CEO age impact on corporate risk

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ABSTRACT: Prior theoretical work generates conflicting predictions with respect to how CEO age impacts risk-taking behavior. This study looks at 106 firms listed on the Euronext Amsterdam and Brussels stock exchange for the year 2014 to investigate the impact of CEO age on risk taking behavior. Consistent with the prediction that risk-taking behavior decreases as CEOs become older, I document a negative relation between CEO age and stock return volatility. Further analyses reveal that older CEOs reduce firm risk through less risky investment policies such as less investment in R&D. No relation is found between CEO age and operating and financial policies due to insignificance of results.

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1. INTRODUCTION

The vogue of corporate governance in the 1970s has become well entrenched as an academic and regulatory topic with increasing amounts of scholars seeking to understand the various implications it has on the manner in which businesses are run. For investors whose capital is tied up in shares of a company it is of primary interest to make sure that they do not run the risk of losing their investment. A board of directors is elected to bear the interest of the investors and run the company accordingly. Central to this governing process is the Chief Executive Officer (CEO). The CEO has multiple responsibilities, towards shareholders and management, and ultimately has to make vital decisions that affect the company's operations. In the last few years there is research that suggests that CEO personal characteristics can impact corporate policies and corporate performance. In a 2012 study Cronqvists et al. concludes that firms behave consistently with how their CEOs behave and act personally. Financing decisions and attitudes towards risks can be shaped by CEOs personal characteristics such as life experience, overconfidence and leverage preferences according to Malmendier et al. (2011). CEO age is a basic characteristic that is readily observable, yet surprisingly there is scare evidence based on research about how CEO's age affects risk taking behavior.

In this paper I attempt to provide evidence on the relation between CEO age and risk-taking behavior. The research aims to answer the central question 'what is the relation between CEO age and firm risk? This will be achieved by analyzing various measures of risk that constitute the risk profile of a company. Firm risk is a measure that shows the uncertainty of firms' activities and indicates the vulnerability of its operations. For investors, risk is of utter importance, as it implies the possibility to lose some or all of their investment. Unstable stock prices are a significant financial indicator of an investments level of risk. Prior research studies use the volatility of firms' stock returns as a principal measure of the overall riskiness of the firm, in these studies greater volatility implies greater risk (Cassel et al., 2012; Guay, 1999; Kini and Williams, 2012). In my research I shall adopt the same measure of risk to gauge the degree of overall firm risk. In 2012 Serfling studied CEO age and stock return volatility in a paper using 2356 unique firms over the 1992 – 2010 period. He found a negative relation between stock return volatility and CEO age. The finding is robust to controlling for several CEO and firm characteristics known to impact firms risk, industry and year fixed effects, firms fixed effects and to employing and instrumental variable approach. He suggests a casual link from CEO age to firm risk. With my research I aim to accumulate additional evidence about this topic. Specifically I will be studying listed western European firms in the year 2014. Due to the time limit to collect data and analyze the results, this paper I will only focus on companies' listed on the Euronext Amsterdam and Brussels stock exchanges and gather data about the year 2014. My research will focus specially on the relation between CEO age and stock return volatility and will look to reinforce and/or contradict conclusions made by Serfling (2012) about firm risk by looking at alternative measures of firm risk that CEOs can affect through corporate policies.

My findings aim to contribute to the stream of research investigating how managerial personal traits impact corporate policies. In contrast to many previously identified CEO traits, CEO age is unique in that it is readily observable and measurable, applies to all CEOs and changes over time. In concurrent work Yim (2013) finds that younger CEOs make more acquisitions because permanent increases in compensation following acquisitions incentivize younger CEOs to make more acquisitions earlier in their careers. In additions Lin et al (2011) show that younger CEOs follow a more active investment style as younger CEOs are more likely to open and close plants. In contrast with these studies, I examine whether CEO age affects risk-taking and the corporate policies through which they occur. I aim to build upon the research done by Serfling (2012) and seek additional evidence to (in)validate the conclusions he has made about the relation between CEO age and firm risk and the relations between CEO age and the corporate policies that influence firm risk. Finally my study also relates to the literature investigating how CEO traits impact firm stock market performance. For example prior work finds that firms managed by founders earn high risk-adjusted returns and that firms led by CEOs who win prestigious awards actually earn lower returns. I contribute by showing that firms led by younger CEOs earn higher – adjusted portfolio returns than firms managed by older CEOs.

The remainder of this paper is organized as follows. Section 2 reviews the literature about the main measures of risk my research shall adopt. Section 3 develops the study principles hypothesis. Section 4 describes the sample selection, method and presents the summary statistics. Section 5 reports empirical findings. Section 6 presents the limitations of the study and section 7 provides the conclusion. Chapter 8 reports the literature used. In appendix A full SPSS outputs of the regressions can be found. Appendix B contains a full list of companies used in this analysis.

2. LITERATURE REVIEW

To recognize the relation between CEO age and firm risk we first need to identify the various measures that can be used to indicate risk of a company. As earlier mentioned, the volatility of firms' stocks is one significant indicator that can be used to do this. There is also certain investment and financial policies that CEOs have control over that can be used to measure firm risk. In the research paper Serfling (2012) examines some corporate policies through which CEOs can influence their firms risk profiles. These are namely: research and development (R&D) expenditure, operations diversification, operating leverage and financial leverage. In this section we shall review literature about these various topics to understand how they are linked to and used to measure firm risk.

