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Managerial Overconfidence and Cash Holding in China: The Moderating Effect of Enterprise Digital Transformation

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ABSTRACT

This study examined whether enterprise digital transformation impacts the relationship between managerial overconfidence and cash holdings. As its quantitative analysis approaches, it employed the fixed effect method and the generalized method of moments. Firstly, a positive relationship can be found between managerial overconfidence and cash holdings. This study uses behavioural finance to explain why overconfident managers always hold more cash. Secondly, this study aims to contribute further to the field of investigation, providing additional insight into this matter. This study highlights the significance of digital transformation in mitigating the cognitive bias of overconfident managers and ensuring the organization's successful development in a highly competitive market. This study finds that enterprise digital transformation effectively mitigates overconfident managers holding excess cash during operations. This research not only enhances the understanding of enterprise digital transformation in relation to economic repercussions but also contributes to the affection of digital economic transformation on the corporate governance of Chinese listed companies.

KEYWORDS

Managerial Overconfidence; Digital Transformation; Cash Holdings; Behavioural Finance

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1. Introduction

A company's most liquid and essential asset is cash (Opler, 1999; Abdalkdoos et al., 2023). An organisation's cash holdings can reveal much about its financial decisions and operating strategy (Dao et al., 2023). This is because cash holding decisions have a direct impact on the development of enterprises (Chen et al., 2020; Asadia et al., 2021).

Previous research assumes that managers are rational beings (Heaton, 2002). Psychologists have proven through a series of experiments and studies that people are generally overconfident and usually result in a decision-making judgement for business managers (Graham & Harvey, 2001; Huang-Meier et al., 2017). Overconfidence is more severe and may cause decisions to deviate from traditional economic theories (Li, 2009; Graham et al., 2017). Moreover, prior research indicates that precautionary and agency motives can explain the cash reserves decision. However, traditional theory cannot effectively connect the correlation between managers' overconfidence and cash holdings. In addition, Zheng and Chen (2018) illustrate that managers in China may be more overconfident. This is because traditional Chinese culture advocates the hierarchical idea and emphasises the importance of authority in Chinese interpersonal relations, making enterprise managers vulnerable to "control illusions." Then, Chinese interpersonal relationships developed a self-assured cognitive bias. Second, China's unique transforming economic environment has shaped several "godfather-level" state-owned enterprises leaders and private enterprise founders during these years; their pivotal role in entrepreneurship and business growth and continued success may strengthen their confident psychology. Third, the flaws in the internal governance and external supervision mechanisms assist Chinese enterprises in creating a suitable "soil" for managers' overconfidence. Therefore, the proportion of overconfidence in Chinese-listed companies may be higher than in foreign-listed companies due to the influence of the Confucian hierarchy and the imperfect external governance mechanism.

Corporate digital transformation has been widespread; The present study primarily concentrates on the definition of enterprise digital transformation (Verhoef et al., 2021) and the influence of digital transformation strategy (Sun et al., 2022). Academics demonstrate the correlation between digital transformation and corporate strategy, which plays an important role in corporate finance and corporate financial management practices (Cao et al., 2022). In addition, corporate digital transformation improves information transparency and alleviates external financing constraints (Zhao et al., 2023). This paper investigates the potential impact of overconfident managers on the cash holdings of corporations. Is there an effect of enterprise digital transformation on the correlation between managers' overconfidence and cash holding? If so, what are the possible mechanisms? These issues have hampered listed companies' decision-making.

This study investigates the association between managers' overconfidence and cash holdings, as well as the influence of enterprise digital transformation on this correlation. This study indicates a strong and positive link between the overconfidence of managers and their cash holdings. However, enterprise digital transformation limits the correlation between managers' overconfidence and cash holdings.

Various robustness checks confirm that the empirical results are robust. The first robust test is changing the independent variable from relative compensation for management to changes in shareholding and earnings. Another approach uses GMM regression to address the issue of endogeneity. The findings in each of these checks are consistent with the main regression results.

