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PENSION PLAN TERMINATIONS AND FREEZES – AN EVENT STUDY OF ABNORMAL RETURNS TO GAUGE MARKET RESPONSE

MARIA GRANT SHARPE
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Reviewed and approved* by the following:

Chris Muscarella
Professor of Finance, L. W.'Roy' and Mary Lois Clark Teaching Fellow
Thesis Supervisor

Brian Davis
Clinical Associate Professor of Finance
Honors Adviser

* Signatures are on file in the Schreyer Honors College.

ABSTRACT

Over the past two decades, private sector pensions have shifted dramatically away from defined benefit pension plans in favor of defined contribution plans such as 401K's and 403b's. Nevertheless, while existing literature has answered many of the big questions surrounding this change, very little has been done to determine how the capital markets feel about pension freezes. The purpose of this study was to try to answer that question. Using an event study methodology, I found that on the day of announcement firms that froze their DB pension plans saw on average a 0.63% abnormal return. My findings further show that markets react immediately to the news of a freeze. Under the presumption that pension freezes reduce long-term costs and shift risk to employees, it is fair to say that on average pension freezes enhance firm value.

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Chapter 1

Introduction

The extinction of defined benefit ("DB") pension plans is no new phenomena. Companies in the U.S have been transitioning from traditional DB plans to modern defined contribution ("DC") pension plans since the 1980's. This long-term trend has been well documented and still persists today. According to research conducted by VanDerhei (2006), between 1975 and 2004 more than 3,400 underfunded DB plans were terminated and at least 165,000 adequately funded DB plans were terminated. An abundance of research has attempted to determine the motivation for such changes (Aon, 2003; Mercer, 2006; Munnell, 2006). In a recent study of Fortune 500 companies conducted by Towers Watson (2016), author Brendan McFarland identifies six key factors propelling the flight from traditional DB pension plans. Namely, corporate desires to better manage retirement costs, a mobile workforce, simplicity of DC plans, government and accounting regulations, market trends, and global competition.

When DB plans were commonplace, employers ensured their employees had secure income through their retired years. The companies that sponsored DB plans held all of the risk associated with investing for retirement. These guaranteed employees a predictable stream of payments in retirement, regardless of market conditions. These size of these payments were determined using a formula, usually some percentage of an employee's final salary over the number of years he or she worked for the company. This structure favored the committed, long-term employee. Accordingly, people worked for the same company for twenty years, accruing benefits that they would eventually receive in retirement.

Today, through the use of DC pension plans, companies have effectively transferred the risks and responsibilities of saving for retirement to the employees themselves. Today, working Americans must manage their own retirement contributions, withdrawals, investments, and distributions (Towers Watson 2016). In doing so, employees today have less secure income in retirement then past generations. The challenge of saving for retirement has proven challenging for many people, especially those that have little knowledge of investing. However, even if people save in a responsible way, they could still come up short at retirement if market conditions deteriorate or if the timing is bad. For example, countless Americans had to defer retirement during the financial crisis of 2007-2008 because their invested retirement savings had lost a significant amount of their value.

In 2015, only 20% of Fortune 500 companies offered a DB pension plan to new hires, down from 59% among the same employers in 1998 (Towers Watson 2016). Companies can transition from a DB plan to a DC plan in two ways, either by terminating their DB pension plan, or freezing it. When companies freeze their DB pension plan, they are essentially stopping future accruals. In the event of a "soft" freeze, all of the employees covered under the DB plan continue to earn benefits up until retirement; however new employees are not eligible for the DB plan. Conversely, in the event of a "hard" freeze accruals stop for current employees as well as new hires. Current employees still receive benefits they have already accrued up until the freeze, but they do not continue to earn benefits with additional years on the job.

Since 1998, 23% of Fortune 500 employers have hard frozen their primary DB plans, and 15% have closed their plans to new hires (Towers Watson 2016). When a company chooses to freeze their DB plan they replace it with some variation of a DC plan, usually a 401K. Employees stand to lose as a result of a DB plan freeze. Employers attempt to compensate

employees by increasing contributions to new DC plans, however this only makes up for a portion of the overall loss.

Pension terminations are very different, and rare outside of bankruptcy proceedings. When a pension plan is terminated, the sponsoring company must pay out all the benefits at one time, either through a lump sum or by paying employees an annuity (Munnell 2006). In order for a company to terminate their DB pension plan completely, the plan must either by fully funded or eligible for transfer to the Pension Benefit Guaranty Corporation (PBGC). Nearly all DB plans are underfunded and the PGBC only accepts the pension liabilities of bankrupt companies, making pension terminations impossible for most viable companies. Since 1998, only 2% of employers in the Fortune 500 terminated their DB plans (Towers Watson 2016). Among Fortune 500 companies that offered DB pensions in 1998, the most common course of action has been to freeze the plan (Towers Watson 2016).

New statistics recently reported in the Towers Watson study (2016) show that pension freezes have risen significantly since the 2008 financial crisis. "In 2009, 21% of DB plan sponsors had frozen pensions and 21% had closed their primary plan to new hires. By 2015, 39% sponsors a frozen DB plan and 24% had closed the plan to new hires" (Towers Watson 2016). Over the past few years it has become very popular for companies to first soft freeze their DP plans, closing them off to new hires, and then later hard freeze them (Towers Watson 2016). Given this new trend, my research aims to analyze how the announcement of a freeze effects sponsoring firm's stock price.

Chapter 2
Literature Review

Corporate pension plans, defined benefit and defined contribution alike, have inspired research spanning several decades producing countless analyses. Existing literature on the matter has considerable breadth and depth. As trends in employee retirement benefits have evolved over time, so to have the studies analyzing such changes. Although the practice of freezing and terminating defined pension plans is no new phenomena, research analyzing market response to such events is still in its infancy.

