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EMPIRICAL IMPLICATIONS OF THE RISK AVOIDANCE MEASURE

A Multi-Disciplinary Analysis in Corporate Finance, Corporate Governance, and Behavioural Finance

Abstract

The aim of this paper is to provide empirical implications of the risk avoidance measure (ρ) on various variables that are tested in financial literature. The variables tested belong to areas of corporate finance (i.e. ROA, ROE and Tobin's Q), corporate governance (i.e. Institutional ownership, poison pills and golden parachute), and behavioural finance (i.e. CEO overconfidence and female CEOs) using estimation methods with clustered standard errors at the firm level. The paper finds ambiguous correlations in relation to firm performance, corporate governance and behavioural finance with the risk avoidance measure. Certain correlations are significant against the assumptions of the model such as total dividends, Tobin's Q, firm market value and stock price volatility. However, the risk avoidance model provides results consistent with literature and its assumptions, such as net income, R&D expense, market value of a firm with golden parachute and poison pill clauses, and the presence of an independent blockholder on the board of directors. The risk avoidance measure may have further applications in practice, however further knowledge of efficient contracting and relative risk aversion are germane to the topic of how to best model risk-taking incentives.

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Table of Contents

Chapter 1. Introduction

This paper is motivated by the reading of Dittmann, Yu and Zhang (2015), which gives the reader an insight into the role of risk-taking incentives in executive compensation in the corporate world. The paper highlights the introduction of a risk avoidance measure (ρ) defined by combining a manager's risk preference to the shape of his/her compensation contract. The parameter ρ is a hurdle rate equal to the required increase in firm value per increase in firm risk that any new project must fulfil in order to be undertaken by the CEO. For example, consider a project that would increase firm risk by 1 percentage point (20% to 21%), and let ρ = 3. This value connotes that the manager will only undertake this project if it increases firm value by at least 3%. All positive NPV projects that increase firm value by less than 3% will be ignored. However, if ρ = -2, the CEO has incentives to take on risky projects with a negative NPV. More specifically, he/she will only initiate the project if it does not destroy firm value by more than 2%. If ρ = 0, then the manager is indifferent in his risk preference and implements all profitable projects regardless of the risk profile. Thus, $\rho > 0$ denotes risk-avoiding incentives and $\rho < 0$ defines risk-taking incentives. Unlike the measures of risk-taking incentives in empirical literature (i.e. utility adjusted vega), Dittmann et al. (2015) constructs a unique measure ρ as a ratio of the utility adjusted vega[1] over the utility adjusted delta.[2] The conceptual framework of the risk avoidance measure is further discussed in Chapter 3.

The purpose of this paper is to test whether the risk avoidance measure can have real world applications; the measure could allow stakeholders, investors and board members to evaluate if the compensation contract provides sufficient incentives for a risky project. Shareholders and investors should be interested in knowing the risk preference of their CEOs, as he may be too risk-averse and ignore profitable risky projects, or too risk-loving and undertake negative NPV projects. The paper provides empirical analyses of the risk avoidance measure on North American firms from 1997-2012 with variables related to corporate finance, corporate governance and behavioural finance.

The corporate finance section largely focuses on varying metrics of firm performance and firm market value in relation to ρ. Many significant relations are found with ρ such as Tobin's Q, market capitalization, and stock price volatility to name a few. However, the effect of the risk-avoidance

[1] Measures the marginal increase in a manager's expected utility per marginal increase in volatility (firm risk).
[2] Measures the extent to which a manager's expected utility increases per marginal increase in stock price (firm value).

measure on firm performance is ambiguous, as no significant relation is found with return on assets (ROA) or return on equity (ROE). Moreover, a positive result is found between Tobin's Q and ρ, implying [against the assumptions of ρ] that risk-avoiding incentives will lead to greater firm performance. Despite the ambiguity in firm performance, a surprisingly positive relation is found between firm market value and the risk avoidance measure; such a relation is inconsistent with the assumptions of the model[3], as it implies that firm market value increases with the rise of a CEO's risk avoidance level. Stock options are granted to incentivize the manager to take risks and create value for the firm. I find an unexpectedly positive relation between stock price volatility and ρ, implying that either stock options are not efficient tools for risk-taking incentives (ongoing debate in financial literature)[4] or a risk-averse CEO adopts specific projects that increase firm volatility and consequently increase the value of his/her stock options (Smith and Stulz (1985)). Stock options also disincentive CEOs to pay out dividends as the value of stock options decrease when dividends are paid out. Surprisingly, I find a positive relation between ρ and total dividends, implying that the assumptions of efficient contracting in the model are not sensible. Consistent with literature, I find that more risk-loving CEOs are linked with an increase in research and development expenses (more capital inflows to innovation), operating expenses and more diversified investment strategy.

Corporate governance is a significant portion of empirical testing in this paper; variables such as adoption of a poison pill or golden parachute (takeover clauses) are differently affected by ρ, with no correlation in the case of a poison pill and a negative correlation in the case of a golden parachute. Quite unexpectedly, the ρ exhibits a strong negative correlation with firm market value with the inclusion of a golden parachute clause; the positive relation between ρ and firm value in the corporate finance section (excluding golden parachutes) is reversed. Tenure of a CEO exhibits a positive correlation with ρ. This result suggests that highly tenured managers exhibit increasing levels of risk-aversion, perhaps due to their entrenchment; entrenched managers do not pursue strategies that optimize firm value, usually go against the interests of shareholders and undertake non-optimal levels of risk for the amount of compensation. Institutional ownership is also tested in relation to ρ with variables ranging from number of 5% blockholders to the presence of an

[3] If firm risk is below certain threshold, ceteris paribus, firm value is increasing in risk.

[4] Haugen and Senbet (1981) contend that executive stock options provide risk-taking incentives as the value of the option increases with the volatility of the underlying asset. However, Lambert et al. (1991), Carpenter (2000) and Ross (2004) argue that stock options can be counter-productive tools for risk-taking incentives as managers may become more averse to increases in firm risk.

independent blockholder on the board of directors. There is a negative correlation between presence of a 5% blockholder and ρ, suggesting that large institutional owners are able to exert corporate governance through direct and indirect intervention within the firm. However, presence of a 1% independent blockholder (IDB) on board shows the opposite relation. This contrasting result has several implications; IDBs are either mainly concerned with the value of their equity stakes and push for low-risk positive NPV projects, or they are more concerned with long-term financial health of the company, thus deterring the manager to make overly risky investment decisions. I have coined a new term, dependent blockholders (DBs), defined as 1% blockholders in the board of directors that are linked to the company either through direct employment or business partnerships. I find a positive relation between DBs and ρ, suggesting that dependent blockholders act similarly to independent blockholders in their exertion of governance, however the possibility of collusion with management is greater, which may require a larger monitoring role for independent directors. The present value of aggregate accumulated benefits (proxy for lucrative pension plan) is significant and negatively correlated with ρ; this result implies that as a manager undertakes more risk, he/she is increasing the present value of his/her retirement plan. If such a factor is able to induce risk-taking incentives, it could be a viable replacement to stock options. Lastly, I contend the findings of Serfling (2014) that risk-taking behaviour increases with CEO age. Against my expectations, no significant relation is found between ρ and CEO age.

The behavioural finance section tests managerial traits to the risk avoidance measure. Elements of psychology are incorporated in the paper as I investigate female risk-taking behaviour. Empirical literature suggests that women exhibit a lower tendency of risk-taking than men in gambling activities (Bruce and Johnson (1994)). However, results are inconsistent with the literature, yielding a negative correlation between presence of a female CEO and ρ. Finally, the section concludes with testing CEO overconfidence on investments in innovative and non-innovative industries (Hirshleifer et al. (2012)). I find a negative relation between ρ and RDA[5] in innovative industries; this result remains consistent with literature that overconfident CEOs in innovative industries are more risk-seeking than CEOs in non-innovative industries, thus driving the growth in innovation-related investments.

[5] Proxy for innovative output, defined as R&D expenditure scaled by total assets.

There are four most significant empirical results from the paper: a 1% decrease in the risk avoidance measure yields an increase in net income by $492,000, an increase in market value of a firm with golden parachute and poison pill clauses by $3.272 million, an increase in research and development expense by $233,200, and the presence of a 1% independent blockholder on the board of directors increases ρ by 34%.

The paper is structured as follows: Empirical literature and hypotheses development is further discussed in Chapter 2, followed by data description in Chapter 3, methodology in Chapter 4, empirical results in Chapter 5 and conclusion in Chapter 6.

Chapter 2. Literature & Hypothesis

2.1 Corporate Finance

Empirical literature on corporate governance has generally focused on three metrics to deduce firm performance: return on assets (ROA), return on equity (ROE) and Tobin's Q. Accounting measures such as ROA and ROE were used by Baptista et al. (2011) and Lam and Lee (2008) as financial performance indicators. Tobin's Q has been utilized in numerous papers such as Chen et al. (2005), Ehikioya (2009) and Morck et al. (1988) due to its derivation of firm value based on market prices. Alternative firm performance measures from Forbes (2002) are also tested, such as changes in net income, assets and sales, in order to evaluate robustness of the risk avoidance theoretical model.[6]

Hypothesis 1A: *Firm performance measures (ROA, ROE, Tobin's Q) exhibit a negative correlation with the risk avoidance measure (ρ).*

Hypothesis 1B: *Forbes' (2002) firm performance measures (Δsales, Δassets, Δnet income) are negatively correlated with the risk avoidance measure (ρ).*

There are various theories that try to link capital structure and value of the firm such as traditional capital structure theory, Modigliani and Miller (1958), Modigliani and Miller (1963) and Jensen and Meckling (1976). Findings from Mule and Mukras (2015) reveal a negative relation between leverage and firm value of Kenyan firms due to poor corporate governance, weak capital structure and inefficient markets. However, majority of literature shows the opposite relation – leverage increases in firm value as found in Indian manufacturing firms (Sharma (2006)), publicly listed Taiwanese firms (Cheng and Tzeng (2011)), Nigerian firms (Adeyemi and Oboh (2011)) and publicly listed American firms (Obradovich and Gill (2013)). The contrast in findings can be explained by the differences in corporate governance structures and financial leverage regulations at an international level (Rouf (2011)). Good corporate governance is a significant contributing factor to firm value and it may differ from country to country due to contrasting governance structures, economic, social and regulatory conditions. Leverage also differs geographically due to disparate tax brackets and fiduciary laws. Obradovich and Gill (2013) note that while their research shows a positive relation with American firm value and financial leverage, this relation no longer holds true beyond a specific point due to the increasing likelihood of bankruptcy and financial distress. Cuong

[6] The firm performance measures utilized by Forbes (2002) are calculated as the following: $(x_t - x_{t-1})/x_{t-1}$.

and Canh (2012) show that the optimal leverage (proxied by debt to assets) should be approximately 59%; beyond this level, leverage may have a detrimental impact on firm value (surrogated by ROE). Various studies use different proxies for firm value (ROE, ROI, ROA, etc.) and leverage (total liabilities to assets, debt to equity, etc.); this study will utilize market capitalization[7] and market leverage.[8] Assuming the US is an efficient market, I expect a positive relation with leverage and firm value, consistent with results from Obradovich and Gill (2013). Regressions by Breugom (2016) reveal a significant and negative relation between ρ and market leverage. Utilizing this relation, it is possible to hypothesize that firm value will decrease in ρ as managers do not initiate projects that could maximize firm value or do not engage in enough positive NPV projects to encourage growth in the firm. However, the findings from Cuong and Cahn (2012) connote a non-linear relation between leverage and firm value. To test their findings, I hypothesize a low-levered firm's value to decrease in ρ and a high-levered firm's value to increase in ρ.

Hypothesis 2A: *Firm market value is negatively correlated with the risk avoidance measure (ρ).*
Hypothesis 2B: *Low-levered firm value is negatively correlated with the risk avoidance measure (ρ).*
Hypothesis 2C: *High-levered firm value is positively correlated with the risk avoidance measure (ρ).*

Prior literature provides evidence that an increase in CEO's risk-taking incentives provide a positive relation with investment returns from R&D and investment acquisitions (Billings et al. (2014); Croci and Petmezas (2015)). In addition, previous studies have documented a strong positive causal relation with a manager's vega and firm risk; the higher the vega, the higher the tendency to execute riskier investments. Due to the perceived increase in risk, returns from investments should also increase in commensurate with the risk undertaken. Therefore, a higher risk avoidance measure should be negatively correlated with ROI and net income as less risky projects will be implemented by the manager.

Hypothesis 3A: *ROI is negatively correlated with the risk avoidance measure (ρ).*
Hypothesis 3B: *Net income decreases in the risk avoidance measure (ρ).*

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[7] Natural logarithm of common shares outstanding multiplied by end of period stock price. Source: Compustat.
[8] Dittmann et al. (2015) define it as (total long-term debt + total debt in current liabilities) / (total assets + market equity – book equity) where book equity is the sum of stockholders' equity, deferred taxes, and investment tax credit minus preferred stock.

The risk avoidance model is based on the utility adjusted vega over the utility adjusted delta of the manager multiplied by the negative reciprocal of firm value (Dittmann et al. (2015)); the delta describes the sensitivity of CEO wealth to the stock price, whereas the vega explains the sensitivity of CEO wealth to stock price volatility. AliJafri and Trabelsi (2014) utilize the delta and vega separately as CEO incentives for taking risk – after controlling for delta, they found that a higher vega is consistent with the level of risk-taking incentives, translating into higher earnings and stock price volatility. This result is also consistent with Coles et al. (2004). Prior literature presents evidence that stock options decrease a manager's risk-taking incentives (DeFusco et al. (1990)) due to increased exposure to firm risk. As firm stock volatility increases, the value of options increases (Smith and Stulz (1985)). Therefore, it is likely that a higher ρ value will yield a decrease in the variance of stock prices as such a manager only initiates low-risk and high expected payoff projects.

Hypothesis 4: *Share price volatility is negatively correlated with the risk avoidance measure (ρ).*

Stock options granted in executive compensation derive their value from the volatility of share price. While the value of stock options proliferates if firm volatility increases, the value of stock options decreases when dividends are paid out (Cohen et al. (2000)). As stock-option based compensation gained popularity in the late 20th century, it caused overall dividend rates to fall since dividend payments lower the stock price (Fama and French (1999)). Jolls (1998) discovers that firms with large option-based executive compensation packages seem to be substituting stock repurchases for dividends, which matches the incentives provided by options. Therefore, I posit that a risk-seeking manager is likely to increase the value of his/her options by reducing total dividend payments and initiating risky projects that escalate firm volatility.

Hypothesis 5: *Total dividend payments is positively correlated with the risk avoidance measure (ρ).*

Corporate strategy such as investment in R&D and diversification of investments is affected by a CEO's risk appetite. Billings et al. (2014) suggest that as executive compensation is largely composed of stock options, the risk-aversion of a manager increases in order to reduce his/her exposure in firm risk, and consequently leads to a decrease in [riskier] R&D investments. This finding is supported by Kothari et al. (2002), larger R&D expenditures have higher overall firm risk and are seen as riskier corporate strategies. Thus, I hypothesize that ρ will exhibit a negative correlation with R&D expenditure. In other aspects of corporate strategy, Serfling (2014) finds a positive link between risk-taking behaviour, operating expenses and diversified investment strategy. In order to test the results of Serfling (2014), I utilize multi-segment businesses (intersegment eliminations) as a proxy for diversified investment strategy (Graham et al. (2002)). Therefore, I postulate the risk avoidance measure to be negatively correlated with operating expenses and diversified investment strategy.

Hypothesis 6: *R&D expense, lower operating expense, and more diversified investment strategy should decrease in the risk avoidance measure (ρ).*

2.2 Corporate Governance

The findings from Breugom (2016) reveal a negative correlation between ρ and the E-Index measure. However, the E-Index is a consolidation of six different measures; four involving limitations on shareholders' power, and two involving takeover readiness provisions (poison pills and golden parachute). Evidence from Bebchuk et al. (2008) shows that the latter two measures have a greater negative relation with firm value (Tobin's Q), and are thus of greater importance to this paper than the E-index measure as a whole. The aforementioned paper reveals that poison pills are costly to shareholders due to the agency costs arising from strengthening protections against replacement for incumbent managers, and discouragement of institutional investors to invest large equity stakes in the company. Therefore, the adoption of a poison pill may have a detrimental effect on firm value. If there is indeed a negative correlation between ρ and firm performance, I argue that the adoption of a poison pill will increase in the risk avoidance measure. In addition, Bebchuk et al. (2008) contends that golden parachutes may have a negative correlation with firm value on the basis that managers of low-value firms may be seeking such hostile acquisitions. Expanding on this argument, I contend that the adoption of a golden parachute will increase in ρ; the value of low-value firms with a golden parachute will exhibit a positive correlation with ρ as risk-seeking managers may encourage hostile acquisitions by undervaluing the company in order to increase the likelihood of severance, and ergo garner a handsome compensation. Since the denotation of a 'low value' firm is ambiguous across literature, the subsample is defined as the lower half of the median-split sample (sample statistics in Appendix A). Combining the arguments of Bebchuk et al. (2008), it is possible to assert that a CEO with both poison pill and golden parachute clauses is more entrenched, risk-seeking and expensive to shareholders than a CEO without such clauses. Therefore, I hypothesize that the market value of a firm with both poison pill and golden parachute clauses is positively related to ρ.