This study presents a new research perspective and enhances cash holding research. Although numerous studies have been dedicated to the subject of managerial overconfidence and cash holdings, there is a dearth of research examining the influence of enterprise digital transformation on the relationship above. Hence, this research not only enhances the understanding of enterprise digital transformation in relation to economic repercussions but also contributes to the influence of digital economic transformation on the corporate governance of Chinese listed companies.

2. Literature review and hypothesis

The current research mostly focused on the analysis of optimal decision behaviour, which is based on the fact that people are rational and make rational decisions. However, managers' decisions are always Impacted by the volatility of market competition and external circumstances (Lin et al., 2023). This is because the uncertainty of the external market environment and macroeconomic policy factors are uncontrollable for individual enterprises. Therefore, if managers exaggerate their own entrepreneurial ability, overestimate their own judgement ability, and lack the ability to avoid risks (Adam et al., 2015), they will overestimate the investment return and underestimate risks. At the same time, enterprise managers believe that they have more market information than others (Drobetz et al., 2010), which leads managers to show cognitive bias and biased self-attribution (Doukas & Petmezas, 2007). The obvious characteristic of overconfident managers is their aggressive investment behavior. On one hand, investment opportunities have the potential to be exclusive and competitive in the market. If managers want to make a more accurate judgement through delayed investment to reduce uncertainty, it is likely to create investment opportunities for competitors, which means enterprises will lose profit opportunities. Therefore, overconfident managers tend to be more sensitive to potential investment opportunities in the market (Galasso & Simcoe, 2011; Hirshleife et al., 2012). On the other hand, enterprises holding more liquid cash assets can resist the "predation" risk of competitors and expand their market share, which can help enterprises expand their competitiveness directly or indirectly in the market (Fresard, 2010). Therefore, managers' overconfidence leads to more cash being held to grasp investment opportunities and resist market competition (Gao et al., 2013). We propose the following hypothesis based on this evidence:

H1: There is a positive correlation between managers' overconfidence and their cash holdings

Digital transformation reduces the precautionary motive for currency holdings. Asymmetrical information can be reduced through digital transformation. Due to the financing constraints resulting from asymmetric information (Fazzari et al., 1988; Almeida et al., 2004), enterprises maintain large amounts of cash reserves. The information environment is altered through the implementation of digital technology, which enhances the efficiency of information collection and transmission (Cong & He, 2019; Sun et al., 2022). The operational and financial status of a company is easy to get from information users, including regulators, investors, and creditors (Jiang et al., 2022). External investors have been able to more precisely value assets, increasing the relevance of enterprise valuation. The lower information asymmetry can mitigate corporate financing costs and constraints. As a result, enterprises become less dependent on internal financing (Sun et al., 2012). Therefore, overconfident managers will make lower cash plans, and the financing constraints can be mitigated due to improved information transparency, which can alleviate the excessive cash holdings of overconfident managers. Based on the above analysis, hypothesis 2 can be presented as follows:

H2: Enterprise digital transformation alleviates the positive correlation between managerial overconfidence and cash holdings.

3. Data and empirical methodology

This study uses the fixed effect method and the generalised method of moments to analyse the correlation between managerial overconfidence and cash holdings, using 5767 observations from 838 Chinese listed companies during 2010–2022. All the data is collected from the CSMAR.

According to Opler (1999) and Shabrina and Lubis (2021), create Models (1) and (2). Model (1) examines the relationship between managers' overconfidence and reserves of cash; Model (2) examines whether digital transformation affects the relationship between OC and CH. All the models employ FEM regression and use GMM to alleviate endogenous problems as a robust test.

$$CH_{it} = \beta_0 + \beta_1 OC_{it} + \sum \beta_{it} CV_{it} + \sum Year + \sum Industry + \varepsilon_{it} \quad (1)$$

$$CH_{it} = \beta_0 + \beta_1 OC_{it} + \beta_2 ln\ \_dt_{it} + \beta_3 OC * ln\ \_dt_{it} + \sum \beta_{it} CV_{it} + \sum Year + \sum Industry + \varepsilon_{it} \quad (2)$$

In models (1) and (2), CH denotes cash holding, OC denotes managerial overconfidence, ln_dt denotes enterprise digital transformation. CV means control variables, which include Firm size (Size), Dividend payment (Div), Internal control (HIC), two duties are integrated and Enterprise nature (Du) and Ownership Management (OM). ε means the error term (Table 1).