2.1 Stock Volatility

Stock returns are profits on an investment. It comprises any change in value and interest or dividends or other such cash flows which the investor receives from the investment. Stock return data can be very helpful when its volatility is calculated from the differences in stock value. The volatility calculation depicts how unstable (or stable) stock prices of shares are over a specific period of time. Volatility is a commonly used measure of firm risk and it can be easily calculated from historical closing stock data for a company over a number of periods. Cassel et al., (2012) investigate the relation between CEO inside debt holdings and the riskiness of firm investment and financial policies. They adopt the volatility measure to indicate the riskiness of firm policies. This volatility measure is also adopted by Kini et al.,(2012) in their paper testing the proposition that higher tournament incentives will result in greater risk-taking by senior managers. In both these studies volatility (of future or past stock returns) has been used to assess the overall total level of firm risk. Guay (1999) also uses a firms stock return volatility to relate CEO wealth to equity risk. Furthermore, Serfling (2012) uses stock return

volatility as a measure of total risk by annualizing standard deviations of daily stock returns for firms over an 8 year period. In all of these studies, greater volatility implies greater risk for the company. For investors historical stock volatility data is a useful tool to identify the levels of risk associated with various investment opportunities. In this research the measure of historical stock volatility shall be used to gauge overall firm risk for over a 1 year period by following these previous studies method of calculating volatility.

2.2 Research and Development Expenditure

Research and development expenditure refers to the investment activities that a business chooses to conduct with the intention of making a discovery that can either lead to the development of new products or procedures, or to improvement of existing products or procedures. Research and development is one of the means by which business can experience future growth by developing new products or processes to improve and expand their operations.

Exploring the determinants of corporate R&D for U.S., Canadian, British, European, and Japanese firms (Bhagat et al., 1995) found that stock returns provide market signals to firms regarding their future growth opportunities, and that these firms increase their investment in R&D to take advantage of such growth opportunities. Research and development is considered a component of the corporate investment strategy, however it is much more risky than capital expenditures according to their evidence. Later in 2002 Kothari et al. proposed and implemented a new method to estimate the relation between R&D investments and the uncertainty of future benefits from those investments. An empirical analysis using a sample of roughly 50,000 firm-year observations from 1972–1997 shows evidence that R&D investments generate future benefits that are far more uncertain than benefits from capital investments. Larger R&D expenditures have higher overall firms risk and are seen to be riskier policy choices.

Eberhart et al (2004) examine a sample of 8,313 cases, between 1951 and 2001, where firms unexpectedly increase their research and development (R&D) expenditures by a significant amount. They found consistent evidence of a misreaction, as manifested in the significantly positive abnormal stock returns that their sample firms' shareholders experienced following these increases. They also found consistent evidence that their sample firms experience significantly positive long-term abnormal operating performance following their R&D increases. Their findings suggest that R&D increases are beneficial investments, and that the market is slow to recognize the extent of this benefit (consistent with investor underreaction). Coles et al. (2006) also find that stock price volatility is significantly positively related to R&D expenditures in their paper that reviews managerial incentives and risk taking. Cassel et al. (2012) and Kini et al. (2012) also determine by their evidence that there is a positive relation between R&D intensity and firm risk.

Therefore, from literature we are able to argue based on the above evidence that there exhibits a positive relation between R&D expenditure as an investment strategy and firm risk (Bhagat et al., 1995; Kothari, 2002; Coles et al., 2006; Cassel et al., 2012; Kini et al., 2012). Although R&D investments are more uncertain than capital expenditures, significant positive stock returns are to be expected by shareholders following increases in R&D investments (Eberhart et al., 2004). Higher R&D investment can provide more returns to shareholders, however are seen to be a more risky form of investment. In this study the intensity of R&D investment shall be used as a measure of firm risk as a signal to investors about a corporation's level of risk.

2.3 Operating Leverage

The firm's operating leverage is defined as the ratio of the fixed to variable operating costs; a high operating leverage refers to a high share of fixed costs relative to variable costs (Lev, 1971). The degree of operating leverage can be substantially changed by managerial decisions. e.g., a switch from steam generating to nuclear production of electricity will result in an increase in the relative share of fixed costs (e.g., depreciation, maintenance, etc.) to variable costs (e.g., coal, wages, etc.).

In a well-cited paper in 1971, Lev indicates that the higher the operating leverage (i.e., the lower the unit variable costs) the larger the overall and systematic risk. It is shown that there is a positive relationship between the two variables by analyzing the results of an empirical test conducted on the electric utility, steel, and oil industries. As operating leverage increases (decreases), both the overall and systematic volatility of the stock's return increases (decreases). Aboody et al. (2014) also reach the same conclusions in their paper examining the effect of operating leverage on firm's future earnings. They find that high operating leverage increases earnings volatility due to a slower cost-adjustment process for high-operating-leverage firms. With the attention to these studies the degree of operations leverage can also be adopted as an alternative measure of firm risk as a marker to investors.

