.44	-77.30	0.84
Log (Total Assets)	36,963	8.90	8.27	3.03	0.00	19.65
R& D/Assets	36,963	0.01	0.00	0.03	0	1.23
Intangibles/Assets	36,963	0.04	0.01	0.10	0	0.92
Yearly sales growth	32,856	0.03	0.04	0.45	-9.47	9.52
Cash Flow Volatility	32,856	1.49	0.26	12.77	0.00	782

#### 4. Empirical specification

Estimations are done using static and dynamic panel data models. The dynamic panel data model is the most recommended to overcome the endogeneity bias problem. This is in addition to introducing the partial adjustment model, which stipulates that firms adjust their cash holdings to a target level accounting for the costs incurred. This adjustment is more or less rapid depending on firm's constraints.

##### 4.1. Static panel data model

We estimate the model where the dependent variable (NCR) is the firm's cash ratio. Three measures are used: the ratio of cash and equivalents to total assets minus cash and equivalents (Dittmar, Mahrt-Smith, & Servaes, 2003), the ratio of cash and marketable securities to total assets (Bates et al., 2009), and the ratio of cash and marketable securities to total assets minus cash and marketable securities (Opler et al., 1999). The independent variables are cash flows (CF), capital expenditures (CAPEX), net working capital (NWC), leverage (LEV), natural logarithm of assets (size), intangibles (INTG), yearly sales growth (YSG), Research & Development (RD), and cash flow volatility (VOL). The variable Market-to-Book

Table 3  
Correlation matrix.

	CASH	NWC	CAPEX	LEV	SIZE	RD	VOL	CF	YSG	INTG
CASH	1.00									
NWC	-.04*	1.00								
CAPEX	-.09*	-.07*	1.00							
LEV	-.27*	-.16*	.12*	1.00						
SIZE	-.13*	-.07*	.07*	.24*	1.00					
RD	.27*	.03*	-.05*	-.16*	-.06*	1.00				
VOL	.00	-.01	-.01*	.02*	-.01*	.02*	1.00			
CF	.05*	.04*	.17*	-.18*	.03*	-.12*	-.02*	1.00		
YSG	-.01	.01	.04*	-.00	.04*	-.01*	-.01*	.12*	1.00	
INTG	-.05*	-.06*	-.03*	.07*	.03*	-.02*	-.00	-.01*	.05*	1.00

**Note:** CASH is cash and cash equivalents by total assets minus cash and cash equivalents. NWC is the ratio of working capital minus cash and cash equivalents by total assets. CAPEX represents the ratio of capital expenditures by total assets. LEV represents the leverage and is computed as the book value of long-term debt by the book value of total assets. SIZE is measured as the natural logarithm of total assets. RD represents R&D expenses (equals zero when R&D is missing) and is scaled by total assets. VOL, the volatility of a firm's cash-flow is measured as the absolute value of the difference between cash flow consecutive changes and average of cash flow changes. CF is the ratio of cash-flow to assets (Earnings before extraordinary items+ depreciation and amortization)/the total assets. YSG, the yearly sales growth is captured by using natural logarithm of sales changes. INTG is the ratio of intangibles to total assets. \*significant at 5% or less.

ratio is not available in the dataset. Therefore, as suggested by many authors, the variable YSG is used to proxy growth opportunities. The variables are winsorized at 1% and 99% to minimize outliers. A panel data estimation with the firms representing individuals and the time variable represented by the year 2010–2018 is implemented. Hausman's test is in favor of the fixed-effects specification over the random effects one.

$$\begin{aligned}
 NCR_{i,t} = & \beta_0 + \beta_1 CF_{i,t} + \beta_2 CAPEX_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 NWC_{i,t} \\
 & + \beta_5 LEV_{i,t} + \beta_6 INTG_{i,t} + \beta_7 YSG_{i,t} + \beta_8 RD_{i,t} + \beta_9 VOL_{i,t} \\
 & + year_{dummies} + \epsilon_{i,t}
 \end{aligned}
 \tag{1}$$

