

CHAPTER 4 RESEARCH DESIGN AND METHODOLOGY

The various hypotheses stated in the previous chapter were tested using either 1-sample t-tests, analysis of variance, or Multivariate Analysis of Variance (MANOVA). The variables tested by the various hypotheses are described in the next section, followed by a formal expression of the models and an explanation of the statistical processes employed. Finally, data sources are described.

VARIABLE DEFINITION

Company Classification

To determine if the adoption of a performance or restricted stock plan makes a difference in firm performance between adopters and non-adopters, it was first necessary to categorize firms as being an adopter or non-adopter. As explained below, a company that fell into the non-adopter category could also be classified as a peer company in a later analysis. Thus, for the analysis of any one hypothesis, each company fell into one of three company classifications: a company was classified as an adopter, a non-adopter, or a peer company, and assumed the value of 1 or 0, depending on the analysis.

Adopter. An adopter is defined as any company that is a first time adopter of either a performance plan or a restricted stock plan during the sample period. Each adopter was required to have eight consecutive years of data. These eight years had to be made up of the three years immediately prior to the year of adoption, the year of adoption and the four years immediately following the adoption. The various data items specific to each adopter and their calculations are detailed in the following section.

Non-adopter. A non-adopter is any company that meets the necessary criteria to remain in the sample, but was not included in the list of companies adopting either a performance or restricted stock plan during the sample period. Each non-adopter company was required to have at least eight consecutive years of the necessary data items, and be in the same three digit SIC code as adopter companies in the same industry.

Peer. A peer company is a single company from the non-adopter group that was matched to an adopter company. The match is performed first on four-digit SIC code¹ and then on market

¹ Where possible, matches were made on four-digit SIC codes. If a match could not be made using four-digits, a three-digit or two-digit match was employed. Approximately 80% of the adopters were matched on at least three-digit SIC codes.

size within the sample. Market size was used as opposed to a more traditional measure such as total asset base for two reasons. First, it seems probable that companies desire to maintain or improve their market position within their industry; therefore, comparing an adopting company to a non-adopter that is closely ranked in market position should provide a better indication of how the adoption of either type of plan affects firm performance. Secondly, matching on percentage of an industry's sales helps alleviate the age bias often associated with matching based on total asset base. Older, established firms are more likely to have greater asset bases, but this may be more an indication of age rather than position in the industry.

Market size was measured as the average sales over each company's eight-year sample period expressed as a percentage of the total sales for that company's industry group over that same eight-year sample period. Where possible, a peer company was used as a peer to only one adopter company; however, in some industry categories, it was necessary to use a peer company more than once in order to keep size matches as close as possible.

General Performance Measure

Return on equity. Several accounting measures are commonly used to evaluate long term management performance. One of the most commonly used profitability measures is ROE, **Return on Equity** (Lambert and Larker, 1987; Abowd, 1990; Traichal and Gallinger, 1995). Also, ROE is frequently used as one means of evaluation in compensation contracts. ROE is defined in a manner similar to the Lambert and Larker study as

$$\text{IBEI}/(\text{TA}-\text{TL})$$

where,

IBEI = income before extraordinary items

TA = total assets

TL = total liabilities

Industries and Industry Specific Measures

As explained in Chapter 3, general performance measures may not capture a firm's production environment, therefore, performance measures that are more industry specific should provide a better indication of the firm's performance. Nine industry groups were utilized in the present study. These groups include Bank and Non-bank Financial; Chemical Manufacturing and Distribution Consumer Products Manufacturing and Distribution; Food Processing and Distribution; Electrical, Electronics and Related Equipment; Heavy Manufacturing; Mining, Fuels and Extractive; Non-financial Service; and Textiles, Paper and Forest Products. These groupings are some of those used by Business Week in their annual "Corporate Scoreboard", and are also the groupings used by S&P Industry Analyst Reports. Therefore the groupings in this study do not always coincide directly with the categories given strictly by SIC codes. These groupings are based on the functional areas of a business, and places in the same industry group, firms that

should have the same type of production environment.² The industry specific ratios chosen for analysis should be important indicators for each type of company within a group and the ratios should in general move in the same direction within an industry. The types of firms that make up each industry as well as the three industry specific variables for each of the nine industry categories are described below. Table 1 provides a summary of these variables and their predicted direction. The section on Data Manipulation and Table 2 provide details of how each variable was calculated.

Bank and Non-Bank Financial

The financial industry group consists of firms in the banking, insurance, and investment areas.³ In many respects, this may seem a broad designation; however, the companies in this industry category face similar environments. Each firm is very dependent on interest rates, the amount of discretionary income available to customers, and to some extent regulation. One important area central to companies in this industry group is the ability to have adequate capital to serve as a cushion to support operating deficiencies. If adoptions of performance or restricted stock plans improve firm performance then adopters should show increases in capital growth after adoption. As discussed in S&P Industry Analyst Reports, capital adequacy is measured as the **change in capital growth**, where capital growth is given as

$$[(CS + PS - TD)_{Post} - (CS + PS - TD)_{Pre}] / (CS + PS - TD)_{Pre}$$

and,

CS = common stock for non-bank financial, and
 = total book value of equity - treasury stock - dollar amount of preferred stock for banks

PS = preferred stock for all companies

TD = total debt for non-bank financial, and
 = total liabilities (excluding valuation reserves) + minority interest in consolidated subs + capital notes and debentures for banks

A second performance measure, associated with both capital and leverage, is a firm's dividend policy. Unlike in some industry categories, most firms in this industry tend to regularly distribute dividends. The consistency or increase in ability to pay cash dividends indicates adequate capital as well as providing an indication of the appropriateness of current and projected levels of debt. As leverage levels change considerably, the ability to distribute dividends changes as well. If adoptions of performance or restricted stock plans improve firm performance then adopters should show larger payments of dividends after adoption of either type of plan. The

² For companies that function in more than one area, the primary SIC code was used to determine the main functional area for that company.