2.4 Financial Leverage

Lastly, financial leverage is the amount of debt that an entity uses to buy more assets. Financial leverage offers many advantages for a firm to move forward. But like most things, there are some limitations that come with financial leverage because when a company uses financial leverage they are technically borrowing funds. The value of stock could drop substantially if stockholders become concerned with the degree of financial leverage. Higher financial leverage increases the firm's risk profile (Mandelker et al., 1984). Financial leverage means high interest payments, which negatively affect the company's bottom-line earnings per share. This can result in volatile earnings. CEOs that select higher financial leverage profiles are seen to have higher risk profiles in the eyes of the investors. Financial leverage can also be used as an instrument to measure firm risk and can provide significant indications regarding a corporation's mixture of assets, liabilities and debt. Cassel et at., (2012) uses the Debt/Equity ratio and Debt/Assets ratio in a paper to investigate CEO inside debt holding and the riskiness of investment and financial policies. In this research we shall also adopt these two financial leverage measures as indictors of firm risk.

2.5 Other measures

2.5.1 Diversification

It is also important to indicate that there are other measures that determine CEO risk taking behavior. Although these will not be studied in our research, due to time and resource constraints, it is important to consider their theory for a thorough understanding of our research topic.

Diversification can also be used as an indictor to investors on the degree of risk the company bears. Simply put operations diversification is an increase in the number of firm operations into one or more business segments or industries. Diversified business operations are those that have different end

customers and produce different products or provide different services.

Theoretical arguments suggest that diversification has both value-enhancing and value-reducing effects. Berger et al. (1995) find evidence for the potential benefits of operating different lines of business within one firm. These include greater operating efficiency, less incentive to forego positive net present value projects, greater debt capacity, and lower taxes. In their paper they also found potential costs of diversification to include the use of increased discretionary resources to undertake value-decreasing investments, cross-subsidies that allow poor segments to drain resources from better-performing segments, and misalignment of incentives between central and divisional managers.

Previously, Weston (1970) and Chandler (1977) suggested that diversified firms have the ability to leverage economies of scale because they provide more efficient operations and more profitable lines of business than stand-alone firms. Lewellen (1971) argued that diversified firms enjoy greater debt capacity and debt tax shields relative to single-line firms due to lower risk. Diversification is associated with lower firm risk due to the existence of multiple lines of business with imperfectly correlated return (Amihud & Lev, 1981). Mansi & Reeb (2002) also argue the risk-reducing effects of corporate diversification; with the diversification effect reducing risk for the entire entity. In a paper investigating whether managerial motives influence firm risk reduction strategies (May, 1995) find that Chief Executive Officers (CEOs) with more personal wealth vested in firm equity tend to diversify. Based on the literature we view the degree of diversification as an investment strategy bares lower levels of risk for the firm as an entity and can be adopted to measure firm risk.

2.5.2 Age of other senior executives

Given that a CEO does not typically determine corporate policies alone but rather makes choices as a member of a team, the risk preference of other senior executives could also contribute to the firms' overall risk profile. If an executive's age also affects risk preferences, then executives in a similar age group as the CEO should reinforce the risk-taking behavior of the CEO. Serfling (2012) investigated whether the risk preferences of the second most influential executive affect the risk-taking behavior of the CEO. It was established that firm risk is the lowest when both the CEO and the next most influential executive are older.

2.5.3 Risk-taking incentives

Furthermore the risk-taking incentives provided to CEOs also affect risk strategies. Such incentives could lead CEOs to pursue certain risk options based on incentives that receive. Prior work shows that stock option compensation also induces CEOs to take greater risks (Coles et al., 2006; Rajgopal and Shevlin, 2002) but that pensions benefits and deferred compensation incentives CEO's to take fewer risks (Cassel et al., 2012). Although these determinants may also influence the risk-taking behavior of CEOs, we do not consider them in our study due to the time frame allowed to conduct our research.

3. HYPOTHESIS DEVELOPMENT

From Serfling (2012) is it clear that there are conflicting perspectives based on evidence of prior theoretical and empirical work with regard to how managers age impacts risk-taking behavior. The first strand of literature is based on the idea of risk aversion of younger managers leading them to adopt conservative investment approaches and policies. In their research empirical evidence was found by (Hirshleifer and Thankor, 1992; Holmstrom, 1999; Schafstein and Stein, 1990) that predicts that because younger managers face greater career concerns, they display more risk-aversion, which can lead to excessive conservatism investment policies. In these studies it is argued that because younger managers do not have reputations as high quality managers, they face greater labor market scrutiny if they make a bad investment decision, which could significantly reduce future career opportunities. Zwiebel (1995) develops a model of how career and reputation concerns affect investment choices and shows that due to these concerns, younger managers will avoid innovative investments that differ from other firms and will undertake projects that are easier for the market to evaluate. Therefore these studies solidify the viewpoint that young managers adopt low risk behavior.

