The Impact of Asset Tangibility on the Speed of Adjusting Cash Holdings in the US non-financial companies

Ahmad Alsaraireh[*]
asaraireh@yahoo.com

Abstract

This study investigates the impact of a firm's asset tangibility on the speed of adjusting cash holdings. The Results show that the speed of adjusting cash holdings is 0.46, indicating that on average firms close around half of the deviation from target in one year. This value of CH-SOA provides evidence that US firms have a target (optimal) level of cash towards which they try to adjust their actual cash level. Moreover, such a result supports the dynamic version of the trade-off theory rather than the static version since the value of CH-SOA is less than one. Furthermore, the main result of this research shows that firms with lower asset tangibility adjust faster to the target level of cash.

Keywords: Tangible Assets, Cash Holdings, Speed of Adjusting Cash Holdings

[*] Department of Business Administration, Faculty of Business, Mutah University.
Received: 14/12/2022. Accepted: 24/3/2022.

تأثير ملموسية الأصول على سرعة تعديل حيازة النقد في الشركات غير المالية الأمريكية

أحمد الصرايرة*

تبحث هذه الدراسة في تأثير حجم الأصول الثابتة على سرعة التعديل في الحيازات النقدية. وتشير النتائج إلى أن سرعة التسوية النقدية تبلغ 0.46، مما يشير إلى أن الشركات تغلق في المتوسط حوالي نصف الانحراف عن الهدف في عام واحد. وتوفر هذه القيمة دليلا على أن الشركات الأمريكية لديها مستوى مستهدف (الأمثل) من النقد الذي تحاول تعديل مستوى النقد الفعلي لديها للوصول إليه. وعلاوة على ذلك، تدعم هذه النتيجة النسخة الديناميكية من نظرية المفاضلة حيث إن قيمة سرعة التسوية في الحيازات النقدية أقل من واحدة. وعلاوة على ذلك، تبين النتيجة الرئيسية لهذا البحث أن الشركات التي تمتلك أصولا ثابتة أقل تنتقل للمستوى المستهدف للنقد بشكل أسرع.

الكلمات المفتاحية: الأصول الثابتة، النقدية، سرعة التسوية النقدية

* **قسم إدارة الأعمال، كلية الأعمال، جامعة مؤتة.**

تاريخ تقديم البحث: 2022/12/14 . تاريخ قبول البحث: 2022/3/24 .

1- Introduction

The financial literature suggests that there are two types of motives for holding cash, namely, transactional motives and precautionary motives. In the first type, holding cash reduces the need of the firm to obtain external financing or to liquidate assets, resulting in a decrease in the transaction costs (Han and Qiu 2007; Opler et al. 1999). Furthermore, according to Myers and Majluf (1984), the presence of market imperfections, such as asymmetric information exposes firms to a higher cost of external financing. Therefore, by keeping cash, firms reduce the probability to forgo investments opportunities. As for the precautionary motives, cash holdings are used either to avoid cash shortage in the future or to meet unanticipated expenses (Han and Qiu 2007), decreasing liquidity constraints and the cost associated with it. In this regard, several studies have attempted to describe the cash holding policy of firms, including Bates et al. (2009); Foley et al., (2007); Fresard (2010), among others.

Furthermore, another strand of literature investigates the heterogeneity of cash holdings' speed of adjustment (henceforth, CH-SOA). In this vein, previous studies concluded that firms have a target (optimal) cash level, and these firms attempt to adjust their cash levels towards this target. Moreover, these studies have suggested that the speed at which firms adjust their cash levels towards the target cash ratio differ among firms depending on each firm's characteristics (see, for example, Guariglia & Yang (2018); Jiang & Lie (2016); Orlova & Raoy (2018), among others). For instance, Guariglia and Yang (2018) and Jiang and Lie (2016) suggest that the CH-SOA is higher when a firm has a cash surplus compared to a firm that faces cash deficits. Moreover, Orlova and Rao (2018) find that non-rated firms adjust faster towards target than rated firms. Dittmar and Duchin (2011) report that the CH-SOA is slower for mature firms. Gao et al. (2013) find that CH-SOA is higher for poorly governed public firms compared to well-governed counterparts due to agency costs. Bates et al. (2018) show that CH-SOA experiences a declining trend over time. Recently, Orlova and Sun, (2018), employing an international sample, show that CH-SOA is significantly affected by investors' protection rights and corporate governance.