³ Bank data are unlike data compiled for the other types of institutions in this industry category. For each variable defined, data are provided for non-bank financial firms as well as for banks.

change in levels of cash dividends paid is measured for each firm in this industry category to assess how the firm's capital and leverage policies affect dividend distributions.

Another area of concern relates to costs associated with overhead. Companies in this industry grouping typically have very large overhead costs that can easily diminish profits if not controlled. If adoption of performance or restricted stock plans improve performance then after adoption, adopters should exhibit an increase in the ability to contain costs. The **change in overhead** is used as a measure of cost efficiency, with overhead measured as

$$[\text{IBEI} - (\text{Sales} - \text{COGS})]/\text{Sales}$$

where,

IBEI	=	income before extraordinary items for non-bank, and
	=	net income for banks
Sales	=	net revenues for non-bank, and
	=	total interest income + trust department income + other charges, commissions and fees for banks
COGS	=	cost of goods sold for non-bank, and
		total interest expense + provision for loan losses for banks

Chemical Manufacturing and Distribution

Consistent with S&P Industry Surveys, this group consists of firms that process all types of chemicals from agriculture products to plastics, as well as those companies that manufacture drugs. Some characteristics associated with this industry include significant international competition, heavy investment in plant and equipment to maintain improved production processes, and a tendency toward over-capacity.

To counteract some of the inherent characteristics this industry is very dependent on conducting research and developing new and improved products. Industry reports⁴ indicate that only through extensive research and development can a company in this category remain an active part of the industry. Therefore, one long-term performance measure seen as important to this industry is the **change in research and development as a percentage of sales**. This provides an indication of the company's efforts to remain a viable part of the industry in the future and the percentage of research and development as a percentage of sales should be greater for adopters after adoption.

This industry is characterized by constant changes in demand for products due to changes in housing starts, defense spending, growth and decline in industrials⁵, and the incredibly competitive arena of pharmaceuticals. It is important that firms closely manage their inventories. It is unwise to allow a large build-up of inventory in this sector because constant changes in demand, products developed, and competition could lead to large volumes of obsolete inventory and substantial inventory write-offs. The **percentage change in inventory to sales** provides an indication of how inventory is being utilized in generating sales. Inventory as a percentage of

⁴ Standard & Poor's Industry Surveys mention research and development as an important aspect of continued growth for the chemical industry. Analyzing these surveys for various time periods covered by the study indicates research and development has always been an important component of this industry.

⁵ The industrial side of the economy accounts for about two-thirds of the demand for chemical products.

TABLE 1

Industry Variables and Predicted Directions

Industry	Percentage Change Measure	Reason for Use	Predicted Direction ¹
Financial	Capital Growth	capital adequacy	+/Increasing
	Overhead Control	operating efficiency	-/Decreasing
	Dividend Growth	capital & leverage policies	+/Increasing
Chemical	Inventory/Sales	inventory management	+/Increasing
	R & D / Sales	ability to compete	+/Increasing
	Capital Spending	ability to stay state of the art	+/Increasing
Consumer Products	Advertising/Sales	ability to attract & maintain customers	+/Increasing
	Inventory Turnover	inventory management	+/Increasing
	Sales Growth	customer success	+/Increasing
Electrical	R & D / Sales	ability to compete	+/Increasing
	Sales Growth	customer success	+/Increasing
	Inventory Turnover	inventory management	+/Increasing
Food Processing	Advertising/Sales	ability to attract & maintain customers	+/Increasing
	Working Capital	cash management	+/Increasing
	Sales Growth	customer success	+/Increasing
Heavy Mfg.	R & D / Sales	ability to compete	+/Increasing
	Overhead Control	operating efficiency	-/Decreasing
	Employees/Sales	downsizing	+/Decreasing
Mining	Sales Growth	customer success	+/Increasing
	Capital Expenditures	ability to stay state of the art	+/Increasing
	Overhead Control	operating efficiency	-/Decreasing
Service	Overhead Control	operating efficiency	-/Decreasing
	Advertising/Sales	ability to attract & maintain customers	+/Increasing
	Dividend Growth	capital & leverage policies	+/Increasing
Textiles	Overhead Control	operating efficiency	-/Decreasing
	Inventory Turnover	inventory management	+/Increasing
	Capital Expenditures	ability to stay state of the art	+/Increasing

¹Predicted direction relates to the expected change in the measure after the adoption of either a performance or restricted stock plan.

sales should, after adoption, be greater for adopters of performance of restricted stock plans than prior to adoption.

