Top 5 Compensation Cost, Holdings & Future Stock Returns

By Stephen F. O'Byrne and S. David Young

In this article, we show that top 5 performance adjusted compensation cost and top 5 holdings predict future stock returns and that the predicted stock return can be used to assess corporate governance and top management pay and to realize excess returns by going long a portfolio of companies with positive pay factors (low cost and high holdings) and short a portfolio of companies with negative pay factors (high costs and low holdings). The key to our analysis is an analytic framework for measuring the three basic objectives of executive pay – providing strong incentives to increase shareholder value, retaining key talent and limiting shareholder cost. The framework, which shows that widely accepted compensation practices do a poor job of aligning management and shareholder interests, is easily adapted to the needs and data resources of different investors. For directors and highly engaged investors, the framework provides company specific measures of incentive strength, retention risk and performance adjusted cost using ten years of historical data and individual company regressions. For more diversified investors, approximate measures of incentive strength and performance adjusted compensation cost can be calculated, without individual company regressions, using only three years of historical data. We show that both the ten year measures and the three year measures predict future excess returns and show how the three year measures can be used to construct profitable long/short portfolios.

Our analysis differs from conventional thinking about executive pay in two important ways. Conventional thinking is that the three basic objectives of executive pay can be achieved by "competitive pay policy" with a high percent of pay at risk. Competitive pay policy is providing competitive target pay, normally 50th percentile pay, regardless of past performance. In theory, it retains key talent because target pay is not allowed to fall below the 50th percentile and it limits shareholder cost because target pay is not allowed to rise above the 50th percentile. When combined with a high percent of pay at risk, it achieves all three basic objectives. The flaw in conventional thinking is the assumption that a high percent of pay at risk provides a strong incentive to increase shareholder value when a company has a competitive pay policy. We'll show below that competitive pay policy creates an inherent "performance penalty" – poor performance is rewarded with more equity grant shares, while superior performance is penalized with fewer equity grant shares - that leads to weak incentives and high pay for poor performance even when 100% of pay is at risk in equity compensation. Our first difference from conventional thinking is that percent of pay at risk is not a meaningful measure of incentive strength. Our second difference is that a company's target pay percentile is not a meaningful measure of compensation cost.

In the body of the paper, we begin with a discussion of compensation policy before we present our measure calculations and backtesting results. We discuss compensation practices at some length to help the reader to understand that widely accepted compensation practices do a poor job of aligning management and shareholder interests and to appreciate that differences in compensation practices might reasonably affect future firm performance. Our compensation policy discussion starts with an analytical framework that uses relative pay and relative performance to measure the three basic objectives of executive pay, shows the prevalence of problems in achieving the basic objectives among S&P 1500 CEOs, shows how the widely accepted concept of "competitive pay policy" undermines the alignment of pay and performance, shows that our analytical framework points the way to "perfect" pay plans that provide perfect alignment with a zero pay premium at industry average performance and shows that comparison of the "perfect" pay plans with conventional pay practices highlights three basic flaws of conventional pay practices.

We then turn to a discussion of how pay factors are related to future period returns. We use two sets of pay factors. The first set, which is more suited for directors and highly engaged investors, uses ten years of historical data and provides company specific measures of pay leverage and alignment. The second set, which is more manageable for diversified investors, uses only three years of historical data and provides only rough proxies for incentive strength and performance adjusted cost. We first present regression models showing how both sets of pay factors affect future 1, 3 and 5 year returns, controlling for the Fama-French factors. These models show that incentive strength and performance adjusted cost have statistically and economically significant effects on future stock excess returns.

We then use the predicted excess returns from historical pay factor models to form long/short portfolios. Our backtests show that the long/short portfolios work better with longer horizons and bigger companies. Long/short portfolios based on predicted three year excess returns for companies with inflation adjusted market equity value of $2+ billion show an average annualized excess return of 195 basis points across 147 long/short portfolios holding a total of 3,973 companies. This excess return is statistically significant at a 1% level.

Measuring the Basic Objectives of Executive Pay

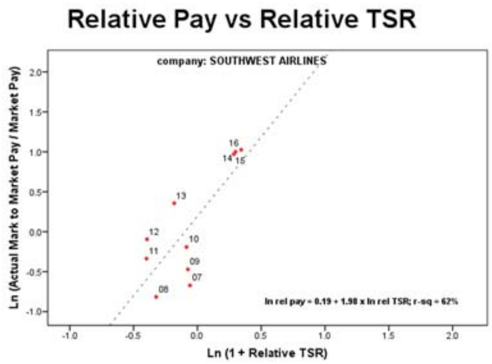
We use a regression of ln relative pay on ln relative performance to measure the basic objectives of executive pay. Figures 1 and 2 show regressions of ln relative "mark to market" pay on ln (1 + relative TSR) for Southwest Airlines and United Continental using CEO pay data for the ten years 2007-2016. The slope of the trendline, what we call "pay leverage", is a measure of incentive strength[1]. It's the percent change in relative pay associated with a 1% increase in relative shareholder wealth. Southwest has pay leverage of 1.98, so the CEO percent pay change is almost double the percent shareholder wealth change, while United Continental has negative pay leverage. Pay leverage provides a quantitative measure of a pay program's success in achieving the first basic objective of executive pay, i.e., providing a strong incentive to increase shareholder value. Pay leverage, as a regression slope, is the product of correlation (or "pay alignment") and relative pay risk. Southwest's pay alignment (r-sq) is 62%. The intercept of the trendline is the pay premium at industry average performance. This is a negative measure of retention risk and a positive measure of shareholder cost. The pay vs performance regression lets us quantify four pay problems: low alignment, high retention risk, high shareholder cost and high pay risk. Figure 3 shows the prevalence of these four problems for S&P 1500 CEOs in 2016.[2]