However, since investigating the firm cash policy is a continuing concern among academics and practitioners, it is important to deepen our understanding in this vein and consider other determinants that may affect the speed of adjusting firm's cash holdings (CH-SOA). A closely related study by Orlova and Rao (2018) has analyzed the cash holding speed of adjustment using the same sample of the present study; however, the present study

distinguishes itself by considering a new factor that may affect the CH-SOA: the asset tangibility. Therefore, to expand this stream of research, this study comes as the first study that aims to investigate the impact of asset tangibility on the CH-SOA.

In this regard, numerous studies stress the importance of tangibles (e.g., Buildings, land, and plants) in obtaining external financing due to their low information asymmetry (e.g., Hart and Moore, 1994; Shleifer and Vishny,1992; Liberti and Sturgess, 2018). Recently, Orlova and Rao (2018) stress the importance of the availability of external financing on the CH-SOA. Furthermore, Bates et al. (2009) and Lyandres and Palazzo (2016) demonstrate that external financing is costly for firms with lower asset tangibility, inducing such firms to preserve precautionary savings. Therefore, studying this relationship is of high importance for both academics and practitioners who attempt to better form cash policies.

Using a sample of 12048 U.S. firms for the period 1985–2017, the main result of this study is that firms with lower asset tangibility adjust faster to the target level of cash; the cash holding speed of adjustment (CH-SOA) is 0.46. This value of CH-SOA provides evidence that US firms have a target (optimal) level of cash towards which they try to adjust their actual cash level. This supports the dynamic version of the trade-off theory rather than the static version as the value of CH-SOA is less than one.

The rest of the paper is organized as follows. Section two discusses the main theories of cash holdings. Section three presents the impact of asset tangibility on CH-SOA and hypothesis development. Sections four and five show the methodology and empirical results. Finally, section six concludes the paper.

2- Theories of cash holdings:

The following sub-sections briefly present the theories that explain the motives of corporate cash holdings.

2.1 Trade-off theory:

According to this theory, firms aim to maximize shareholder wealth by setting a target cash level and rebalancing their actual cash levels to maintain this target. In so doing, managers depend on the assessment of the costs benefits of keeping cash. The main cost of holding cash is the opportunity cost that stems from the fact that investing in cash and liquid assets provide a lower return as compared to the return on other investments

with a similar level of risk (Opler et al. (1999); Dittmar, Mahrt-Smith, and Servaes (2003)). Regarding the benefits of holding cash, firms have two main motives: the transaction cost motive and the precautionary motive (Opler et al. (1999); Kim, Mauer, and Sherman (1998). On the first motive, Opler et al. (1999) suggest that holding excess cash enables firms to meet business operations needs without the need for the costly assets' liquidation or external finance.

The precautionary motive suggests that keeping low levels of liquid assets makes firms vulnerable to any unexpected shocks and would expose these firms to a cost premium that will be incurred when accessing capital markets. This motive also suggests that being short on cash, firms are more likely to forgo positive net present value projects in the presence of information asymmetry problems (Guariglia and Yang, 2018).

To this end, the trade-off theory proposes that when firms adjust their cash levels towards a target level, these firms should trade-off between the adjustment costs resulting from rebalancing the cash amounts (the costs of being on target), and the costs of being off-target. Furthermore, the speed at which firms adjust their cash levels mainly depends on the adjustment costs a firm faces. Several studies have supported the trade-off view, among others, Kim, Mauer, and Sherman (1998), Opler et al. (1999). Ozkan and Ozkan (2004), Lee and Powell (2011), Venkiteshwaran (2011), and Guariglia and Yang (2018).

2.2 Pecking order theory:

According to this theory, firms rely on their internal sources of funds (retained earnings) first. Then, they move to debt and the final choice for firms is issuing equity (Myers, 1984). This preference stems from the problem of information asymmetry, where firms with higher asymmetric information use internal funds due to the cost of obtaining external finance causing such firms to be financially constrained (Myers and Majluf, 1984). Thus, Opler et al. (1999) suggest that, under this framework, firms do not have an optimal cash level towards which they should adjust their cash balances. Dittmar and Duchin (2011) find that the application of this theory is more relevant to the cash management behavior of older firms.