To examine the results' sensitivity to the measures of cash holdings, the dependent variable (NCR) is calculated according to the specifications mentioned above. The variable (NWC) is calculated without cash. Results are reported in Table 4. The literature review shows that the expected coefficients of some of our determinants are ambiguous. To contextualize the results about underlying theories, interactions of the main determinants with the firm size are included. Firms are sorted by size using the median size of the logarithm of total assets. The interactions of the firm size with the main determinants of cash holdings are widely used to proxy financial constraints (Baum et al., 2013). The augmented model is specified as follows:

$$\begin{aligned}
 NCR_{i,t} = & \alpha_0 + \alpha_1 CF_{i,t} + \gamma_1 (CF_{i,t} * D_{i,t}) + \alpha_2 CAPEX_{i,t} + \\
 & \gamma_2 (CAPEX_{i,t} * D_{i,t}) + \alpha_3 SIZE_{i,t} + \alpha_4 NWC_{i,t} + \\
 & \gamma_3 (NWC_{i,t} * D_{i,t}) + \alpha_5 LEV_{i,t} + \gamma_4 (LEV_{i,t} * D_{i,t}) + \\
 & \alpha_6 INTG_{i,t} + \gamma_5 (INTG_{i,t} * D_{i,t}) + \alpha_7 YSG_{i,t} + \\
 & \gamma_6 (YSG_{i,t} * D_{i,t}) + \alpha_8 RD_{i,t} + \gamma_7 (RD_{i,t} * D_{i,t}) + \\
 & \alpha_9 VOL_{i,t} + year_{dummies} + \epsilon_{i,t}
 \end{aligned}
 \tag{2}$$

Table 4  
Results of the fixed-effects model.

	Depvar1	Depvar2	Depvar3
CF	0.2797*** (0.0139)	0.1599*** (0.0077)	0.3490*** (0.0198)
CAPEX	-0.3196*** (0.0191)	-0.2062*** (0.0105)	-0.5148*** (0.0271)
SIZE	0.0058*** (0.0016)	0.0039*** (0.0009)	0.0110*** (0.0023)
NWC	-0.5274*** (0.0084)	-0.2865*** (0.0051)	-0.6603*** (0.0131)
LEV	-0.4057*** (0.0098)	-0.2525*** (0.0054)	-0.5174*** (0.0140)
INTG	-0.4764*** (0.0198)	-0.3186*** (0.0109)	-0.7585*** (0.0280)
YSG	-0.0263*** (0.0029)	-0.0143*** (0.0016)	-0.0424*** (0.0043)
RD	-0.0098 (0.0753)	-0.0210 (0.0415)	-0.2817*** (0.1067)
VOL	0.0000 (0.0003)	-0.0001 (0.0001)	-0.0004 (0.0004)
Year-dummies	Yes		
N	36,963	36,963	36,963
F (16,28,733)	353.34	378.9	287.46
Pr>F	0.0000	0.0000	0.0000

**Note:** Year-dummies are included in the regression setting. Standard errors are reported between brackets. \*\*\*/\*\*/\* indicate a significance level at 1%, 5%, and 10% respectively.

D is a dummy variable taking the value 1 for “Big” firms and 0 for “Small” firms. The results of the estimation are reported in Table 5.

#### 4.2. Dynamic panel data

The last hypothesis states that firms, through an adjustment process, maintain their cash holdings at the target level. This effect is captured by introducing the lagged dependent variable. The model offers the possibility to reconcile the pecking order theory and the trade-off theory. Fixed or random effects models ignore the influence of historical realizations of

Table 5  
The augmented fixed-effects model.

	Coefficients	Std. Err.
Big*CF	0.0719***	0.0388
Big*CAPEX	-0.2739**	0.0524
SIZE	0.0101***	0.0025
Big*NWC	-0.1769***	0.0234
Big*LEV	-0.2155***	0.0246
Big*INTG	-0.3348***	0.0452
Big*YSG	-0.0400***	0.0065
Big*RD	-0.3816**	0.1570
VOL	-0.0004	0.0004
Year-dummies	Yes	
N	36,963	
F (23,28,726)	207.64	
Pr>F	0.0000	

**Note:** Interactions coefficients represent the difference between the slopes of the variables for the base (small firms) and the slope of big firms. Main effects are included but not reported, except for the variables SIZE and VOL. Year-dummies are included in the regression setting. \*\*\*/\*\*/\* indicate a significance level at 1%, 5%, and 10% respectively.

regressors on the dependent variable. To overcome the endogeneity bias, the system Generalized Method of Moments (GMM) estimator is adopted following the approach proposed by Roodman (2009).

