Do Corporate Managers Believe in Luck? Evidence of the Chinese Zodiac Effect

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Abstract

We study the responses of Chinese public firm chairpersons to their perceptions of bad luck pertaining to the Chinese zodiac year. We find that these perceptions of bad luck increase managers' sense of risk and lead them to increase their corporate cash holdings, even though the actual underlying risk remains unchanged. The effect is temporary and begins at the end of the quarter prior to the commencement of the zodiac year. When the zodiac year has passed, the level of risk perceived decreases and the bias disappears. The distortion between perceived and actual risk is significant, and the increase in cash holdings is both suboptimal and inefficient, in our view. Overall, these managerial reactions to the zodiac year are consistent with theories about belief in luck.

Keywords: Risk perception, behavioural bias, belief in luck, superstition, zodiac year, cash holdings

1. Introduction

'Why are your companies performing so well?'
'Luck.'

—Lars Sørensen, rated the best performing chief executive officer of 2015 by *Harvard Business Review*

Starting with the pioneering work of Roll (1986), numerous studies have analysed the effect of cognitive bias on managerial behaviour, including overconfidence (Malmendier & Tate 2005, 2008), hubris (Hayward & Hambrick 1997), optimism (Landier & Thesmar 2009), and heuristics (Dessaint & Matray 2017). A common thread underlying this line of research is the effect of cognitive bias on managers' assessment of risk and hence on their behaviour. Following this line of literature, this paper asks whether firm managers irrationally believe in luck and thus make predictable risk assessment mistakes that could affect corporate policies (e.g. cash holdings) and outcomes.

According to the psychology literature, individuals with a belief in bad or good luck consider luck to be a deterministic phenomenon, while rational individuals view luck as simply the outcome of random chance and unpredictable events (Darke & Freedman 1997; Rand 2009; Zhou *et al.* 2012; Thompson & Prendergast 2013). The psychological literature shows that this irrational belief in bad or good luck does, however, have an impact on an individual's risk expectation and, accordingly, affects the individual's behaviour. Following the illusion of control theory (Langer 1975; Wohl & Enzle 2002), belief in bad or good luck will make individuals either underestimate or overestimate their control over what might otherwise be considered fortuitous events. Hence, there may be a tendency to either overestimate or underestimate the probability of a negative outcome from an uncertain event, even though its actual probability remains unchanged. Thus, if firm managers believe in bad (or good) luck, their perception of risk may be higher (or lower) than the actual risk. Specifically, we hypothesise that the perceived risk of managers affected by such cognitive bias increases (or decreases) depending on the strength of belief in bad (or good) luck.

The empirical testing of this hypothesis has two main obstacles. First, the risk perceived by the manager cannot be directly observed. To address this issue, we focus on how managers estimate the risk of liquidity at the company level, and we use recorded variations in corporate cash holdings to measure how their perception of risk changes. Given evidence that corporate cash holdings are primarily used as a buffer against the risk of a liquidity shortage,[1] any variation in cash holdings will provide a good indication of changes in managers' risk perception. Second, direct observation of managers' beliefs about luck is unfeasible, since they may be reluctant to express such beliefs. We address this problem by testing managers' reactions to their Chinese zodiac year when it is believed to predict bad luck.

[1] Froot and O'Connell (1999) and Holmström and Tirole (2000) provide a theoretical basis for predicting that cash will be used in imperfect financial markets as an insurance mechanism against the risk of liquidity shock. Several papers empirically document a positive correlation among various possible sources of cash shortfall in the future and current cash holdings; these studies thus confirm that precautionary motives are central to the accumulation of cash reserves (Kim *et al.* 1998 and Sherman, 1998; Opler *et al.* 1999 and Williamson, 1999; Almeida *et al.* 2004 2004; Bates *et al.* 2009 2009; Acharya *et al.* 2012 2012).

The culture surrounding the Chinese zodiac year (*Ben Ming Nian*) is well suited for our purposes, since the individual's zodiac year is widely believed to relate to one's personal luck. According to traditional Chinese astrology, individuals entering their zodiac year are expected to encounter bad luck, including the loss of money, relationship difficulties, and career challenges. Second, zodiac years can be considered exogenous to both firms and individual managers, since they occur cyclically every 12 years, based upon the individual's birth year. From an empirical analysis perspective, the zodiac year provides a random setting, since, in any given year, a 12th of the population will be in their zodiac year. Hence, variations in corporate policies observed around a managers' zodiac year cannot easily be attributed to unobserved heterogeneity or reverse causality. Finally, belief in bad luck attributed to one's zodiac year still retains broad influence in China; even individuals raised with modern belief systems are still taught to avoid major life changes during their zodiac year (Fisman *et al.* 2019). These cultural expectations of the zodiac year allow us to estimate the effect of the belief in luck on managers' perceived risk by comparing how firms adjust their cash holdings during the managers' zodiac year.

We analyse the reaction of chairpersons in terms of corporate cash holdings in relation to their zodiac year to investigate whether they irrationally believe in luck and thus make predictable risk assessment errors that may adversely affect company policies. Thus, within the context of the widely held Chinese zodiac year belief system, if chairpersons irrationally believe in luck, they may be expected to react to their zodiac year in their decision making. Since such a belief is inherently irrational, their reactions are anticipated to be suboptimal and inefficient.

To test our conjecture, we construct a data set pertaining to the chairpersons of Chinese listed firms. In particular, we establish the names, birth year, gender, and educational achievements of 3,756 board chairpersons born in China from a sample of all 2,557 listed non–state-owned enterprises (non-SOEs) during the period 2007–2018. We focus on the chairpersons of non-SOEs, since they are, generally speaking, the ultimate decision makers of the firms and hence, by law, the highest decision-making authorities of these organisations[2] (Kato & Long 2006; Feng & Johansson 2018; Fisman *et al.* 2019).

In our baseline tests, we group firm years based on whether their chairpersons were in their zodiac year. We then compare the cash holdings levels of those firms managed by chairpersons in their zodiac year to others. We also investigate the efficiency and optimality of the changes in cash holdings during managers' zodiac years by comparing the sources of the changes in cash holdings, as well as the value of such holdings.

We document two primary parameters pertaining to the cash responses of managers in their zodiac year. The first is how managers responded to their zodiac year in terms of increasing corporate cash holdings. The levels of cash holdings of chairpersons in their zodiac year increased by approximately 0.7 percentage points of total assets relative to other firm-years. Second, this increase in cash holdings was temporary, since the level of cash holdings increased from the end of the quarter prior to the commencement of the zodiac year until the end of that zodiac year, after which it immediately reverted to pre–zodiac year levels. Both findings are consistent with the prevalence of a belief system relating to good or bad luck. Notably, the belief in bad luck associated with one's zodiac year increases perceived risk and leads chairpersons to increase their cash holdings as a precautionary measure, even though the real

[2] See Section 4.1 for details.

underlying risk has not changed. As the zodiac year passes, both perceived risk and cash holdings revert to pre–zodiac year levels.

In the specific context of our study, the decisions of chairpersons in their zodiac year are deemed to be suboptimal and inefficient, since the increase in corporate cash holdings reflects a distortion of resource allocation and a decrease in cash value. By applying the mediation effect model, we show that chairpersons increase their retention of earnings and/or decrease risky investments – for example, in research and development (R&D) or mergers and acquisitions (M&As) – during their zodiac year. Such behaviour partially explains the increases in corporate cash holdings observed, indicating a distortion of resource allocation. In addition, the increase in cash holdings directly affects shareholder wealth. Using the methodology of Faulkender and Wang (2006), we show that the market value (in terms of cash) decreases for those firms whose chairperson is in a zodiac year, since the additional cash leads to a smaller increase in market capitalisation relative to other firms, suggesting that markets see such actions as wasteful and inefficient.

We also perform a battery of additional analyses. First, we find that the zodiac effect is nonsignificant for SOEs. This result suggests that, unlike in non-SOEs, chairpersons in SOEs serve more of a custodial role in carrying out the government's wishes. Second, we find our results remain essentially unchanged when we run robustness checks controlling for industry, time, and chairperson birth year fixed effects, as well as other chairpersons' characteristics (e.g. education, experience, and gender). In addition, we find that our results remain robust to using an alternative proxy measurement for corporate cash holdings. Further, we use propensity score matching (PSM) to ensure that the chairperson's zodiac year effect is not otherwise explained by observable differences in the characteristics of a given firm or chairperson in relation to those firms managed by chairpersons in their zodiac year.

Overall, our results support the contention that corporate chairpersons believe in luck. The ramifications of this cognitive bias are that it unduly affects their assessment of risk and leads to suboptimal corporate policies.

This paper makes several contributions. First, it contributes to a growing literature on the effects of managerial cognitive bias and corporate behaviour. Previous studies in this field have primarily focused on hubris, overconfidence, and optimism (Roll 1986; Malmendier & Tate 2005, 2008; Landier & Thesmar 2009) or heuristics (Dessaint & Matray 2017). In contrast, research into managers' belief in luck remains scarce. Although a related study by Fisman *et al.* (2019) analyses the effect of zodiac years, it mainly focuses on two types of risky corporate investment*,* and there is no overarching discussion as to the mechanisms or outcomes of this zodiac year effect. Our paper adds to the literature by showing novel evidence about corporate liquidity reactions to a negative zodiac year shock to an individual's perceived luck. Moreover, we use quarterly data to provide more precise evidence on the effect during the whole zodiac year. Finally, our finding that zodiac year beliefs lead chairpersons to make suboptimal decisions that destroy the value of cash for shareholders improves our understanding of the efficiency of the link between belief in luck and risk taking.

Our study also offers important contributions to the literature on corporate cash holdings by showing that the chairperson's belief in luck, a form of cognitive bias, significantly affects the average value of cash holdings. The prior literature emphasises the role of a firm's financial constraint (Faulkender & Wang 2006), growth opportunities (Denis & Sibilkov 2010),

corporate governance (Pinkowitz & Williamson 2002), and chief executive officer risk taking incentives (Liu *et al.* 2014). This study adds the dimension of cash holdings to the chairperson's belief in luck, which negatively affects the value of cash.

The remainder of the paper is structured as follows. Section 2 reviews the literature on zodiac year belief and belief in luck. Section 3 presents the testable hypotheses. Section 4 details the data and methodology. Section 5 outlines the results. Finally, Section 6 concludes the paper.

2. Literature Review

Zodiac year

According to traditional Chinese astrology, each lunar year, in a 12-year cycle, is assigned a specific animal as part of the Chinese zodiac (*sheng xiao*) classification scheme. The Chinese zodiac begins with the sign of the Rat, followed by the Ox, Tiger, Rabbit, Dragon, Snake, Horse, Goat, Monkey, Rooster, Dog, and finally the Pig (Robiyanto *et al.* 2015). Every person has a zodiac sign designated based on his or her Chinese lunar year of birth. For example, a person's zodiac sign is the Tiger because the person was born in the year of the Tiger. Every 12 years, starting with the birth year, a person's individual zodiac sign will align with the zodiac sign of that year. This lunar year is called the persons' zodiac year, or *Ben Ming Nian*.

