RECURSIVE RELATIONSHIPS IN EXECUTIVE COMPENSATION

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ABSTRACT

Asian businesses in the 21st century will learn from the experience of their US counterparts in promoting better governance of executive compensation in publicly-traded companies. In this paper we examine the membership of the compensation peer groups for 121 of the largest US-headquartered, publicly-traded firms. We find that the existence of self-reinforcing recursive relationships through peer groups is pervasive. We illustrate that the effects from these relationships could be very large. Finally, we measure the association between the size of a firm's recursive effect and that firm's average compensation for named executives. The association is large, positive, and statistically significant. Thus our findings suggest that recursive relationships arising from the widespread use of peer-group benchmarking is affecting executive compensation levels for many large US firms. These findings should alert Asian businesses to the effect that the practice of peer-group benchmarking may have on executive compensation

Key Words: Recursive effects, executive compensation, compensation levels

INTRODUCTION

The use of peer group compensation data as an input to setting executive compensation levels has been the subject of criticism. Practices drawing criticism include setting target levels for compensation at the high end of the range of a firm's peer group and strategically selecting highly-compensating 'peers' for benchmarking. Inherent in these criticisms is the presumption of intentional devious behavior to increase compensation levels. We doubt that such behavior is common among the compensation committees of large publicly traded firms. However, the current study examines a previously unidentified effect that is unlikely to be intentional but is commonplace: the effect from recursive relationships that arise naturally through the wide-spread use of peer-group benchmarking.

To demonstrate the extent of the potential problem, the membership of the executive compensation peer groups for 121 of the largest US headquartered, publicly-traded firms were gathered. A recursive relationship exists when there is a set of linkages between the peer groups that forms a continuous loop from a firm back to itself. An analysis reveals the existence of pervasive recursive relationships. The potential effect of these relationships on subsequent compensation adjustments is then estimated. Finally, an association is shown to exist between the size of a firm's recursive effect and the average compensation paid to that firm's top five named executives. These results suggest that recursive relationships may be having a hitherto unrecognized effect on executive compensation levels for US firms.

RELATED LITERATURE

Recently, Bizjak, Lemmon, and Naveen (2008) have noted the wide spread use of peer group benchmarking. In a sample of 100 compensation committee reports taken from the 1997 annual reports of S&P 500 firms, they found that "96 firms indicated that they use benchmarking or peer groups" and "the vast majority of the firms that use peer groups target pay levels at or above the 50th percentile of their peer group" (p153).

Bizjak et al have examined the pattern of changes in executive compensation for firms over time. They found that executives whose pay in a period was below the median of their peers in similar sized firms received larger pay increases in subsequent periods than those who had been paid above the median. They conclude that "the use of peer groups and competitive benchmarking has a nontrivial effect on changes in pay of the CEO" (p 166).

Faulkender and Yang (2007) also investigated the use of peer groups. They examined the 83 S&P 500 firms that reported their peer group members for executive compensation for fiscal 2005. Faulkender and Yang examined the explanatory power of peer group pay levels against other common variables used to explain differences in pay (such as firm size and stock return). They conclude, "Inclusion of measures of the median or 75th percentile of compensation for the group dominates other characteristics that have traditionally been used to explain cross-sectional variation in executive pay" (p 17).

Given the important role that levels of peer group compensation play, Faulkender and Yang then examined characteristics of the firms selected to be members of peer groups. While firms frequently select peer group members of approximately the same size and from the same industry, they also found evidence that some 'peers' may be selected because they compensate highly: "Compensation committees seem to be endorsing compensation peer groups that include unrelated firms because such firms would potentially ratchet up the level of pay for the CEOs" (p 3). The potential motivation for such behavior is addressed by Bebchuk and Fried (2003). They point out that both outside directors and compensation consultants have strong incentives to benefit a company's CEO because of the CEO's influence on the continuing tenure of the board member and the consultant.

