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Research Article

Managers' Overconfidence and Corporate Cash Holding in China: The Interaction Effect of Product Market Competition

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Abstract

Traditional corporate finance theory holds that people are entirely rational. However, psychological research shows that people are not wholly rational, which means that when people make decisions, their beliefs and preferences usually produce systematic biases manifested by behavioral characteristics such as overconfidence and loss avoidance. Therefore, managers' behaviors can be influenced to some extent by their psychological characteristics, implying that managers are not entirely rational. Thus, the main purpose of this study is to examine the relationship between managers' overconfidence and corporate cash holding decisions in Chinese listed companies. This study also investigated the influence of market product competition on the relationship between managers' overconfidence and corporate cash-holding decisions. This study used the data of the A-share listed companies in Shanghai and Shenzhen Stock Exchange from 2010-2022 as the sample and applied FEM and Generalized Method of Moments (GMM) for analyzing the data. The empirical results show that managers' overconfidence have the positive correlation with cash holding. Therefore, managers tend to hold more cash for internal financing. However, this positive relationship can be alleviated by product market competition. This study will assist enterprises in developing a comprehensive and effective enterprise cash-holding plan to assist companies in making scientific cash-holding decisions.

Keywords: Manager's Overconfidence, Cash holding level, Market competition, Shenzhen Stock Exchange.

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1 INTRODUCTION

As imperfect capital market research has become more in-depth, many corporate financial researchers have focused on capital issues such as cash holdings. A company's most liquid and essential asset is cash. An organization's cash holdings can reveal its financial decisions and operating strategies. This is because cash holding decisions have a direct impact on the development of enterprises: lower cash holdings will result in financial difficulties due to capital shortages (Chen et al., 2020; Batuman et al., 2022); too much cash holdings will result in the loss of investment income, and high cash holdings will increase the risk of managers abusing cash (Bo et al., 2024; Dong, 2019).

Researchers have begun to conduct extensive research and exploration on corporate cash holdings from various perspectives since Keynes first illustrated the prevention and speculative motivation for companies to maintain cash liquidity. According to Zhou and Han (2010), companies hold large amounts of cash to avoid the risk of competitors in the product market and steal their investment opportunities and market share. Fazzari et al. (1988) and Vereshchagina (2023) stated that investment expenditure is determined by the amount of endogenous capital under external financing constraints. Opler (1999) found that enterprise cash holdings positively correlate with enterprise growth and size, which strongly supports the static trade-off model of cash holdings.

According to Lee and Powell (2011), corporate cash holding levels in Australia are positively associated with cash flow volatility, capital expenditure, and net investment but negatively associated with net working capital, implying that continuously holding excess cash will result in higher agency costs. Yang et al. (2016) examined data from Shanghai and Shenzhen Stock Exchange A-share listed companies from 2003 to 2012 and discovered that industry growth can positively affect enterprise cash holding levels. Better investment opportunities and elimination of higher risks are presented to high-growth industries. Therefore, stable financial support is required to maintain the market dominance.

However, the current research assumes that managers are rational. Psychologists have proven through a series of experiments and studies that people are generally overconfident, not wholly rational, and usually result in decision-making judgement for business managers (Zhang & Wang, 2017; Bo et al., 2024). Overconfidence is severe and may cause decisions to deviate from traditional economic theories (Graham, et al., 2017). Although scholars have developed mature theoretical frameworks, such as pecking order theory, trade-off theory, and agency theory, existing researchers believe that managers are entirely rational and conduct analyses and tests primarily from the perspectives of business characteristics, corporate governance, and the external environment, with little regard for managers' overconfidence. In addition, studies on the effect of managers' overconfidence on business decisions focus primarily on investment and financing decisions and mergers and acquisitions (M&A) and rarely include corporate cash holdings. Therefore, it is necessary to discuss how overconfident managers influence cash holding levels under the assumption of irrational investors.

Moreover, previous research indicates that precautionary and agency motives can explain the decision to keep cash (Denis & Wang, 2024; Sun et al., 2023; Wang et al., 2024). However, traditional theory cannot effectively explain the relationship between managerial overconfidence and cash holdings. This is because managerial overconfidence falls under the purview of psychology, whereas cash holdings fall under that of economics. Therefore, it is necessary to investigate and analyze the relationship between managerial overconfidence and corporate cash holdings using behavioral financial theory, particularly for overconfidence theory that can efficiently connect psychology and economics.