2.3 Free cash flow theory:

According to this theory, firms with high free cash flows may experience a conflict of interest between managers and shareholders over the pay-out policy (Jensen, 1986). Managers in such firms may use this cash

in investing in value-destroying projects to achieve respective goals, such as empire-building, or they may have entrenchment motives. However, the free cash flow theory does not predict an optimal or target level of cash holding (Guariglia and Yang, 2018). Studies that support this view include Harford (1999), Blanchard, Lopez-de-Silanes, and Shleifer (1994), Dittmar, Mahrt-Smith, and Servaes (2003), and Dittmar and Mahrt-Smith (2007), who find that firms with excess cash are less likely to be a takeover target; however, they are more likely to make value-decreasing acquisitions.

3- The impact of asset tangibility on CH-SOA and hypothesis development:

This section presents the relevant argument on the possible impact of asset tangibility and the quality of tangible assets on the CH-SOA and develops the research hypotheses.

A considerable amount of literature has focused on the importance of tangibles (including buildings, land, and plants) in obtaining external financing (e.g., Hart and Moore, 1994; Shleifer and Vishny,1992; Liberti and Sturgess, 2018). Regarding the impact of asset tangibility in CH-SOA, recently, Orlova and Rao (2018) stresses the importance of the availability of external financing on the CH-SOA. However, this impact seems ambiguous. For instance, one may argue that firms with easier access to external finance will be less constrained leading to a lower cost of adjustment, which enables such firms to rebalance their cash levels more rapidly. Supporting this view, Lockhart and Flannery (2010) demonstrate that firms with easier access to external finance have a higher leverage SOA.

Alternatively, on the contrary of their constrained counterparts, less constrained firms with easier access to external finance may be less concerned about adjusting their cash levels since external finance can be used as a substitution of cash. In this regard, Bates et al. (2009) and Lyandres and Palazzo (2016) demonstrate that external financing is costly for firms with lower asset tangibility, due to the high information asymmetry these firms have, inducing such firms to preserve precautionary savings to meet their investment and liquidity needs, which also increase the cost of being off-target for such firms. Considering this discussion, this research attempts to test the following hypothesis:

H_1: Firms with lower asset tangibility adjust faster to their target cash holdings level.

4- Methodology

4.1 Estimation framework

Previous studies employ several forms of the standard partial adjustment model to estimate the firm's speed of adjustment towards the optimal level in any given year (see, for example, Bates et al. (2018), Dittmar & Duchin (2011), Gao et al. (2013), and Orlova & Rao (2018). The partial adjustment model can be written as follows:

$$Cash_{i,t+1} - Cash_{i,t} = \lambda\left(Cash^{*}_{i,t+1} - Cash_{i,t}\right) + \delta_{i,t+1} \quad (1)$$

Where,

Cash* is the firm's target ratio of cash,

λ is the speed of adjustment towards target, i.e., SOA

δ is the disturbance term, and

We scale Cash and Cash* by Net Assets (Total Assets minus cash). Previous studies use the following model to estimate the target level of cash holdings:

$$Cash^{*}_{i,t+1} = \beta X_{it} \quad (2)$$

Where X_{it} represents the firm-specific factors that determine the firm's cash holdings target level, and β is a vector of coefficients. Following the literature of cash holdings, factors that influence a firm target cash holding include dividend dummy and market-to-book ratio, size, capital expenditure and leverage (Opler et al. (1999), Bates et al., (2009), Orlova and Rao (2018), and Dittmar & Duchin (2011)).

Substituting and rearranging model (1) and (2) yields the following estimable model:

$$Cash_{i,t+1} = (\lambda\beta)X_{it} + (1-\lambda)Cash_{i,t} + \delta_{i,t+1} \quad (3)$$

There are two approaches to estimate the target level of cash and the speed of adjustment (SOA), using equation (3). The first approach is to simultaneously estimate both the target and the SOA (Venkiteshwaran,

2011). The second approach is to estimate them separately (Faulkender et al. (2012) and Oztekin & Flannery (2012)).

