

MERGER CONSIDERATION STRUCTURES

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April, 2001

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Acknowledgement

Special thanks to Professor Daniel Graham for guiding and directing me in this study and for his help in quantifying the merger structures.

I would like to dedicate this work to my parents for their unwavering support throughout my college career.

I. Overview

Background Information

Over the past two decades, mergers and acquisitions activity has blossomed as a result of many factors including continued global expansion, the emergence of new markets, and the wave of new businesses spawned by growth in the technology sector. All of these factors have served as proliferous avenues for the current M&A boom. In fact during recent years, merger and acquisitions activity has accounted for \$1.07 trillion and \$480 billion in the first quarters of 2000 and 2001 respectively (Yahoo). Mergers and Acquisitions are destined to be a more prominent economic vehicle for growth and innovation in the global economy.

One of the most important aspects of merger negotiations involves the determination of the value and structure of the merger consideration. The consideration, a price that the acquirer pays for the target company, can be composed entirely of cash or a combination of cash and securities such as subordinated promissory notes, preferred stock, or common stock (Reed 112-113). In instances where the merger consideration consists entirely of cash, the monetary valuation of the merger remains constant from the date of announcement to the consummation of the merger. However, the monetary valuations of merger considerations comprised of equity are dynamic since the acquisition currency, the acquirer's stock, is subject to market fluctuations. Therefore, either the monetary value of the consideration is held constant by adjusting the quantity of stock offered or the quantity of stock issued remains fixed and the consideration price fluctuates. Within the context of the deal, it is not possible to simultaneously fix both the consideration's monetary value and the quantity of stock offered. As a result, the exact specification of the consideration is not known until the consummation of the merger, but the ultimate outcome can be influenced by the structure of the consideration.

There are two basic pricing mechanisms for mergers involving equity: fixed exchange ratio and fixed value pricing (Lehman Research). All merger agreements are characterized by the same fundamental properties. The stock prices of both the acquirer and target denoted by P_A and P_T respectively are determined by the market and are assumed by the efficient market hypothesis, to reflect all of the available complete public information. Additionally, the quantity of the target's shares to be acquired, N_T , is also stated in the

contract and typically is a quantity equivalent to the total number of outstanding shares of the target's common stock.

This paper will provide a theoretical and mathematical specification of the fundamental consideration structures utilized in mergers and acquisitions with considerations containing equity. In addition, I will expand this discussion to encompass complex consideration structures called collars and analyze their effects on the overall fundamental structures, fixed value and fixed exchange ratio transactions. The main focus of this paper is to determine if the selection of a particular consideration structure can be explained by the financial characteristics of the acquirer and target firms. Also, I will try to determine the role of collars as forms of risk management in these deal structures and whether there are any particular market situations in which collars are utilized most frequently.

II. Formal Description of Merger Consideration Structures

Fundamental Merger Consideration Structures – Fixed Ratio

In a fixed exchange ratio agreement, the acquirer and target agree upon a rate at which to exchange the acquirer's shares for the target's shares. This structure, by construction, eliminates all of the variability in the quantity of shares paid and, instead, channels this volatility to the monetary value of the consideration. The contract explicitly specifies an exchange ratio, E^* , which is equal to the ratio between the quantity of acquirer shares offered in the consideration, N_A , and the quantity of target shares acquired, N_T . Manipulating this ratio shows that the quantity of shares tendered by the acquirer is a product of the exchange ratio and the quantity of target shares acquired.

$$E^* = N_A / N_T \quad (1)$$

$$N_A = E^* N_T \quad (2)$$

Although the exchange ratio and the quantity of shares tendered by the acquirer remain fixed by the contract, the price paid per share of the target's stock, P_M , varies directly with changes in the market-determined value of the acquirer's stock, P_A . Formally, the mathematical relation is:

$$P_M = P_A E^* = P_A (N_A / N_T^*) \quad (3)$$

As a result, the value of the consideration paid to the target is simply the product of the acquirer's stock price, P_A , and the total number of target shares acquired, N_A .

$$P_A N_A = P_A E^* N_T^* \quad (4)$$

Therefore a merger with this pricing structure is susceptible to fluctuations in the value of the consideration resulting from changes in the acquirer's share price. This result is demonstrated graphically in *Figure 1*. Additionally, the target's total net value of the consideration, the merger premium, is the amount of money that the acquirer pays in excess of the target share price multiplied by the total number of target shares acquired.

$$\text{Total Merger Premium} = (P_A E^* - P_T) N_T^* \quad (5)$$

Thus, this deal structure eliminates the acquirer's risk of dilution at the expense of merger consideration stability (Lehman). In fact, the value of the deal may significantly vary from the time of announcement to closing.

Fundamental Merger Consideration Structures – Fixed Value

Alternatively, mergers involving a fixed value pricing mechanism successfully prevent fluctuations in the value of the consideration since the acquirer offers a fixed price per share of the target's stock. In this deal structure, the exchange ratio is subjected to fluctuations resulting from variability in the acquirer's stock price (Lehman). Merger contracts constructed as fixed value transactions specify a fixed deal price P_M^* . Also, the number of target shares acquired, N_T^* , has a fixed value as in the fixed exchange ratio structure. Recall that the following mathematical relationship holds:

$$P_M^* = P_A (N_A / N_T^*) \quad (6)$$

² An asterisk will be used to denote values that are explicitly fixed in the merger agreement.