The model is specified as follows:

$$NCR_{i,t} = \beta_0 + \beta_1 NCR_{i,t-1} + \beta_2 CAPEX_{i,t-1} + \beta_3 SIZE_{i,t-1} + \beta_4 NWC_{i,t-1} + \beta_5 LEV_{i,t-1} + \beta_6 INTG_{i,t-1} + \beta_7 YSG_{i,t-1} + \beta_8 RD_{i,t-1} + \beta_9 VOL_{i,t-1} + year\_dummies + v_i + \varepsilon_{i,t} \quad (3)$$

This setting includes the lagged value of the dependent variable. The adjustment speed is measured by the term  $1 - \beta_1$ . Higher the value of  $\beta_1$ , lower the speed of adjustment. The term  $v_i$  captures the heterogeneity. The most difficult part is to find valid instruments. Intuition plays an important role, as one can even perform a posteriori tests to check the reliability of the instruments. The instruments in the system GMM are the lagged levels in differences and the lagged differences in levels equations. All firm-characteristics variables are treated as endogenous and lagged once, except the variables CF and NWC which are implemented with two lags. The time dummies and the variables CAPEX, NWC, and RD are strictly exogenous. The remaining variables are implemented with two lags at the equation level and up to five lags in the regression on differences. This specification yields the best results. Diagnostic tests of instrument validity and serial correlation are provided. Table 6 reports the results.

### 5. Results and discussion

Here, we discuss our findings on the effect of firm-specific variables on cash holdings in emerging markets. Table 4 presents regression outputs using three different specifications for

Table 6  
Two-steps system GMM dynamic panel estimations.

	Coefficients	Robust Std. Err	t-statistic
NCR <sub>t-1</sub>	0.7676***	0.1048	7.32
SIZE	-0.0027	0.0032	-1.98
CF	-0.1679**	0.0700	-2.40
CAPEX	-0.2650**	0.1206	-2.20
NWC	-0.0771*	0.0459	-1.68
LEV	-0.1318**	0.0554	-2.38
YSG	0.0197	0.0412	0.48
RD	0.7806*	0.4570	1.71
INTG	-0.1251*	0.0732	-1.71
VOL	-0.0114	0.0076	-1.55
Year-dummies	Yes		
Firm-year	36,963		
Firms	4107		
Instruments	128		
J	107.19		
J p-value	0.504		
AR (2)	0.555		

**Note:** The dependent variable is the firm cash ratio (NCR) calculated as in Opler et al. (1999). Standard errors are robust, and the lagged variable of NCR is predetermined by GMM specification. The Hansen J statistic for the null hypothesis of instrument and validity is reported. AR (2) test second order serial autocorrelations. \*\*\*/\*\*/\* indicate a significance level at 1%, 5%, and 10% respectively.

the dependent variable. All models are well-fitted. However, in specification 3, all variables are significant except cash flow volatility (VOL). In addition, the relative importance of the coefficients from one specification to another is sensitive to the formula used to compute the different ratios. Thus, the interpretation will be focused on the last column of the table. The variable cash flow (CF) exhibits a positive and significant coefficient. Therefore, cash holdings and cash-flow are positively associated in concordance with the pecking order theory. Opler et al. (1999) and Ferreira and Vilela (2004) report similar findings. Regarding the variable CAPEX, the coefficient is negative and significant, consistent with the findings of Dittmar et al. (2003) and Bates et al. (2009). On the contrary, the coefficient of leverage (LEV) is also negative and significant. It is only the free cash flow theory which makes an unambiguous statement on the negative relationship between cash holdings and leverage. Indeed, debt is supposed to have a disciplinary power on managers and exerts downward pressure on liquidity.

The variable net working capital (NWC) exhibits a negative coefficient, thereby corroborating our hypothesis, and is consistent with the predictions of the trade-off theory. Indeed, net working capital is the perfect substitute for cash (Almeida et al., 2004).