For the purpose of this study, the second approach is employed because it allows to compare the adjustment of cash holding speed among different subsamples according to Orlova and Rao, (2018). In this regard, Faulkender et al. (2012) pointed out that estimating equation (3) for each sample separately may lead to inconsistency in modelling the target cash holdings across the specifications, which yields misleading results (Orlova and Rao (2018)). Therefore, following Orlova and Rao (2018), the two-step system Generalized Method of Moments (GMM) estimator by Blundell & Bond (1998) is employed to estimate equation (3) for the whole sample to obtain βs and λ that enable us to compute the target level of cash and the deviation from the target for each firm-year.

$$\widehat{DEV}_{i,t+1} = \widehat{Cash^{*}_{i,t+1}} - Cash_{it} \quad (4)$$

Where $\widehat{DEV}_{i,t+1}$, is the estimated deviation from the target and represents the difference between the estimated target level of cash ($\widehat{Cash^{*}_{i,t+1}}$) and the actual level of cash ($Cash_{it}$).

The substitution of equation (4) into equation (1) yields a regression that can be estimated with Ordinary Least Squares (OLS) model:

$$Cash_{i,t+1} - Cash_{i,t} = \lambda_{i,t+1}\left(\widehat{DEV}_{i,t+1}\right) + \delta_{i,t+1} \quad (5)$$

This model allows us to relax the assumption that the speed of adjustment is homogenous amongst firms, allowing the cash holding speed of adjustment to depend on some firm-specific factors.

$$\lambda_{i,t+1} = \gamma_0 + \lambda_{i,t+1} Z_{i,t} \quad (6)$$

And by substituting equation (6) into (5), we obtain,

$$Cash_{i,t+1} - Cash_{i,t} = (\gamma_0 + \lambda_{i,t+1} Z_{i,t})\left(\widehat{DEV}_{i,t+1}\right) + \delta_{i,t+1} \quad (7)$$

Where $Z_{i,t}$ includes firm-specific factors that are assumed to affect thespeed of adjustment of firm's cash holding. Moreover, $\left(\widehat{DEV}_{i,t+1}\right)$ interacts with the asset tangibility dummy variable to test the research hypothesis.

- Tangibility (TAN) is a dummy variable that equals 1 for firms with lower than median of tangible assets of the whole sample, 0 otherwise.

4.2 Control Variables

Existing literature has shown that the variables that influence the firm cash holdings will affect the cash holding speed of adjustment also (Orlova and Rao (2018)). Therefore, in addition to the year and industry effects, we include a set of control variables, such as capital expenditure (CAPEXP), Dividend (DIV), Leverage (LEV), Market to Book ratio (MtoB) and size (SIZE) while examining the impact of our main independent variables on the cash holding speed of adjustment.

4.3 Data

The sample of this study consists of all the U.S. firms from Compustat for the period 1985–2017. After excluding financial and utility firms from the sample, as well as firms with missing or negative values of total assets, sales and equity, the sample contains 12048 unique firms. Main variables are winsorized at the 1st and 99th percentiles except for dividends. We use Fama and French (1997) industry classification (48 industry classification available from French's website). Variable's definitions are provided in Table 1.

Table (1): Variables' definitions.

Variables	Definition
Cash	It is cash and short-term investments (che) scaled by net assets, defined as Total Assets (at) minus Cash (che).
$Cash^*$	It is the target value of cash holdings, and it is an estimated value based on the following firm characteristics: size, market-to-book ratio, capital expenditures, leverage, and dividend (dummy).
DEV	It represents the deviation from target that is the difference between current Cash and target level of cash.
Dividend (DIV)	It is a dummy variable that equals one if a firm pays dividends in a specific year, and zero otherwise.
Leverage (LEV)	It is a short-term debt (dlc) plus a long-term debt (dltt), scaled by total assets (at).

Variables	Definition
Market-to-Book ratio (MtoB)	It is defined as total assets (at) minus book equity (ceq) plus a market value of equity (mkvalt), divided by total assets (at).
Size	It is the natural logarithm of the book value of total assets (at).
Capexp	It is capital expenditure (capx) divided by total assets (at).
Tangibility (TAN)	It is a dummy variable that equals 1 for firms with lower than median of tangible assets of the whole sample, 0 otherwise.