Hypothesis 7A: *A CEO with a high risk avoidance value is more likely to adopt the poison pill.*
Hypothesis 7B: *A CEO with a high risk avoidance value is more likely to have a golden parachute clause in the compensation contract.*
Hypothesis 7C: *The market value of low-value firms with a golden parachute is positively correlated with the risk avoidance measure (ρ).*
Hypothesis 7D: *The market value of firms with a golden parachute and a poison pill is positively correlated with the risk avoidance measure (ρ).*

Managers that are highly entrenched will pursue subjective strategies that are often non-optimal in value creation and against shareholder interests. Managerial entrenchment is best defined by Weisbach (1988) "Managerial entrenchment occurs when managers gain so much power that they are able to use the firm to further their own interests rather than the interests of shareholders".[9] In previous financial literature, the correlation between managerial entrenchment and firm performance have engendered mixed conclusions. Evidence from Schleifer and Vishny (1989) suggest that entrenched managers work to extract private benefits rather than increasing corporate wealth by undertaking non-optimal and subjective projects. However, such CEOs also have the power in directing corporate strategy and negotiations that may benefit the company (Moussa, Rachdi, Ammeri (2013)). Ahimud and Lev (1999) and Stulz (1990) contend against the previous argument that the manager makes particular investments that increases the principal-agency cost by making revocation more difficult. Dikolli et al. (2011) suggest that a CEO's tenure can be used a proxy for a CEO's level of entrenchment. Since the mean of the risk avoidance measure is greater for a high E-index (see Table 1 in Appendix A), I contend that the risk avoidance measure is positively correlated with the tenure of a CEO.

Hypothesis 8: *The risk avoidance measure (ρ) is positively correlated with CEO tenure (number of vocational years in the same firm).*

[9] http://economics.about.com/od/termsbeginningwithe/g/entrenchment.htm

Serfling (2014) contends that there is a negative correlation between CEO age and risk-taking behaviour, specifically lower stock return volatility, lower R&D expense, lower operating expense and more diversified investment strategy. This result is consistent with the findings of Vroom and Pahl (1971) as these authors find younger managers to be less risk-averse than older managers. By using the risk avoidance measure (ρ) as a proxy for risk-taking behaviour, I test the contentions of Serfling (2014) by positing a positive relation with ρ and CEO age.

Hypothesis 9: *The risk avoidance measure (ρ) exhibits a positive relationship with CEO's age.*

Breugom (2016) finds a negative, but insignificant correlation with the presence of a 5% blockholder and ρ. The result, however, may not be entirely valid as the author includes firms with less than 5 years of data in the sample; leading to bias from insufficient firm-level data. With the exclusion of firms with less than 5 years of data, it is possible that the relation remains negative, but emerges significant. In order to find a causal relationship, I utilize the number of 5% blockholders and the presence of a 5% blockholder. I hypothesize the number and the presence of a blockholder to decrease in ρ as large shareholders can exert corporate governance through two mechanisms (Hirschman (1970)): direct intervention within a firm (known as "voice") through a shareholder proposal, private letter to managers or voting against directors, and the threat or action of trading shares (known as "exit"). If a manager initiates a project that destroys firm value ex post, a blockholder can sell its shares, thus pushing down the share price and further punishing the manager. Ex ante, the mere threat of an exit (most common in practice) can induce the manager to execute value-maximizing strategies for the firm (Edmans (2014)). To test the consistency of the results by Breugom (2016), I hypothesize that total institutional ownership (expressed as a percentage of shares outstanding) should decrease in the risk avoidance measure.

Hypothesis 10A: *Presence and number of 5% blockholders are negatively correlated with the risk avoidance measure (ρ).*

Hypothesis 10B: *Total institutional ownership is negatively correlated with the risk avoidance measure (ρ).*

Inside blockholders[10] (large shareholders on the board of directors), independent or linked with the firm (dependent), have different implications in their role of corporate governance than outside blockholders. Shleifer and Vishny (1986) explain that the presence of a large shareholder on board can prove to be an effective mechanism for governance if the shareholder overcomes the free-rider problem in monitoring managers. Furthermore, Bertrand and Mullainathan (2001) contend that the presence of an inside blockholder can substantially reduce CEO compensation for luck (i.e. abnormal positive returns). Agrawal and Nasser (2012) make an important distinction that the boards' ability to monitor managers relies on having strong, motivated and truly independent directors – a truly independent director is one who is not under the influence of the CEO and will challenge the CEO in pursuing interests at the expense of shareholders or initiating a project that does not maximize firm value. However, an independent blockholder (IDB)[11] may also reap private benefits at the expense of shareholders by colluding with the CEO. The findings from Agrawal and Nasser (2012) and Agrawal and Nasser (2011) conclude that the presence of an IDB ameliorates contracting and monitoring of the CEO, higher firm valuation, lower proportion of CEO's equity-based pay (particularly options) and lower firm risk. Therefore, I hypothesize the presence of an IDB to increase in the risk avoidance measure as the IDB will challenge risky investment decisions and urge value-maximizing projects.

Hypothesis 11A: *Presence of an IDB (1% independent blockholder) is positively correlated with the risk avoidance measure (ρ).*

Although little research is conducted so far on dependent blockholders on board (DB), such entities are motivated by shared benefits of control and private benefits of control. Shared benefits of control follows the monitoring hypothesis where blockholders can exert their influence on management to conduct more optimal investment decisions and increase firm value (Holderness (2003); Shleifer and Vishny (1986)). Barclay and Holderness (1989) were the first to offer evidence that the private benefits of large block-ownership are positive in most firms, however they also concluded that 20% of observations revealed negative net private benefits of control. Therefore, it is likely that a DB's

[10] Definition of a blockholder is ambiguous across literature (Edmans (2014)). For hypotheses 11a and 11b, I utilize the framework of Agrawal and Nasser (2012) that defines a blockholder as an individual or entity that owns at least 1% of company shares. The use of a 5% blockholder is discouraged in this context due to insufficient data.

[11] Following prior literature on boards (Agarwal and Nasser (2012); Adams et al. (2010)), an independent director is defined as an individual that has never worked as an executive of the company, and does not have any current or previous business relationships (i.e. customer, supplier, consultant).

effectiveness in governance is ambiguous due to their personal agendas: a DB may push the manager to make costly decisions that benefit themselves (i.e. doing business at higher prices with a firm that the DB partly owns), or a DB increases its equity stake and is consequently incentivized to monitor managers more thoroughly in order to increase firm value. Thus, I hypothesize that the presence of a DB holds no significant relation to *ρ*.

Hypothesis 11B: *Presence of a DB (1% dependent blockholder) holds no statistically significant relation with the risk avoidance measure (ρ).*

Eisdorfer et al. (2015) provide evidence that managers with a lucrative pension plan have an adverse effect on firm performance and level of dividends (proxied by dividend yield and dividend payout ratio). Managers with a wealthy pension plan are likely to manifest characteristics of managerial entrenchment as mentioned by Weisbach (1988). If managers with high pension plans can proxy managerial entrenchment, then its possible to assert that a manager with a high risk avoidance measure should have a deleterious effect on dividend yield and payout ratio. I further extend on this hypothesis by including the dividends over assets (DOA) ratio, which represents the return on assets that go directly to shareholders.[12] This ratio has not yet been tested in past literature. While the data from Eisdorfer et al. (2015) is not publicly available, a lucrative pension plan can be proxied by the aggregate actuarial present value of the manager's accumulated benefits under the company's pension plan (Liu et al. (2014); (Lee and Tang (2013)). Therefore, I hypothesize a positive relation between present value of accumulated benefits and *ρ*.

Hypothesis 12A: *Dividends payout ratio, dividend yield and dividends over assets are negatively correlated with the risk avoidance measure (ρ).*
Hypothesis 12B: *Present value of accumulated benefits (pension value) is positively correlated with the risk avoidance measure (ρ).*

2.3 Behavioural Finance

This hypothesis is built around empirical literature of finance and psychology, particularly documenting gender-related differences in risk-aversion (Faccio et al. (2012)). In psychology, Bruce

[12] Calculated as (Annual Total Dividends / Total Assets): https://bankinfo.sageworks.com/blog/post/dividends

and Johnson (1994) and Johnson and Powell (1994) display evidence that women exhibit a lower tendency of risk-taking than men in gambling/betting activities. Barber and Odean (2002) produce findings that show that men are more overconfident than women and are more susceptible to bias in the area of stock trading. In finance, Sundén and Surette (1998) and Bernasek and Schwiff (2001) find that women are significantly more risk-averse than men in their allocation of wealth to pensions. However, there is no existing evidence in empirical literature that gender-related differences and risk-taking choices will result in a misallocation of capital. This paper investigates the validity of the contention that female managers are more risk-averse than male managers in publicly listed firms in North America.

Hypothesis 13: *The risk avoidance measure (ρ) is positively correlated with female managers.*

Hirshleifer et al. (2012) examine the CEO overconfidence puzzle; they create parameters of CEO overconfidence based on overestimating expected cash flows and underestimating risk. The overconfident CEO accepts good, but risky projects (low expected payoffs), generally avoided by rational managers. This parameter is similar to ρ as low values of the measure (i.e. ρ = 1%) may denote an overconfident manager accepting risky, but good (positive NPV) projects that will increase firm value by at least 1% per additional percentage of firm risk. Hirshleifer et al. (2012) find a statistically significant relationship between CEO overconfidence, greater risk-taking, greater innovation related investments (R&D expenditure scaled by total assets) and greater firm value in innovative industries (Tobin's Q). By using ρ as a proxy for CEO overconfidence, I hypothesize innovation related investments to decrease in ρ. Since Hirshleifer et al. (2012) find no significant relation between CEO overconfidence and the aforementioned variables in non-innovative industries, I hypothesize no significant relation between the risk avoidance measure and innovation related investments in non-innovative industries.

Hypothesis 14A: *Innovation related investments (R&D expenditure scaled by total assets) is negatively correlated with the risk avoidance measure (ρ) in innovative industries.*

Hypothesis 14B: *Innovation related investments holds a statistically insignificant relation with the risk avoidance measure (ρ) in non-innovative industries.*

Chapter 3. Data description

This paper provides empirical research on the study of Dittmann et al. (2015). From 1997-2012, Dittmann et al. (2015) constructed a dataset for six risk-aversion levels[13] of the risk avoidance measure (ρ) for Chief Executive Officers (CEOs) of 2,441 publicly listed North American firms. Data on CEO compensation contracts were retrieved from ExecuComp, resulting in 14,293 observations of 1,707 U.S. CEOs. For the context of this paper, firms with insufficient data (less than 5 years of observations throughout entire sample period) are excluded from the sample in order to reduce biases in estimation, resulting in 11,385 total observations of 1,265 U.S. CEOs. The risk avoidance measure is calculated by the following equation:

$$\rho := -\frac{\nu^{ua}}{PPS^{ua}} \frac{1}{P_0}.$$

The risk avoidance measure equals the utility adjusted vega of the manager (ν^{ua}) scaled by the utility adjusted pay-for-performance sensitivity (PPS^{ua}) multiplied by the negative reciprocal of the initial stock price. The utility adjusted vega (ν^{ua}) represents the marginal increase in the manager's expected utility for a marginal increase in volatility (assuming firm value [P_0] stays constant). Also known as the utility adjusted delta (PPS^{ua}), it measures how much the manager's expected utility increases for a marginal increase in stock price. The parameters within the model are subject to the utility function of the CEO in the following equation:

$$U(W_T, e) = V(W_T) - C(e) = \frac{W_T^{1-\gamma}}{1-\gamma} - C(e).$$

The utility function of the CEO, $U(W_T, e)$, is essentially the utility gained from wealth minus the costs of effort. There is also constant relative risk aversion in the model, γ, with respect to W_T. Costs of effort are assumed to increasing and convex in effort. There is no direct cost linked with the manager's choice of volatility. Volatility affects the manager's utility indirectly from stock price distribution and utility function V (.). Lastly, it is assumed that the CEO has outside employment opportunities, that give him/her expected utility $\underline{U}$. For further information, refer to Dittmann et al. (2015).

[13] Relative levels of risk aversion: γ = 0.5, 1, 2, 3, 4, 6.

The aim of this paper is to provide a thorough analysis on the implications of the risk avoidance measure on corporate finance, governance, and behavioural finance variables. It is pertinent to investigate the validity of the theoretical model across multiple disciplines in order to test the robustness of the mathematical framework. A conservative level of relative risk aversion ($\gamma = 3$) is implemented in the regression framework, with a mean risk avoidance of 2.20%, minimum of -3.41% and maximum of 26.79%. Further descriptive information is outlined in sub-chapter 3.1.

The following data is obtained from Compustat, ISS and Thomson Reuters databases. I first analyze corporate finance variables; ROA is the ratio of net profit to total assets. ROE is the ratio of net profit to total equity capital. Tobin's Q is the ratio of the market value of total assets to the book value of total assets. Asset change is the percentage change of total assets from year *t-1* to year *t*. Sale change is the percent change in net sales from year *t-1* to year *t*. Net income change is the percent change in net income from year *t-1* to year *t*. Market value of firm (at fiscal year-end) is obtained by taking the natural logarithm of the variable (normal distribution). High and low-levered firms are differentiated by splitting the sample by market leverage at the median (13.5%); the corresponding value is then multiplied by the natural logarithm of firm market value. Return on investment (ROI) is net income over total assets. Net income corresponds to net profit after taxes and interest. Stock price volatility corresponds to Black-Scholes values calculated by a 60-month (5 years) average price.

The second part of the paper focuses on variables related to corporate governance; poison pill is a dummy variable equalling 1 if a poison pill clause is present in the firm's charter, 0 if no such clause is present. Golden parachute is another dummy variable equalling 1 if a golden parachute clause is present in the firm's charter, 0 otherwise. The sample is split at the median of firm market value ($2.1 billion) to calculate high and low firm market value; low firm market value (below median) is then multiplied by the golden parachute dummy to create the interaction term *LowValueGP*, denoting firms with low market value and a golden parachute clause (resulting zeroes extracted). Similarly, firm market value is multiplied by both poison pill and golden parachute variables to create the interaction term *MValueGPill*, denoting market value of firms with both poison pill and golden parachute clauses. *CEOTenure* denotes number of fiscal years appointed as CEO. The dummy variable *Blockholder* equals 1 if the firm includes at least one 5% blockholder in its total institutional ownership. The variable *NumOfBlock* defines the number of 5% blockholders in the company. Total institutional ownership, *TotalInstOwn*, is measured as percentage of shares outstanding. Data for independent blockholders on board are distinguished by their board affiliation as "independent", and own at least 1% of shares outstanding in a company. Dependent blockholders on board are classified as "linked" or "employee" on the board, and own at least 1% of shares outstanding in a company. Dividend payout ratio, *DPAY*, is total dividends paid in a fiscal year divided by net income. Dividend yield, *divyield*, is dividends per share divided by the price per share. Dividends over assets ratio, *DOA*, denotes total dividends in a fiscal year over total assets. Pension value of a CEO is the present value of aggregate accumulated benefits at the end of fiscal year.

Lastly, I formulate the behavioural finance variables; Research and development expense, *RNDX*, is expressed in thousands. Total operating expenses, *OPRX*, is expressed in thousands. The variable *DIVERSE* is a dummy variable that equals 1 when a firm has a nonzero value for intersegment eliminations, thus denoting diversity in investment strategy with multiple divisions within a business. CEO age is expressed in years. The dummy variable *Female* equals 1 if the CEO is female. *RDA* denotes research and development expense scaled by total assets of a firm. I follow the method of Hirshleifer et al. (2012) in distinguishing between innovative and non-innovative industries.[14] *Innovgamma* defines the risk avoidance measure in innovative industries.[15] *Noninnovgamma* defines the risk avoidance measure in non-innovative industries.[16]

Sub-chapter 3.1 provides further information on all 38 variables utilized in hypotheses testing. Table A provides the descriptive summary (variable type and definition) and Table B outlines the summary statistics of each variable.

[14] Source: *Internet Appendix for "Are Overconfident CEOs Better Innovators?"* pg. 8.
[15] Petroleum & natural gas, household & office furniture, commercial machinery & computer hardware, electronic equipment, medical equipment, consumer goods, communications, business services and engineering research.
[16] Agricultural services, coal mining services, heavy construction, food & drink products, tobacco products, transit transportation, retail (building material), metal mining & services, apparel & finished products, wholesale (durable goods), retail (auto dealers, gas stations, construction (special contractors).