Simultaneously, external economic changes, such as the political and cultural environment, influence cash holding levels for trading and preventive and speculative reasons. Acemoglu (2003) and Floros et al. (2024) show that enterprises in countries with imperfect systems and unstable economic environments will maintain high cash holding levels to deal with external uncertainty. Meanwhile, Baum (2008) discovered in an empirical study of data from 1993 to 2002 that when the external economic environment's instability increases, enterprises tend to increase liquidity to avoid uncertainty risks and thus maintain a high cash holding level. Wang et al. (2014) conducted a study on data from Chinese listed companies from 2003 to 2011 and discovered that macroeconomic policy uncertainty affects the cash holding level of enterprises. When macroeconomic policy uncertainty is high, managers increase their free cash for preventive incentives and the entrusted agent promotes the relationship positively.

Jiang et al. (2015) and Vuong et al. (2023) state that political environmental uncertainty has a positive effect on enterprise cash holding levels, but the political impact of state-owned enterprises is relatively small. Scholars have mainly studied macroeconomic uncertainty (Hoberg et al., 2014), national uncertainty aversion culture (Wang et al., 2014), and the institutional environment (Chen et al., 2015; Huang et al., 2016) among others, with little regard for product market competition pressure (Dong, 2019; Sheikh, 2018).

The above analysis reveals that several issues cannot be resolved; therefore, it is critical to address how to make reasonable cash-holding decisions. The first issue is that internal factors and the external environment, such as changes

in the company's financial indicators, improved corporate governance, and changes in the external political and cultural environment, influence cash-holding decisions. However, the external governance mechanism has received little attention in the relevant research, particularly in product market competition.

According to researchers, product market competition can improve information transparency, alleviate external financing constraints, and influence enterprise managers' internal and external financing decisions. Second, existing research assumes that managers make rational decisions and ignores the understanding of their irrational decisions, which does not explain many real economic problems. However, managers' overconfidence can influence cash holding levels due to conflicts between their interests and shareholders, resulting in a decline in cash performance and an increase in cash holding costs.

Therefore, enterprises face challenges in determining their level of cash holdings and developing a cash holding plan to achieve high cash performance at a reasonable cost. Third, traditional theory cannot effectively explain the relationship between managerial overconfidence and cash holdings. This is because managerial overconfidence falls under the purview of psychology, whereas cash holdings fall under that of economics. Therefore, in recent years, the academic community has introduced behavioral economics theory as a theoretical topic and has begun to debate the impact of managers as irrational economic people on enterprise operation and management. Consequently, overconfident managers are more optimistic or pessimistic about corporate cash holdings. Does product market competition affect the relationship between managerial overconfidence and corporate cash holdings? These issues have hampered the decision-making of listed companies.

Therefore, based on the system background of Chinese listed companies, this study investigates the relationship between managerial overconfidence and enterprise cash holdings, and explains how the interaction role of product market competition affects this relationship. In modern corporate finance, this study will assist enterprises in developing a comprehensive and effective enterprise cash-holding plan to assist them in making scientific cash-holding decisions.

2 LITERATURE REVIEW

Most research on corporate cash holding level focuses on the risk of corporate financial indicators (Cai et al., 2015), corporate internal governance (Zhang &Lu, 2012), external environment and market competition (Hoberg et al., 2014; Han & Zhou, 2011), market environment, and macroeconomic policy (Acemoglu et al., 2003). Existing literature focuses on the analysis of the optimal decision behavior, or the optimal behavior, which is based on people being rational and making rational decisions. However, managers' decisions are affected by the uncertainty of market competition and the external environment (Han & Min, 2018). This is because uncertainty in the external market environment and macroeconomic policy factors are uncontrollable for individual enterprises. Therefore, if managers exaggerate their own entrepreneurial ability, overestimate their own judgment ability, and avoid risks (Adam et al., 2015), they will overestimate the investment return and underestimate risks. Simultaneously, enterprise managers believe that they have more market information than others (Drobetz et al., 2010), which leads managers to show cognitive bias (Wu & Huang, 2010) and biased self-attribution (Doukas & Petmezas, 2007). An obvious characteristic of overconfident managers is aggressive investment behavior (Zhang & Li, 2023). On one hand, investment opportunities have the potential to be exclusive and competitive in the market. If managers want to make a more accurate judgment through delayed investment to reduce uncertainty, they are likely to create investment opportunities for competitors, which means that 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, while enterprises that hold more liquid cash assets can resist the "predation" risk of competitors and expand their market share, which can help them expand their competitiveness directly or indirectly in the market (Fresard, 2010). Therefore, overconfident managers are willing to hold more cash assets to grasp investment opportunities and resist market competition (Gao et al., 2013). Based on this, we propose the following hypothesis:

H1: Managers' overconfident have positive relationship with the cash holdings.

