Analysts' forecast optimism and cash holding: Evidence from China

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ABSTRACT

Analysts play an important role as information intermediaries. In this paper, we empirically analyze the impact of analysts' forecast optimism on firms' cash holdings. Based on China's A-share listed companies from 2011–2021 as the research sample, we find that analyst forecast optimism significantly decreases the company's cash holdings. Meanwhile, based on a cash-cash flow sensitivity model, we show that analyst forecast optimism reduces the company's financing constraint and further makes the company's cash holdings decrease. Moreover, the larger (or older) the firm, the smaller the negative effect of analyst optimism on cash holdings.

1. Introduction

In the capital market, securities analysts play an important role as information intermediaries and play an essential role in collecting, screening, collating, analyzing, and processing information and its transmission to the public. Information plays a crucial role in the capital market, and the operation and development of the capital market depend on a large amount of information. However, information asymmetry is prevalent due to information disclosure irregularities and inefficient transmission. Zhao, Li, Govindaraj, and Zhong (2022) find that separating control and ownership within a company will lead to a severe information asymmetry problem. Managers within the company have the incentive and ability to exploit this loophole to conceal information about the company from shareholders and use their information advantage for personal gain (Liang, Cui, & Yuan, 2022). There is also a severe information asymmetry problem in the disclosure of information outside the company, and company managers have the incentive to exaggerate the value of the company's investment to outside investors in order to enable the company to raise more capital and thus attract investors to invest (Brown, Lin, & Zhou, 2022).

In order to cope with uncertainty about the cost of future financing constraints, financing sources. (Kong, Lin, Wang, & Xiang, 2021), companies with more significant financing constraints tend to accumulate cash based on precautionary motives, increasing cash holdings (Cho & Kim, 2020). The three motives for firms to hold cash and maintain liquidity are transactional, precautionary, and speculative. According to cash holding theory, firms with more significant financing constraints will hold more cash (Huang, Li, Wang, & Wu, 2022). Analysts predict that optimism will lead to lower financing costs, so analysts predict that optimism will further affect the cash holdings of companies by influencing their financing constraints. However, most investors in the market, lacking in analytical skills and expertise, need to be able to comprehensively analyze and understand the various financial reports and related information disclosed by listed companies.

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Based on this, this paper selects a sample of A-share listed companies in China from 2011–2021 and empirically analyzes the impact of analysts' forecast optimism on cash holdings based on the financing constraint channel. It is find that analysts' optimism reduces the company's cash holdings by lowering the company's financing constraint; this paper conducts a cash-cash flow sensitivity model test and finds that analysts' optimism does lower the company's financing constraint, which in turn reduces the company's cash holdings; at the same time, the analysis of the moderating effect based on individual company characteristics finds that the larger the size of the company, the more optimistic analysts' forecasts are on The analysis of the moderating effect of individual firm characteristics find that the larger the firm, the less the negative effect of analyst optimism on cash holdings; the older the firm, the less the negative effect of analyst optimism on cash holdings.

The main contribution of this paper is that most of the current research on analyst behavior is devoted to exploring the economic consequences of analyst concerns. In contrast, more research is needed on the impact of analysts' earnings forecast optimism. This article extends and deepens our research on the impact of analysts' behavior on firms by examining the impact of analysts' forecast relationships on firms' cash holdings. It also provides direction for subsequent research by clarifying, through a cash-cash flow sensitivity model, that analysts' forecast optimism can affect a firm's cash holdings through a financing constraint.

2. Theoretical analysis and hypothesis

Analysts act as information intermediaries in the capital market through information gathering and screening. With the help of their professional skills, they analyze the information disclosed by the company and then make professional predictions situation of the company before releasing research reports to the market (Zhang, Shrider, Han, & Wu, 2022). Since analysts have the role of digging and interpreting the information disclosed by the company, for investors, analysts are secondary providers of information (Hu, Long, Luo, & Peng, 2021). Analysts have many channels to obtain information about companies, such as public information channels like annual reports, interim reports, quarterly reports, company announcements, and earnings conferences. In addition, analysts can also obtain some private information through corporate executives and other channels. Analysts analyze and publish professional research reports (Liu & Liu, 2022). Investors, in turn, get more information about the company by studying the analysts' research reports.