Based on the relation between one's birth year and the zodiac, the Chinese intuitively relate the zodiac to one's luck. For example, the zodiac year (*Ben Ming Nian*) is commonly associated with bad luck. The Chinese believe that individuals in their zodiac year may come into conflict with Tai Sui, a mysterious power or celestial body that controls people's fortunes. This conflict puts them at greater risk to such misfortunes as health issues, relationship difficulties, career challenges, and economic loss. Accordingly, individuals in their zodiac year are advised to be extremely cautious in decision making and any situations they might encounter (Zhou 1994).

The culture surrounding the Chinese zodiac year (*Ben Ming Nian*) provide a rare opportunity to systematically study the effect of belief in luck on chairpersons' decision making with little concern about endogeneity. As mentioned, one's zodiac year is believed to relate to luck and recurs every 12th year since birth. In any given year, then, a random 1/12th of any given population will be in their zodiac year, providing a random setting for empirical analysis. Therefore, it is reasonable to assume that the zodiac year effect constitutes an clear exogenous shock. Second, belief in bad luck during one's zodiac year is still widespread across China, and even individuals with modern outlooks avoid major life changes during their zodiac year (Fisman *et al.* 2019). This allows us to objectively study the irrational effects of belief in luck by analysing the reactions of corporate board chairpersons during their zodiac year. Their reactions to predictions of bad luck in their zodiac year are associated with their irrational belief in luck (i.e. where personal luck affects their future expectations).

Belief in luck

Belief in luck is irrational cognition about factors and events due to chance (Day & Maltby 2003). Individuals who hold an irrational belief in luck consider luck to be a deterministic phenomenon in itself, whereas rational individuals view luck as simply being a random and otherwise unpredictable trait (Darke & Freedman 1997; Thompson & Prendergast 2013). In addition, individuals' belief in luck is associated with expectations of external control (external

locus of control hypothesis) (Rotter 1966; Kelley 1967; Weiner 1972; Darke & Freedman 1997). By believing in luck, individuals thus tend to irrationally consider the result of an event to be the product of external factors such as chance (Rotter 1966).

Belief in luck is often manifested as irrationality in terms of making decisions based on the probability of events (Chiu & Storm 2010). Irrational cognition regarding luck can increase one's unrealistic optimism or pessimism and hence affect expectations in the decision-making process (Rotter 1966; Kelley 1967; Weiner 1972). Based on the external locus of control theory, individuals with a belief in luck are more likely to be affected by external factors that are unrelated to the actual risk involved. External factors, such as personal luck and/or its proximity, can generate a discrepancy between perceived and actual risk. According to Damisch *et al.* (2010), belief in good luck in particular may make individuals overrate the probability of a positive outcome (i.e. winning a game), even though its actual probability may be quite low, while belief in bad luck will make individuals overestimate the probability of a negative outcome (i.e. suffering loss), despite its actual probability being low. In other words, individuals with a belief in good luck tend to underestimate likely risk, while those who believe in bad luck tend to overestimate it.

3. Hypotheses

Cash holdings in the zodiac year

We ask whether corporate managers believe in good or bad luck and hence overreact to risk arising in their zodiac year. If managers believe in luck, their level of perceived risk is generally too low when they expect good luck and too high when they expect bad luck. This implies that temporary changes in perceived risk will be observed in response to a 'lucky' event or outcome, even though the real underlying risk does not change. Specifically, managers' perceived risk will increase in zodiac years, which are traditionally believed to bring bad luck. To test this prediction, we assume that changes in risk perception can be inferred from variations in corporate cash holdings. Prior research shows that risk management is the main driver of cash holdings policies. When firms have limited access to external financing, cash is used as an insurance mechanism against the risk of liquidity deficit (Froot & O'Connell 1999 1993; Holmström & Tirole 2000). In other words, cash holdings offer a buffer against any risks in terms of cash shortages, allowing firms to finance valuable investment opportunities.

In terms of the Chinese zodiac year, our event of interest, managers who believe in luck will tend to set aside cash for the whole year, because the zodiac year belief predicts that the bad luck lasts from the first day of the Chinese Lunar New Year until the last. Thus, it is very reasonable to predict that managers will increase cash holdings before the beginning of zodiac year as a precautionary move, and we therefore argue the following hypothesis.

Hypothesis 1: Corporate cash holdings will increase during a chairperson's zodiac year.

Sources of Cash

Because the liquidity risk is unlikely to change during a chairperson's zodiac year, increasing cash holdings may be deemed suboptimal resource allocation. Therefore, our second hypothesis relates to changes in the counterparts to this increase in cash holdings. Possible sources of increases in cash holdings are an increase in operating profits, a drop in operating investments,

a decrease in risky investments, an increase in new financing from debt or equity, or an increase in earnings retention. If a change in cash holdings is a result of the 'shock factor' of luck brought about by a zodiac year, then an increase in operating cash flow and a drop in net working capital are less likely. This is because it is chairpersons' belief in bad luck that likely has a psychological impact on them, rather than the actual impacts of changes in operating profit or working capital requirements. In addition, to avoid risk, those managers who believe in luck are less likely to raise new funding in their zodiac year. However, since the perceived risk is greater in their zodiac year, managers are more likely to retain cash from earnings and to decrease risky investments, leading to examine the following hypotheses.

Hypothesis 2a: Chairpersons will retain more earnings in their zodiac year.

Hypothesis 2b: Chairpersons will decrease risky investments in their zodiac year.

Value of Cash

We now address whether changes in cash holdings in a chairperson's zodiac year are due to a rational decision-making process or a source of value destruction for corporate shareholders. If such a decision is rational, any increase in cash holdings should be efficiently used and hence lead to a similar increase in cash value for the firm's shareholders. If such cash holdings could have been better employed elsewhere, the additional cash holdings could incur a potential loss to shareholders in terms of market capitalisation.

According to our first prediction, chairpersons who believe in luck will overestimate the risk arising in their zodiac year and hence irrationally increase cash holdings. Such a reaction is likely to be costly for shareholders, since increasing cash holdings in this case is suboptimal in terms of resource allocation. Therefore, we hypothesise the following.

Hypothesis 3: The value of cash holdings will decrease during the chairperson's zodiac year.

4. Data and Methodology

Data

We construct our main sample by combining two data sets. The first data set comprises all non-SOEs[3] listed on the Shanghai and Shenzhen Stock Exchanges from 2007 to 2018. Information on these firms was collected from the China Securities Market & Accounting Research (CSMAR) database. We study non-SOEs rather than SOEs because the decisions of the former, being under less formal political control, are less likely to be affected by politics (Zif 1981; Liang & Ma 2020), and SOEs thus enjoy greater autonomy in relation to their business goals. We select 2007 as the starting year, because a new corporate accounting standard was implemented at this time that made the disclosure of financial indicators (such as R&D exenditure) more comprehensive and hence transparent. To eliminate the impact of abnormal financial conditions, we exclude firms tagged ST and *ST[4] from our samples.

[3] We identify non-SOEs firms according to the nature of the ultimate controller. Specifically, we require that non-SOEs not be controlled by the central government, a local government, a proxy administrative agency, or any other SOE.

[4] According to regulations in China, if a firm reports two consecutive years of negative profits, the prefix ST is added its name abbreviation to warn investors of substantial risk. If an ST firm experiences

Second, we construct a data set where we identify the board chairs for non-SOEs listed on the Shanghai and Shenzhen Stock Exchanges. We first collect the names of the board chairs from the CSMAR database. We then retrieve their biographical data, including their age, gender, highest educational achievement, and nationality, via searches of Genius Finance, Sina Finance, or Google/Baidu. We exclude foreign-born board chairs (1.9% of chairpersons in our main sample) to minimise cultural differences. We focus on chairpersons instead of chief executive officers because, in non-SOEs, the chairperson is generally the ultimate controller of the firm and is thus, by law, the highest decision-making authority within the organisation (Kato & Long 2006; Feng & Johansson 2018; Fisman *et al.* 2019).

By combining these two data sets, we construct a final main sample of 2,557 non-SOEs with 3,756 chairpersons. For these firms, we obtain quarterly financial data from the CSMAR database. We use quarterly rather than annual data to identify changes in the cash holdings of these firms during their chairperson's zodiac year, to achieve the highest possible precision.

Table 1 presents descriptive statistics for the key dependent variables. Panel A reports summary statistics[5] for the whole sample, while Panel B presents similar statistics for the subsamples segmented by the chairperson's zodiac year. The last column in Panel B shows the *t*-statistics from a two-sample test of the equality of means across both zodiac and non-zodiac year firms. The difference in cash holdings is 1.034 percentage points (significant at the 1% level), the difference in corporate size is 0.042 (significant at the 5% level), while the difference in the market-to-book (*MTB*) ratio is -0.121 (significant at the 1% level). The latter suggests that firms are relatively undervalued during the chairperson's zodiac year, compared to other years. The difference in net working capital (*NWC*) is 0.6% (significant at the 5% level) and, accordingly, the difference in capital expenditure is 0.1% (significant at the 1% level). In columns (1) and (2) of Panel C, we further present the means of cash for zodiac and non-zodiac firms, respectively, as well as their differences by quarter. The difference in cash holdings is significant for each quarter and gradually shrinks from quarter 1 (Q1) to quarter 4 (Q4). This result is also plotted in Figure 1.

[Insert Table 1 here]

[Insert Figure 1 here]

Methodology

Cash holdings in the chairperson's zodiac year

We examine the effects of belief in bad luck during the chairperson's zodiac year on risk perception, as determined via changes in corporate cash holdings, using the following model:

$$Cash_{iyqc} = \alpha_i + \delta_{yq} + \beta_1 Zodiac_{iyqc} + \chi_{iyq} + \gamma_{yqc} + \mu_{iyqc} \qquad (1)$$

where, for firm *i*, at the end of year *y*, calendar quarter *q* (1 to 4), and chairperson *c*, $Cash_{iyqc}$ is the amount of cash and cash equivalents as a percentage of total assets, α_i is firm fixed effects, δ_{yq} denotes time (i.e. year–quarter) fixed effects, $Zodiac_{iyqc}$ is a dummy variable that equals one if the firm chairperson is in his or her zodiac year (hereafter extending from

a third year of negative net profits, an asterisk is added further to alert potential investors to the fact that the company is very close to being delisted.

[5] All variables are winsorised at the first and 99th percentiles and are defined in Appendix A.

quarter 1 to quarter 4 of that year) and zero otherwise, and μ_{iyqc} is the error term, clustered at the firm level to account for potential serial correlations.[6]

We also add control variables for firm characteristics and chairpersons' personal characteristics. The firm control variables are denoted by χ_{iyq}, measured at the end of each quarter q of year y. These control variables are firm size (the natural logarithm of total assets), leverage (measured as the ratio of total debt to total assets), the market-to-book ratio (market capitalisation over total equity), capital expenditure (Cexp, capital expenditure scaled by total assets), NWC (the ratio of net working capital to total assets), and cash flow (the ratio of net earnings to total assets).