The final industry specific variable for the chemical industry relates to **change in capital spending**. As previously stated, the chemical industry relies on heavy investments in plant and equipment to continually update production processes. In addition, this industry often requires substantial changes in plant and equipment in order to meet environmental requirements. The percentage change in plant and equipment provides the measure of each company's commitment to fixed capital. After adoption, the level of capital spending should increase for adopters of performance and restricted stock plans after adoption.

Consumer Products Manufacturing & Distribution

This category includes companies that manufacture and distribute end-user consumer products (exclusive of food products) such as clothing, furniture, household appliances, and cosmetics. Though this may seem like an unlikely set of firms to place together, as producers/distributors of consumer products these firms have some very common goals and are affected by many of the same problems. Regardless of whether a firm is a manufacturer of household appliances or cosmetics, the whims of consumers have the largest impact on the success of each of these lines of business. The consumer products life cycle is naturally an evolutionary process and it is difficult to counteract. The key strategy is to plan more effectively to sustain profitability in different stages.

A major factor for any business in the consumer products industry is advertising. Advertising dollars must be used effectively in order to generate sales. Thus, the first industry specific ratio for consumer products is the **change in advertising expense as a percentage of sales**. Advertising is used to differentiate products, locations and entire stores. Advertising is often the first link between the customer and the product, and thus plays a substantial role in the success of consumer related businesses. Adopters should show an increase in advertising expense as a percentage of sales after adoption of either type of plan.

Another area of importance in this industry is the ability to manage inventory. The **percentage change in inventory turn-over** provides a measure of management efficiency. Consumer tastes are constantly changing, making it easy to develop a build-up of inventory that may become obsolete more quickly than in other industries. Adopters of performance or restricted stock plans should exhibit greater inventory turnover than exhibited prior to adoption.

Changes in sales growth is a measure of success with the consumer. According to industry analysts, to remain competitive a company in the consumer products industry needs to have increasing sales growth. The consumer products industry is very competitive, and sales growth serves to expand or maintain market share, therefore adopters, in an effort to improve firm performance per the performance plan design, should show increases in sales growth after adoption of either type of plan.

Electrical, Electronics, and Related Equipment

This industry group includes manufacturers of computers, computing equipment, and electric components such as semiconductors. This segment of manufacturing has grown increasingly competitive. Consumers are demanding bigger, better and faster products. These demands result in several key measures of success for these firms. First, technological changes and intense pricing pressure have led manufacturers to vastly alter their business models to ones of high volume, low-margin productions. Measuring **change in sales growth** helps determine their success at meeting this new business model. If adoption of a performance or restricted stock plan is effective, one would expect the rate of sales growth to increase.

Keeping up with the demands for improved performance and speed requires large expenditures in research and development. The **change in research and development as a percentage of sales** is a measure of how well the firm is meeting the demand placed by consumers as well as their ability to grab market share to sharpen their competitive edge. After adoption, adopters of performance and restricted stock plans should show increases in research and development costs as a percentage of sales as compared to prior to adoption.

Additionally, a key area for these firms is inventory control. Due to the continuous introduction of new products, shifts in demand, and the ability of products to rapidly become obsolete, it is important to have prompt inventory turnover. The **change in inventory turnover** measures management's ability to foresee demand swings and product shifts and therefore avoid the potential for future inventory writedowns. Inventory turnover should be greater for adopters after adoption of either a performance or restricted stock plan.

Food Processing & Distribution

Companies in this category include manufacturers of food and beverages, as well as large distributors of food products. This industry is a mature, slow growth industry that performs well in any economic climate; moreover it is fairly recession-proof when total consumption is considered. Steps to improving future business prospects include marketing more effectively, improving cost efficiency, and maintaining adequate cash.

The food industry is typically a cash intensive industry because new plant capacity needs are modest and basic manufacturing processes have changed little over the years. For many food products, the largest costs associated with the product are not the ingredients in the product; rather, packaging, marketing and distribution comprise the major costs. Sufficient liquidity is needed to meet these frequent and extensive costs. The **change in working capital**, defined as current assets minus current liabilities, provides a measure of how a firm is maintaining and utilizing cash. Performance and restricted stock plan adopters should exhibit higher levels of working capital after adoption of either type of plan.

The ability to market more effectively was measured by examining the **change in advertising expense as a percentage of sales**. Manufacturers are under tremendous pressure to differentiate their products from the products of others. The most common and effective way to do this is to advertise. Advertising is particularly important in distinguishing name brand products from generic brands, especially given the growing number of cost conscious consumers. After

adoption, adopters should show greater percentage change advertising expense as a percentage of sales than prior to adoption.

The **percentage change in sales growth** is another area of interest in measuring long-term firm performance in the consumer products industry. Sales should grow in line with population growth, about 2% per year. Name recognition also contributes to sales growth as consumers often buy more of a product if the product already has high sales. If adoption of a performance or restricted stock plan is effective, one would expect the rate of sales growth to increase.

Heavy Manufacturing

Companies in this industry group consist of firms that produce heavy equipment such as automobiles; air, space and defense products; farm equipment; etc. This industry is predominately mature and cyclical, and these features affect its members similarly. One important objective for these companies is to keep their products on the cutting edge.

Most of these companies are forced to continually change to differentiate their products. In addition, as end-user tastes change, such companies must control or change such product characteristics as safety features, environmental features, maintenance requirements, technological aspects and quality. The way to do this is to continually invest in research & development. The **change in research and development as a percentage of sales** provides an indication of how well research dollars are being spent. If adoptions are effective, there should be a greater percentage change in research and development as a percentage of sales for adopters after adoption as compared to prior to adoption..