Earnings forecasts are an essential part of analysts' work. External investors need to understand the company's future development and make reasonable judgments before making investments. Analysts' earnings forecasts can enhance investors' perceptions of the company, and Su, Zhang, and Liu (2022) find through their study that analysts' earnings forecasts are meaningful. Hou et al. (2021) also find empirically that the validity of analysts' earnings forecasts remains in our capital market. In particular, He, Huang, and Zhu (2021) point out that the validity is more pronounced regarding forecasts with annual data.

As an information brokers, analysts should maintain an objective and neutral position. However, many studies have shown that analysts' earnings forecasts are biased and tend to issue optimistic forecasts due to "cognitive biases" and "motivational drivers." On the one hand, analysts' earnings forecasts are subject to specific errors due to external objective factors such as the level of company disclosure and changes in market trends (Cai et al., 2021).

In addition, analysts tend to issue more optimistic earnings forecasts in order to maximize their interests. One reason is a connection between analysts and the company's management. Analysts can issue more accurate and valuable research reports through the information obtained from this source, thus improving their reputation and increasing their income (Tan, Tan, & Chan, 2021). When an analyst releases negative news about a company, management may cut off contact, leaving the analyst without crucial private information. Another reason is that some analysts work for companies with an underwriting relationship with the target, and the sales of the target company's stock will affect the analyst's compensation. To get more compensation, analysts tend to issue optimistic earnings forecasts (Haider, Sultana, Singh, & Tham, 2020).

Analysts' earnings forecast optimism affects the degree of financing constraints of the firm through information mediation. Analysts' optimistic earnings forecasts have a particular puffing effect. They will induce outside investors to underestimate the risk of the company and overestimate the return of the company's stock, which will lead to a reduction in the demand for risk compensation and an increase in the willingness of investors to provide capital, thus reducing the cost of financing constraints of the company (Boubakri, Bouslimi, & Zhong, 2022).

Money demand theory suggests that there is a precautionary motive for a company to hold cash, a motive for a company to hold cash to maintain a certain level of cash liquidity to prevent risk and reduce the likelihood of future financial crises. Given the cost of financing constraints, sources of financing, and the uncertainty of future cash flows, firms with more significant financing constraints are likely to hold more cash to cope with risk (Jackson, 2022).

Based on the above analysis, this paper proposes the following hypotheses:

H1: Analysts' forecast optimism has a negative effect on the firm's cash holdings based on financing constraints,.

The degree of financing constraints is closely related to the firm's size, with larger firms subject to fewer financing constraints than smaller firms. On the one hand, the size of a firm affects its business credit, and the larger a firm is, the higher its business credit will be, and thus the firm will be subject to fewer financing constraints (Babar et al., 2021). On the other hand, the smaller the firm's size, the less transparent its information will be, the more serious the information asymmetry problem will be, and the more constraints the firm will face in terms of external ease. In addition, the country size of the company will also affect the company's financing opportunities (Jiang et al., 2022). The analysis in this paper suggests that analysts predict optimism to reduce a firm's cash holdings mainly indirectly by affecting the degree of financing constraints of the firm. The financing constraint, on the other hand, is closely related to the firm's size, with larger firms facing less financing constraint.

Table 1

Variable definition table.

Type	Name	Symbols	Definition
Explained variables	Cash holdings	*CASH*	(Monetary funds + short-term investments)/Total assets at the end of the period
Explanatory variables	Analysts forecast optimistic bias	*Anfe*	$Anfe_{i,t-1} = \frac{1}{N}\sum_{k=0}^{k=N}(Feps_{i,k,t} - Eps_{i,t})/|Eps_{i,t}|$
Intermediate variables	Financing constraints	*Fc*	Measured by a single variable dividend payout ratio
Control variables	Company Size	*Size*	Ln (total assets at the end of the period)
	Gearing ratio	*Lev*	Total liabilities at end of period / Total assets at end of period
	Company Age	*Age*	Current - year of company establishment + 1
	Net profit margin on total assets	*Roa*	Net income after tax / Total assets at the end of the period
	Capital Expenditure	*Cap*	Expenses incurred in acquiring long-term assets/total assets at the end of the period
	Shareholding Concentration	*Cr*	Percentage of shareholding of the largest shareholder
	Net working capital	*Nwc*	(Working capital - money capital - short-term investments)/Total assets at end of period
	Tobin's Q value	*Tq*	Market value of total assets / Book value of total assets