According to the literature review analysis, previous research on managers' overconfidence and cash holdings is (1) Research and Development (R&D) (Deshmukh et al., 2021). (2) Corporate Governance (Aksar et al., 2022). (3) Financial Characteristics (Zhang et al., 2020; Kim et al., 2013) and so on. In the previous analysis, product market competition as an external pressure and supervision mechanism affects cash-holding decisions and alleviates agency problems. Product market competition plays a critical role in restraining agency problems (Alchian, 1950). In addition, Hart (1983) and Li (2023) denote that under higher product market competition pressure, managers are more likely to overestimate their ability to work harder to improve performance, thus reducing agent conflict for private interests and alleviating holding excess free cash, thus reducing the cash holding level.

Except for research on the correlation between product market competition and cash holding, scholars have also examined the interaction effect of product market competition, which mainly focuses on cash holding and innovation

(Lyandres & Palazzo, 2016), the company's financial strategy and cash retention (Hoberg, et al., 2014), manager overconfidence, and enterprise investment risk (Gao, 2021) and so on. This means that scholars rarely consider the interaction variable for product market competition between manager overconfidence and cash holdings (Deshmukh et al., 2021). Moreover, there are also a few domestic scholars who use Chinese-listed companies as samples to conduct research.

Therefore, this study examines the interaction effect of product market competition on managers' overconfidence in their cash holdings. Product market competition alleviates asymmetric information through three channels: information comparison, merger and acquisition (M&A) threats, and reputation incentives. First, information comparison holds that product market competition conveys the business performance and behavior information of senior executives, which improves information transparency. In other words, the more competitive companies in the product market, the less asymmetric the information (Holmstrom, 1982). The second is the threat of M&A. This indicates that fierce product market competition may lead to financial failure for enterprises and increase the risk of acquisition. This means that if the enterprise is facing poor management and will be acquired, it delivers the information that executives cannot complete their job efficiently, which will reduce the conflicts between executives and shareholders' interests to protect their own interests. The third method is reputation incentive. Reputation incentives also verify the role of product market competition in improving information transparency. In a competitive product market, reputation is a comprehensive reflection of the market on information, such as individual efforts and ability, which determines the personal value of senior executives. Therefore, product market competition is an effective external governance mechanism that can increase cash holding efficiency and encourage overconfident managers to make a lower cash holding plan due to the psychological impact of market competition. Based on this, the following hypothesis can be developed:

H2: Product market competition negatively influences the relationship between manager overconfidence and corporate cash holdings.

3 METHODOLOGY

This study uses the data of A-share listed companies in Shanghai and Shenzhen from to 2010-2022 as the sample, and according to the data of the A-share listed companies in Shanghai and Shenzhen, the data were selected according to the 2012 industry classification standards of the China Securities Regulatory Commission. This study handles the collected data: (1) excluding financial companies, because financial companies hold a lot of cash according to their operating characteristics and accounting system; (2) Excluding Class ST companies and companies with an asset-liability ratio greater than 1 and less than 0; (3) excluding the listed companies that issue B shares, H shares, and other overseas shares, because the market prices of these stocks, accounting standards, and regulatory environment are different from A shares; (4) excluding the samples changed to CEO or chairman in the inspection year because changes in important executives have a significant impact on company decisions; (5) excluding IPO samples, share increases, rights offerings, and convertible bonds in the current year, because these financing practices of companies can affect their cash holdings; and (6) excluding company samples with missing data. Data were obtained from the CSMAR database and processed using Stata statistical software.

According to research from scholars, the measures of managers' overconfidence can be divided into three categories: the first indicator includes influencing factors, such as macro index, media reports, relative compensation, manager status, and individual characteristics; the second indicator is based on outcome performance, such as investment, merger and acquisition, stock options, shareholding change, and surplus forecast; thirdly, comprehensive indicators are based on different influencing factors and result performance.