On the other hand, it is costly in this industry to keep up with the fast pace of changes demanded, resulting in the need to cut costs as much as possible. One way this is being done is through downsizing and modernization. An important measure of downsizing and cost containment is the **percentage change in the number of employees as a percentage of sales**. Heavy manufacturing firms over the years have found the need to sell off unprofitable segments, combine lines and modernize resulting in a more efficient use of employees in generating sales. After adoption, adopters should exhibit larger percentage changes in the number of employees as a percentage of sales than exhibited prior to adoption.

In an attempt to streamline, many companies in this industry group have been selling off excess capacity, modernizing existing lines and maintaining only those products or segments that are most profitable. The overall affect of streamlining is that the **change in operating expenses as a percentage of revenues** should decline, thereby indicating successful efforts at cost containment.

Mining & Extractive

Due to the extreme costs associated with exploration and development in the mining industry, it is necessary to utilize state of the art technology to be profitable. In addition, implementing current technology to improve extraction and processing is necessary to compete with foreign competitors. A measure of firms' attempts to keep up with this improved technology

is the **percentage change in capital spending**. Overall, capital spending should increase over time for these firms.

As new technologies are implemented to improve and speed extraction, as housing starts grow, and as consumers are spending more and more travel dollars, firms should experience increases in sales. The **percentage change in sales growth** provides an indication of how the firm's capital spending is improving sales. If adoptions of performance and restricted stock plans are effective, adopters should exhibit increases in sales growth after adoption of either type of plan.

The increased costs associated with capital improvements as well as increased environmental costs make it necessary for firms in the mining and extractive industries to closely guard profitability. This profitability is contingent not only on increased sales performance but the ability to contain non-capital costs. This cost containment is measured by the **percentage change in operating expenses as a percentage of operating revenues**. With improved efficiency, this measure will decrease over time.

Non-financial Service

This group includes services such as phone, publishing & broadcasting, car rental, travel and the hospitality companies. Each of the companies in this group is greatly affected by consumer discretionary spending, and, though the level of discretionary spending has tended to steadily increase, the number of service organizations competing for those dollars has increased as well. Attractive features that are attractive to consumers are easier access to services and improved value for their dollar. Methods to compete for the discretionary funds are important to the survival of service industries.

Advertising is important to non-financial service organizations, regardless of the state of the economy. According to Standard & Poor's Industry Surveys for Non-Financial Service companies, during slowdown of consumer spending service companies should increase advertising expense as during hard-times promotions get consumers into stores. During more prosperous times, when consumers don't need incentives for such services, advertising helps distinguish among the services. Therefore, the **change in advertising as a percentage of sales** is a very important performance measure for this industry and adopters should have greater percentage changes in this variable after adoption of either type of plan.

Typically, these firms have tight profit margins and must carefully control costs. Therefore, overhead control is a good measure of how well costs are being contained. Overhead control is measured as the **change in operating expenses as a percentage of revenues**. Price wars are a common occurrence in the service sector. Having to change or cut prices regularly to compete makes the ability to control operating expenses more important than in many industries. Performance and restricted stock plan adopters should exhibit operating expenses that are a lower percentage of revenues after adoption of either of these two types of plans.

Lastly, similar to the financial group, the success of these firms is often measured by their ability to consistently pay dividends. Dividend policy is affected by the level of capital as well as current and projected levels of debt. The **percentage change in dividends** is measured for these firms to assess how well the firms are maintaining capital levels and managing debt. If adoptions

of performance or restricted stock plans improve firm performance, then adopters should show greater percentage changes in levels of dividends after adoption of either type of plan.

Textiles, Paper and Forest Products

This group includes firms in textiles and paper manufacturing. These manufacturers are highly dependent on basic demand, which is generated by consumer spending for clothing, semi-durable home furnishings, reading materials and paper products. Indirect demand for products manufactured in other sectors that rely on textiles for their completed product (automobiles, mobile homes), or paper products for packaging also have a significant effect on this industry group.

Manufacturers in paper and textiles seeking to improve productivity, flexibility, and competitive position must make significant capital expenditures. Most of the production in this industry group requires a variety of integrated processing steps. Delays or inefficiencies at any one level can greatly affect the timing and margins associated with production. Textile and paper manufacturers routinely rework production lines to improve product and cost efficiency. Therefore, a measure of a company's willingness and ability to stay on the cutting edge of production is **change in the levels of plant and equipment** and it is expected that this change should be greater for adopters after adoption of a performance or restricted stock plan.

Costly capital outlays force these companies to contain other costs as much as possible. A measure of cost containment is the **change in operating expenses as a percentage of revenues**. Demand for textile and paper products is somewhat cyclical as spending patterns for these goods are reflected in general merchandise store sales. Because of this cyclical nature, monitoring operating costs is extremely important to help prevent wide swings in earnings during low points of the cycle. Adopters should exhibit lower operating expenses as percentage of revenues after adoption as compared with prior to adoption.

Consumer tastes in clothing, home furnishings, and reading materials are constantly changing and require companies in this industry group to carefully assess the amount of any one product to produce.⁶ Overbuying by retailers can result in curtailed procurement and possible overruns, or overstocking of inventory items. Examining the **change in inventory turnover** provides an indication of how well these firms are moving inventory. Adopters should have higher inventory turnover after adoption of either a performance and restricted stock plan.