The control variables for chairpersons' personal characteristics, denoted by γ_{yqc}, are the age of the board chair (to control for the age effect on corporate cash holdings), being female (a dummy variable indicating whether the chairperson is female), and education (an indicator for the board chair's level of educational attainment, where 1 denotes a senior middle school degree or lower, 2 denotes a junior college degree, 3 denotes a bachelor's degree, 4 a master's degree, and 5 a doctoral degree. To alleviate concerns about an age effect in the relation between the zodiac year and corporate cash holdings, we additionally control for 12-year age cohorts centred around the zodiac year (i.e. [19, 30], [31, 42], etc.) in our models. Detailed definitions of all the variables used in the empirical analysis may be found in Appendix A.

Sources of cash

We first run an ordinary least squares (OLS) regression on the possible resources called upon for the increase in cash holdings, including operating margins, net working capital (*NWC*), and new financing, to check our rationale for the second hypothesis, that these factors are less likely to be the key sources for increases in cash holdings during a zodiac year. The control variables are the chairperson's age, gender, education and the firm's size, leverage ratio, and market-to-book ratio. Firm and time fixed effects are also included in the analysis. Detailed definitions of all the variables in the empirical analysis may be found in Appendix A.

We then use the mediation effect model to test our second hypothesis relating to the sources of cash holdings. Using the mediating effect model of Baron and Kenny (1986), we supplement our baseline model with the following regression:

$$Source_{iyqc} = \alpha_i + \delta_{yq} + \beta_2 Zodiac_{iyqc} + \varphi_{iyq} + \gamma_{yqc} + \mu_{iyqc} \quad (2)$$

$$Cash_{iyqc} = \alpha_i + \delta_{yq} + \beta_3 Zodiac_{iyqc} + \beta_4 Souce_{iyqc} + \chi_{iyq} + \gamma_{yqc} + \mu_{iyqc} \quad (3)$$

where $Source_{iyqc}$ includes earnings retention and risky investments. In keeping with prior studies, we use the reduction in dividend payouts (Dessaint & Matray 2017) to measure earnings retention, and R&D and M&A expenditures as proxies for risky investments. We considered M&A investments to be risky because corporate acquisitions are deemed inherently riskier than organic internal growth, due to the typically large commitment of time and resources (Bernile *et al.* 2017). We considered R&D expenditures to be risky because they involve many uncertainties (e.g. the time and scale of the investment). Second, many studies have previously adopted M&A and R&D expenditures as proxies for risky investments (Coles *et al.* 2006; Cassell *et al.* 2012; Kini & Williams 2012; Feng & Johansson 2018; Fisman *et al.*

[6] In Appendix B, we also apply robust standard errors and standard errors clustered at the industry level in this baseline model, to relax the assumption that multiple observations from the same industry are uncorrelated. The results show that our findings are robust under more conservative considerations.

2019). The control variables in Eq. (2) are γ_{yqc} (essentially the same as in Eq. (1)) and φ_{iyq} (which includes the firm's size, leverage ratio, and market-to-book ratio). The control variables employed in Eq. (3) are the same as for our baseline model, Eq. (1). The term μ_{iyqc} is the error term, clustered at the firm level to account for potential serial correlations.[7]

To analyse the mediation effect, the following three conditions must be met. The independent variable (*Zodiac*) should be significantly related to the dependent variable (*Cash*). Second, the independent variable (*Zodiac*) should be significantly related to the mediator variable (i.e. Source). Finally, the dependent variable (*Cash*) should be regressed against both the independent variable (*Zodiac*) and the mediator. Let us suppose that the mediator variable mediates the association between *Cash* and *Zodiac*. In this case, the mediator should be significant, and the significance of the independent variable of interest (i.e. *Zodiac*) should be reduced after the mediator variable is added to the regression.

Value of cash

To measure the impact of chairpersons' reactions to their zodiac year in terms of the value of cash holdings, we adopt the valuation model proposed by Faulkender and Wang (2006).[8] We augment their baseline model with our zodiac year variable and add its interaction with the change in cash holdings variable. Specifically, we construct the following equation:

$$\Delta MV_{iyqc} = \alpha_i + \delta_{yq} + \beta_1 \frac{\Delta Cash_{iyqc}}{MV_{iyqc-1}} + \beta_2\left(Zodiac_{iyqc}\right) + \beta_3\left(Zodiac_{iyqc} * \frac{\Delta Cash_{iyqc}}{MV_{iyqc-1}}\right) + \partial_{iyq} + \gamma_{yqc} + \mu_{iyqc} \quad (4)$$

where the dependent variable ΔMV_{iyqc} denotes the change in equity market value over quarter q, scaled by the equity market value at the end of the quarter q - 1, and $\Delta Cash_{iyqc}$ is the change in corporate cash holdings over the quarter, scaled by equity market value. The control variables for firm characteristics, denoted by ∂_{iyq}, include changes in earnings, interest, dividends, net assets, R&D expenditures, market leverage, new financing, lagged cash, and interaction terms between change in leverage and lagged cash, as well as between changes in cash and lagged cash. The controls for chairperson characteristics, denoted by γ_{yqc}, are similar to those in specification (1). We also control for firm fixed effects (α_i) and time fixed effects (δ_{yq}). We additionally control for 12-year age cohorts centred around the zodiac year (i.e. [19, 30], [31, 42], etc.). The term μ_{iyqc} is the error term clustered at the firm level, to account for potential serial correlations.

5. Results

Cash holdings

We examine the effect of a belief in luck on the risk perceived by firm chairpersons through differences in corporate cash holdings during a chairperson's zodiac year. Table 2 reports the effects of chairpersons' belief in luck in their respective zodiac years. In the first column, we

[7] In Appendix B, we apply robust standard errors and standard errors clustered at the industry level in the mediation effect model to relax the assumption that multiple observations from the same industry are uncorrelated. The results show that our findings are robust under more conservative considerations.

[8] Similar to Dessaint and Matray (2017), we apply one notable adjustment to the specification of Faulkender and Wang (2006), in that we do not use the market-adjusted return as a dependent variable. Instead, we use the raw stock return and add time fixed effects, as suggested by Gormley and Matsa (2014).

include only the variable zodiac as a covariate. We then add progressively more controls, including chairperson characteristics (columns (2) and (3)), firm characteristics controls (column (3)), and age cohort fixed effects (column (4)). According to the results in column (3), on average, during the chairperson's zodiac year, firms increased their cash holdings as a percentage of total assets by approximately 0.655 percentage points during the four quarters of that year. This effect represents an average increase in cash holdings of approximately 16 million yuan. The coefficient of the zodiac variable is quite stable across these specifications. Consistent with our first hypothesis, chairpersons respond to the prediction of bad luck during their zodiac year by increasing their firm's cash holdings, although there is no indication that the risks were any greater than they were previously.

[Insert Table 2 here]

We investigate the dynamics of this increase in cash holdings in Table 3, specifically studying the differences between the levels of cash holdings of those firms with a chairperson in his or her zodiac year and the others. We replace the zodiac variable with a set of dummy variables denoted by *Pre(Post)-zodiac qi and Zodiac qi*, indicating the quarters before (after) and during the chair's zodiac year. The regression coefficient estimated for each dummy variable measures the differences in the levels of quarterly cash holdings between firms in (before or after) the chairperson's zodiac year and others. This approach allows us to identify when the effect starts and how long it lasts.

Table 3 shows that the level of cash holdings begins to increase one quarter prior to the commencement of the zodiac year,[9] and these increases in cash holdings peak during the second quarter of the zodiac year. The coefficients for the *Zodiac q2* variables (the second quarter of zodiac year) reveal that, on average, chairpersons in their zodiac year respond to premonitions of bad luck by increasing their firm's cash holdings by 0.766% of their total assets (approximated at 19 million yuan) at the end of the second quarter of their zodiac year. The levels of cash holdings then begin to decline and the effect vanishes at the conclusion of the zodiac year. The coefficient for the *Post-zodiac qi* variables indicate that the average difference in cash holdings between firms whose chairperson is in a zodiac year and other firms is indistinguishable from zero one year after the chairperson's zodiac year.

[Insert Table 3 here]

We plot the results of this analysis in Figure 2, which shows a distinct increase in cash holdings in the zodiac year relative to other lunar years. This result indicates that the chairpersons' reactions to their zodiac year are not due to other time-dependent variables (e.g. age).

[Insert Figure 2 here]

The patterns in the changes in levels of cash holdings are consistent with Hypothesis 1. Chairpersons who believe in luck will set aside additional cash before the cusp of the zodiac year as a precautionary measure. As time goes by and other pressing needs take centre stage, the perceived probability of risk drops back towards its initial value, at which point these chairpersons reduce corporate cash holdings.

[9] The positive and statistically significant effect observed for Pre-zodiac q4 is consistent with our interpretation of the precautionary cash holdings hypothesis. Since the Chinese lunar year begins between January and February in the Gregorian calendar, Zodiac q1 is the first balance sheet published after this event. The Pre-zodiac q4 shows the change in cash holdings made in reaction to the zodiac year as a precautionary move.

Sources of Cash

We posit that possible sources for the increase in cash holdings during a chairperson's zodiac year could derive from earnings retention and/or a decrease in risky investments rather than from the diversion of other resources. To test this hypothesis, we first conduct an OLS regression on operating margins, net working capital (*NWC*), and new financing before applying the mediation model to test the effect of earnings retention, as well as risky investments. The literature (Lang *et al.* 2012; Chen *et al.* 2019; Tsang *et al.* 2019) has widely adopted this mediation model to provide direct evidence of underlying financial mechanisms in other settings.

In Table 4, we examine whether chairperson' beliefs in the adverse fortunes of their zodiac year affect operating activity, operating investment, or financial activity. Column (1) shows that the zodiac year has no effect on operating revenues for those firms whose chairperson is in his or her zodiac year, since they suffer no statistically significant decrease in operating margin. This finding further confirms that the widely held belief in personal misfortunes attributed to the zodiac year does not apply to corporate operating profits. As shown in Table 4, we find no evidence that the proximity of the zodiac year modifies either net working capital (column (2)) or new financial activity (column (3)), since none of the coefficients are statistically significant.

[Insert Table 4 here]

Table 5 reports the results of the mediation effect on earnings retention and risky investment. In column (1), the findings from column (3) of Table 2 are repeated for the sake of comparison, providing the first-stage result of our mediation analysis. As discussed, we report a significantly positive association between levels of cash holdings and the chairperson's zodiac year. Column (2) reports the results of the second-stage mediation analysis. The coefficient of the zodiac variable is negative and significant when we employ *Dividend* as the dependent variable. Therefore, consistent with belief in bad luck, this result suggests that chairpersons retain more earnings in their zodiac years as a buffer against premonitions of personal misfortune.

[Insert Table 5 here]

In column (3) of Table 5, we include both Zodiac and Dividend as testing variables when we use cash holdings as the dependent variable. We find that the dividend payout is negatively correlated to cash holdings, consistent with the notion that a reduction in dividend payout is serving as the source of the increase in cash holdings. Importantly, although Zodiac remains positively and significantly associated with cash holdings, its coefficient (0.653) is smaller when compared to the corresponding coefficient in column (1) (0.655), consistent with a partial mediation effect of earnings retention.