Based on previous research and the Chinese institutional background, this study chooses three variables from the above three categories to measure the relationship between managers' overconfidence and cash holdings as follows. The first measure is the relative compensation for management, which is selected from the first category. This indicator is based on influencing factors used by Wang (2021) and Chen (2020). The second variable comes from the second category, outcome performance, which is a change in management shareholding. Zheng and Chen (2018) used this indicator. The third measure is shareholding and earnings change. This indicator is connected to different variables to be measured. Wang et al. (2022) used this variable.

Table 1. Main Variables and Description

Variable name	symbol	Variable meaning
Cash holding	CH	(Monetary funds + trading financial assets / Total assets)
Relative compensation for management	REC	Top 3 executive compensation / executive compensation combined
Changes in management shareholding	CMS	If the manager actively increases the shareholding in the current period, OC takes 1, indicating that the manager has high confidence; otherwise, OC takes 0, which means that the manager has low confidence.
Shareholding and earnings changes	SEC	With holding growth rate minus the difference of earnings per share growth to measure managers overconfidence level, if the result is positive, OC=1, if the result is zero or negative, OC=O.
Lerner Index	PMC	(Operating income-operating cost-sales expenses administrative expenses) / operating income.
Firm size	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

This section focuses on verifying the relationship between manager overconfidence and corporate cash holdings. The regression model was established as follows: CH is cash holding and OC is managers' overconfidence. In addition, to accurately measure the relationship between manager overconfidence and cash holding, control variables are also selected, which include firm size (Size), dividend payment (DIV), internal control (HIC), customer concentration (CC), and the two duties are integrated (Du). Enterprise nature, year, and industry virtual variables are also added to the type.

Model 1:

$$CH_{it} = \beta_0 + \beta_1 SEC_{it} + \beta_2 REC_{it} + \beta_3 CMS_{it} + \beta_4 Size_{it} + \beta_5 Div_{it} + \beta_6 HIC_{it} + \beta_7 Du_{it} + \beta_8 State_{it} + \sum Year + \sum Ind + \varepsilon_{it} \quad (1)$$

Model 1 was used to test hypothesis H1. If the regression coefficient β of the variable OC (SEC, REC, CMS) is significantly positive, indicating that managers' overconfidence and cash holdings have a positive relationship, then H1 is established. If the three independent variables are both positive and significant, managers' overconfidence can encourage managers to hold more cash in their daily operations. Otherwise, hypothesis 1 was not supported.

Model 2:

$$CH_{it} = \beta_0 + \beta_1 SEC_{it} + \beta_2 REC_{it} + \beta_3 CMS_{it} + \beta_4 PMC_{it} + \beta_5 PMC * SEC_{it} + \beta_6 PMC * REC_{it} + \beta_7 PMC * CMS_{it} + \beta_8 CV_{it} + \sum Year + \sum Ind + \varepsilon_{it} \quad (2)$$

In Model 2, PMC (Lerner_indit) and PMC*OC (OC is measured by SEC, REC, and CMS) are added to examine the interaction role of product market competition on the relationship between managers' overconfidence and cash holdings among Chinese listed companies (Shanghai and Shenzhen). Model 2d mixes the three independent variables in the same equation to check the interaction effect of product market competition on the relationship between managers' overconfidence and cash holdings in Chinese list companies. If the interaction variables are positive and significant, product market competition can alleviate the positive correlation between managers' overconfidence and cash holdings. Otherwise, hypothesis 2 was not supported.

4 RESULTS

Table 2 presents descriptive statistics for the variables included in the model, providing values for the observed number (N), mean, standard deviation (Std.dev), minimum (min) and maximum (max).

Table 2. Descriptive Statistics

Variable	Obs	Mean	Std.dev.	Min	Max
CH	6,849	0.178	0.122	0.00136	0.980
SEC	6,849	0.368	0.482	0	1
REC	6,831	0.469	0.147	0	1
CMS	6,849	0.186	0.389	0	1
PMC	6,849	0.123	0.0905	-0.468	1
Size	6,849	22.91	1.443	17.64	28.61
Div	6,849	0.708	0.455	0	1
HIC	6,849	0.947	0.223	0	1
Du	6,849	0.163	0.369	0	1
State	6,849	0.698	0.459	0	1

Note: This table provides descriptive statistics for all continuous variables in the present study.