Variables Related to Time And Size

Time. The year in which a performance or restricted stock plan was adopted may have an impact on the results of this study. Performance plans first entered the compensation arena in the early-70's and restricted stock plans were first implemented in the mid-70's. During the years of introduction as well as for several years after, the implementation of either type of plan was most probably with the intent of linking pay and performance. However, as explained below, it is

⁶ The producers of paper used in packaging and for office products are less affected by consumer demand, but these firms also produce paper used for household paper products, newspapers, books, etc.

possible that these earlier adoptions had a greater impact on firm performance than did adoptions in later years.

A possible explanation for why earlier adoptions provide more significant increases in firm performance is that as these plans became more prevalent, firms may have viewed adoption as a necessary means of keeping/luring executives. When a significant number of firms began using these types of plans, it may have been essential for these plans to be a part of the compensation package in order to “keep up with the Joneses.”

Peter Chingos, a compensation consultant with KPMG Peat Marwick, in a Business Week article discussing changes in compensation planning, points out, “I am seeing a level of scrutiny and attention to detail I have not seen in my 22 years of consulting” (Byrne, 1993). In discussing how the compensation focus has changed, Chingos goes on to say that as late as 1990 his job was mostly to report to boards of directors what competitors paid their executives, so there would be justification for bigger pay packages for the boss.

Further, in the 1996 Compensation Survey by the Wall Street Journal, Mercer et al. (1996) discuss how timing may affect the effectiveness of some compensation packages. Mercer et al. divide the past thirty years into three pertinent time periods. The first is 1965-1975, when CEOs were typically loyal insiders paid mostly in cash. The few stock options that were granted during this time lost most of their value during the market doldrums in the late 60’s and early 70’s. Because tying compensation to the market was not very beneficial during this time, pay consultants were motivated to come up with alternative plans such as performance shares and restricted stock. Companies began to feel they could not compete if they had only one type of long-term plan, however, so these types of performance and tenure based plans became “in addition to” other types of compensation. The second period was 1975-1985, when superstar CEOs, many of whom were outsiders, emerged. The options given to these superstars Iacocca for example created some wealthy individuals as the market rebounded. The success of the few, however, led to other, less deserving CEOs asking for and often receiving similar packages. Lastly, from 1985-1995, the bull market gained and payoffs from stock-based compensation were substantial. There was also a frenzy of leveraged buyouts, which increased many CEO pay deals. The buyouts enhanced CEO bargaining power and thus lead to bigger and better compensation packages. Thus, according to Mercer, et al., it is probable that time of adoption will have an influence on how effective adoptions are at improving firm performance.

To see if the results of this study are dependent on time, a dummy variable was used in the analysis. In the general analysis, all firms were coded as to whether the adoption (or the base year for non-adopter and peer matches) occurred during the first decade of the analysis, 1972-1981, or whether the adoption occurred in the last decade of the analysis, 1982-1991.⁷ The TIME effects are explained in relation to each hypothesis in Chapter 5.

Size. Within a given industry, the size of the firm may determine whether or not it adopts either a performance plan, a restricted stock plan, or neither. These adoptions may be limited to large companies that need the extra contracting, or adoptions may be predominately used in the

⁷ The three periods depicted in the Mercer article were not used due to the small industry sample sizes; moreover data were not available as far back as the early time period discussed in the article. Using two periods should still capture some of the changes that have taken place in the compensation arena.

smaller companies as a means of attracting and keeping superior management. To evaluate the effects of size, all companies in the study were ranked within their industry based on average sales and assigned to either the top half of the size category or the lower half. Size effects are discussed in Chapter 5.

Data Manipulation

Adopters

A pre-adoption and post-adoption time period for each firm in the sample was established. The pre-adoption period is the three years prior to the year of the announcement of the adoption, and the post-adoption period consists of two time segments. The first segment includes the year of adoption as well as the following two years.⁸ A three-year cycle is chosen because the largest percentage of firms use this time frame in setting awards for performance plans (Kanter, 1990). A second post adoption period was employed to evaluate a more long term effect of the adoptions and includes the year of adoption plus the following four years. Long-term or long-range is often considered to be five or more years down the road. Though many compensation plans are established with a three-year evaluation time period, it is possible and probable that the effects of decisions made during the evaluation period will not be fully realized until a period beyond the evaluation year(s). Examining the changes in the related variables for the typical evaluation period, as well as for a period beyond this, will provide a better indication of the true long-term effects of the adoption of either a performance or restricted stock plan. For each adopter firm in the sample, both the industry-specific variables and the general performance variable were calculated for the pre-adoption and both post-adoption time periods. Pre-adoption and post-adoption variables were calculated using an average of the firm's financial information for the appropriate time period. The following three steps explain, using the general performance measure, ROE, how the variables used in this analysis were calculated.