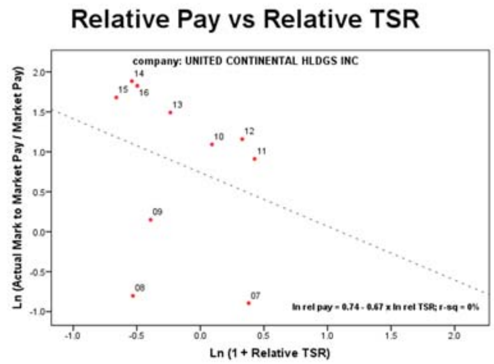
Figure 1

Figure 2

[1] Our calculation of "mark to market" pay is explained in detail in Stephen F. O'Byrne and E. Mark Gressle, "How 'Competitive Pay' Undermines Pay for Performance (and What Companies Can Do to Avoid That)" in the *Journal of Applied Corporate Finance* (Spring 2013). We estimate CEO mark to market pay using reported CEO grant date pay. We ignore incumbent turnover and assume that equity grants are held for assumed periods.

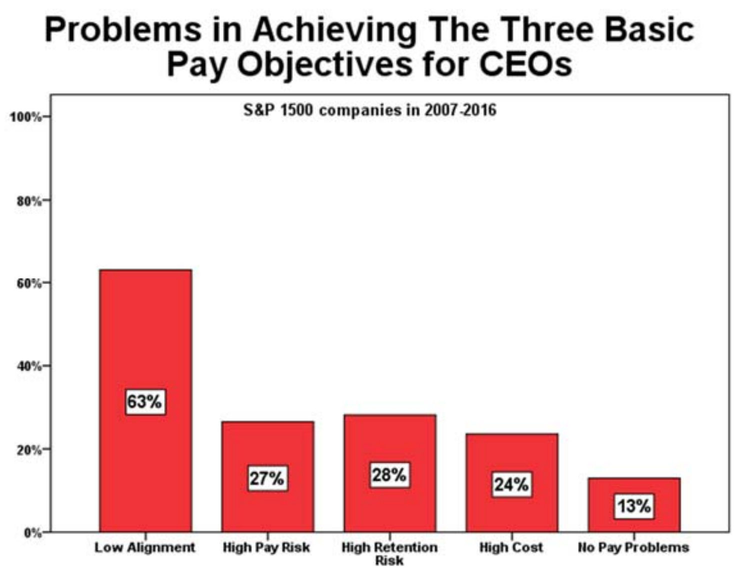
[2] In this exhibit, low alignment is alignment (r-sq) < 50%, high pay risk is relative pay risk > 1.5, high retention risk is a percent pay premium < -33% and high cost is a percent pay premium > 50%.





The observations in Figures 1 and 2 are cumulative measures of relative pay and relative performance. Mark to market pay values equity compensation based on the stock price at the end of each cumulative measurement period. Relative mark to market pay for a period is mark to market pay divided by cumulative market pay. Market pay is trendline grant date pay for position, industry and revenue size, as we explain in more detail below. Since grant date pay, and hence, market pay, is a present value, but mark to market is a future value, our calculation of cumulative market pay includes an adjustment for the expected accretion of market pay.[3]

Figure 3



Competitive Pay Policy Undermines The Alignment of Pay and Performance

Figure 3 shows that pay alignment (r-sq) is less than 50% for 63% of S&P 1500 CEOs. Figure 4 helps us understand why alignment is relatively low even though virtually all companies claim to align pay with performance. Figure 4 shows two five year scenarios where the stock price is $10 at the start of year 1

[3] We estimate an accretion factor by comparing average mark to market pay with average grant date pay. The accretion factor increases with the duration of the pay vs performance analysis. Our current accretion factor is (1 + .022)^duration.

and $20 at the end of year 5. In the "Good Early Performance" scenario the stock price rises to $30 in year four before declining to $20 in year 5, while in "Bad Early Performance" the stock price falls to $5 in year three before recovering to $20 in year 5. In both scenarios, we provide competitive pay, i.e., an annual stock grant with a grant date value equal to market pay of $1,000. The number of grant shares is calculated by dividing market pay by the stock price at the beginning of the year. Both scenarios have the same number of the number of grant shares in year one (100 = $1,000/$10). But grant shares in the Good Early Performance scenario are 70% lower in year 3 (50 vs 167) and 80% lower in year 4 (40 vs 200). At the end of year 5, Good Early Performance has 290 shares worth $5,400, while Bad Early Performance has 735 shares worth $14,690, or 153% more, even though both scenarios have the same cumulative performance. This example shows that competitive pay policy, i.e., providing market pay regardless of past performance, can undermine alignment. And this is not an extreme example of stock volatility. The volatility of the ten annual returns in Figure 4 is 0.41. This is only 60th percentile volatility for S&P 1500 companies since 1992.

