2010

The Effect of Age upon CEO Compensation: A Cross-Industry Study

Anthony Bouvier
Claremont McKenna College

CLAREMONT McKENNA COLLEGE

THE EFFECT OF AGE UPON CEO COMPENSATION: A CROSS-INDUSTRY STUDY

SUBMITTED TO

PROFESSOR HENRIK CRONQVIST

AND

DEAN GREGORY HESS

BY

ANTHONY BOUVIER

FOR

SENIOR THESIS

FALL/2010

November 29, 2010

Table of Contents

I. Introduction

The compensation of CEO's has been at the forefront of the public's mind for the past few years. During the recession, one could not go a day without hearing about the atrocious salaries and bonuses that executives were being paid. Although it only recently became an explosive topic, academics have been researching all aspects of compensation for many years. One of the earliest looked at the idea of pay for performance (Jensen and Murphy 1990), and the field has taken off from there. Many studies have been done on the determinants of compensation, and I was interested in how age relates to compensation. I created a model for determining compensation, but also took it one step further and looked at the compensation structure across different industries as well. I found that age did indeed influence compensation levels, but that it only had some effect on pay structure and only in certain industries.

II. Literature Review

There are many angles that have been taken to analyze CEO compensation. For example, (Milbourn 2003) investigated whether a CEO's reputation affected their stock-based compensation. Hill and Phan (1991) argued that CEO tenure is a major factor in determining compensation. They hypothesized that the influence of CEOs over their board of directors and the likelihood their compensation packages matched their personal preferences would increased the longer the incumbent had tenure (Hill and Phan 1991). Similarly, Davidson et al. (2006) examine the determinant of CEO age at a succession. They found that board members are more likely to choose a new CEO that is closer to their own age. Interestingly enough, they also found that this bias did not negatively impact performance, but instead improved it somewhat (Davidson, Nemec, and Worrell 2006).

The main theme in these studies is the fact that there is definitely a non-financial component of some kind on the determinants of CEO compensation. One of the most important human determinants is age (McKnight et al. 2000). McKnight et al. argue that the size of the company, shareholder return, and CEO turnover are not sufficient enough variables to explain the differences in CEO compensation by themselves, which is where the addition of the age variable can pick up the slack. They believe that there is a personal attribution aspect to it as well, for which age can be a proxy. Their findings supported their hypotheses that the compensation level of CEO's would be positively related to age, but there were diminishing returns on pay increases as age increased. This effect was so profound, that the compensation level started to decrease as an incumbent approached retirement age.

Another interesting factor related to age is the idea of a career horizon (Davidson et al. 2007). It has been shown that the tenure of an executive can be broken down into five distinct periods or "seasons" (Hambrick and Fukutomi 1991). An executive has different goals and motivations at different points in his career, and the length of his career horizon until he retires can affect the decisions that are made. Davidson et al. use this to explain why it would be advantageous for an executive to inflate earnings in the year or two prior to a succession. They argue that the executives are incentivized to do this because their pay packages are too heavily based on performance. Because they are about to retire, they can benefit from the upside of inflating earnings without having to experience the repercussions of their actions a few years down the road.

I will differ from these studies because I will create a more complete model for determining compensation, incorporating the different aspects discussed by the literature that I mentioned. I will also look at pay structure across industries to determine whether there are

fundamental differences. Then, I will see if the pay structure for executives in different industries changes with age.

My hypotheses are as follows:

1) Age will be a statistically significant determinant of all components of compensation.
2) In mature industries where products and services are difficult to differentiate from the competition's, the compensation structure will be weighted more towards guaranteed compensation (salary) than to variable pay. Furthermore, in these industries, the percentage of fixed compensation will decrease with age.

III. Data and Methodology

Data Sources

Data were gathered from Standard & Poor's Compustat database, through Wharton Data Research Services (WRDS). The main cross-sectional sample of 2009 CEOs was compiled from the Annual Executive Compensation subset of Compustat, which provided all of the data on the individual incumbent CEOs and their companies, as well as their compensation. Data on individual firms' market capitalizations was also provided by Compustat, in the Annual Fundamentals subset. The analysis was done on data from 2009 because it is the most recent complete fiscal year, and it is far enough removed from the recession that compensation has returned to some sense of normalcy. Also, there have been no papers on this subject after the recession, so my data will be unique in that respect. The raw data had about 1800 observations, but some were missing data, so after cleaning it up, I was left with a little over 1600 observations. My analyses will be very statistically accurate because I have a sufficiently large

enough sample to get a representative cross section of the universe of publicly traded companies in the United States.

	Age	*Tenure*	*Market Cap*	*Total Shares Owned*	*Base*	*STI*	*LTI*	*TDC*
Mean	55.19	8.14	6,943,303,470	2,194,489	798,549	1,143,170	2,582,778	4,524,497
Standard Error	0.17	0.17	505,387,741	345,315	10,116	42,345	84,202	114,369
Median	55	6	1,653,366,850	574,625	750,000	620,140	1,438,778	3,114,286
Mode	56	2	1,001,639,100	25,000	1,000,000	0	0	750,000
Standard Deviation	6.96	6.95	20,578,654,057	14,060,713	411,891	1,724,213	3,428,568	4,656,923
Sample Variance	48.50	48.34	4.23481E+20	1.97704E+14	1.69655E+11	2.97291E+12	1.17551E+13	2.16869E+13
Kurtosis	0.97	5.51	76.71	537.96	73.13	30.86	17.57	11.74
Skewness	0.32	1.98	7.66	21.65	5.31	4.47	3.29	2.77
Range	62	58	3.22332E+11	408252723.2	8,092,855	19,891,275	35,209,440	43,377,600
Minimum	31	1	1,944,450	266.839	7,145	0	0	81,840
Maximum	93	59	3.22334E+11	408252990	8,100,000	19,891,275	35,209,440	43,459,440
Count	1658	1658	1658	1658	1658	1658	1658	1658

