Asian Academy of Management Journal of Accounting and Finance

AAMJAF Vol. 12, No. 2, 127–152, 2016

DYNAMICS OF CORPORATE CASH HOLDINGS IN CHINESE FIRMS: AN EMPIRICAL INVESTIGATION OF ASYMMETRIC ADJUSTMENT RATE AND FINANCIAL CONSTRAINTS

Ajid ur Rehman[1*], Man Wang[2] and Sajal Kabiraj[3]

[1, 2]School of Accounting, Dongbei University of Finance and Economics, Dalian, P.R China, 116025
[3]International Business School, Dongbei University of Finance and Economics, Dalian, P.R China, 116025

[*]Corresponding author: ajid.rehman@gmail.com

ABSTRACT

Grounded in the notion of speed of adjustment this study investigates the adjustment rate of corporate cash holdings and financial constraints in Chinese firms. For this purpose data of 867 A-listed Chinese firms over a 14 years period (2001–2014) is analysed. The study applies Arellano and Bond (GMM2) and Blundell and Bond (GMM1) dynamic panel data model to investigate asymmetric speed of adjustment. We report considerable evidence about asymmetric adjustment of corporate cash holdings, i.e., downward adjustment rate is significantly higher than upward adjustment rate. This higher downward adjustment rate holds even after controlling for financial constraints. Moreover financial constraints also play an important role in dynamic cash adjustment. Financially unconstrained firms are found to adjust faster to their target cash holdings as compared to financially constrained firms. The high speed of adjustment for above target cash level firms holds even after controlling for financial constraints.

Keywords: Cash holdings, adjustment rate, upward adjustment, downward adjustment, financial constraints, Chinese firms

Published date: 21 April 2017

To cite this article: Rehman, A. U., Wang, M., & Kabiraj, S. (2016). Dynamics of corporate cash holdings in chinese firms: an empirical investigation of asymmetric adjustment rate and financial constraints. *Asian Academy of Management Journal of Accounting and Finance, 12*(2), 127–152. https://doi.org/10.21315/aamjaf2016.12.2.6

To link to this article: https://doi.org/10.21315/aamjaf2016.12.2.6

INTRODUCTION

Based on the work of Modigliani and Miller (1958), it can be argued that in frictionless market firms are at ease in securing funds and there is no need to accumulate cash for future liquidity concerns. However in practical world capital markets are not frictionless and firms are not always able to raise as much funds as they need. Firms have to search for optimal external sources. This scarcity of funds and search for funds sources are very likely to affect firms' cash management practices.

The general purpose of hoarding cash is to support operating activities and ensure that these activities run smoothly, and to ensure that firm is able to invest in times of shocks or scarcity of funds. However holding cash have some associated costs. Most prominent costs include the lower return on most liquid assets and agency costs associated with agency conflicts between managers and shareholders. Although Opler, Pinkowitz, Stulz and Williamson (1999) comprehensively examined the determinants of cash holdings; however, the motive to hoard cash is a highly debatable topic of corporate finance. The research studies conducted in the strands of pecking order theory (Myers & Majluf, 1984) propose that high cash reserves enable the firms to invest in high Net Present Value (NPV) projects especially when external financing sources are more costly (Almeida, Campello, & Weisbach, 2004; Denis & Sibilkov, 2009). This indicates firm's cash reserves are determined by investing, financing and payout patterns. On the other hand agency theory (Jensen, 1986) advocates a weakness in discipline for managers and CEOs in time of high cash holdings and misappropriation of high cash reserves in value decreasing projects (Dittmar, Mahrt-Smith, & Servaes, 2003; Faulkender & Wang, 2006; Dittmar & Mahrt-Smith, 2007). This indicates neither the pecking order nor the agency theory explain adjustment of cash holdings. Actually it is in the perimeter of trade off theory to explain adjustment of corporate cash holdings to an optimal level based on a tradeoff of benefits and costs associated with certain level of cash. Based on these costs and benefits an optimal level of cash is determined and when cash deviates from this level firm tries to adjust its cash towards that optimal level. There are considerable research studies which provide empirical support for the presence of optimal (target) level of cash holdings for firms. These studies include Kim, Mauer, and Sherman (1998), Opler et al. (1999), Ozkan and Ozkan (2004), Garcia-Teruel and Martinez-Solano (2008), and Rehman and Wang (2015). Despite extensive research very little evidence exists on the asymmetric adjustment (from above and below the target level of cash) of corporate cash holdings. There are numerous studies on investment (Ono, 2003; Pratap, 2003) and capital structure literature that have studied adjustment from optimal level asymmetrically (Byoun, 2008; Kim, Shin, & Dang, 2009). More

recently Hugonnier, Malamud and Morellec (2015) reports that target level of cash holdings exist such that firms use payout policies to reduce cash to maintain a reduced or optimal level of cash and utilise retained earnings and other investing strategies to increase level of cash to an optimal level of cash.

Moreover financial constraints have different implications for firms which are financially constrained. Thus cash policies of constrained firms become more attractive from research point of view. Almeida et al. (2004) advocates a high sensitivity of cash policies of finically constrained firms to cash flow volatility and other firm's specific determinants of cash holdings as compared to financially unconstrained firms.

Thus in order to investigate upward and downward adjustment of corporate cash holdings and across financial constraints in Chinese firms, this study uses an extensive set of data of 867 A-listed Chinese firms over a 14 years period (2001–2014). We employ two dynamic panel data models for the purpose of robustness i.e., Blundell and Bond (2000) system dynamic model (GMM1 from here on) and Arellano and Bond (1991) linear dynamic panel data model (GMM2 from here on). We find that speed of adjustment for cash holdings is higher for firms having cash holdings above the target level of cash holdings. We report adjustment rates of 0.621 (GMM1) and 0.46 (GMM2) for below target firms. While for above target firms GMM1 reports an adjustment rate of 0.74 and GMM2 reports an adjustment speed of 0.69. This higher speed of adjustment of above target firms holds even after incorporating financial constraints into our analysis. Moreover we report considerable evidence that speed of adjustment is higher for financially unconstrained firms than financially constrained firms.

REVIEW OF PRIOR STUDIES AND HYPOTHESIS DEVELOPMENT

The presence of market frictions and market imperfection make corporate cash holdings relevant. There is a huge debate on corporate cash holdings from the motives of hoarding cash. Many prior researchers attributed precautionary motives to be underlying factors of cash management. Keynes (1936) described transaction motive as to be the hallmark in cash management such that cash reserves will save transaction costs involved with capital rising and will present sale of assets for payment purposes. Moreover for firms having their purpose of shareholders wealth maximisation will consider the cost and benefits associated with holding cash. In this regard Opler et al. (1999) examined factors that can act as the gradient for optimal cash policy where the marginal costs and benefits of cash holdings are equal. Firms having access to capital markets and which can easily raise funds

have less liquid assets in their reserves. Similarly, Shleifer and Vishny (1993) argue that firms having assets that can easily be sold off, have the tendency to hold less cash. Firms with greater investment opportunities will try to hold more cash, so that in time of optimal opportunities they are not faced with cash shortage thus avoiding the slipping away of a better investment opportunity. Holding financial instruments can also reduce level of firm's cash holdings. Firms can easily use financial instruments for hedging and raising the required capital. Moreover firms with shorter cash conversion cycles are expected to hold less cash.