An article in the popular financial press (Morgenson 2006) also expresses skepticism on the use of peer group membership for compensation benchmarking. It notes the issue of 'cherry picking' peers to establish a high standard for comparison. The author further observes that not all firms can have their executive salaries positioned in the top quartile of firms. If many firms strive to be at the top end of the compensation distribution there will be a further ratchet effect on compensation over time (humorously referred to as the 'Lake Woebegone Effect').

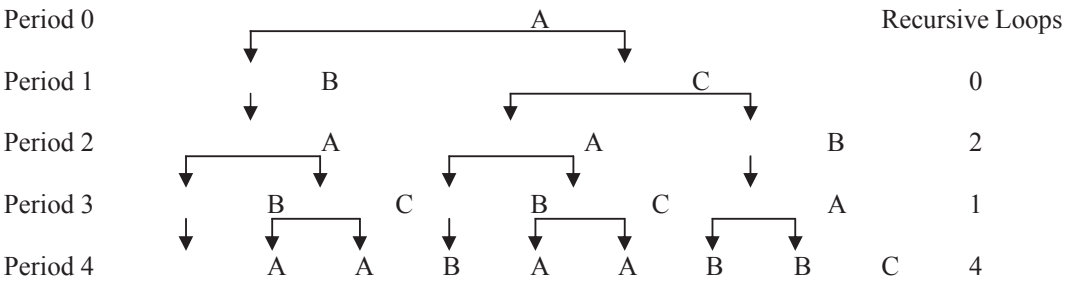
It appears that as potential abuses of the benchmarking process become known, steps are taken to mitigate them. The website for Mercer Human Resources (2007) and an article by two members of the human resources group at Pricewaterhouse Coopers (Olsen and Tabacznski 2007) both warn firms that there should be good justification for the selection of a company's peers. Both sources then list several criteria that will help provide justification (such as size, competitors for managerial talent, and industry). However, both consultants recommend the use of compensation peer groups, with Olsen and Tabacznski recommending that a peer group contain 12 to 20 firms, and Mercer recommending groups with 10 to 15 members. Our concern in the current study is that the wide-spread use of peer group benchmarking may lead to a previously unrecognized problem: the potential for self-reinforcing recursive relationships.

In 2006 the Securities and Exchange Commission (SEC) introduced new disclosure requirements on executive pay. Annual reports with a balance sheet date after December 15, 2006 must now disclose considerably more detail on the process by which executive compensation levels are chosen. The availability of this new data now makes it possible to study the recursive effects that may arise from the wide-spread use of peer group benchmarking. That is, the process by which benchmarks are set may be free of intentional bias, but the widespread use of the process itself may introduce dynamic relations that influence compensation over time.

RECURSIVE PEER RELATIONSHIPS

A recursive relationship exists in a system when a change in a variable leads, through a chain of interactions, to another change in the same variable in a subsequent period. "Feedback noise" in a public-address system is a frequently encountered example.

A simple illustration shows how recursive relationships might exist in a peer-group benchmarking system. Consider three firms that use peer-group benchmarking for setting compensation levels: Firms A, B and C. Each period the firms adjust their compensation to reflect their peer's compensation in the prior period. Further, A is a member of B and C's peer group; B is a member of A's peer group, while C is a member of [1]both A and B's peer group. If Firm A raises its compensation in period zero[1], the change will affect the peer-group compensation distribution for both Firms B and C in period one. There is no feedback loop to Firm A in period one. But when Firms B and C adjust their compensation in period one, in reaction to A's change in period zero, then two feedback loops are established for Firm A in period two. The pyramid below traces the effects for Firm A and reveals that this system results in zero, two, one, and four recursive relationships for firm A in periods one through four respectively.



The number of recursive loops varies for the three firms. A similar analysis would show that this system yields zero, two, one, and four recursive loops for Firm B and zero, one, one, and two recursive loops for C in periods one through four.

But not all sets of peer groups will result in recursive functions. Thus, the widespread use of peer-group benchmarking *may* lead to recursive relationships. But whether it *does*, and whether they are significant, are empirical questions. To determine if recursive functions actually exist among compensation peer groups we examined a sample of the largest firms headquartered in the US. A description of the methodology follows.