Unlike the fixed ratio structure, the quantity of acquirer shares in a fixed value transaction varies with fluctuations in the stock price of the acquirer. This can be expressed as:

$$N_A = (P_M^* N_T^*) / P_A \quad (7)$$

Thus, due to exchange ratio volatility, the number of shares issued is inversely related to changes in the acquirer's share price. Therefore, acquirers must address issues of equity dilution when their stock price depreciates in value. In extreme cases, severe fluctuations in the exchange ratio can result in termination of the merger since the merger will not receive approval from the acquirer's shareholders. In addition, the value of the merger consideration paid by the acquirer can be expressed as:

$$P_A N_A = P_M^* N_T^* \quad (8)$$

Also, in this form of merger consideration structure, the merger premium is defined by:

$$\text{Total Merger Premium} = (P_M^* - P_T) N_T^* \quad (9)$$

This pricing structure guarantees a fixed consideration price by transferring the volatility in the acquirer's share price to the exchange rate. This results in an increased risk of acquirer equity dilution.

Merger Considerations with Collar Structures

A collar is a financial contract designed to combat the risk inherent in acquisitions involving considerations comprised of equity. Unlike merger considerations composed entirely of cash, the value of a consideration containing equity is subject to the market variability inherent in the value of the stock. In many ways, the use of a collar in mergers is analogous to the use of derivatives in the stock market. Collars are used in combination with fixed exchange ratio and fixed value pricing mechanisms to create increasingly complex consideration structures. In fact, collars dictate different consideration structures depending on the state of the environment. Essentially, collars specify a manner in which to dynamically adjust the consideration to reflect market changes without re-negotiating the

merger agreement. Therefore, this instrument provides an efficient means of handling highly volatile market conditions by distributing the consideration risk between the number of acquirer shares tendered and the deal price paid per share.

Fixed Exchange Ratio Consideration Structures with Collars

In fixed exchange ratio deals containing collars, the contract specifies a deal price range in terms of a lower bound, P_M' , and an upper bound, P_M'' , for which the merger consideration is structured as a fixed ratio transaction for a given E^* . This region where the exchange ratio is fixed is defined as the collar. As in a fixed exchange ratio merger without a collar, the number of shares of the acquirer's stock tendered remains fixed inside this collar region. Formally:

$$N_A / N_T = E^* \quad \text{if } P_M \hat{I} (P_M', P_M'') \quad (10)$$

$$N_A = E^* N_T \quad \text{if } P_M \hat{I} (P_M', P_M'') \quad (11)$$

However, in situations where $P_A E^* \bar{I} (P_M', P_M'')$, the deal price lies outside the collar. As a result, the collar is triggered and different deal structure specifications, resembling fixed value deals, become applicable. The following conditions outline the three possible values of N_A in mergers using fixed ratios with collars:

$$N_A = (P_M' N_T^*) / P_A \quad \text{if } P_A E^* < P_M' \quad (12)$$

$$N_A = E^* N_T^* \quad \text{if } P_M' \leq P_A E^* \leq P_M'' \quad (13)$$

$$N_A = (P_M'' N_T^*) / P_A \quad \text{if } P_M'' < P_A E^* \quad (14)$$

Therefore the number of acquirer shares issued to the target firm is inversely related to the acquirer's stock price when the transaction takes place outside of the collar as shown by conditions (12) and (14). However within the collar region, the quantity of acquirer shares offered, as consideration, remains constant.

Contrastingly the deal price varies within the collar, but does not fluctuate with changes in P_A outside of the collar. The following three conditions accurately describe this result:

$$P_A N_A = P_M' N_T^* \quad \text{if } P_A E^* < P_M' \quad (15)$$

$$P_A N_A = P_A E^* N_T^* \quad \text{if } P_M' \leq P_A E \leq P_M'' \quad (16)$$

$$P_A N_A = P_M'' N_T^* \quad \text{if } P_M'' < P_A E \quad (17)$$

In the same manner the merger premiums can be defined mathematically as:

$$\text{Total Merger Premium} = (P_T - P_M') N_T^* \quad \text{provided that condition (15) holds true}$$

$$\text{Total Merger Premium} = (P_T - P_A E^*) N_T^* \quad \text{provided that condition (16) holds true}$$

$$\text{Total Merger Premium} = (P_T - P_M'') N_T^* \quad \text{provided that condition (17) holds true}$$

Thus, the consideration does not depend on the acquirer's stock price when the transaction occurs outside the boundaries of the collar, where conditions (15) and (17) hold. In these situations, the merger consideration structure is characterized by a fixed value transaction. Yet within the collar, the structure retains properties of a fixed ratio structure where consideration fluctuates with P_A .

Fixed Value Consideration Structures with Collars

The consideration structure of a fixed value transaction with a collar has the opposite properties of the fixed ratio deal structure with a collar. For these transaction structures, the merger agreement defines a range in terms of exchange ratios where E' represents the lower bound and E'' represents a higher bound. Within this range, the merger consideration is structured as a fixed value transaction for a specified P_M^* . The quantity of acquirer shares tendered in this form of deal structure is defined by the following three conditions:

$$N_A = E' N_T^* \quad \text{if } P_M^* / P_A < E' \quad (18)$$

$$N_A = (P_M^* N_T^*) / P_A \quad \text{if } E' \leq P_M^* / P_A \leq E'' \quad (19)$$

$$N_A = E'' N_T^* \quad \text{if } E'' < P_M^* / P_A \quad (20)$$

Therefore within the collar, condition (19), the number of acquirer shares issued in the consideration is inversely related to changes in the acquirer's stock price. However, outside

the collar in conditions (18) and (20), movements in the stock price of the acquirer have no effect on the number of shares issued.