Table 1. Variable Definition.

Variable name	Variable symbol	Variable meaning
		Dependent variable (CH)
Cash holding	CH	(Monetary funds + trading financial assets / Total assets)
		Independent variable (OC)
Relative compensation for management	REC	Top 3 executive compensation / executive compensation combined
Shareholding and earning changes	SEC	Using shareholding growth rate minus the difference of earnings per share growth. If the result is positive, OC=1; if one variable is negative or the result is zero or negative, OC=0.
		Moderating variable (ln_dt)
Enterprise digital transformation	Ln_dt	The company's digital transformation degree can be divided into five aspects, which include artificial intelligence, block chain, cloud computing, big data, and the application of digital technology. Sum of the five aspects of word frequency number. Using logarithms to measure the degree of digital transformation can reduce the interference of empirical results.
		Control variable (CV)
Ownership Management	OM	Ownership Management is the ratio of senior managers to the number of shares outstanding at the end of fiscal year.
Firm size (CNY-100 million)	Size	Natural logarithm of the total assets at the end of the year
Dividend payment	Div	Dividend payment is taking 1, otherwise, Div takes 0
Internal control	HIC	If the internal control index is higher than the median industry of the sample year, HIC takes 1, otherwise, HIC takes 0
The two duties are integrated	Du	If the chairman and the general manager are held by the same person, the value is 1. Otherwise, 0
Enterprise nature	State	SOE is1. Non-SOE value 0

4. Empirical analysis

Table 2 illustrates that the mean (Std.dev) of CH is 0.179 (0.123). The variable representing digital transformation (Ln_dt) has a mean (Std.dev) value of 1.227 (1.354). This indicates that the digital transformation process differs among individual firms. For the SEC and REC, the mean values are 0.376 and 0.469, respectively, which means about 40% of managers are overconfident about the enterprises.

Table 2. Descriptive statistics.

Variable	Obs	Mean	Std.dev.	Min	Max
CH	5,767	0.179	0.123	0.00136	0.980
Ln_dt	5,767	1.227	1.354	0	6.140
SEC	5,767	0.376	0.484	0	1
REC	5,767	0.469	0.145	0.155	1
HIC	5,767	0.958	0.200	0	1
OM	5,767	0.0412	0.169	0	2.550

Size	5,767	22.88	1.416	17.64	28.61
Div	5,767	0.708	0.455	0	1
Du	5,767	0.164	0.370	0	1
State	5,767	0.702	0.457	0	1

Note: CH denotes cash holding, REC means Relative compensation for management. SEC denotes Shareholding and earning changes. ln_dt denotes enterprise digital transformation. Size means Firm size, Div denotes Dividend payment Div, HIC means Internal control, Du means two duties are integrated and Enterprise nature and OM denotes Ownership Management.

According to Zheng and Chen (2018) and Chen et al. (2020) research, the univariate test is used to preliminary and tentatively check hypothesis 1. Table 3 is used to test the group difference between the cash holding levels of enterprises with high management confidence and those with low management confidence. The results show that when managers are more overconfident, the mean and median levels of corporate cash holdings were 0.187, 0.183, and 0.153, 0.149, respectively. In contrast, when managers are non-overconfident, the mean and median levels of corporate cash holdings were 0.171, 0.176, and 0.144, 0.146, respectively. Besides, no matter overconfidence or non-overconfidence for managers, the mean is all larger than the median. Besides, compared with non-overconfident managers, overconfident managers hold more cash. It is preliminary and tentatively supports hypothesis 1.

Table 3. Univariate Test.

Variables	non-overconfidence			overconfidence			MeanDiff
	Obs	Mean	Median	Obs	Mean	Median	
CH (REC)	3879	0.171	0.144	2970	0.187	0.153	-0.016***
CH (SEC)	4330	0176	0.146	2519	0.183	0.149	-0.007**

Note: This table provides univariate test for dependent variable and independent variables. CH denotes corporate cash holding. SEC denotes Shareholding and earnings changes. REC denotes Relative compensation for management.