4.4 Descriptive statistics

Table (2) below presents brief descriptive statistics of the main variables included in the model. The mean of cash-to-asset ratio is .80 and the median is .106, which is a high ratio, showing the high importance of cash for firms. This finding is consistent with the results of Dittmar & Duchin (2012) and Orlova and Rao (2018). Regarding the determinants of corporate cash holdings, the table shows that the market-to-book ratio has a mean of 2.14 and a standard deviation of 1.655. Leverage mean is 36.3% and the standard deviation is 0.722. Capital expenditure variable has a 0.062 mean and 0.077 standard deviation. The mean of the dividend variable is 35.2% with 0.478 standard deviation. Finally, the firm size has a mean of 18.376 and a standard deviation of 2.827.

Table (2): Summary Statistics

	Mean	25th percentile	Median	75th Percentile	Standard Deviation
Cash	0.803	0.027	0.106	0.399	2.672
MtoB	2.140	1.107	1.547	2.508	1.655
LEV	0.363	0.029	0.211	0.417	0.722
Capexp	0.062	0.015	0.036	0.077	0.077
DIV	0.352	0	0	1	0.478
Size	18.376	16.558	18.406	20.285	2.827
DEV	-0.203	0.018	0.636	0.902	3.008
TAN	0.497	0	0	1	0.499

4.5 Correlation Matrix

Table (3) below shows the correlation matrix of the key variables included in the GMM model. Cash holding variable is positively and significantly related to the investment opportunities, meaning that firms with high investment opportunities tend to hold more cash. However, the table shows that leverage (-0.0542), capital expenditure (-0.1378), whether the firm pays dividends (-0.1147), and size (-0.1656) are negatively and significantly correlated to cash holdings indicating that firms that tend to hold less cash are large firms, and firms with higher leverage ratio, higher capital expenditure, and non-dividend paying firms. These preliminary results are consistent with previous studies on the determinants of cash holdings (e.g., Cheung, 2016). Finally, correlations between independent variables exhibit no multicollinearity problem.

Table (3): Correlation matrix

	Cash	**MtoB**	**LEV**	**capexp**	**DIV**	**Size**	**DEV**	**TAN**
Cash	1							
MtoB	0.048	1						
LEV	-0.054	0.498	1					
Capexp	-0.138	0.028	0.027	1				
DIV	-0.115	-0.088	-0.047	0.022	1			
Size	-0.165	-0.424	-0.352	0.041	0.329	1		
DEV	-0.694	0.132	-0.076	-0.037	0.139	0.253	1	
TAN	0.231	0.042	-0.044	-0.452	-0.168	-0.186	-0.150	1

5- Empirical Results

5.1 Overall Cash holding speed of adjustment

In this part, we estimate CH-SOA emplying the full sample using Blundell & Bond (1998) system GMM estimator[*]. The table shows that the coefficient of the lagged dependent variable is 0.54, which corresponds to a SOA of 0.46, indicating that on average firms close around half of the deviation from the target in one year.

[*] We use the first and second order serial correlation (AR1 and AR2), respectively, to test serial correlation, and the results were 0.000 for the probability of AR1 and 0.6930 for AR2. Also, to ensure the validity of instruments used, the Sargan test P-value was 0.2157. These results indicate that the GMM estimates are consistent, and the instruments are valid.

Table (4): full sample cash holding speed of adjustment (CH-SOA)

	Cash
Cash lag	0.545***
	(0.0284)
DIV	-0.0125
	(0.0435)
MtoB	0.000164
	(0.00181)
Capexp	-2.554***
	(0.260)
LEV	-0.164***
	(0.0419)
Size	0.0295
	(0.0346)
Constant	-2.912
	(6.089)
Industry Effects, Year Effects	Yes Yes
Observations	71,144
Number of firms	9,186