The overall monetary value of the consideration also has a hybrid fixed price and fixed value structure. Within the collar, the price paid per share of target acquired is held constant at a value P_M^* specified by the contract. However outside of the collar, the deal price is subjected to volatility in the acquirer's share price and behaves in a manner characteristic of a fixed ratio pricing structure. These situations can be summarized as follows:

$$P_A N_A = P_A E' N_T^* \quad \text{if } P_M^* / P_A < E' \quad (21)$$

$$P_A N_A = P_M^* N_T^* \quad \text{if } E' \leq P_M^* / P_A \leq E'' \quad (22)$$

$$P_A N_A = P_A E'' N_T^* \quad \text{if } E'' < P_M^* / P_A \quad (23)$$

Also, the premiums paid to the target for these cases are:

$$\text{Total Merger Premium} = (P_T - P_A E') N_T^* \quad \text{provided that condition (21) holds true}$$

$$\text{Total Merger Premium} = (P_T - P_M^*) N_T^* \quad \text{provided that condition (22) holds true}$$

$$\text{Total Merger Premium} = (P_T - P_A E'') N_T^* \quad \text{provided that condition (23) holds true}$$

The Effects of the Target's Stock Price

In both a fixed exchange ratio and fixed value deal structure, the acquirer assumes all of the risk resulting from volatility in the target's stock price. By construction, the merger consideration does not directly depend on changes in the target's stock price. However, the deal structures do differ in the assignment of the volatility in the acquirer's stock. In a fixed exchange ratio, fluctuations in the stock price of the acquirer have a direct effect on the deal price, P_M , since $P_M = P_A E^*$ where E^* , the exchange ratio, is fixed. Thus, the value of the merger consideration appreciates with rises in the acquirer's stock, but the target is exposed to depreciations in the overall deal value when the acquirer's stock falls. Thus, the fixed ratio structure distributes the risk between both the acquirer and target by transposing their respective stock price volatility risks. Contrastingly, in a deal structured as a fixed value transaction, the acquirer is subjected to both the volatility in its own stock as well as that of

its acquisition target. As a result, the target is indemnified from stock price volatility risk and, effectively, allocates this risk entirely to the acquirer.

Therefore in both fundamental consideration structures, the acquirer is exposed to the volatility of the target's stock price. However, this is a misleading representation. Prior to the announcement of the merger, the acquirer conducts a detailed audit of the target company through a process called due diligence. The due diligence process entails "inquiring into all relevant aspects of the past, present, and predictable future of the business to be purchased" in order to gain the information necessary to formulate a valuation for the target company (Reed 347). After this process, the acquirer possesses complete information to formulate an accurate valuation of the target company. Additionally, the acquirer assesses synergies that will be present in the pro forma corporation and incorporates the benefits of these intangibles into the overall valuation of the target firm. Thus from the acquirer's perspective, the deal price tendered reflects the true valuation of the target, thereby, making the target's market price, P_T , irrelevant to the structure of the consideration. In fact, the limit of the target's market price can be said to approach the deal price as the time approaches the closing date of the merger, $\lim P_T \rightarrow P_M$.

III. Merger Valuation with Derivates Model

As explained earlier, there is a simple formula for calculating the consideration in a fixed value and fixed exchange ratio. In a fixed value structure, the overall total consideration is strictly $P_M^* N_T$ and in the fixed exchange ratio structure, it is equivalent to $P_A E^* N_T^*$. Therefore in the first case, the valuation is strictly constant and in the later, it is a function of P_A . However, the use of collars further complicates this valuation. For example in a fixed value consideration with a collar, the overall deal valuation is either $P_A E' N_T^*$, $P_M^* N_T^*$, or $P_A E'' N_T^*$ depending on which of the three conditions is satisfied (see equations (21), (22), and (23)). In this present form, it is impossible to compare the overall differences in the valuation of the merger consideration resulting from the presence of a collar to consideration paid using one of the fundamental deal structures. However though the use of derivatives, it is possible to assign an overall market valuation to mergers with collars that is not dependent on the conditions outlined in equations (21), (22), and (23).

The overall merger valuation in both an exchange ratio and a fixed value structure is, in some cases, directly dependent on the price of the acquirer. As a result, the merger consideration is a form of security whose value is derived from the acquirer's stock price. Therefore this merger consideration can be perceived as a compilation of derivatives, specifically call and put options, whose combined payoff has the same fundamental characteristics as the merger consideration.

In this model, all of the options used to price a particular consideration share common characteristics such as the value of the underlying security, the risk free rate, and the time to expiration. In particular, the price of the underlying security for these options is equivalent to the value of the acquirer's stock, P_A . The risk free rate is often empirically approximated as the yield on a 10 year government bond. The time to expiration, t , is defined as the length of the time period, expressed annually, from the announcement of the merger to its consummation. Often the closing date of the merger is not known with absolute certainty at the time of announcement, but most agreements specify an expected closing date or have provisions for contract re-negotiation if the deal is not consummated by a certain date. Also, the valuation decisions and structure of the agreement are prepared with the intent of closing on this expected date. Therefore this assumption is reasonable for obtaining a close approximation to the time of expiration.

Consider a merger structured as a fixed value consideration with a collar. Recall that the merger agreement specifies a value for P_M , E' , E'' , and N_T . Fixed value merger considerations generate payoffs within the collar equivalent to purchasing N_T risk free securities whose combined returns are equal to $P_M^* N_T^*$ at the time of closing. This is equivalent to the valuation of a consideration in a fixed value agreement. However unlike a strictly fixed value consideration structure, the monetary valuation of the payoff is not equal to $P_M^* N_T$ below the floor price, P_M^*/E' , but is instead equal to $P_A E' N_T^*$. This payoff can be simulated by selling a quantity of $E' N_T^{*3}$ puts at a strike price of P_M^*/E' . The value of the merger consideration above the ceiling price, P_M^*/E'' , was shown to be $P_A E'' N_T^*$. This result can also be modeled using derivatives as buying a quantity of $E'' N_T^*$ calls at a strike

³ This theoretical model assumes that it is possible to buy and sell fractional units of an option. Although this may not be possible in the market, this model is only meant to discover a valuation for a merger consideration. In no way is it actually necessary to purchase these options in application.

price of P_M^*/E'' . This combination of securities is equivalent to the overall valuation of the merger consideration and can be simplified to the single equation:

$$\text{Consideration Value} = (P_M^* + E''P_C - E'P_P)N_T^* \quad (24)$$

In this equation, P_P and P_C are the prices of the put and call options respectively. Since the cost to purchase this consideration was valued by this model, the consideration value is equal to the negative of this result, as shown in the above formula.