We then include R&D expenditures in our mediation model. In Table 5, column (1) again serves as the first-stage benchmark, while columns (4) and (5) report the second- and third-stage results of the mediation analysis based on R&D expenditures. These results satisfy the requirements of the second- and third-stage regressions for mediation analysis: the negative coefficient on Zodiac in column (4) suggests that chairpersons actively reduce their R&D expenditures in their zodiac years, and the coefficient of Zodiac is smaller in column (5) than it is in column (1), consistent with the partial mediation effect. The same result is obtained for M&A expenditures, as shown in columns (6) and (7).

Overall, these results suggest that chairpersons tend to retain more earnings and reduce risky investments in R&D and M&As to increase cash holdings during their zodiac year.

Value of Cash

In Table 6, we analyse the marginal value of cash of firms during the chairperson's zodiac year. In column (1), we control for firm and time fixed effects. The coefficient of the change in cash holdings in column (1) indicates that, when cash holdings increase by one yuan, the market value increases by approximately 0.47 RMB in a non-zodiac year. Column (1) also shows that the increase in market value is significantly smaller when cash holdings increase, because of the proximity of the zodiac year. The coefficient of the interaction term between the zodiac year and the change in cash holdings shows that an increase of one yuan in cash holdings for both firms with a chairperson in his or her zodiac year and other firms leads to a smaller increase in market value for the former, for a loss of 0.1 yuan in market value relative to other firms. This discount for each additional yuan in cash suggests that shareholders view this extra cash as wasteful, thereby confirming that the chairpersons' decision to increase cash holdings is deemed suboptimal. In column (2), we control for chairperson age cohort fixed effects. The zodiac year indicator is stable in this specification.

[Insert Table 6 here]

Overall, these results show that the decision to temporarily hoard cash during a chairperson's zodiac year negatively impacts firm value by reducing the value of cash.

Test of SOEs

In this section, we further examine the belief in the bad luck effect during zodiac years for SOEs. In Table 7, we show the results of our placebo test focused on SOEs. In contrast to non-SOEs, whose chairperson generally represents his or her own financial interests as a controlling shareholder, in SOEs the chairperson represents the interests of (and takes instructions from) the government. An SOE chair thus serves more of a custodial role in carrying out the government's wishes. Hence, we may assume that chairpersons' characteristics (including their zodiac year status) are less plausibly relevant to their firms' liquidity policies. Consistent with this view, we find no correlation between the SOE chairpersons' zodiac year status and their cash holdings, as shown in Table 7.

[Insert Table 7 here]

Robustness check

More controls

In this section, we cover a number of additional robustness tests. In Table 8, we investigate whether the increase in corporate cash holdings documented above remains robust after applying further controls.

First, we use industry and time fixed effects to remove anomalous trends in different industries and find that they do not alter our estimation (column（1) of Panel A in Table 8). The impact of zodiac year belief on corporate cash holding also remains robust when the chairperson's birth year are controlled for by adding chairperson birth year fixed effects (column (2)). Further, according to the results in column (3), the zodiac year belief effect observed remains robust after the nonlinear effect of the chairperson's age on corporate cash holdings is controlled for.

In Panel B of Table 8, we add more variables, including the chairperson's level of academic attainment, experience, and gender, and their interaction terms with the zodiac year variable as controls. We do so because these are all factors that may affect a chairperson's managerial

decisions, such as those involving cash holdings (MacCrimmon & Wehrung 1990; Huang & Kisgen 2013; Bernile *et al.* 2017; Dessaint & Matray 2017; Feng & Johansson 2018). We add each factor, progressively, to our model to test the robustness of the relation between the zodiac year and corporate cash holdings.

[Insert Table 8 here]

We investigate the education effect by conducting our baseline regression (1) with the interaction term between the zodiac and bachelor's degree variables. The results of this analysis are reported in column (1) of Panel B in Table 8. We found no significant reduction of the zodiac year effect.

To test whether an increase in cash holdings during a chairperson's zodiac year depends on experience, we also include interaction terms between the variables for zodiac and overseas experience (column (2)) and trauma experience[10](column (3)), respectively, in our baseline regression (1). Column (2) of Panel B in Table 8 shows that past overseas experience has no effect on the relation between belief in luck and corporate cash holdings. Column (3) further shows that the relation is unaffected by a chairperson's reported experience of trauma.

As shown in column (4) of Panel B in Table 8, whether managers are female or male has no significant impact upon the relation between the zodiac year and corporate cash holdings.

Taken together, the results in Panel B of Table 8 indicate that the relation between a chairperson's zodiac year and corporate cash holdings is robust to and not moderated by the chairperson's personal characteristics, including education, experience, and gender.

An alternative measure of cash holdings

We also check that our results pertaining to cash over total assets are robust to an alternative measurement of cash holdings by applying our main analysis on the ratio of cash to net assets. Table 9 shows that the zodiac year effect remains significant, regardless of the measurement of cash holdings.

[Insert Table 9 here]

PSM

We also combine our regression approach with a matching approach to alleviate any concerns of bias introduced by the linear settings of our regression model. We create two data samples comparable across all of the control variables, differing only in terms of whether the chairperson is in his or her zodiac year. To construct these samples, we implement a PSM process following Drucker and Puri (2005) and match firms whose chairpersons are in their zodiac year with firms of similar characteristics whose chairperson is not in a zodiac year. Specifically, the method comprises a probit regression to estimate propensity scores, $p(Y = 1/X = x)$, based on the probability of receiving a binary treatment Y conditional on all the control variables x. In our setting, we consider chairpersons in their zodiac year as the treated, and we estimate the probability of a chairperson being in a zodiac year by using the independent variables based on specification (3) of Table 2. Then, for each firm–year–quarter with a zodiac

[10] The trauma experience indicates the experience of the Great Chinese Famine, which happened during the year from 1959 to 1961. Due to the severe shortage of food, approximately 30 million (Li & Yang 2005)died during those years. As a comparison, this is far more than the number of victims during World War I, during which over nine million combatants and seven million civilians died as a result of the war. Feng and Johansson (2018) found that the experience of the famine is associated with more conservative managerial behaviour.

year chairperson, we use the propensity score to find a comparable firm–year–quarter with a non–zodiac year chairperson based on the nearest-neighbour method.

To ensure the adequacy of the matching estimation method, we require that the absolute difference in propensity scores among pairs not exceed 0.05. If there are more firm–year–quarters with a non–zodiac year chairperson that meet this criterion, then we retain those firm–year–quarters with the smallest differences in propensity scores. Using this approach, we find 4,890 unique pairs of matched firm–year–quarters.

Panel A of Table 10 reports the differences in the means of the independent variables for zodiac year and non–zodiac year chairpersons for the matched sample. The *t*-statistics of the corresponding differences in means indicate that almost all the independent variables are comparable to the matched sample. Using this matched sample in Panel B, we rerun the regressions as shown in columns (3) and (4) of Table 2. The results remain robust, reaffirming that the zodiac year effect is not an artefact of any functional form misspecification bias.

[Insert Table 10 here]

6. Conclusion

This paper provides empirical evidence that managers exhibit biases when assessing risk. We show that managers temporarily increase the amount of corporate cash holdings as a result of a biased risk perception caused by an irrational premonition of bad luck. Such a reaction cannot be viewed as rational, even given prevailing uncertainties, since the real liquidity risks are not necessarily greater during a chairperson's zodiac year. Rather, this reaction is consistent with the theory of belief in luck (Darke & Freedman 1997; Damisch *et al.* 2010), which predicts that a belief in bad luck will tend to make managers overestimate the probability of a negative outcome, even though its actual probability remains unchanged.

More importantly, we show that such aberrant judgement is suboptimal and inefficient in terms of resource allocation and shareholder value. Financial managers tend to retain cash from earnings and by reducing their levels of risky investments in such areas as R&D and M&A expenditures, inducing shareholder loss. We also provide evidence suggesting that the relation between belief in luck and cash holdings during a chairperson's zodiac year is robust to a variety of controls, including the type of firm, the industry, and the chairperson's demographic characteristics.

Our findings are important for our general understanding of how cognitive bias influences managerial decisions. In this paper, we show that corporate liquidity policy is adversely affected by a chairperson's belief in luck, which ultimately harms firm value. Given the large and increasing diversity of risks that must be assessed daily by the key decision makers of companies, our results suggest that the economic cost of this bias could be considerable.

Our results also have important implications for the literature on investors' attitudes towards luck and portfolio allocation. Examining the relation between an investor's zodiac year and risk taking may prove to be an equally promising endeavour for future research.

References

Acharya, V., Davydenko, S.A., Strebulaev, I.A., 2012. Cash holdings and credit risk. The Review of Financial Studies 25, 3572-3609

Almeida, H., Campello, M., Weisbach, M.S., 2004. The cash flow sensitivity of cash. The Journal of Finance 59, 1777-1804

Baron, R.M., Kenny, D.A., 1986. The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. Journal of personality and social psychology 51, 1173

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

Bernile, G., Bhagwat, V., Rau, P.R., 2017. What doesn't kill you will only make you more risk‐loving: Early‐life disasters and CEO behavior. The Journal of Finance 72, 167-206

Cassell, C.A., Huang, S.X., Sanchez, J.M., Stuart, M.D., 2012. Seeking safety: The relation between CEO inside debt holdings and the riskiness of firm investment and financial policies. Journal of Financial Economics 103, 588-610

Chen, S., Huang, Y., Li, N., Shevlin, T., 2019. How does quasi-indexer ownership affect corporate tax planning? Journal of Accounting and Economics 67, 278-296

Chiu, J., Storm, L., 2010. Personality, perceived luck and gambling attitudes as predictors of gambling involvement. Journal of Gambling Studies 26, 205-227

Coles, J.L., Daniel, N.D., Naveen, L., 2006. Managerial incentives and risk-taking. Journal of financial Economics 79, 431-468

Damisch, L., Stoberock, B., Mussweiler, T., 2010. Keep your fingers crossed! How superstition improves performance. Psychological Science 21, 1014-1020

Darke, P.R., Freedman, J.L., 1997. The belief in good luck scale. Journal of research in personality 31, 486-511

Day, L., Maltby, J., 2003. Belief in good luck and psychological well-being: The mediating role of optimism and irrational beliefs. The Journal of psychology 137, 99-110

Denis, D.J., Sibilkov, V., 2010. Financial constraints, investment, and the value of cash holdings. The Review of Financial Studies 23, 247-269

Dessaint, O., Matray, A., 2017. Do managers overreact to salient risks? Evidence from hurricane strikes. Journal of Financial Economics 126, 97-121

Drucker, S., Puri, M., 2005. On the benefits of concurrent lending and underwriting. the Journal of Finance 60, 2763-2799

Faulkender, M., Wang, R., 2006. Corporate financial policy and the value of cash. The journal of finance 61, 1957-1990

Feng, X., Johansson, A.C., 2018. Living through the Great Chinese Famine: Early-life experiences and managerial decisions. Journal of Corporate Finance 48, 638-657

Fisman, R., Huang, W., Ning, B., Pan, Y., Wang, Y., 2019. Superstition and risk-taking: Evidence from "zodiac year" investment in China.