The regression analysis for Table 4 used the Fixed Effects Model (FEM) to check the correlation between managers' overconfidence and cash holdings. The regression analysis for Column (1) demonstrates a statistically significant and positive correlation at the 1% level, with coefficients of 0.049. This discovery illustrates that one unit rise in managerial overconfidence results in a 0.049 unit increase in the amount of cash holdings. The results illustrate that managerial overconfidence has a positive correlation with cash holdings, which is consistent with Tran et al. (2021) and Hayward and Hambrick (1997). That means the higher the managers' overconfidence, the higher the cash holding level for the enterprise.

This is because overconfident managers show knowledge illusions and control illusions. This way, overconfident managers overestimate their ability to judge the future and control the risk of uncertainty, which leads to their performance feedback producing an upward deviation. Simultaneously, if managers predict market development that is consistent with the actual market operation, self-attribution bias will be generated, which will promote managers to be more confident. This phenomenon makes managers believe that the current enterprise value is undervalued, external financing costs are higher, and they tend to take internal financing (Malmendier et al., 2011). As a result, managers tend to hold more cash for internal financing, which can reduce their continuous dependence on the capital market and eliminate the need to provide information about capital investment projects. Moreover, overconfident managers are enthusiastic about challenging and risky investments and tend to implement R&D investments to gain a competitive advantage in the future. Therefore, if overconfident managers want to get higher investment returns to show their ability, they should prepare enough money to grasp the investment opportunities. In addition, overconfident managers may use more cash to develop innovation. However, innovation involves higher levels of risks (such as potential financial distress or cash flow instability), which lead to companies increasing their cash holdings to resist risks (Huang et al., 2016).

Through the above analysis, it can be found that managers may waste enterprise money due to agent motivation, but overconfident managers hold more cash to meet the stronger investment demand. Overconfident managers tend to hold more cash for internal financing needs and better grasp the future good investment opportunities, and R&D investment for more stable and stronger sustained funding support, which positively correlated with cash holding level.

In addition, Table 4 shows that enterprise digital transformation mitigates the positive correlation for the above variables. The regression indicates a negatively correlated effect on managers' overconfidence with cash holdings at the 1% level. This finding supports H2. This finding demonstrates that overconfident managers' positive impact on the cash holdings can be mitigated with the development of enterprise digital transformation. This is because enterprise digital transformation reduces governance costs (Frynas et al., 2018) and alleviates asymmetric information (Zhao et al., 2023), which mitigate managers' overconfidence and help managers avoid cognitive bias when they make decisions.

Table 4. Regression Estimates of Managerial Overconfidence and Cash Holding.

	Main regression		Robust test	
VARIABLES	OC=REC	OC=REC	OC=SEC	OC=SEC
	CH	CH	CH	CH
OC	0.049***	0.054***	0.005**	0.005**
	(3.85)	(4.11)	(2.13)	(2.13)
ln_dt		0.005**		0.003**
		(2.51)		(2.01)
OC*ln_dt		-0.001***		-0.003*
		(-3.68)		(-1.82)
HIC	0.006	0.006	0.006	0.005
	(1.01)	(0.90)	(0.90)	(0.76)
Size	-0.011***	-0.011***	-0.012***	-0.013***
	(-5.34)	(-4.69)	(-5.56)	(-5.72)
Div	0.020***	0.020***	0.019***	0.020***
	(6.05)	(5.85)	(5.80)	(5.95)
Du	0.001	0.001	0.001	0.001
	(0.22)	(0.14)	(0.28)	(0.27)
State	-0.019***	-0.018***	-0.018***	-0.019***
	(-3.88)	(-3.66)	(-3.68)	(-3.81)
Constant	0.407***	0.395***	0.437***	0.461***
	(8.44)	(7.47)	(9.23)	(9.21)
Observations	5,750	5,558	5,767	5,767
R-squared	0.21	0.22	0.19	0.20
Number of codes	838	828	838	838
ind FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