The second strand of literature predicts that younger managers make more, bolder, and riskier investments compared to older managers. Prendergast and Stole (1996) develop a managerial signaling model and argue that younger managers attempt to signal to the market that they are high quality managers with superior ability by pursuing riskier and more aggressive investment strategies. In particular, younger managers overweight their personal beliefs and exaggerate their investment behavior to appear talented. Further, older managers are reluctant to change their investment behavior because it may indicate that their previous investment decisions were incorrect. In discussing the role that managerial backgrounds play in organizational outcomes, Hambrick and Mason (1984) posit three reasons why younger managers are generally associated with attempting the novel, unprecedented, and taking risks. First, older managers may be at a point in their lives where financial security and career security are more important. Second, older managers may have greater commitment to the status quo of the firm. Lastly, older executives may have less mental and physical stamina or are less able to grasp new ideas and learn new behaviors. In addition, older managers have a tendency to seek more information, to evaluate information in-depth, and take longer to make decisions (Taylor, 1975). This viewpoint of literature adopts the standpoint that young mangers would behave in a more risker manner adopting riskier policies and investments.

Based on the literature, it is clear how CEO age can empirically relate to risk-taking. If the signaling explanation is adopted there should be a negative relation between CEO age and risk-taking. However if the career concerns dominate their should be a positive relation between the variables. Personally, as an aspiring manager, I would want to grab the opportunity to manage with both hands. I agree more with the signaling explanation as I would want to make a mark and a name for myself early on in my career. Therefore, this leads to the study's principal hypothesis.

Hypothesis: Younger CEOs prefer more risk

4. SAMPLE SELECTION, METHOD AND SUMMARY STATISTICS

As formerly mentioned, prior studies use the volatility of a firm's stock returns as a measure of the overall riskiness of the firm, where greater volatility implies greater risk (Cassell et al., 2012; Guay, 1999; Kini and Williams, 2012). Thus, our hypothesis leads to the prediction that firms managed by younger CEOs will have higher stock volatility.

Also if CEOs affect firm risk, they can only do so through channels that they have control over. As we have earlier seen, there are various other indicators that can be used to measure firm risk. First, CEOs can reduce R&D expenditures, as R&D

expenditures are considered a riskier form of investment compared to capital expenditures due to their higher degree of uncertainty regarding future benefits (Bhagat and Welch, 1995; Cassell et al., 2012; Coles et al., 2006; Eberhart et al., 2004; Kini and Williams, 2012; Kothari et al., 2002). Second, CEOs can make investments that result in lower operating leverage. Specifically, for a given level of sales and earnings, investments that reduce fixed costs result in lower operating leverage. Because the profits of firms with greater operating leverage are more sensitive to fluctuations in sales, firms with greater operating leverage are riskier (Chen et al., 2011; Lev, 1974; Mandelker and Rhee, 1984). CEOs can also reduce firm risk through more conservative financial policies. By maintaining lower leverage ratios, CEOs can reduce their firms' overall risk (Coles et al., 2006; Lewellen, 2006).
Therefore, this study's hypothesis generates the empirical predictions that CEO age is negatively related to R&D expenses, operating leverage and financial leverage. It is also important to mention the analyses made by Serfling (2012) on which this research is based. In the study Serfling (2012) documents a negative relation between CEO age and investment in R&D, operating leverage and financial leverage. I shall test these above-mentioned hypotheses about firm risk and the corporate polices by collecting and analyzing data that can be can be seen in the following section.

4.1 Sample Selection

The initial sample consists of 284 listed & formerly listed firms on the Euronext Amsterdam and Brussels stock exchanges during the year 2014. Following Serfling (2012) utilities (SIC 4900-4999) and financial firms (SIC 6000-6999) are removed from the sample. I obtain CEO-, financial statement- and stock return- data from the ORBIS database. Missing stock value data is obtained from Yahoo Finance. After collecting all the necessary data and removing observations with missing and outlier values, the final sample consists of 106 industrial firms and their CEOs respectively. Table 1 presents the summary statistics of the data with Panel A showing the statistics of the full sample and Panel B reporting the summary by 3 CEO age categories. Values are expressed in 2014-euro values and have been analyzed with Microsoft excel and SPSS. In Appendix B a list of all the companies used in the analysis can be found. The raw data for the firms can be accessed via the finance bank.

4.2 CEO age and measures of risk

The variable of interest in this paper is CEO age. I obtain CEO age of each company directly from the ORBIS database and missing values are looked up online. The natural logarithm of CEO age (Log CEO Age) is used in multivariate regressions. The mean (stand deviation) CEO is 57,30 (7,55) years old.
Total risk of the company is computed through the stock volatility variable examined over a one-year period by collecting monthly closing prices. Monthly stock closing prices for 2014 are collected and the annualized standard deviations are used as a measure of volatility. This stock return data is directly available on ORBIS. The mean (standard deviation) volatility is 33,7% (20,7%). In multivariate regressions, I use the natural logarithm of this measure. Serlfling (2012) documents a mean volatility of 45.88% (40.33%) in his paper studying 2356 unique firms over the 1992 – 2010 period. The difference in our mean volatility values could be due this study's much smaller sample size and shorter observed period. Also, Sefling (2012) calculated annual volatility from daily closing prices whilst I calculated annual volatility from monthly closing prices.
Furthermore, I examine other risk measures namely R&D expenditures, operating leverage and book leverage. Following Coles et al (2006), Kini and Williams (2012) and Serfling (2012), I define R&D intensity as firm R&D expenditures divided by book value of assets. If a firm does not report R&D expenses in a given year I assume the value to be zero. The mean (standard deviation) of R&D intensity is 0,022 (0,044).
The financial policy of book leverage has been calculated by collecting various financial data from ORBIS firms. Data collected about assets, liabilities and shareholder equity has been used to calculate the book leverage ratio. Data about these various financials were not directly available so they had to be deferred from present data variables. Primarily the value of 'Total liabilities' has been calculated by subtracting the value of 'shareholders equity' from the value of 'total liabilities and shareholders equity' as to be found on the database. The rest of the data was available and we have calculated two ratios: Debt/Equity ratio and Debt/ Total assets ratio. The mean Debt/Equity ratio is 1,63 (1,27). The mean Debt/ Total assets ratio is 0,55 (0,19).
I estimate operating leverage by first collecting operating income and sales data for the firms for years 2013-2014. I calculated the % change in sales and % change operating income from the difference between years. Missing values on ORBIS were found by directly consulting the company's financial statements. I calculated the operating leverage by dividing % change in sales by % changes in operating income. The mean operating leverage is 66.8%.