Froot, K.A., O'Connell, P.G., 1999. The pricing of US catastrophe reinsurance. In: The Financing of Catastrophe Risk. University of Chicago Press, pp. 195-232.

Gormley, T.A., Matsa, D.A., 2014. Common errors: How to (and not to) control for unobserved heterogeneity. The Review of Financial Studies 27, 617-661

Hayward, M.L., Hambrick, D.C., 1997. Explaining the premiums paid for large acquisitions: Evidence of CEO hubris. Administrative science quarterly, 103-127

Holmström, B., Tirole, J., 2000. Liquidity and risk management. Journal of Money, Credit and Banking, 295-319

Huang, J., Kisgen, D.J., 2013. Gender and corporate finance: Are male executives overconfident relative to female executives? Journal of financial Economics 108, 822-839

Kato, T., Long, C., 2006. CEO turnover, firm performance, and enterprise reform in China: Evidence from micro data. Journal of Comparative Economics 34, 796-817

Kelley, H.H., 1967. Attribution theory in social psychology. In: Nebraska symposium on motivation. University of Nebraska Press

Kim, C.-S., Mauer, D.C., Sherman, A.E., 1998. The determinants of corporate liquidity: Theory and evidence. Journal of financial and quantitative analysis, 335-359

Kini, O., Williams, R., 2012. Tournament incentives, firm risk, and corporate policies. Journal of Financial Economics 103, 350-376

Landier, A., Thesmar, D., 2009. Contracting with optimistic entrepreneurs: Theory and evidence. Review of Financial Studies 22, 117-150

Lang, M., Lins, K.V., Maffett, M., 2012. Transparency, liquidity, and valuation: International evidence on when transparency matters most. Journal of Accounting Research 50, 729-774

Langer, E.J., 1975. The illusion of control. Journal of personality and social psychology 32, 311

Li, W., Yang, D.T., 2005. The great leap forward: Anatomy of a central planning disaster. Journal of Political Economy 113, 840-877

Liang, J., Ma, L., 2020. Ownership, Affiliation, and Organizational Performance: Evidence from China's Results-Oriented Energy Policy. International Public Management Journal 23, 57-83

Liu, Y., Mauer, D.C., Zhang, Y., 2014. Firm cash holdings and CEO inside debt. Journal of Banking & Finance 42, 83-100

MacCrimmon, K.R., Wehrung, D.A., 1990. Characteristics of risk taking executives. Management science 36, 422-435

Malmendier, U., Tate, G., 2005. CEO overconfidence and corporate investment. The journal of finance 60, 2661-2700

Malmendier, U., Tate, G., 2008. Who makes acquisitions? CEO overconfidence and the market's reaction. Journal of financial Economics 89, 20-43

Opler, T., Pinkowitz, L., Stulz, R., Williamson, R., 1999. The determinants and implications of corporate cash holdings. Journal of financial economics 52, 3-46

Pinkowitz, L., Williamson, R., 2002. What is a dollar worth? The market value of cash holdings. The Market Value of Cash Holdings (October 2002)

Rand, K.L., 2009. Hope and optimism: Latent structures and influences on grade expectancy and academic performance. Journal of personality 77, 231-260

Robiyanto, R., Hersugondo, S., Puryandani, S., 2015. Chinese zodiac effect and precious metals returns of 1900-2013. International Journal of Applied Business and Economic Research 13

Roll, R., 1986. The hubris hypothesis of corporate takeovers. Journal of business, 197-216

Rotter, J.B., 1966. Generalized expectancies for internal versus external control of reinforcement. Psychological monographs: General and applied 80, 1

Thompson, E.R., Prendergast, G.P., 2013. Belief in luck and luckiness: Conceptual clarification and new measure validation. Personality and Individual Differences 54, 501-506

Tsang, A., Xie, F., Xin, X., 2019. Foreign institutional investors and corporate voluntary disclosure around the world. The Accounting Review 94, 319-348

Weiner, B., 1972. Attribution theory, achievement motivation, and the educational process. Review of educational research 42, 203-215

Wohl, M.J., Enzle, M.E., 2002. The deployment of personal luck: Sympathetic magic and illusory control in games of pure chance. Personality and social psychology bulletin 28, 1388-1397

Zhou, J., 1994. An analysis about « Ben Ming Nian» and « Kan Er Nian». Study of the folklore, 16-21

Zhou, K., Tang, H., Sun, Y., Huang, G.-H., Rao, L.-L., Liang, Z.-Y., Li, S., 2012. Belief in luck or in skill: Which locks people into gambling? Journal of Gambling Studies 28, 379-391

Zif, J., 1981. Managerial strategic behavior in state-owned enterprises—Business and political orientations. Management Science 27, 1326-1339

Appendix A Variable Definitions

Age	The age of the chairperson.
Cash	Cash and cash equivalents scaled by total assets.
Cexp	Capital expenditure scaled by total assets.
CF	Net earnings scaled by total assets.
Education	Indicator of the board chair's educational attainment, where 1 denotes senior middle school or lower, 2 a junior college degree, 3 a bachelor's degree, 4 a master's degree, and 5 a doctoral degree.
Female	Dummy variable indicating whether the chairperson is female.
Bachelor	Dummy variable indicating whether the chairperson attained a bachelor's degree or above.
Dividend	Total dividends over last year's net income.
Oversea experience	Dummy variable indicating if the chairperson has overseas experience.
Trauma experience	Dummy variable indicating whether the chairperson experienced the Chinese Great Famine.
Cash	Cash and cash equivalents scaled by total asset at the end of each quarter.
NCash	Cash and cash equivalents scaled by net total asset (total asset minus cash and cash equivalents) at the end of each quarter.
Leverage	Ratio of total debt to total assets.
M&A	Ratio of the total value of the transactions the firm makes in M&A deals over total assets.
MTB	Market capitalisation over total equity.
New finance	Issuance of long-term debt plus the sale of new stocks scaled by equity market value.
NWC	Net working capital, that is, current assets (less cash) minus current liabilities over total assets.
Operating margin	Operating income after depreciation over total revenues.
R&D	R&D expenditure over total revenues.
Size	Natural logarithm of total assets.
Zodiac	Dummy variable that equals one if the chairperson of the firm is in his or her zodiac year, and zero if not.
ΔCash	Change in cash and cash equivalents scaled by total assets.
ΔEarnings	Change in net income before extraordinary items scaled by market value.
ΔInterest	Change in interest expenses scaled by market value.

ΔMV	Change in equity market value over the quarter scaled by the equity market value for the previous quarter.
ΔNA	Change in total assets minus all cash and cash equivalents scaled by the market value.
ΔDividend	Change in dividends scaled by the market value.
ΔNWC	Change in net working capital scaled by market value.
ΔRD	Change in R&D expenses (set to zero if not applicable) scaled by the market value.

Appendix B: Standard errors of different types

Table B.1: Standard errors of different types in baseline model

This table presents the replication of our baseline model with different types of error terms. The dependent variable is the total amount of cash and cash equivalents scaled by the total assets of the firm at the end of the quarter, and Zodiac is a dummy variable equal to one if the chairperson of the firm is in his or her zodiac year. All other variables are defined as in Appendix A. All continuous variables are winsorised at the first and 99th percentiles. All regression coefficients are multiplied by 100 for readability. In Panel A, we use robust standard errors. In Panel B, error terms are clustered at the industry level. The t-statistics are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A:

	Dependent variable: Cash (%)			
	(1)	(2)	(3)	(4)
Zodiac	0.863***	0.737***	0.655***	0.717***
	(4.600)	(3.907)	(4.513)	(4.920)
Age		-0.610***	-0.280***	
		(-42.391)	(-24.132)	
Female		-2.971***	-1.817***	-1.335***
		(-5.465)	(-4.321)	(-3.227)
Education		-3.076***	-0.865***	-0.557***
		(-22.970)	(-7.132)	(-4.664)
Size			-3.662***	-3.925***
			(-35.488)	(-38.782)
Leverage			-58.136***	-58.110***
			(-83.474)	(-83.221)
MTB			-0.893***	-0.921***
			(-32.209)	(-33.060)
NWC			-51.293***	-51.498***
			(-89.094)	(-89.113)
Cexp			-14.860***	-14.400***
			(-10.077)	(-9.765)
CF			50.166***	51.288***
			(27.170)	(27.664)
Age cohort fixed effects				Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Observations	63,763	59,925	56,708	56,708
Adj. R^2	0.407	0.439	0.658	0.656

Panel B:

	Dependent variable: Cash (%)			
	(1)	(2)	(3)	(4)
Zodiac	0.863***	0.737***	0.655**	0.717**
	(3.411)	(2.646)	(2.269)	(2.519)

Age		-0.610***	-0.280***	
		(-8.891)	(-10.446)	
Female		-2.971*	-1.817	-1.335
		(-1.740)	(-1.173)	(-0.870)
Education		-3.076***	-0.865**	-0.557
		(-5.993)	(-2.323)	(-1.534)
Size			-3.662***	-3.925***
			(-4.656)	(-4.900)
Leverage			-58.136***	-58.110***
			(-13.221)	(-13.008)
MTB			-0.893***	-0.921***
			(-9.756)	(-9.993)
NWC			-51.293***	-51.498***
			(-13.617)	(-13.480)
Cexp			-14.860***	-14.400***
			(-5.038)	(-4.981)
CF			50.166***	51.288***
			(12.653)	(13.001)
Age cohort fixed effects				Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Observations	63,763	59,925	56,708	56,708
Adj. R^2	0.407	0.439	0.658	0.656

Table B.2: Standard errors of different types in the mediation effect model

In this table, we replicate our mediation effect model with different types of error terms. The variable in the heading of each column is the dependent variable of the corresponding regression; Cash is the total amount of cash and cash equivalents scaled by the total assets of the firm at the end of the quarter; Dividend represents total dividends over the last year's net income; *R&D* is R&D expenditures divided by total revenues; and M&A is the ratio of the total value of a firm's transactions across all M&A deals over total assets. All other variables are defined in Appendix A. All continuous variables are winsorised at the first and 99th percentiles. All regression coefficients are multiplied by 100 for readability. In Panel A, we use robust standard errors. In Panel B, the error terms are clustered at the industry level. The t-statistics are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Regression with robust standard errors

		Earning retention		Risky investment			
Dependent variables	Cash (%)	Dividend (%)	Cash (%)	R&D (%)	Cash (%)	M&A (%)	Cash (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Zodiac	0.655***	-0.252**	0.653***	-0.045***	0.648***	-0.235**	0.647***
	(4.513)	(-2.271)	(4.508)	(-3.095)	(4.485)	(-2.560)	(4.462)
R&D			-0.299**				
			(-2.072)				
Dividend					-17.093***		
					(-9.090)		
M&A							-3.228***
							(-4.601)
Age	-0.280***	0.077***	-0.280***	0.006***	-0.281***	0.016**	-0.280***
	(-24.132)	(4.881)	(-24.107)	(6.361)	(-24.325)	(2.085)	(-24.100)
Female	-1.817***	0.074	-1.816***	-0.011	-1.760***	-0.157	-1.822***
	(-4.321)	(0.132)	(-4.318)	(-0.325)	(-4.181)	(-0.552)	(-4.329)
Education	-0.865***	0.134	-0.865***	0.006	-0.867***	0.069	-0.864***
	(-7.132)	(0.893)	(-7.135)	(0.532)	(-7.155)	(0.800)	(-7.127)