Step 1 - Calculation of Pre-adoption, Post-1 adoption and Post-2 adoption Data

The calculation of ROE involves the variables IBEI (Income Before Interest and Taxes), TA (Total Assets) and TD (Total Debt). The year subscripts are anchored around the year of adoption, year 0.

$$IBEI_{pre} = \text{Average} (IBEI_{-3}, IBEI_{-2}, IBEI_{-1})$$

$$IBEI_{post-1} = \text{Average} (IBEI_0, IBEI_{+1}, IBEI_{+2})$$

$$IBEI_{post-2} = \text{Average} (IBEI_0, IBEI_{+1}, IBEI_{+2}, IBEI_{+3}, IBEI_{+4})$$

$$TA_{pre} = \text{Average} (TA_{-3}, TA_{-2}, TA_{-1})$$

⁸ If the company had a fiscal year end that occurs during the first five months of the calendar year, then the year of adoption was considered to be the year prior to the published year for purposes of pulling the correct data from COMPUSTAT.

$$TA_{\text{post-1}} = \text{Average} (TA_{0}, TA_{+1}, TA_{+2})$$

$$TA_{\text{post-2}} = \text{Average} (TA_{0}, TA_{+1}, TA_{+2}, TA_{+3}, TA_{+4})$$

$$TD_{\text{pre}} = \text{Average} (TD_{-3}, TD_{-2}, TD_{-1})$$

$$TD_{\text{post-1}} = \text{Average} (TD_{0}, TD_{+1}, TD_{+2})$$

$$TD_{\text{post-2}} = \text{Average} (TD_{0}, TD_{+1}, TD_{+2}, TD_{+3}, TD_{+4})$$

Using averages should eliminate extreme results that may arise if only the year prior to adoption, or any single year throughout the analysis period, is used. Additionally, the measured variables should change in the indicated direction through time but may not on a yearly basis; thus, using averages helps eliminate this problem.

Step 2 - Data Manipulation

$$\text{Pre-adoption ROE} = \text{IBEI}_{\text{pre}} / (TA_{\text{pre}} - TD_{\text{pre}})$$

$$\text{Post-1 adoption ROE} = \text{IBEI}_{\text{post-1}} / (TA_{\text{post-1}} - TD_{\text{post-1}})$$

$$\text{Post-2 adoption ROE} = \text{IBEI}_{\text{post-2}} / (TA_{\text{post-2}} - TD_{\text{post-2}})$$

The final sets of variables used in the analysis were formed from the data manipulations in Step 2 and their calculation is explained in Step 3.

Step 3 - Variable Formulation

$$\text{ROE1} = \text{Post-1 adoption ROE} - \text{Pre-adoption ROE}$$

$$\text{ROE2} = \text{Post-2 adoption ROE} - \text{Pre-adoption ROE}$$

Each firm's data from these two time periods was then used in three different comparisons: intra-firm, with intra-industry non-adopters, and with a peer non-adopter. Table 2 provides a list of the definitions of the variables used for each industry group, and unless otherwise indicated, the value of each variable was computed by applying the three steps presented above.

Non-adopters

In order to eliminate as many conflicting factors (economic, regulatory, technological) as possible in comparisons involving non-adopter firms, non-adopters include all firms in the same three-digit SIC code that had the required data. While it is probable that some of the comparison firms were also adopters of performance plans, there should also be firms that were non-adopters. The comparison can still be made between the adopters and non-adopters because the probability

is less than one that all companies would have adopted a performance or restricted stock plan in the same year. The effects of adopters in the non-adopter group should average out.

Additionally, because there is the probability of adopters existing in the non-adopter group, positive results from this study are more robust.

Non-adopter data was calculated to help control for problems created by entry and exit into an industry. First of all, as stated above, all firms with the same three-digit SIC code, and with the required data available for at least eight consecutive years, were obtained from the COMPUSTAT tapes. This means that the non-adopter sample size varied from year to year as companies entered and exited into the industry. To control for the change in the composition of the industry, averages across the industry were calculated for each data item.⁹ For example, for one year there may have been 60 non-adopter firms in the sample and in the following year there may have been 75 non-adopter firms. Each variable used in the analysis was averaged over the number of firms for that year, and these averages were used to calculate the ratios used in the analysis. This approach resulted in only one observation per year for non-adopter firms. This yearly data were “matched” to the adopter data - for example, if in a particular industry, there were 4 adoptions in a single year, then the non-adopter data for that year would be used four times in order to have one non-adopter observation for each adopter observation.¹⁰

Peers

A peer company is a non-adopter¹¹ that most closely matches the adopter company in size. As explained in the definition of a peer company, size is calculated as the percentage sales of the company based on the total sales of the entire industry sample. Peers were first selected based on four digit SIC code and size. If necessary, to find a more appropriate match, the peer was chosen from either a three digit SIC code match or simply from the industry group as a whole.¹²

⁹ It was suggested that the median data be used for non-adopters; however, using medians did not result in significantly different results.

¹⁰ The analysis was also run placing non-adopter information in the sample only once if an adoption occurred in that year. The results were the same, but the significance was slightly smaller.

¹¹ Peer companies were not checked as to whether or not they had adopted a performance or restricted stock plan in year = 0. The peers were simply chosen from the pool of non-adopters which may include some firms that adopted one of these types of plans. Therefore, it is possible that the adopter vs. non-adopting peer tests may be adopter vs adopting peer for some matches.

¹² According to Young (1996) many companies are now using a Peer Review system in evaluating executives. The difficulty is in finding a peer, which is usually a member of the same S&P index. Some comparisons are as simple as looking at ranking within the index, while others incorporate such features as return to stockholders relative to the S&P index for that group. She adds that a big problem with peer reviews lies in differences in reporting and accounting practices.