CEO Compensation Measures

Multiple regression analyses were used with the different components of compensation as the dependent or y-variables and different measures proven in the literature as explanatory or x-variables. The components of executive compensation were broken down into 4 parts: Base salary, Short-Term Incentives, Long-Term Incentives, and Total Direct Compensation. Base salary is straight forward and the most consistent of all of the variables because the vast majority of CEOs (and everyone below them for that matter) receive a base salary

Short-Term Incentives (STI) are the non-salary cash portion of compensation. This is more colloquially known as a "bonus", but I wanted to be more specific because there are multiple types of payouts that can be considered as bonuses. The first is the traditional performance "bonus" which is tied to some type of financial or operating metric. The other type of "bonus" is called a discretionary bonus. These payments are not tied to any performance metric, rather the Compensation Committees can choose to award cash at their discretion to executives at the end of the year. The purpose of the discretionary bonus is to give the Compensation Committee the ability to incentivize the executives if they are not eligible for a performance bonus because of circumstances beyond their control (i.e. a recession). Therefore, I have defined STI as the sum of the performance bonus and any discretionary bonus paid in a given year.

Long-Term Incentives (LTI) are the non-cash portions of compensation, and can be broken down into stock option and restricted stock grants. Restricted Stock or Restricted Stock Units (RSUs) are converted into common shares once they have vested, giving full value to the recipient. Options, on the other hand, have vesting schedules like RSUs, but they are different because upon vesting, the recipient has the right to purchase stock at a specified price, called the

strike or exercise price. Generally, the strike price is the closing price of the company's stock on the date of grant, so the value in options is only the difference between the selling price and the exercise price. Black-Scholes is the most prominent option valuation method used in industry, but I used the FAS 123 method because the data was more complete. Therefore, I defined my LTI variable as the sum of the FAS 123 valuations of stock options and RSUs granted to executives in 2009.

The last component of composition is Total Direct Compensation (TDC), which is the sum of the previous three components. This represents all of the compensation directly granted to CEOs during the year. There are other indirect forms of compensation such as benefits and perquisites, and although it can be argued that these provide incentives as well, the total dollar value of these perks is miniscule compared to the TDC, so I did not include them in the analyses. Also, the benefits and perks were grouped together in the data in a column called "All Other Compensation", which made it impossible to tell what exactly was included in that number. There was no way of knowing the breakdown of what perks were received and the dollar amount for each, which would have been the most interesting topic to analyze.

I ran separate regressions with each of these compensation components as the dependent variable, and the same general set of explanatory variables. The main variables supported in the literature are age, size of company, tenure, and industry controls. The age of CEOs in 2009 is straight forward, and I also created a quadratic age term because it fit some of the data more accurately than the linear variable on its own. Market capitalization was used as a proxy for the size of the company, and was calculated by multiplying the common shares outstanding by the closing share price on December 31, 2009. Tenure was the length of time that the CEO had been in his current role, rounded to the nearest year. The industry controls were dummy variables for

each of the ten economic sectors based on the first two digits of the GIC code assigned to the firm. I also included the number of shares owned overall by the each CEO because it could add more explanatory power to shifts in compensation.

Compensation Structure

After I performed a cross-sectional analysis of the pay levels of the entire US market, controlling for industry fixed effects, I analyzed the pay mix across these industries. I created new variables that were the percentage each component (base, STI, and LTI) made up of Total Direct Compensation. Then, I plotted these percentages against age to see how the pay mix differs for as age changes. I started with the entire data set, which was inconclusive, and then broke it down into the ten economic sectors specified by the first two numbers of a company's GIC code. Some sectors were still too broad, so I went one step further, breaking the sectors into industry groups which were derived by using the next two numbers from the GIC code as well. This resulted in a total of 25 industry groups, each with graphs for all three components versus age.

I focused on the percentage of base salary because it represents the guaranteed portion of an executive's compensation. I created summary statistics for the base salary percentage of every industry, using the mean and median base salary to compare them. Finally, I analyzed the change in base salary percentage versus age, determining which industries were positively and negatively correlated as well as showed the largest and smallest changes.

IV. Results

Age Model

The first test that was run regressed base salary on the independent variables (Table 1). Consistent with the literature, it was found that age is statistically significant with a positive coefficient, and the age-squared term is also significant at the 1% level, but with a negative coefficient. More specifically, it was found that for every one year increase in age, base salary would increase by about $40,500, but would incur diminishing returns at a rate of $-310 per year increase in age-squared. This quadratic fit is represented in Figure 1, where base salary increases with age with diminishing returns until around age 65, where the negative quadratic term becomes greater than the linear age term and salary begins to decrease. Market capitalization was extremely significant in every regression that was run, which emphasizes the intuitive fact that it is the main determinant of the level of CEO compensation. For every $1 billion increase in market capitalization, base salary increased by $5,480. However, tenure became insignificant once the industry controls were added, suggesting age is sufficient enough to describe the variation in base salary. Also, for every 1 million shares of company stock owned, base salary decreased by $1,840, which was significant at the 1% level. This is makes sense because the more stock the CEO has received as compensation, the lesser the fraction that base salary makes up of overall pay. Therefore, at a certain point, increasing base salary does not serve to incentivize the CEO as efficiently as other forms of pay. The R^2 for this first regression was 0.193, meaning about 20% of the variation in base salary can be explained by my model. This shows that my model is decent at determining base salary because there are so many other concrete and intangible variables related to each company and CEO that I was not able to include.