Harford, Klasa and Maxwell (2014) argue that cash holdings are also affected by firm's refinancing risk. Their arguments are based upon the precautionary motive of firm's cash holding. They report evidence that firms increase cash holdings in order to alleviate refinancing risk and saves cash from the free cash flows. Their findings are further supported by Acharya, Davydenko and Strebulaev (2013). Acharya et al. (2013) utilise the precautionary motive to explain the direct relationship between cash and credit spreads. They found that on average riskier firms accumulates higher cash. The findings in the strand of precautionary motive of cash accumulation are further supported by Bates, Kahle and Stulz (2009). While analysing the US firms they reported that there exists a dramatic increase in firms' cash holdings in the US firms during the period of 1980–2006 due to precautionary motives of firms. This behaviour of increased cash holdings was prevalent in firms which do not pay dividends, for firms which recently issued an Initial Public Offering (IPO) and for firms characterised with higher idiosyncratic risk.

In the context of financial constraints there exists some evidence to explain firms' cash holding behaviour. According to Almeida et al. (2004) firms with higher investment needs and inhabiting in a highly imperfect market tend to hoard more cash to efficiently manage their liquidity because there investment ability is constrained by market frictions. They reported that cash holdings are affected by financial constraints such that financially constrained firms are more sensitive to cash flow volatility pattern than unconstrained firms. Financially constrained firms hold more cash in time of higher cash flows while unconstrained firms are not much affected by cash flow volatility. Denis and Sibilkov (2009) argue that for constrained firms there are higher cash levels which can be associated with higher level of investment and higher investment results in higher value for constrained firms as compared to unconstrained firms. After a survey of 1050 chief financing officers (CFOs) in 2008, Campello, Graham and Harvey (2010) argued that in time of lesser liquidity and cash crunch, firms tend to cut their investment in technology, research and development (R&D), and even downsize. They further reported that in time of crises firms cut a sizable portion of their cash savings and dividend

payout. Majority of CFOs argued that financial constraints hit their pursuit of profitable investment projects. Furthermore constrained firms may sell off their assets to generate funds especially in times of liquidity crises.

H1: The adjustment rate of cash holding is higher for financially unconstrained firms than financially constrained firms.

In the context of firm's asymmetric adjustment, it can be argued intuitively, that when a firm cash level is above its optimal level, it can distribute dividends, make repayments on loans etc. to bring the cash level down to the optimal level. On the other hand if a firm cash level is below optimal level, it can slash its investment, reduce or stop payout or even raise external funds to attain the optimal cash level. Thus in time of uncertainty it will be easy to bring down cash reserve to optimal level when cash level of the firm is above target level than to increase cash level when it is below target level.

Based on the above arguments we develop following hypotheses.

H2: Downward adjustment rate is higher than upward adjustment rate of corporate cash holdings.

H3: Higher downward adjustment holds even after controlling for financial constraints.

Determinants of Cash Holdings

We follow Opler et al. (1999) for various determinants of cash holdings incorporated in our regression models. Following section provides a debate on the relationship between cash holdings and various determinants of cash holdings.

Growth opportunities

Ozkan and Ozkan (2004) argue that due to the intangibility associated with cash flows of future projects, the relevance of these cash flows is wiped out. This argument is further supported by D'Mello, Krishnaswami and Larkin (2008). According to them valuing firms with higher future cash flows will be very difficult since valuation depends upon the realisation of these cash flows. According to the arguments of pecking order theory firms with higher investment opportunities will need more cash for investment. On the other hand trade off theory advocates the need of higher cash to invest in future projects in times of financial distress. This avoidance of cash shortfall comes under the transaction motive of holding cash

(Opler et al., 1999). The motive to avoid financial distress is supported by research in the strand of precautionary motive of holding cash (Bates et al., 2009).

On the other hand many studies reported a negative relationship between cash holdings and growth opportunities. These studies include Ferreira and Vilela (2004), Jani, Hoesli and Bender (2004) and Bates et al. (2009). They base their arguments on agency theory and argue that firms may even invest in projects with negative NPV due to agency conflicts especially in firms with entrenched management and low growth opportunities.

The above arguments show an unclear relationship between cash holdings and growth opportunities. This study follows Hill, Kelly and Highfield (2010) in measuring growth opportunities. Growth opportunities are measured through the ratio of market value of assets and book value of assets.

Firm size

Titman and Wessels (1988) argue that smaller firms tend to be more financially distressed because economies of scale can be achieved through corporate cash management. Ozkan and Ozkan (2004) argue that information asymmetry is associated with smaller firms. Due to this information asymmetry it is difficult for smaller firms to raise external funds (Ferreira & Vilela, 2004). One important consideration in this regard is the better credit position of bigger sized firms and availability of credit lines to them (Opler et al., 1999). These two factors makes bigger sized firms to raise external funds at ease and hence reap the benefits of economics of bigger size (D'Mello et al., 2008). This negative relationship is based on trade off theory and corresponds to transaction motive of cash holdings (Bates et al., 2009). However according to Opler et al. (1999), Ferreira and Vilela (2004), and Jani, Hoesli and Bender (2004), higher profits are associated with bigger firms and hence these firms accumulate more cash after controlling for their investment. Thus on the basis of their arguments size positively affects cash holdings. Furthermore agency theory advocates that bigger sized firms have higher dispersion of ownership and thus managers have discretion in their financial decision making. This shows that agency theory predicts a positive relationship.

The above arguments show an unclear relationship between firm size and cash holdings. This study takes the natural logarithm of firm's total assets to measure firm's size.

Cash flow

According to Kim et al. (1998) and Ferreira and Vilela (2004) cash flow increases liquidity and decreases the need to hold extra cash. Trade off theory advocates a negative relationship between cash holdings and cash flow. However, Ferreira and Vilela (2004) argue that firms keep most of the cash from cash flows and thus pecking order theory predicts a positive relationship. Deloof (2003) argue that cash is the most liquid assets and firms that utilize liquid assets to finance their investments will thus retain most of the cash flows as cash holdings. This relationship is supported by Garcia-Teruel and Martinez-Solano (2008). They reported higher cash levels for firms having larger cash flows. These findings correspond to financing motives of cash holdings. Deloof (2003) supports precautionary motives of holding cash to finance operation in time of lower liquidity.

Thus on the basis of these contrasting views of two theories we expect cash flow to influence corporate cash holdings either positively or negatively. We follow Hill, Kelly and Highfield (2010) to measure cash flows. We calculate cash flows by subtracting interest expense, tax and any common dividend from EBIT (Earnings before Interest and Taxes). We add depreciation and amortisation to EBIT and divide it by total assets for scaling purpose.