*Notes: t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. CH denotes cash holding, REC means Relative compensation for management. SEC denotes Shareholding and earning changes. ln_dt denotes enterprise digital transformation. Size means Firm size, Div denotes Dividend payment Div, HIC means Internal control, Du means two duties are integrated and Enterprise nature and OM denotes Ownership Management.*

Sun et al. (2022) noted that enterprise digital transformation can alleviate the asymmetric information and improve information transparency and reliability. Furthermore, the digital environment's boundary-free attributes eliminate information barriers between enterprises (Foerster-Metz et al., 2018). To gain an advantage and progress in the fierce market competition, enterprises will typically enhance the transparency and exchange of information with external stakeholders, including trading competitors, small and medium-sized investors, and other external individuals, which enables companies to provide more precise and timely information. Therefore, external investors can judge the authenticity of the company's operating conditions and financial information through the comparability of the company and its industry, reducing the risks of investment, better judging the expected rate of return, and increasing investment confidence, which can alleviate the financing constraints and the company's dependence on internal funds. Based on the above analysis, enterprise digital transformation can restrain overconfident managers from holding excess cash. Therefore, the result is consistent with the study and supports hypothesis 2.

The empirical results demonstrate the robustness of the test when the independent variable is changed from Relative compensation for management to Shareholding and earning changes. The regression indicates a positive relationship at the 1% level, and the coefficient is 0.005. This finding is consistent with the study and supports hypothesis 1. Moreover, the regression indicates a negatively correlated effect on managers' overconfidence with cash holdings. The result is consistent with H2.

Table 5 uses GMM to solve endogenous problems and as a robust test to recheck the hypothesis 1 and 2. GMM regression shows a positive relationship for REC and CH, with a 0.147 coefficient at the 1% level. When the independent variable is changed from relative compensation for management to shareholding and earning changes, the result is the same. In addition, OC*ln_dt indicates a negative relationship at the 1% level with a -0.145 coefficient. The result points out that digital transformation for firms is alleviating the above positive relationship, which is consistent with base regression results. The empirical results demonstrate the robustness of the test when the independent variable is changed from relative compensation for management to shareholding and earning changes. The result is consistent with H1 and H2.

Table 5. GMM Regression.

VARIABLES	OC=REC CH	OC=SEC CH	OC=REC CH	OC=SEC CH
L.CH	0.578***	0.723***	0.614***	0.686***
	(5.15)	(0.053)	(0.056)	(0.134)
OC	0.147***	0.032*	0.128	0.007
	(2.82)	(0.019)	(0.082)	(0.023)
OC*ln_dt			-0.145***	-0.005***
			(0.056)	(0.002)
ln_dt			0.030***	0.013
			(0.010)	(0.009)
HIC	0.007	-0.012	0.079	-0.017
	(0.19)	(0.053)	(0.059)	(0.070)
Size	0.009**	0.008**	-0.021**	-0.019*
	(2.36)	(0.004)	(0.010)	(0.010)
Div	0.013	0.013	0.059***	0.016
	(0.97)	(0.014)	(0.023)	(0.025)
Du	0.009	0.035	-0.002	-0.003
	(0.33)	(0.025)	(0.008)	(0.007)
State	0.044**	0.080***	0.036	0.057**
	(2.03)	(0.020)	(0.034)	(0.025)
Constant	-0.249**	-0.219*	0.301	0.438*
	(-2.54)	(0.112)	(0.239)	(0.240)
Number of code	703	703	702	703
ar1	-5.394	-7.961	-9.100	-5.003
ar1p	6.88e-08	0	0	5.64e-07
ar2	0.363	1.341	-0.0694	1.378
ar2p	0.717	0.180	0.945	0.168
hansen	60.32	82.55	89.77	62.41
hansenp	0.151	0.401	0.576	0.356
Observations	4322	4336	4282	4336

*Notes: z-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. CH denotes cash holding, REC means Relative compensation* *for management. SEC denotes Shareholding and earning changes. ln_dt denotes enterprise digital transformation. Size means Firm size, Div denotes Dividend payment Div, HIC means Internal control, Du means two duties are integrated and Enterprise nature and OM denotes Ownership Management.*