3.1 Data description tables

Table A – Descriptive Summary

Variable	Type	Description
Dependent Variables		
Risk Avoidance Measure[17] (rg3), (lagged version: rg3_1)	Continuous	Measured by the utility adjusted vega scaled over the utility adjusted delta, multiplied by the negative reciprocal of firm value[18]
ROA (roa)	Continuous	Ratio of net profit after tax to total assets
ROE (roe)	Continuous	Ratio of net profit after tax to total equity capital
Tobin's Q (TBQ)	Continuous	Ratio of firm market value to book value of total assets
ΔAssets (assetchg)	Continuous	Change in total assets
ΔSales (salechg)	Continuous	Change in net sales (revenue); winsorized 1st and 99th percentile
ΔNetIncome (incomechg)	Continuous	Changes in total profits after taxes; winsorized 1st and 99th percentile
MarketValue (MV)	Continuous	Natural logarithm of total market value of firm (market share price multiplied by outstanding shares)
MVlow (MVlow)	Continuous	Natural logarithm of market value of low-levered (under 59%) firm
MVhigh (MVhigh)	Continuous	Natural logarithm of market value of high-levered (equal to or greater than 59%) firm
ROI (roi)	Continuous	Return on investment: net income divided by net assets
NetIncome (ni)	Continuous	Total profits after taxes
SharePriceVol (bs_volatility)	Continuous	Stock price volatility based on Black-Scholes values of the past 60 months (5 years)
Total Dividends (dvt)	Continuous	Total dividends paid at the end of fiscal year; winsorized 1st and 99th percentile
PoisonPill (ppill)	Dummy	Takes value 1 if poison pill is adopted; 0 otherwise
GoldenParachute (gparachute)	Dummy	Takes value 1 if golden parachute is adopted; 0 otherwise
LowValueGP (mvlowgp)	Continuous	Interaction variable: Value of firms in the lower half of the median split sample multiplied by golden parachute

[17] (ρ) doubles as an independent and dependent variable.
[18] Further information on the risk avoidance measure can be found in Dittmann et al. (2015).

		dummy; resulting 0 values are excluded
MValueGPill (mvgpill)	Continuous	Interaction variable: Market value of firm multiplied by golden parachute and poison pill dummy; resulting 0 values are excluded
RNDX	Continuous	Total expenses in research and development
XOPR (OPRX)	Continuous	Total Operating Expenses
DIVERSE (DIVERSE)	Dummy	Takes value 1 if company has nonzero intersegment sales; 0 otherwise
DPAY (DPAY)	Continuous	Total dividends over net income; winsorized 1st and 99th percentile
DivYield (divyield)	Continuous	Dividends per share divided by share price; winsorized 1st and 99th percentile
DOA (DOA)	Continuous	Total dividends over total assets; winsorized 1st and 99th percentile
PensionValue (PV)	Continuous	Present value of aggregate accumulated benefits at the end of the fiscal year
RDA	Continuous	R&D expenditure scaled by total assets
Independent Variables		
Female (female)	Dummy	Takes value 1 if female CEO; 0 otherwise
CEOAge (page)	Discrete	Age of CEO
CEOTenure (CEOTenure)	Discrete	Number of CEO vocational years in the same firm
NumOfBlock (NumOfBlock)	Discrete	Number of >5% institutional blockholder ownership
PresenceOfBlock (Blockholder)	Dummy	Takes value = 1 if at least one >5% blockholder exists; 0 otherwise
TotalInstOwn (Ownership)	Continuous	Total institutional ownership as percentage of shares outstanding
IndpBlock (IDB)	Dummy	Takes value = 1 if at least one >1% independent blockholder on board of directors is present; 0 otherwise
DepBlock (DB)	Dummy	Takes value = 1 if at least one >1% affiliated blockholder on board of directors is present; 0 otherwise
Innovgamma (innovgamma)	Continuous	Risk avoidance in innovative industries
Noninnovgamma (noninnovgamma)	Continuous	Risk avoidance in non-innovative industries
Control Variables		
Leverage (ML)	Continuous	Ratio of total liabilities to total assets (market value)
Firmsize (Assets)	Continuous	Natural logarithm of total assets

(Words in parentheses correspond to the variable's name in the STATA data-file.)

Table B – Summary Statistics

Variable	Observations	Mean	Median	Min	Max	Std. Dev.
ρ (γ = 3)	11385	2.203	1.888	-3.412595	26.78742	1.640
ρ_{t-1} (γ = 3)	8750	2.294	1.982	-3.412595	26.78742	1.647
ROA (%)	10116	4.216	4.621	-263.073	83.786	10.696
ROE (%)	9707	10.999	11.974	-120.674	84.829	17.463
TBQ	9012	1.228	0.917	0.0651776	6.722366	1.077
Assetchg (%)	10116	10.870	6.209	-77.875	662.849	28.318
Salechg (%)	11157	8.936	7.328	-44.775	97.436	18.150
Nichg (%)	9661	7.874	8.920	-821.851	833.429	125.099
Market Value (log)	10351	7.719	7.642	1.360848	13.34798	1.629
MVlow (log)	5113	7.845	7.752	1.360848	13.34798	1.671
MVhigh (log)	5238	7.597	7.554	1.372348	12.46807	1.577
ROI (%)	9373	.0432	.049	-2.627143	0.8422089	.111
Net Income (millions)	10557	445.003	94.713	-38732	45220	1939.907
SharePriceVol (%)	6372	.409	.358	0.108	4.09	.208
Total Dividends (millions)	7209	169.936	48.319	0.003	3266	349.354
PoisonPill	11385	.093	0	0	1	.290
GoldenParachute	11385	.242	0	0	1	.429
LowValueGP (millions)	1066	1000.676	932.718	29.1195	2083.617	553.064
MValueGPill (millions)	665	6062.513	2234.206	30.2764	195100.2	14040.960
RNDX (millions)	5900	255.309	33	0	12183	863.499
OPRX (millions)	10654	5731.698	1440.584	0	432703	18633.820
DIVERSE	11385	.074	0	0	1	.262
DPAY (%)	10327	.207	.085	-1.369682	2.759904	.361
DivYield (%)	8801	.0166	.008	0	3.415385	.063
DOA (%)	9978	.0133	.005	0	0.9438434	.029
PV ('000s)	2864	1740.472	444.211	0	69412.71	4222.262
IndpBlock	11385	.007	0	0	1	.081
DepBlock	11385	.044	0	0	1	.206
Female	11385	.020	0	0	1	.141
Age (years)	7468	53.472	53	31	95	7.487
CEOTenure (years)	7659	12.014	10	0	61	8.134
NumOfBlock	8835	2.357	2	0	10	1.622
PresenceOfBlock	9658	.874	1	0	1	.332
TotalInstOwn (%)	8834	.738	0.760	1.28E-06	1.613648	.188
Innovgamma (γ = 3)	3906	2.279	1.944	-2.076381	26.78742	1.763
Noninnovgamma (γ = 3)	937	2.213	1.952	-2.143312	10.73457	1.540
Leverage (%)	11385	.172	.135	0	.9778633	.158
Firmsize (log)	10116	7.895	7.739	2.574443	14.47741	1.696

Chapter 4. Methodology

Ordinarily least squares with clustered standard-errors at the firm level (OLS-CSE) and fixed-effects (FE) regressions will be utilized as the main estimation methods. Dummy variables are estimated using a probit regression with clustered standard-errors at the firm level (P-CSE). While OLS with Gauss-Markov assumptions is unparalleled compared to any other estimation model for producing unbiased and consistent results, endogeneity problems often arise. Such problems may be mitigated by clustered standard-errors. Year and firm FE regressions can also mitigate endogeneity by controlling for time-invariant characteristics. For each regression model, estimations with year and firm FE are conducted separately with robust standard-errors clustered at firm level. Thus, the regressions produce cross-sectional analyses of firms relating to the risk avoidance measure and the variables discussed in chapter 2.

I test the 1-year lag of the risk avoidance measure [$\rho_{(t-1)}$] in order to account for delays in financial reporting and constant restructure of management (hiring and firing of CEOs). All hypotheses in chapter 2 are regressed with $\rho_{(t-1)}$ in Appendix C. The intuition of the lagged variable is that the economic benefits and costs of the risk-taking strategies employed by the CEO in year *t* will be more evident in financial reporting in year *t+1*. In addition, if a new CEO enters a firm in the middle of fiscal year *t*, the corresponding risk avoidance measure will not correspond to the ex-CEO's actions entirely. Thus, usage of a lagged risk avoidance measure [$\rho_{(t-1)}$] may lead to more significant estimations by matching CEO actions in year *t*-1 with firm parameters in year *t*.

The inclusion of control variables *Leverage* and *Firmsize* into the empirical framework stems from literature as both variables are viable proxies for firm growth opportunities and are therefore appropriate measures to utilize in firm performance regressions (Al-Swidi et al. (2012), Lehn et al. (2003), Kyereboah-Coleman and Biepke (2006), Alsaeed (2006), Frank and Goyal (2003), Himmelburg et al. (1999), Sarkar et al. (2000), Dogan and Topal (2014)). *Leverage* is defined as the market prices for total liabilities over total assets. *Firmsize* is defined as the logarithm of total sales (logged for normality). Chapter 7 provides robustness checks for a different level of relative risk-aversion ($\gamma = 1$) of the risk avoidance measure.

4.1 Model regressions

Models (1) and (2) represent the empirical framework of the paper:

$$Y_{i,t} = \beta_0 + \beta_1 RiskAvoidance_{i,t,t-1} + \beta_2 Leverage_{i,t} + \beta_3 Firmsize + \varepsilon_{i,t} \quad (1)$$

$$RiskAvoidance_{i,t,t-1} = \beta_0 + \beta_1 X_{i,t} + \beta_2 Leverage_{i,t} + \beta_3 Firmsize + \varepsilon_{i,t} \quad (2)$$

$Y_{i,t}$	$X_{i,t}$
ROA	$CEOTenure$
ROE	$Blockholder$
TBQ	$NumOfBlock$
$\Delta Assets$	$TotalInstOwn$
$\Delta Sales$	$IndpBlock$
$\Delta NetIncome$	$DepBlock$
$MarketValue$	Age
$MVlow$	$Female$
$MVhigh$	$Innovgamma*$
ROI	$Noninnovgamma*$
$NetIncome$	
$SharePriceVol$	
$Dividends$	
$PoisonPill$	
$GoldenParachute$	
$LowValueGP$	
$MValueGPill$	
$DPAY$	
$DivYield$	
DOA	
$PensionValue$	
$RNDX$	
$OPRX$	
$DIVERSE$	
RDA	

*These variables have a unique model specification. Refer to Appendix B for a full list of individual model regressions.

Chapter 5. Empirical Analyses

This section provides an overview of analyses, implications and inferences derived from OLS and fixed-effects regressions of the risk avoidance measure. The organization of chapter 5 follows the structure of chapter 2; corporate finance, corporate governance, and finally behavioural finance variables are evaluated chronologically.

5.1 Corporate Finance

Hypothesis 1A posits firm performance to be negatively correlated with the risk avoidance measure. In order to control for crises years in the sample, a cross-sectional analysis using year-FE is suitable for testing the risk avoidance model. The regressions for hypothesis 1A are presented below:

Table 1A

(1), (4), (7) refer to OLS-CSE regressions. (2), (5), (8) are Year FE regressions. (3), (6) and (9) are Firm FE regressions.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	ROA	ROA	ROA	ROE	ROE	ROE	TBQ	TBQ	TBQ
ρ ($\gamma = 3$)	-0.0527	-0.0459	-0.109	0.0760	-0.0629	-0.0983	0.0871***	0.0802***	0.0509***
	(0.0928)	(0.106)	(0.105)	(0.154)	(0.179)	(0.171)	(0.0123)	(0.0135)	(0.00845)
Firmsize	0.710***	0.705***	1.294***	1.895***	1.927***	0.542	-0.0754***	-0.0736***	-0.240***
	(0.183)	(0.183)	(0.384)	(0.217)	(0.219)	(0.596)	(0.0146)	(0.0149)	(0.0277)
Leverage	-19.23***	-18.84***	-27.72***	-24.67***	-24.52***	-36.67***	-3.657***	-3.643***	-3.421***
	(1.088)	(1.103)	(2.116)	(1.942)	(1.978)	(3.510)	(0.141)	(0.146)	(0.131)
Constant	2.030	2.847*	-1.004	-0.0867	1.620	13.03***	2.251***	2.282***	3.582***
	(1.586)	(1.574)	(3.087)	(1.833)	(1.893)	(4.844)	(0.120)	(0.123)	(0.221)
Firm FE	NO	NO	YES	NO	NO	YES	NO	NO	YES
Year FE	NO	YES	NO	NO	YES	NO	NO	YES	NO
Firm clusters	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	10,116	10,116	10,116	9,707	9,707	9,707	9,012	9,012	9,012
R-squared	0.079	0.090	0.069	0.060	0.076	0.039	0.330	0.338	0.253
Number of company	1,126	1,126	1,126	1,120	1,120	1,120	1,114	1,114	1,114

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

I find that the effect of ρ is insignificant for return on assets (ROA) and return on equity (ROE). Regressions (8) and (9) show that Tobin's Q (TBQ) is the only variable in hypothesis 1A that produces a significant result. In regression (8), a 1% increase in ρ yields an increase in *TBQ* by approximately 0.08%. This result is inconsistent with the assumptions of the risk avoidance model; The result implies that as a CEO's risk avoidance increases, he/she chooses less risky and more value-creating projects per unit of firm volatility, thus increasing *TBQ*. It is possible that there is time-varying endogeneity in the model which is impeding a negative correlation. While FE regression is a partial solution to endogeneity, the estimation method cannot fully mitigate the problem. Examples of endogeneity in this example may include changes in capital structure (if a firm increases its equity level relative to debt, the firm is required to increase its rate of return in order to meet demands of its investors, thus discouraging the manager to undertake exceedingly risky projects) and changes in ownership (owners may differ in their appetite for risk, thus encouraging CEOs to undertake less risky, positive NPV projects). Or, the assumptions of ρ are not practical to obtain a negative correlation in this regression framework. The OLS-CSE regression produces a higher coefficient of 0.087%, but without any FE controls, it is likely more subject to endogeneity bias and thus will not be used for interpretation. The lagged risk avoidance regression estimates a similar coefficient of 0.086% using year-FE.[19] Therefore, hypothesis 1A is rejected.

Hypothesis 1B tests the firm performance variables of Forbes (2002). Similar to hypothesis 1A, a negative correlation between firm performance and ρ is tested below:

Table 1B

(1), (4) and (7) refer to OLS-CSE regressions. (2), (5) and (8) are Year FE regressions. (3), (6) and (9) are Firm FE regressions.

VARIABLES	(1) ΔAssets	(2) ΔAssets	(3) ΔAssets	(4) ΔSales	(5) ΔSales	(6) ΔSales	(7) ΔNetIncome	(8) ΔNetIncome	(9) ΔNetIncome
ρ ($\gamma = 3$)	1.526***	1.179***	2.119***	1.081***	0.942***	0.879***	-3.155***	-1.753*	-5.947***
	(0.209)	(0.209)	(0.291)	(0.136)	(0.146)	(0.171)	(0.836)	(0.930)	(1.240)
Firmsize	1.340***	1.428***	9.219***	0.431***	0.498***	0.812	3.648***	3.591***	-7.984**
	(0.190)	(0.194)	(1.124)	(0.129)	(0.129)	(0.600)	(0.832)	(0.837)	(3.678)
Leverage	-6.729***	-6.177***	-10.58**	-11.28***	-9.844***	-26.50***	-113.3***	-100.8***	-336.2***
	(2.393)	(2.372)	(5.265)	(1.463)	(1.443)	(2.991)	(11.26)	(11.29)	(26.02)
Constant	-1.904	1.142	-64.75***	5.097***	8.255***	5.124	3.977	6.671	139.8***
	(1.561)	(1.959)	(9.132)	(1.086)	(1.372)	(4.853)	(7.236)	(9.067)	(30.41)
Firm FE	NO	NO	YES	NO	NO	YES	NO	NO	YES
Year FE	NO	YES	NO	NO	YES	NO	NO	YES	NO
Firm clusters	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	10,116	10,116	10,116	9,919	9,919	9,919	8,575	8,575	8,575
R-squared	0.013	0.033	0.022	0.019	0.120	0.018	0.018	0.050	0.046
Number of company	1,126	1,126	1,126	1,126	1,126	1,126	1,111	1,111	1,111

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Changes in assets and sales are both significant and positively correlated with ρ. Regression (2) outlines a 1.179% increase in asset change per 1% increase in a CEO's risk avoidance. Sales change increases by 0.942% per 1% increase in ρ in regression (5). Homologous to the interpretation for hypothesis 1A, as a CEO's risk avoidance increases, he/she chooses less risky and more value-creating projects that consequently improve firm performance (against assumptions of the model).

[19] Refer to Appendix C for lagged (ρ) regressions.

The lagged ρ regression produces positive, but smaller coefficient estimates for change in assets (0.864%) and sales (0.672%). Change in net income is the only variable that is in-line with the hypothesis; decreasing by -1.753% per 1% increase in ρ supports the intuition that as a CEO's risk avoidance increases, he/she ignores risky yet value-maximizing projects that would be beneficial for both company and shareholders. It is possible that a risk-avoiding CEO pursues strategies that do not necessarily increase net profits, but instead ameliorate the market position of the firm (supported by the positive coefficient of Tobin's Q). The results in Table 1B may be contradictory due to the variety of industries in the sample, ranging from capital-intensive to labour-intensive firms, and financial to non-financial firms. Each industry has different expectations for asset growth, sales growth and profit margins. However, with contradicting results, it is implausible to conclude a causal relationship between firm performance and the risk avoidance measure. Therefore, I do not find sufficient evidence to accept hypothesis 1B.

Hypothesis 2 posits a negative correlation between firm market value (high and low levered firms) and the risk avoidance measure. The table below portrays the regression coefficient estimates:

Table 2

(1), (4), (7) refer to OLS-CSE regressions. (2), (5), (8) are Year FE regressions. (3), (6) and (9) are Firm FE regressions.