The variable R&D and INTG are significant and negative, partly consistent with our predictions. This negative coefficient can find an explanation in the pecking order theory (Opler et al., 1999). The relationship between cash holdings and growth opportunities (YSG) is negative, as suggested by the free cash flow theory. In addition, the volatility of cash flow (VOL) is found to be insignificant in all model specifications. The impact of the variable SIZE on cash holdings, although small, is positive and significant. To sum up, the baseline model shows a negative and significant relationship of cash holdings with variables intangibles and yearly sales growth. The impact of cash flow on cash holdings is positive and consistent with our predictions while cash flow volatility is found to be statistically insignificant. Further evidence is provided by the model with interactions.

Table 5 presents the results of the model with interactions. The variable size is widely used in the literature as a proxy for financial constraints and generally determines the behavior of the other variables in the analysis. The augmented model includes size interactions with all significant variables in the previous framework. The dependent variable is the same as in specification 3.

The results show that the effect of cash flow on cash holdings is relatively higher (+7%) for large firms. Generally, large firms in emerging countries reduce their cash holdings in greater proportions, compared to small firms, in response to increasing intangibles and R&D expenses. A negative relation of cash holdings with the variables CAPEX, LEV, NWC, and YSG exists but the effect is also moderated by small firms. One of the possible explanations could lie in the low degree of multinationalization and the constraints to access capital markets.

Next, we analyze the cash adjustment process through the GMM estimator. Table 6 presents the results. The variable of concern is the lagged dependent variable of NCR.

The results show that the one-year lagged dependent variable impacts positively and significantly cash holdings for the subsequent year. This indicates that firms adjust their cash holdings to the target level. The speed of adjustment to the target cash level is 0.23 (1-0.77), as reflected by the slope of the lagged dependent variable. This variable is lower than what is reported for developed countries (Guney et al., 2003; Ozkan & Ozkan, 2004; Drobetz & Grüninger, 2007). The costs caused by market frictions in most emerging countries can be a deterrent for firms against reverting to the optimal level.

The effects of past realizations of control variables CF, NWC, LEV, CAPEX, and INTG are negative and significant, while lagged R&D expenses are positively related to cash holdings. Variables SIZE, YSG, and VOL are found to be insignificant. We note that the coefficients of growth opportunities (YSG) and R&D turned positive compared to the model with main effects, while the coefficient of CF is now negative (−0.17).

The overall results show that the increase of cash holdings in emerging countries is associated with a decrease in net working capital, leverage, capital expenditure, intangibles, and R&D expenses. The size of the firm has a positive effect on cash holdings to a lesser extent. In addition, the more the firm generates cash flow, the greater the increase in its cash reserves. According to the free cash flow hypothesis, the negative relationship between cash holdings and growth opportunities suggests the existence of agency problems that encourage managers to hoard cash and invest in unprofitable projects. It is important to note that all these relations are reinforced for large firms. Most results find their substance in the pecking order theory. To complete the analysis, the dynamic framework gives new insights. The results show that the cash endowments of the previous year have a significant effect on current cash holdings, supporting the hypothesis that the firms partly respond to the partial adjustment model by setting a target level of cash holdings. However, the speed of adjustment is low compared to similar studies carried on developed countries.

## 6. Conclusion

Studies on corporate finance have been largely structured for decades around the search for an optimal long-term financial structure. Recently, questions have arisen about the colossal amounts of liquid assets accumulated by firms around the world. The frontier between short-term and long-term dynamics is so tenuous that operational imbalances become structural. The purpose of this paper was to study the determinants of cash holdings in emerging countries for the period 2010–2018. The results indicate that the profile of a liquid firm in these countries presents one or more of the following characteristics. These firms have a large size, low capital expenditure, leverage, intangibles, and research & development expenses. They probably face a moral hazard problem as poor growth opportunities do not prevent managers from hoarding cash to invest in unprofitable projects. Finally, there is a cash level target. However, the partial adjustment

process is slow compared to developed countries due to high adjustment costs and market imperfections. This work, although contributing to the literature on liquidity management in emerging markets' firms, is limited by the lack of corporate governance and market data. Also, future research avenues could include more appropriate measures of intangible capital in corporate finance issues.