From the descriptive statistics results, it is evident that the variable had 6849 observations. The maximum cash holding level of the sample is 98%, whereas the minimum is almost zero (0.136%). This result implies significant variations in cash holding levels among China's listed companies. The average level of cash holdings was 17.8%, with a standard deviation of 12.2%. This finding suggests that almost 20% of the assets held by the sampled listed companies are cash.

The Lerner index can be measured as the product market competition, where smaller values indicate higher competition. Though the above table 4.1 shows the results, it can be finding that the mean and standard deviation is 0.123 and 0.0905 respectively. The mean value of 12.3% indicates smaller values, which indicates higher pressure in the market. The standard deviation was 0.0905, which is small. A low standard deviation indicates that each number and mean are relatively close to each other, the amplitude is small, and the overall distribution of the data is close to the center, which means that the entire market may face high market competition.

Using SEC as a reference indicator of managers' overconfidence, the maximum value is 1, minimum value is 0, and mean value is 0.368. SEC refers to shareholdings and earnings changes. The measure calculates managers' overconfidence by subtracting the growth rate from the difference in earnings per share growth from the changes in management shareholding. If the result is positive, OC=1. If one variable is negative or the result is zero or negative, OC=0. The results indicate that almost 40% of the companies are positive, signifying that the growth rate of management shareholding is higher and more beneficial for the company under their control. This suggests that managers of listed companies in China generally exhibit overconfidence.

REC is used as an indicator of managerial overconfidence, with a maximum of 1, a minimum of 0, and a mean value of 0.469. As indicated by the proportion of executive compensation, managerial overconfidence is present in nearly 50% of the managers. Thus, overconfidence is widespread among the managers of listed firms in China.

When CMS is used as a reference indicator of managerial overconfidence, the range of values is between 0 and 1, with a mean value of 0.186. As the ratio of managerial shareholding to outstanding shares is used to measure managerial overconfidence, the mean value of 0.186 indicates that approximately 20% of managers increase their shareholding, which is a high proportion of managerial shareholding.

Other variables are control variables, which were also analyzed. The minimum and maximum values of company size (Size) are 17.64 and 28.61, respectively, which indicates that there is a large difference in the size of the sample companies. The mean dividend payment (Div) is 0.708, which shows that more than 70% of the sample companies have paid cash dividends. The mean of the internal control (HIC) and the two duties are integrated (Du) are 0.947 and 0.163, respectively, which illustrates that the company's internal control is more effective and that there are fewer concurrent positions of chairman and general manager in Chinese listed companies. In addition, the mean state was 0.698. This number indicates the proportion of state-owned enterprises in the sample and the number of non-state-owned enterprises. State-owned enterprises account for nearly 70% of the total, meaning that state-owned enterprises account for a relatively large proportion of listed companies in China.

4.1 Correlation Analysis

From Table 3, the independent variable of managerial overconfidence (OC) demonstrates a correlation with the dependent variable of the level of firm cash holdings (CH) and is significant at the 1% level. The Lerner index measures

product market competition (PMC), whereby the higher the index value, the lower the competitive pressure. Although there is a positive correlation coefficient between the Lerner index and CH, market competitive pressure is negatively correlated with corporate cash holdings.

Among the control variables, firm size (Size), enterprise nature (State), the two duties are integrated (Du), and dividend payment (Div) are all significantly positively correlated with the dependent variable corporate cash holding level (CH) at the 1% level. The correlation coefficient between the state variable and cash holding level variable is -0.045, indicating a significantly negative relationship at the 1% level. This suggests that non-state-owned enterprises may have higher cash holding levels than state-owned enterprises. Size is -0.157 and is significantly negative at the 1% level, which indicates that smaller enterprises tend to hold more cash.