When the same regression was run on Short-Term Incentives as the dependent variable, a linear age model was the best fit. Age was again significant at the 1% level, and it was found that for every 1 year increase in age, short-term incentives increased by $20,804. Firm size had more of an effect on STI than on base salary. For every $1 billion increase in market capitalization, the value of STI granted increased by $23,100. Tenure was originally significant, but fell out of importance when the industry controls were added. The total shares owned variable was again negative, showing a decrease in STI $5,590 for every 1 million increase in shares, but it was only significant at the 10% level. The R^2 for this regression dropped, so only 12.5% of the variation in short-term incentives was explained by the model. One of the possible reasons for the drop was the fact that many of the CEOs did not receive a bonus in 2009. This skewed the regression results downward, so age, firm size, and shares owned would have an increased effect on STI if the zeros were taken out. I chose to run my analysis with the zeros still included because it accurately reflects instances where an executive does not receive a bonus (for whatever reason). The problem is that the number of CEOs who did not receive STI is probably still elevated from the lingering effects of the recession. Also, the predictions of a continued slowed economic recovery could have kept these levels depressed below what they would normally be, even though we are not officially in the recession anymore.

Long-Term Incentives behaved very differently than either base salary or STI. Age was not significant in predicting the levels of LTI at any level, but instead, tenure was significant at the 1% level. The interesting thing was that tenure had a negative effect on LTI: for every 1 year increase in CEO tenure, the value of long-term incentives granted decreased by $32,911. Both firm size and total shares owned were also significant at the 1% level as well. For every $1 billion increase in market capitalization, LTI increased by $55,300, and for a 1 million increase

in shares owned, LTI decreased by $21,000. Intriguingly enough, the R^2 for this model was between the values of STI and base salary, explaining 14.7% of the variation in long-term incentives. One of the reasons why age is not a good determinant of long term incentives might be the fact that there are so many different ways to incentivize CEOs with equity. The vast differences between options and restricted stock, both in how they are valued and how they are granted could contribute to inconsistent data. Since I was methodologically sound in the way I compiled the data, even if there is some inconsistencies, it was found that age is not a good predictor of long-term incentives.

When we take a step back and consider the level of overall pay, Total Direct Compensation behaved very similar to short-term incentives. Age was again significant, but at the 5% level this time, and for every 1 year increase in age, total compensation increased by $37,064. Interestingly enough, firm size, tenure, and total shares owned were all statistically significant at the 1% level. Firm size had the largest effect, increasing TDC by $83,800 for every $1 billion increase in market capitalization. Tenure was next, decreasing TDC by $44,138 for every additional year that the CEO retains his job. Finally, for every 1 million increase in total shares owned, TDC decreased by $28,300. This is the only regression where all three of these independent variables were significant, which accounts for the increase in the R^2 to 0.187. It makes sense that age and all of the other independent variables significantly affect the level of total direct compensation because the variation in how the pay mix is broken down is taken out of the equation. We are just analyzing the overall pay level that each CEO receives, so the data should have been much more accurate than each of the components individually. Like base salary, there were no zeros to skew the results, so although there is still room for improvement, my model explains variations in TDC fairly well.

Industry Comparisons

Fixed Compensation Percentage

I found that there was some variation between industries in both the percentage of fixed compensation and how it changed with age. First, I looked at the median percentage of base salary to test the first part of my hypothesis (Table 2). The findings were inconclusive as to whether or not I was correct in postulating that mature industries where product differentiation is difficult had a higher percentage of fixed compensation.

Banks had the highest median, and at about 59%, it was almost double the median base salary percentage of the closest industry. This is intuitive because there are so many banks of all sizes who offer very similar services. The main differentiator between the major banks today is the threat of bankruptcy, so it makes sense that the compensation structure is more heavily weighted toward riskless pay so there is not as much incentive for executives to undertake risk for their firms. Next in line are the automobile and equipment industries, with medians of 30.5% and 28.2% respectively. These industries are similar because they are both consolidated and extremely correlated with the state of the economy. But, product and service differentiation is difficult for both industries, which supports my hypothesis. On the other hand, the consumer goods industry, which includes agricultural products, packaged foods and drinks, brewers and distillers, and tobacco, had the lowest median at only 16%. These are all well-established segments where there is a lot of competition, but in this case, compensation was geared towards a much more risky structure. These executives are being incentivized to differentiate their firms from the competition, even though it is very tough to do so in these industries. This casts doubt on my hypothesis because a mature industry has a very low median base salary percentage.

The second and third from the bottom are the Energy and Telecom industries, which have medians of 16.6% and 17.4% respectively. The energy industry is mostly made up of oil and gas companies, which have very high risks associated with them. There are such high costs for exploration of new oil sites and the operation of existing wells that firms need their executives to be constantly pushing the limits to stay ahead of the competition. The same goes for the Telecom industry because technology is an ever evolving beast, and if these companies are not on the cutting edge, they will not survive. These two industries support my hypothesis because the firms need their executives to take big risks to stay ahead of their competitors. However, my hypothesis is again thrown into question by the Electronic Hardware industry. It has the fourth highest median base salary percentage, at 27.4%, but it is made up of companies who manufacture computer and electrical components, which require a lot of research and development to stay on the same playing field as their competition.