### Declaration of competing interest

The Author declares that there is no conflict of interest.

### Appendix A. Descriptive of the main variables by country.

	CASH	CF	CAPEX	LEV	NWC	SIZE	R&D	INTG	YSG	VOL
<b>UAE</b>										
Firm-year	180	180	180	180	180	180	180	180	160	160
Mean	0.083	0.085	0.048	0.192	0.080	7.489	0.000	0.050	-0.006	0.654
Median	0.057	0.085	0.038	0.183	0.076	7.324	0.000	0.000	0.018	0.177
STD	0.082	0.083	0.048	0.150	0.134	1.550	0.000	0.105	0.273	1.415
<b>Argentina</b>										
Firm-year	252	252	252	252	252	252	252	252	224	224
Mean	0.077	0.104	0.058	0.207	0.107	7.372	0.000	0.057	0.241	3.246
Median	0.059	0.103	0.038	0.172	0.104	6.990	0.000	0.005	0.243	0.331
STD	0.074	0.099	0.055	0.166	0.188	2.107	0.000	0.161	0.261	31.05
<b>Brazil</b>										
Firm-year	1152	1152	1152	1152	1152	1152	1152	1152	1024	1024
Mean	0.102	0.077	0.044	0.278	0.076	7.986	0.004	0.144	0.074	2.596
Median	0.080	0.075	0.034	0.278	0.059	7.856	0.000	0.063	0.080	0.269
STD	0.086	0.078	0.041	0.178	0.157	1.762	0.014	0.181	0.248	24.04
<b>Chile</b>										
Firm-year	756	756	756	756	756	756	756	756	672	672
Mean	0.063	0.071	0.049	0.254	0.081	10.315	0.000	0.074	0.067	1.125
Median	0.048	0.066	0.035	0.265	0.055	10.905	0.000	0.033	0.064	0.219
STD	0.059	0.072	0.049	0.141	0.157	3.316	0.001	0.106	0.333	7.374
<b>Colombia</b>										
Firm-year	171	171	171	171	171	171	171	171	152	152
Mean	0.063	0.063	0.041	0.165	0.035	14.779	0.000	0.088	0.075	1.329
Median	0.043	0.054	0.029	0.130	0.011	14.538	0.000	0.030	0.067	0.277
STD	0.062	0.064	0.037	0.124	0.145	1.747	0.000	0.109	0.207	4.304
<b>Croatia</b>										
Firm-year	333	333	333	333	333	333	333	333	296	296
Mean	0.066	0.062	0.056	0.225	0.027	7.186	0.000	0.031	0.041	0.933
Median	0.037	0.065	0.043	0.206	0.008	7.012	0.000	0.007	0.046	0.235
STD	0.082	0.080	0.045	0.160	0.187	1.108	0.000	0.062	0.173	2.983
<b>Indonesia</b>										
Firm-year	2025	2025	2025	2025	2025	2025	2025	2025	1800	1800
Mean	0.106	0.087	0.062	0.254	0.067	13.067	0.000	0.025	-0.094	0.971
Median	0.072	0.075	0.041	0.239	0.038	14.046	0.000	0	0.080	0.232
STD	0.108	0.094	0.063	0.188	0.184	3.599	0.003	0.080	1.310	5.112
<b>S. Korea</b>										
Firm-year	5085	5085	5085	5085	5085	5085	5085	5085	4520	4518
Mean	0.082	0.052	0.049	0.255	0.032	13.167	0.014	0.037	0.027	1.709
Median	0.063	0.055	0.035	0.253	0.025	12.886	0.004	0.014	0.034	0.317
STD	0.075	0.089	0.047	0.164	0.182	1.602	0.003	0.066	0.323	14.205
<b>Mexico</b>										
Firm-year	621	621	621	621	621	621	621	621	552	552
Mean	0.087	0.079	0.047	0.270	0.055	10.176	0.000	0.162	0.063	0.870
Median	0.071	0.075	0.038	0.260	0.030	10.187	0.000	0.058	0.085	0.204
STD	0.073	0.062	0.040	0.168	0.154	1.488	0.002	0.210	0.314	3.805
<b>Malaysia</b>										
Firm-year	3924	3924	3924	3924	3924	3924	3924	3924	3488	3488
Mean	0.171	0.073	0.039	0.163	0.100	6.122	0.002	0.046	0.039	1.420
Median	0.113	0.069	0.024	0.126	0.107	5.965	0.000	0.004	0.041	0.277
STD	0.249	0.145	0.045	0.157	1.249	1.627	0.017	0.103	0.398	10.751
<b>Pakistan</b>										
Firm-year	882	882	882	882	882	882	882	882	784	784