VARIABLES	(1) MarketValue	(2) MarketValue	(3) MarketValue	(4) MVlow	(5) MVlow	(6) MVlow	(7) MVhigh	(8) MVhigh	(9) MVhigh
ρ ($\gamma = 3$)	0.0360***	0.0328***	0.0183***	0.0819***	0.0590***	0.0374***	-0.0209**	-0.00942	-0.00574
	(0.00856)	(0.00962)	(0.00536)	(0.0126)	(0.0142)	(0.00791)	(0.0101)	(0.0114)	(0.00636)
Firmsize	0.892***	0.894***	0.849***	0.926***	0.930***	0.835***	0.874***	0.874***	0.889***
	(0.0153)	(0.0155)	(0.0202)	(0.0224)	(0.0223)	(0.0317)	(0.0158)	(0.0159)	(0.0231)
Leverage	-3.592***	-3.548***	-3.754***	-4.396***	-4.521***	-4.959***	-3.133***	-3.049***	-3.801***
	(0.114)	(0.118)	(0.136)	(0.507)	(0.511)	(0.265)	(0.140)	(0.142)	(0.139)
Constant	1.221***	1.306***	1.628***	0.932***	1.092***	1.740***	1.329***	1.364***	1.370***
	(0.112)	(0.114)	(0.159)	(0.155)	(0.160)	(0.244)	(0.122)	(0.124)	(0.192)
Firm FE	NO	NO	YES	NO	NO	YES	NO	NO	YES
Year FE	NO	YES	NO	NO	YES	NO	NO	YES	NO
Firm clusters	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	9,195	9,195	9,195	4,560	4,560	4,560	4,635	4,635	4,635
R-squared	0.794	0.799	0.570	0.764	0.771	0.466	0.834	0.838	0.647
Number of company	1,114	1,114	1,114	788	788	788	826	826	826

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

I find positive and significant correlations with ρ and firm market value in regressions (1) – (3) for hypothesis 2A. Focusing on the year-FE regression, firm market value increases by 0.033% per 1% increase in a CEO's risk avoidance level. Similar to the result in table 1A, this coefficient neither supports the hypothesis nor the assumptions of the model. The coefficient is either susceptible to endogeneity bias (i.e. changes in capital structure or ownership over time) or the assumptions of ρ are not sound to obtain a negative correlation. The lagged ρ regression similarly provides a positive, but larger coefficient of 0.046%. Therefore, I find no evidence in favour of hypothesis 2A.

Regression (5) in table 2 shows a positive and significant coefficient (against the conjecture of hypothesis 2B); per 1% increase in ρ, market value of low-levered firms increases by 0.059%. This positive value goes against the intuition that a negative relation between firm value and ρ could be obtained by a positive relation between leverage and firm value (Cuong and Canh (2012)), and a negative relation between leverage and ρ (Breugom (2016)). Firm value of low-levered firms is more sensitive to changes in ρ than firm market value of the whole sample; the lagged ρ regression further attests to this sensitivity by producing a larger, significant and positive coefficient of 0.067%. A probable reason for this sensitivity is that low-levered firms are able to garner more growth opportunities than high-levered firms by installing more leverage at a lower cost of debt (cost of debt is commensurate with leverage). Another plausible reason for the sensitivity is that the manager is more influenced to act based on shareholders' interests due to the large percentage of equity financing – with mainly equity at stake, the manager avoids risky projects and instead searches for high NPV, low risk projects that create value for the firm. Therefore, there is insufficient evidence to support hypothesis 2B and the hypothesis is consequently rejected.

Unexpectedly, regressions (7) – (9) produce only negative coefficients for hypothesis 2C. While only OLS-CSE regression produces a significantly negative coefficient for ρ, the result increases the likelihood that the assumptions of the risk avoidance measure are not sensible to obtain the desired correlation as opposed to endogeneity in the model biasing the results. The assumptions violated in the model could relate to efficient contracting or relative risk aversion. With no evidence substantiating a positive correlation, I reject hypothesis 2C.

Hypothesis 3 conjectures return on investments (ROI) and net income to be decreasing in the risk avoidance measure. The table below illustrates the regression coefficients:

Table 3

(1) and (4) refer to OLS-CSE regressions. (2) and (5) are Year FE regressions. (3), and (6) are Firm FE regressions.

VARIABLES	(1) ROI	(2) ROI	(3) ROI	(4) NetIncome	(5) NetIncome	(6) NetIncome
ρ ($\gamma = 3$)	-0.00127	-0.00137	-0.00176	-21.85	-18.65	-49.20***
	(0.000993)	(0.00111)	(0.00117)	(18.30)	(22.46)	(17.88)
Firmsize	0.00975***	0.00969***	0.0152***	501.1***	499.7***	394.9***
	(0.00193)	(0.00194)	(0.00412)	(82.44)	(82.85)	(65.59)
Leverage	-0.216***	-0.212***	-0.309***	-2,171***	-2,158***	-1,137***
	(0.0113)	(0.0115)	(0.0220)	(453.2)	(468.0)	(200.2)
Constant	0.00711	0.0194	-0.0182	-3,047***	-3,028***	-2,337***
	(0.0167)	(0.0166)	(0.0327)	(528.7)	(538.1)	(508.1)
Firm FE	NO	NO	YES	NO	NO	YES
Year FE	NO	YES	NO	NO	YES	NO
Firm clusters	YES	YES	YES	YES	YES	YES
Observations	9,373	9,373	9,373	9,373	9,373	9,373
R-squared	0.091	0.106	0.076	0.171	0.172	0.032
Number of company	1,122	1,122	1,122	1,122	1,122	1,122

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Perusing table 3, it is implausible to infer that return on investments decreases in ρ; Regressions (1) – (3) produce insignificant coefficients for ρ. Since the negative signs are consistent with the hypothesis, the insignificance is likely to result from endogenous factors such as changes in capital structure and ownership of the firm. Therefore, I find insufficient evidence to accept hypothesis 3A. Net income, however, has a negative and statistically significant coefficient of -49.20 at the 1% level. This coefficient is interpreted as a decrease in net income of $492,000 per 1% increase in ρ. Thus, if a CEO pursues risk-avoiding strategies, it will have a detrimental effect on a company's financial performance (in-line with assumptions of the model). Such risk-averse projects may create value for the firm, but may not be value-maximizing in the perspective of shareholders. This negative result is in-line with the result from table 1B with a negative coefficient of change in net income (-1.753%). The lagged ρ regression also produces a negative, but larger coefficient of -50.47; Thus, further establishing the negative correlation. It is important to note that the coefficient of -49.20 corresponds to firm-FE regression – after controlling for individual firm traits and time-invariant characteristics, a significantly negative relation is estimated. Without such controls, both

OLS and year-FE regressions produce a negative, but insignificant coefficient. Therefore, I find evidence that is in-line with hypothesis 3.

Hypothesis 4 tests the assumptions of CEO risk-taking incentives. With stock options and share prices embedded in the model, I expect a negative relation between stock price volatility and ρ. The table below outlines the regression details:

Table 4

(1) refers to OLS-CSE regression. (2) is Year FE regression. (3) delineates Firm FE regression.

VARIABLES	(1) SharePriceVol	(2) SharePriceVol	(3) SharePriceVol
ρ ($\gamma = 3$)	0.0182***	0.0209***	0.0115***
	(0.00246)	(0.00272)	(0.00218)
Firmsize	-0.0471***	-0.0467***	-0.0210***
	(0.00298)	(0.00293)	(0.00702)
Leverage	0.0855**	0.0904***	0.119***
	(0.0342)	(0.0345)	(0.0453)
Constant	0.712***	0.570***	0.522***
	(0.0256)	(0.0245)	(0.0564)
Firm FE	NO	NO	YES
Year FE	NO	YES	NO
Firm clusters	YES	YES	YES
Observations	5,625	5,625	5,625
R-squared	0.160	0.239	0.032
Number of company	1,053	1,053	1,053

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Regressions (1) – (3) produce significant coefficients, but year-FE regression is utilized for main analysis as it stands out in its relatively high R^2 of 23.9%. The positive coefficient of 0.02% is unanticipated as the CEO would be dis-incentivized to take risks (and incur firm volatility) if compensated with stock options. With a positive coefficient, per 10% increase in a CEO's risk-avoidance equals a 0.2% increase in stock price volatility. This volatility should be undesirable by a risk-averse manager in order to reduce exposure to firm (idiosyncratic) risk; firm volatility is usually perceived negatively by market agents (investors, stockbrokers, etc.) as it poses uncertainty on a company's financial health. Additionally, when risk avoidance level increases, a manager initiates only low-risk and high payoff projects per additional percentage of firm volatility. In theory, it is intuitive for the variance of stock price to decrease if only low-risk projects are initiated. The positive coefficient implies that either this relation does not uphold in practice (due to personal agendas of management, influence of company news in the stock market, change of management of ownership) or perhaps the relative risk-aversion parameter plays a bigger role in understanding the relation between ρ and stock price volatility. Following the argument of Smith and Stulz (1985) that firm volatility increases the value of stock options, some managers may be incentivized to initiate low-risk, high payoff projects that are against shareholder interests in order to induce firm volatility in the market and consequently increase the value of their stock options. Although unlikely, managers would follow such a strategy if their expected utility of wealth is lower than their expectations. Thus, hypothesis 4 is rejected due to opposing evidence.

Hypothesis 5 postulates that total dividend payments are increasing in the risk avoidance measure. The table below displays the regression results:

Table 5

(1) refers to OLS-CSE regression. (2) is Year FE regression. (3) is Firm FE regression.

VARIABLES	(1) Total Dividends	(2) Total Dividends	(3) Total Dividends
ρ (γ = 3)	-5.177	-5.093	-8.219***
	(3.835)	(4.362)	(2.809)
Assets	121.6***	121.3***	117.0***
	(9.209)	(9.343)	(11.84)
ML	-187.9***	-191.6***	-31.97
	(51.34)	(53.31)	(34.42)
Constant	-796.5***	-775.5***	-780.1***
	(66.64)	(66.65)	(98.58)
Firm FE	NO	NO	YES
Year FE	NO	YES	NO
Firm clusters	YES	YES	YES
Observations	6,379	6,379	6,379
R-squared	0.313	0.315	0.113
Number of company	824	824	824

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Contrary to the assumptions of efficient contracting in the risk avoidance measure, regression (3) connotes that total dividends are decreasing in ρ. The risk avoidance coefficient of -8.219 explains a reduction in dividend payments by -$82,190 per 1% increase in ρ. This result is contrary to the assumptions of efficient contracting in the risk avoidance measure as risk-loving managers should be enticed to increase the value of their compensation by reducing total dividends (dividends have a negative effect on stock price). The insignificant, but negative coefficient of regression (2) could weakly explain non-sensibility of the assumptions in the model. Therefore, no evidence is found in favour of hypothesis 5 and the hypothesis is consequently rejected.

Hypothesis 6 tests the negative relation between the risk avoidance measure, R&D expenditure (RNDX), operating expenses (OPRX) and diversification in investment strategy (DIVERSE). Firm-FE are excluded from P-CSE regressions as such an estimation method is not allowed in STATA. Regression details are delineated below:

Table 6

(1) and (4) are OLS-CSE. (2) and (5) are Year FE. (3) and (6) are Firm FE. (7) and (8) are Probit (P-CSE) regressions.

VARIABLES	(1) RNDX	(2) RNDX	(3) RNDX	(4) OPRX	(5) OPRX	(6) OPRX	(7) DIVERSE	(8) DIVERSE
ρ (γ = 3)	12.16	7.682	-23.32**	-137.7	-161.2	-220.8**	-0.0478***	-0.0347
	(12.32)	(15.74)	(9.848)	(125.4)	(168.4)	(108.0)	(0.0180)	(0.0213)
Firmsize	286.5***	287.2***	177.7***	5,504***	5,501***	4,205***	0.0352	0.0334
	(52.80)	(53.12)	(42.05)	(919.7)	(929.7)	(615.9)	(0.0218)	(0.0224)
Leverage	-1,028***	-1,050***	-6.306	-13,580***	-13,885***	-790.1	0.685***	0.712***
	(271.8)	(274.0)	(71.11)	(4,237)	(4,385)	(1,265)	(0.213)	(0.219)
Constant	-1,792***	-1,757***	-1,033***	-34,485***	-34,226***	-26,367***	-1.743***	-3.104***
	(353.8)	(351.8)	(315.8)	(5,955)	(5,766)	(4,644)	(0.175)	(0.362)
Firm FE	NO	NO	YES	NO	NO	YES	NO	NO
Year FE	NO	YES	NO	NO	YES	NO	NO	YES
Firm clusters	YES	YES	YES	YES	YES	YES	YES	YES
Observations	5,153	5,153	5,153	9,462	9,462	9,462	10,116	10,116
R-squared	0.248	0.249	0.088	0.203	0.204	0.079	0.014	N/A
Number of company	637	637	637	1,121	1,121	1,121	1,126	1,126

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Firm-FE regressions engender negative and statistically significant coefficients for ρ relating to *RNDX* and *OPRX*. A 1% increase in ρ yields a decrease in research and development expense by $233,200 and operating expenses by $2.208 million. These results are consistent with the results from Serfling (2014) that a more risk-averse manager will lower R&D and operating expenses. The lagged ρ regression produces more negative coefficients for *RNDX* at -26.71 and *OPRX* at -344.8. Regression (7) estimates a significant coefficient of -0.0478 for *DIVERSE*, which is in line with the hypothesis. This coefficient delineates an increase in capital flows within business divisions by 0.478% per 10% decrease in ρ. It is possible that this coefficient is slightly biased due to the exclusion of any year-based controls during a sample of two separate financial crises (exogenous shocks increasing systematic risk). There is no significant relation found in regression (8). Thus, there is sufficient empirical evidence to support hypothesis 6.

5.2 Corporate Governance

Hypothesis 7 predicts a positive relation between ρ, takeover defense clauses, and market value of firms with takeover defense clauses. Details of the regressions are presented below:

Table 7

(1) – (4) are P-CSE regressions. (5) and (8) are OLS-CSE regressions. (6) and (9) are Year FE, (7) and (10) are Firm FE regressions.

VARIABLES	(1) PoisonPill	(2) PoisonPill	(3) GoldenParachute	(4) GoldenParachute	(5) LowValueGP	(6) LowValueGP	(7) LowValueGP	(8) MValueGP	(9) MValueGP	(10) MValueGP
ρ ($\gamma = 3$)	-0.108***	0.00952	-0.270***	-0.0459**	-30.69**	-13.91	-29.59***	1,180	1,238	-327.2**
	(0.0177)	(0.0211)	(0.0169)	(0.0197)	(15.18)	(16.30)	(10.11)	(1,011)	(1,019)	(148.0)
Firmsize	-0.0173	-0.0718***	0.106***	0.0803***	334.7***	335.7***	733.6***	6,588***	6,540***	4,983***
	(0.0191)	(0.0245)	(0.0149)	(0.0222)	(29.74)	(29.57)	(65.95)	(1,550)	(1,539)	(1,292)
Leverage	-0.298	-0.389*	-0.481***	-0.231	-727.5***	-678.8***	-2,108***	-23,403***	-22,490***	-19,470***
	(0.197)	(0.236)	(0.168)	(0.220)	(171.6)	(175.0)	(281.4)	(6,538)	(6,404)	(6,045)
Constant	-0.917***	-0.502**	-0.945***	-0.0433	-1,202***	-1,308***	-3,810***	-43,490***	-41,339***	-29,133***
	(0.164)	(0.211)	(0.125)	(0.184)	(188.4)	(187.2)	(451.0)	(11,577)	(10,788)	(9,386)
Firm FE	NO	NO	NO	NO	NO	NO	YES	NO	NO	YES
Year FE	NO	YES	NO	YES	NO	YES	NO	NO	YES	NO
Firm clusters	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	10,116	4,296	10,116	4,296	976	976	976	591	591	591
R-squared	0.015	0.034	0.084	0.084	0.369	0.380	0.362	0.380	0.385	0.131
Number of company	1,126	972	1,126	972	337	337	337	235	235	235

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Regression (1) produces a significant and negative coefficient for ρ pertaining to the adoption of a poison pill clause. This result explains that adoption of a poison pill decreases in likelihood by 0.108% per 1% increase in ρ. Such a result implies that a positive relation between adoption of a poison pill and ρ cannot be inferred from a negative correlation between firm performance and ρ. Thus, adoption of a poison pill does not necessarily have a detrimental on firm performance. Regression (2) with year-FE produces a negative, but insignificant coefficient. Therefore, hypothesis 7A is rejected due to opposing evidence.

Regressions (3) and (4) portray negative and significant relations between adoption of a golden parachute and the risk avoidance measure. These results are consistent with the findings of Breugom (2016) that shows a negative relation with the Entrenchment-Index (includes golden parachute clause) and ρ. Pertaining to the year-FE regression, a 1% increase in ρ explains a -0.0459% reduction in the probability of adopting a golden parachute. Thus, this result implies that risk-loving managers are more likely to have a golden parachute clause in the firm’s charter; such a clause is costly to shareholders, but is implemented for a variety of reasons such as protecting shareholder interests, retaining competent management and shielding against hostile takeovers. Therefore, hypothesis 7B is rejected due to contrasting evidence.

The firm-FE regressions produce significant coefficients for ρ in relation to *LowValueGP* (low-value firms with golden parachute) and *MValueGPill* (firm value with golden parachute and poison pill). A negative and statistically significant (at the 1% level) coefficient of -29.59 is estimated for the correlation between ρ and low market value of firms with a golden parachute. This coefficient translates to a decrease in a firms' market value by $295,900 per 1% increase in a CEO's risk-avoidance level (lagged ρ regression also estimates a negative, but smaller coefficient of -22.12). This result is consistent with the assumptions of the model that if a CEO's risk-avoidance level is high, he/she will ignore risky, but value maximizing projects that are beneficial to shareholders. Most notably, this result contradicts the findings in table 2 (positive correlation with ρ and firm market value); inclusion of a golden parachute clause has entirely negated the relationship. This finding also contrasts from the contentions of Bebchuk et al. (2008), where the author argues that risk-loving managers seek hostile acquisitions in order to activate their golden parachute clause, thus decreasing firm value as a consequence. thus, risk-seeking managers seem to be benefiting rather than financially harming firms with a golden parachute. I find no evidence to support hypothesis 7C.