Figure 4

Competitive Pay Policy Leads to Huge Pay Differences for the Same Cumulative Performance

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Market pay		1,000	1,000	1,000	1,000	1,000
GOOD EARLY PERFORMANCE						
Stock price	10	15	20	25	30	20
Shares (= market pay / BOY stock price)		100	67	50	40	33
Cumulative shares		100	167	217	257	290
Ending wealth						**5,800**
BAD EARLY PERFORMANCE						
Stock price	10	7	6	5	8	20
Shares (= market pay / BOY stock price)		100	143	167	200	125
Cumulative shares		100	243	410	610	735
Ending wealth						**14,690**

Our Analysis Points the Way to "Perfect" Pay Plans

A great benefit of the relative pay – relative performance regression is that it encourages search for "perfect" pay plans, i.e., pay plans that provide perfect alignment with an intercept of zero. The search for perfect pay plans leads to two insights: (1) alignment is perfect if there is consistent sharing, i.e., excess pay sharing in the excess return is equal to market pay sharing in expected value (see Appendix 1 for the derivation), and (2) there is a simple pay plan with annual grants of performance shares that provides perfect alignment with a zero pay premium at industry average performance.

The Four Features of the "Perfect" Pay Plan

The perfect performance share plan has four basic features. First, target pay is market pay adjusted for trailing relative performance. With pay leverage of 1.0, target pay = market pay x (1 + relative TSR from the start of the perfect pay plan). Second, the number of performance shares is equal to target pay divided by the stock price at the date of grant. Third, the vesting multiple is equal 1/(1 + industry return from date of grant). Fourth, all cash paid out prior to retirement is a draw against the value of the performance shares.[4]

Figure 5 shows that tying grant shares to target pay eliminates the difference in pay for the same cumulative performance that we observed n Figure 4. In year two, the beginning price is $15 in Early Good Performance and $7 in Early Bad Performance. When grant shares are based on market pay, as they are in Figure 4, Early Good Performance receives 67 shares in year 2, while Early Bad Performance receives 143. Figure 5 shows that this discrepancy is corrected when grant shares are calculated from target pay, which is equal to market pay x (1 + relative TSR). For Early Good Performance, relative TSR is +36% (= (15/11) – 1), so target pay is $1,364 and grant shares are 90.9 (= $1,364/$15). For Early Bad Performance, relative TSR is -36%, so target pay is $636 and shares are 90.9 (= $636/$7). A little algebra shows that grant shares are equal to market pay divided by the initial stock price adjusted for the subsequent industry return, i.e. grant shares = (market pay/[(1 + industry TSR) x year 0 stock price]. This implies that grant shares are constant as long as the industry is flat, but are reduced when the industry portfolio rises in value and increased when the industry portfolio declines in value. Both scenarios end up with 423 shares and cumulative "mark to market" pay of $8,452.

[4] It possible to show that this "perfect" performance share plan as the same underlying structure as noted perfect pay plans, i.e., the optimal investment manager fee structure developed by Don Raymond of Canada Pension Plan and the Dynamic CEO Compensation plan developed by finance professors Alex Edmans and Xavier Gabaix. See Stephen F. O'Byrne, "Three Versions of Perfect Pay for Performance (Or The Rebirth of Partnership Concepts in Executive Pay)", *Journal of Applied Corporate Finance* (Winter 2014).

Figure 5

Tying Target Pay to Trailing Relative Performance Eliminates Pay Differences for the Same Cumulative Performance

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Market pay		1,000	1,000	1,000	1,000	1,000
Beginning stock x (1 + industry return)	10	11	12	13	14	15
GOOD EARLY PERFORMANCE						
Stock price	10	15	20	25	30	20
Relative return (at beginning of year)		0%	36%	67%	92%	114%
Target pay (= market x (1 + relative return))		1,000	1,364	1,667	1,923	2,143
Grant shares (= target pay / BOY stock price)		100	91	83	77	71
Cumulative shares		100	191	274	351	423
Ending wealth						**8,452**
BAD EARLY PERFORMANCE						
Stock price	10	7	6	5	8	20
Relative return (at begininng of year)		0%	-36%	-50%	-62%	-43%
Target pay (= market x (1 + relative return))		1,000	636	500	385	571
Shares (= target pay / stock price)		100	91	83	77	71
Cumulative shares		100	191	274	351	423
Ending wealth						**8,452**

Making target pay is equal to market pay x (1 + relative TSR) treats Good Early Performance and Bad Early Performance the same, but isn't enough to make the relative pay ratio equal to the relative performance ratio. Figure 5 shows that cumulative pay for both scenarios ($8,452) is 69% greater than cumulative market pay ($5,000) even though cumulative shareholder wealth is only 33% greater than industry shareholder wealth. This is why the perfect pay plan requires that the vesting multiple be equal to 1/(1 + industry return from the date of grant). Figure 6 shows that this vesting multiple reduces cumulative pay for both scenarios to $6,667, or 33% greater than cumulative market pay.