Existing literature evaluating the effect of pension freezes on firm value is meager and largely conflicting. Three papers have used equity market event studies in an attempt to gauge market sentiment towards freezes: Rubin (2007), Milevsky and Song (2008), and McFarland, Pang, and Warshawsky (2009). The findings of these papers influenced the structure of my own analysis in many ways and therefore merit discussion.

Rubin's (2007) paper titled "The Impact of Pension Freezes on Firm Value" pioneered research on pension freezes as they relate to value creation for a firm. Prior to Rubin, little to no literature addressed freezes from the perspective of the capital markets. Using an event study methodology and a sample of fifteen firms he tests his hypothesis that "healthy firms experience an increase in firm value as a result of freezing their DB pension plans". His rational for such an increase is supported by related literature on the motivation for pension freezes.

Under the assumption that companies freeze their pension plans to reduce systemic risk and improve cost structure, Rubin argues that is it reasonable to believe freezes create value. He takes a two-fold approach: foremost examining the effect of pension freezes on firm value, while also addressing market efficiency under such circumstances.

Rubin uses a single factor market model to calculate cumulative average abnormal returns over three event windows using a Patell Z test statistic. The outcomes of the event study show that in short windows around the announcement date AR's were not statistically significant. He found nothing to suggest that the market expected the freeze. However, in the long run AR's did eventually trend up indicating that the reaction was delayed and prolonged. He attributes this delay to investor error in interpreting complex pension data calculate Rubin concludes that freezes enhance the underlying value of the firm and that the relationship is casual.

As with most trailblazing research, Rubin's analysis has several shortfalls the most obvious being sample size. It is a reach to make any strong conclusions using a sample size of only fifteen firms. In an attempt to strengthen the explanatory power of the market model he further limits the sample by including only healthy firms, but in doing so he is missing the big picture.

Research has shown that pension freezes do not exist in a vacuum and are often occur in tandem with other major corporate events such as restructuring, bankruptcy, and mergers (Munnell 2006). Similarly, by using large test intervals as far out as 250 days after the announcement and as premature as 30 days before, there is considerable risk that unrelated events contaminated the event window.

In their paper titled "Do Markets Like Frozen DB Pensions? An Event Study." Milevsky and Song (2008) use the same approach as Rubin, but expand the sample size and include explanatory variables. While Rubin approached the issue from a distinct financial- economic perspective, Milevsky and Song employ a more comprehensive analysis. The authors are the first

to try and explain variations in abnormal returns by analyzing several firm specific characteristics.

Using an event study methodology, the authors test their hypothesis on a sample of 75 firms that announced pension terminations between 2001 and 2007. Similar to Rubin, the authors use a single variable market model to calculate CAR over four different event windows, namely (0,0), (-10,0), (-10,10), and (-20,20). Additionally, Milevsky and Song break the full sample into subgroups by firm specific characteristics. These explanatory variables are used to proxy for the risk level and performance of firms that announced freezes. Event studies are then conducted on each subgroup in additional to the full sample.

The results of the paper show a positive announcement effect in all event windows studied, however none prove to be statistically significant from zero. After adjusting for outliers in the data through winsorization, the authors find positive and statistically significant CAR's in short event windows surrounding the announcement. These findings directly oppose those of Rubin (2007), who found no relationship at all in the short term. The paper contributes new results regarding the factors that drive and impact CARs. An analysis of the types of firms that announced DB pension freezes shows that some subgroups outperformed others. Specifically, CAR's were greater for firms with a higher beta, higher pension cost, lower historical stock returns and lower ROE.

Milevsky and Song interpret the winsorised sample outcomes as being the result of reduced pension longevity risk exposure. When a firm announces s pension freeze it is essentially eliminating the risk associated with the stochastic maturity of pension plans. The authors attribute their subsample results to a combination of risk shifting and market signaling. The authors describe a "good news and bad news paradox". For small companies that are in

financial distress the market cheers at the announcement of a pension freeze, as this may improve the value of the firm. For larger and thus safer firms, the announcement may act as a negative signal, sending a message to the markets that the firm is headed for financial distress.

In their 2009 paper titled "Does freezing a defined-benefit pension plan increase company value?" McFarland, Pang and Warshawsky (2009) continue Milevsky and Song's (2008) comprehensive analysis. The group uses the largest sample size of pension freezes to date, comprised of a total of 82 publicly traded companies that announced freezes from 2003 to 2007. This literature is the first to use both parametric and nonparametric tested under the event study methodology.

The authors conduct three separate tests to verify whether abnormal returns in either direcction are statistically significant. The first test, a market model risk model, is used to test for abnormal returns security by security and determine if those abnormal returns are statistically significant. Test two tests the null hypothesis that the freeze has no impact on stock prices by calculating cumulative average abnormal returns (CAAR). McFarland et al. (2009) uses this test statistic to average the effect across all securities in each event window. Test three is a nonparametric sign test used as a check for the robustness of standard parametric tests. In addition to these test the group also conducted an OLS regression on the test 1 results on a variety of different company/plan variables.

McFarland et al. (2009) were unable to reject their null hypothesis that the freeze event has no impact on stock prices. The outcomes of tests 1,2, and 3 indicate that CAR's across all event windows were insignificant and often negative. OLS regression analysis revealed that two variables were significant in explaining the variation in CARs: company size and plan funding risk. Like Milevsky and Song, this paper found no relationship between CARs and the funded

status of the plan or the profitability of the company. Although while these results are interesting, McFarland et al. (2009) ultimately concludes that "freezing DB pension appear to have little impact on sponsoring companies' market value".

To explain these results, the authors put forth several alternative explanations. They believe that there is no conclusive research that proves freezing or terminating a DB pension plans results in less costs to the company, and that any potential benefits from the freeze are offset or outweighed by 401K contributions under new defined contribution plans and costs related to employee morale, productivity, attraction and retention. Alternatively, the small declines in firm value could indicate that freezes signal overall financial distress to the market.