Size	-3.662***	0.757***	-3.659***	0.212***	-3.584***	-0.461***	-3.678***
	(-35.488)	(7.215)	(-35.455)	(23.623)	(-34.815)	(-6.774)	(-35.616)
Leverage	-58.136***	-3.018***	-58.153***	-0.265***	-58.395***	-1.173***	-58.161***
	(-83.474)	(-4.801)	(-83.452)	(-5.818)	(-84.951)	(-3.090)	(-83.531)
MTB	-0.893***	0.370***	-0.891***	0.018***	-0.892***	0.396***	-0.880***
	(-32.209)	(10.291)	(-32.115)	(6.928)	(-33.042)	(15.208)	(-31.623)
NWC	-51.293***		-51.272***		-51.424***		-51.253***
	(-89.094)		(-89.101)		(-90.423)		(-89.031)
Cexp	-14.860***		-14.827***		-14.395***		-14.907***
	(-10.077)		(-10.055)		(-9.789)		(-10.106)
CF	50.166***		50.015***		49.239***		50.010***
	(27.17)		(27.048)		(26.905)		(27.105)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	56,708	50,829	50,378	57,178	56,683	57,204	56,708
Adj. R^2	0.658	0.251	0.658	0.664	0.660	0.026	0.658

Panel B: Regression with errors clustered at industry level

		Earning retention		Risky investment			
Dependent variables	Cash (%)	Dividend (%)	Cash (%)	R&D (%)	Cash (%)	M&A (%)	Cash (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)

Zodiac	0.655**	-0.252**	0.653**	-0.045**	0.648**	-0.235**	0.647**
	(2.269)	(-1.963)	(2.263)	(-2.042)	(2.233)	(-2.440)	(2.241)
R&D					-17.093***		
					(-2.681)		
Dividend			-0.299**				
			(-2.012)				
M&A							-3.228***
							(-4.573)
Age	-0.280***	0.077***	-0.280***	0.006***	-0.281***	0.016***	-0.280***
	(-10.446)	(4.731)	(-10.428)	(3.068)	(-10.527)	(2.835)	(-10.428)
Female	-1.817	0.074	-1.816	-0.011	-1.760	-0.157	-1.822
	(-1.173)	(0.139)	(-1.172)	(-0.210)	(-1.131)	(-0.572)	(-1.176)
Education	-0.865**	0.134	-0.865**	0.006	-0.867**	0.069	-0.864**
	(-2.323)	(0.881)	(-2.324)	(0.242)	(-2.312)	(0.853)	(-2.323)
Size	-3.662***	0.757***	-3.659***	0.212***	-3.584***	-0.461***	-3.678***
	(-4.656)	(6.749)	(-4.651)	(4.064)	(-4.479)	(-5.400)	(-4.685)
Leverage	-58.136***	-3.018***	-58.153***	-0.265*	-58.395***	-1.173***	-58.161***
	(-13.221)	(-4.982)	(-13.213)	(-1.925)	(-13.282)	(-3.054)	(-13.228)
MTB	-0.893***	0.370***	-0.891***	0.018***	-0.892***	0.396***	-0.880***
	(-9.756)	(10.604)	(-9.700)	(2.878)	(-9.724)	(10.004)	(-9.604)
NWC	-51.293***		-51.272***		-51.424***		-51.253***
	(-13.617)		(-13.614)		(-13.749)		(-13.580)
Cexp	-14.860***		-14.827***		-14.395***		-14.907***
	(-5.038)		(-5.024)		(-5.094)		(-5.085)
CF	50.166***		50.015***		49.239***		50.010***
	(12.653)		(12.486)		(12.568)		(12.639)

Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	56,708	50,829	50,378	57,178	56,683	57,204	56,708
Adj. R^2	0.658	0.251	0.658	0.664	0.660	0.026	0.658

Table 1. Descriptive statistics

This table reports firm-level summary statistics. The sample contains 2,557 non-SOEs, with data from CSMAR, over 2007–2018. Panel A reports the statistics of the main variables in the full sample. Panel B presents the average values of the variables for the zodiac year and non–zodiac year groups, separately. Panel C presents the mean value of cash for zodiac year and non–zodiac year firms by quarter. The last column shows the differences between the two samples. All continuous variables are winsorised at the first and 99th percentiles. The variables are defined in the Appendix. ***, **, and * denote significance at 1%, 5%, and 10% levels, respectively.

	Panel A: Full sample (non-SOEs)						**Panel B**: Balance			
	N	Mean	SD	P25	P50	P75	Zodiac = 1	Zodiac = 0	Difference	t-Statistic
	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(1) - (2)	(3)
Zodiac	63,778	8.57%	28%	0	0	0				
Age	63,778	51.93	7.994	47	51	57	51.788	51.942	-0.154	-1.368
Female	63,778	5.4%	22.6%	0	0	0	5%	5.4%	-0.4%	-1.524
Degree	59,940	3.278	0.98	3	3	4	3.291	3.277	0.014	0.953
Cash	63,763	18.49%	15.83%	7.246%	13.31%	24.55%	19.431%	18.397%	1.034%	4.616***
Size	63,778	21.64	1.151	20.81	21.49	22.26	21.673	21.631	0.042	2.571**
Leverage	63,778	38%	21%	20.7%	36.2%	53%	37.7%	38%	-0.3%	-1.319
MTB	60,825	2.68	2.58	1.14	1.92	3.23	2.568	2.689	-0.121	-3.257***
NWC	63,334	11.5%	20%	-0.965%	11.6%	24.4%	12.1%	11.5%	0.6%	2.280**
Cexp	63,692	3.4%	3.97%	0.651%	1.98%	4.64%	3.5%	3.4%	0.1%	2.614***
CF	63,778	2.99%	3.7%	0.765%	2.23%	4.69%	3%	3%	0%	1.211

Panel C: Quarterly balance: Cash holdings (%)

	Zodiac = 1	Zodiac = 0	Difference
	(1)	(2)	(1) - (2)
Q1	20.021%	18.454%	1.566%***
Q2	19.617%	18.459%	1.158%***
Q3	19.424%	18.466%	0.958%**
Q4	19.380%	18.467%	0.913%**

Table 2. Zodiac proximity and corporate cash holdings

This table presents OLS estimates of the effects of belief in bad luck on the level of corporate cash holdings during a chairperson's zodiac year. The dependent variable is the total amount of cash and cash equivalents scaled by the total assets of the firm at the end of the quarter, and Zodiac is a dummy variable equal to one if the chairperson of the firm is in a zodiac year. All other variables are defined in Appendix A. All continuous variables are winsorised at the first and 99th percentiles. All regression coefficients are multiplied by 100 for readability. Standard errors are clustered at the firm level. The t-statistics are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable: Cash (%)				
	(1)	(2)	(3)	(4)
Zodiac	0.863***	0.737**	0.655***	0.717***
	(2.615)	(2.252)	(2.622)	(2.862)
Age		-0.610***	-0.280***	
		(-12.850)	(-8.072)	
Female		-2.971*	-1.817	-1.335
		(-1.792)	(-1.517)	(-1.141)
Education		-3.076***	-0.865***	-0.557*
		(-8.116)	(-2.630)	(-1.733)
Size			-3.662***	-3.925***
			(-10.562)	(-11.549)
Leverage			-58.136***	-58.110***
			(-28.048)	(-28.063)
MTB			-0.893***	-0.921***
			(-12.992)	(-13.353)
NWC			-51.293***	-51.498***
			(-30.842)	(-30.841)
Cexp			-14.860***	-14.400***
			(-5.527)	(-5.345)
CF			50.166***	51.288***
			(13.950)	(14.126)
Age cohort fixed effects				Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
N	63,763	59,925	56,708	56,708
Adj. R^2	0.407	0.439	0.658	0.656

Table 3. Zodiac proximity and changes in the dynamics of corporate cash holdings

This table presents the OLS estimates of the effects of belief in luck on the level of corporate cash holdings during a chairperson's zodiac year, by quarter. We study the differences in the levels of cash holdings between zodiac and other firms at different points in time before and after the chairperson's zodiac year. The dependent variable is the total amount of cash and cash equivalents scaled by the total assets of the firm at the end of the quarter. The variables *Pre(Post)-zodiac qi* and *Zodiac qi* are dummies that equal one if the chairperson of the firm in quarter *qi* is in (before/after) his or her zodiac year. All other variables are defined in Appendix A. All continuous variables are winsorised at the first and 99th percentiles. All regression coefficients are multiplied by 100 for readability purposes. Standard errors are clustered at the firm level. The t-statistics are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable: Cash (%)		
	Coef.	t-Statistics
Pre-zodiac q1	0.288	(0.843)
Pre-zodiac q2	0.102	(0.145)
Pre-zodiac q3	-0.093	(-0.303)
Pre-zodiac q4	0.508**	(2.143)
Zodiac q1	0.732**	(2.473)
Zodiac q2	0.766***	(2.702)
Zodiac q3	0.670**	(2.336)
Zodiac q4	0.481*	(1.714)
Post-zodiac q1	0.284	(0.927)
Post-zodiac q2	0.235	(0.435)
Post-zodiac q3	0.079	(0.24)
Post-zodiac q4	-0.294	(-0.78)
Firm and chairperson characteristics controls	Yes	
Firm fixed effects	Yes	
Time fixed effects	Yes	
N	56,708	
Adj. R^2	0.658	

Table 4. Source of changes in cash holdings due to zodiac year proximity

This table presents the OLS estimates of the effect of the proximity of a chairperson's zodiac year on various outcome variables that affect the level of corporate cash holdings. The variable Zodiac is a dummy equal to one if the chairperson of the firm is in his or her zodiac year. All other variables are defined in Appendix A. All continuous variables are winsorised at the first and 99th percentiles. All regression coefficients are multiplied by 100 for readability. Standard errors are clustered at the firm level, The t-statistics are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable	Operating margin (%)	NWC (%)	New finance (%)
OLS	(1)	(2)	(3)
Zodiac	0.212	-0.127	-0.080
	(0.689)	(-0.525)	(-0.142)
Age	-0.186***	0.072*	-0.360***
	(-5.551)	(1.852)	(-8.414)
Female	-1.657	-0.826	-0.461
	(-1.198)	(-0.570)	(-0.469)
Education	-1.426***	0.657*	-2.135***
	(-3.588)	(1.791)	(-4.620)
Size	2.834***	1.827***	-1.607***
	(8.753)	(5.217)	(-4.134)
Leverage	-28.941***	-55.971***	-21.327***
	(-15.281)	(-32.311)	(-13.697)
MTB	-0.251***	0.069	-1.521***
	(-2.777)	(0.986)	(-20.313)
Firm fixed effects	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes
N	57,178	56,776	57,204
Adj. R^2	0.467	0.750	0.192