TABLE 2
Variable Definition

Industry	Variable	Variable Name	Definition
Financial	CAPGRW ¹	Capital Growth	$\frac{(CS+PS-TD)_t - (CS+PS-TD)_{t-1}}{(CS+PS-TD)_{t-1}}$
	OHCTRL	Overhead Control	$\frac{[(IBEI - (SALES - COGS))_t]}{SALES_t}$
	DIV ¹	Dividend Change	$\frac{\text{Dividends}_t - \text{Dividends}_{t-1}}{\text{Dividends}_{t-1}}$
Chemical	INV/SLS RD/SLS CAPSP ¹	Inventory/Sales R&D/Sales Capital Spending	$\frac{\text{Inventory/Sales R \& D Expense/Sales PP\&E}_t - \text{PP\&E}_{t-1}}{\text{PP\&E}_{t-1}}$
Consumer	AD/SLS INVTURN	Advert./Sales Inventory Turnover	$\frac{\text{Advertising Expense/Sales COGS}}{(INV_t + INV_{t-1})/2}$
	SLSGRW ¹	Sales Growth	$\frac{SALES_t - SALES_{t-1}}{SALES_{t-1}}$
Electrical	RD/SLS SLSGRW ¹	R&D/Sales Sales Growth	$\frac{\text{R \& D Expense/Sales SALES}_t - \text{SALES}_{t-1}}{SALES_{t-1}}$
	INVTURN	Inventory Turnover	$\frac{COGS}{(INV_t + INV_{t-1})/2}$
Food	AD/SLS WRKCAP SLSGRW ¹	Advert./Sales Working Capital Sales Growth	$\frac{\text{Advertising Expense/Sales Current Assets - Current Liabilities SALES}_t - \text{SALES}_{t-1}}{SALES_{t-1}}$

¹These particular variables use only one data element and therefore did not necessitate the use of Step 2 related to data manipulation.

TABLE 3

Variable Definition

Industry	Variable	Variable Name	Definition
Heavy Mfg.	RD/SLS OPEX/REV	R&D/Sales Operating Expense/Revenue	R & D Expenses/Sales $\frac{[\text{IBEI} - (\text{SALES} - \text{COGS})]}{\text{SALES}}$
	EMP/SLS	Employees/Sales	Number of Employees/Sales
Mining	SLSGRW ¹	Sales Growth	$\frac{\text{SALES}_t - \text{SALES}_{t-1}}{\text{SALES}_{t-1}}$
	CAPEX ¹	Capital Expenditure	$\frac{\text{PP\&E}_t - \text{PP\&E}_{t-1}}{\text{PP\&E}_{t-1}}$
	OPEX/REV	Operating Expense/Revenue	$\frac{[\text{IBEI} - (\text{SALES} - \text{COGS})]}{\text{SALES}}$
Service	OPEX/REV	Operating Expense/Revenue	$\frac{[\text{IBEI} - (\text{SALES} - \text{COGS})]}{\text{SALES}}$
	AD/SLS DIV ¹	Advert./Sales Dividend Change	Advertising Expense/Sales $\frac{\text{Dividends}_t - \text{Dividends}_{t-1}}{\text{Dividends}_{t-1}}$
Textiles	OPEX/REV	Operating Expense/Revenue	$\frac{[\text{IBEI} - (\text{SALES} - \text{COGS})]}{\text{SALES}}$
	INVTURN	Inventory Turnover	$\frac{\text{COGS}}{(\text{INV}_t + \text{INV}_{t-1})/2}$
	CAPEX ¹	Capital Expenditure	$\frac{\text{PP\&E}_t - \text{PP\&E}_{t-1}}{\text{PP\&E}_{t-1}}$

¹These particular variables use only one data element and therefore did not necessitate the use of Step 2 related to data manipulation.

Statistical Analysis

Student's t tests

To analyze hypotheses H1A and H2A, a one-sample t-test was used. The tested equations under the null hypothesis for H1A are

$$\text{and } ROE_{(Post1)} - ROE_{(Pre)} = 0 \quad (1)$$

$$ROE_{(Post2)} - ROE_{(Pre)} = 0 \quad (2)$$

The tested equations under the null hypothesis for H2A are

$$\text{and } INDRATIO_{ij(Post1)} - INDRATIO_{ij(Pre)} = 0 \quad (3)$$

$$INDRATIO_{ij(Post2)} - INDRATIO_{ij(Pre)} = 0 \quad (4)$$

where, $i = 1..3$, and $j = 1..9$ and

INDRATIO = the change in the specific industry ratio for a given industry, with three ratios per industry and nine industries.