This table reports the results of Blundell & Bond's (1998) estimator for the following model: $Cash_{i,t+1} = (\lambda\beta)X_{it} + (1-\lambda)Cash_{i,t} + \delta_{i,t+1}$, where X_{it} is a vector of observable firm-specific characteristics that affect the firm's target level of cash holdings, β is a vector of coefficients, and λ is the speed of adjustment. The determinants of target cash holdings include dividend (dummy), market-to-book ratio, capital expenditures (Capex), leverage, size, industry effects, and year-fixed effects. Robust standard errors are in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Overall, the results reported in table (4) show how economically meaningful is the magnitude of CH-SOA, which confirms the results in prior literature (e.g., Orlova and Rao, 2018). This finding is also consistent with the trade-off theory in that firms have a target (optimal) level of cash towards which they try to adjust their actual cash level (Chang et al. (2017)).

Regarding the control variables, a negative and significant effect for leverage (LEV) is found, indicating that firms with higher leverage ratios tend to hold less cash, which is in line with the pecking order theory. Another possible explanation of this finding could be that firms with high leverage are more monitored by lenders, which reduces the management discretion to hold large amounts of cash, according to Drobetz and Gruninger (2007). Similarly, there is a negative and a significant relationship between capital expenditure (capexp) and cash, which also supports the pecking order theory as firms with higher investment expenditure will rely on cash as a source of finance before accessing external sources of fund. This result is consistent with Jani et al. (2004). . In the following section, we focus on the asymmetry of CH-SOA among firms, taking into consideration asset tangibility.

5.2 The impact of asset tangibility

Table (5) below shows the impact of asset tangibility on the CH-SOA. It was previously assumed that firms with a lower ratio of tangible assets will face more difficulties in accessing capital markets, inducing such firms to keep their cash level up to target to avoid the high cost of being off target. The estimate of deviation (DEV) is significant at the 1% level and shows that, on average, firms adjust towards the target level with a SOA of 0.71.

Table (5): The impact of asset tangibility

	(1)
VARIABLES	ΔCash
DEV	0.711***
	(0.0140)
TAN*DEV	0.681***
	(0.0322)
Capexp	1.741***
	(0.192)
DIV	0.119***
	(0.0266)
LEV	0.0213
	(0.0248)
MtoB	-0.00164*
	(0.000856)
Size	-0.154***

	(0.0214)
Constant	15.47***
	(4.791)
Observations	94,609
Number of gvkey	12,048
R-squared	0.383
Industry effect	Yes
Year effect	Yes

This table reports results for the OLS estimator for the following model $Cash_{i,t+1} - Cash_{i,t} = (\gamma_0 + \lambda_{i,t+1} Z_{i,t}) (\widehat{DEV_{i,t+1}}) + \delta_{i,t+1}$. Where $Z_{i,t}$ includes firm-specific factors that are assumed to affect a firm's cash holding speed of adjustment. Moreover, $(\widehat{DEV_{i,t+1}})$ is interacted with the asset tangibility dummy variable to test the impact of asset tangibility in the CH-SOA. Robust standard errors are in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Regarding the impact of asset tangibility on CH-SOA, the coefficient of the interaction term (TAN*DEV) is positive, and it is statistically significant at 1% level, revealing that CH-SOA of firms with lower level of asset tangibility is higher than that for firms with a higher level of tangible assets, as expected. This result is consistent with Orlova and Rao (2018), who find small and unrated firms adjust faster towards their target level.

6- Conclusion

This research extends the recent literature on the factors that lead the speed of adjusting cash holdings (CH-SOA) to be heterogeneous among firms. More specifically, it addresses the impact of a firm's asset tangibility on the speed of adjusting cash holdings. The results of this research show that the speed of adjusting cash holding is 0.46, indicating that on average firms close around half of the deviation from the target in one year. This value of CH-SOA provides evidence that US firms have a target (optimal) level of cash towards which they try to adjust their actual cash level. Moreover, this result supports the dynamic version of the trade-off theory rather than the static version as the value of CH-SOA is less than one.

Furthermore, the main result of this research shows that firms with lower asset tangibility adjust faster to the target level of cash. The results of this research are of high importance for both academic and practitioners who attempt to better form cash policies.

References:

Bates, T., Chang, C. & Chi, J. (2018). Why has the value of cash increased over time?. *Journal of Financial and Quantitative Analysis*, 53(2), 749-787.