Overall, it was difficult to conclude whether there was a definite trend in the median percentage of fixed compensation. Many of these industries are still very broad, and it could be that I would have to continue breaking them into their individual sub-industries in order to obtain conclusive results. It does seem, however, that manufacturing companies tended to have a higher median base salary percentage, which could suggest that any type of manufacturing requires less risk taken by the CEO.

Comparison with Age

My hypothesis also stated that for industries where there is a higher median percentage of fixed income, the percentage would decrease with age. I also found that this was inconclusive, but was most likely incorrect because the industries with the highest median percentage tended to

increase with age. Of the five highest median base salary percentages, Banks, Commercial Services, and Electronic Hardware were positively correlated with age, and Equipment and Construction and Automotive were negative, but only weakly correlated. Interestingly, the bottom also followed a similar pattern, with three that were positively correlated with age (Figures 1-5). Most of the industries had base salary percentage only weakly correlated with age, but a couple of them were fairly strongly correlated. The Aerospace and Defense, Transportation, and Insurance industries all showed a little over a 1% increase in the percentage of base salary for every year increase in age (Figures 6-8). This means that as CEOs get older and more experienced, the amount of risk in their compensation decreases substantially in these industries. This could be because these industries value experience, and include this 1% "age premium" to secure their executives for the long-term. However, the findings were not very significant, so there is no conclusive evidence that this phenomenon exists.

V. Conclusion

My compensation model confirmed my first hypothesis that age is a significant factor for base salary, short-term incentives, and total direct compensation, but not for long-term incentives. This confirmed the literature and allowed for the investigation of age with regards to pay structure. My second hypothesis was not confirmed because there was much variation in the structure of compensation across similar industries. Also, age does not seem to determine changes in CEO pay structure except for in certain industries. This might be the reason that there was no literature that has examined this topic, but there should be some other variations on my analysis that could prove insightful. For example, further analysis could be also done to determine the causes of the change of structure with age in the relevant industries.

VI. Appendix

Table 1: Age Model

VARIABLES	(1) Base	(2) STI	(3) LTI	(4) TDC
Age	40,479***	20,804***	9,813	37,064**
	(11,063)	(6,389)	(12,616)	(16,664)
Age^2	-310.2***			
	(97.73)			
Market Cap	5.48e-06***	2.31e-05***	5.53e-05***	8.38e-05***
	(3.86e-07)	(1.94e-06)	(3.84e-06)	(5.07e-06)
Tenure		-9,181	1.017e+06**	-44,138***
		(6,444)	(503,408)	(16,807)
Total Shares Owned	-0.00184***	-0.00559*	-0.0210***	-0.0283***
	(0.000585)	(0.00299)	(0.00591)	(0.00780)
Industry Controls	X	X	X	X
Constant	-460,796	-18,422	1.852e+06**	2.312e+06**
	(316,355)	(390,512)	(771,124)	(1.019e+06)
Observations	1,673	1,673	1,673	1,673
R-squared	0.193	0.125	0.147	0.187

Standard errors in parentheses

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

Table 2: Base Salary as a Percentage of Total Direct Compensation

Industry	Number of Observations	Base Mean	Base Median	Age Median	Age Minimum	Age Maximum
Banking	88	57.3%	58.5%	56	36	78
Automotive	17	32.1%	30.5%	58	52	69
Equipment	124	32.0%	28.2%	56	38	70
Commercial Services	51	33.7%	28.1%	54	42	67
Electronic Hardware	115	37.0%	27.4%	54	39	73
Entertainment	38	41.3%	26.3%	57.5	43	79
Hospitality	70	30.9%	25.8%	53	42	76
Retail	104	33.5%	25.3%	53	42	76
Materials	99	31.7%	24.5%	57	43	80
Appliances	72	35.5%	23.5%	54	33	74
Insurance	62	29.6%	23.2%	56.5	39	78
Utilities	76	24.3%	23.2%	56	46	67
Transportation	34	30.0%	23.0%	57	47	73
Semiconductors	75	29.1%	22.8%	54	40	72
Food & Drug	19	30.1%	22.7%	57	45	73
REITs	65	30.1%	22.5%	53	39	80
Life Sci, BioTech, Pharma	57	28.7%	21.6%	55	42	82
Healthcare	124	28.6%	21.6%	54	39	75
I-Banking & Finance	49	29.3%	21.1%	53	39	66
Software	123	28.2%	21.1%	53	38	73
Household Products	14	29.6%	19.7%	55	31	68
Aerospace & Defense	27	27.9%	18.8%	59	50	93
Telecom	24	18.7%	17.4%	53.5	44	71
Energy	89	22.0%	16.6%	56	41	79
Consumer Goods	49	21.7%	16.0%	55	45	71