THE SAMPLE

The Yahoo! Stock Screener (2008) revealed there were 240 firms traded in the US whose market capitalization exceeded US$25 billion on May 11, 2008 (the day we started the project). Of these, 106 were eliminated because they are not headquartered in the US, six did not provide peer-group details, one was an exchange traded fund, and proxy statements were not found for six firms. This yielded a satisfactory sample of 121 firms. Thus our analysis uses large, US headquartered, publicly-traded firms whose market capitalization exceeded US$25 billion[2].

The most recent proxy statement as of June 2008 for each sample firm was reviewed to hand-gather the names of the members of the firm's compensation-benchmarking peer group, and the amount of compensation paid to the top five named executives. An initial analysis revealed that eight of the sample companies were not listed as a member of the compensation peer group for any of the other 121 sample firms. The remaining 113 firms appeared as a peer group member in from one to forty five of the other 121 firms. The average number of peer groups in which the 121 firms appeared (this includes the eight firms which appear in one) was 11.9 with a standard deviation of 8.7. Thus it appears there is ample opportunity for recursive relationships to exist.

[1] Numerous reasons for the increase are possible: a reaction to inflation, a bid for retention, a reward for performance, and so on. Our concern is not with the circumstances that give rise to the initial increase, but with the subsequent ramifications the change induces.

[2]The $25 billion cut off is a pre-selected screen available on the Yahoo! Stock Screener. We wanted a sample of large firms as their compensation practices attract the most attention, but we had no reason to pick an alternative value for market capitalization so we used the available screen.

RESULTS

The results that follow are for all 121 firms in the sample. However, in interpreting the results it should be noted that the eight firms which do not appear as a member of a peer group for any of the 121 sample firms cannot be affected by a recursive function through *these* firms. There were also two firms who did not list any of the other firms in the sample as a peer. Thus the maximum number of 121 firms for which we might identify recursive relations through peer-group membership is 111.

Table 1 Panel A summarizes the recursive relationships found for the sample firms after two, three, and four periods. In the second period there is at least one recursive loop through the peer groups for 108 of the firms. This number increases to 109 and 111 after periods three and four. Panel A also indicates that multiple recursive loops per firm are common. Panel B presents the average number of recursive loops per firm, after periods two through seven (the pattern is clear so further periods were deemed unnecessary).

TABLE 1: Growth Over Time in the Number of Recursive Loops Through Compensation Peer Groups for 121 Large US-headquartered Publicly-traded Firms

Panel A: Number of Firms Having the Indicated Range of Recursive Loops in Periods Two Through Four

	Loops in Period		
Loops	Two	Three	Four
0	13	12	10
1-5	51	18	2
6-10	40	10	4
11-15	10	4	7
16-20	6	5	2
21-30	1	8	2
31-40		12	1
41-50		4	2
51-100		28	13
101-500		20	29
500-1,000			20
1,001-5,000			28
5,001-9,999			1
TOTAL	121	121	121

Panel B: The Average Number of Recursive Loops per Firm for Periods Two Through Seven

Period	Average Number of Loops
2	6
3	53
4	738
5	11,055
6	174,963

7	2,832,139	

Taken together, Panels A and B of Table 1 indicate that recursive relationships through compensation peer groups for these firms is pervasive and the growth rate in the number of recursive loops over time is substantial. However, the significance of these recursive relationships depends on the reaction that a firm makes to a change in compensation by a peer-group member. If firms adjust their compensation negligibly in response to changes by a peer, there may be little effect from recursive functions. In that case, the existence of even an enormous number of recursive functions may not be of practical significance. But if compensation levels are responsive to changes by a peer the effect could be substantial.

ILLUSTRATION OF THE POSSIBLE SIZE OF RECURSIVE EFFECTS

The actual response a firm makes to a change in the compensation of one of its peer group members is likely to vary across firms and even within firms over time. However, we use some plausible average values to illustrate what the potential size of the recursive effects might be.