Figure 6

Making the Vesting Multiple Equal to 1 / (1 + Industry Return) Is The Third Component of The "Perfect" Pay Plan

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Market pay		1,000	1,000	1,000	1,000	1,000
Beginning stock x (1 + industry return)	10	11	12	13	14	15
GOOD EARLY PERFORMANCE						
Stock price	10	15	20	25	30	20
Relative return (beginning of year)		0%	36%	67%	92%	114%
Target pay (= market x (1 + relative return))		1,000	1,364	1,667	1,923	2,143
Grant shares (= target pay / BOY stock price)		100	91	83	77	71
Industry return from grant to end of year 5		50%	36%	25%	15%	7%
Year 5 vesting multiple (= 1 /(1 + industry return))		0.67	0.73	0.80	0.87	0.93
Vesting grant shares		67	67	67	67	67
Cumulative vesting shares		67	133	200	267	333
Ending wealth						**6,667**
BAD EARLY PERFORMANCE						
Stock price	10	7	6	5	8	20
Relative return (beginning of year)		0%	-36%	-50%	-62%	-43%
Target pay (= market x (1 + relative return))		1,000	636	500	385	571
Grant shares (= target pay / BOY stock price)		100	91	83	77	71
Industry return from grant to end of year 5		50%	36%	25%	15%	7%
Year 5 vesting multiple (= 1 /(1 + industry return))		0.67	0.73	0.80	0.87	0.93
Vesting grant shares		67	67	67	67	67
Cumulative vesting shares		67	133	200	267	333
Ending wealth						**6,667**

The perfect pay plan highlights three basic flaws of conventional pay practice: (1) providing competitive target pay regardless of past performance, rather than competitive target pay for average past performance, (2) paying for industry performance, rather than management's contribution to shareholder value and (3) weak mechanisms for link cumulative pay and cumulative performance.

Key Findings from the Excess Return Regressions

Figures 1 and 2 show how we compute mark to market pay leverage, pay alignment and the pay premium at industry average performance. We also use ten year regressions to compute grant date pay leverage, pay alignment and the pay premium at industry average performance. In the grant date pay regressions, the dependent variable is the natural log of annual relative pay, not cumulative relative pay. Our grant date pay regressions use annual pay because the "perfect" pay plan shows that annual, not cumulative, relative grant date pay must be perfectly correlated with cumulative relative performance for cumulative mark to market pay to be perfectly correlated with cumulative relative performance.

We first test the ability of these ten year measures of leverage, alignment and performance adjusted cost to explain future 1, 3 and 5 year returns. We then test the ability of our simplified three year measures of incentive strength and performance adjusted cost to explain future 1, 3 and 5 year returns. The simplified measures eliminate the need for individual company regressions.

To test the impact of pay factors on future excess returns, we developed multiple regression models of 1, 3 and 5 year excess returns for S&P 1500 companies. Since our basic pay for performance regression uses ten years of data[5] and our data source, S&P's Execucomp database, begins in 1992, our first base year for measuring future returns is 2001. This allows us to test the impact of pay factors on 16 annual returns, 14 3 year returns and 12 five year returns. The dependent variable in each regression is ln((1 + TSR)/(1 +expected TSR based on a four factor Fama-French model).[6] We measure TSR beginning and ending four months after fiscal year end to ensure that the pay factor data in our model is known to investors at the start of the return measurement.[7] We use a stepwise multiple regression to help us evaluate three basic choices in measuring the dimensions of pay for performance: (1) should we use P4P measures for the CEO or the Top 5? (2) should we use P4P measures based on mark to market pay or grant date pay? (3) should we measure P4P using relative TSR or relative operating return? We test these alternatives after taking account of momentum (i.e., prior relative return) and time (i.e., dummy variables for each year).

In our model of future one year returns, momentum and time explain 4.7% of the variation in ln(1 + excess return) across a sample of 10,397 cases, as Figure 7 shows. After momentum and time, the first most significant explanatory variable in a stepwise regression is an incentive strength variable, Top 5 mark to market ("MtM") pay leverage vs relative TSR, and the second most significant variable is a cost variable, the Top 5 pay premium at industry average performance, measured as relative operating return. Together, these two variables explain an additional 0.1% of the variance in ln(1 + 1yr excess return).[8] A two standard deviation difference in pay leverage increases the 1 year excess return by 2.1

[5] Most of our papers prior to 2017 use five year pay for performance regressions. See, for example, Stephen F. O'Byrne, "Achieving Pay for Performance", *Conference Board Director Notes* (December 2012) and Stephen F. O'Byrne, "Measuring and Improving Pay for Performance" in the *Handbook of Board Governance*, Richard LeBlanc, editor (John Wiley & Sons, 2016). Following on work by MSCI using ten year performance data, i.e., Ric Marshall and Linda-Eling Lee, "Are CEOs Paid For Performance?", MSCI (July 2016), we shifted to ten year pay for performance regressions to recognize that equity duration and the appropriate time horizon of alignment is greater than five years. See, for example, Stephen F. O'Byrne, "Pay for Performance at S&P 1500 Companies", *Seeking Alpha* (13Jun17) and Stephen F. O'Byrne, "Say on Pay: Is It Needed? Does it Work", *Journal of Applied Corporate Finance* (Winter 2018).

[6] The factors in our four factor Fama-French model are the market, size, profitability and investment. We use a 60 month regression to quantify the four beta factors for each company and then use the company betas plus the risk-free rate and the four factor returns to calculate the company's Fama-French expected return.

[7] The 10-K filing is due 60 days after fiscal year end (90 days before 2004), but the proxy is often filed in the fourth month after fiscal year end.