Table 3. Correlation Coefficient Test Diagram

Variables	CH	SEC	REC	CMS	PMC	Size	Div	HIC	Du	State
CH	1									
SEC	0.027**	1								
REC	0.085***	0.0130	1							
CMS	0.105***	0.043***	0.00900	1						
PMC	0.040***	-0.0170	0.00300	0.0100	1					
Size	-0.152***	-0.023*	-0.236***	-0.197***	0.049***	1				
Div	0.143***	0.0180	-0.131***	0.050***	0.049***	0.228***	1			
HIC	0.033***	0.0170	-0.029**	0.033***	-0.00900	0.059***	0.076***	1		
Du	0.030**	0.028**	0.080***	0.300***	0.00400	-0.116***	-0.00200	0.043***	1	
State	-0.045***	-0.061***	-0.180***	-0.281***	-0.024**	0.221***	0.073***	0.00600	-0.255***	1

Table shows relationship between managerial overconfidence and cash holding. In this table, the three independent variables are shareholding and earnings changes (SEC), changes in management shareholding (CMS) and relative compensation for management (REC). The purpose focus on analysis the relationship between managerial overconfidence and cash holding from multiple dimensions. It can be finding that managerial overconfidence has the positive correlation with corporate cash holding.

Table 4. Regression Test between Managerial Overconfidence and Cash Holdings

VARIABLES	CH
SEC	0.007***
	(2.90)
REC	0.050***
	(2.75)
CMS	0.110***
	(7.26)
Size	-0.016**
	(-2.42)
Div	0.020***
	(4.82)
HIC	0.015**
	(2.22)
Du	-0.009
	(-1.48)
State	-0.015*
	(-1.73)
Constant	0.440***
	(2.73)
Observations	6,764
Number of code	917
R-squared	0.112
ind FE	YES
Year FE	YES

Note: t-statistics in parentheses*** p<0.01, ** p<0.05, * p<0.1.

From Table 4 it can be seen that the SEC, REC, CMS, and CH regression coefficients are 0.007, 0.050, and 0.110, respectively, and all are significant at the 1% level. This means that when SEC, REC, and CMS increased by one unit, CH increased by 0.007, 0.050, and 0.110 units, respectively. This result is consistent with the analysis above. The control variables show the same results. Findings of the interaction effect of product market competition on the relationship between manager overconfidence and enterprise cash holdings. The fixed effects model (FEM) was used to estimate the model.

It can be found that managers' overconfidence has a significant positive impact on cash holdings and is significant at the 1% level. This finding is consistent with that of Wang (2022). The interaction variable was OC*PMC, and OC was measured by SEC, REC, and CMS. The regression results show that OC*PMC has a positive relationship and is significant at the 1% level, meaning that product market competition can effectively restrain the positive relationship between managers' overconfidence and cash holdings. This is because product market competition can efficiently reduce information asymmetry.

Chen and Jiang (2017) indicated that product market competition can alleviate the asymmetry of internal and external information and improve information transparency and reliability. Therefore, external investors can judge the authenticity of a 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 financing constraints, financing costs, and the company's dependence on internal funds. Based on the above analysis, an improvement in product market competition can restrain overconfident managers from holding excess cash. Therefore, the result is consistent with this study and supports Hypothesis 2.

Table 5. Interaction Effect of Product Market Competition on the Relationship between Managerial Overconfidence and Cash Holdings

VARIABLES	CH
SEC	0.007***
	(3.21)
REC	0.051***
	(4.38)
CMS	0.108***
	(12.12)
PMC	0.052*
	(1.77)
SEC*PMC	0.038***
	(4.92)
REC*PMC	0.053***
	(3.30)
CMS*PMC	0.014***
	(2.65)
Size	-0.016***
	(-5.88)
Div	0.018***
	(5.67)
HIC	0.017
	(0.97)
Du	-0.008**
	(-2.20)
State	-0.015***
	(-3.25)
Constant	0.416***
	(5.67)
Observations	6,764
Number of code	917
R-squared	0.119
ind FE	YES
Year FE	YES

Note: t-statistics in parentheses*** p<0.01, ** p<0.05, * p<0.1.

4.2 Robustness Test

The presence of a lagged dependent variable in cash regressions that captures the possibility of mean reversion or persistence in cash holdings is another potential source of endogeneity (Dao et al., 2023; El Kalak, Goergen & Guney, 2020). Although the two-stage least squares method can address this problem, the system generalized method of moments (GMM) for dynamic panel data developed by Arellano and Bover (1995) not only produces consistent estimates, but also improves efficiency (Roodman, 2009). Therefore, this study uses GMM to mitigate the endogeneity problem and as a robust test method to support the main regression results (Wang et al., 2023).