Basing a target compensation level on the average compensation of a peer group would make the firm's compensation sensitive to a change by *any* member of the peer group. To avoid such sensitivity, firms typically specify that they target their compensation level at some stated percentile among the distribution of their peer members' compensation levels (most often the 50^{th} or 75^{th} percentile). Thus, in theory, a firm would react to a peer-group member's change in compensation only if the change caused the peer to 'leapfrog' the firm at the critical percentile in its distribution. Thus a conservative estimate is that only a change in compensation for the peer-group member whose previous compensation abutted the critical percentile would lead to a reaction by the firm using the peer group as a guide. Assuming random placement of peers within a group, we estimate the probability that a firm making a compensation change is at that critical percentile as 1/n where n is the number of members in the peer group. Thus, for the initial illustration, we assume that on average firms make a 1/n unit change in compensation in reaction to a one-unit change in a peer-group member's compensation.

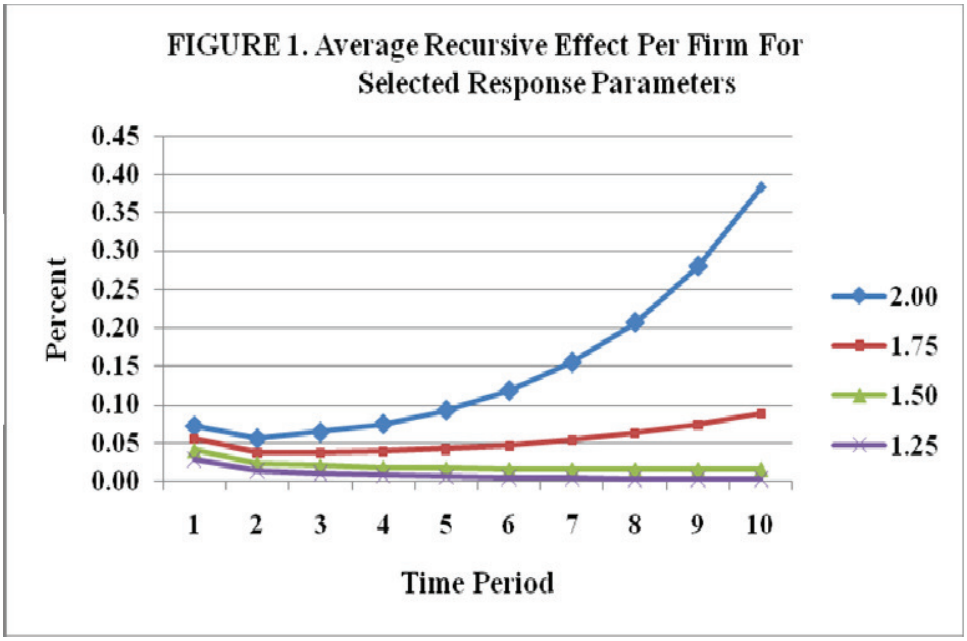
The size of the resulting recursive effects are summarized in Table 2. For the assumed reaction, the size of the recursive effect for 73 of the firms exceeds one per cent in period two. However, the effects diminish over subsequent periods. Thus, even though Table 1 shows rapid growth in the *number* of recursive loops, the very small reaction that we have assumed for the illustration in Table 2 overcomes that growth to dampen the overall effect over time.

TABLE 2: Summary of the Size of Each Firm's Recursive Effect From a One-Unit Change in Executive Compensation After Two, Three and Four Periods

Size (as a Percent) of the Subsequent Recursive Effect From a One-unit Change in Compensation [a]	Number of Firms in Range for Periods		
	Two	Three	Four
<0.10	13	32	45
0.10-0.99	35	59	62
1.00-1.99	30	21	10
2.00-2.99	19	5	4
3.00-3.99	11	4	
4.00-4.99	4		
5.00-5.99	4		
6.00-6.99	4		
7.00-7.99	1		
TOTAL	121	121	121

Average Percent Effect (All Firms)	1.79	0.69	0.40

[a]Assuming that firms react to a one-unit change in a peer's executive compensation by adjusting its subsequent compensation by 1/n where n is the total number of firms in the peer group.