Using this same methodology, the value of a fixed exchange ratio collar can be determined with derivatives. As outline earlier, a merger agreement utilizing a fixed exchange ratio specifically specifies values for E , P_M' , and P_M'' . Within the collar of a fixed exchange ratio merger, the valuation of the consideration is equal to buying $E^* N_T^4$ shares of the acquirer's stock for a total combined value equivalent to $P_A E^* N_T$ at the date of closing. In fact, this valuation is identical to that of a fixed ratio consideration. Outside of the collar region where $P_A < P_M' / E^*$ or $P_A > P_M'' / E^*$, the valuation of the merger consideration is equal to $P_M' N_T^*$ and $P_M'' N_T^*$ respectively. Thus, outside the collar region, the valuation of the consideration in a fixed exchange ratio transaction without a collar and one with a collar are not equivalent. Therefore, in order to account for these differences in payoff below the floor price, it is necessary to purchase $E^* N_T^*$ puts at a strike price of P_M' / E^* . Similarly, the payoff from the merger consideration above the ceiling price is equivalent to selling $E^* N_T^*$ calls at a strike price of P_M'' / E^* . This combination of securities will model the behavior of the merger consideration valuation. Therefore the following equation expresses the value of a fixed exchange ratio consideration with a collar:

$$\text{Consideration Value} = (P_P - P_C - P_A)E^* N_T^* \quad (25)$$

The Treatment of Risk within Merger Consideration Structures

An optimal contract will distribute the volatility risk efficiently for both the acquirer and the target. Theoretically holding all other factors constant, the deal structure should be

⁴ Assumes that it is possible to purchase fractions of a share. This is only used to determine the valuation of the consideration in this model and is not actually purchased in reality.

chosen such that the stock price risks each firm bear are efficiently redistributed. In the instance where the combined portfolio of the acquirer and target represents less overall risk than a portfolio comprised entirely of the acquirer's stock, then the stock price volatility risk of both companies should be assigned to the acquirer. In this scenario, from the perspective of the acquirer, holding shares of the target's stock serves as a hedge against price fluctuations in its own stock. A fixed price deal structure is appropriate in this instance since it assigns risk in a manner that is consistent with this theory. However in instances where the risk of the combined portfolio exceeds the risk of the acquirer's stock, this reasoning does not show any immediately apparent solution since the fixed exchange ratio structure would only serve to assign the target's stock price volatility to the acquirer and vice versa.

IV. Empirical Findings

Data Description

For this study, I analyzed mergers announced from January 1999 to July 2000 with consideration structures utilizing collars. Of the population of 75 mergers valued over \$55 million at announcement, 31 were excluded due to data acquisition difficulties. After a merger is consummated, databases tend to drop historical pricing information for acquired firms. In some instances, a target's stock ticker may be assigned to another firm, thereby, further complicating the data collection process. These omissions from the sample should not impact the results of the findings in this study since there does not appear to be any particular systematically biased or intentionally exclusionary influences involved.

The comprehensive listing of mergers containing collars was compiled by Lehman Brothers for internal research purposes. Due to my affiliation with Lehman Brothers and my past assistance maintaining this listing, I obtained permission to analyze this data in my research. Detailed merger information pertaining to the structuring of the merger consideration was obtained from accessing SEC filings available at *EDGAR Online*. In addition, Lehman Brothers provided the historic stock quotes that I utilized in my analysis through use of FactSet, a commercial financial database.

My sample of mergers without collars was drawn from an annual publication called *Mergerstat*. I took a random sample initially consisting of 50 mergers that were announced

during 1999⁵. From this sample, mergers containing collars were omitted. In addition, I had to omit a number of mergers due to the same data acquisition difficulties present in the collection of historic stock price data for mergers with collars.

Effect of Volatility on Consideration Structure

It seems reasonable to propose that since the value of the fixed exchange ratio merger consideration is dependent on the acquirer's stock price, increased variability in P_A should impact the selection of a fundamental deal structure. For example, firms may prefer to structure their deals using fixed value mechanisms in the presence of significant volatility in the acquirer's stock price since this deal structure is immune to fluctuations in the acquirer's stock. However, an analysis of the data does not support this hypothesis and suggests that there is no apparent correlation between acquirer stock price volatility as measured using the variance of the acquirer's stock price with lognormal distribution⁶ and choice of a fundamental deal structure. For this analysis, I used variance of the log-normally distributed stock prices as a proxy for volatility.

Among mergers with collars, the acquirer's stock price variance ranges from 0.0066 to 0.3050 for fixed ratio considerations with collars and from 0.0022 to 0.2614 for fixed value considerations with collars. Also, in both fixed value and fixed ratio consideration structures with collars, the majority of the acquirer's stock price variances fall between a range of 0 to 0.1 as shown in *Figure 9*. Thus, the variance distributions for both fundamental deal structures are identical since they truly only differ by their outliers. This suggests that the selection of fixed value and fixed ratio consideration structures with collars is independent of the variance in the acquirer's stock price.

This result is duplicated in the data for mergers without collars, but the results are not as prominent. The majority of the variances of the acquirer's stock price for both the fixed value and fixed ratio structures lie within a range from 0 to 0.1. However, the relatively

⁵ Unlike the sample of mergers with collars, the sample of mergers without collars does not contain any mergers announced in 2000. This is because the publication containing data for the year 2000 was not published in time to be included in this paper.