As indicated by the divergent outcomes of these three studies, much of what is known about market reactions to pension freezes is unsubstantiated and inconclusive. This is largely attributable to the lack of *a priori* data selection criteria (McFarland et al.,2009). It is very difficult if not impossible to ascertain the exact moment when markets impounded the news of a freeze. Ultimately the important questions remain unanswered. How does the market react to the announcement of a defined benefit freeze? Is there any evidence to suggest in the event of a pension freeze announcement some companies outperform or underperform the market relative to specific firm characteristics? The purpose of my research is to further contribute to the existing literature and shed some light on these unanswered questions.

Chapter 3

Data Collection

When a public or private corporation makes the decision to terminate or freeze their pension plan they are required by law to file several forms with various government agencies. A company that is seeking to terminate their pension plan must follow the Pension Benefit Guarantee Corporation's ("PBGC") Part 4041 regulation and file a Form 5300 application with the agency as well as a Form 5310 with the Internal Revenue Service ("IRS").

Companies seeking to freeze their pensions plans submit to similar reporting requirements and must give notice of the freeze to the Department of Labor via the Form 5500. The DOL is required by law to report this data to the public, however the reporting lag for government agencies is severe at best and freezes in the past ten years are too recent to be included in available data.

Literature from the 1980's relating to overfunded pension terminations (Anderson & Chen 1986; Haw & Ruland 1988) used the date that these forms were filed with their perspective government agencies as a proxy for the date in which news of a company's pension termination or freeze became public knowledge. This approach is erroneous and results in an inaccurate and contaminated measure of the event date. As explained by Mitchell and Mullheren (1989), in many if not all cases the filing date is not the first time news of a pension freeze became public knowledge. In several cases the filing date succeed a public company announcement by several days if not weeks. Therefore, even if this information were publicly available, it would be inapplicable.

Due to the lack of data, most studies in the past have relied on private consulting firms to analyze freezes (Rubin, 2007). In accordance with similar papers by Rubin (2007), Milevsky & Song (2008), and McFarland, Pang, & Warshawksy (2009), the data used for my research was retrieved through a combination of trusted scholarly databases and careful evaluation of public announcements. Fortunately, the Pension Rights Center's (a nonprofit consumer organization) compiles a comprehensive list of companies and organizations that from 2007 through the present day have announced significant changes to their defined benefit ("DB") pension plans. From this list, as well as independent research, I identified 74 companies that have frozen or terminated their DB pension plans between the years of 2007 and 2015. After adjusting the data set for private firms, nonprofit firms such as hospitals, and government entities the resulting data set includes 54 publicly traded, U.S companies that have frozen or terminated their DB pensions plans since 2007. While there are subtle and technical differences between a pension freeze and a pension termination that should be noted, in accordance with existing literature (Rubin (2007); Milevsky & Song (2008)) I treat them as one homogenous event.

Identifying the exact date on which the news of a company pension freeze became public knowledge is a tedious and challenging task. Using the Dow Jones & Company Factiva database, I searched major business publications for news of a company's pension freeze. To narrow my results, I searched keywords such as "pension", "freeze", and "terminate". I filtered the results of these searches by looking for the announcement that had the earliest publication date. In many cases the publication would state, "On Wednesday firm XYZ announced that they will be freezing their employees 'DB pension plans effective January 1st". In these instances, I would reference the date of day the publication was referring to. For several of the companies I was unable to locate any news of the freeze in any major or minor news publication. In these

instances, I referred to public filings in the EDGAR database to find news of the freeze in an 8-K or 10-K.

I reviewed each article or public filing containing the announcement carefully and any reasons the company cited for the freeze were noted. In many cases a company cited several reasons for the freeze, with only two companies citing no reason at all. Ultimately I divided all reasons noted into six categories:

- Reason 0: No Reason – These companies identified no reason for the freeze.
- Reason 1: Financial Distress – Companies that froze their DB pension plans because they were struggling to meet other financial obligations.
- Reason 2: Bandwagon – Companies froze their DB pensions to be consistent with industry-competitive practice
- Reason 3: Cost Savings – Companies that froze their DB plans to reduce the costs associated with employee benefits.
- Reason 4: Restructuring – Companies that froze their DB plans as part of a restructuring initiative.
- Reason 5: Merger/Acquisition – Companies that froze their DB plans as part of a merger or acquisition.
- Reason 6: Reduce Volatility – Companies that froze their DB plans in order to reduce exposure to market volatility via pension investments.

The first column of Table 1 titled "N: Only Reason" gives the number of firms in the sample that cited only that specific reason as their motivation for freezing. For example, 5 companies cited reason 1: financial distress, as their only motivation for the DB plan freeze. The second column of Table 1 titled "N: Including Reason" specifies the number of firms in the

sample that identified that reason, along with another, as their motivation for freezing. For example, 11 companies cited reason 3: cost savings, as one of their motivations for freezing the DB plan.

Table 1 Motives for Pension Freeze

Motives for Pension Freeze

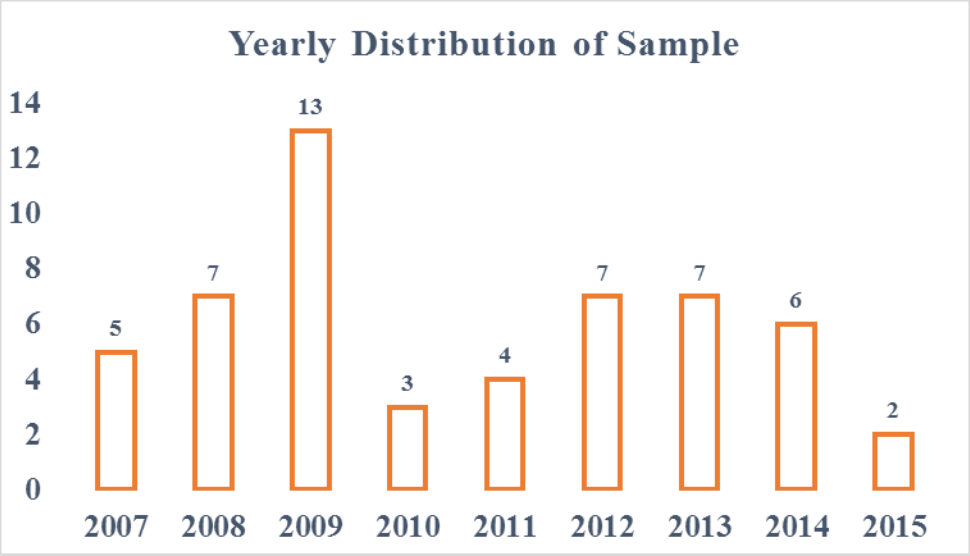
Variable	N: Only Reason	N: Including Reason
Reason 1: Financial Distress	5	16
Reason 2: Bandwagon	6	-
Reason 3: Cost Savings	19	11
Reason 4: Restructuing	-	4
Reason 5: Merger/Aquistion	2	-
Reason 6: Reduce Volatility	-	7
Reason 0: No Reason	2	-