We repeated the calculation of the potential size of the recursive effects with alternative response factors for the reaction to a change in a peer-group member's compensation. Instead of using 1/n as the probability that a peer member is at the critical percentile we used 2/n (if there are an even number of members in a peer group, a firm might react to a compensation change by a firm just above or just below it in the compensation distribution; alternately, a firm might not just match a change). We also used 1.25/n, 1.5/n and 1.75/n.

Figure 1 provides a plot of the average size of the recursive effects for all 121 firms (including the ten firms for whom the value is zero) each period, for ten periods, using the various response parameters. With a response factor of 1.5/n the average size of the recursive effect increases very slightly over time. The increasing trend becomes more pronounced for 1.75/n and quite large for 2/n. Thus there is the potential for recursive effects to have a substantial impact.

RECURSIVE EFFECTS AND COMPENSATION LEVELS

The number of recursive effects and the illustrated size of the effects suggest they may affect compensation outcomes. We next examined the association between the relative size of a firm's recursive effect (using 1/n as the response factor) and the average compensation level for that firm's top five named executives[3]. Panel A of Table 3 provides the results from fitting two models of compensation levels to the data. Model One uses only a measure of firm size as an explanatory variable for compensation levels. Firm size was measured as the market capitalization of each firm on May 11, 2008. Market capitalization was chosen because it both reflects size and the market's estimate of the prospects for a firm (and by extension the market's collective happiness with top management).

TABLE 3: Executive Compensation Levels and Recursive Effects

Panel A: Regression Estimates of Parameter Values for Two Models of Executive Compensation

Model	Intercept	Size	Recursive Effect	Adjusted R^2
1	-3.01	3.06 (p=0.002)		0.071
2	-0.96	2.01 (p=0.014)	118.16 (p=0.002)	0.136

The dependent variable in both models is the average total compensation (in millions) of each firm's top five named executives. Firm size is measured by the natural log of market capitalization (in billions). The recursive effect in model two is the second period effect using 1/n as the response factor to a peer's compensation change and n is the number of firms in the peer group.

Panel B: Predicted Average Executive Compensation Levels Using Model 2 with the Indicated Values for Market Capitalization and Recursive Effects

	Predicted Average Executive Compensation*			
Market Capitalization	Second Period Recursive Effect (Percentage)			
(US$ Billion)	0.5	1.5	2.5	3.5
25	7.1	8.2	9.4	10.6
50	8.5	9.6	10.8	12.0
75	9.3	10.4	11.6	12.8
100	9.8	11.0	12.2	13.4

*The model was estimated using observations from US$25 billion to US$100 billion for market capitalization and 0.0 to 7.7 percent for recursive effects. Only 21 firms exceeded US$100 billion in market capitalization and only 15 had a second-period recursive effect larger than 3.5 so the ranges in the table cover most firms.

Consistent with other studies, the coefficient for the size variable in Model One is significant (p= 0.002). Model Two adds a variable representing the size of the firm's recursive effect in period two. Table 3 reveals that the coefficient on the recursive effect is significant (p = 0.002), and the R^2 for the model increases from 0.071 to 0.136. Panel B presents the predicted average executive compensation level from Model 2 for a range of values for market capitalization and recursive effects[4]. Both variables have similar large effects. This result suggests that recursive effects play a significant role in the determination of compensation levels over time.

[3] Results for only the CEO are similar.
[4] The model is nonlinear so a direct comparison of parameter values is not sufficient.

CONCLUSION

This investigation has shown that recursive relationships are prevalent through the compensation peer groups for large US headquartered firms. Recursive loops were found to exist for 111 of the 121 largest publicly-traded US firms. The size of the effects on observed compensation levels were shown to be of a similar magnitude as the effect from firm size. Thus the widespread use of peer-group benchmarking is likely contributing to changes in executive compensation among US firms.

Our results show that recursive relationships are common among large US companies. Whether these results also apply to Asian companies is an open empirical question. But if the size of the set of potential comparators amongst Asian companies is smaller, the potential recursive effects could be much denser with larger consequent effects.

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