[8] Excess operating return is the sum of capitalized excess EVA improvement and estimated unexpected change in future growth value (FGV), expressed as a percent of beginning market value. Excess ΔEVA is ΔEVA – "expected EVA improvement" (or "EI") where EI is estimated based on a model of change in FGV. The estimated unexpected change in FGV is the difference between ex-post estimated ΔFGV and the ΔFGV assumption used in the EI calculation. See Stephen F. O'Byrne, "A Better Way to Measure Operating Performance (Or Why the EVA Math Really Matters)", *Journal of Applied Corporate Finance* (Summer 2016).

percentage points. A two standard deviation difference in pay premium reduces the 1 year excess return by 1.9 percentage points.

In our model of future three year returns, momentum and time explain 3.8% of the variation in ln(1 + 3yr excess return) across a sample of 8,026 cases, as Figure 7 shows. After momentum and time, the first and second most significant explanatory variables in the stepwise regression are top 5 mark to market ("MtM") pay leverage vs relative TSR and top 5 pay premium at industry average performance, measured as relative operating return, the same two variables selected in the one year return regression. Together, these two variables explain an additional 0.6% of the variance in ln(1 + 3yr excess return). A two standard deviation difference in pay leverage increases the 3 year excess return by 4.5 percentage points. A two standard deviation difference in pay premium reduces the 3 year excess return by 7.1 percentage points.[9]

Figure 7

Explanatory Variables		Ln(1 + 1Yr Excess Return)	Ln(1 + 3Yr Excess Return)	Ln(1 + 5Yr Excess Return)
Top 5 MtM Pay Leverage (vs rTSR) [min 0]	Coefficient	0.016	0.034	0.034
	t-stat	3.433	3.594	2.343
Top 5 Grant Date Pay Premium (vs Rel Oper Rtr) [min 0]	Coefficient	-0.019	-0.071	-0.093
	t-stat	-2.622	-5.003	-4.355
Variance explained by time and momentum variables		4.7%	3.8%	2.6%
Incremental variance explained by cost and pay leverage		0.1%	0.6%	0.3%
Mean ln excess return		-0.006	0.007	0.018
Standard deviation of ln excess return		0.294	0.517	0.686
Number of cases		10,397	8,026	6,176

Figure 8 shows models of 1, 3 and 5 year excess returns using simpler measures of incentive strength and compensation cost that use no more than three years of historical pay data and don't require individual company regression trendlines. Our measure of incentive strength is ln(top 5 holdings/market compensation) x gross stock correlation with relative TSR where the holdings multiple of market pay is truncated at 20x[10]. Total holdings include stock owned, restricted stock, unvested performance shares and stock options. Our measure of performance adjusted compensation cost is three year average top 5 ln relative pay minus ln(1 + 3 year relative TSR). These measures can be easily calculated by investors. The biggest challenge is estimating market compensation, but that's not difficult, as we show in Appendix 2.

These simpler, more current variables explain more variance than the long horizon variables for both 1 and 5 year excess returns. They also have bigger impacts on the dependent variables. In the 1 year

[9] In the five year model, the first variable to enter the stepwise regression after time and momentum, is the mark to market pay premium vs relative operating return. For comparability with the one and three year regressions, we show the five year regression using the same variables as the one and three year regressions.

[10] Capping the holdings multiple at 20x gives the variable more explanatory power than the simple winsorized variable, i.e., the "uncapped" variable, or capping the holdings multiple at 30x or 40x. Multiplying by the gross stock correlation with relative TSR provides a better measure of incentive strength by discounting the value of stock to the extent it reflects industry factors (which provide no incentive).

excess return model, a two standard deviation difference in incentive strength increases the predicted excess return by 2.5 (vs. 2.1) percentage points and a two standard deviation difference in performance adjusted cost reduces the predicted excess return by 3.4 (vs. 1.9) percentage points. In the 3 year excess return model, a two standard deviation difference in incentive strength increases the predicted excess return by 5.0 (vs. 4.5) percentage points and a two standard deviation difference in performance adjusted cost reduces the predicted excess return by 9.8 (vs. 7.1) percentage points.

Figure 8

Explanatory Variables		Ln(1 + 1Yr Excess Return)	Ln(1 + 3Yr Excess Return)	Ln(1 + 5Yr Excess Return)
Stk Correlation with rTSR x Ln(Top 5 Total Holdings/Market Total Compensation [max = 20])	Coefficient	0.016	0.030	0.031
	t-stat	4.309	3.988	2.737
Top 5 3 Yr Avg Grant Date Ln Relative Pay [current sales] - Ln(1 + 3Yr Relative TSR) [min 0]	Coefficient	-0.043	-0.132	-0.113
	t-stat	-5.479	-6.642	-4.445
Variance explained by time and momentum variables		4.7%	3.8%	2.6%
Incremental variance explained by cost and pay leverage		0.4%	0.6%	0.4%
Mean ln excess return		-0.006	0.007	0.018
Standard deviation of ln excess return		0.294	0.517	0.686
Number of cases		10,397	8,026	6,176

The pay models in Figures 7 & 8 have two simple messages: over-paying for your performance is bad and reduces future returns and building strong shareholder value incentives, measured by pay leverage or proxied by total holdings as a multiple of market compensation, is good and increases future returns. An immediate, and important, implication of the model is that directors need to pay attention to the trade-off between cost and incentive and find ways to increase holdings without over-paying for performance. A “mega-grant” to boost incentives increases performance adjusted cost, and the net effect can be negative.