Bates, T., Kahle, K. & Stulz, R. (2009). Why do US firms hold so much more cash than they used to?. *The journal of finance*, 64(5), 1985-2021.

Blundell, R. & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of econometrics*, 87(1), 115-143.

Chang, Y., Benson, K. & Faff, R. (2017, February). *Asymmetric modelling of the adjustment speed of cash holdings*. In Asian Finance Association (AsianFA) 2017 Conference.

Chaney, T., Sraer, D. & Thesmar, D. (2012). The collateral channel: How real estate shocks affect corporate investment. American Economic Review, 102(6), 2381-2409.

Cheung, A. (2016). Corporate social responsibility and corporate cash holdings. *Journal of Corporate Finance*, 37, 412-430.

Dittmar, A. & Duchin, R. (2011). *Dynamics of cash*. Working paper. University of Michigan.

Dittmar, A., Mahrt-Smith, J., & Servaes, H. (2003). International corporate governance and corporate cash holdings. *Journal of Financial and Quantitative analysis*, 38(1), 111-133.

Drobetz, W. & Grüninger, M. (2007). Corporate cash holdings: Evidence from Switzerland. *Financial Markets and Portfolio Management*, 21(3), 293-324.

Faulkender, M., Flannery, M., Hankins, K. & Smith, J. (2012). Cash flows and leverage adjustments. *Journal of Financial economics*, 103(3), 632-646.

Foley, C., Hartzell, J., Titman, S. & Twite, G. (2007). Why do firms hold so much cash? A tax-based explanation. *Journal of financial economics*, 86(3), 579-607.

Fresard, L. (2010). Financial strength and product market behavior: The real effects of corporate cash holdings. *The Journal of finance*, 65(3), 1097-1122.

Gao, H., Harford, J., & Li, K. (2013). Determinants of corporate cash policy: Insights from private firms. *Journal of Financial Economics*, 109(3), 623-639.

Guariglia, A. & Yang, J. (2018). Adjustment behavior of corporate cash holdings: the China experience. *The European Journal of Finance*, 24(16), 1428-1452.

Han, S. & Qiu, J. (2007). Corporate precautionary cash holdings. *Journal of corporate finance*, 13(1), 43-57.

Hart, O. & Moore, J. (1994). A theory of debt based on the inalienability of human capital. *The Quarterly Journal of Economics*, 109(4), 841-879.

Jiang, Z. & Lie, E. (2016). Cash holding adjustments and managerial entrenchment. *Journal of Corporate Finance*, 36, 190-205.

Jani, E., Hoesli, M. & Bender, A. (2004). *Corporate cash holdings and agency conflicts*. Available at SSRN 563863.

Kim, C., Mauer, D. & Sherman, A. (1998). The determinants of corporate liquidity: Theory and evidence. *Journal of financial and quantitative analysis*, 33(3), 335-359.

Liberti, J. & Sturgess, J. (2018). The anatomy of a credit supply shock: evidence from an internal credit market. *Journal of Financial and Quantitative Analysis*, 53(2), 547-579.

Lockhart, G. & Flannery, M. (2010). *Adjusting to target capital structure: The effect of credit lines*. Working Paper, University of Nebraska–Lincoln.

Lyandres, E. & Palazzo, B. (2016). Cash holdings, competition, and innovation. *Journal of Financial and Quantitative Analysis*, 51(6), 1823-1861.

Myers, S. (1984). Capital structure puzzle. *The Journal of Finance*, 39(3), pp.574-592.

Myers, S. & Majluf, N.(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.

Öztekin, Ö. & Flannery, M. (2012). Institutional determinants of capital structure adjustment speeds. *Journal of financial economics*, 103(1), 88-112.

Orlova, S. & Rao, R. (2018). Cash holdings speed of adjustment. International Review of Economics & Finance, 54, 1-14.

Shleifer, A., & Vishny, R. W. (1992). Liquidation values and debt capacity: A market equilibrium approach. *The journal of finance*, 47(4), 1343-1366.

Venkiteshwaran, V. (2011). Partial adjustment toward optimal cash holding levels. *Review of Financial Economics*, 20(3), 113-121.