4.3 Control Variables

Following Coles et al. (2006), Cassell et al. (2012), Kini and Williams (2012) from Serfling (2012) I include several CEO and firm characteristics that are potentially correlated with corporate policies and CEO age as control variables. The control variables data are collected about the firm's 2014 data from ORBIS and include the following:

- Book Assets is the book value of assets (in euro millions) seen as 'total assets' on ORBIS. The mean (standard deviation) firm has Book Assets of 3243,83 (7179,70) million euros.
- Market-to-Book is the market value (enterprise value on ORBIS) of the firm divided by book value of assets. The mean (standard deviation) is 0,95 (0,70).
- Return on Assets is income before extraordinary items divided by book value of assets. The value is taken from ORBIS and is calculated using net income. The mean (standard deviation) firm has a ROA of 2,73 (8,89).
- Cash Holdings is the book value of cash and short-term investments divided by book value of assets. The mean (standard deviation) firm has 13,9% (15%) of assets in cash.
- Sales Growth is the percentage increase in sales from year 2013 to year 2014. The mean (standard deviation) firm has year-over-year sales growth of 20,5% (99,7%)
- Firm Age is the number of years since the IPO. The mean firm age is 80,5 years old.

4.4 Descriptive Statistics

Firstly, the results in table 1 show that there are not always 106 observations in the samples due to some missing data. For the control variables there is quite a large standard deviation from the mean. The variable operating leverage also displays a large standard deviation. Furthermore, Panel B of Table 1

presents descriptive statistics by CEO age categories. Three CEO age categories are made by splitting CEOs as following: *Younger* CEOs are aged 29-52, Middle-aged CEOs are aged 53-58 and oldest CEOs are aged 59 or older. Furthermore when comparing the values of the Oldest and youngest CEO categories we see that firms managed by the oldest CEOs have slightly lower stock volatility, invest more in R&D and have higher financial and operating leverage. I test for significant differences in means between the oldest and the youngest age category using a t-test and the results can be seen next to the mean of the oldest CEO values. Assuming a significance level of 0,05 we see that all the significant values are greater than 0,05. Based on this results it can be said that the samples of oldest and youngest CEO age categories do not significantly differ amongst all the tested variables.

Table 1 Summary statistics

This table reports summary statistics for 106 listed and formerly listed firms on the Euronext Amsterdam and Brussels stock exchange for 2014. Financial and utility firms are excluded, so are samples with missing data. Panel A reports summary statistics for the full sample. Panel B reports summary statistics by CEO age categories. CEO Age is the age of the CEO in 2014. Each variable has been explored via SPSS and outlier values have been removed from the sample. Values are expressed in 2014 euros. I test for significant differences in means between the oldest age and the youngest age category using a t-test. I denote: ns for $p > 0.05$, * for $p \leq 0.05$, ** for $p \leq 0.01$ or *** for $p \leq 0.001$ to indicate the level of significance next to the mean of the older CEO.

Panel A	**Observations**	**Mean**	**Standard Deviation**	**Minimum**	**Maximum**
Measures of Risk					
Total Risk (%)	105	33.74	20.73	9.80	108.90
R&D Intensity	105	0.022	0.044	0.00	0.212
Operating leverage	102	0.668	1.426	0.015	8.984
Book leverage D/E	104	1.629	1.266	0.081	6.709
Book leverage D/A	106	0.552	0.188	0.075	0.943
CEO characteristisc					
CEO age (years)	106	57.30	7.55	44	84
Firm Characteristics					
Book Assets (million €)	105	3243.83	7179.70	4.00	4827.00
Market to book	104	0.948	0.700	0.091	4.748
Return on Assets	104	2.725	8.890	-37.414	33.101
Cash Holdings	105	0.139	0.146	0.001	0.733
Sales Growth	105	0.205	0.997	-0.757	6.972
Firm age (years)	106	80.5	199.73	1.00	214.00