Regression (10) reveals a negative and significant ρ coefficient of -327.2 in relation to market value of firms with a golden parachute and a poison pill clause. This coefficient translates to a decrease in firm market value by $3.272 million per 1% increase in ρ. Not only is this coefficient about 10 times larger than the coefficient in regression (7), it also contends against the theorem that entrenched managers [with golden parachute and poison pill clauses] decrease firm value due to expensive contracting, risk-seeking strategies and extraction of private benefits. This negative coefficient implies that firms with such clauses are better-suited to handle riskier projects and require competent managers that are able to deliver firm value from their risk-seeking decisions. It is difficult to infer that this negative relation will hold for highly negative values of ρ, thus the relation is more likely to be non-linear as opposed to linear. Therefore, I reject hypothesis 7D.

Hypothesis 8 postulates the risk avoidance measure to be increasing in CEO tenure. Details of the regressions are presented below:

Table 8

(1) is OLS-CSE regression. (2) is a Year FE regression. (3) is a Firm FE regression.

VARIABLES	(1) ρ (γ = 3)	(2) ρ (γ = 3)	(3) ρ (γ = 3)
CEOTenure	0.0273***	0.0245***	0.0287***
	(0.00562)	(0.00533)	(0.00607)
Firmsize	-0.0370	0.000894	-1.016***
	(0.0225)	(0.0215)	(0.0740)
Leverage	-0.507**	-0.994***	1.321***
	(0.213)	(0.217)	(0.286)
Constant	2.334***	2.727***	9.778***
	(0.196)	(0.200)	(0.589)
Firm FE	NO	NO	YES
Year FE	NO	YES	NO
Firm clusters	YES	YES	YES
Observations	6,774	6,774	6,774
R-squared	0.026	0.204	0.128
Number of company	905	905	905

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

All regressions produce a positive and significant coefficient (including lagged ρ regressions). Regression (2) produces a higher R^2 of 20.4%, with a *CEOTenure* coefficient of 0.0245. This coefficient is interpreted as a 2.45% increase in ρ per additional year of tenure as CEO. The implications of such a coefficient are vast; managers are likely to make less risky investment decisions as tenure increases in order to act in the interests of shareholders and preserve firm stability. In addition, managers with higher tenure are more likely to act based on their personal utility of wealth, initiating only low-risk and high NPV projects in order to reduce firm volatility and exposure to firm risk. Tenure of a CEO could explain the level of managerial entrenchment (Dikolli et al. (2011)); As entrenchment increases, the manager avoids high risk and value-creating projects, potentially harming or obstructing growth in firm value. Highly entrenched managers are also likely to pursue actions with a personal agenda that would benefit themselves (and other potential parties) rather than the company as a whole. Based on the regressions above, it is clear that a positive correlation between CEO tenure and ρ exists, with a plausible causal relation based on the managerial entrenchment hypothesis (Weisbach 1988). Therefore, there is sufficient evidence in favour of hypothesis 8.

Hypothesis 9 contends that a CEO's risk avoidance level is increasing in age. The regression details are outlined below:

Table 9

(1) is an OLS regression. (2) is year-FE. (3) is firm-FE.

VARIABLES	(1) ρ (γ = 3)	(2) ρ (γ = 3)	(3) ρ (γ = 3)
Age	0.00813**	0.00503	0.00330
	(0.00411)	(0.00391)	(0.00322)
Firmsize	-0.0841***	-0.0160	-1.123***
	(0.0192)	(0.0183)	(0.0717)
Leverage	-0.0313	-0.451**	1.046***
	(0.186)	(0.191)	(0.321)
Constant	2.261***	2.920***	10.58***
	(0.259)	(0.266)	(0.568)
Firm FE	NO	NO	YES
Year FE	NO	YES	NO
Firm clusters	YES	YES	YES
Observations	6,673	6,673	6,673
R-squared	0.009	0.209	0.120
Number of company	1,110	1,110	1,110

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Serfling (2014) contends CEO age to be negatively correlated with risk-seeking behaviour. The OLS-CSE coefficient produces a significant result in-line with hypothesis 9, but it cannot be used for inference as it may be subject to endogeneity bias (additionally, a weak R^2 of 0.9% cannot conclude any causal relationship). Such bias may arise from omitted managerial traits such as ethnicity and educational background, or changes in capital structure or ownership of the firm, or may arise from incorrect assumptions of the model such as efficient contracting and relative risk aversion. Both firm-FE and year-FE regressions produce positive, but insignificant coefficients. Thus, either the estimated coefficients suffer from a large bias, or the assumptions of the model are incorrect for obtaining a negative correlation between CEO age and ρ. Therefore, I find insufficient evidence to support hypothesis 9.

Hypothesis 10 investigates the relation between different metrics of institutional ownership and the risk avoidance measure; presence of a 5% blockholder, number of 5% blockholders and total institutional ownership are posited to be negatively correlated with the risk avoidance measure. Regression details are outlined below:

Table 10

(1), (4) and (7) refer to OLS regressions. (2), (5) and (8) are Year FE regressions. (3), (6) and (9) are Firm FE regressions.

VARIABLES	(1) ρ (γ = 3)	(2) ρ (γ = 3)	(3) ρ (γ = 3)	(4) ρ (γ = 3)	(5) ρ (γ = 3)	(6) ρ (γ = 3)	(7) ρ (γ = 3)	(8) ρ (γ = 3)	(9) ρ (γ = 3)
Blockholder	-0.457***	-0.137	-0.171**						
	(0.0899)	(0.0876)	(0.0760)						
NumOfBlock				-0.205***	-0.0712***	-0.119***			
				(0.0185)	(0.0190)	(0.0183)			
Ownership							-1.695***	-0.486**	-1.899***
							(0.197)	(0.198)	(0.260)
Firmsize	-0.115***	-0.0318*	-1.228***	-0.165***	-0.0554**	-1.217***	-0.0935***	-0.0302	-1.044***
	(0.0198)	(0.0192)	(0.0630)	(0.0224)	(0.0220)	(0.0669)	(0.0211)	(0.0200)	(0.0718)
Leverage	-0.136	-0.671***	1.255***	0.00277	-0.585***	1.498***	-0.436**	-0.729***	0.965***
	(0.186)	(0.193)	(0.270)	(0.208)	(0.215)	(0.289)	(0.208)	(0.211)	(0.285)
Constant	3.502***	3.492***	11.80***	3.945***	3.777***	11.82***	4.220***	3.775***	11.66***
	(0.193)	(0.191)	(0.488)	(0.205)	(0.208)	(0.519)	(0.242)	(0.230)	(0.517)
Firm FE	NO	NO	YES	NO	NO	YES	NO	NO	YES
Year FE	NO	YES	NO	NO	YES	NO	NO	YES	NO
Firm clusters	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	8,522	8,522	8,522	7,781	7,781	7,781	7,781	7,781	7,781
R-squared	0.020	0.215	0.148	0.049	0.224	0.160	0.051	0.223	0.167
Number of company	1,021	1,021	1,021	917	917	917	917	917	917

Robust standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

In order to account for differences in firm governance structures, it is best to evaluate hypothesis 10 based on firm-FE regressions. Presence of a 5% blockholder explains a decrease in ρ by 17.1% (lagged ρ regression estimates a more negative coefficient of -0.206). This coefficient emerges significant in contrast to the findings of Breugom (2016). To buttress this finding, number of 5% blockholders is also negatively correlated with ρ at a coefficient of -0.119. Thus, a 1 person increase in number of blockholders yields a -11.9% decrease in ρ. This result supports the theorems of Hirschman (1970) that large shareholders are able to better exert corporate governance through mechanisms of "voice" and "exit". Large shareholders are incentivized to better monitor management in order to maximize the value of their shares. Consequently, blockholders are able to influence the manager to undertake risky, but high NPV and value-creating projects. Therefore, I find evidence in-line with hypothesis 10A.

Total institutional ownership is also negatively correlated with ρ at a coefficient of -1.899; signifying a decrease in ρ by -1.899% per 1% increase in total institutional ownership (lagged ρ regression yields a similarly negative coefficient of -1.927). This coefficient is larger in magnitude, but consistent with the findings of Breugom (2016). Managers are plausibly more incentivized to induce effort, increase rates of return and maximize firm value when institutions hold majority equity stakes within the firm. Therefore, I find evidence in favour of hypothesis 10B.

Hypothesis 11 is related to the institutional ownership theorem. I expect a positive relation between ρ and independent blockholders on board (IDBs), and an insignificant relation between ρ and dependent blockholders on board (DBs). Details of the regressions are presented below:

Table 11

(1) and (4) are OLS regressions. (2) and (5) are year-FE regressions. (3) and (6) are firm-FE regressions.

VARIABLES	(1) ρ (γ = 3)	(2) ρ (γ = 3)	(3) ρ (γ = 3)	(4) ρ (γ = 3)	(5) ρ (γ = 3)	(6) ρ (γ = 3)
IDB	0.618**	0.216	0.340*			
	(0.309)	(0.305)	(0.180)			
DB				0.743***	0.424***	0.376***
				(0.0893)	(0.0852)	(0.0674)
Firmsize	-0.0744***	-0.0187	-1.069***	-0.0666***	-0.0149	-1.056***
	(0.0179)	(0.0173)	(0.0571)	(0.0179)	(0.0173)	(0.0572)
Leverage	-0.408**	-0.919***	1.035***	-0.381**	-0.902***	1.038***
	(0.177)	(0.182)	(0.247)	(0.175)	(0.181)	(0.245)
Constant	2.849***	3.148***	10.45***	2.754***	3.115***	10.34***
	(0.147)	(0.153)	(0.444)	(0.146)	(0.153)	(0.444)
Firm FE	NO	NO	YES	NO	NO	YES
Year FE	NO	YES	NO	NO	YES	NO
Firm clusters	YES	YES	YES	YES	YES	YES
Observations	10,116	10,116	10,116	10,116	10,116	10,116
R-squared	0.010	0.197	0.123	0.018	0.200	0.126
Number of company	1,126	1,126	1,126	1,126	1,126	1,126

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Regressions (3) and (6) include firm-FE and estimate positive, significant coefficients for independent and dependent blockholders on board. Starting with *IDB*, the presence of a 1% independent blockholder on board increases ρ by 34%. This result is in line with expectations from the findings of Agarwal and Nasser (2012) that the presence of an IDB leads to higher valuation and lower firm risk by challenging risky investment decisions. With such a presence on board, the CEO is urged to make smart and slightly risky investment decisions that will ameliorate firm performance and maximize firm value. The lagged ρ regression produces a positive, but larger coefficient of 0.444, thus providing further support to this hypothesis. Therefore, I find sufficient evidence supporting hypothesis 11A.

Hypothesis 11B specifically pertains to DBs – the presence of a 1% dependent blockholder on board explains a 37.6% increase in ρ. Not only is such a correlation statistically significant at the 1% level, the R^2 and magnitude of the coefficient is higher for *DB* than for *IDB*. This result suggests that DBs have similar exertion of governance compared to that of IDBs. Although dependent blockholders may be more subject to pursue personal agendas than independent blockholders, the result implies that DBs make the CEO more risk-avoiding than IDBs. This is inconsistent with the assumptions that DBs are only concerned with their equity stakes and want to see their shares grow as much as possible with risky, but high NPV projects. The fact that all three regressions for hypothesis 11B produce significantly positive coefficients insinuates that either there is a major confounding factor missing in the structural model, or the assumptions of DBs are erroneous. Holderness (2003) and Shleifer and Vishny (1986) provide evidence that blockholders can exert their influence on management to conduct more optimal investment decisions that create firm value. The lagged ρ regression produces a similarly positive, but smaller coefficient of 0.326. Therefore, hypothesis 11B is rejected due to contrasting evidence.

Hypothesis 12 relates different metrics of dividend payments to the risk avoidance measure. Results of the regressions are outlined below:

Table 12A

(1), (4) and (7) refer to OLS regressions. (2), (5) and (8) are Year FE regressions. (3), (6) and (9) are Firm FE regressions.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	DPAY	DPAY	DPAY	DivYield	DivYield	DivYield	DOA	DOA	DOA
ρ ($\gamma = 3$)	-0.0210***	-0.0234***	-0.0157***	-0.00107***	-0.00115***	-0.000266	-0.00110***	-0.000832***	-0.00160***
	(0.00322)	(0.00395)	(0.00317)	(0.000312)	(0.000380)	(0.000307)	(0.000256)	(0.000287)	(0.000467)
Firmsize	0.0459***	0.0460***	0.00944	0.00151***	0.00146***	0.00189**	0.000436	0.000302	-0.00111
	(0.00413)	(0.00418)	(0.0103)	(0.000427)	(0.000432)	(0.000916)	(0.000394)	(0.000413)	(0.000871)
Leverage	0.131***	0.123**	0.0431	0.0396***	0.0378***	0.0514***	-0.0120***	-0.0118***	0.00156
	(0.0505)	(0.0512)	(0.0463)	(0.00817)	(0.00790)	(0.0162)	(0.00349)	(0.00357)	(0.00838)
Constant	-0.127***	-0.0247	0.160*	0.000202	0.00108	-0.00642	0.0144***	0.0189***	0.0254***
	(0.0333)	(0.0369)	(0.0815)	(0.00389)	(0.00377)	(0.00853)	(0.00342)	(0.00345)	(0.00668)
Firm FE	NO	NO	YES	NO	NO	YES	NO	NO	YES
Year FE	NO	YES	NO	NO	YES	NO	NO	YES	NO
Firm clusters	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	9,164	9,164	9,164	7,748	7,748	7,748	9,978	9,978	9,978
R-squared	0.064	0.073	0.007	0.022	0.028	0.007	0.008	0.018	0.008
Number of company	1,122	1,122	1,122	913	913	913	1,122	1,122	1,122

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Regression (2), (5) and (8) produce negative and statistically significant coefficients at the 1% level. As ρ increases by 1%, dividend payout ratio decreases by -0.0234%. As a CEO's risk avoidance level goes up, the level of total dividends to net income decreases. Since a negative relation between ρ and net income has already been established, this implies that total dividends are decreasing at a rate faster than net income. The lagged ρ regression produces a similar coefficient of -0.0212. Dividend yields are also decreasing in ρ, at a rate of -0.001 or -0.001% per 1% increase in ρ. Despite the miniscule coefficient, an increase in the CEO's risk avoidance level evokes a negative in dividend yield, either through an increase in the stock price (supported by empirical results of stock price volatility) or a reduction in dividends per share. Finally, *DOA* is negatively correlated with ρ at a coefficient of -0.0008. Although this coefficient infinitesimally small, it implies that either assets are increasing (supported by empirical results of change in net assets) or dividends are decreasing, or both. It is possible that a high level of risk avoidance will lead to poor firm performance, resulting in a lower level of dividends for shareholders and investors. Therefore, I find evidence that is in-line with hypothesis 12A.

Hypothesis 12B posits a positive correlation with ρ and present value of aggregate accumulated benefits. The regression details are outlined below:

Table 12B

Regression (1) and (4) is OLS. Regression (2) and (5) is year-FE. Regression (3) and (6) is firm-FE.

VARIABLES	(1) PV	(2) PV	(3) PV	(4) PV	(5) PV	(6) PV
ρ (γ = 3)	13.39	41.82	-97.19			
	(64.82)	(68.76)	(65.91)			
ρ_{t-1} (γ = 3)				-50.71	-11.06	-249.5***
				(74.42)	(78.20)	(94.09)
Firmsize	395.2***	387.7***	777.3**	424.5***	413.1***	718.6*
	(68.13)	(68.48)	(311.4)	(78.23)	(77.40)	(380.8)
Leverage	23.44	28.84	-649.0	86.38	28.28	-1,322
	(595.4)	(604.1)	(1,214)	(664.7)	(668.8)	(1,451)
Constant	-1,777***	-1,997***	-4,812*	-1,841***	-2,096***	-3,809
	(564.9)	(591.5)	(2,744)	(648.8)	(676.8)	(3,325)
Firm FE	NO	NO	YES	NO	NO	YES
Year FE	NO	YES	NO	NO	YES	NO
Firm clusters	YES	YES	YES	YES	YES	YES
Observations	2,502	2,502	2,502	2,077	2,077	2,077
R-squared	0.029	0.033	0.004	0.030	0.036	0.009
Number of company	550	550	550	528	528	528

Robust standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Regressions (1) – (3) connote the present value of aggregate accumulated benefits to be uncorrelated with the risk avoidance measure. The positive coefficient from year-FE and negative coefficient from firm-FE suggest that there are confounding factors that are able to strongly influence this correlation. Lagged ρ on the other hand, produces a statistically significant coefficient in regression (6) of -249.5. This coefficient suggests that a 1% increase in ρ will yield a decrease in PV by \$2,495; PV seems to act like a risk-taking incentive for a CEO as the more risk he undertakes, the larger his present value accumulation of benefits. Thus, practitioners could perhaps better incentivise managers to take risks with larger pension plans rather than with stock options. Although such a method may be costlier to shareholders, it could also prove to be a more optimal mechanism for risk-taking incentives and efficient contracting than stocks and stock options. Therefore, there is no evidence in favour of hypothesis 12B.