Leverage

Leverage increases financial distress and there are chances of firms' bankruptcy with increased leverage. Firms with higher level of leverage are expected to hold more cash in order to cope with bankruptcy risk (Deloof, 2003). This corresponds to precautionary motives of holding excess cash. This is also in line with trade off theory and hence leverage is expected to have a direct relationship with corporate cash holdings. On the other hand Ferreira and Vilela (2004) and D'Mello et al. (2008) argue that firms' leverage corresponds to firms' ability to raise more debt and thus less cash is held by firms with high leverage. Thus an inverse relationship between cash holdings and leverage is expected. Research in the strands of pecking order theory advocates that raising debt is preferred after all the retained earnings are used up. Thus in a situation when firms' investment needs exceeds retained earnings firms use cash to finance their investments and thus cash level falls. In the context of agency theory Jensen (1986) advocates that more cash is held by an entrenched management when investment opportunities are lower and cash is not distributed as dividend to shareholders. During periods of poor investment opportunities the management may use cash to finance even projects having negative NPV due to managers' vested interest and such projects are immune to be scrutinised by many participants of financial markets. This shows that leverage is

expected to influence corporate cash holdings both positively as well as negatively. We measure leverage as the ratio to total debt to total assets.

Networking capital

Networking capital is a liquidity source. Ferreira and Vilela (2004) on the basis of trade off theory argue that firms having higher networking capital tend to hold less cash. Being a liquid source, networking capital can also be liquidated when needed to finance investments. This is in line with the transaction motive of holding cash. Hence trade off theory predicts an inverse relationship between cash holdings and networking capital. However in the context of cash conversion cycle (CCC) this relationship will be negative. Jani et al. (2004) argue that firms with shorter CCC holds less cash because shorter CCC frees up cash which can then be used to finance investment. Thus a positive relationship between cash holdings and networking capital (NWC) is expected. To measure NWC this study subtracts accounts payable from the sum of accounts receivables and inventories. This value is then divided by total assets for scaling purpose.

Capital expenditure

According to Opler et al. (1999) firms having higher needs of capital expenditure tend to hold more cash. Thus on the basis of trade off theory firms having higher investment needs of capital expenditure hold more cash, so that they are in a better position to finance their capital expenditure. This positive relationship is reported by Bates et al. (2009), who argue that capital expenditure is a proxy of distress and hence capital expenditure positively affects corporate cash holdings. There are two important costs that can be related to capital expenditure. One is transaction cost while other constitutes opportunity cost. According to Jani et al. (2004) these two costs become more important for firms having less cash or assets with higher liquidity. Thus firms with greater capital expenditure hold more cash. However, in the context of pecking order theory, Opler et al. (1999) advocate that firms will use cash in order to finance capital expenditure and hence such firms report lower cash levels. Their findings are supported by Jani et al. (2004). Thus pecking order theory predicts an inverse relationship between cash holdings and capital expenditure.

DATA AND METHODOLOGY

We use an extensive set of date over a 14 years period (2001–2014). We select 867 A-listed non-financial firms listed on Chinese stock market. Data is collected from RESSET, WIND and CSMAR (China Stock Market and Accounting Research)

Chinese databases. Firms codes ranges from C00002 to C601991. A total of 12063 firm level observations over a period from 2001 to 2014 are included in analysis. Data is further divided into two subsamples i.e., firms with cash holdings above target level and firms with cash holdings below the target level. The categorization of firms into above and below target firms is borrowed from capital structure literature **(**Hovakimian, Opler, & Titman, 2001; Drobetz & Wanzenried, 2006).

Measurement of Financial Constraints

Altman's Z score

In the first step of our analysis we identify financially flexible firms using the Altman's Z-scores index model as suggested by Bancel and Mitoo (2011). It consists of the variables that capture some unique effects of the crisis. The model is based on leverage, liquidity and profitability ratios as follows:

Table 1
Distribution of firms across industries

Industry code	Industry name	No. of firms
A01	Farming	22
A02	Forestry	6
A03	Animal husbandry	13
A04	Fishery	11
A05	Service industry for farming, forestry, animal husbandry and fishery	2
B06	Coal mining and washing	26
B07	Exploitation of petroleum and natural gas	7
B08	Extracting and dressing of ferrous metal mines	6
B09	Extracting and dressing of non-ferrous metal ores	22
B11	Mining support activities	15
C13	Agro-food processing industry	42
C14	Foodstuff manufacturing industry	32
C15	Wine, soft drinks and refined tea industry	36
C17	Textile industry	69
C18	Leather, fur, down and related products and footwear	16
C20	Timber processing, wood, bamboo, cane, palm fibre and straw products	7
C21	Cabinetmaking industry	9

(continued on next page)

Table 1: (*continued*)

Industry code	Industry name	No. of firms
C22	Papermaking and paper product industry	28
C23	Printing and reproduction of recorded media	7
C24	Culture, education, engineering beauty, sports and entertainment goods industry	14
C25	Petroleum refining, coking and nuclear fuel	21
C26	Chemical feedstock and chemical manufacturing industry	203
C27	Medicine manufacturing industry	179
C28	Chemical fiber manufacturing industry	25
C29	Rubber and plastic products industry	49
	Total	867

$$\text{Altman's Z-score} = 1.2X1 + 1.4X2 + 3.3X3 + 0.6X4 + 0.999X5$$

Where:

X1 = Cash ratio minus Trade payables ratio; this is the sum of cash and cash equivalents minus the trade payables divided by the total assets to measure the liquidity of the firm.

X2 = Retained earnings/total assets; the retained earnings represent net earnings not paid out as dividends, but retained by the company to be reinvested in its core business or to pay debt.

X3 = earnings before interest and taxes/total assets; this is a ratio that measures a company's earnings before interest and taxes (EBIT) against its total net assets.

X4 = book value of equity/book value of total liabilities; this is a financial ratio indicating the relative proportion of shareholders' equity and debt used to finance a company's assets.

X5 = sales/total assets; this ratio measures the ability of the firm to generate revenues using its assets. The higher the ratio of sales to total assets, the more efficiently the company is run and the better company leadership is at managing assets.

The Altman Z-score provides zones of discrimination for interpretation; however we divide the score into three quartiles. The highest quartile corresponds to firms that are financially unconstrained while the lowest quartile corresponds to firms with financial constraints.

SA index

Hadlock and Pierce (2010) created SA index to measure financial constraints and argued that exogenous firm's factors are useful in measuring firm's financial constraints. Their SA index is based on size and age of firm. Firms with low constraints have high SA score and vice versa. Size can be measured through the natural logarithm of firm's total assets or sales. Age is calculated since the firm's listing date. We use size measure based on assets as well as sales to calculate SA index.

$$SA_1 = -0.737(Assets) + 0.043(Assets)^2 + -0.040(Firm's\ Age)$$

$$SA_2 = -0.737(Sales) + 0.043(Sales)^2 + -0.040(Firm's\ Age)$$

After calculating SA1 and SA2 we divide the values into three quartiles. Firms belonging to quartile three are the financially unconstrained firms while those firms which belong to quartile 1 are categorised as financially constrained firms.