Panel B	**Older CEO Observations**	**Mean**	**Middle CEO Obervations**	**Mean**	**Younger CEO Obervations**	**Mean**
Measures of Risk						
Total Risk (%)	33	0.309 ^{ns}	43	0.349	29	0.352
R&D Intensity	34	0.112 ^{ns}	42	0.026	29	0.027
Operating leverage	31	0.92 ^{ns}	43	0.66	28	0.40
Book leverage D/E	32	1.808 ^{ns}	43	1.537	29	1.569
Book leverage D/A	34	0.564 ^{ns}	43	0.540	29	0.556
CEO characteristisc						
CEO age (years)	34	65.77 ^{ns}	43	55.950	29	49.379
Firm Characteristics						
Book Assets (million €)	34	3096.67 ^{ns}	42	4602.50	29	1445.10
Market to book	34	1.023 ^{ns}	41	0.943	29	0.868
Return on Assets	33	0.466 ^{ns}	42	3.550	29	4.009
Cash Holdings	33	0.146 ^{ns}	43	0.139	29	0.130
Sales Growth	33	0.246 ^{ns}	43	0.088	29	0.329
Firm age (years)	34	57.97 ^{ns}	43	61.90	28	66.67

5. EMPERICAL FINDINGS

In this section, I examine the relation between CEO age and the 5 measures of risk employed in our study. I explain the findings of our results and remark upon their importance. Table 2 shows the correlation matrix of the variables and table 3 shows the regressions results from SPSS analysis.

5.1 CEO age and stock volatility

The hypothesis from reviewing literature generates the prediction that CEO age is negatively related to stock volatility. Thus, if older CEOs prefer less risk compared to younger CEOs, there should be a negative relation between CEO age and stock volatility. Model 1 of table 3 presents the coefficient results from the regression. The dependent variable in Model 1 is the natural logarithm of stock volatility. The results in model 1 shows negative relation between CEO age and firm stock volatility (-.902). In terms of economic significance, the coefficient estimates in Models 1 imply that a 25% increase in CEO age leads to a decrease in total stock volatility of 22,55 % ($= 0.902 * 0.25$). The OLS regression uses a dataset based on 106 companies to generate the model and statistics. There is an adjusted R^2 value of 0,170. This value that has been adjusted for the number of predictors in the model shows that 17% of the total variability

Table 2 Correlation Matrix

This table reports the correlations between all the variables used in our analysis. Pearson's correlation coefficients have been calculated via SPSS. I denote: * for $p \leq 0.05$, ** for $p \leq 0.01$ or *** for $p \leq 0.001$ to indicate the level of significance next to coefficient. In brackets I indicate the p values are calculated by SPSS.

	Total Risk	R&D Intensity	Operating leverage	Book leverage D/E	Book leverage D/A	CEO age	Assets (millions)	Market to book	ROA	Cash Holdings	Sales Growth	Firm age
Total Risk	1	.193* (.050)	-.071 (.483)	.212* (.031)	.192* (.049)	-.091 (.354)	.176 (.074)	-.110 (.270)	-.189 (.055)	.176 (0.74)	.020 (.84)	-.285** (.003)
R&D Intensity	.193* (.050)	1	-.073 (.467)	-.265** (.007)	-.262** (.007)	-.187 (.056)	-.056 (.572)	.309** (.001)	-.012 (.903)	.348** (.000)	.348** (.000)	-.200* (043)
Operating leverage	-.071 (.483)	-.073 (.467)	1	-.155 (.124)	-.226* (.023)	.026 (.793)	-.051 (.614)	-.237* (.017)	.110 (.277)	.091 (.365)	-.003 (.973)	-.010 (.925)
Book leverage D/E	.212* (.031)	-.265** (.007)	-.155 (.124)	1	.863** (.000)	.117 (.238)	.097 (.331)	-.218* (.028)	-.199* (.045)	-.305** (.002)	-.057 (.569)	-.062 (.535)
Book leverage D/A	.192* (.049)	-.262** (.007)	-.226* (.023)	.863** (.000)	1	.066 (.502)	.189 (.053)	-.222* (.024)	-.249* (.011)	-.397** (.000)	-.048 (.624)	.053 (.592)
CEO age (years)	-.091 (.354)	-.187 (.056)	.026 (.793)	.117 (.238)	.066 (.502)	1	.008 (.932)	.033 (.739)	-.233** (.017)	012 (.905)	-.001 (.951)	-.016 (.868)
Book Assets (millions)	.176 (.074)	-.056 (.572)	-.051 (.614)	.097 (.331)	.189 (.053)	.008 (.932)	1	.030 (.763)	.034 (.730)	-.164 (.097)	.016 (.875)	.232* (.018)
Market to book	-.110 (.270)	.309** (.001)	-.237* (.017)	-.218* (.028)	-.222* (.024)	.033 (.739)	.030 (.763)	1	-.073 (.461)	.264** (.007)	.025 (.803)	-.125 (.198)
Return on Assets	-.189 (.055)	-.012 (.903)	.110 (.277)	-.199* (.045)	-.249* (.011)	-.233** (.017)	.034 (.730)	-.073 (.461)	1	.004 (.965)	-.228* (.021)	.040 (.691)
Cash Holdings	.176 (0.74)	.348** (.000)	.091 (.365)	-.305** (.002)	-.397** (.000)	.012 (.905)	-.164 (.097)	.264** (.007)	.004 (.965)	1	.230* (.019)	-.223* (.023)
Sales Growth	.020 (.84)	.348** (.000)	-.003 (.973)	-.057 (.569)	-.048 (.624)	-.001 (.951)	.016 (.875)	.025 (.803)	-.228* (.021)	.230* (.019)	1	.045 (.652)
Firm age (years)	-.285** (.003)	-.200* (043)	-.010 (.925)	-.062 (.535)	.053 (.592)	-.016 (.868)	.232* (.018)	-.125 (.198)	.040 (.691)	-.223* (.023)	.045 (.652)	1