In addition to the company's size, there is also a relationship between the age of the company and the financing constraints faced by the company. Compared with mature companies that have been established for a long time, companies that have been established for a shorter period will face more significant financing constraints. On the one hand, the company's information disclosure could be higher due to its short existence, so there is a severe information asymmetry problem with banks and investors (Zhang et al., 2020). On the other hand, the short time the company has been in the market makes its reputation low. Therefore, it makes the company's credit quota in banks smaller, investors need to trust it more, financing is restricted, and the financing constraint it faces is more significant (Chen, Yang, Zhang, & Zhou, 2020). Therefore, the shorter the company is established, the smaller the financing constraint faced by the company will be, further affecting the relationship between analysts' forecast optimism and the company's cash holdings, with some moderating effect.

Therefore, this paper proposes the hypothesis that

> **H2: Relative to smaller companies, the impact of analyst forecast optimism on firm cash holdings is smaller for larger companies.**
> **H3: Analysts of longer established companies predict a more minor effect of optimism on corporate cash holdings than shorter established companies.**

3. Study design

3.1. Data sources

This article selects listed companies in Shanghai and Shenzhen A-shares from 2008–2021 as the research sample and finally obtains 21,756 observations by excluding financial companies, and ST companies, excluding samples with missing analysts' names and report release dates, and excluding samples with missing variable data. The data used in This paper are obtained from the CSMAR database.

3.2. Model and variables

This paper first constructs the following benchmark regression model to examine the impact of analysts' forecast optimism on cash holdings:

$$CASH_{i,t} = \beta_0 + \beta_1 Anfe_{i,t-1} + \alpha control_{i,t-1} + \gamma_1 Industry + r_2 Year + \varepsilon_t \tag{1}$$

The explanatory variable in this paper is the cash holdings (*CASH*). $Anfe_{i,t-1}$ is the primary independent variable in this paper and represents the mean of the degree of optimistic deviation of analysts' earnings forecasts for firm i in year t, defined as:

$$Anfe_{i,t-1} = \frac{1}{N}\sum_{k=0}^{k=N}\left(Feps_{i,k,t} - Eps_{i,t}\right) \Big/ |Eps_{i,t}|$$

The difference between $Feps_{i,k,t}$ and $Eps_{i,t}$ is the deviation of analysts' earnings forecasts and is smoothed by the absolute value of $Eps_{i,t}$. Finally, the mean of all analysts' forecast optimism deviations for firm i in year t is used to measuring the degree of analysts' forecast optimism deviation for the firm in year t. A more significant value of *Anfe* represents a more extensive analyst's forecast optimism deviation for the firm.

This paper draws on the research setting based on related literature ((Han, Kong, & Liu, 2018; Kong, Liu, & Liu, 2020, 2021; Liu, Kong, & Yang, 2022; Wang, Xiong, Mirza, Shao, & Yue, 2021). We select firm size (*Size*), gearing (*Lev*), firm age (*Age*), the net profit margin on total assets (*Roa*), capital expenditure (*Cap*), equity concentration (*Cr*), net working capital (*Nwc*), and Tobin's Q (*Tq*) as control variables to measure individual firm characteristics, financial characteristics, and firm Governance structure as control variables. Also, this paper controls for industry effects and year effects.

Meanwhile, in order to further investigate whether analysts' forecast optimism affects firms' cash holdings through the financing

Table 2
Descriptive statistical analysis.