Figure 1

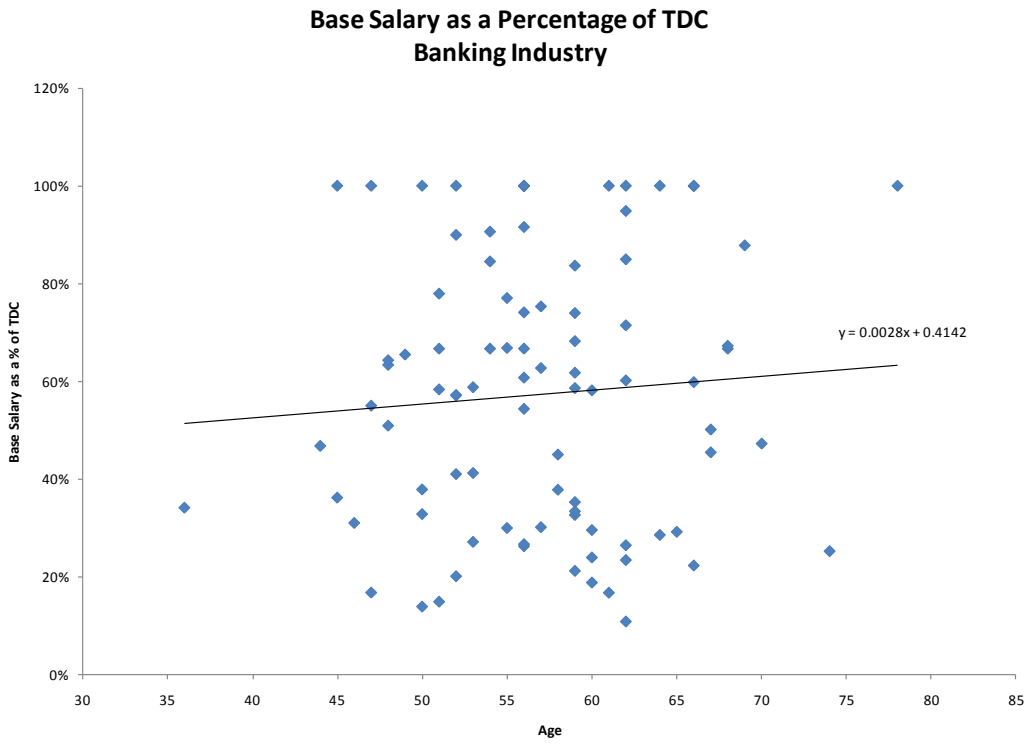


Figure 2

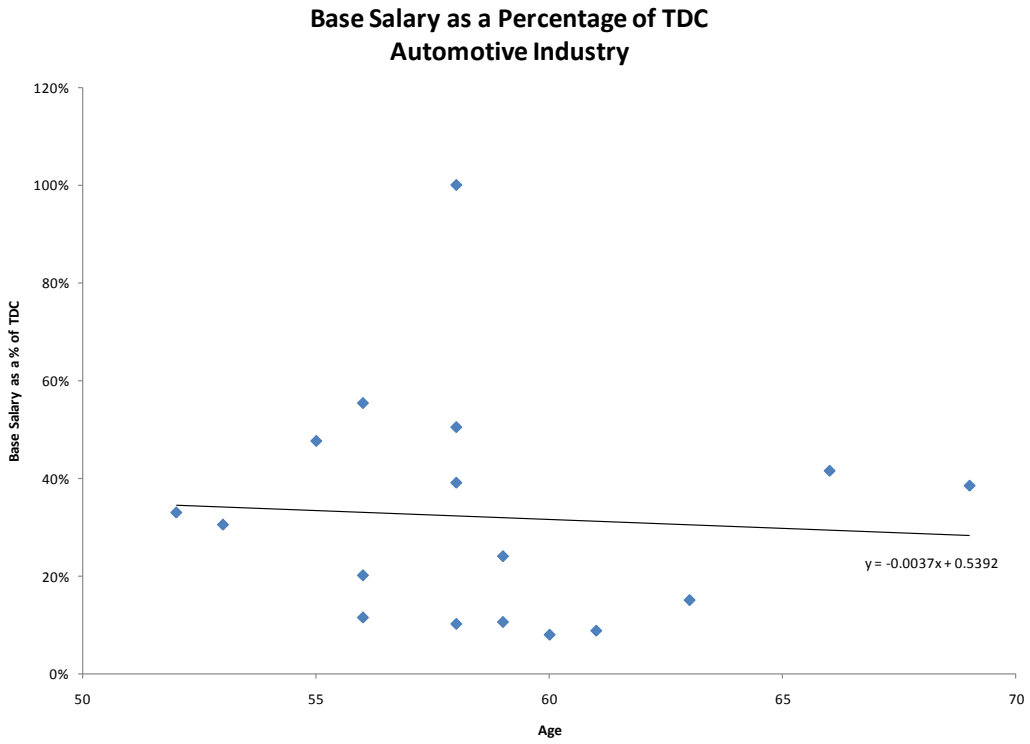


Figure 3

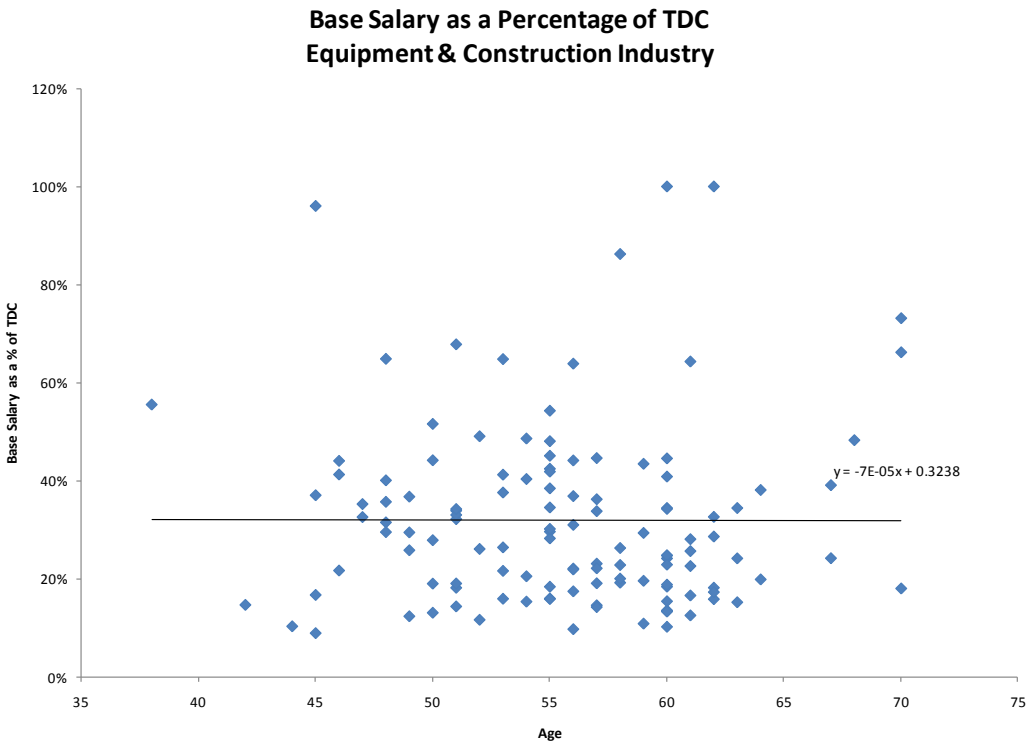


Figure 4

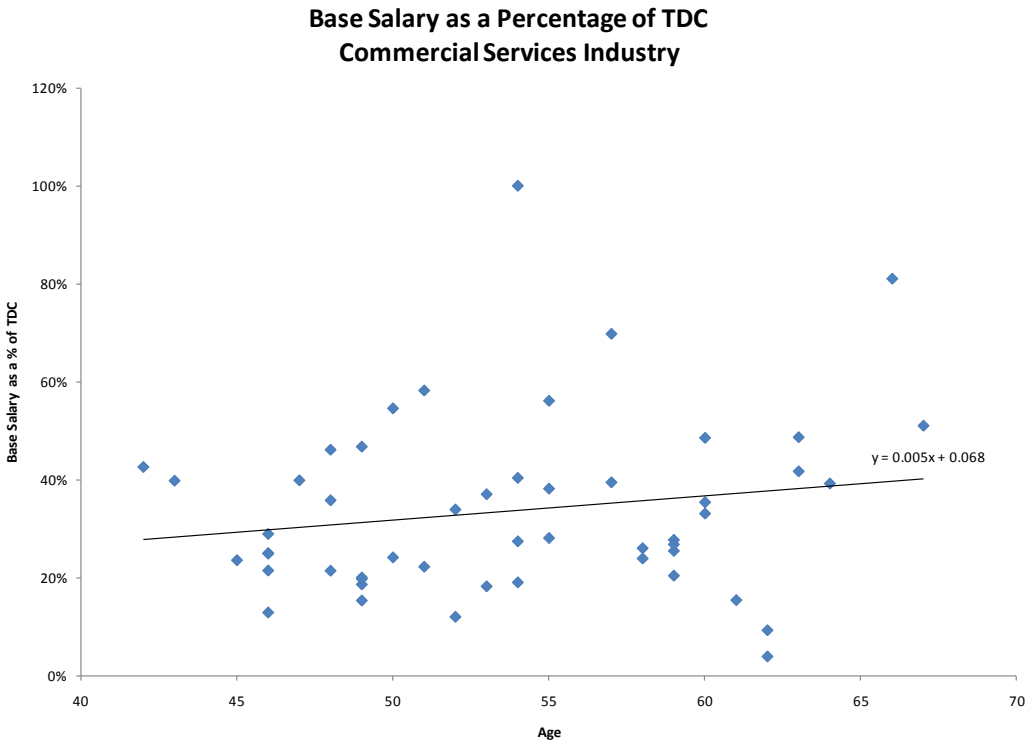


Figure 5

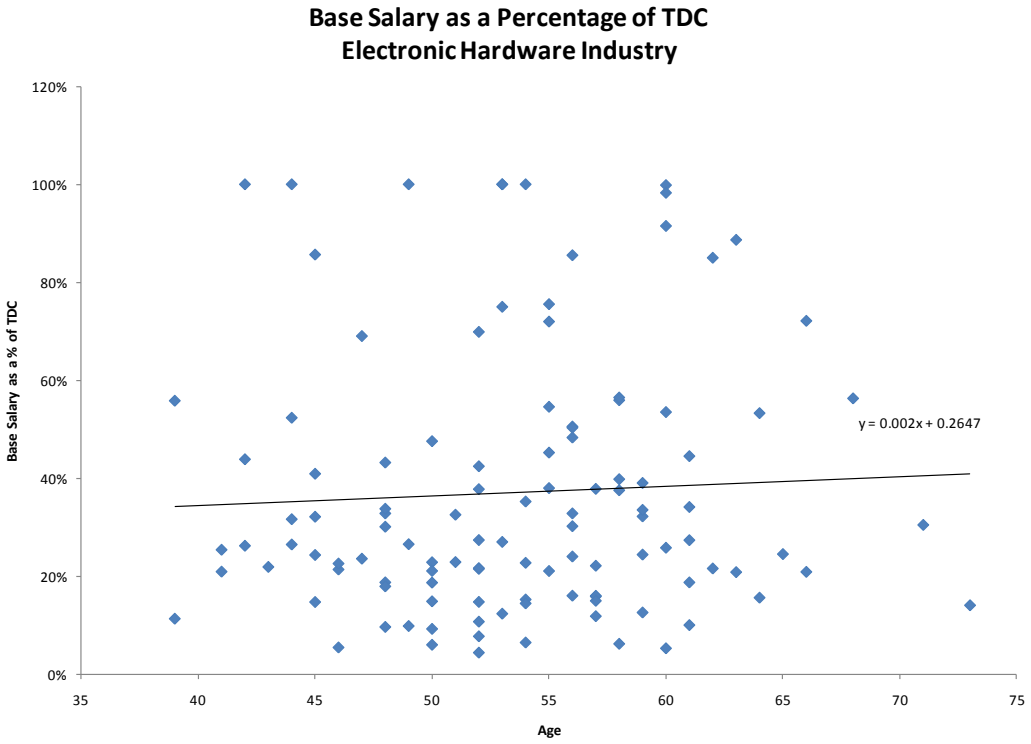


Figure 6

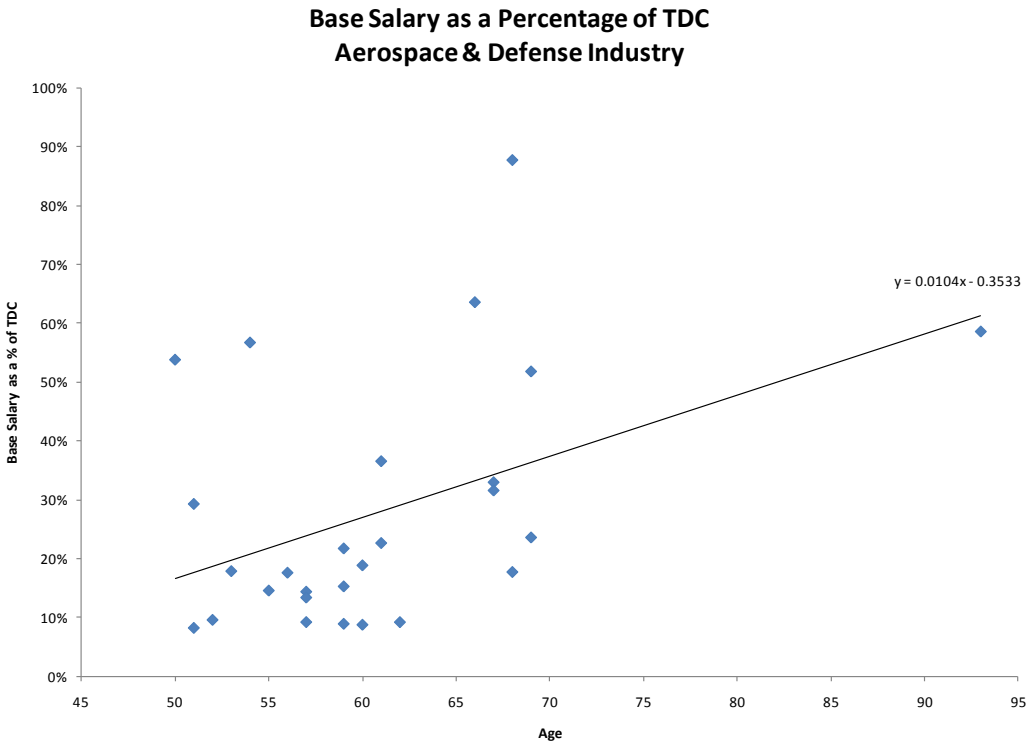


Figure 7

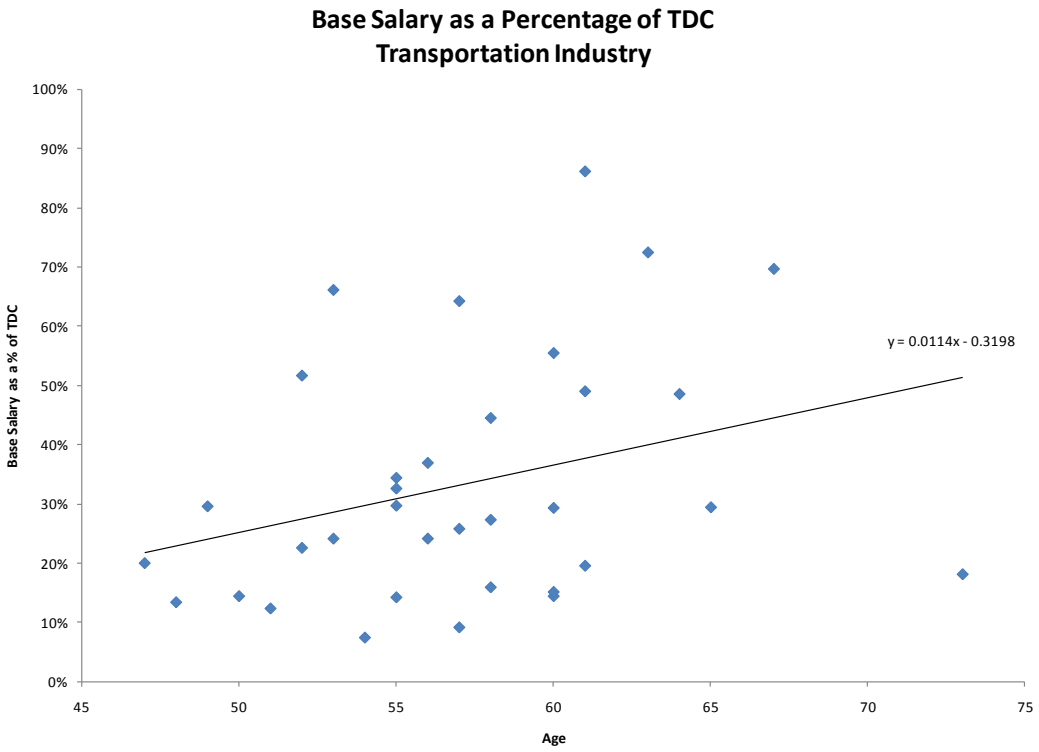
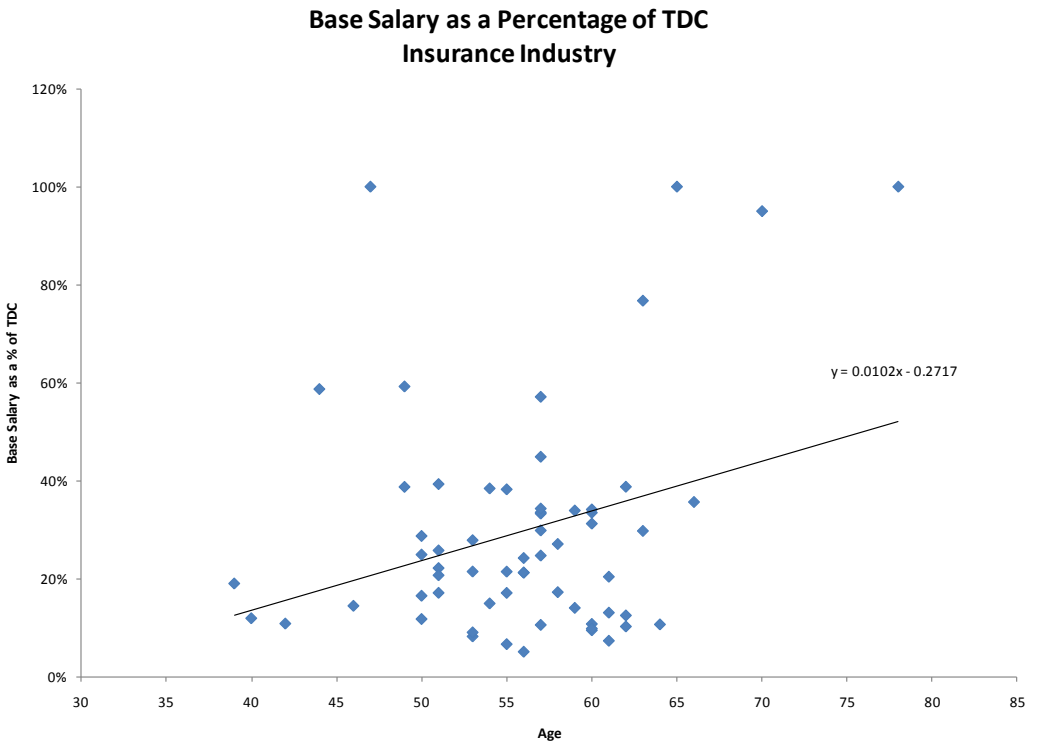


Figure 8



VII. Acknowledgements

I would like to thank Professor Henrik Cronqvist for his knowledge and guidance throughout this project. Next time, I will find a unique angle to analyze Swedish twins.

VIII. References

Statement of Financial Accounting Standards no. 123 (Revised 2004) (2004): .