Statistical Model and Estimation Strategy

Since the objective of this study is to investigate the dynamic adjustment of cash towards the optimal target we develop our model from the literature on capital structure adjustment (Getzmann, Lang, & Spremann, 2014).

$$CASH^*_{it} = \alpha_{01} + \beta X_{it} + \mu_{it} \quad (1)$$

Where

α_{01} corresponds to the constant term. $CASH^*_{it}$ is the target cash for firm i at time t.
X_{it} is a vector term to represent the firm i independent variables at time t.
μ_{it} is the error term for a firm i at time t.

Ideally a firm should operate at optimal level of cash holdings. However, the adjustment costs and the associated tradeoff may delay adjustment to an optimal level of cash holdings. Moreover optimal target level of cash depends on number of exogenous and endogenous factors. These factors changes over time and so does the speed to achieve a target level of cash holdings. Hence firms try to partially adjust to an optimal cash level through a partial adjustment model.

$$CASH_{i,t} - CASH_{i,t-1} = \delta(CASH^*_{it} - CASH_{i,t-1}) \quad (2)$$

Equation 2 can be rewritten as

$$CASH_{it} = (1- \delta)CASH_{i,t-1} + CASH^{*}_{it} \quad (3)$$

$CASH_{it}$ is the actual cash holdings of a firm i at time t. δ is the adjustment parameter and its value ranges between 0 and 1. If δ =1; it means firm has achieved full adjustment of cash holdings within one accounting period. The speed of adjustment depends upon costs associated with adjustment which itself depends upon different determinants of cash holdings.

Combining Equations 1 and 3 we get the following equation.

$$CASH_{it} = \alpha_{0i} + (1- \delta)CASH_{i,t-1} + \delta\beta X_{it} + \mu_t \quad (4)$$

In Equation 4, δ is the partial adjustment parameter, 1- is the adjustment rate. X_{it} is the vector form of firm specific factors (cash holdings' determinants). We incorporate financial constraints in Equation 4 to get the following Equation 5.

$$CASH_{it} = \alpha_{0i} + (1- \delta)CASH_{i,t-1} + \delta\beta X_{it} (financialconstraint) + \mu_t \quad (5)$$

In order to test our hypothesis we estimate Equations 4 and 5 through Blundell and Bond and Arellano and Bond dynamic panel data estimation methods.

RESULTS AND DISCUSSION

Table 2 corresponds to descriptive statistics. The statistics are for overall firms, for firms with cash level above the optimal level and for firms having their cash level below the optimal cash levels. Optimal cash level is determined by subtracting fitted value of OLS regression from actual cash values. For firms with cash above target cash levels, the subtraction value is positive and for below target firms this value is negative. Table 2 shows that mean value of cash is much higher for above target firms then below target firms.

Similarly mean values of leverage and cash flows for above target firms are much higher, suggesting that these firms hold large cash in order to cope with any financial distress. Tobin's Q is also higher for above target firms then below target firms, which again suggest that to finance higher growth opportunities, firms try to hold more cash.

Table 2
Descritive statistics

Variable	Full sample			Below target			Above target		
	Obs	Mean	STD	Obs	Mean	STD	Obs	Mean	STD
CASH	12063	0.133	0.112	7048	0.068	0.040	5015	0.224	0.118
LEV	12063	0.815	16.144	7048	0.535	0.751	5015	1.209	25.018
NWC	12063	-0.105	8.477	7048	0.009	0.262	5015	-0.265	13.142
CAPEX	12063	0.248	0.194	7048	0.247	0.205	5015	0.250	0.176
SIZE	12063	21.644	1.332	7048	21.697	1.294	5015	21.568	1.379
TOBINQ	12063	2.001	4.516	7048	1.917	4.550	5015	2.133	4.459
CFLOW	12063	0.095	1.126	7048	0.088	0.202	5015	0.104	1.730

Notes: Obs = Observations; STD = Standard Deviation

Table 3 represents correlations between variables. The last column represents values for variance inflation factor. Table 3 indicates that correlation values are within limits and there is no serious issue of correlation between independent variables.

Table 3
Correlation matrix

	CASH	SIZE	CAPEX	NWC	LEV	TOBINQ	CFLOW	VIF
CASH	1							
SIZE	-0.06	1						1.16
CAPEX	-0.17	0.12	1					1.09
NWC	0.29	0.10	-0.21	1				2.48
LEV	-0.07	-0.09	0.04	-0.70	1			3.72
TOBINQ	0.09	-0.27	-0.10	-0.15	0.54	1		2.6
CFLOW	0.08	-0.02	-0.03	0.14	-0.09	0.41	1	1.49

Notes: CASH is the ratio of firm's cash to total assets. SIZE indicates firm's size and measured by taking natural log of firm's total assets. CAPEX is total capital expenditure to total assets. NWC is the ratio of networking capital to total assets. LEV is total leverage and it is the ratio of total debt to total assets. TOBINQ is ratio of market value of firm total assets to book value of total assets. CFLOW is cash flow calculated by subtracting interest payments, dividend and taxes from EBIT. VIF is the variance inflation factor.

Values for VIF (Variance inflation factor) are well in accepted range (below 10). These two facts indicate the absence of multicolinearity between independent variables.

Regression Analysis

Equations 4 and 5 are estimated using two methods of dynamic panel data estimation. One of the methods is Blundell and Bond Dynamic Panel System Estimation (GMM1), while the other method is Arellano and Bond dynamic panel data model (GMM2). Table 4 corresponds to panel data estimation of overall firms. The first three columns' results correspond to GMM1 while last three columns correspond to results of GMM2.

Table 4
Dynamic panel data regression results for overall firms

	GMM1	GMM2
Adj Rate(λ)	0.617	0.627
CASH(L1)	0.383*** (20.14)	0.373*** (8.52)
LEV	0.045*** (6.06)	0.054* (1.53)
SIZE	-0.001 (-0.29)	-0.002 (-0.37)
CAPEX	0.078*** (9.36)	0.079*** (6.13)
NWC	0.151*** (9.87)	0.162** (2.93)
TOBINQ	-0.001* (-1.58)	-0.001 (-0.51)
CFLOW	0.009*** (3.37)	0.013 (1.38)
_cons	0.040 (0.79)	-0.011 (-0.14)
Number of groups	866	866
Number of instruments	85	85
Arellano-Bond test	0.1644	0.1647

Notes: ***, **,* correspond to statistical significance at 99%, 95% and 90% respectively. t test values are given in parenthesis. GMM1 is Blundell and Bond estimation. GMM2 is Arellano and Bond estimation. CASH (L1) is lagged cash variable. CASH is the ratio of firm's cash to total assets. SIZE indicates firm's size and measured by taking natural log of firm's total assets. CAPEX is total capital expenditure to total assets. NWC is the ratio of networking capital to total assets. LEV is total leverage and it is the ratio of total debt to total assets. TOBINQ is ratio of market value of firm total assets to book value of total assets. CFLOW is cash flow calculated by subtracting interest payments, dividend and taxes from EBIT.