⁶ David G. Luenberger in the book, *Investment Science*, shows that stock prices have lognormal distributions. As a result, all of my data is analyzed based on this assumption.

small number of fixed value mergers without collars relative to the fixed ratio mergers may cast some doubt on this conclusion due to the small sample size.

Effect of Stock Price Correlation between Acquirer and Target on Consideration

Structure

As previously stated, one of the major differences between fixed value and fixed ratio consideration structures involves the assignment of the acquirer's stock price volatility risk. In a fixed value consideration, the acquirer assumes both the risk of the target's and its own price fluctuations impacting the monetary value of the merger consideration. However, in a fixed ratio structure, the acquirer's stock price volatility risk is assigned to the target. Therefore it seems plausible that in instances where the acquirer and target's stock prices are negatively correlated that a fixed value structure would be utilized since it would allow the acquirer to essentially use the target's stock volatility as a hedge. However, the data shows that the correlation between the firms' stock prices is not a factor in deal selection.

For the sample of mergers with collars, 31 out of 44 mergers had a positive correlation coefficient between the acquirer and the target. In fact, 9 out of 11 or 82% of fixed ratio mergers with collars had positive correlation coefficients and 22 out of 33 or 67% of all fixed value mergers with collars had positive correlation coefficients between the merging firms. As depicted in *Figure 10*, the distributions of the correlation coefficient and each of the collar types share a very similar distribution, which suggests that there is no true relationship between the correlation coefficient and the structure chosen.

Similarly to the analysis of variance and agreement structure, the sample consisting of mergers without collars displayed similar results to the sample utilizing collars. In this sample, 29 out of 39 or approximately 74% of the mergers had positive correlation coefficients between the acquirer and the target. For the fixed value subset, 3 out of 6 or 50% of the correlation coefficients were positive and 26 out of 33 or 77% of the fixed ratio mergers had positive correlation coefficients. Although the percentage of fixed value mergers with positive correlation coefficients is considerably smaller than the other subsets, this is probably the result of a small sample set and should not be interpreted as a significant result.

Probability Distribution Analysis of the Collars

I also performed an analysis of the probability distributions of the acquirer's stock for mergers with collars and tried to determine if there were any striking differences between fixed ratio and fixed value considerations. For this study, I examined all of the merger agreements for my sample of 44 mergers with collars and recorded the floor and ceiling prices in terms of the acquirer's stock price. In some cases where the merger agreement specified the collar ranges in terms of the deal price, P_M , I had to convert this price into a value for P_A using the mathematical formulas specified earlier. I then integrated along the lognormal probability distribution of the acquirer's stock in each merger to find the probabilities corresponding to the following three ranges: 0 to the floor price, the floor price to the ceiling price, and the ceiling price to infinity. The data obtained from this research is summarized in *Figure 5*. The overall pattern found by this analysis was ambiguous.

Table 1

Analysis of Probability Distribution for Mergers with Collars			
Consideration Structure	Averages of Percent Distributions		
	Probability $P_A < \text{Floor}$	Probability $P_A \text{ in Collar}$	Probability $P_A > \text{Ceiling}$
All	36.17%	50.19%	16.35%
Fixed Price	29.52%	53.00%	18.02%
Fixed Ratio	52.82%	37.18%	10.00%

Table 2

Analysis of Probability Distribution for Mergers with Collars			
Consideration Structure	Ranges of Probability Distributions		
	Probability $P_A < \text{Floor}$	Probability $P_A \text{ in Collar}$	Probability $P_A > \text{Ceiling}$
All	0% - 94.00%	4.69% - 99.87%	0% - 81.17%
Fixed Price	0% - 94.00%	4.83% - 99.87%	0% - 77.45%
Fixed Ratio	4.14% - 83.32%	14.69% - 62.19%	0.03% - 81.17%

Both *Table 1* and *Table 2*, displayed above, show the results of this probability distribution analysis. The data in the first table alone seems to suggest that there is a difference in the probability distributions between fixed price and fixed ratio mergers with collars. In fact, a fixed ratio merger has an average distribution of 37.18% within the collar while a fixed price merger has an average distribution of 53% within the collar. Also, the average percentage of distribution below the floor price is 52.82% and 29.52% for fixed ratio and fixed value mergers with collars respectively. Therefore it may be possible to conclude that probability distribution of the stock price of the acquirer in a fixed ratio merger with a collar is more highly concentrated below the floor of the collar while a fixed value merger with a collar has a distribution that is relatively more highly concentrated within the collar.

However, an analysis of the ranges of the distribution seem to contradict this result since a fixed ratio and a fixed value consideration structure with a collar both have similar probability distribution ranges above and below the collar prices as shown by *Table #*. The discrepancies between these two findings may, in fact, be resulting from the relatively smaller sample size of the fixed ratio mergers with collars. However, it is also possible that this finding is significant regardless of the small sample size. In fact, 7 out of 10 or 70% of

the mergers have probability distribution percentages for the acquirer's stock price below the floor price with values above 50.11%. One possible explanation supporting this result is that fixed exchange ratio structures with collars yield a consideration valuation similar to a fundamental fixed value transaction outside the collar. Thus, for a probability distribution in which there is a large probability density beneath the floor level, a fixed value consideration structure would ensure that the price remains fixed. This would ultimately redistribute the high risk of volatility in the value of the consideration outside the collar to volatility in the exchange ratio.

Effect of Volatility on Collar Presence

In addition to examining possible indices of fundamental deal structure, I performed a similar analysis to determine if the inclusion of collars in merger agreements was dependent on volatility. One possible hypothesis is that in the presence of high volatility, collars would serve as a mediating instrument that could spread the volatility between the value of the consideration and the total quantity of shares issued in the consideration. However, the data suggests that the volatility, represented by the variance of the acquirer, is not a factor in choosing to structure a merger consideration with a collar.