Backtesting Long/Short Portfolios Based on Predicted Return from Pay Factors

The final objective of this paper is show that the predicted excess returns from the two pay factors can be used to form profitable long/short portfolios. Our analysis follows the approach laid out by Richard Tortoriello of Standard & Poor’s in his book *Quantitative Strategies for Achieving Alpha*.[11] We first divide the investible universe into quintiles based on Fama-French ex-ante expected return.[12] We then divide each quintile into a second set of quintiles based on predicted return from pay factors. We next combine the five top pay factor quintiles from each of the five expected return quintiles into a single equally weighted positive pay factor portfolio, and similarly combine the five bottom pay factor quintiles into a single equally bottom negative pay factor portfolio. We go long the positive pay factors and short

[11] McGraw-Hill, 2009. Following Tortoriello, we exclude companies with stock prices less than $2 and market equity value than is less than 1/50th of the mean market equity value of S&P 500 companies.

[12] Tortoriello normally uses market value, not Fama-French expected return.

the negative pay factors, so the return difference between the positive and negative pay factor portfolio is our measure of success.

A major challenge in applying this concept is that roughly a quarter of companies have fiscal years ending prior to December. We would like to keep these companies in our investable universe instead of limiting the investable universe to companies with calendar year ends. One way to do that would be to invest at the end of the "year" after all companies have reported their compensation data. Compustat groups together fiscal years ending in June of the current year through May of the following year. For example, 2018 in Compustat includes companies with fiscal years ending between June of 2018 and May of 2019. If we were to invest annually following Compustat's year convention, we would have to wait until the end of September 2019, when companies with May 2019 fiscal year ends have filed their proxies, to define our short and long portfolios for all companies with fiscal years ending in June 2018 through May 2019. But this would mean that our decision to invest in a company with a June 2018 fiscal year end would come 11 months after it filed its proxy.

An alternative approach is to invest at the end of each month based on the proxy disclosures during that month filed by companies with fiscal year ends four months earlier.[13] With this approach, we do a new calculation of pay factor quintiles each month using all proxy disclosures in that month and the prior 11 months. If a newly disclosing company falls in the top quintile, we invest. If it falls in the bottom quintile, we go short. With monthly investing, we can either invest an equal amount in each qualifying company or, in theory, an equal amount each month. Investing an equal amount each month is not a sensible risk-management strategy because three quarters of all months have fewer than 10 qualifying companies (i.e., companies in the top or bottom pay factor quintiles).

Investing an equal amount in each qualifying company is almost problematic because it carries substantial exposure to extreme returns at small companies. To limit the impact of small companies, Tortoriello excludes companies with market equity values less than 1/50th of the mean market equity value of the S&P 500 companies. We use a broader exclusion of small companies, eliminating all companies with inflation adjusted market equity values below $2 billion. This exclusion increases the impact of pay factors, as we note below.

In our backtest, we developed long/short portfolios for each month of the 18 years 1997-2014 and compared long and short portfolio returns for the subsequent one and three year periods. We measure future returns starting at the end of the fourth month after the fiscal year end to ensure that the proxy is available before our investment is made. We found that the long/short differential was not statistically significant for one year returns, but was statistically and economically significant for three year returns.

Our analysis identified 1,986 long positions and 1,987 short positions across all 216 months.[14] The mean long return was 25.92%, or 5.85% more than the mean short return of 20.07%. This is the return from an equal investment in each company. A t-test shows that the difference in returns is statistically

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[13] We assume that all companies file their proxies by the end of the fourth month after their fiscal year end.
[14] 216 = 18 years x 12 months.

significant at a 0.4% probability level.[15] The mean excess return from an equal investment each month was 4.54%, but many months have few qualifying companies. For the 53 months with at least 10 qualifying companies, the mean excess return is 11.41% and a t-test shows that this return is statistically significant at a 3.4% probability level. Figure 9 shows average 3 year returns by investment year, while Figure 10 shows the average difference in predicted excess returns by year.[16] Figure 9 shows that the positive pay factors portfolio has not underperformed since 2003.

Figure 9

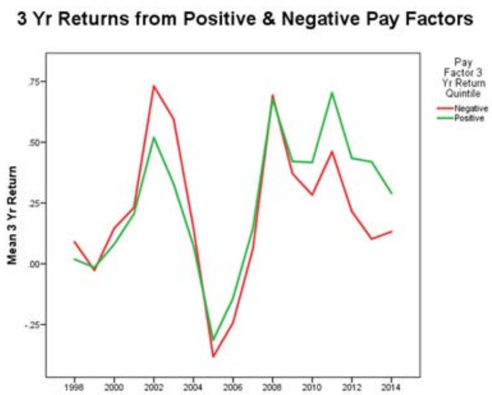
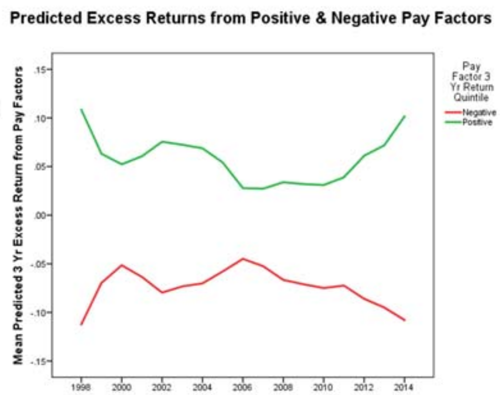


Figure 10



Conclusion

Our portfolio simulations, as well as our regression models, have two simple messages: over-paying for your performance is bad and reduces future returns and building strong shareholder value incentives, measured by pay leverage or proxied by total holdings as a multiple of market compensation, is good and increases future returns. These messages won't surprise many investors. In our experience, most investors believe that top management incentives have an important impact on company performance, that high management pay is a sign of poor stewardship and lack of focus on shareholder value, and that managers without "skin in the game" are not likely to look out for shareholder interests.