Table 5. Sources of cash in zodiac years

This table presents the results for the mediation effect of earnings retention and risky investments, investigating possible sources for the increase in cash holdings in the chairperson's zodiac year. The heading of each column gives the dependent variable of the corresponding regression; Cash is the total amount of cash (and cash equivalents) scaled by the total assets of the firm at the end of the quarter; Dividend represents the firm's total dividends over its net income the previous year; R&D is R&D expenditures divided by total revenues; and M&A is the ratio of the total value of the transactions of the firm across all M&A deals over total assets. All other variables are defined in Appendix A. All continuous variables are winsorised at the first and 99th percentiles. All regression coefficients are multiplied by 100 for readability. Standard errors are clustered at the firm level. The t-statistics are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

		Earning retention		Risky investment			
Dependent variable	Cash (%)	Dividend (%)	Cash (%)	R&D (%)	Cash (%)	M&A (%)	Cash (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Zodiac	0.655***	-0.252**	0.653***	-0.045**	0.648***	-0.235**	0.647***
	(2.622)	(-1.991)	(2.619)	(-2.353)	(2.611)	(-2.574)	(2.593)
R&D					-17.093***		
					(-3.752)		
Dividend			-0.299**				
			(-2.035)				
M&A							-3.228***
							(-4.766)
Age	-0.280***	0.077***	-0.280***	0.006***	-0.281***	0.016**	-0.280***
	(-8.072)	(4.731)	(-8.062)	(2.792)	(-8.088)	(2.167)	(-8.063)
Female	-1.817	0.074	-1.816	-0.011	-1.760	-0.157	-1.822
	(-1.517)	(0.139)	(-1.515)	(-0.155)	(-1.469)	(-0.586)	(-1.519)
Education	-0.865***	0.134	-0.865***	0.006	-0.867***	0.069	-0.864***
	(-2.630)	(0.881)	(-2.631)	(0.184)	(-2.640)	(0.840)	(-2.628)

Size	-3.662***	0.757***	-3.659***	0.212***	-3.584***	-0.461***	-3.678***
	(-10.562)	(6.749)	(-10.552)	(7.555)	(-10.319)	(-7.301)	(-10.603)
Leverage	-58.136***	-3.018***	-58.153***	-0.265**	-58.395***	-1.173***	-58.161***
	(-28.048)	(-4.982)	(-28.044)	(-2.276)	(-28.183)	(-3.053)	(-28.083)
MTB	-0.893***	0.370***	-0.891***	0.018***	-0.892***	0.396***	-0.880***
	(-12.992)	(10.604)	(-12.950)	(2.896)	(-13.020)	(14.217)	(-12.790)
NWC	-51.293***		-51.272***		-51.424***		-51.253***
	(-30.842)		(-30.832)		(-31.006)		(-30.823)
Cexp	-14.860***		-14.827***		-14.395***		-14.907***
	(-5.527)		(-5.514)		(-5.358)		(-5.544)
CF	50.166***		50.015***		49.239***		50.010***
	(13.950)		(13.871)		(13.706)		(13.917)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	56,708	5,0829	50,378	57,178	56,683	57,204	56,708
Adj. R^2	0.658	0.251	0.658	0.664	0.660	0.026	0.658

Table 6. Change in the value of cash holdings in the chairperson's zodiac year

This table presents the OLS estimates of the effect of the proximity of the chairperson's zodiac year on the marginal value of corporate cash holdings. The dependent variable is the change in equity market value over the quarter, scaled by the equity market value. The change in cash is the change in corporate cash holdings over the quarter, scaled by the equity market value. The variable Zodiac is a dummy equal to one if the chairperson of the firm is in his or her zodiac year. We estimate the marginal value of cash over the whole sample using the specification of Faulkender and Wang (2006) and Dessaint and Matray (2017). Controls include changes in earnings, interest, dividends, net assets, R&D, market leverage, new financing, lagged cash, and interaction terms. All other variables are as defined in Appendix A. All continuous variables are winsorised at the first and 99th percentiles. Standard errors are clustered at the firm level. The t-statistics are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable: ΔMV				
	(1)		(2)	
	Coef.	t-Statistics	Coef.	t-Statistics
Zodiac	-0.008*	(-1.661)	-0.008*	(-1.684)
ΔCash	0.471***	(12.537)	0.474***	(12.603)
Zodiac × ΔCash	-0.101**	(-1.961)	-0.104**	(-2.021)
Age	-0.002***	(-5.200)		
Female	-0.021	(-1.624)	-0.016	(-1.193)
Education	-0.017***	(-4.783)	-0.017***	(-4.714)
Cash	0.219***	(25.015)	0.221***	(25.349)
ΔInterest	0.511	(0.071)	0.562	(0.078)
ΔRD	1.641	(1.207)	1.756	(1.290)
ΔNA	0.249***	(13.501)	0.250***	(13.549)
ΔEarnings	0.353***	(7.632)	0.353***	(7.633)
ΔDividend	-0.527***	(-6.652)	-0.524***	(-6.610)
New finance	-0.319***	(-18.809)	-0.320***	(-18.724)
Leverage	-0.067***	(-4.701)	-0.069***	(-4.896)
ΔCash × Cash	0.138***	(5.941)	0.141***	(6.021)

Leverage × ΔCash	-0.414***	(-6.385)	-0.419***	(-6.450)
Age cohort fixed effects				Yes
Firm fixed effects		Yes		Yes
Time fixed effects		Yes		Yes
N		52,294		52,294
Adj. R^2		0.024		0.024

Table 7. Zodiac year proximity and cash holdings in the SOE sample

This table presents the OLS estimates of the effects of the belief in bad luck during a chairperson's zodiac year on the level of corporate cash holdings in the SOE sample. The dependent variable is the total amount of cash and cash equivalents scaled by the total assets of the firm at the end of the quarter, and Zodiac is a dummy variable equal to one if the chairperson of the firm is in his or her zodiac year. All other variables are defined in Appendix A. All continuous variables are winsorised at the first and 99th percentiles. All regression coefficients are multiplied by 100 for readability. Standard errors are clustered at the firm level. The t-statistics are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable: Cash (%)				
	(1)	(2)	(3)	(4)
Zodiac	-0.044	-0.082	-0.141	-0.138
	(-0.214)	(-0.388)	(-0.735)	(-0.723)
Age		-0.041	-0.013	
		(-1.453)	(-0.476)	
Female		0.962	0.559	0.570
		(0.954)	(0.589)	(0.597)
Education		-0.468**	-0.262	-0.225
		(-2.011)	(-1.155)	(-1.008)
Size			0.290	0.270
			(0.997)	(0.947)
Leverage			-27.509***	-27.451***
			(-15.210)	(-15.219)
MTB			-0.215***	-0.218***
			(-3.562)	(-3.601)
NWC			-26.793***	-26.802***
			(-15.917)	(-15.906)
Cexp			-6.890**	-6.846**
			(-2.323)	(-2.305)
CF			44.144***	44.270***
			(13.056)	(13.097)
Age cohort fixed effects				Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
N	45,985	44,081	42,356	42,356
Adj. R^2	0.589	0.586	0.653	0.653

Table 8. Robustness check: Further controls

This table presents the results of additional tests to examine whether the effects of zodiac year proximity on the main variable outcomes are robust to alternative specifications. In Panel A, the dependent variable is the total amount of cash and cash equivalents scaled by total assets at the end of the quarter. In Panel B, we add controls for the chairperson's personal sophistication and their interaction term with the zodiac year variable. Variables measuring the chairperson's degree of sophistication include the possession of a bachelor's degree, overseas experience, trauma experience (a dummy variable indicating whether the chairperson has lived through a traumatic experience such as a famine) and being female. The control variables are the same for the baseline regressions, and education is omitted in column (1) of Panel B. All other variables are as defined in Appendix A. All continuous variables are winsorised at the first and 99th percentiles. All regression coefficients are multiplied by 100 for readability. Standard errors are clustered at the firm level. The t-statistics are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A:

	Dependent variable: Cash (%)					
	Industry and time fixed effects (1)		Chairperson's birth year fixed effects (2)		Nonlinear age effect (3)	
	Coef.	t-Statistic	Coef.	t-Statistic	Coef.	t-Statistic
Zodiac	0.654***	(2.613)	0.662***	(2.618)	0.647***	(2.589)
Age	-0.280***	(-8.034)			0.017	(0.071)
Age^2					-0.003	(-1.233)
Female	-1.802	(-1.499)	-0.867	(-0.707)	-1.731	(-1.441)
Education	-0.859***	(-2.605)	-0.321	(-0.943)	-0.903***	(-2.731)
Size	-3.672***	(-10.581)	-4.364***	(-13.010)	-3.641***	(-10.451)
Leverage	-58.025***	(-27.887)	-57.853***	(-28.256)	-58.238***	(-28.205)
MTB	-0.893***	(-12.945)	-0.961***	(-13.904)	-0.89***	(-12.938)
NWC	-51.159***	(-30.632)	-51.77***	(-31.394)	-51.314***	(-30.926)
Cexp	-14.530***	(-5.310)	-14.268***	(-5.299)	-15.057***	(-5.600)
CF	50.994***	(13.888)	52.836***	(14.582)	50.190***	(13.961)
Firm fixed effects	Yes		Yes		Yes	

Time fixed effects		Yes		Yes
Industry and time fixed effects	Yes			
Chairperson birth year fixed effects		Yes		
N	56,708	56,708		56,708
Adj. R^2	0.657	0.656		0.658

Panel B: Control for the chairperson's sophistication

Dependent variable: Cash (%)				
	Educational background	Past experience		Gender
	(1)	(2)	(3)	(4)
Zodiac	1.268**	0.585**	0.898***	0.552**
	(2.327)	(2.267)	(2.747)	(0.2556)
Bachelor	-2.451***			
	(-2.981)			
Zodiac × Bachelor's	-0.764			
	(-1.249)			
Overseas experience		-0.906		
		(-1.080)		
Zodiac × Overseas experience		1.079		
		(0.991)		
Trauma experience			6.544***	
			(5.628)	
Zodiac × Trauma experience			-0.630	
			(-1.215)	
Female				1.902
				(1.612)
Zodiac × Female	-1.750	-1.780	-1.655	-1.965
	(-1.448)	(-1.485)	(-1.364)	(-1.634)
Firm and chairperson characteristics controls	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
N	56,708	56,708	56,708	56,708
Adj. R^2	0.658	0.658	0.661	0.658