As is evident from Table 1, the most frequently cited reason for a freeze was reason 3: "cost savings" which in part goes hand in hand with reason 1: "financial distress". This agrees with research by Munnell (2006), Mercer (2006), and Aon (2003) showing that the most sited reason for a DB pension freeze/termination was "long term cost savings". More surprisingly, six firms gave reasons that I identified as "jumping on the bandwagon". These firms did not have specific or strategic rationale for freezing their pensions plans, but rather indicated that they were doing so to be consistent with industry-competitive practice.

The sample spans a wide range of industries. Each company's FactSet Industry was used to denotes the company's primary line of business, specifically the industry in which the company derives fifty percent of its revenue. Categorizing the companies' industries in this way provided me with refined list of industry fitting to the sample size. The most frequent industry for pension freezes was the Aerospace & Defense industry, constituting eleven percent of the sample.

It is important to note that in Figure 1, 15 out of 54 announcements, approximately a fourth of the sample, occurred in 2009. Event-date clustering around the 2008 financial crisis could result in cross-sectional correlation of abnormal returns and distortions from event-induced volatility changes. With an abundance of caution, I say that I do not believe this overlap in events tampers with the assumption of zero covariance. It is my opinion that the tumultuous nature of the markets during 2007-2008 does not significantly influence the result of the overall study.

Figure 1 Yearly Distribution of Sample



In an attempt to explain any cross-sectional variation among abnormal returns, I name nine firm specific explanatory variables. Seven of the nine explanatory variables are accounting measurements. To control for econometric simultaneity, these variables were collected from each firm at the end of the fiscal year preceding the announcement. Existing literature accepts that financial statements reported in compliance with GAAP are often unrepresentative of the true viability of a company at market value (Milevsky & Song, 2008). However, there is sizable research that suggests investor's use accounting data (often improperly) when valuing a pension

(Coronado & Sharpe, 2008; Picconi, 2006). While this information should be considered cautiously, the use of accounting data in pension valuation is common enough that it warrants inclusion in this study. The seven accounting variables are as follows:

- Total Firm Assets ("SIZE"): defined as the sum of the current and long term assets of the firm. This variable is used as a proxy for firm size.
- Return on Total Equity ("ROE"): defined as the ratio of net income to total equity where total equity is the sum of common and shareholders' equity. This variable is used as proxy for firm profitability preceding the event.
- Return on Total Assets ("ROA"): defined as the ratio of net income to total assets. This variable is used as a proxy for management efficiency.
- Leverage ("LEV"): defined as the ratio of total debt to total assets. This variable serves as one proxy for firm specific risk. Leverage magnifies both the gains and losses of a firm and often is an indication of a company's "skin in the game".
- Funded Status ("STAT"): defined as the fair value of total pension plan assets less the projected DB pension obligation ("PBO"). This variable represents the economic state of the plan prior to freezing.
- Total Interest Cost ("INT"): This variable is a proxy for the cost of the pension plan to the firm. It represents the additional liability the firm must take on because employees are one year closer to collecting their accrued benefits. For every year that employees near retirement, the company must pay interest on the accrued assets of the DB plan.
- Total Service Cost ("SER"): This variable is an additional proxy for the cost of the pension plan to the firm. It is the additional liability passed on to the company

from another year of employee service. For each year that passes, the company must pay a servicing cost on the accrued liabilities of the DB pension plan.

These explanatory variables are pulled directly from the FactSet database. Four companies did not report a number for ROE in their financial statements and in these cases ROE was calculated manually using net income taken from the income statement and total equity taken from the balance sheet. Each company is identified by the ticker symbol that it used at the time of the announcement. It is critical that the historical ticker, and not the current ticker be used. Often ticker symbols are recycled. For example, at different points in time the ticker symbol both Milacron Inc. and Macy's used "MZ" as their respective ticker. Additionally, several of the firms in the sample were acquired by another company or merged with another company and at that point took on a consolidated ticker. For example, when Kraft Foods Inc. announced their pension freeze in 2010 they were trading under the ticker "KFT". However, two years later in 2012 the company was bought by Mondelez International and began trading under the "MDLZ" ticker.

In addition to these seven accounting variables, I also calculated two risk variables for each firm: volatility and beta. Similar to the accounting variables described above, volatilities and betas for each company tare used gauge risk relative to the market prior to the announcement date.

These two variables were calculated manually using daily stock price data from YAHOO finance. The volatility variable serves as a proxy for total market risk. Using a macro I created within Excel, I pulled the daily stock returns for all companies in the sample twenty seven trading days prior to the announcement date. Using these returns I performed a simple standard deviation calculation to compute the daily standard deviation of returns. The beta variable serves

as a proxy for firm risk relative to the market By definition beta is the slope coefficient resulting from the regression of excess stock returns on excess market returns. Using the same excel macro I found the daily Standard and Poor ("S&P") returns for the 27-day trading days prior to each freezing announcement. I then performed a simple linear regression, regressing the S&P returns against the daily stock returns mentioned above to arrive at a raw beta for each firm 27 days prior to the event date. The table below details the summary statistics of the full sample.