Nonetheless, few investors make systematic use of a quantitative measure of incentive strength and even fewer try to estimate market pay and performance adjusted cost. Many investors believe that disclosed performance measures provide the best insight on management incentives. We believe that most investors would benefit from spending more time on measuring cost and incentive strength even when it comes at the expense of proxy review and performance measure analysis. We have shown that measuring market pay is practical data analysis for investors and that the predicted future stock return from performance adjusted cost and incentive strength can be used to (1) evaluate and rank management pay and corporate governance and (2) earn excess returns forming long/short portfolios based on the predicted future stock return from pay factors.

[15] The t-stat is 2.887. The standard deviations are 0.60271 for the long returns and 0.67242 for the short returns. If we include companies with inflation adjusted market equity value below $2 billion, the mean return difference is 1.74% with a t-stat of 0.932.
[16] The years shown are Compustat years, which include companies with fiscal years ending in June of the year through May of the following year.

Investors need to understand that competitive pay policy greatly reduces the “information” provided by performance measure disclosure. In Figure 4, we showed that 100% payment in stock does not provide strong shareholder value incentives because competitive pay policy creates a systematic performance penalty in grant shares, rewarding poor performance with more shares and penalizing superior performance with fewer shares. Similarly, the use of an ROIC measure does not ensure a strong incentive for capital efficiency. Competitive pay policy creates a systematic performance penalty in target setting, rewarding poor ROIC with lower target ROIC and penalizing superior ROIC with higher target ROIC, so the multi-year incentive for better ROIC is much weaker than the annual bonus payout schedule suggests. Competitive pay policy also ties target pay to revenue growth (via market pay), so the incentive for capital efficiency is offset by an incentive for revenue growth regardless of ROIC.

Appendix 1: Perfect pay for performance requires consistent sharing in expected and “excess” value

In this appendix, we show that perfect pay for performance requires consistent sharing in expected and “excess” value. For simplicity, we’ll assume that pay leverage is 1.0, so the perfect relationship between relative pay and relative TSR is ln relative pay = 0 + 1 x ln (1 + relative TSR), or relative pay = 1 + relative TSR. In this simple case, we’ll see that perfect pay for performance requires equal sharing in expected and excess value.

If we define excess pay as [actual pay – market pay], we can express relative pay, which is actual pay / market pay, as [(market pay + excess pay) / market pay] or as 1 + [excess pay / market pay]. From this, we can see that perfect pay for performance requires excess pay / market pay = relative TSR. If we define excess shareholder wealth as [actual shareholder wealth – expected shareholder wealth], we can express relative TSR, which is [(1 + TSR) / (1 + industry TSR)] – 1, as [excess shareholder wealth / expected shareholder wealth]. Thus, perfect pay for performance requires excess pay / market pay = excess shareholder wealth / expected shareholder wealth, or excess pay / excess shareholder wealth = market pay / expected shareholder wealth. In other words, excess value sharing = expected value sharing.

Let’s apply this analysis to Figure 4 assuming that there are 10,000 shares outstanding and the five year industry return is 50%. Beginning market value is $100,000 and the industry return implies that expected shareholder wealth is $150,000. This implies that cumulative market pay of $5,000 is 3.3% of expected shareholder wealth. This should also be the excess pay share of the excess return. The ending stock price of $20 implies an excess return of $50,000. Excess pay for Good Early Performance is $800 (= $5,800 – market pay of $5,000), or 1.6% of the excess return, while excess pay for Bad Early Performance is $9,690, or 19.4% of the excess return. Good Early Performance is underpaid, while Bad Early Performance is way over paid. With the perfect performance share plan, as shown in Figure 6, excess pay is $1,667 (= $6,667 - $5,000), or 3.33% of excess shareholder wealth ($50,000), and hence, the excess pay share of excess shareholder wealth is equal to the market pay share of expected shareholder wealth.

Appendix 2: Investors Can Easily Calculate Market Rates of Pay

Market rates of pay are a critical component of our incentive and cost analysis. Market pay is an executive’s opportunity cost, just as cost of equity is a shareholder’s opportunity cost. While investors are quite comfortable estimating cost of capital, it's very rare, in our experience, for investors to make any effort to estimate market rates of pay. In this appendix, we show that estimating market rates of pay is straightforward data analysis that should not be difficult for the vast majority of institutional investors.

Executive pay levels vary with position, company size and industry. CEOs are paid more than CFOs. CEOs at companies with $10 billion in revenue are paid more than CEOs at companies with $1 billion in revenue and media company executives are paid more than retailing executives at companies of equal revenue. Our basic concept of market pay for an executive is average expected pay for executives with the same position, company size and industry. In practice, given limited samples, "average" pay is the predicted value from a regression that controls for position, company size and industry.[17] We estimate market pay using the "grant date pay" disclosed in the proxy, with two adjustments.[18]

A key challenge in market rate models is establishing the relationship between pay and company size. From the start of executive pay surveys, it was apparent that the CEO of a $10 billion company was not paid 10 times more than the CEO of a $1 billion company. Within a few years of the first executive pay survey in 1950, survey analysts discovered that a log-log model fits executive pay data much better than a linear model.[19] A log-log model, i.e., $\ln(\text{pay}) = \alpha + \beta \times \ln(\text{revenue})$ implies that a given percentage difference in size is associated with a fixed percentage difference in pay. A typical slope ("β") in a log-log model is 0.4, so a doubling in size increases pay by 32%[20] and the CEO of a $10 billion company is paid 2.5 times, not 10 times, more than the CEO of a $1 billion company.