Table 9. Robustness check: Alternative measurements of cash

This table presents additional tests to examine whether the effects of zodiac year proximity on the main variable outcomes are robust to an alternative measurement of cash holdings. The dependent variable is an alternative measure of cash holdings, specifically the total amount of cash and cash equivalent scaled by total assets net corporate cash at the end of each quarter. The control variables are the same as in our baseline model. All other variables are as defined in Appendix A. All continuous variables are winsorised at the first and 99th percentiles. All regression coefficients are multiplied by 100 for readability. Standard errors are clustered at the firm level. The t-statistics are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	Dependent variable: NCash (%)			
	(1)	(2)	(3)	(4)
Zodiac	2.287**	1.804*	1.595**	1.801**
	(2.297)	(1.824)	(1.975)	(2.218)
Age		-1.671***	-0.821***	
		(-12.642)	(-8.332)	
Female		-7.614*	-4.494	-3.193
		(-1.760)	(-1.412)	(-1.010)
Education		-8.076***	-2.359**	-1.325
		(-7.471)	(-2.484)	(-1.436)
Size			-9.438***	-10.294***
			(-9.370)	(-10.426)
Leverage			-150.345***	-150.057***
			(-23.860)	(-23.852)
MTB			-2.699***	-2.792***
			(-13.166)	(-13.476)
NWC			-144.070***	-144.646***
			(-25.813)	(-25.710)
Cexp			-85.602***	-83.864***
			(-10.388)	(-10.179)
CF			102.571***	106.077***
			(9.188)	(9.428)
Age cohort fixed effects				Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
N	63,760	59,922	56,708	56,708
Adj. R^2	0.374	0.403	0.596	0.594

Table 10. Robustness check: Propensity score matching

Panel A presents the differences in means between subsamples of firms with zodiac year and non–zodiac year chairpersons, together with the corresponding t-statistics for each control variable presented in Table 2. The matched sample is based on chairperson zodiac year PSM. Panel B presents coefficient estimates of specifications (3) and (4) of Table 2 for the matched sample. The dependent variable is the total amount of cash (and cash equivalents) scaled by the total assets of the firm at the end of the quarter, and Zodiac is a dummy variable equal to one if the chairperson of the firm is in his or her zodiac year. All other variables are as defined in Appendix A. All continuous variables are winsorised at the first and 99th percentiles. All regression coefficients are multiplied by 100 for readability. Standard errors are clustered at the firm level. The t-statistics are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A

Matched sample		
	Difference in means	t-Statistics
Age	-2.3	(-1.16)
Female	-1.4	(-0.68)
Education	1.7	(0.85)
Size	2.9	(1.45)
Leverage	2.2	(1.08)
MTB	1.4	(0.76)
NWC	-2.4	(-1.18)
Cexp	-1.6	(-0.8)
CF	-1.6	(0.82)
Entire sample	9,780	
Zodiac-year sample	4,890	
Non-zodiac year sample	4,890	

Panel B

Dependent variable: Cash (%)				
	(1)		(2)	
	Coef.	t-Statistics	Coef.	t-Statistics
Zodiac	0.838***	(2.635)	0.835***	(2.622)
Age	-0.231***	(-4.601)		
Female	-1.707	(-0.946)	-1.164	(-0.662)
Education	-0.528	(-1.046)	-0.371	(-0.735)
Size	-3.476***	(-7.778)	-3.651***	(-8.324)
Leverage	-60.313***	(-19.207)	-60.557***	(-19.228)
MTB	-1.199***	(-12.401)	-1.221***	(-12.588)

NWC	-54.990***	(-22.349)	-55.235***	(-22.395)
Cexp	-12.113**	(-2.548)	-11.919**	(-2.516)
CF	44.678***	(7.659)	45.555***	(7.822)
Age cohort fixed effects				Yes
Firm fixed effects		Yes		Yes
Time fixed effects		Yes		Yes
N		9780		9780
Adj. R^2		0.735		0.734

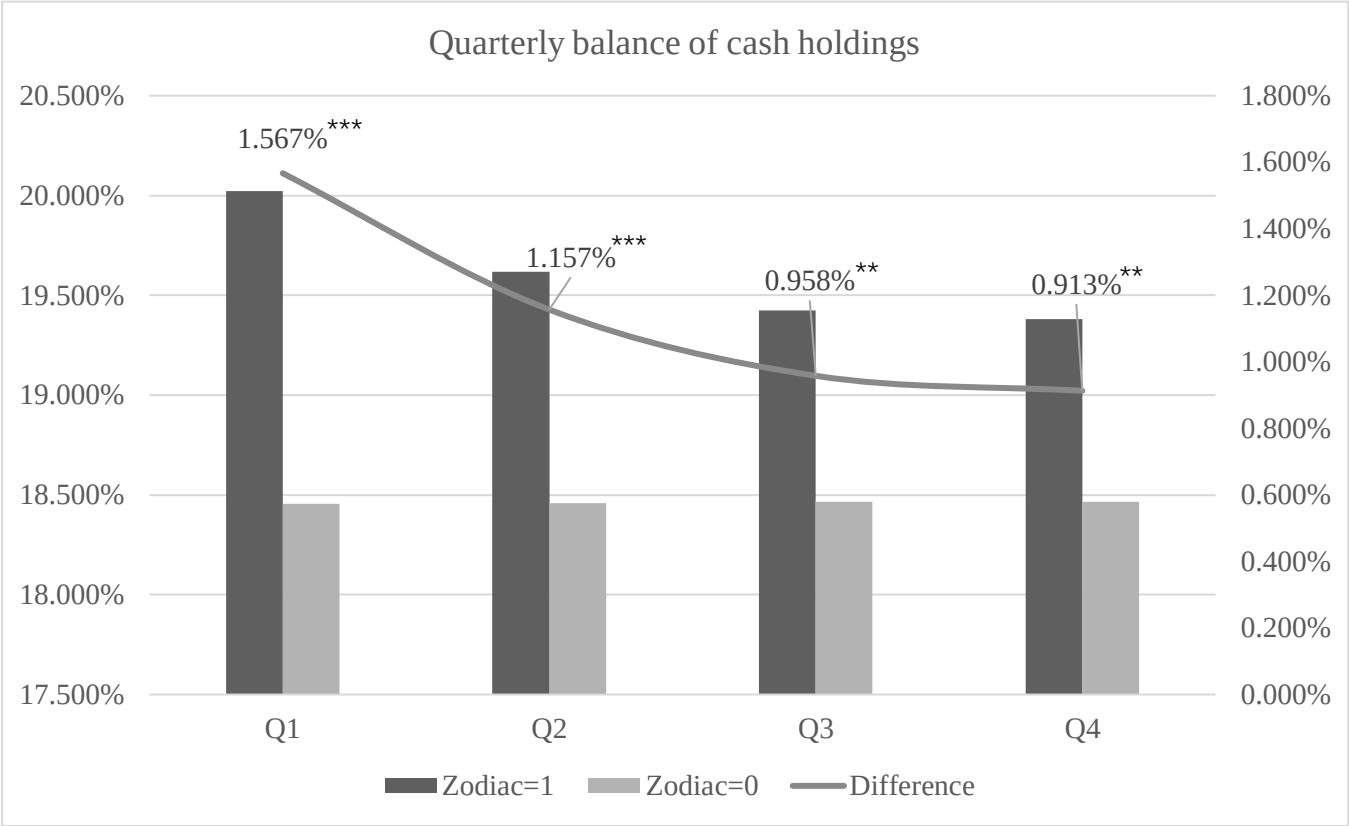

Figure 1. The quarterly balance of cash holdings (%). The sample comprises data from CSMAR on 2,557 non-SOEs from 2007 to 2018. This graph compares the quarterly corporate cash holdings of firms with a chairperson in a zodiac year versus a chairperson in a non-zodiac year. The dark vertical bars plot the mean cash holdings for firms in each quarter of the zodiac year, while the grey bars plot the mean cash holdings for firms in normal years. The solid line plots the differences between the two groups for each quarter. ∗∗∗, ∗∗, and ∗ denote significance at the 1%, 5%, and 10% levels, respectively.

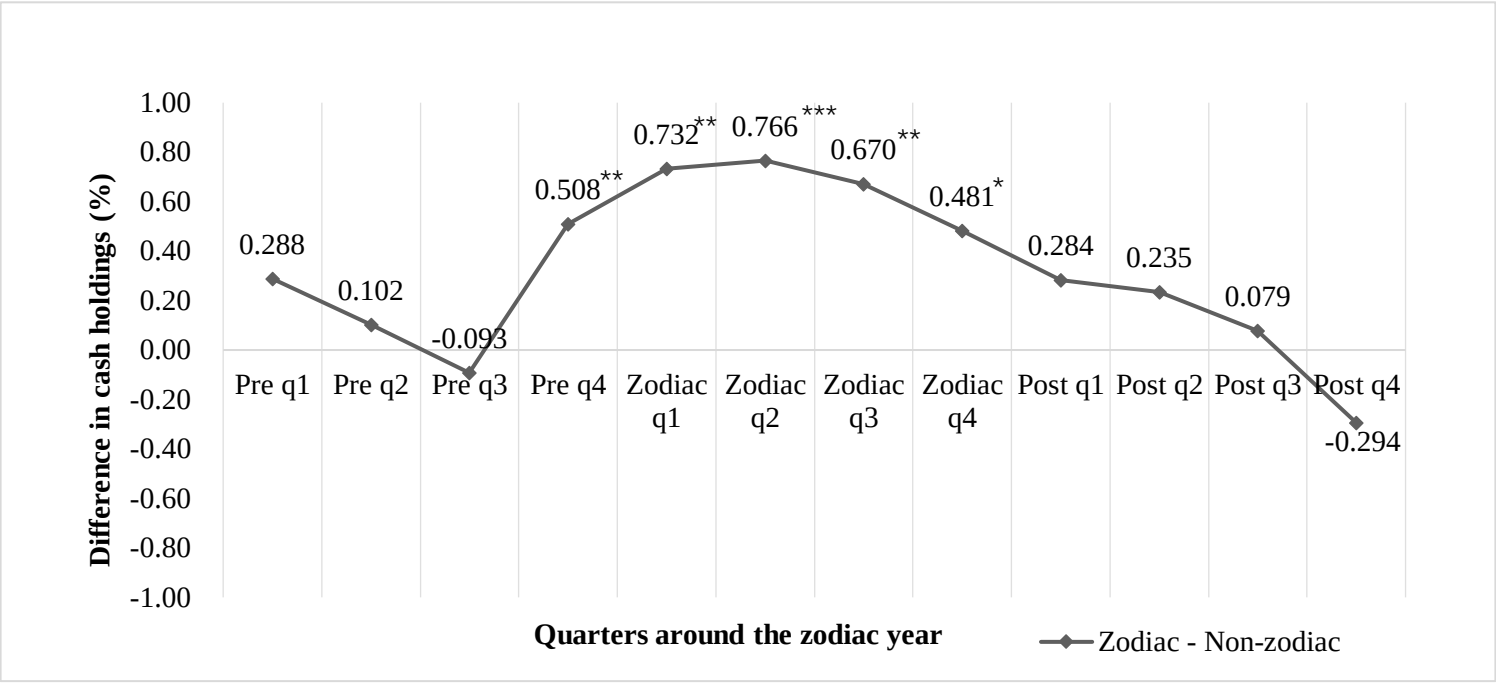

Figure 2. Zodiac year proximity and corporate cash holdings. This figure presents the differences in corporate cash holdings across progressive quarters surrounding the chairperson's zodiac year. All the difference estimates use the remainder of the listed firms as the non-zodiac group. The graph plots the regression coefficients from Table 3. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.