Table 5 shows results for firms with cash holdings below and above target level of cash holdings. Above and below target of cash holdings are calculated by estimating the fitted value using OLS. These fitted values are subtracted from actual values. For firms having cash holdings above optimal level the resulting value of subtraction is positive and for firms having cash holdings below target level of cash holding a negative value is found. Table 5 incorporates results for both GMM1 and GMM2.

Tables 6 and 7 show results for firms with financial constraints. Table 6 shows results for GMM1, while Table 7 shows results for GMM2. In order to incorporate financial constraints as controlling factor we do further analysis by combining the firms asymmetry (above and below target firms) and financial constraints. Tables 8 and 9 correspond to the combine analysis of constraints and symmetric adjustment.

Adjustment Rate for Overall Firms

Table 4 shows regression results for over all firms. Table 4 reports a positive and statistically significant coefficient for lagged cash (CASHL1). Coefficient for GMM1 is 0.383, while for GMM2 it is 0.627. This shows that Chinese firms follow a target level of cash holdings in line with trade off theory. Table 4 indicates an adjustment rate of 0.617 and 0.637 for GMM1 and GMM2 respectively. This is an evidence of robustness of our results. The coefficients for lagged values of cash are not only positive but also statistically significant. This shows that Chinese firms follow a partial adjustment policy towards an optimal cash position. This corresponds to trade off theory. These results are consistent with Rehman and Wang (2015) who empirically proved that Chinese firms adjust their cash holdings to a target level. Partial adjustment also indicates that Chinese firms follow a target level of cash holding. The overall model estimated by both GMM1 and GMM2 methods are statistically significant. Sragan test value for GMM1 and GMM2 is not given because models are estimated with robust standard errors. Number of groups for both estimations is greater than number of instruments. For GMM1 and GMM2 number of groups is 866 and number of instruments are 85 each. Furthermore Arellano Bond autocorrelation test (2nd order) value for GMM1 is 0.1644 and it is statistically insignificant. The same test reports a value of 0.1647 for GMM2. Both these values are statistically insignificant which indicates the absence of 2nd order autocorrelation.

Determinants of Cash Holdings

Along with adjustment rate Table 4 also indicates the relationship of cash holdings with its determinants. Coefficient for leverage (LEV) is positive for both GMM1 and GMM2; however for GMM2 it is statistically insignificant. This is in line with empirical research in the strand of trade off theory. Highly levered firms tend to accumulate more cash to prevent bankruptcy chances and to reduce financial distress (Deloof, 2003). This accumulation of cash for prevention of bankruptcy is in accordance with precautionary motives of holding cash. Size shows a negative and statistically insignificant relationship. This may be due to the fact that bigger firms enjoy reputation and such firms are also at ease to raise external funds in time

of need. Thus bigger firms will hold less cash. Both the models show a positive and significant coefficient for CAPEX (0.078 and 0.079). Thus firms with higher capital expenditure hold more cash (Opler et al., 1999). This is in accordance with trade off theory. Our findings are also supported by Bates et al. (2009). Firm liquidity or networking capital (NWC) shows positive and significant relationship in both models. This corresponds to Jani et al. (2004). They argue that firm cash holdings may increase because of the shorter cash conversion cycle of firm. For growth opportunities (Tobin's Q) both models result in negative and statistically insignificant coefficients. For cash flow (CFLOW) GMM1 results in a positive and statistically significant coefficient. This is in accordance with the arguments of Ferreira and Vilela (2004) that most of the cash flow is reserved as cash and it acts as readily available source of liquidity (Deloof, 2003).

Adjustment Rate for Above and Below Target Level

Table 5 represents regression results for firms with cash level above and below optimal level of cash holdings. First three columns of Table 5 shows result for GMM1, while last three columns correspond to the results of GMM2. For below target level firms GMM1 shows a statistically significant adjustment coefficient equal to 0.379. While for above target firms GMM1 reports a statistically significant coefficient of 0.25. Thus adjustment rate is 0.621(1-0.379) and 0.75(0.25) for below and above target firms respectively. GMM2 reports adjustment coefficients of 0.539 and 0.31 for below and above target firms respectively. Thus adjustment rates are 0.461 (1-0.539) and 0.69 (1-0.31) for below and above target firms respectively. Hence regression results of Table 5 shows that adjustment rates of downward adjustment is higher than adjustment rates for upward adjustment. Thus there is considerable evidence in support of our hypothesis that downward adjustment rate is higher than upward adjustment of cash holdings. Numbers of groups are greater than number of instruments for GMM1 and GMM2.

Adjustment Rate of Cash Holdings across Financial Constraints

Tables 6 and 7 represent GMM regression results across financial constraints. Table 6 corresponds to GMM1 estimation while GMM2 estimation is given in Table 7. We used three measures of Financial Constraints. First two columns of Tables 6 and 7 correspond to Altman Z's Score measure of financial constraints. Middle two columns represents results for SA1 (assets based measure) and remaining two columns shows results for SA2 (Sales based measure). For all three measures of financial constraints and for both of our models adjustment coefficients are positive and statistically significant (Tables 6 and 7). Thus there is considerable evidence Chinese firms follows a target level of cash holdings both in financially constrained and unconstrained situation.

Table 5
GMM regression results for above and below target firms

Variables	GMM1		GMM2	
	Below	Above	Below	Above
Adj Rate(λ)	0.621	0.75	0.461	0.69
CASH(L1)	0.379***	0.25***	0.53***	0.31***
	(21.13)	(10.21)	(11.59)	(5.1)
LEV	0.060***	0.19***	0.055***	0.19**
	(12.61)	(9.27)	(4.27)	(3.06)
SIZE	-0.022**	0.06***	-0.017**	0.07***
	(-6.5)	(11.44)	(-2.37)	(6.34)
TANG	-0.12***	-0.05**	-0.13***	-0.06**
	(-13.39)	(-3.14)	(7.31)	(-2.19)
LIQ	0.20***	0.28***	0.21***	0.27***
	(13.58)	(11.75)	(4.91)	(4.77)
TOBINQ	-0.01***	0.04***	-0.05**	0.00*
	(-9.91)	(3.76)	(-3.41)	(1.93)
CFLOW	-0.02***	-0.04**	-0.2**	-0.03*
	(18.1)	(-4.02)	(7.95)	(-1.67)
_cons	-0.45**	-1.28**	-0.33**	-1.38**
Number of groups	834	790	827	768
Number of instruments	97	97	85	85
Arellano-Bond test	0.888	0.1864	0.147	0.830

Notes: ***, **, and * correspond to statistical significance at 99%, 95% and 90% significant level respectively. t test values are given in parenthesis. GMM1 is Blundell and Bond estimation. GMM2 is Arellano and Bond estimation. CASH (L1) is lagged cash variable. CASH is the ratio of firm's cash to total assets. SIZE indicates firm's size and measured by taking natural log of firm's total assets. CAPEX is total capital expenditure to total assets. NWC is the ratio of networking capital to total assets. LEV is total leverage and it is the ratio of total debt to total assets. TOBINQ is ratio of market value of firm total assets to book value of total assets. CFLOW is cash flow calculated by subtracting interest payments, dividend and taxes from EBIT.