It is common in cost of capital analysis to smooth key parameters such as beta and the equity risk premium. The goal of the smoothing is to simplify analysis by reducing statistical noise in the opportunity cost measure. In estimating market rates, we smooth pay-size sensitivity across time and across positions/top 5 pay ranks. It's easy to smooth pay-size sensitivity across time by using a long history period for the regression $\ln(\text{inflation adjusted pay}) = \alpha + \beta \times \ln(\text{inflation adjusted revenue})$ but that leads to biased market rates when inflation adjusted pay levels are rising faster than inflation adjusted revenue. To calculate market rates using a smoothed sales slope but current pay data, we use the formula ln inflation adjusted market pay = mean ln inflation adjusted pay + smoothed sales slope x

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[17] We don't adjust market rates for performance because the empirical impact of performance on expected pay, which is quite modest, reflects a crude averaging of disparate company views of how pay should affect performance. Since one of our goals is establish normative relationships between pay and performance and measure how far companies depart from those normative relationships, embedding a weak performance effect in market pay serves no useful purpose.

[18] We make two adjustments to bring reported grant date pay closer to expected pay. We replace the actual annual change in pension value with the expected accretion in pension value at the start of the year and we replace the non-equity incentive compensation paid during the year with the target value of the new non-equity incentive compensation awarded during the year. Equity compensation is reported in the proxy at its grant date expected value, so we don't need to rely on regression analysis to convert individual executive realized pay into average expected pay.

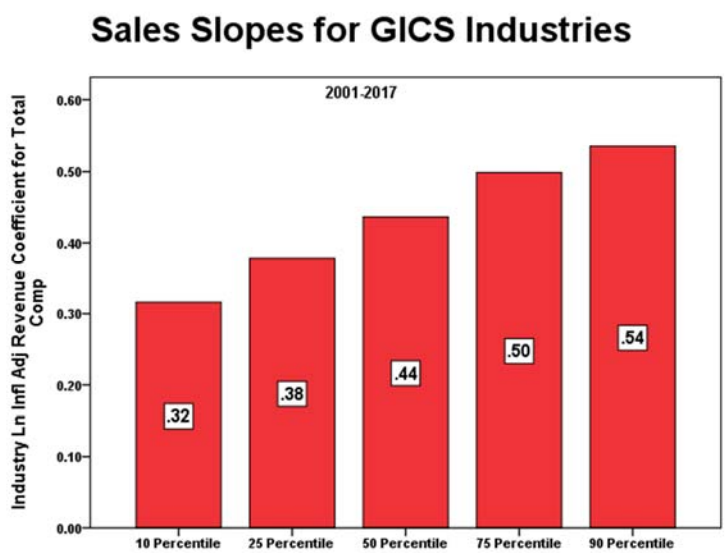
[19] The first executive compensation survey was conducted in 1950 by the American Management Association (AMA) and a leading executive compensation consultant, Arch Patton of McKinsey. In Patton's 1951 article in the Harvard Business Review, he shows CEO pay broken down by five profit size group, but by 1955, he's presenting log-log graphs of pay versus sales in the Harvard Business Review.

[20] The model, $\ln(\text{total compensation}) = \alpha + \beta \times \ln(\text{sales}) + \varepsilon$, implies that market pay, that is, predicted total compensation = $\exp(\alpha) \times \text{sales}^{\beta}$. This implies that a doubling in revenue increases market pay by $2^{\beta} - 1$.

(ln inflation adjusted revenue – mean ln inflation adjusted revenue)[21] where the smoothed sales slope is calculated using top 5 aggregate pay for all companies in the GICS industry and all history years in Execucomp (e.g., 1992 through the current year) but mean ln pay and mean ln revenue are calculated using more current data for the position and industry (e.g., five year average ln (pay) and ln(revenue) for CEOs in the GICS industry).

We calculated a smoothed sales slope for each year (using data from 1992 to the current year) for each of the 68 GICS industries. Figure 11 shows that the sales slopes range from 0.32 at the 10th percentile to 0.54 at the 90th percentile. These slopes imply that the impact of a doubling in revenue size ranges from 25% at the 10th percentile to 45% at the 90th percentile.

Figure 11



The data used for our market rates also reflect two adjustments to limit the impact of extreme pay practices: (1) we assume minimum annual pay of $100,000 for all top executives to limit the impact of executives, mainly CEOs, who take pay of zero or $1[22] and (2) we truncate pay at the 1st and 99th percentiles using the residuals from a regression that assumes a constant ln sales coefficient across all years.

[21] This formula can be re-written as ln (inflation adjusted market pay) = mean ln(inflation adjusted pay) – smoothed sales slope x mean ln(inflation adjusted revenue) + smoothed sales slope x ln(inflation adjusted revenue) = constant + smoothed sales slope x ln(inflation adjusted revenue).

[22] This affects 0.36% of CEO-years, but only 0.14% of other top 5 years.