5.3 Behavioural Finance

Hypothesis 13 focuses on whether gender creates a difference in a manager's level of risk-aversion in corporate strategy. I expect a female CEO to be more risk-averse and thus be positively correlated with the risk avoidance measure. Table 13 portrays regression details below:

Table 13

(1) is an OLS regression. (2) is year-FE. (3) is firm-FE.

VARIABLES	(1) ρ (γ = 3)	(2) ρ (γ = 3)	(3) ρ (γ = 3)
Female	-0.476**	-0.137	-0.738**
	(0.187)	(0.182)	(0.309)
Firmsize	-0.0777***	-0.0198	-1.068***
	(0.0180)	(0.0173)	(0.0574)
Leverage	-0.409**	-0.919***	1.046***
	(0.178)	(0.182)	(0.249)
Constant	2.888***	3.157***	10.46***
	(0.148)	(0.154)	(0.445)
Firm FE	NO	NO	YES
Year FE	NO	YES	NO
Firm clusters	YES	YES	YES
Observations	10,116	10,116	10,116
R-squared	0.011	0.197	0.125
Number of company	1,126	1,126	1,126

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Controlling for individual firm characteristics, the firm-FE regression produces a statistically significant and negative coefficient of -0.738. This result implies that when the CEO is a female (*Female* equals 1), the risk avoidance measure decreases by 73.8%. This result is consistent with evidence from the sample; the overall mean ρ is 2.20%, but falls to 1.77% if the CEO is a female. However, the results from regressions (1) and (3) are highly inconsistent with literature from psychology (Bruce and Johnson (2014)) and from finance (Sundén and Surette (1998)) that women exhibit lower tendencies to be risk-loving compared to men. In addition, females have a smaller range of risk-taking behaviour (7%) compared to men (30%), thus making female CEOs less volatile in their risk-aversion to investment decisions. Therefore, there is no evidence in favour of hypothesis 13 and the hypothesis is consequently rejected.

Hypothesis 14A tests the results of Hirshleifer et al. (2012) by using the risk avoidance measure as a proxy for CEO-overconfidence and positing a negative correlation between ρ and R&D expenditure scaled by total assets (RDA) in innovative industries. Hypothesis 14A posits an insignificant correlation between ρ and RDA in non-innovative industries. Regression details are presented below:

Table 14

(1) and (4) are OLS regressions. (2) and (5) are year-FE. (3) and (6) are firm-FE.

VARIABLES	(1) RDA	(2) RDA	(3) RDA	(4) RDA	(5) RDA	(6) RDA
innovgamma	0.000595	0.000240	-0.00257*			
	(0.00110)	(0.00135)	(0.00134)			
noninnovgamma				-0.000555**	-0.000716***	-0.00007
				(0.000211)	(0.000254)	(0.000131)
Firmsize	-0.00935***	-0.00940***	-0.0302***	0.000318	0.000401	-0.000250
	(0.00215)	(0.00223)	(0.00860)	(0.000729)	(0.000768)	(0.000478)
Leverage	-0.132***	-0.137***	0.0322	0.0100	0.00922	-0.00853***
	(0.0284)	(0.0291)	(0.0310)	(0.00787)	(0.00835)	(0.00289)
Constant	0.150***	0.148***	0.293***	0.000455	0.00238	0.00611
	(0.0161)	(0.0173)	(0.0628)	(0.00532)	(0.00471)	(0.00399)
Firm FE	NO	NO	YES	NO	NO	YES
Year FE	NO	YES	NO	NO	YES	NO
Firm clusters	YES	YES	YES	YES	YES	YES
Observations	2,371	2,371	2,371	348	348	348
R-squared	0.138	0.144	0.149	0.099	0.128	0.120
Number of company	288	288	288	52	52	52

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Both independent variables are interaction terms connoting CEO overconfidence in innovative and non-innovative industries. Regression (3) illustrates a negative coefficient of -0.00257 for *innovgamma*, implying a decrease in *RDA* by 0.003% per 1% increase in a CEO's risk avoidance level in innovative industries. This result is compatible with the findings of Hirshleifer et al. (2012) that CEO overconfidence leads to greater risk-taking and capital in investments. Therefore, there is evidence in favour of hypothesis 14A. For non-innovative industries, the firm-FE regression produces an insignificant coefficient (consistent with hypothesis 14B), however the relation turns significant when estimated with year-FE (lagged ρ regression produces similarly negative coefficients). It is possible that a minuscule negative relation exists also in non-innovative industries, which contends against the results of Hirshleifer et al. (2012). It is also possible that *noninnovgamma* is insignificant in the firm-FE regression due to lack of sufficient data (52 firms). Concluding with only firm-FE analyses, no statistically significant relation holds and there is insufficient evidence in favour of hypothesis 14B.

Chapter 6. Robustness Checks

The level of relative risk aversion (γ = 3) is the biggest assumption made in the analysis of empirical results of the risk avoidance measure. The risk avoidance level of a CEO increases in the value of γ; the table below outlines this relationship with summary statistics for γ = 1, 3 and 6.

Table 15

Variable	Observations	Mean	Median	Std. Dev.	Minimum	Maximum
ρ **(γ = 1)**	11385	.920	.724	1.062	-3.703	26.378
ρ **(γ = 3)**	11385	2.203	1.888	1.640	-3.413	26.787
ρ **(γ = 6)**	11385	3.219	2.856	2.069	-3.211	51.496

Table 14 delineates an increasing mean for *ρ* as relative risk aversion increases. A CEO has a high risk avoidance level of 3.219% with (γ = 6) and a low risk avoidance level of 0.920% with (γ = 1). With a sample consisting of mainly moderate to large sized companies, CEOs are likely to be more risk-taking (low relative risk aversion) than CEOs of smaller companies due to the lower probability of financial distress. Therefore, robustness checks are conducted for *ρ* (γ = 1) using only firm-FE regressions.

6.1 Robustness checks (regressions)

Regressions of hypotheses 1A and 1B are shown below:

Table 16

VARIABLES	(1) ROA	(2) ROE	(3) TBQ	(4) assetchg	(5) salechg	(6) nichg
ρ (γ = 1)	-0.467***	-0.521*	0.0721***	2.542***	0.954***	-11.87***
	(0.165)	(0.268)	(0.0147)	(0.481)	(0.273)	(2.010)
Firmsize	1.118***	0.317	-0.250***	8.541***	0.454	-8.778**
	(0.365)	(0.575)	(0.0280)	(1.114)	(0.587)	(3.541)
Leverage	-27.47***	-36.38***	-3.419***	-10.33*	-26.34***	-334.4***
	(2.111)	(3.501)	(0.131)	(5.315)	(3.006)	(25.93)
Constant	0.535	15.03***	3.701***	-57.12***	8.989*	143.4***
	(2.885)	(4.590)	(0.223)	(8.931)	(4.677)	(28.64)
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	NO	NO	NO	NO	NO	NO
Firm clusters	YES	YES	YES	YES	YES	YES
Observations	10,116	9,707	9,012	10,116	9,919	8,575
R-squared	0.071	0.040	0.252	0.019	0.016	0.049
Number of company	1,126	1,120	1,114	1,126	1,126	1,111

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The results from chapter 5 relating to hypothesis 1A are different from the results in table 16. *ROA* and *ROE* both emerge negative and statistically significant, which is in-line with the contentions of hypothesis 1A. The insignificance of *ROA* and *ROE* in table 1A perhaps explain the non-sensibility of the model in regards to relative risk aversion. Therefore, the results from table 1A are not robust to a change in γ. Results from table 1B are robust to a change in γ.

Regressions of hypothesis 2 are outlined below in table 17:

Table 17

VARIABLES	(1) MV	(2) MVlow	(3) MVhigh
ρ (γ = 1)	0.0105	0.0492***	-0.0329***
	(0.00841)	(0.0131)	(0.0102)
Firmsize	0.835***	0.824***	0.880***
	(0.0200)	(0.0314)	(0.0225)
Leverage	-3.742***	-4.939***	-3.768***
	(0.136)	(0.265)	(0.138)
Constant	1.761***	1.860***	1.449***
	(0.156)	(0.239)	(0.185)
Firm FE	YES	YES	YES
Year FE	NO	NO	NO
Firm clusters	YES	YES	YES
Observations	9,195	4,560	4,635
R-squared	0.569	0.464	0.649
Number of company	1,114	788	826

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Results from table 17 are not robust to a change in γ as the coefficients for ρ differ in significance for *MV* and *MVhigh*. Only hypothesis 2B (MVlow) is robust to a change in γ.

Regressions of hypothesis 3 are portrayed below in table 18:

Table 18

VARIABLES	(1) ROI	(2) NetIncome
ρ ($\gamma = 1$)	-0.00150	-73.66***
	(0.00137)	(26.18)
Firmsize	0.00697**	401.0***
	(0.00316)	(66.77)
Leverage	-0.325***	-1,133***
	(0.0158)	(200.5)
Constant	0.0768***	-2,426***
	(0.0245)	(515.2)
Firm FE	YES	YES
Year FE	NO	NO
Firm clusters	YES	YES
Observations	8,134	9,373
R-squared	0.125	0.032
Number of company	1,008	1,122

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Results from table 18 are robust to a change in γ, with net income becoming more negative, revealing a stronger correlation between ρ and net income when changing relative risk aversion.

Regressions of hypothesis 4 are outlined below:

Table 19

VARIABLES	(1) SharePriceVol
ρ ($\gamma = 1$)	0.0232***
	(0.00361)
Firmsize	-0.0184***
	(0.00676)
Leverage	0.115**
	(0.0450)
Constant	0.506***
	(0.0537)
Firm FE	YES
Year FE	NO
Firm clusters	YES
Observations	5,625
R-squared	0.044
Number of company	1,053

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The result from table 19 is robust to a change in γ, yielding a larger magnitude in the coefficient compared to table 4.

Regressions of hypothesis 5 are portrayed below:

Table 20

VARIABLES	(1) Total Dividends
ρ ($\gamma = 1$)	-12.33***
	(4.004)
Firmsize	118.6***
	(11.70)
Leverage	-31.39
	(34.55)
Constant	-801.3***
	(96.72)
Firm FE	YES
Year FE	NO
Firm clusters	YES
Observations	6,379
R-squared	0.113
Number of company	824

Robust standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

The result from table 20 is robust to a change in γ, with a more negative coefficient for ρ compared to table 5.

Regressions of hypothesis 6 are delineated below:

Table 21

VARIABLES	(1) RNDX	(2) OPRX	(3) DIVERSE
ρ ($\gamma = 1$)	-25.89**	-171.3	0.00289
	(10.72)	(113.1)	(0.00267)
Firmsize	187.1***	4,333***	0.0252***
	(42.08)	(646.4)	(0.00660)
Leverage	-15.81	-887.4	-0.0632*
	(70.68)	(1,267)	(0.0373)
Constant	-1,130***	-27,672***	-0.115**
	(315.3)	(4,944)	(0.0514)
Firm FE	YES	YES	YES
Year FE	NO	NO	NO
Firm clusters	YES	YES	YES
Observations	5,153	9,462	10,116
R-squared	0.085	0.078	0.003
Number of company	637	1,121	1,126

Robust standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Results from table 21 are robust to a change in γ, except for operating expenses. The significantly negative coefficient from table 6 is still negative, but no longer significant after a change in relative risk aversion.

Regressions of hypothesis 7 are outlined below:

Table 22

VARIABLES	(1) ppill	(2) gparachute	(3) mvlowgp	(4) mvgpill
ρ ($\gamma = 1$)	-0.00923**	-0.0561***	-44.31***	-616.1***
	(0.00362)	(0.00765)	(14.77)	(219.8)
Firmsize	0.124***	0.320***	738.1***	4,943***
	(0.0111)	(0.0147)	(65.60)	(1,268)
Leverage	0.0775*	-0.133*	-2,100***	-19,387***
	(0.0446)	(0.0719)	(283.4)	(5,998)
Constant	-0.893***	-2.214***	-3,864***	-29,013***
	(0.0871)	(0.116)	(446.8)	(9,193)
Firm FE	YES	YES	YES	YES
Year FE	NO	NO	NO	NO
Firm clusters	YES	YES	YES	YES
Observations	10,116	10,116	976	591
R-squared	0.063	0.188	0.363	0.136
Number of company	1,126	1,126	337	235

Robust standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Regressions (1) and (2) are no longer estimated using probit, therefore firm-FE are allowed to be used for estimating the variables. All results in table 22 are robust to a change in γ, with smaller regression coefficients in the poison pill and golden parachute regressions compared to table 7, but much larger and negative coefficients for firm value with golden parachute and firm value with golden parachute and poison pill regressions. A 1% decrease in ρ now increases firm value with golden parachute and poison pill clauses by $6.161 million, and increases firm value with golden parachutes by $443,100.

Regressions of hypothesis 8 are shown below:

Table 23

VARIABLES	(1) ρ ($\gamma = 1$)
CEOTenure	0.0153***
	(0.00340)
Firmsize	-0.584***
	(0.0467)
Leverage	0.869***
	(0.184)
Constant	5.267***
	(0.372)
Firm FE	YES
Year FE	NO
Firm clusters	YES
Observations	6,774
R-squared	0.098
Number of company	905

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The result from table 23 is robust to a change in γ, although the coefficient has decreased in magnitude compared to the coefficient in table 8.

Regressions of hypothesis 9 are depicted below:

Table 27

VARIABLES	(1) ρ ($\gamma = 1$)
Age	0.00109
	(0.00194)
Firmsize	-0.661***
	(0.0441)
Leverage	0.860***
	(0.221)
Constant	5.864***
	(0.352)
Firm FE	YES
Year FE	NO
Firm clusters	YES
Observations	6,673
Number of company	1,110
R-squared	0.090

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The result in table 27 is robust to a change in γ.

Regressions of hypothesis 10 are outlined below:

Table 24

VARIABLES	(1) ρ ($\gamma = 1$)	(2) ρ ($\gamma = 1$)	(3) ρ ($\gamma = 1$)
Blockholder	-0.0930**		
	(0.0466)		
NumOfBlock		-0.0763***	
		(0.0120)	
Ownership			-1.215***
			(0.164)
Firmsize	-0.706***	-0.696***	-0.586***
	(0.0381)	(0.0403)	(0.0439)
Leverage	0.923***	1.079***	0.738***
	(0.181)	(0.195)	(0.192)
Constant	6.391***	6.399***	6.299***
	(0.296)	(0.313)	(0.311)
Firm FE	YES	YES	YES
Year FE	NO	NO	NO
Firm clusters	YES	YES	YES
Observations	8,522	7,781	7,781
R-squared	0.115	0.126	0.133
Number of company	1,021	917	917

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Results from table 24 are robust to a change in γ. All of the coefficients are smaller in magnitude compared to the coefficients in table 10.

Regressions of hypothesis 11 are portrayed below:

Table 25

VARIABLES	(1) ρ ($\gamma = 1$)	(2) ρ ($\gamma = 1$)
IDB	0.172	
	(0.108)	
DB		0.209***
		(0.0443)
Firmsize	-0.625***	-0.618***
	(0.0361)	(0.0362)
Leverage	0.764***	0.766***
	(0.171)	(0.170)
Constant	5.719***	5.651***
	(0.282)	(0.284)
Firm FE	YES	YES
Year FE	NO	NO
Firm clusters	YES	YES
Observations	10,116	10,116
R-squared	0.094	0.096
Number of company	1,126	1,126

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Regression (2) in table 25 connotes a robust result for *DB* for a change in γ. However, *IDB* fails to be robust to a change in γ as the coefficient emerges insignificant.

Regressions of hypothesis 12 are shown below:

Table 26

VARIABLES	(1) DPAY	(2) DivYield	(3) DOA	(4) PV
ρ (γ = 1)	-0.0241***	-0.00006	-0.00204***	-134.9
	(0.00512)	(0.000540)	(0.000661)	(90.98)
Firmsize	0.0110	0.00218**	-0.000665	788.8**
	(0.0102)	(0.000906)	(0.000817)	(309.5)
Leverage	0.0450	0.0511***	0.00146	-629.0
	(0.0463)	(0.0162)	(0.00842)	(1,224)
Constant	0.134*	-0.00919	0.0203***	-4,993*
	(0.0798)	(0.00828)	(0.00598)	(2,708)
Firm FE	YES	YES	YES	YES
Year FE	NO	NO	NO	NO
Firm clusters	YES	YES	YES	YES
Observations	9,164	7,748	9,978	2,502
R-squared	0.008	0.007	0.006	0.004
Number of company	1,122	913	1,122	550

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

All results in table 26 are robust to a change in γ. The magnitude of the coefficients is larger for *DPAY* and *DOA* compared to the coefficients in table 12.

Regressions of hypothesis 13 are depicted below:

Table 28

VARIABLES	(1) ρ (γ = 1)
Female	-0.443**
	(0.195)
Assets	-0.624***
	(0.0362)
ML	0.771***
	(0.172)
Constant	5.720***
	(0.283)
Firm FE	YES
Year FE	NO
Firm clusters	YES
Observations	10,116
Number of company	1,126
R-squared	0.095

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The result in table 28 is robust to a change in γ.