For Altman's Z score the adjustment coefficient is 0.237 and 0.222 (Table 6 GMM1) for constrained and unconstrained firms respectively. Thus based on GMM1 for Altman's Z score measure, adjustment rate for corporate cash holding is 0.763 (1-0.237) and 0.778(1-0.224) for financially constrained and unconstrained firms respectively.

Similarly for SA1 measure of financial constraints, adjustment rates are 0.644 and 0.743 for financially constrained and unconstrained firms respectively (Table 6). Moreover for SA2 (sales based) measure of financial constraints,

adjustment rate of corporate cash holdings is 0.568 and 0.69 for constrained and unconstrained firms respectively. Thus there is considerable evidence to accept our second hypothesis that adjustment rate for cash holdings is higher in financially unconstrained firms than financially constrained firms.

Table 6
Regression results for constrained and unconstrained firms (GMM1)

Variables	Z score		SA1		SA2	
	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained
Adj Speed(λ)	0.76	0.77	0.64	0.74	0.568	0.690
CASH(L1)	0.23*** (4.5)	0.23*** (4.7)	0.36*** (6.7)	0.26*** (7.3)	0.43*** (8.7)	0.31*** (7.8)
LEV	0.014 (1.39)	0.21** (5.99)	0.02* (1.73)	0.16*** (7)	0.03** (2.97)	0.11*** (4.62)
SIZE	0.027*** (3.67)	0.001 (0.14)	0.012 (1.23)	0.01** (2.27)	0.01* (1.76)	0.003 (0.67)
TANG	0.026* (1.81)	0.067** (2.11)	0.07*** (4.09)	0.04** (2.98)	0.06** (2.59)	0.06*** (4.04)
LIQ	0.059*** (3.93)	0.37*** (7.85)	0.061 (1.71)	0.22*** (12.3)	0.08*** (3.41)	0.22*** (11.25)
TOBINQ	0.001 (-0.3)	0.002 (0.9)	-0.00 (-0.6)	0.002 (1.1)	-0.03** (-2.1)	0.004 (1.5)
CFLOW	-0.03*** (-5.3)	0.006* (1.67)	0.011 (3.20)	0.02** (2.64)	-0.02* (-1.6)	-0.011 (-0.42)
_cons	-0.53	-0.05	-0.20	-0.30	-0.35	-0.082
Number of groups	696	718	549	579	537	572
Number of instruments	85	85	97	97	97	97
Arellano-Bond test	0.239	0.282	0.476	0.682	0.125	0.666

Notes: ***, **, and * correspond to statistical significance at 99%, 95% and 90% significant level respectively. t-test values are given in parenthesis. GMM1 is Blundell and Bond estimation. GMM2 is Arellano and Bond estimation. Z score is Altman's Z score. SA1 is assets' measure of financial constraints. SA2 is sales' measure of financial constraints. CASH (L1) is lagged cash variable. CASH is the ratio of firm's cash to total assets. SIZE indicates firm's size and measured by taking natural log of firm's total assets. CAPEX is total capital expenditure to total assets. NWC is the ratio of networking capital to total assets. LEV is total leverage and it is the ratio of total debt to total assets. TOBINQ is ratio of market value of firm total assets to book value of total assets. CFLOW is cash flow calculated by subtracting interest payments, dividend and taxes from EBIT.

For the purpose of robustness we also checked adjustment rate using GMM2 estimation (Table 7). Adjustment rates of corporate cash holdings for Altman's Z score are 0.76 and 0.80 for financially constrained and unconstrained firms respectively. Similarly for SA1 financial constraints adjustment rates are 0.61 and 0.78 for financially constrained and unconstrained firms respectively.

SA2 measure of financial constraints report adjustment rates of 0.55 and 0.75 for financially constrained and unconstrained firms. All the models estimations are statistically significant because for all models in Table 7 report more number of groups than instruments and all the Arellano Bond tests are insignificant showing an absence of 2nd order multicolinearity. Thus there exists enough evidence that adjustment rate of cash holdings is higher for financially unconstrained firms than financially constrained firms.

Table 7
Regression results for constrained and unconstrained firms (GMM2)

Variables	Z score		SA1		SA2	
	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained
Adj Speed(λ)	0.76	0.80	0.61	0.78	0.55	0.75
CASH(L1)	0.24***	0.20***	0.39***	0.22***	0.45***	0.25***
	(4.50)	(4.73)	(5.90)	(5.54)	(6.91)	(5.83)
LEV	0.01	0.21***	0.02	0.16***	0.03**	0.11***
	(1.39)	(5.99)	(1.42)	(7.88)	(2.83)	(5.96)
SIZE	0.03***	0.00	0.02	0.01**	0.03**	0.00
	(3.67)	(0.14)	(1.55)	(2.25)	(2.17)	(0.71)
TANG	0.03*	0.07**	0.07***	0.05**	0.07**	0.06***
	(1.81)	(2.11)	(3.54)	(3.37)	(2.69)	(4.31)
LIQ	0.06***	0.37***	0.05	0.22***	0.07**	0.22***
	(3.93)	(7.85)	(1.43)	(12.13)	(3.39)	(11.93)
TOBINQ	0.00	0.00	0.00	0.00	0.00**	0.00
	(-0.26)	(0.86)	(0.35)	(0.88)	(-2.12)	(1.63)
CFLOW	-0.04***	0.01*	-0.01**	0.03**	-0.02	0.00
	(-5.38)	(1.67)	(2.55)	(3.11)	(-1.56)	(-0.18)
_cons	-0.53	-0.06	-0.29	-0.28	-0.50**	-0.08
Number of groups	696	718	522	578	491	571
Number of instruments	85	85	85	85	85	85
Arellano-Bond test	0.2389	0.2821	0.4375	0.9132	0.119	0.9599

Notes: ***, **, and * correspond to statistical significance at 99%, 95% and 90% significant level respectively. t test values are given in parenthesis. GMM1 is Blundell and Bond estimation. GMM2 is Arellano and Bond estimation. Z score is Altman's Z score. SA1 is assets' measure of financial constraints. SA2 is sales' measure of financial constraints. CASH (L1) is lagged cash variable. CASH is the ratio of firm's cash to total assets. SIZE indicates firm's size and measured by taking natural log of firm's total assets. CAPEX is total capital expenditure to total assets. NWC is the ratio of networking capital to total assets. LEV is total leverage and it is the ratio of total debt to total assets. TOBINQ is ratio of market value of firm total assets to book value of total assets. CFLOW is cash flow calculated by subtracting interest payments, dividend and taxes from EBIT.

Downward and Upward Adjustment Rates across Financial Constraints

Tables 8 and 9 show regression results for asymmetric (upward and downward) cash adjustment to an optimal level across firms' financial constraints. Table 8 represents results for GMM1 while Table 9 shows results for GMM2. First 4 columns of Tables 8 and 9 corresponds to firm level observations above the target level of cash holdings while remaining four columns corresponds to below target level of cash holdings. Panel A, B and C of Tables 8 and 9 represent the financial constraints measure i.e, Altman's Z score, SA1 and SA2 respectively.