ANOVA

H1B and H1C only have one dependent variable and one categorical independent variable and were therefore analyzed using analysis of variance (ANOVA). To analyze these two hypotheses, two separate ANOVAs were executed for each of the nine industry groups. Expressed in general form, (Hair, 1992) the two ANOVA equations are

$$\text{and } ROE1 = \alpha + \beta_1 COCLASS \quad (5)$$

$$ROE2 = \alpha + \beta_1 COCLASS \quad (6)$$

where

$$ROE1 = ROE_{(Post1)} - ROE_{(Pre)}$$

$$ROE2 = ROE_{(Post2)} - ROE_{(Pre)} \quad (\text{as defined earlier), and}$$

$$COCLASS = 1 \text{ if the company is an adopter, } 0 \text{ if it is a non-adopter for H1B} \\ = 1 \text{ if the company is an adopter, } 0 \text{ if it is a peer for H1C}$$

MANOVA

Hypotheses H2B and H2C have multiple dependent variables and therefore were analyzed using multivariate analysis of variance (MANOVA).¹³ Expressed in general form (Hair 1992), the full MANOVA model is

$$\text{RATIOONE}_{ij} + \text{RATIOTWO}_{ij} + \text{RATIOTHREE}_{ij} = \alpha + \beta_1 \text{COCLASS} + \beta_2 \text{TIME} + \beta_3 \text{SIZE}, \quad (7)$$

where $i = 1..3$, $j = 1..9$, and

RATIOONE = change in the first industry-specific ratio between the pre-adoption period and the appropriate post-adoption period;

RATIOTWO = change in the second industry-specific ratio between the pre-adoption and the appropriate post-adoption period;

RATIOTHREE = change in the third industry-specific ratio between the pre-adoption and appropriate post-adoption period;

COCLASS = equals 1 if the company is an adopter and 0 for non-adopters for H2B;
= equals 1 if the company is an adopter and 0 for peers for H2C;

TIME = equals 0 if the year of adoption, or the base year for non-adopters, occurred in the first 10 years (1972-1981) of the analysis and equals 1 if the adoption (match) occurred in the last 10 years of the analysis (1982-1991);

SIZE = equals 0 if company sales to total industry sample sales of the company is in the bottom 50% of the sample, and equals 1 otherwise.

The **TIME** and **SIZE** variables were only added to the model in instances where significant results were achieved from the main model (which included only the **COCLASS** variable). **TIME** and **SIZE** effects were analyzed using ANOVA and further clarified through an analysis of means (ANOMEANS) procedure.

Data

The data used in this analysis were collected for periods of at least eight years for each of 3,231 companies over the period 1969 through 1995. Data sources included COMPUSTAT

¹³ MANOVA is the most appropriate analysis given the multiple, metric dependent variables (which are often correlated) and the multiple, non-metric independent variables.

tapes and various private sources. The sample selection and data collection process are explained in the next section.

Sample Selection

The sample period covered 20 years of adoptions (1972-1991) and 27 total years, (1969-1995). The time period covered all the years for which adoptions were readily available. A list of adopting companies was obtained from two sources. Performance plan adopters from 1973-1980 were identified from the 1992 study by Gaver et al.¹⁴ In addition, performance plan and restricted stock plan adopters for the years 1972-1991 were obtained from Richard Kimble of Frederick W. Cook & Co., compensation specialists. These adoptions are for the top 200 industrial and top 200 service companies. The final adopter sample consists of 335 companies over nine industries. Table 4 provides statistics on the number of firms and observations for both adopters and non-adopters in each industry.

Non-adopter companies were identified by doing a search on COMPUSTAT for all firms in specific SIC codes that had the data items necessary for the study. This search was conducted for each specific three digit SIC code for each year in the study.

Financial data were extracted from the COMPUSTAT tapes for all adopter and non-adopter firms. To ensure banking information was correct, the data for a small sample¹⁵ of banks were checked using actual annual reports.

Data Assembly

Adopters. The data items gathered from COMPUSTAT were assembled using an electronic spreadsheet. The first step was to mark the year of adoption for adopters and calculate the averages for each data item for each of the three measurement periods, Pre, Post1 and Post2. Next, the general performance ratio and the industry specific ratios were calculated for each of the three periods. Finally the change between Pre and Post1, and Pre and Post2 were calculated and incorporated into a new spreadsheet. This resulted in one spreadsheet for each of the nine industry groups and the spreadsheet data were used in testing the hypotheses related to adopters only as described in equations (1), (2), (3) and (4).

Non-adopters. Again, the data were assembled using electronic spreadsheets. For each industry group, the data were sorted by year and the average for each data item was calculated for each year. This resulted in one year of data for each year 1969-1995. The data were then divided into eight year intervals, (1969-1976, 1970-1977, etc.) to match the eight year intervals surrounding adoptions. Next the appropriate ratios were calculated for the time intervals needed to match adopters, Pre, Post1 and Post2. Lastly, the changes between Pre and Post1 and Pre and

¹⁴ Gaver, et al, (1992), used 238 companies with the concentration of their firms in banking, building, food processing and petroleum.

¹⁵ Annual reports for 5 banks were compared against the COMPUSTAT data to verify that what was used in this study to compute, for example, COGS was really what is reported as such by the banks. There were no discrepancies.

Post2 were calculated. These changes were incorporated along with the adopter data into nine spreadsheets the data from which were used to analyze equations (5), (6), (7).

Peer. One of the variables calculated for all firms was average sales over the eight year period. Adopter firms were sorted by SIC code and by average sales. Non-adopter firms were sorted in the same manner. A simple macro was used to attempt the matches based on exact SIC and average sales. Visualization became the tool of choice for those firms where a match was not made, or a better match on average sales could be obtained by staying within the industry but moving away from exact SIC matches. These companies, adopters and peers, were compiled by industry into nine spreadsheets the data from which were used to analyze equations (5), (6) and (7).

Results of the various statistical analyses are presented in the next chapter.