Table 2 Explanatory Variable Summary Statistics

Explanatory Variable Summary Statistics

Variable	N	Mean	Median	Max	Min
VOL (%)	54	3.59%	2.16%	13.83%	0.68%
BETA	54	1.33	1.25	3.78	-0.49
SIZE (in millions $)	54	$126,396.65	$14,393.00	$2,144,258.00	$142.73
ROE (%)	54	13.11%	7.14%	420.49%	-260.04%
ROA (%)	54	3.20%	2.19%	56.53%	-24.82%
STAT (in millions $)	54	-$2,266.47	-$306.31	$449.00	-$25,437.00
LEV (%)	54	26.76%	25.92%	93.96%	0.00%
INT (in millions $)	54	$578.25	$107.18	$6,130.00	$0.61
SERV (in millions $)	54	$216.47	$61.60	$1,906.00	$0.54

Chapter 4
Methodology

To test the null hypothesis (H_0), which says that the freezing of a DB pension plan has no effect on the stock prices of the sponsor company, I employ an event study methodology originated by Fama, Fisher, Jensen and Roll (1969). Such methodology is the standard of research concerning the estimation of abnormal returns. In short, the event study functions statistically by determining the abnormal returns that can be attributed to a specific event adjusting for the returns attributable to conditions of the overall market. This allows me to assume event independence, line up all of the individual events within a specified window of time, and gauge the overall effect of the event. The event study analysis is applied to the full 54 firm sample as well as the seven reason-based subgroups previous described.

I employ the event study methodology using a program created by the University of Pennsylvania's Center for Research in Security Prices ("CRSP"). The following is a detailed discussion of the inputs and outputs of the CRSP Event Study Suite ("event study").

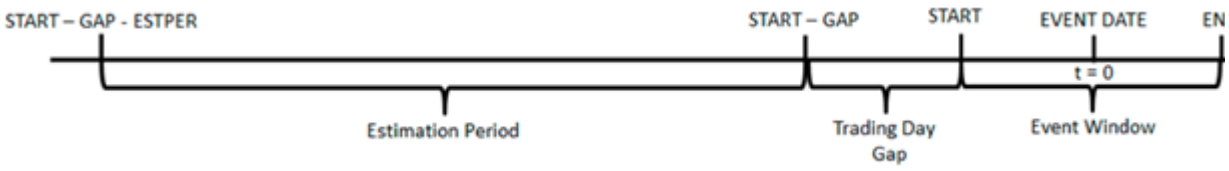
The event study program requires 3 inputs: and input file, a risk model type, and four estimation parameters. The input file is simply a txt file containing each company's PERMNO and the date of the announcement. A PERMNO is a unique and permanent company identifier assigned by CRSP. Unlike ticker symbols, PERMNOs never changes and are never recycled. Therefore, using PERMNOs rather then tickers insures that each company is accurately represented. The risk model is fit for each firm in the sample over the specified estimation period. The model coefficients are then used to calculate returns during the indicated event window. In accordance with previous literature, I use a single variable market model to calculate abnormal returns for each firm in the sample (Rubin 2007; Milevsky & Song 2008; McFarland,

Pang, & Warshawksy 2009). Alternate risk models generally add little explanatory power and are meant to accommodate special data situations (MacKinlay 1997). The market model uses abnormal returns defined according to the Capital Asset Pricing Model.

The four estimation parameters are as follows:

- Estimation Window: The length of the time period (in trading days) used to estimate the expected return and residual return variance. This parameter was held constant at one hundred days for all event studies.
- Minimum Number of Valid Returns: The minimum number of non-missing return observations within the estimation window required to produce estimates of expected return. This parameter was held constant at seventy observations for the all event studies.
- Gap: The number of trading days to be established between the end of the estimation window and the beginning of the event window. The purpose of the gap is to reduce the likelihood that market model is affected by the event-induced return variance. This parameter was held constant at twenty days for all event studies.
- Event Window Start/End: The beginning and end of the event window measured relative to the event time, denoted as (0,0)

Figure 2 Event Study Timeline



The event study is run over four narrow event windows to capture total share price reaction to the pension freeze announcement while omitting price changes from non-related events. While I assume semi-strong efficient markets, it is very possible that word of the announcement was leaked prior to the company making an official public announcement. For example, employers typically notify employees of a change in benefits prior to releasing a statement to the media and this could lead to anticipation of the announcement. Conversely, pension plans are complex and some research suggests that investors do not accurately account for their impact on firm value (Rubin 2007).

Research on how the market values pensions is very divided. Coronado and Sharpe (2008) and Picconi (2006) argue that the markets are inefficient at valuing pensions. This inefficacy stems from investor error in calculating and interpreting off balance sheet liability as well as changes in plan assumptions (Picconi 2006). On the other hand, Brown (2004) and Jin, Merton, and Bodie (2006), present evidence that the market is efficient in valuing pensions. Brown argues that the market properly discounts pension plans with unrealistic assumptions made by management. Although unlikely, it is possible that the market could take some time to digest the financial implications of a pension freeze, resulting market inefficiency. Accordingly, I test abnormal returns in event windows preceding, following, and surrounding the announcement date. The daily abnormal returns ("AR") for each firm in the sample.

$$AR_{jt} = R_{jt} - \left(\hat{\propto}_j + \hat{\beta}_j R_{mt}\right)$$

Where:

R_{jt} = The actual return for company *j* in period *t*; and,

$\hat{\propto}_j + \hat{\beta}_j R_{mt}$ = The expected return for company *j* in period *t*; where

$\hat{\propto}_j$ = the intercept term;

β_j = A regression constant; and,

R_{mt} = The return on the market in period *t*

are cumulated over event windows of (0,0), (-2,2), (-5,0), and (0,3) trading days surrounding the announcement date,

$$CAR_j = \sum AR_{jt}$$

then averaged across the number of firms in the sample,

$$\overline{CAR} = \left(\frac{1}{N}\right) \sum CAR_j$$

to calculate the mean cumulative abnormal returns ("CAR").