Table 8
Regression results for asymmetric speed and constraints (GMM1)

	Above		Below	
	Constrained	Unconstrained	Constrained	Unconstrained
Panel A: Z score				
Adj Speed (λ)	0.88	0.76	0.69	0.75
Cash (L1)	0.12*	0.24***	0.31***	0.25***
	(1.68)	(5.22)	(7.39)	(5.58)
Number of groups	442.00	542.00	617.00	599.00
Number of instruments	97.00	97.00	97.00	97.00
Arellano-Bond test	0.94	0.27	0.33	0.03
Panel B: SA1				
Adj Speed (λ)	0.74	0.79	0.66	0.69
Cash (L1)	0.26***	0.21***	0.34***	0.31***
	(4.45)	(3.95)	(6.31)	(6.54)
Number of groups	399.00	428.00	417.00	507.00
Number of instruments	97.00	97.00	97.00	97.00
Arellano-Bond test	0.64	0.72	0.54	0.07
Panel C: SA2				
Adj Speed (λ)	0.81	0.80	0.55	0.69
Cash (L1)	0.19***	0.20***	0.45***	0.31***
	(3.23)	(4.42)	(9.32)	(7.10)
Number of groups	398.00	421.00	475.00	480.00
Number of instruments	97.00	97.00	97.00	97.00
Arellano-Bond test	0.25	0.9941	0.40	0.26

Notes: ***, **, and * corresponds to statistical significance at 99%, 95% and 90% significant level respectively. t statistics are given in parenthesis. GMM1 is Blundell and Bond estimation. GMM2 is Arellano and Bond estimation. Z score is Altman's Z score. SA1 is assets' measure of financial constraints. SA2 is sales' measure of financial constraints. CASH (L1) is lagged cash variable. CASH is the ratio of firm's cash to total assets.

Table 9
Regression results for asymmetric speed and constraints (GMM2)

	Above		Below	
	Constrained	Unconstrained	Constrained	Unconstrained
Panel A: ZSCORE				
Adj Speed (λ)	0.881	0.80	0.55	0.56
Cash (L1)	0.119* (1.540)	0.20** (3.17)	0.45*** (8.19)	0.44*** (6.76)
Number of groups	418.000	500.00	608.00	584.00
Number of instruments	85.000	85.00	85.00	85.00
Arellano-Bond test	0.780	0.32	0.23	0.06
Panel B: SA1				
Adj Speed (λ)	0.753	0.83	0.48	0.57
Cash (L1)	0.247* (2.730)	0.17** (2.79)	0.52*** (9.84)	0.43*** (7.28)
Number of groups	357.000	423.00	459.00	504.00
Number of instruments	85.000	85.00	85.00	85.00
Arellano-Bond test	0.749	0.72	0.34	0.12
Panel C: SA2				
Adj Speed (λ)	0.852	0.86	0.43	0.60
Cash (L1)	0.148* (1.71)	0.14** (2.64)	0.57*** (8.23)	0.40*** (7.20)
Number of groups	334.000	416.00	523.00	479.00
Number of instruments	85.000	85.00	85.00	85.00
Arellano-Bond test	0.478	0.8899	0.7518	0.21

Notes: ***, **, and * corresponds to statistical significance at 99%, 95% and 90% significant level respectively. t statistics are given in parenthesis. GMM1 is Blundell and Bond estimation. GMM2 is Arellano and Bond estimation. Z score is Altman's Z score. SA1 is assets' measure of financial constraints. SA2 is sales' measure of financial constraints. CASH (L1) is lagged cash variable. CASH is the ratio of firm's cash to total assets.

For Altman's Z score the above target firms report downward adjustment rates of 0.88 and 0.76 for constrained and unconstrained respectively, while for below target firms adjustment rates are 0.69 and 0.75 for constrained and unconstrained firms respectively (Table 8, GMM1). Similarly according to GMM2 (table 9) adjustment rates for above target firms are 0.88 and 0.80 for financially constrained and unconstrained firms respectively. For below target firms this rate is 0.55 and 0.56 for constrained and unconstrained firms (Table 9). This shows that downward adjustment rate is higher than upward adjustment rate even after

controlling for financial constraints. Thus based on Altman's Z score measure of financial constraints both GMM1 and GMM2 deliver estimates that are consistent with our third hypothesis. Similarly Table 8 (GMM1) shows that for the measure SA1 (Panel B) and above target firms adjustment rates are 0.74 and 0.79 for constrained and unconstrained firms respectively. This speed for below target firms is 0.66 and 0.69 for constrained and unconstrained firms respectively. Moreover according to Table 9 for SA1 measure, above target firms report adjustment rates of 0.75 and 0.83 for constrained and unconstrained firms respectively. The same measure for below target firms (Table 9) reports adjustment rate of 0.48 and 0.57 for constrained and unconstrained firms respectively. Thus based on SA1 measure of financial constraints we have considerable evidence that higher firm total assets to book value of total assets. CFLOW is cash flow calculated by subtracting interest payments, dividend and taxes from EBIT.

CONCLUSION

This study tries to empirically examine downward and upward adjustment behaviour of corporate cash holdings in Chinese firms. For this purpose we followed research studies in capital structure literature to first find out the above and below target cash holdings (Hovakimian et al., 2001; Drobetz & Wanzenried, 2006). In order to estimate adjustment rate this study utilises Arellano and Bond (GMM2) and Blundell and Bond (GMM1) dynamic panel data models. Findings indicate that downward adjustment rate is higher than upward adjustment rate. Both GMM models give robust results. We estimate upward and downward adjustment rate by incorporating financial constraints into the model. There is considerable evidence that downward adjustment rate is higher even after controlling for financial constraints. This may be due the fact that when a firm cash level is above its optimal level, it can distribute dividends, make repayments on loans etc., to bring the cash level down to the optimal level. On the other hand if a firm cash level is below optimal level, it can slash its investment, reduce or stop payout or even raise external funds to attain the optimal cash level. Thus alternatives available for downward adjustment towards optimal cash level results in higher downward adjustment rate. The results could be explained by the fact that more adjustment costs are associated with upward adjustment than downward adjustment process. In other word, the adjustment costs play an important role while adjusting for an optimal cash level.

Moreover the study further investigates adjustment rate of corporate cash holdings across three financial constraints, i.e., Altman's Z score, SA1 and SA2. All the three measures of financial constraints give results that are consistent with

our hypothesis. We found considerable evidence that those firms speedily adjust corporate cash holdings when they are financially unconstrained. This is in line with Almeida et al. (2004) that firms with higher investment needs and inhabiting in a highly imperfect market tend to hoard more cash to efficiently manage their liquidity because there investment ability is constrained by market frictions. They reported that cash holdings are affected by financial constraints such that financially constrained firms are more sensitive to cash flow volatility pattern than unconstrained firms.