	N	Mean	Std	Max	Min
CASH	21,756	0.179	0.132	0.653	0.018
Anfe	21,756	0.795	2.126	13.289	0.595
Fc	21,756	0.329	2.137	7.72	0.000
Size	21,756	23.286	1.052	27.187	19.796
Lev	21,756	0.438	0.217	0.875	0.046
Age	21,756	17.287	5.823	55.000	3.000
Roa	21,756	0.049	0.046	0.201	−0.132
Cap	21,756	0.062	0.057	0.263	0.000
Cr	21,756	37.297	16.327	76.923	0.326
Nwc	21,756	0.029	0.213	0.623	−0.536
Tq	21,756	1.973	1.265	7.384	0.912

Table 3
Analysts' earnings forecast optimism and cash holdings.

	(1) CASH	(2) CASH	(3) FC	(4) CASH	(5) CASH
Anfe	−0.032***	−0.015***	0.216***	−0.017***	−0.008*
	(9.873)	(−7.975)	(15.976)	(−5.293)	(−1.916)
Fc				−0.016***	
				(10.723)	
Size		−0.067***	−0.187***	−0.079***	−0.068***
		(−7.649)	(8.793)	(−8.726)	(−7.823)
Lev		−0.327***	−0.438***	−0.273***	−0.295***
		(24.329)	(20.372)	(27.293)	(21.982)
Age		−0.132***	−0.027***	0.013***	−0.016***
		(7.532)	(7.237)	(9.832)	(8.623)
Roa		0.423***	−0.316***	0.537***	0.376***
		(15.956)	(−4.832)	(19.932)	(18.238)
Cap		−0.523***	−0.187***	−0.546***	−0.542***
		(−33.869)	(29.653)	(21.683)	(27.984)
Cr		0.003***	0.001***	0.003***	0.003***
		(6.394)	(9.875)	(5.347)	(6.843)
Nwc		−0.213***	−0.426***	−0.237***	−0.227***
		(−27.983)	(−8.823)	(−49.239)	(−34.628)
Tq		−0.001	−0.017***	−0.019***	−0.008
		(−0.523)	(−7.548)	(−3.923)	(−0.923)
CF					0.967***
					(8.763)
CF*Anfe					−0.096**
					(−2.637)
cons	0.186***	0.453***	0.129**	0.487***	0.439***
	(31.798)	(26.237)	(2.823)	(23.923)	(21.293)
Ind/Year	Yes	Yes	Yes	Yes	Yes
N	21,756	21,756	21,756	21,756	21,756
Adj-R^2	0.263	0.367	0.275	0.369	0.358

constraint channel, this paper constructs model (2) and model (3) based on model (1) and conducts a mediating effect test by causal stepwise regression test as follows:

$$FC_{i,t} = \alpha_0 + \alpha_1 Anfe_{i,t-1} + \alpha control_{i,t-1} + \gamma_1 Industry + r_2 Year + \varepsilon_t \tag{2}$$

$$CASH_{i,t} = \theta_0 + \theta_1 Anfe_{i,t-1} + \theta_2 FC_{i,t} + \theta control_{i,t-1} + \gamma_1 Industry + r_2 Year + \varepsilon_t \tag{3}$$

Among them, FC is the mediating variable financing constraint. Usually, there are three main ways to measure financing constraints: single indicator method, multivariate composite index method, and model metric haircut. This paper uses the single indicator method to study the dividend payment rate as the proxy variable of financing constraint. The specific definition of each variable is shown in Table 1.

4. Empirical analysis

4.1. Descriptive statistics analysis

Table 2 shows the results of the descriptive statistical analysis. From the results, it can be seen that the mean value of *Anfe* is 0.795 and the minimum value is 0.595, both of which are greater than 0, indicating that there is optimism in the earnings forecasts of analysts

Table 4
Robustness test.