The results of this analysis were similar to the previous study of the variance's implications on the fundamental deal structure. The majority of the acquirer's variances for mergers without collars were clustered between 0 and 0.1 as shown in *Figure 13*. The same result is also true for the mergers with collars. Therefore, there does not appear to be any striking relationship between the acquirer's variance and the use of a collar in a merger.

Effect of Correlation on Collar Presence

The correlation coefficient was also found to have little impact on the decision to use a collar structure in the formulation of the consideration. As outlined earlier, 31 out of 44 or 70% of all mergers with collars had a positive correlation between each target and their respective acquirer. Also, 29 out of 39 or 74% of all mergers without collars displayed a positive correlation between the target and acquirer. By looking at *Figure 14*, it seems readily apparent that both mergers with and those without collars share the same correlation

coefficient distribution. Thus, it seems highly unlikely that the correlation between a target and an acquirer has a direct effect on the form of consideration structure chosen.

V. Conclusions

Summary of Research Findings

Through a detailed and rigorous analysis of the data, I have determined that there is no significant indice or group of indices that can serve as a reliable indicator for the use of a particular deal structure or the incorporation of collars. In fact, my results show an overall random distribution in all of my comparisons. Thus, I have concluded that there is no particular justification for determining consideration structure preferences since an efficient Pareto optimal contract can occur independent of the deal structure. This result holds true since the consideration structure is not the sole issue of negotiation within a merger. In fact, there are numerous issues of negotiation involved in a merger including issues pertaining to employee benefits, the potential for earn-out agreements, and pro forma management organizational structures.

Explanation of Empirical Results

The underlying theme behind all of these results is that the structure of a merger consideration is not a factor of quantifiable variables. Instead the ultimate merger structure chosen is purely a matter of negotiation between the acquirer and target. Historic precedents and the preferences of the investment banks and firms involved most likely also influence the merger structure. Although this result may seem surprising since certain deal structures appear to perform better at reducing risk in certain environmental conditions than others, there is a simple explanation. Consider a situation in which a specific consideration structure is chosen that appears to benefit the target, perhaps a fixed value structure was chosen in a time of high market volatility. Then, the target will be forced to make concessions of an equivalent value to compensate the acquirer. This same logic can be applied to the decision to utilize a collar in a merger consideration.

Additionally, I proved that it is possible to mimic the payoff structure of fixed value and fixed ratio considerations with collars using risk management instruments such as derivatives. As a result, it may be more efficient for a company to manage the risk caused by

fluctuations in the consideration through a means external to the merger contract. For example, suppose that the target sought to have a collar added to a fixed exchange ratio structure but the negotiated price of the collar involved giving up a very valuable employee benefits plan as a concession to the acquirer. It may be the case that managing the risk caused by fluctuations in the consideration can be performed for a lower cost utilizing derivatives or other investment projects. In this case, the target will choose to forgo the collar and manage its risk external to the merger agreement.

Although merger agreements are extremely complex and difficult to analyze, they do provide some striking insight into the process of selecting efficient contracts. In fact the creation of merger risk management tools such as collars provide companies with more opportunities to efficiently distribute the risk inherent in mergers and acquisitions activities. Even though there is no general method for selecting a particular merger consideration structure due to the vast quantity of variables involved, the creation of new risk management resources for mergers is extremely important for promoting greater efficiency and increasing growth in M&A deal volume.