5. Additional tests

The previous analysis viewed product market competition as an external pressure and supervision mechanism that affects cash holding decisions and alleviates agency problems (Stigler, 1958). In addition, the more competitive companies in the product market, the less asymmetric information (Holmstrom, 1982; Li, 2023). Therefore, market competition is the key to motivating firms to implement transformation and alleviating asymmetric information (Cheng & Masron, 2023). To examine whether market competition is the channel through which managers' overconfidence affects enterprise cash holdings, this study introduces the Herfindahl-Hirschman Index (HHI) to evaluate the degree of competition in various industries. The sample is divided into two subsets: (1-HHI) is higher than the mean value, which means high product market competition (High PMC), and (1-HHI) is less than the mean (Low PMC). Then, we re-estimated the regression result as follows:

Columns (1) and (2) show that when product market competition is high, enterprise digital transformation efficiently mitigates overconfident managers holding excess cash. This implies that the influence of enterprise digital transformation on the relationship between overconfident managers and cash holdings is more pronounced in firms with higher product market competition. This is because the high level of product market competition alleviates information asymmetry and encourages managers who are overconfident to work harder to improve performance and cash value. However, when product market competition is low, the result is not significant. The reason is that the high level of market concentration leads to enterprises being willing to hold more cash to defend the plunder risk from oligarchic enterprises (Table 6).

Table 6. Heterogeneous effects of managers' overconfidence on cash holdings.

VARIABLES	(1) High PMC CH	(2) Low PMC CH
REC	0.040**	-0.021
	(2.55)	(-0.80)
ln_dt	0.001	0.004
	(0.38)	(1.20)
RCE_ln_dt	-0.001***	0.000
	(-4.50)	(0.45)
HIC	0.003	0.025*
	(0.36)	(1.90)
Size	-0.020***	-0.011
	(-5.48)	(-1.63)
Div	0.026***	0.016**
	(6.51)	(2.38)
Du	0.001	0.000
	(0.18)	(0.04)
State	-0.015***	-0.054***
	(-2.64)	(-5.02)
Constant	0.446***	0.420***
	(4.21)	(2.65)
Observations	4,041	1,517
R-squared	0.096	0.174
ind FE	YES	YES
Year FE	YES	YES

*Notes: z-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. HHI denotes product market competition, High PMC means product market competition is high, otherwise is low. CH denotes cash holding, REC means Relative compensation for* *management. SEC denotes Shareholding and earning changes. ln_dt denotes enterprise digital transformation. Size means Firm size, Div denotes Dividend payment Div, HIC means Internal control, Du means two duties are integrated and Enterprise nature and OM denotes Ownership Management.*

6. Conclusion and Limitation

This study uses Chinese listed companies from Shanghai and Shenzhen Stock Exchanges, including 5767 observations between 2010 and 2022. This study examines the effect of digital transformation on the relationship between managerial overconfidence and cash holdings. The empirical findings provide evidence as follows: First, overconfident managers are positively correlated with their level of cash holding. Second, digital transformation alleviates the positive relationship described above. In addition, the findings are consistent with the robust test, which includes change alternative measures of managerial overconfidence and GMM estimation. Moreover, when product market competition is high, enterprise digital transformation efficiently mitigates overconfident managers holding excess cash. However, when product market competition is low, the result is not significant. That means the fierce product market competition promote enterprise digital transformation mitigating overconfident managers hold excess cash.

The findings of this study show that digital transformation can mitigate excess cash holding levels by improving information transparency. Therefore, enterprises should embrace digital transformation strategies and develop digital technologies.

However, this study does possess certain constraints. We collected the data for this study from the Shanghai and Shenzhen stock exchanges, which limited the scope of observation to a sample of Chinese listed companies. Therefore, the actual evidence is insufficient to substantiate the claims made by all Chinese-listed companies. Moreover, the shortcomings are associated with the methodology used for this study analysis. Although the annual reports include non-financial information, it is important to note that the keywords associated with digital transformation may not provide an exact estimate of the degree of digital transformation.

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Conflict of interest

All the authors claim that the manuscript is completely original. The authors also declare no conflict of interest.

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