(continued on next page)



(continued)

	CASH	CF	CAPEX	LEV	NWC	SIZE	R&D	INTG	YSG	VOL
Mean	0.068	0.109	0.062	0.243	0.065	8.818	0.000	0.013	0.085	0.869
Median	0.023	0.097	0.043	0.222	0.050	8.604	0.000	0	0.091	0.249
STD	0.100	0.091	0.064	0.206	0.169	1.533	0.004	0.053	0.244	2.964
<b>Peru</b>										
Firm-year	450	450	450	450	450	450	450	450	400	400
Mean	0.065	0.094	0.052	0.194	0.057	6.805	0.000	0.059	0.024	0.846
Median	0.035	0.074	0.038	0.176	0.048	6.782	0.000	0.003	0.041	0.295
STD	0.088	0.093	0.049	0.141	0.163	1.301	0.003	0.101	0.212	2.887
<b>Philippines</b>										
Firm-year	819	819	819	819	819	819	819	819	728	728
Mean	0.132	0.084	0.047	0.211	0.002	9.267	0.001	0.079	0.101	1.464
Median	0.097	0.068	0.031	0.199	-0.000	9.205	0.000	0.009	0.084	0.241
STD	0.134	0.092	0.051	0.172	0.181	2.186	0.005	0.142	0.522	11.453
<b>Poland</b>										
Firm-year	2016	2016	2016	2016	2016	2016	2016	2016	1792	1792
Mean	0.089	0.078	0.052	0.158	0.102	5.053	0.003	0.094	0.082	1.336
Median	0.052	0.075	0.033	0.143	0.086	5.072	0.000	0.028	0.069	0.289
STD	0.109	0.108	0.059	0.128	0.176	1.960	0.019	0.145	0.356	10.688
<b>Qatar</b>										
Firm-year	126	126	126	126	126	126	126	126	112	112
Mean	0.114	0.107	0.046	0.159	0.032	8.099	0.000	0.081	0.082	0.238
Median	0.078	0.098	0.025	0.123	0.020	8.223	0.000	0.009	0.101	0.156
STD	0.109	0.049	0.054	0.150	0.122	1.412	0.000	0.196	0.269	0.356
<b>Russia</b>										
Firm-year	567	523	567	567	567	567	567	567	504	504
Mean	0.061	0.120	0.072	0.273	0.055	10.689	0.001	0.041	0.171	0.947
Median	0.042	0.108	0.063	0.265	0.040	10.582	0.000	0.009	0.081	0.277
STD	0.068	0.101	0.054	0.183	0.191	2.161	0.004	0.075	0.568	3.379
<b>Saudi Arabia</b>										
Firm-year	792	792	792	792	792	792	792	792	704	704
Mean	0.078	0.111	0.065	0.219	0.063	7.715	0.000	0.031	0.016	1.037
Median	0.058	0.096	0.044	0.209	0.046	7.555	0.000	0.000	0.031	0.177
STD	0.089	0.101	0.068	0.185	0.157	1.508	0.002	0.087	0.277	7.789
<b>Thailand</b>										
Firm-year	3105	3105	3105	3105	3105	3105	3105	3105	2760	2760
Mean	0.083	0.091	0.053	0.212	0.096	8.224	0.000	0.037	0.041	1.443
Median	0.053	0.088	0.035	0.188	0.084	8.001	0.000	0.005	0.040	0.251
STD	0.090	0.102	0.058	0.163	0.211	1.543	0.003	0.091	0.282	13.278
<b>Turkey</b>										
Firm-year	1026	1026	1026	1026	1026	1026	1026	1026	912	912
Mean	0.095	0.076	0.055	0.231	0.075	6.609	0.007	0.045	0.134	1.983
Median	0.058	0.068	0.033	0.209	0.065	6.466	0.000	0.005	0.133	0.362
STD	0.102	0.085	0.103	0.182	0.191	2.002	0.026	0.095	0.395	10.973
<b>Taiwan</b>										
Firm-year	12,015	12,015	12,015	12,015	12,015	12,015	12,015	12,015	10,680	10,680
Mean	0.191	0.062	0.041	0.188	0.099	8.346	0.031	0.018	0.002	1.607
Median	0.158	0.065	0.023	0.163	0.096	8.134	0.014	0.003	0.011	0.275
STD	0.142	0.113	0.051	0.163	0.168	1.784	0.052	0.048	0.317	14.227
<b>South Africa</b>										
Firm-year	666	666	666	666	666	666	666	666	592	592
Mean	0.121	0.101	0.055	0.159	0.058	8.753	0.004	0.110	0.062	0.931
Median	0.093	0.098	0.048	0.133	0.052	8.850	0.000	0.059	0.078	0.184
STD	0.095	0.087	0.039	0.136	0.150	1.784	0.029	0.135	0.246	5.378