Table 3 Regressions

This table reports results from regressions relating CEO age to stock volatility, operating leverage, financial leverage and R&D for 106 Euronext Brussels and Amsterdam firms from 2014. Financial and utility firms are excluded. The dependent variable in model 1 is LOG Volatility, in model 2 is operating leverage, in model 3 is Research and Development, in model 4 is Debt/ Equity and in model 5 is Debt / Assets in individual regression models. Log CEO Age is the natural logarithm of the age of the CEO. Control variables include, Log Book Assets, Market-to-Book, Book Leverage, Return on Assets, Cash Holdings, Sales Growth and Log Firm Age.Value of significance is shown in brackets bellow the coefficient values. I denote: * for $p \leq 0.05$, ** for $p \leq 0.01$ or *** for $p \leq 0.001$ to indicate the level of significance next to coefficient.

	Model 1: Stock Volatility	**Model 2: Operating Leverage**	**Model 3: R&D Intensity**	**Model 4: Financial Leverage D/E**	**Model 5: Financial Leverage D/A**
Constant	3.185 (.056)	-2.691 (.520)	0.304** (.010)	-0.130 (.974)	0.609 (.272)
LOG CEO age	-0.902* (.029)	1.017 (.321)	-0.073* (.012)	0.416 (.667)	-0.041 (.763)
LOG total assets	-0.024 (.348)	-0.022 (.732)	-0.001 (.742)	0.124* (.036)	0.023** (.008)
Market-to-book	-0.067 (.442)	-0.622** (.006)	0.019** (.002)	-0.367 (.079)	-0.052 (.080)
ROA%	-0.017* (.030)	0.040* (.047)	-0.001 (.140)	-0.021 (.243)	-0.004 (.111)
Cash Holdings	0.886* (.044)	-1.949 (.081)	0.073* (.040)	-1.943 (.060)	-0.366* (0.013)
Sales Growth	-0.051 (.345)	-0.037 (.916)	0.011** (.005)	-0.004 (.977)	0.000 (.994)
Firm age	-0.129** (0.005)	-0.094 (.409)	-0.003 (.405)	-0.250* (.021)	-0.022 (.151)
Adjusted R^2	0.170	0.060	0.270	0.143	0.192
ANOVA sig	0.001 [b]	0.084 [b]	0.000 [b]	0.004 [b]	0.000 [b]

of the dependent variable (LOG volatility) is explained by model. The ANOVA value shows a significance of 0.001. Based on this value there is very strong evidence that the model does indeed explain the dependent variable of stock volatility. Now that it is established that our model does predict the variable volatility we can look at the coefficients that the regression has computed. As we can see in the table, the signifiance value for the variable (log) CEO age is 0.029. As this value is lower than 0.05 there is enough evidence assume that the variable CEO age is significant and does help predict stock volatility. As previously mentioned in our literature review it is suggested that firms managed by older CEOs will have a lower stock return volatility. Due to the fact that our model is significant and the coefficient is negative we have enough evidence to suggest that we can accept this hypothesis. Based on our results of the studied firms we can say that there is a negative relation between CEO age and stock return volatility. Comparing my results to that of Serfling (2012) we reach the same conclusion regarding this hypothesis. However, Serflings results imply a much smaller coefficient (-.183) for the variable CEO age which indicates a weaker negative relationship compared to my results.

5.2 CEO age and the riskiness of investment and financial policies

In this section, I examine the other measures of firm risk that CEOs have influence over. Specifically, I investigate whether CEO age impacts R&D expenditures, operating leverage and financial leverage. Model 2-5 of table 3 presents the results of these individual regression analyses showing results from pooled OLS regressions. The full SPSS outputs can be found in Appendix A.

5.2.1 Operating Leverage

I examine the relation between CEO age and operating leverage in model 2. Firms with greater operating leverage are associated with greater risk. Therefore, if older CEOs prefer less risk compared to younger CEOs, there should be a negative relation between CEO age and operating leverage. The dependent variable in Model 2 is operating leverage, defined as the percentage change in operating income for a percentage change in sales. The adjusted R squared value of Model 2 is 0.211 which implies that 21% of the total variability of the dependent variable operating leverage is explained by model. From the ANOVA value we see a significance of 0.000 which means that the model does significantly explain the dependent variable of operating leverage. Therefore the coefficient in this model can be trusted. As we can see in the table, the significance value for the variable coefficient CEO age is 0.214. As this value is larger than 0.05 we can assume that the variable operating leverage is not significant and does not help predict operating leverage. As the theory previously mentioned in our literature review suggests that firms managed by older CEOs will have a lower operating leverage. Due to the fact that our model is not significant we cannot draw any conclusions from our results about this model. The relation between CEO age and operating leverage is inconclusive.