I employ a scaled parametric test statistic developed by Patell (1976) commonly known as Patell's Z. This test overcomes the classic t-test's tendency toward event induced volatility by standardizing event window cumulative abnormal returns by the standard deviation of the estimation period cumulative abnormal returns.

$$t_{Patell} = \frac{\sum_{j=1}^{M} SCAR_{jt}}{\sqrt{\sum_{j=1}^{M} \frac{K_j - 2}{K_j - 4}}}$$

Where standardized cumulative abnormal returns are

$$SCAR_{jt} = \frac{CAR_{jt}}{\sqrt{N * VAR(\varepsilon_{ARj})}}$$

And therefore

$$t_{Patell} = \frac{mean(SCAR_{jt})}{\left(\sqrt{\sum_{j=1}^{M} \frac{K_j - 2}{K_j - 4}}\right) / M}$$

Where:

M = the number of firms in the sample

K_j = the number of non-missing returns

This test assumes that cross-sectional independence in abnormal returns as well as that there is no event-induced change in the variance of the event-period abnormal returns.

Similar to existing pension freeze literature, I apply multivariate regression analysis to try to explain cross sectional variations in the CAR's generated by the event study. Specifically, I regress nine firm specific explanatory variables on the CAR's of each company. For an elaborated explanation of these nine variables please refer to the Data Collection section of this paper. The regression model is fit four times, once for each event window, and is defined as:

$$CAR_{jt} = \propto_j + \beta_1 SIZE_j + \beta_2 ROE_j + \beta_3 ROA_j + \beta_4 LEV_j + B_5 STAT_j + \beta_6 INT_j + \beta_7 SER_j + \beta_8 VOL_j + \beta_9 BETA_j$$

Chapter 5

Results

Presented in the table below are the summary statistics for the CARs across all four-event windows. On the announcement date (0,0) there is a positive mean CAR of 0.63% that is significant at the 5% level (Patell Z = 2.60). Positive mean CAR's are also exhibited in the event windows preceding and following the announcement, however none reach an acceptable level of statistical significance. I am able to reject the null hypothesis of no stock price impact. There is compelling evidence that the freezing of DB pension plans has a statistically significant effect on the price of the sponsoring firm's stock. It also appears that as I expected, the market reacts immediately to the news of a pension freeze. I find no evidence to support the theories of announcement leakage prior to announcement, or market lag following the announcement. These outcomes concur with Milevsky and Song's (2008) findings of small CARs in short event windows surrounding the announcement date. As you can see, CARs vary significantly, ranging from very high CARs to very low CARs. This phenomenon indicates that there may be a correlated variable at play.

Table 3 Full Sample Summary Statistics

Full Sample Summary Statistics

Variable	CAR [0,0]	CAR [-2,2]	CAR [0,3]	CAR [-5,0]
N	54.00	54.00	54.00	54.00
Mean	0.63%	1.24%	0.57%	0.93%
Median	0.12%	0.38%	0.56%	0.12%
Max	18.75%	26.31%	18.86%	23.32%
Min	-12.87%	-16.39%	-15.24%	-15.41%
Patell Z	2.60	0.88	0.60	1.27

In an attempt to determine if the reason for freezing the plan was a determining factor for the abnormal returns, I portion the full sample into subsamples according to reasons stated in the public announcement. Existing literature on pension freezes does not attempt to explain variance in CAR's as a function of the reason for freezing. Presented in the table below are the results for the seven subsamples

Table 4 Cumulative Average Abnormal Return by Reason

Cumulative Average Abnomral Return By Reason

Variable	N	CAAR [0,0]	CAAR [-2,2]	CAAR [0,3]	CAAR [-5,0]
Financial Distress	5	0.82%	5.03%	0.88%	1.88%
Financial Distress + X	16	-0.21%	3.67%	2.39%	1.48%
Bandwagon	6	0.09%	-1.02%	0.61%	0.15%
Cost Savings	19	0.93%	-0.14%	0.14%	0.17%
Cost Savings + X	11	0.32%	1.62%	1.93%	-0.15%
Restructuring + X	4	9.30%	6.50%	10.86%	7.38%
Reduce Volatility + X	7	-1.21%	0.27%	-0.67%	1.31%

X = another reason for freezing the DB plan other then the one being tested
Statistically Significant

At the announcement date (0,0), companies that stated "cost savings" as their only motivation for freezing and companies that included "restructuring" as one of their motivations for freezing experience positive mean CAR's of 0.93% and 9.30% and Patell Z's of 2.65 and 2.21 respectively. It is important to note that only four companies are included in the "restructuring" sample, one of which is Anheuser Busch who had a CAR of 27.79% for the event date. It is likely that this outlier has skewed the overall results for this subsample. These findings support arguments made by Rubin (2007) who speculated that firms freeze their pensions plans as part of an overall change in company strategy. The findings also add support to Rauh, Stefanescu, and Zeldes (2013) theory that substantial cost savings are realized from freezes, even net of increase in 401K contributions. This further substantiates Milevsky and Song's (2007) rational that by cutting pension costs, and therefore limiting the risk associated with DB plans, the market cheers.

The more striking result is observed in event window (-2,2) for firms citing "financial distress" as their only motivation to freeze. Here, the mean CAR for the sample was 5.03% at a 2.10 significance level. This finding conflicts directly with my hypothesis of immediate market reaction. Although it is a reach, I would speculate that this might be due to confounding events. Through my research I found that in many instances a company would miss earnings or file for bankruptcy and then immediately freeze their pension as a cost cutting measure. This larger event window could be capturing the effects of coinciding events.