Regressions of hypothesis 14 are depicted below:

Table 29

VARIABLES	(1) RDA	(2) RDA
Innovgamma (γ=1)	-0.00336*	
	(0.00181)	
Noninnovgamma (γ=1)		9.18e-05
		(0.000159)
Assets	-0.0295***	-0.000274
	(0.00831)	(0.000434)
ML	0.0312	-0.00847***
	(0.0306)	(0.00288)
Constant	0.285***	0.00636*
	(0.0596)	(0.00355)
Observations	2,371	348
R-squared	0.147	0.119
Number of company	288	52

Robust standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Results in table 29 are robust to a change in γ.

6.2 Sample selection bias

The dataset provided by Dittmann et al. (2015) contains moderate survivorship bias as the sample contains CEOs who are covered on the Execucomp database for at least five years. Additionally, I exclude firms with less than 5 years of data in order to mitigate biased estimates resulting from insufficient observations. However, this exclusion of firms only increases the survivorship bias in the sample, and thus smaller firms are underrepresented in the dataset, CEOs have lower option holdings relative to number of shares outstanding, and salaries of CEOs are much higher due to larger firm size.

6.3 Endogeneity bias

The endogeneity problem transpires when the explanatory variable is correlated with the error term in a regression model. The models I utilize[20] may be subject to endogeneity bias such as changes in capital structure, ownership, agendas of shareholders, and agendas of management. A good instrument (IV) can mitigate the problem of endogeneity, however in practice it is extremely difficult to find a good instrument (Renders and Gaeremynck (2006)). Reverse causality is another concern for testing firm performance and governance variables: Good firm performance can influence

[20] Shown in Appendix B

governance structures, however bad governance structures can also influence firm performance (Bhagat and Black (2002)). Therefore, it is problematic to conclude a causal relationship in the firm performance regressions.

Chapter 7. Conclusion & Remarks

The risk avoidance measure (ρ) has various empirical implications in the disciplines of corporate finance, corporate governance, and behavioural finance. In corporate finance, I find ambiguous evidence for firm performance: a positive relation holds for Tobin's Q and change in sales, however a negative relation is found for change in net income and net income. This seems to imply that the assumptions of the model are not sensible for certain firm parameters, or perhaps the structural models suffer from endogeneity bias which yields the opposite negative relation. Examples of biases may include changes in capital structure, changes in shareholder interests and changes in ownership. Despite empirical evidence suggesting that stock options provide incentives to managers to take less risk (DeFusco et al. (199)), stock price volatility increases with ρ. This result implies that either the risk avoidance measure cannot explain this relation, or that stock options do not suffice as viable tools for risk-taking incentives. The negative relation between present value of aggregate accumulated benefits and ρ suggests that lucrative pension plans may be a more optimal tool for incentivizing managers to be less risk-avoiding.

A handful of corporate governance variables held consistent results with empirical literature, specifically presence of a 5% blockholder, number of blockholders, total institutional ownership, CEO tenure and presence of a 1% independent blockholder. Blockholders and institutional owners hold a negative relation with ρ, implying that as institutions increase their share of equity in a company, they are able to better exert influence on management to undertake projects that fit their agenda or undertake projects that are risky, but have very high NPV values. Equity holders usually require greater rates of return as opposed to debt holders. Independent blockholders on board (IDBs) have the opposite relation with regular blockholders, suggesting that an institutional owner on the board can possibly exert more governance than regular institutional owners. IDBs are able to challenge risky investment decisions in order to protect their equity stake, thus likely driving the ρ upwards. Tenure of a CEO also has a significantly positive effect on the CEOs risk avoidance level; such a result could give credence to the managerial entrenchment hypothesis that such managers [with high level of tenure] work to extract private benefits rather than increasing corporate wealth by initiative non-optimal and subjective projects.

Consistent with results from literature, risk-seeking managers incur more expenses than risk-averse managers in the areas of research and development and operating costs. Female CEOs are negatively related to ρ, meaning females are inclined to be more risk-seeking in comparison to male CEOs. In addition, female managers have a much narrower range of 7% for risk-avoidance compared with 30% for males (refer to table B in chapter 3). Finally, the risk avoidance measure seems to be an appropriate proxy for CEO overconfidence, yielding consistent results with Hirshleifer et al. (2012); Overconfident CEOs (low and negative levels of ρ) are positively correlated with greater investments in innovative industries, with no definitive correlation found in non-innovative industries.

In conclusion, there are four most noteworthy empirical results from the entirety of the paper: a 1% decrease in the risk avoidance measure yields an increase in net income by $492,000, an increase in market value of a firm with golden parachute and poison pill clauses by $3.272 million, an increase in research and development expense by $233,200, and the presence of a 1% independent blockholder on the board of directors increases ρ by 34%. Therefore, the conclusions presented in this paper gives the reader an insight into the role of risk-taking incentives in executive compensation, and the implications of the risk avoidance measure on various variables tested across financial literature.

Appendix A

Table 30 – Risk Avoidance in Subsamples[21]

Variable	Subsamples (S1)	Subsamples (S2)	Mean ρ in S1	Mean ρ in S2	T-test	Median ρ in S1	Median ρ in S2	Wilcoxon	Obs. S1	Obs. S2
Market leverage	high	low	1.29	1.45	0.01	1.04	1.20	0.01	849	850
Book leverage	high	low	1.36	1.38	0.68	1.09	1.15	0.88	850	850
Banks	bank	non-bank	1.26	1.39	0.28	0.83	1.16	0.00	135	1393
Market leverage | non-bank	high	low	1.26	1.53	0.00	1.04	1.30	0.00	693	693
Book leverage | non-bank	high	low	1.31	1.48	0.01	1.07	1.23	0.01	693	694
E-Index	high	low	1.45	1.30	0.03	1.22	1.01	0.01	547	976
CC-Ownership	high	low	1.49	1.14	0.00	1.25	0.90	0.00	644	645
Institutional ownership	high	low	1.37	1.33	0.57	1.18	0.97	0.02	772	772
Presence of a 5% blockholder	yes	no	1.37	1.13	0.05	1.11	0.73	0.01	1420	124

Appendix B: Model Regressions

Hypothesis 1A:

$$ROA_{i,t} = \beta_0 + \beta_1 RiskAvoidance_{i,t} + \beta_2 Leverage_{i,t} + \beta_3\, Firmsize + \varepsilon_{i,t}$$

$$ROE_{i,t} = \beta_0 + \beta_1 RiskAvoidance_{i,t} + \beta_2 Leverage_{i,t} + \beta_3\, Firmsize + \varepsilon_{i,t}$$

$$Tobin's\ Q_{i,t} = \beta_0 + \beta_1 RiskAvoidance_{i,t} + \beta_2 Leverage(M)_{i,t} + \beta_3\, Firmsize + \varepsilon_{i,t}$$

Hypothesis 1B:

$$\Delta Sales_{i,t} = \beta_0 + \beta_1 RiskAvoidance_{i,t} + \beta_2 Leverage_{i,t} + \beta_3\, Firmsize + \varepsilon_{i,t}$$

$$\Delta Assets_{i,t} = \beta_0 + \beta_1 RiskAvoidance_{i,t} + \beta_2 Leverage_{i,t} + \beta_3\, Firmsize + \varepsilon_{i,t}$$

$$\Delta NetIncome_{i,t} = \beta_0 + \beta_1 RiskAvoidance_{i,t} + \beta_2 Leverage_{i,t} + \beta_3\, Firmsize + \varepsilon_{i,t}$$

Hypothesis 2A:

$$MarketValue_{i,t} = \beta_0 + \beta_1 RiskAvoidance_{i,t} + \beta_2 Leverage_{i,t} + \beta_3\, Firmsize + \varepsilon_{i,t}$$

Hypothesis 2B:

$$MVlow_{i,t} = \beta_0 + \beta_1 RiskAvoidance_{i,t} + \beta_2 Leverage_{i,t} + \beta_3\, Firmsize + \varepsilon_{i,t}$$

Hypothesis 2C:

$$MVhigh_{i,t} = \beta_0 + \beta_1 RiskAvoidance_{i,t} + \beta_2 Leverage_{i,t} + \beta_3\, Firmsize + \varepsilon_{i,t}$$

[21] Source: Dittmann et al. (2015)

Hypothesis 3A:

$$ROI_{i,t} = \beta_0 + \beta_1 RiskAvoidance_{i,t} + \beta_2 Leverage_{i,t} + \beta_3\, Firmsize + \varepsilon_{i,t}$$

Hypothesis 3B:

$$NetIncome_{i,t} = \beta_0 + \beta_1 RiskAvoidance_{i,t} + \beta_2 Leverage_{i,t} + \beta_3\, Firmsize + \varepsilon_{i,t}$$

Hypothesis 4:

$$SharePriceVol_{i,t} = \beta_0 + \beta_1 RiskAvoidance_{i,t} + \beta_2 Leverage_{i,t} + \beta_3\, Firmsize + \varepsilon_{i,t}$$

Hypothesis 5:

$$Total\ Dividends_{i,t} = \beta_0 + \beta_1 RiskAvoidance_{i,t} + \beta_2 Leverage_{i,t} + \beta_3\, Firmsize + \varepsilon_{i,t}$$

Hypothesis 6:

$$RNDX_{i,t} = \beta_0 + \beta_1 RiskAvoidance_{i,t} + \beta_2 Leverage_{i,t} + \beta_3\, Firmsize + \varepsilon_{i,t}$$

$$OPRX_{i,t} = \beta_0 + \beta_1 RiskAvoidance_{i,t} + \beta_2 Leverage_{i,t} + \beta_3\, Firmsize + \varepsilon_{i,t}$$

$$DIVERSE_{i,t} = \beta_0 + \beta_1 RiskAvoidance_{i,t} + \beta_2 Leverage_{i,t} + \beta_3\, Firmsize + \varepsilon_{i,t}$$

Hypothesis 7A:

$$PoisonPill_{i,t} = \beta_0 + \beta_1 RiskAvoidance_{i,t} + \beta_2 Leverage_{i,t} + \beta_3\, Firmsize + \varepsilon_{i,t}$$

Hypothesis 7B:

$$GoldenParachute_{i,t} = \beta_0 + \beta_1 RiskAvoidance_{i,t} + \beta_2 Leverage_{i,t} + \beta_3\, Firmsize + \varepsilon_{i,t}$$

Hypothesis 7C:

$$LowValueGP_{i,t} = \beta_0 + \beta_1 RiskAvoidance_{i,t} + \beta_2 Leverage_{i,t} + \beta_3\, Firmsize + \varepsilon_{i,t}$$

Hypothesis 7D:

$$MValueGPill_{i,t} = \beta_0 + \beta_1 RiskAvoidance_{i,t} + \beta_2 Leverage_{i,t} + \beta_3\, Firmsize + \varepsilon_{i,t}$$

Hypothesis 8:

$$RiskAvoidance_{i,t} = \beta_0 + \beta_1 CEOTenure_{i,t} + \beta_2 Leverage_{i,t} + \beta_3\, Firmsize + \varepsilon_{i,t}$$

Hypothesis 9:

$$RiskAvoidance_{i,t} = \beta_0 + \beta_1 Age_{i,t} + \beta_2 Leverage_{i,t} + \beta_3 \, Firmsize + \varepsilon_{i,t}$$

Hypothesis 10A:

$$RiskAvoidance_{i,t} = \beta_0 + \beta_1 Blockholder_{i,t} + \beta_2 Leverage_{i,t} + \beta_3 \, Firmsize + \varepsilon_{i,t}$$

$$RiskAvoidance_{i,t} = \beta_0 + \beta_1 NumOfBlock_{i,t} + \beta_2 Leverage_{i,t} + \beta_3 \, Firmsize + \varepsilon_{i,t}$$

Hypothesis 10B:

$$RiskAvoidance_{i,t} = \beta_0 + \beta_1 TotalInstOwn_{i,t} + \beta_2 Leverage_{i,t} + \beta_3 \, Firmsize + \varepsilon_{i,t}$$

Hypothesis 11A:

$$RiskAvoidance_{i,t} = \beta_0 + \beta_1 IndpBlock_{i,t} + \beta_2 Leverage_{i,t} + \beta_3 \, Firmsize + \varepsilon_{i,t}$$

Hypothesis 11B:

$$RiskAvoidance_{i,t} = \beta_0 + \beta_1 DepBlock_{i,t} + \beta_2 Leverage_{i,t} + \beta_3 \, Firmsize + \varepsilon_{i,t}$$

Hypothesis 12A:

$$DivYield_{i,t} = \beta_0 + \beta_1 RiskAvoidance_{i,t} + \beta_2 Leverage_{i,t} + \beta_3 \, Firmsize + \varepsilon_{i,t}$$

$$DPAY_{i,t} = \beta_0 + \beta_1 RiskAvoidance_{i,t} + \beta_2 Leverage_{i,t} + \beta_3 \, Firmsize + \varepsilon_{i,t}$$

$$DOA_{i,t} = \beta_0 + \beta_1 RiskAvoidance_{i,t} + \beta_2 Leverage_{i,t} + \beta_3 \, Firmsize + \varepsilon_{i,t}$$

Hypothesis 12B:

$$PensionValue_{i,t} = \beta_0 + \beta_1 RiskAvoidance_{i,t} + \beta_2 Leverage_{i,t} + \beta_3 \, Firmsize + \varepsilon_{i,t}$$

Hypothesis 13:

$$RiskAvoidance_{i,t} = \beta_0 + \beta_1 Female_{i,t} + \beta_2 Leverage_{i,t} + \beta_3 \, Firmsize + \varepsilon_{i,t}$$

Hypothesis 14A:

$$RDA_{i,t} = \beta_0 + \beta_1 Innovgamma_{i,t} + \beta_2 Leverage_{i,t} + \beta_3 \, Firmsize + \varepsilon_{i,t}$$

Hypothesis 14B:

$$RDA_{i,t} = \beta_0 + \beta_1 Noninnovgamma_{i,t} + \beta_2 Leverage_{i,t} + \beta_3 \, Firmsize + \varepsilon_{i,t}$$

Appendix C: Lagged ρ_{t-1} Regressions

Regressions 1A

VARIABLES	(1) ROA	(2) ROA	(3) ROA	(4) ROE	(5) ROE	(6) ROE	(7) TBQ	(8) TBQ	(9) TBQ
ρ_{t-1} (γ = 3)	0.00901	0.0605	-0.0153	0.0975	0.0697	-0.0210	0.0935***	0.0858***	0.0490***
	(0.117)	(0.130)	(0.163)	(0.161)	(0.182)	(0.194)	(0.0135)	(0.0145)	(0.00917)
Assets	0.757***	0.749***	1.602***	1.894***	1.933***	0.931	-0.0711***	-0.0692***	-0.249***
	(0.210)	(0.208)	(0.582)	(0.230)	(0.231)	(0.722)	(0.0155)	(0.0159)	(0.0318)
ML	-19.38***	-18.78***	-28.28***	-24.87***	-24.60***	-37.53***	-3.624***	-3.623***	-3.425***
	(1.167)	(1.169)	(2.404)	(2.067)	(2.071)	(4.053)	(0.152)	(0.158)	(0.147)
Constant	1.533	1.514	-3.579	-0.142	1.466	9.890*	2.182***	2.220***	3.646***
	(1.872)	(2.136)	(4.874)	(1.991)	(2.072)	(5.875)	(0.129)	(0.129)	(0.253)
Firm FE	NO	NO	YES	NO	NO	YES	NO	NO	YES
Year FE	NO	YES	NO	NO	YES	NO	NO	YES	NO
Firm clusters	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	7,781	7,781	7,781	7,468	7,468	7,468	7,222	7,222	7,222
R-squared	0.079	0.093	0.071	0.062	0.080	0.041	0.327	0.336	0.252
Number of company	1,126	1,126	1,126	1,114	1,114	1,114	1,109	1,109	1,109

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Regressions 1B

VARIABLES	(1) assetchg	(2) assetchg	(3) assetchg	(4) salechg	(5) salechg	(6) salechg	(7) nichg	(8) nichg	(9) nichg
ρ_{t-1} (γ = 3)	1.115***	0.864***	1.596***	0.533***	0.672***	-0.0619	-0.243	0.442	-0.692
	(0.192)	(0.198)	(0.251)	(0.161)	(0.165)	(0.206)	(0.975)	(1.076)	(1.688)
Assets	1.423***	1.536***	9.761***	0.475***	0.584***	0.0334	4.228***	4.211***	3.859
	(0.214)	(0.217)	(1.336)	(0.142)	(0.143)	(0.761)	(1.007)	(1.007)	(4.661)
ML	-7.748***	-7.137***	-13.32**	-11.77***	-10.01***	-25.74***	-112.8***	-97.92***	-388.6***
	(2.652)	(2.589)	(6.191)	(1.731)	(1.682)	(3.606)	(12.86)	(12.61)	(32.46)
Constant	-1.917	1.439	-68.07***	5.848***	5.703***	13.08**	-6.889	-27.27**	41.87
	(1.729)	(2.483)	(10.59)	(1.211)	(1.613)	(6.155)	(8.809)	(11.19)	(39.39)
Firm FE	NO	NO	YES	NO	NO	YES	NO	NO	YES
Year FE	NO	YES	NO	NO	YES	NO	NO	YES	NO
Firm clusters	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	7,781	7,781	7,781	7,634	7,634	7,634	6,596	6,596	6,596
R-squared	0.012	0.038	0.022	0.013	0.129	0.013	0.017	0.059	0.050
Number of company	1,126	1,126	1,126	1,126	1,126	1,126	1,098	1,098	1,098