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Figure 1

Fixed Exchange Ratio Consideration Structure

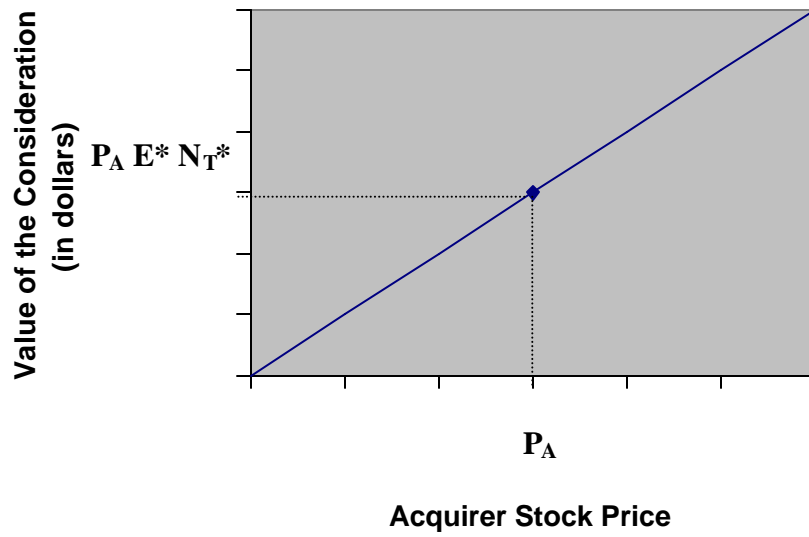


Figure 2

Fixed Value Consideration Structure

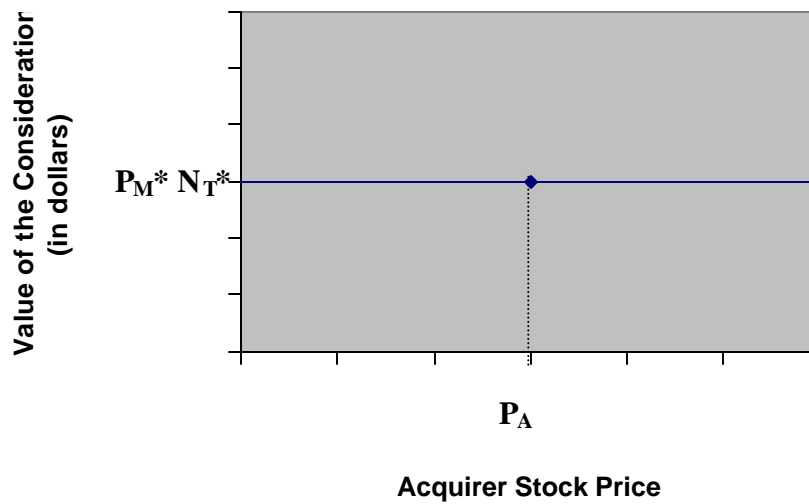


Figure 3

Fixed Value Consideration Structure with Collar

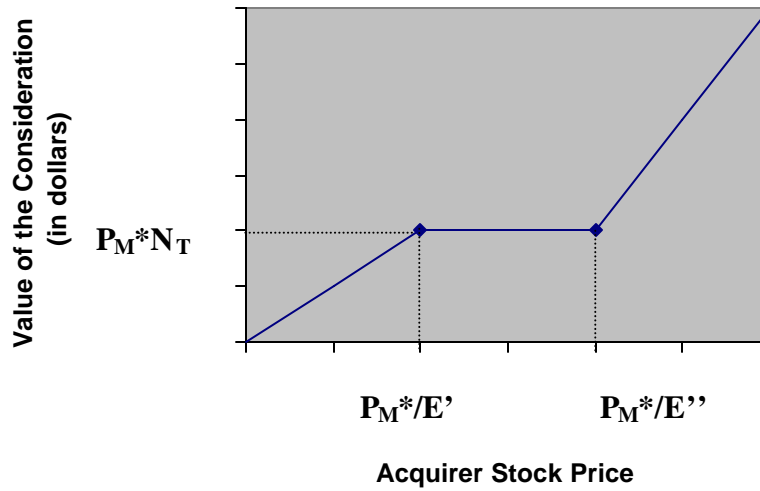


Figure 4

Fixed Exchange Ratio Consideration Structure with Collar

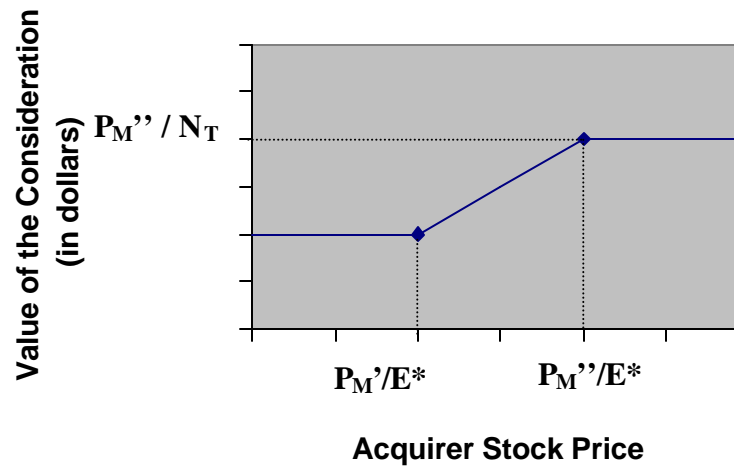


Figure 5 – Collar Probability Distribution

Date	Company	Ticker	Collar Type	P _A Price Floor	P _A Price Ceiling	Probability P _A < Floor	Probability P _A in Collar	Probability P _A > Ceiling
7/17/2000	AES Corp IPALCO Enterprises Inc.	AES IPL	Fixed Price	\$31.49	N/A	0.13%	99.87%	N/A
7/10/2000	Cytogen Corp Advanced Magnetics Inc.	CYTO AVM	Fixed Price	\$8.55	\$11.56	60.34%	26.60%	13.06%
7/7/2000	Invitrogen Corp Dexter Corp	IVGN DEX	Fixed Price	\$60.00	\$80.00	45.51%	44.43%	10.06%
6/23/2000	ConAgra Inc. International Home Foods	CAG IHF	Fixed Price	\$18.00	\$22.00	30.34%	57.34%	12.32%
6/12/2000	Northrop Grumman Corp Comptek Research Inc	NOC CTK	Fixed Price	\$74.00	\$84.01	85.84%	9.53%	4.63%
5/30/2000	WPS Resources Corporation Wisconsin Fuel & Light Co	WPS WIFL	Fixed Ratio	\$27.79	\$33.96	69.04%	30.65%	0.31%
5/16/2000	Terra Networks(Telefonica SA) Lycos Inc	TRLY LCOS	Fixed Price	\$45.37	\$68.07	1.48%	21.08%	77.45%
5/2/2000	Clarent Corp ACT Networks Inc	CLRN ANET	Fixed Ratio	\$54.99	\$70.70	4.14%	14.69%	81.17%
3/16/2000	eGain Communications Inference Corp	EGAN INFR	Fixed Ratio	\$48.25	\$58.97	76.72%	19.38%	3.90%
3/13/2000	CoreComm Ltd Voyager.Net Inc	COMM VOYN	Fixed Ratio	\$41.17	\$56.97	83.32%	16.65%	0.03%
3/6/2000	Applied Digital Solutions Inc Destron Fearing Corp	ADSX DFCO	Fixed Ratio	\$8.00	\$16.00	68.81%	27.14%	4.04%
2/14/2000	Computer Associates Intl Inc Sterling Software Inc	CA SSW	Fixed Ratio	\$63.10	\$77.12	51.18%	47.45%	1.37%
1/27/2000	Greater Bay Bancorp,California Bank of Santa Clara	GBBK BNSC	Fixed Ratio	\$38.39	\$44.61	50.11%	46.07%	3.83%