5.2.2 Research & Development

The regression coefficients of firm R&D expenditures can be seen in model 3. Because R&D expenditures are considered a riskier form of investment due to their higher degree of uncertainty regarding future benefits, if older CEOs prefer less risk compared to younger CEOs, there should be a negative relation between CEO age and R&D expenditures. The dependent variable in Model 3 is R&D expenses divided by book value of assets. The model shows an adjusted R^2 value of 0.27. The ANOVA significance value is 0.000 which means there is very strong evidence the model does indeed explain the dependent variable of R&D. Now that it is established that our model does predict R&D we can look at the coefficients that the regression has computed. As we can see in the table, the significance value for the variable CEO age is 0.012. As this value is lower than 0,05 there is enough evidence to assume that the variable CEO age is significant and does help predict R&D. Looking at the unstandardized coefficient for this variable we denote a negative value of -0.073. As this value is negative it indicates a negative relations between CEO age and R&D investment. As the theory previously mentioned in our literature review suggests that firms managed by older CEOs will have a lower R&D investments. Due to the fact that our model is significant and the coefficient is negative we have enough evidence to suggest that we can accept the hypothesis. Based on our results of the studied firms we can say that there is a negative relation between CEO age and R&D expenditure.

5.2.3 Financial policies

CEOs can also reduce risk through more conservative financial policies. I next analyze the relation between CEO age and firm financial leverage by looking at Debt/ Equity in model 4 and Debt/ Assets in model 5. If older CEOs prefer less risk compared to younger CEOs, there should be a negative relation between CEO age and financial leverage. The dependent variable in Model 4 is debt/ equity and model 5 is debt/ assets. The models show an adjusted R squared value of 0.143 and 0,193 respectively, which indicate the total variability explained by the model. Looking the ANOVA values, they are lower the 0.05. This means that for both the models there is very strong evidence that the models do indeed explain the dependent variable of debt/ equity and debt/ assets respectively. Now that it is established that our models do predict debt/ equity and debt/ assets we can take a look at their coefficients. As we can see in the table, the significant values for the variable CEO age is 0.667 and 0.764. As these values are much higher than 0.05 there is not enough evidence to assume that the variable CEO age helps predict debt/ equity and debt/ assets. Based on the model we cannot generate a conclusion.

Collectively, the results in Table 3 suggest that older CEOs decrease their firms' risk by investing less in R&D and also have lower stock volatility. As the significance of the coefficients of the other dependent variables are too high we are unable to make reliable conclusions based on those models. Lastly, we have also attempted to compute additional regression models namely for each CEO age category (Older, middle, younger). However, these have not been included in our analysis due to their inconclusiveness. None of the regression models of the CEO age categories allow us to draw viable conclusions because they are insignificant.

6. LIMITATIONS

As we have seen in the above section from a total of 5 models only 2 of them prove to be significant. This indicates that there are numerous limitations to our regressions and adopted study approach. In this section I shall comment on the limitations and improvements that can be made to this study in order to generate more reliable results.

First of all the reliability of the models within this study would be significantly improved with a larger sample size. In

our study the sample size was roughly 106 firms. Adopting more of firms in the study would mean our results would have increased external validity, accuracy and increase the chance that outliers will be captured. Also a larger sample size would lower the variance found in the chosen variables. Furthermore, due to resource constraints not all the control variable was able to be included in the regression. Although the most vital control variables were included there are some that are still missing. If more resources and time were available for this study the following variables could be included in other to increase the strength of the regression. As control variables, CEO tenure that shows how long the CEO has been at the firm, CEO compensation that shows compensations contracts awarded to CEOs for certain actions, the total CEOs portfolio Delta where portfolio delta is the dollar increase in wealth (in thousands) for a 1% increase in stock price, Block holder presence which shows the presence of a shareholder that owns more than 10% stake in the company and stock returns which shows the annual stock returns during the fiscal year could also be included in the regression. Including these control variables would better the regression models. Also, as another measure of risk we could include firm diversification. This would give us yet another indicator to use to assess how firm risk changes with CEO age.
Lastly, our regression models do not take into account industry fixed effects or firm fixed effects. Involving these fixed effects in our regression would increase the reliability of our results significantly. Our results could also be affected by the horizon problem. The horizon problem arises when managers near retirement sacrifice investment in long-term projects that are good for the firm's long-term performance in exchange for short-term projects that temporarily improve short-term performance. The typical methods that CEOs use to temporarily inflate short-term performance are reducing R&D expenses and managing accruals. The horizon problem relates to this study in that the finding that older CEOs invest less in R&D to reduce firm risk could be explained away if the result is driven by older CEOs near retirement decreasing R&D expenditures to improve short-term performance rather than to reduce risk.

7. CONCLUSION

In this paper studied 106 firms on the Euronext Brussels and Amsterdam stock exchanges during the year 2014. I provide evidence on whether a CEO's age impacts his/her risk-taking behavior. Consistent with the theoretical prediction that risk-taking behavior decreases as CEOs age, I find that CEO age is negatively related to firm stock return volatility. Next, I examined the channels through which CEOs can influence firm risk. I find that older CEOs invest less in research and development. I was unable to make conclusions about CEO age and relations to operating leverage and financial leverage due to insignificance of results. My results validate findings made by Serfling (2012). I find the same relationships between CEO age and risk taking behavior and seen by lower stock return volatility and less R&D investment. I am unable to compare the other measure of risk to Serfling.

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