Bryan, Stephen, LeeSeok Hwang, and Steven Lilien. 2000. CEO stock-based compensation: An empirical analysis of incentive-intensity, relative mix, and economic determinants. *Journal of Business* 73 (4) (10): 661-93.

Chen, Yenn-Ru, and Bong Soo Lee. 2010. A dynamic analysis of executive stock options: Determinants and consequences. *Journal of Corporate Finance* 16 (1) (02): 88-103.

Cunat, Vicente, and Maria Guadalupe. 2009. Executive compensation and competition in the banking and financial sectors. *Journal of Banking and Finance* 33 (3) (03): 495-504.

Davidson, Wallace N.,III, Carol Nemec, and Dan L. Worrell. 2006. Determinants of CEO age at succession. *Journal of Management and Governance* 10 (1): 35-57.

Davidson, Wallace N., Biao Xie, Weihong Xu, and Yixi Ning. 2007. The influence of executive age, career horizon and incentives on pre-turnover earnings management *Journal of Management and Governance* 11 (1): 45-60.

Graham, John R., Si Li, and Jiaping Qiu. Managerial attributes and executive compensation. *AFA 2010 Atlanta Meetings Paper* (September 14, 2009).

Hambrick, Donald C., and Gregory D. S. Fukutomi. 1991. The seasons of a CEO's tenure. *The Academy of Management Review* 16 (4) (Oct): 719-42.

Hill, Charles W. L., and Phillip Phan. 1991. CEO tenure as a determinant of CEO pay. *The Academy of Management Journal* 34 (3) (Sept): 707-17.

Jensen, Michael C., and Kevin J. Murphy. 1990. Performance pay and top-management incentives. *Journal of Political Economy* 98 (2) (04): 225-64.

Kanagaretnam, Kiridaran (Giri), Robert Mathieu, and Gerald J. Lobo. CEO compensation mix and analysts' forecast accuracy and bias ((December 2005)).

McKnight, Phillip J. 2000. CEO age and top executive pay: A UK empirical study. *Journal of Management and Governance* 4 (3): 173-87.

Milbourn, Todd T. 2003. CEO reputation and stock-based compensation. *Journal of Financial Economics* 68 (2): 233-62.

Murphy, Kevin J. 1998. Executive compensation .

Noe, Thomas H. 2009. Tunnel-proofing the executive suite: Transparency, temptation, and the design of executive compensation. *Review of Financial Studies* 22 (12) (12): 4849-80.

Williams, Melissa A., and Ramesh P. Rao. 2006. CEO stock options and equity risk incentives. *Journal of Business Finance and Accounting* 33 (1-2) (January): 26-44.