Table 5 shows regression test between managerial overconfidence and cash holding through GMM analysis. In Table 6, the three independent variables shareholding & earnings changes (SEC), relative compensation for management (REC) and changes in management shareholding (CMS) put into one model to regression. From the first column, it can be finding SEC, REC and CMS with CH regression coefficient is 0.17, 0.176 and 0.044 respectively and significantly positive at the 10%, 1% and 10% level. The result is consistent the above analysis.

Table 5. GMM Regression Test for Managerial Overconfidence and Cash Holding

VARIABLES	CH
L.CH	0.412***
	(7.05)
SEC	0.017*
	(1.70)
REC	0.176***
	(3.88)
CMS	0.044*
	(1.72)
Size	-0.001
	(-0.38)
DIV	0.005
	(0.40)
HIC	0.041*
	(1.77)
Du	0.002
	(0.33)
State	0.036**
	(2.46)
Div	0.011***
	(2.74)
Constant	-0.033
	(-0.39)
Observations	5,138
Number of code	838
ar1	-7.322
ar1p	0
ar2	0.221
ar2p	0.825
Hansen	257.3
Hansenp	0.152
N	5138
Difference (Hnull = exogenous)	0.196

Note: z-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table 6 shows the effect of the interaction variables OC*PMC (OC is measured by SEC, REC, and CMS) through GMM analysis. In Table 4.6, the three independent variables of shareholding and earnings changes (SEC), relative compensation for management (REC), and changes in management shareholding (CMS) are put into one model for regression. All the interacting variables are significant and positively related to cash holdings. This result is consistent with the analysis above.

Table 6 GMM Regression Test for Interaction effects

VARIABLES	CH
L.CH	0.399***
	(5.06)
SEC*PMC	0.116**
	(2.29)
REC*PMC	0.136*
	(1.77)
PMC	0.203***
	(4.46)
CMS*PMC	0.011**
	(2.28)
SEC	0.010
	(0.60)
REC	-0.051
	(-0.51)
CMS	-0.035
	(-0.29)
Size	-0.003
	(-0.39)
HIC	-0.014
	(-0.38)
Du	-0.000
	(-0.01)
State	0.092***
	(2.79)
Constant	0.101
	(0.52)
Observations	5,140
Number of code	838
ar1	-6.009
ar1p	1.87e-09
ar2	0.976
ar2p	0.329
hansen	88.93
hansenp	0.147
N	5140

Note: z-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

5 CONCLUSION

Based on the overconfident theory, asymmetric information theory, and relevant research for academic scholars, this study proposes hypotheses, establishes a model, and conducts a multiple regression empirical study on the relevant data of Chinese listed companies from 2010 to 2022. This study proves the relationship between enterprise cash holdings and managerial overconfidence and tests the effect of product market competition on managerial overconfidence in cash holdings. The main conclusions of this study are as follows.

First, overconfident managers tend to hold more cash during their daily operations. From the perspective of the overconfident theory, it can be finding that overconfident managers show knowledge illusion and control illusion. Thus, overconfident managers overestimate their ability to judge the future and control the risk of uncertainty, which leads to upward deviation in their performance feedback. Therefore, overconfident managers increase firms' cash holdings.

Second, product market competition effectively mitigates managers' cash holdings. Product market competition can encourage managers to work hard through the performance monitoring of external competitors, which can reduce the agency conflict of the company and restrain managers' motivation to hold more free cash to satisfy their private consumption, and then reduce enterprise cash holdings.

As a result, the following suggestions can be made for Chinese list companies: Compared to other scholars' studies, the findings of this study could assist enterprises in enhancing the effectiveness of their corporate market operations. Managers tend to fulfil their self-interest by holding more cash, which ultimately leads to a decline in corporate performance and increased operating costs. Therefore, it is recommended that a reasonable level of cash holdings be determined based on the changes in the external financing environment. Enterprises should regularly assess changes in the external competitive environment and develop a clear plan to establish reasonable cash holding levels. Moreover, building an effective internal governance mechanism can promote managers' operational efficiency, which can enhance the value of cash holdings and reduce the operating costs caused by managers' overconfidence. Although this study possesses certain research value, it is based on Chinese companies listed on the Shanghai and Shenzhen Stock Exchange, so the research conclusions may not be applicable to all published Chinese companies.

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