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Regressions 2A, 2B, 2C

VARIABLES	(1) MV	(2) MV	(3) MV	(4) MVlow	(5) MVlow	(6) MVlow	(7) MVhigh	(8) MVhigh	(9) MVhigh
ρ_{t-1} (γ = 3)	0.0509***	0.0462***	0.0299***	0.0888***	0.0668***	0.0424***	0.000858	0.00732	0.0125*
	(0.00897)	(0.0101)	(0.00560)	(0.0134)	(0.0149)	(0.00784)	(0.0107)	(0.0119)	(0.00654)
Assets	0.894***	0.895***	0.855***	0.931***	0.934***	0.840***	0.869***	0.868***	0.889***
	(0.0160)	(0.0161)	(0.0220)	(0.0232)	(0.0229)	(0.0342)	(0.0163)	(0.0164)	(0.0268)
ML	-3.538***	-3.491***	-3.738***	-4.371***	-4.536***	-4.896***	-3.133***	-3.028***	-3.833***
	(0.123)	(0.126)	(0.160)	(0.528)	(0.531)	(0.294)	(0.160)	(0.162)	(0.154)
Constant	1.162***	1.241***	1.550***	0.854***	1.045***	1.672***	1.328***	1.328***	1.346***
	(0.117)	(0.118)	(0.172)	(0.162)	(0.171)	(0.263)	(0.126)	(0.126)	(0.219)
Firm FE	NO	NO	YES	NO	NO	YES	NO	NO	YES
Year FE	NO	YES	NO	NO	YES	NO	NO	YES	NO
Firm clusters	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	7,354	7,354	7,354	3,676	3,676	3,676	3,678	3,678	3,678
R-squared	0.794	0.799	0.572	0.766	0.774	0.467	0.832	0.837	0.661
Number of company	1,110	1,110	1,110	762	762	762	792	792	792

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Regressions 3A, 3B

VARIABLES	(1) ROI	(2) ROI	(3) ROI	(4) NetIncome	(5) NetIncome	(6) NetIncome
ρ_{t-1} (γ = 3)	-0.000325	0.000288	-0.000136	-22.50	-15.15	-50.47***
	(0.00127)	(0.00140)	(0.00182)	(21.20)	(25.61)	(18.34)
Assets	0.0104***	0.0103***	0.0198***	542.9***	540.9***	430.9***
	(0.00223)	(0.00221)	(0.00623)	(91.78)	(92.50)	(63.89)
ML	-0.217***	-0.210***	-0.319***	-2,268***	-2,228***	-1,018***
	(0.0122)	(0.0123)	(0.0251)	(498.7)	(507.2)	(193.6)
Constant	-0.000184	0.00187	-0.0564	-3,346***	-3,341***	-2,621***
	(0.0198)	(0.0224)	(0.0516)	(580.0)	(585.7)	(483.6)
Firm FE	NO	NO	YES	NO	NO	YES
Year FE	NO	YES	NO	NO	YES	NO
Firm clusters	YES	YES	YES	YES	YES	YES
Observations	7,184	7,184	7,184	7,184	7,184	7,184
R-squared	0.092	0.109	0.080	0.197	0.199	0.042
Number of company	1,117	1,117	1,117	1,117	1,117	1,117

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Regressions 4

VARIABLES	(1) SharePriceVol	(2) SharePriceVol	(3) SharePriceVol
ρ_{t-1} (γ = 3)	0.0227***	0.0209***	0.0164***
	(0.00257)	(0.00278)	(0.00209)
Assets	-0.0460***	-0.0453***	-0.0487***
	(0.00315)	(0.00312)	(0.00796)
ML	0.0809**	0.0803**	0.0842**
	(0.0317)	(0.0323)	(0.0339)
Constant	0.691***	0.600***	0.728***
	(0.0268)	(0.0266)	(0.0639)
Firm FE	NO	NO	YES
Year FE	NO	YES	NO
Firm clusters	YES	YES	YES
Observations	4,068	4,068	4,068
R-squared	0.196	0.252	0.107
Number of company	961	961	961

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Regressions 5

VARIABLES	(1) Total Dividends	(2) Total Dividends	(3) Total Dividends
rg3_1	-5.799	-5.080	-9.263***
	(4.196)	(4.643)	(2.969)
Assets	118.0***	117.5***	119.3***
	(9.322)	(9.452)	(10.21)
ML	-188.8***	-190.5***	-64.99**
	(50.47)	(52.53)	(32.62)
Constant	-769.3***	-751.2***	-780.3***
	(68.20)	(69.53)	(78.94)
Firm FE	NO	NO	YES
Year FE	NO	YES	NO
Firm clusters	YES	YES	YES
Observations	4,896	4,896	4,896
R-squared	0.306	0.308	
Number of company	802	802	802

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Regressions 6

VARIABLES	(1) RNDX	(2) RNDX	(3) RNDX	(4) OPRX	(5) OPRX	(6) OPRX	(7) DIVERSE	(8) DIVERSE
ρ_{t-1} (γ = 3)	15.47	11.86	-26.71**	-232.1	-203.0	-344.8**	-0.0271	-0.0235
	(15.62)	(18.87)	(10.93)	(156.8)	(207.0)	(136.0)	(0.0188)	(0.0219)
Assets	290.5***	291.1***	190.8***	5,642***	5,639***	4,147***	0.0326	0.0311
	(54.62)	(54.91)	(50.65)	(988.8)	(999.8)	(659.9)	(0.0240)	(0.0244)
ML	-1,066***	-1,089***	53.06	-14,446***	-14,615***	-644.6	0.639***	0.670***
	(281.1)	(282.5)	(64.41)	(4,614)	(4,731)	(1,411)	(0.229)	(0.237)
Constant	-1,832***	-1,797***	-1,132***	-35,275***	-35,278***	-25,670***	-1.726***	-2.684***
	(367.3)	(373.2)	(385.3)	(6,337)	(6,181)	(4,941)	(0.191)	(0.280)
Observations	3,935	3,935	3,935	7,286	7,286	7,286	7,781	7,781
R-squared	0.246	0.248	0.089	0.201	0.202	0.079		
Number of company			632			1,119		

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Regressions 7A, 7B, 7C, 7D

VARIABLES	(1) PoisonPill	(2) PoisonPill	(3) GoldenParachute	(4) GoldenParachute	(5) LowValueGP	(6) LowValueGP	(7) LowValueGP	(8) MValueGP	(9) MValueGP	(10) MValueGP
ρ_{t-1} (γ = 3)	-0.102***	0.0169	-0.225***	-0.0478**	-15.37	-7.804	-22.12**	577.2	645.2	-77.12
	(0.0188)	(0.0220)	(0.0161)	(0.0199)	(14.63)	(15.37)	(10.97)	(870.3)	(992.3)	(160.1)
Assets	-0.0218	-0.0743***	0.108***	0.0803***	332.5***	336.1***	728.4***	6,990***	6,968***	5,229***
	(0.0211)	(0.0264)	(0.0163)	(0.0238)	(31.15)	(30.76)	(75.58)	(1,617)	(1,615)	(1,205)
ML	-0.380*	-0.402	-0.510***	-0.219	-714.4***	-658.6***	-2,163***	-23,464***	-22,604***	-17,518***
	(0.215)	(0.253)	(0.185)	(0.238)	(183.4)	(187.7)	(347.1)	(6,779)	(6,863)	(5,695)
Constant	-0.848***	-0.500**	-0.922***	-0.0298	-1,195***	-1,299***	-3,761***	-45,593***	-43,326***	-31,649***
	(0.180)	(0.229)	(0.136)	(0.197)	(197.1)	(200.9)	(517.9)	(11,512)	(11,185)	(8,830)
Firm FE	NO	NO	NO	NO	NO	NO	YES	NO	NO	YES
Year FE	NO	YES	NO	YES	NO	YES	NO	NO	YES	NO
Observations	7,781	3,571	7,781	3,571	845	845	845	488	488	488
R-squared					0.361	0.379	0.350	0.392	0.397	0.165
Number of company							316			205

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Regressions 8

VARIABLES	(1) ρ_{t-1} (γ = 3)	(2) ρ_{t-1} (γ = 3)	(3) ρ_{t-1} (γ = 3)
CEOTenure	0.0271***	0.0245***	0.0257***
	(0.00652)	(0.00624)	(0.00733)
Assets	-0.0215	0.0114	-1.016***
	(0.0259)	(0.0247)	(0.0885)
ML	-0.758***	-1.139***	0.670**
	(0.239)	(0.245)	(0.302)
Constant	2.336***	2.711***	10.02***
	(0.227)	(0.234)	(0.706)
Firm FE	NO	NO	YES
Year FE	NO	YES	NO
Observations	5,091	5,091	5,091
R-squared	0.027	0.190	0.114
Number of company			866

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Regressions 9

VARIABLES	(1) ρ_{t-1} (γ = 3)	(2) ρ_{t-1} (γ = 3)	(3) ρ_{t-1} (γ = 3)
Age	0.00907**	0.00572	0.00295
	(0.00448)	(0.00428)	(0.00316)
Assets	-0.0650***	-0.00486	-1.119***
	(0.0210)	(0.0205)	(0.0804)
ML	-0.307	-0.606***	0.284
	(0.204)	(0.214)	(0.315)
Constant	2.183***	2.733***	10.79***
	(0.286)	(0.283)	(0.639)
Firm FE	NO	NO	YES
Year FE	NO	YES	NO
Observations	5,297	5,297	5,297
R-squared	0.008	0.176	0.114
Number of company			1,086

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Regressions 10A, 10B, 10C

VARIABLES	(1) ρ_{t-1} (γ = 3)	(2) ρ_{t-1} (γ = 3)	(3) ρ_{t-1} (γ = 3)	(4) ρ_{t-1} (γ = 3)	(5) ρ_{t-1} (γ = 3)	(6) ρ_{t-1} (γ = 3)	(7) ρ_{t-1} (γ = 3)	(8) ρ_{t-1} (γ = 3)	(9) ρ_{t-1} (γ = 3)
Blockholder	-0.531***	-0.202**	-0.206***						
	(0.103)	(0.102)	(0.0764)						
NumOfBlock				-0.206***	-0.0643***	-0.136***			
				(0.0208)	(0.0214)	(0.0205)			
Ownership							-1.602***	-0.385*	-1.927***
							(0.220)	(0.220)	(0.314)
Assets	-0.103***	-0.0258	-1.245***	-0.154***	-0.0446*	-1.224***	-0.0811***	-0.0208	-1.065***
	(0.0222)	(0.0218)	(0.0721)	(0.0254)	(0.0251)	(0.0772)	(0.0237)	(0.0227)	(0.0818)
ML	-0.399**	-0.855***	0.539*	-0.264	-0.786***	0.666**	-0.695***	-0.914***	0.0626
	(0.201)	(0.212)	(0.283)	(0.226)	(0.238)	(0.294)	(0.227)	(0.234)	(0.297)
Constant	3.624***	3.575***	12.21***	4.028***	3.795***	12.19***	4.216***	3.754***	12.14***
	(0.219)	(0.222)	(0.564)	(0.232)	(0.236)	(0.604)	(0.272)	(0.261)	(0.596)
Firm FE	NO	NO	YES	NO	NO	YES	NO	NO	YES
Year FE	NO	YES	NO	NO	YES	NO	NO	YES	NO
Observations	6,654	6,654	6,654	6,103	6,103	6,103	6,103	6,103	6,103
R-squared	0.021	0.201	0.137	0.049	0.209	0.149	0.045	0.207	0.153
Number of company			1,009			906			906

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Regressions 11A, 11B

VARIABLES	(1) ρ_{t-1} (γ = 3)	(2) ρ_{t-1} (γ = 3)	(3) ρ_{t-1} (γ = 3)	(4) ρ_{t-1} (γ = 3)	(5) ρ_{t-1} (γ = 3)	(6) ρ_{t-1} (γ = 3)
IDB	0.768**	0.328	0.444**			
	(0.351)	(0.346)	(0.226)			
DB				0.836***	0.481***	0.326***
				(0.109)	(0.101)	(0.0749)
Assets	-0.0547***	-0.00388	-1.085***	-0.0464**	0.000126	-1.074***
	(0.0204)	(0.0196)	(0.0665)	(0.0204)	(0.0196)	(0.0666)
ML	-0.676***	-1.091***	0.515*	-0.648***	-1.073***	0.518*
	(0.195)	(0.202)	(0.267)	(0.193)	(0.201)	(0.265)
Constant	2.832***	3.132***	10.79***	2.731***	3.067***	10.69***
	(0.166)	(0.175)	(0.521)	(0.166)	(0.174)	(0.522)
Firm FE	NO	NO	YES	NO	NO	YES
Year FE	NO	YES	NO	NO	YES	NO
Observations	7,781	7,781	7,781	7,781	7,781	7,781
R-squared	0.011	0.182	0.113	0.020	0.185	0.115
Number of company			1,126			1,126

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Regressions 12A

VARIABLES	(1) DPAY	(2) DPAY	(3) DPAY	(4) DivYield	(5) DivYield	(6) DivYield	(7) DOA	(8) DOA	(9) DOA
ρ_{t-1} (γ = 3)	-0.0209***	-0.0212***	-0.0108***	-0.00177***	-0.00180***	-0.00178***	-0.00105***	-0.000660**	-0.00183***
	(0.00351)	(0.00433)	(0.00334)	(0.000328)	(0.000384)	(0.000431)	(0.000259)	(0.000297)	(0.000409)
Assets	0.0436***	0.0432***	0.0219	0.00175***	0.00176***	-0.000969	0.000466	0.000323	-0.00153*
	(0.00440)	(0.00447)	(0.0137)	(0.000392)	(0.000379)	(0.00165)	(0.000382)	(0.000402)	(0.000885)
ML	0.132**	0.126**	0.0326	0.0306***	0.0292***	0.0366***	-0.0130***	-0.0126***	0.00113
	(0.0568)	(0.0580)	(0.0507)	(0.00628)	(0.00610)	(0.00699)	(0.00322)	(0.00325)	(0.00575)
Constant	-0.109***	-0.0352	0.0545	0.000938	0.00240	0.0216	0.0143***	0.0170***	0.0294***
	(0.0356)	(0.0411)	(0.109)	(0.00392)	(0.00353)	(0.0138)	(0.00333)	(0.00321)	(0.00707)
Firm FE	NO	NO	YES	NO	NO	YES	NO	NO	YES
Year FE	NO	YES	NO	NO	YES	NO	NO	YES	NO
Observations	7,025	7,025	7,025	6,075	6,075	6,075	7,663	7,663	7,663
R-squared	0.057	0.064	0.005	0.023	0.029	0.007	0.009	0.017	0.012
Number of company			1,115			902			1,121

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Regressions 12B

VARIABLES	(1) PV	(2) PV	(3) PV
ρ_{t-1} (γ = 3)	-50.71	-11.06	-249.5***
	(74.42)	(78.20)	(94.09)
Assets	424.5***	413.1***	718.6*
	(78.23)	(77.40)	(380.8)
ML	86.38	28.28	-1,322
	(664.7)	(668.8)	(1,451)
Constant	-1,841***	-2,096***	-3,809
	(648.8)	(676.8)	(3,325)
Firm FE	NO	NO	YES
Year FE	NO	YES	NO
Observations	2,077	2,077	2,077
R-squared	0.030	0.036	0.009
Number of company			528

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Regressions 13

VARIABLES	(1) ρ_{t-1} ($\gamma = 3$)	(2) ρ_{t-1} ($\gamma = 3$)	(3) ρ_{t-1} ($\gamma = 3$)
Female	-0.476**	-0.166	-0.838*
	(0.212)	(0.209)	(0.446)
Assets	-0.0589***	-0.00542	-1.087***
	(0.0205)	(0.0197)	(0.0670)
ML	-0.680***	-1.093***	0.526*
	(0.196)	(0.203)	(0.269)
Constant	2.880***	3.151***	10.82***
	(0.167)	(0.176)	(0.525)
Firm FE	NO	NO	YES
Year FE	NO	YES	NO
Observations	7,781	7,781	7,781
R-squared	0.011	0.181	0.114
Number of company			1,126

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Regressions 14A, 14B

VARIABLES	(1) RDA	(2) RDA	(3) RDA	(4) RDA	(5) RDA	(6) RDA
innovgamma $_{t-1}$	0.000525	0.000111	-0.00397***			
	(0.00116)	(0.00144)	(0.00121)			
noninnovgamma $_{t-1}$				-0.000506**	-0.000631**	-0.0002
				(0.000218)	(0.000254)	(0.000144)
Assets	-0.00909***	-0.00910***	-0.0336***	0.000378	0.000467	-0.000224
	(0.00210)	(0.00213)	(0.00826)	(0.000656)	(0.000691)	(0.000572)
ML	-0.136***	-0.141***	0.0334	0.00941	0.00931	-0.00471*
	(0.0271)	(0.0279)	(0.0258)	(0.00721)	(0.00787)	(0.00252)
Constant	0.149***	0.152***	0.323***	-0.000394	-2.88e-05	0.00524
	(0.0161)	(0.0170)	(0.0611)	(0.00484)	(0.00400)	(0.00476)
Firm FE	NO	NO	YES	NO	NO	YES
Year FE	NO	YES	NO	NO	YES	NO
Observations	1,794	1,794	1,794	261	261	261
R-squared	0.140	0.147	0.183	0.119	0.149	0.050
Number of company			286			52

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

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