	(1) CASH	(2) CASH	(3) FC	(4) CASH	(5) CASH
R.Anfe	−0.236***	−0.127***	−0.758***	−0.065**	−0.008
	(−10.769)	(−4.293)	(8.769)	(−2.736)	(0.427)
Fc				0.235***	
				(7.685)	
Controls	Yes	Yes	Yes	Yes	Yes
CF					1.728***
					(8.873)
CF*R.Anfe					−1.057***
					(5.238)
cons	1.726***	3.627***	4.827***	3.236***	3.237***
	(26.938)	(17.923)	(9.827)	(16.283)	(15.283)
Ind/Year	Yes	Yes	Yes	Yes	Yes
N	19,750	19,750	18,676	18,676	19,738
Adj-R²	0.167	0.303	0.102	0.326	0.295

in the sample. In addition, the maximum value of *Anfe* is 13.289, the minimum value is 0.595, and the standard deviation is 2.126, indicating a wide variation in the optimistic bias of analysts' forecasts faced in the sample. The maximum value of *CASH* is 0.653, and the minimum value is 0.018, with a standard deviation of 0.132, indicating some variation in the level of cash holdings among the companies in the sample.

4.2. Analysts' earnings forecast optimism and cash holdings

Firstly, Eq. (1) in Table 3 shows the univariate regression results, controlling only for industry effects and year effects, and the regression coefficient of *Anfe* is negative and significant at the 1% significance level; after adding the corresponding variables of individual company characteristics, financial characteristics, and corporate governance structure in (2), the coefficient of *Anfe* is find to be negative and still significantly negative at the 1% level, which indicates that the earnings forecast given by analysts is about optimistic the company holds the less cash.

In (2)-(4) in Table 3, we explore whether the optimism of analysts' forecasts affects cash holdings through the financing constraint channel. The results of (3) in Table 3 show that the coefficient of *Anfe* is significantly positive, indicating that the more optimistic the analysts' earnings forecasts are, the higher the dividend payout ratio of the company and the lower the financing constraint of the company. In contrast, the regression results of (4) in Table 3 show that the coefficient of *Anfe* is significantly negative, but the significance does not decrease, while the coefficient of dividend payout ratio (*Dive*) is significantly positive. This result may arise because policy constraints, management preferences, and other factors besides financing constraints may affect a company's dividend payout. Using a single indicator to measure the financing constraints may need to be more objective.

Further, this paper constructs a cash-cash flow sensitivity model to analyze the financing constraints of the company, which is as follows:

$$CASH_{i,t} = \beta_0 + \beta_1 Anfe_{i,t-1} + \beta_2 CF_{i,t-1} + \beta_3 \left(Anfe_{i,t-1} * CF_{i,t-1}\right) + \alpha Control_{i,t-1} + \gamma_1 Industry + \gamma_2 Year + \varepsilon_t \tag{4}$$

Where *CF* is the firm's cash flow, which is the net cash outflow from operating activities divided by total assets at the end of the period, the coefficient of *CF* captures the size of the firm's financing constraint. Table 3 in (5) shows the regression results of the cash-cash flow sensitivity model. From the regression results, the coefficient of *CF* is significantly positive, indicating that listed companies in the sample are generally dependent on internal corporate funds, and financing constraints are prevalent. In addition, the coefficient of *Anfe*CF* is significantly negative at the 5% level. Analysts forecast optimism will lead to lower cash-cash flow sensitivity of the company, significantly alleviating the company's financing constraint, which in turn makes the company's cash holdings decrease. The regression results indicate that analysts' earnings forecasts are optimistic. The company's financing constraint will be approximately minor, reducing the company's cash holdings, confirming hypothesis H1 of this paper.

4.3. Robustness test

Since analysts may have a fixed preference bias for a particular class of companies when giving earnings forecasts, the findings in this paper may be confided by endogeneity issues. Despite the previous analysis, this paper's explanatory and control variables lagged by one period. However, to further mitigate the interference of endogeneity issues in the study, this paper refers to the methodology of Bhuiyan et al. (2019) to construct analysts' residual forecast optimism variables. Analysts' impact forecast optimism is related to many factors of the firm, such as firm size, past performance, firm capital increase, external financing activities, and volatility of operating cash flows. To control for the effects of these factors, this paper first runs the following regressions:

$$Anfe_{i,t} = \alpha_0 + \alpha_1 Size_{i,t} + \alpha_2 L.ROA_{i,t} + \alpha_3 Growth_{i,t} + \alpha_4 EFA_{i,t} + \alpha_5 CFV_{i,t} + \gamma_1 Year + \varepsilon_t \tag{5}$$

This paper labels the residuals obtained from the above regression runs as "residual analyst forecast optimism bias (*R.Anfe*)" and uses this variable to replace analyst forecast optimism bias (*Anfe*) as a proxy variable for analyst forecast optimism.