## References

- Ahrends, M., Drobetz, W., & Puhan, T. X. (2018). Cyclicity of growth opportunities and the value of cash holdings. *Journal of Financial Stability*, 37, 74–96.
- Al-Najjar, B. (2013). The financial determinants of corporate cash holdings: Evidence from some emerging markets. *International Business Review*, 22(1), 77–88.
- Almeida, H., Campello, M., & Weisbach, M. S. (2004). The cash flow sensitivity of cash. *The Journal of Finance*, 59(4), 1777–1804.

- Alvarez, R., Sagner, A., & Valdivia, C. (2012). Liquidity crises and corporate cash holdings in Chile. *The Developing Economies*, 50(4), 378–392.
- Bates, T. W., Kahle, K. M., & Stulz, R. M. (2009). Why do US firms hold so much more cash than they used to? *The Journal of Finance*, 64(5), 1985–2021.
- Baum, C. F., Caglayan, M., & Talavera, O. (2013). The effects of future capital investment and R & D expenditures on firms' liquidity. *Review of International Economics*, 21(3), 459–474.
- Bigelli, M., & Sánchez-Vidal, J. (2012). Cash holdings in private firms. *Journal of Banking & Finance*, 36(1), 26–35.
- Brown, J. R., & Petersen, B. C. (2011). Cash holdings and R&D smoothing. *Journal of Corporate Finance*, 17(3), 694–709.
- Chung, H. (2017). R&D investment, cash holdings and the financial crisis: Evidence from Korean corporate data. *Applied Economics*, 49(55), 5638–5650.
- Denis, D. J., & Sibilkov, V. (2009). Financial constraints, investment, and the value of cash holdings. *Review of Financial Studies*, 23(1), 247–269.
- Dittmar, A., Mahrt-Smith, J., & Servaes, H. (2003). International corporate governance and corporate cash holdings. *Journal of Financial and Quantitative Analysis*, 111–133.
- Drobetz, W., & Grüninger, M. C. (2007). Corporate cash holdings: Evidence from Switzerland. *Financial Markets and Portfolio Management*, 21(3), 293–324.
- Falato, A., Kadyrzhanova, D., Sim, J., & Steri, R. (2020). Rising intangible capital, shrinking debt capacity, and the US corporate savings glut. Shrinking Debt Capacity, and the US Corporate Savings Glut (March 18, 2020) [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3198030](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3198030).
- Feng, X., Lo, Y. L., & Chan, K. C. (2019). Impact of economic policy uncertainty on cash holdings: Firm-level evidence from an emerging market. *Asia-Pacific Journal of Accounting & Economics*, 1–23.
- Ferreira, M. A., & Vilela, A. S. (2004). Why do firms hold cash? Evidence from EMU countries. *European Financial Management*, 10(2), 295–319.
- Gu, T. (2017). US multinationals and cash holdings. *Journal of Financial Economics*, 125(2), 344–368.
- Guizani, M. (2017). The financial determinants of corporate cash holdings in an oil rich country: Evidence from Kingdom of Saudi Arabia. *Borsa İstanbul Review*, 17(3), 133–143.
- Guney, Y., Ozkan, A., & Ozkan, N. (2007). International evidence on the non-linear impact of leverage on corporate cash holdings. *Journal of International Financial Management*, 17(1), 45–60.
- Hall, T., Mateus, C., & Mateus, I. B. (2014). What determines cash holdings at privately held and publicly traded firms? Evidence from 20 emerging markets. *International Review of Financial Analysis*, 33, 104–116.
- Han, S., & Qiu, J. (2007). Corporate precautionary cash holdings. *Journal of Corporate Finance*, 13(1), 43–57.