The outcomes for all other subsamples tested are a mixed bag, with mean CAR's varying positive and negative but none reaching an appropriate level of statistical significance. Due to insufficient sample size, the reason zero "No Reason" and reason five "Merger/Acquisition"

subgroups were omitted from the event study. A mere two companies cited these reasons as their motivation to freeze, and therefore these subgroups are not tested

The source of the positive stock price response to pension freezes has been hotly debated. There appears to be no consensus among academics regarding the rational for positive CARs at the announcement of a DB pension plan freeze. Tables 5 and 6 below detail the outcomes of the four, full sample multivariable regressions.

Table 5 Multivariable Regression Results

Multivariable Regression Results

	E [0,0]			E [-2,2]		
Predictor	Coef. Est	Std. Err	t stat	Coef. Est	Std. Err	t stat
VOL	2.42994%	19.75148%	0.12	1.52492%	39.92630%	0.04
BETA	1.09724%	0.66171%	1.66	-0.09019%	1.33760%	-0.07
SIZE	0.00001%	0.00000%	2.96	0.00001%	0.00000%	2.29
ROE	-0.00294%	0.00909%	-0.32	0.00142%	0.01837%	0.08
ROA	0.02060%	0.06247%	0.33	-0.07567%	0.12629%	-0.60
STAT	-0.00102%	0.00052%	-1.97	-0.00018%	0.00105%	-0.17
LEV	0.01094%	0.03329%	0.33	-0.00273%	0.06729%	-0.04
INT	-0.00442%	0.00230%	-1.93	-0.00001%	0.00464%	0.00
SERV	0.00086%	0.00222%	0.39	-0.00333%	0.00450%	-0.74

Table 6 Multivariable Regression Results

Multivariable Regression Results

	E [0,3]			E [-5,0]		
Predictor	Coef. Est	Std. Err	t stat	Coef. Est	Std. Err	t stat
VOL	-29.36191%	34.55356%	-0.85	-26.98224%	29.99859%	-0.90
BETA	-0.00760%	1.15760%	-0.01	-0.38887%	1.00500%	-0.39
SIZE	0.00001%	0.000003%	2.86	0.00001%	0.000003%	1.79
ROE	0.00873%	0.01589%	0.55	0.00896%	0.01380%	0.65
ROA	-0.04893%	0.10929%	-0.45	-0.06523%	0.09488%	-0.69
STAT	-0.00146%	0.00091%	-1.61	0.00043%	0.00079%	0.55
LEV	0.08222%	0.05824%	1.41	0.06476%	0.05056%	1.28
INT	-0.00543%	0.00402%	-1.35	0.00219%	0.00349%	0.63
SERV	-0.00199%	0.00389%	-0.51	-0.00244%	0.00338%	-0.72

For each firm specific characteristic, the estimated coefficient, standard error, and t-value is listed. Across all four regressions, firm size had the only statistically significant relationship with CAR's. In any case the estimation coefficient is positive, indicating that larger firms (as defined by total assets) experience higher CARs when freezing their pension plans. This is inconsistent with Milevsky and Song (2007) and McFarland, et al. (2008) arguments that smaller firms experience higher CARs.

Excluding size as a parameter, the results of multivariable regression analysis diverge. Tables 7 and 8 detail the outcomes of the four, full sample multivariable regressions eliminating size as a tested parameter.

Table 7 Multivariable Regression Results (excluding size)

Multivariable Regression Results (excluding size)

	E [0,0]			E [-2,2]		
Predictor	Coef. Est	Std. Err	t stat	Coef. Est	Std. Err	t stat
VOL	4.11550%	21.37561%	0.19	4.16781%	41.75764%	0.10
BETA	1.81429%	0.66661%	2.72	1.03412%	1.30223%	0.79
ROE	-0.00310%	0.00984%	-0.32	0.00116%	0.01922%	0.06
ROA	0.01649%	0.06762%	0.24	-0.08211%	0.13210%	-0.62
STAT	-0.00047%	0.00052%	-0.90	0.00069%	0.00102%	0.67
LEV	0.00983%	0.03604%	0.27	-0.00446%	0.07040%	-0.06
INT	-0.00233%	0.00237%	-0.99	0.00327%	0.00462%	0.71
SERV	0.00223%	0.00236%	0.95	-0.00118%	0.00460%	-0.26

Table 8 Multivariable Regression Results (excluding size)

Multivariable Regression Results (excluding size)

	E [0,3]			E [-5,0]		
Predictor	Coef. Est	Std. Err	t stat	Coef. Est	Std. Err	t stat
VOL	-26.50912%	37.19579%	-0.71	-25.43231%	30.71258%	-0.83
BETA	1.20600%	1.15996%	1.04	0.27049%	0.95778%	0.28
ROE	0.00846%	0.01712%	0.49	0.00881%	0.01413%	0.62
ROA	-0.05589%	0.11767%	-0.47	-0.06901%	0.09716%	-0.71
STAT	-0.00052%	0.00091%	-0.58	0.00094%	0.00075%	1.25
LEV	0.08035%	0.06271%	1.28	0.06374%	0.05178%	1.23
INT	-0.00189%	0.00412%	-0.46	0.00411%	0.00340%	1.21
SERV	0.00033%	0.00410%	0.08	-0.00118%	0.00338%	-0.35

On the day of the announcement, Beta appears to explain at substantial part of CARs. A positive 1.0% increase in beta results in a 1.8% increase in CAR at a significance level of 2.72. These outcomes point towards Milevsky and Song's (2007) theory of marginal risk shifting. Relatively risky companies (higher betas) have more to gain from the shifting of longevity risk from the firm to the employees, thus resulting in higher CARs. I find no evidence of any other statistically significant relationships between any of the parameters and CAR's in the three remaining event windows.

Chapter 6

Conclusion

Now more than ever young Americans face the sizable responsibility of saving for retirement, but it was not always this way. Thirty years ago all working Americans had to do to ensure livelihood after age 65 was put in their time on the job. Defined benefit pension plans provided by employers insured that people received secure income for the rest of their lives. Those days have long since passed, and now millions of people must plan for retirement income themselves.