The conclusion derived for the study is subject to some limitation and owing to these limitations the study can be extrapolated across various dimensions. The samples can be divided into pre and post crises era (crises-2008). For example during financial crises liquidity many companies evaporated and thus it will have an important implication for industries as a whole during crises. Furthermore Chinese stock market provides a unique setting for these studies due to the State owned and non-state owned enterprises. By dividing the sample into subsample of SOEs and NSOEs this study can further extrapolated to incorporate the sectorial level consideration especially with respect to the financing alternatives available to Chinese SOEs and NSOEs? Furthermore as per the findings of Jiang, Rapach, Strauss, Tu and Zhou (2007), China specific indicators like banks' loan expansion rate can be included as an interactive term because of the peculiar characteristics of Chinese stock market.

Industry business cycle can also be incorporated (Wu & Shamsuddin, 2012) Apart from Industry another important consideration would be firm size. It will add more pragmatism to incorporate size effects by categorizing firms into small and large cap portfolios of industries (Hou & Moskowitz, 2005; Hou, 2007).

ACKNOWLEDGEMENT

This paper is one of the research results of China National Planning Office of Philosophical and Social Sciences Project. Project number: 15GBL058.

REFERENCES

Acharya, V., Davydenko, S., & Strebulaev, I. (2013). Cash holdings and credit risk. *Review of Financial Studies, 25*(12), 3572–3609.

Almeida, H., Campello, M., & Weisbach, M. (2004). The cash flow sensitivity of cash. *Journal of Finance*, *59*(4), 1777–1804.

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies*, *58*(2), 277. https://doi.org/10.2307/2297968

Bancel, F. & Mitoo, U. R. (2011). Financial flexibility and the impact of global financial crisis: Evidence from France. *International Journal of Managerial Finance, 7*(2), 179–216.

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.

Blundell, R., & Bond, S. (2000). GMM estimation with persistent panel data: An application to production functions. *Econometric Reviews*, *19*(3), 321–340.

Byoun, S. (2008). How and when do firms adjust their capital structures toward targets? *Journal of Finance, 63*(6), 3069–3096.

Campello, M., Graham, J., & Harvey, C. (2010). The real effects of financial constraints: Evidence from a financial crisis. *Journal of Financial Economics, 97*(3)*,* 470–487.

Deloof, M. (2003). Does working capital management affect profitability of Belgian firms? *Journal of Business Finance & Accounting*, *30*(3–4), 573–588.

Denis, D., & 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. (2007). Corporate governance and the value of cash holdings. *Journal of Financial Economic, 83*(3), 599–634.

Dittmar, A., Mahrt-Smith, J., & Servaes, H. (2003). International corporate governance and corporate cash holdings. *Journal of Financial and Quantitative Analysis*, *38*(01), 111–133.

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

Drobetz, W., & Wanzenried, G. (2006). What determines the speed of adjustment to the target capital structure? *Applied Financial Economics*, *16*(13), 941–958. https://doi.org/10.1080/09603100500426358

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

Ferreira, M., & Vilela, A. (2004). Why do firms hold cash? Evidence from EMU countries. *European Financial Management, 10*(2), 295–319.

Garcia-Teruel, P. J., & Martinez-Solano, P. (2008). On the determinants of SME cash holdings: Evidence from Spain. *Journal of Business Finance and Accounting, 35*(1–2), 127–149.

Getzmann, A., Lang, S. & Spremann, K. (2014). Target capital structure and adjustment speed in Asia. *Asia-Pacific Journal of Financial Studies, 43*(1)*,* 1–30.

Hadlock, C., & Pierce, J. (2010). New evidence on measuring financial constraints: Moving beyond the KZ index. *Review of Financial Studies, 23*(5), 1909–1940.

Harford, J., Klasa, S., & Maxwell, W. (2014). Refinancing risk and cash holdings. *Journal of Finance, 69*(3), 975–1012. https://doi.org/ 10.1111/jofi.12133

Hill, M. D., Kelly, G. W., & Highfield, M. J. (2010). Net operating working capital behavior: A first look. *Financial Management, 39*(2), 783–805. https://doi.org/10.1111/j.1755-053X.2010.01092.x

Hou, K. (2007). Industry information diffusion and the lead–lag effect in stock returns. *Review of Financial Studies, 20*(4), 1113–1138.

Hou, K., & Moskowitz, T. (2005). Market frictions, price delay, and the cross-section of expected returns. *Review of Financial Studies, 18*(3), 981–1020.

Hovakimian, A., Opler, T., & Titman, S. (2001) The debt equity choice. *Journal of Financial and Quantitative Analysis, 36*(1), 1–24.

Hugonnier, J., Malamud, S., & Morellec, E. (2015). Capital supply uncertainty, cash holdings, and investment. *Review of Financial Studies, 28*(2), 391–445.

Jani, E., Hoesli, M., & Bender, A. (2004). *Corporate cash holdings and agency conflicts,* Working paper. Geneva: University of Geneva.

Jiang, F., Rapach, D. E., Strauss, J. L., Tu, J., & Zhou, G. (2007). How predictable is the Chinese stock market? *Journal of Financial Research,* 107–121.

Jensen, M. C. (1986). Agency cost of free cash flow, corporate finance, and takeovers. *Corporate Finance, and Takeovers. American Economic Review*, *76*(2), 323–329. Retrieved from http://papers.ssrn.com/sol3/Papers.cfm?abstract_id=99580

Keynes, M. (1936). *The general theory of employment in interest and money*. London: Harcourt Brace.

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. https://doi.org/10.2307/2331099

Kim, M., Shin, Y., & Dang, V. A. (2009). *Asymmetric capital structure adjustments: New evidence from dynamic panel threshold models*. SSRN working paper. Available at http://ssrn.com/abstract=1444488

Modigliani, F., & Miller, M. (1958). The cost of capital, corporation finance and the theory of investment. *American Economic Review, 48*(3), 261–297.

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.

Ono, M. (2003). A computational approach to liquidity-constrained firms over an infinite horizon. *Journal of Economic Dynamics and Control, 28*(1), 189–205.

Opler, T., Pinkowitz, L., Stulz, R., & Williamson, R. (1999). The determinants and implications of corporate cash holdings. *Journal of Financial Economics, 52*(1), 219–244.

Ozkan, A., & Ozkan, N. (2004). Corporate cash holdings: An empirical investigation of UK companies. *Journal of Banking and Finance*, *28*(9), 2103–2134.

Pratap, S. (2003). Do adjustment costs explain investment-cash flow insensitivity? *Journal of Economic Dynamics and Control*, *27*(11–12), 1993–2006.

Rehman, A. U., & Wang, M. (2015). Corporate cash holdings and adjustment behavior in Chinese firms: An empirical analysis using generalized method of moments. *Australasian Accounting Business & Finance Journal*, *9*(4), 20.

Shleifer, A., & Vishny, R. W. (1993). Corruption. *The Quarterly Journal of Economics*, *108*(3), 599–617.

Titman S., & Wessels R. (1988). The determinants of capital structure choice. *Journal of Finance, 43*(1), 1–19.

Wu, Q. & Shamsuddin, A. (2012). Do industries lead the stock market in Australia? An examination of gradual information diffusion hypothesis. 23rd Australasian Finance and Banking Conference, 15–17 December 2010, Sydney Australia.