- He, Z., & Wintoki, M. B. (2016). The cost of innovation: R&D and high cash holdings in US firms. *Journal of Corporate Finance*, 41, 280–303.
- Horioka, C. Y., & Terada-Hagiwara, A. (2014). Corporate cash holding in Asia. *Asian Economic Journal*, 28(4), 323–345.
- Jensen, M. C. (1986). Agency costs of free cash flow, corporate finance, and takeovers. *The American Economic Review*, 76(2), 323–329.
- Joe, D. Y., & Oh, F. D. (2018). Credit ratings and corporate cash holdings: Evidence from Korea's corporate reform after the 1997 Asian financial crisis. *Japan and the World Economy*, 45, 9–18.
- Kahle, K. M., & Stulz, R. M. (2013). Access to capital, investment, and the financial crisis. *Journal of Financial Economics*, 110(2), 280–299.
- Keynes, J. M. (1936). *The general theory of employment, interest, and money*. London: Macmillan.
- Koo, J., & Maeng, K. (2019). Investment opportunities and cash holdings of firms: An empirical study on Korean firms. *Applied Economics*, 51(23), 2492–2500.
- Levitas, E., & McFadyen, M. A. (2009). Managing liquidity in research-intensive firms: Signaling and cash flow effects of patents and alliance activities. *Strategic Management Journal*, 30(6), 659–678.
- Lian, Y., Sepehri, M., & Foley, M. (2011). Corporate cash holdings and financial crisis: An empirical study of Chinese firms. *Eurasian Business Review*, 1(2), 112–124.
- Lim, J., & Lee, S. C. (2019). Relationship between the characteristics of CEOs and excess cash holdings of firms. *Emerging Markets Finance and Trade*, 55(5), 1069–1090.
- Marwick, A., Hasan, M. M., & Luo, T. (2020). Organization capital and corporate cash holdings. *International Review of Financial Analysis*, 101458.
- Myers, 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.
- Opler, T., Pinkowitz, L., Stulz, R., & Williamson, R. (1999). The determinants and implications of corporate cash holdings. *Journal of Financial Economics*, 52(1), 3–46.
- Ozkan, A., & Ozkan, N. (2004). Corporate cash holdings: An empirical investigation of UK firms. *Journal of Banking & Finance*, 28(9), 2103–2134.
- Peters, R. H., & Taylor, L. A. (2017). Intangible capital and the investment-q relation. *Journal of Financial Economics*, 123(2), 251–272.
- Pinkowitz, L., Stulz, R., & Williamson, R. (2006). Does the contribution of corporate cash holdings and dividends to firm value depend on governance? A cross-country analysis. *The Journal of Finance*, 61(6), 2725–2751.
- Roodman, D. (2009). A note on the theme of too many instruments. *Oxford Bulletin of Economics & Statistics*, 71(1), 135–158.
- Shiau, H. L., Chang, Y. H., & Yang, Y. J. (2018). The cash holdings and corporate investment surrounding financial crisis: The Cases of China and Taiwan. *The Chinese Economy*, 51(2), 175–207.
- Thakur, B. P. S., & Kannadhasan, M. (2019). Corruption and cash holdings: Evidence from emerging market economies. *Emerging Markets Review*, 38, 1–17.
- Trejo-Pech, C. O., Noguera, M., & Gunderson, M. (2016). Corporate cash holdings and economic crises in Mexico. In *Financial deepening and post-crisis development in emerging markets*. New York: Palgrave Macmillan.
- Uyar, A., & Kuzey, C. (2014). Determinants of corporate cash holdings: Evidence from the emerging market of Turkey. *Applied Economics*, 46(9), 1035–1110.