Over the past two decades, private sector pensions have shifted dramatically away from defined benefit pension plans in favor of defined contribution ("DC") plans such as 401K's and 403b's. The downward trend of DB plans began in the 1980's and is continues today. Today, DB pension plans are rare outside of certain government and state jobs, and even these are mostly underfunded. In short, DB plans are costly and burdensome for corporations.

By transitioning from a DB plan to a DC plan companies effectively transfer the risk of investing to employees. In doing so, they also cut costs, as they are no longer responsible for such a large liability. Terminating a pension plan is a costly endeavor, so instead most companies freeze them. Pension freezes allow companies to reap all of the benefits of a termination, but at a much smaller cost. Thinking about it in this way, trends in private sector pension benefits make a lot of sense. Nevertheless, while existing literature has answered many of the big questions surrounding this change, very little has been done to determine how the capital markets feel about pension freezes. The purpose of this study was to try to answer that question.

Using an event study methodology, I found that on the day of announcement firms that froze their DB pension plans saw on average a 0.63% abnormal return. To my knowledge, these

results are the first to find a statistically significant CAR on the event date. This outcome is consistent with existing literature by Milevsky and Song (2008) that found positive abnormal returns surrounding the event date but lacked statistical relevance. Despite the disagreement among researches over efficiency related to pension valuation, my findings show that markets react immediately to the news of a freeze.

Under the presumption that pension freezes reduce long-term costs and shift risk to employees, it is fair to say that on average pension freezes enhance firm value. However, I say this with the upmost care. While on average, most firms in the sample saw positive abnormal returns related to the decision, many firms also experienced negative abnormal returns. The inconsistencies across daily abnormal returns at the individual level indicate to me that there is another force at play.

Looking at the multivariable regression for answers, there appears to be two explanations at odds with each other. On one hand, firms with higher risk (measured by beta) saw higher CARs relative to safer, low beta firms. On the other hand, larger firms (measured by total assets) saw higher CARs relative to smaller firms. Thinking about this from a risk transfer perspective, these two statistically significant outcomes are at odds with each other. One possible explanation for this that the market does not discriminate based on how much risk a company offloads. Regardless of the financial state of the company, the market cheers. The regression fails to provide rational for the volatile daily abnormal returns.

In discussing the outcomes of the study, I think it is necessary to address the robustness of this data. Despite using very narrow event windows to conduct my event study, I cannot rule out the possibility of a confounding variable. Pension freezes are impactful and stochastic events that occur in tandem with other significant events. For example, in reading hundreds of pension

freeze announcements I found that it is common for a company to announce a restructuring or merger in the same exact announcement as a pension freeze. In these cases, it is impossible to separate the effects of the two events.

As previously noted, I also cannot rule out the possibility of event clustering. The event study methodology assumes the covariance among CARs is zero. However, since a significant portion of my data was collected during the 2007-2008 recession, there is the possibility of correlation among announcements.

Further research on this topic would also benefit from better data collection. The lack of consistent data and collection methods makes research on pension freezes very challenging. The results of the study are only as good as announcements the data is collected from.

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ACADEMIC VITA

CURRENT ADDRESS:
825 Bellaire Ave
State College, PA 16802

Maria Grant Sharpe
(724) 984-2011
maria.g.sharpe@gmail.com

PERMANENT ADDRESS:
99 Lincoln Farm Road
New Salem, PA 15468

Education:

The Pennsylvania State University University Park, PA

The Schreyer Honors College *Anticipated Graduation: May 2016*
Smeal College of Business

- **Bachelors of Science in Finance**

Leadership:

Recycling Coordinator, Jefferson Township Municipality *Summer 2014-Spring 2015—Scottsdale, PA*

- Collected recyclable materials from local businesses and various drop locations
- Managed a team of 20 volunteers in the organization of recyclable materials and coordinated weekly meetings
- Worked to promote sustainability and conservation in the rural community

Administrative Chair, Finance Committee *Fall 2013- Spring 2014—State College, PA*
Penn State Dance Marathon (THON)

- Prepared weekly committee agendas and recorded meeting minutes
- Assisted other finance committees in organizing all cash and check donations raised through THON

Relevant Experience

Bank of New York Mellon Capital Markets *May-August 2014—Pittsburgh, PA*
Mortgage Backed Securities Desk – Trade Assistant

- Designed and implemented an agency mortgage-pricing model in Excel, which integrated Bloomberg data and TradeWeb software into an analysis of live mortgage and treasury bid/ask prices
- Knowledge of MBS trading and the agency MBS market, including the use of advanced trading mechanisms (SWAPS, ROLLS, FLYS), P&L computations, and risk management
- Published and presented an agency mortgage "primer" to the desk that will be used to illustrate the fundamentals of the agency mortgage market to new clients
- Daily use of Bloomberg terminal functions, Visual Basic Application software, TradeWeb trading platform, and Microsoft programs
- Collaborated with traders, dealers, as well as back and middle office personnel on a daily basis in a high intensity environment

W.B Kania & Associates, LLC *April 2013-August 2013—Uniontown, PA*
Accounting Intern

- Assisted CPA in the completion of several pension plan (401K) audits which included preparing supporting schedules that documented the testing of compliance and internal control procedures
- Practical experience in the use and manipulation of various accounting and tax software (Peachtree, QuickBooks and CCH ProFx) designed for automated accounting and business tax return preparation
- Prepared federal and state quarterly payroll tax reports for varied industrial and retail clients
- Daily use of the Microsoft suite of programs (Word, Excel, Access, Power Point) to facilitate financial analysis and provide detailed schedules for continuing independent audits, individual tax return preparation and IRS correspondence
- Interacted with individual clients to address financial and tax planning objectives and needs

Dudas Farm, Inc *Summer 2010, 2011, 2012—Brownsville, PA*
Produce Vendor

- Independently operated a road side produce stand 10 hours a day 5 days a week
- Explained the details of the Farmers Market Voucher Program to senior citizens and low income families
- Maintained a working cash balance without the use of electronic computing devices