Table 5
Moderating effect.

	(1) CASH	(2) CASH	(3) CASH	(4) CASH
Anfe	−0.157**		−0.037***	
	(−2.623)		(3.623)	
R.Anfe		−0.596**		−0.173***
		(−2.537)		(−3.549)
Controls	Yes	Yes	Yes	Yes
Size	−0.067***	−0.108***		
	(−8.328)	(−8.437)		
*Size*Anfe*	0.007**			
	(2.423)			
*Size*R.Anfe*		0.027*		
		(1.972)		
Age			−0.016***	−0.017***
			(−8.349)	(−6.738)
*Age*Anfe*			0.001**	
			(2.325)	
*Age*R.Anfe*				0.012***
				(3.437)
cons	3.239***	5.326***	4.237***	3.826***
	(15.832)	(10.983)	(13.948)	(10.827)
Ind/Year	Yes	Yes	Yes	Yes
N	21,756	19,750	21,756	19,750
Adj-R²	0.352	0.239	0.362	0.315

The results of (1) and (2) in Table 4 show that the coefficients of *R.Anfe* are both negative and significant, further demonstrating that analyst forecast optimism bias reduces the firm's cash holdings. The mediation tests from (2)-(4) in Table 4 are consistent with the above study that the dividend payout ratio is not entirely caused by the influence of the firm's financing constraints. The analysis of (5) in Table 4, based on the cash-cash flow sensitivity model, shows that analyst forecast optimism makes the company's cash holding level decrease mainly by reducing the company's financing constraint, and hypothesis 1 is tested.

4.4. Moderating effect

Larger companies will be less constrained by financing than smaller companies. In turn, the optimism of analysts' forecasts for larger companies has less impact on cash holdings. The longer a company is established, the better its disclosure regime, the better its reputation in the marketplace, and the closer its relationship with banks, making it less constrained to raise capital.

Table 5 shows the results of the moderating effect analysis based on firm traits, and this paper analyzes the moderating effect from firm size and firm Age. Table 5 (1) and (2) shows the moderating effect analysis of firm size, and it can be seen that the coefficients of *Anfe* and *R.Anfe* are significantly negative. The coefficients of *Anfe*Size* and *R.Anfe*Size* are significantly positive, indicating a negative relationship between analysts' forecast optimism and firm cash holdings. The larger the firm size is, the smaller the negative effect of analysts' forecast optimism on firm cash holdings, hypothesis H2 is verified.

Table 5, (3), and (4) shows the analysis of the moderating effect of the firm's Age, it can be seen that *Anfe* and *R.Anfe* are significantly negative, and the coefficient of *Anfe*Age* and *R.Anfe*Age* is significantly positive, which indicates that there is a moderating effect of *Age*. This indicates a significant negative effect of analysts' forecast optimism on the firm's cash holdings. The longer the firm's establishment practice and the less the firm's financing constraints, the smaller this negative effect is, and hypothesis H3 is verified.

5. Conclusion

This paper empirically examines the relationship between analysts' forecast optimism and companies' cash holdings, using A-share listed companies in China as the research sample from 2011–2021. We find that there is a significant negative relationship between analysts' forecast optimism and companies' cash holdings. Furthermore, in order to test whether the effect of analysts' optimism is generated through the financing channel, this paper conducts a cash-cash flow sensitivity model and find that analysts' optimism reduces the company's financing constraint, which in turn reduces the company's cash holdings; at the same time, the analysis of the moderating effect based on individual company characteristics find that the larger the company, the smaller the negative effect of analysts' optimism on cash holdings. The analysis of the moderating effect of individual firm characteristics finds that the larger the firm, the smaller the negative effect of analyst optimism on cash holdings; the older the firm, the smaller the negative effect of analyst optimism on cash holdings.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to

influence the work reported in this paper.

Data availability

The authors do not have permission to share data.

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