Date	Company	Ticker	Collar Type	P _A Price Floor	P _A Price Ceiling	Probability P _A < Floor	Probability P _A in Collar	Probability P _A > Ceiling
1/17/2000	ScanSoft Inc Caere Corp	SSFT CAER	Fixed Price	\$4.50	\$8.50	70.76%	25.57%	3.67%
12/9/1999	Titan Corp Advanced Communication Systems	TTN ACSC	Fixed Price	\$25.50	\$32.50	94.00%	4.83%	1.17%
12/1/1999	King Pharmaceuticals Inc Medco Research Inc	KG MRE	Fixed Ratio	\$33.00	\$49.87	36.77%	62.16%	1.07%
10/20/1999	Thermo Electron Corp Thermo TerraTech Inc	TMO TTT	Fixed Ratio	\$18.13	\$23.13	77.46%	22.15%	0.39%
10/15/1999	Genzyme Corp. Cell Genesys Inc	GENZ CEGE	Fixed Price	\$31.50	\$55.13	0.00%	69.21%	30.78%
10/13/1999	Consolidated Edison Inc Northeast Utilities	ED NU	Fixed Price	\$36.00	\$46.00	0.00%	80.66%	19.34%
10/7/1999	Intuit Inc Rock Financial Corp	INTU RCCK	Fixed Price	\$27.33	\$39.67	22.18%	77.79%	0.03%
10/5/1999	MCI WorldCom Sprint Corp.	WCOM FON	Fixed Price	\$62.15	\$80.85	0.01%	35.50%	64.49%
10/5/1999	UICI HealthPlan Services Corp	UCI HPS	Fixed Price	\$28.00	\$30.00	77.11%	21.80%	1.09%
10/4/1999	Summit Bancorp, Princeton, NJ NMBT Corp, New Milford, CT	SUB NMBT	Fixed Price	\$27.36	\$37.02	0.16%	46.63%	53.21%
9/28/1999	Alcatel SA Genesys Telecommun Labs	ALA GCTI	Fixed Ratio	\$26.99	\$32.99	38.05%	60.45%	1.49%
9/22/1999	City National Corp, California Pacific Bank NA, CA	CYN PBSF	Fixed Price	\$28.05	\$37.95	0.07%	77.83%	22.10%
9/15/1999	Photronics Inc Align-Rite International Inc	PLAB MASK	Fixed Price	\$21.00	\$28.25	3.41%	88.57%	8.02%
9/7/1999	Hilton Hotels Corp Promus Hotel Corp	HLT PRH	Fixed Price	\$11.97	\$13.23	3.47%	29.20%	67.33%

Date	Company	Ticker	Collar Type	P _A Price Floor	P _A Price Ceiling	Probability P _A < Floor	Probability P _A in Collar	Probability P _A > Ceiling
8/30/1999	Guidant Corp CardioThoracic Systems Inc	GDT CTSI	Fixed Price	\$54.00	\$65.99	45.14%	53.58%	1.28%
8/27/1999	Medtronic Inc Xomed Surgical Products Inc	MDT XOMD	Fixed Price	\$66.60	\$81.40	4.60%	94.53%	0.87%
8/22/1999	Process Energy Corp. Florida Progress Corp	PGN FPC	Fixed Price	\$37.13	\$45.39	36.95%	63.05%	0.00%
8/13/1999	Provident Financial Group Inc Fidelity Financial of Ohio Inc	PFGI FFOH	Fixed Price	\$40.00	\$44.50	12.12%	75.08%	12.81%
8/9/1999	Gold Banc Corp,Leawood,Kansas Union Bankshares Ltd,Denver,CO	GLDB UBSC	Fixed Price	\$13.00	\$16.00	22.97%	73.97%	3.06%
8/4/1999	Carlisle Cos Inc Titan International Inc	CSL TWI	Fixed Price	\$46.55	\$52.44	37.55%	61.45%	1.00%
8/3/1999	Provident Financial Group Inc OHSL Financial Corp,OH	PFGI OHSL	Fixed Price	\$40.00	\$50.00	20.51%	79.41%	0.08%
7/27/1999	Cooper Tire & Rubber Co Standard Products Co	CTB SPD	Fixed Price	\$20.00	\$24.80	8.56%	79.63%	11.80%
7/23/1999	Texas Instruments Inc Unitrode Corp	TXN UTR	Fixed Price	\$135.81	\$156.13	85.87%	12.35%	1.78%
7/21/1999	Johnson & Johnson Centocor Inc	JNJ CNTO	Fixed Price	\$85.71	\$104.76	0.46%	99.42%	0.12%
7/15/1999	Eastern Enterprises EnergyNorth Inc	EFU EI	Fixed Price	\$36.00	\$44.00	29.78%	70.20%	0.02%
7/8/1999	Abbott Laboratories Perclose Inc.	ABT PERC	Fixed Price	\$40.00	\$49.09	0.16%	73.15%	26.69%
3/19/1999	Synovus Financial Corp,GA Merit Holding Corp,Tucker,GA	SNV MRET	Fixed Price	\$17.00	\$22.80	0.00%	23.86%	76.14%
3/17/1999	Global Crossing Ltd Frontier Corp	GX FRO	Fixed Price	\$34.56	\$56.78	90.90%	8.99%	0.11%

Date	Company	Ticker	Collar Type	P _A Price Floor	P _A Price Ceiling	Probability P _A < Floor	Probability P _A in Collar	Probability P _A > Ceiling
3/16/1999	Plexus Corp SeaMED Corp	PLXS SEMD	Fixed Ratio	\$30.00	\$37.50	25.44%	62.19%	12.37%
2/1/1999	America Online Inc MovieFone Inc	AOL MOFN	Fixed Price	\$129.49	\$175.19	83.71%	11.89%	4.40%
1/26/1999	Warner-Lambert Co Agouron Pharmaceuticals Inc	WLA AGPH	Fixed Price	\$64.52	\$74.00	0.21%	52.13%	47.66%

Figure 6 – General Statistics for Mergers with Collars

Date	Company	Ticker	Mean	Variance	Standard Deviation	Covariance	Correlation Coefficient
7/17/2000	AES Corp	AES	42.03	16.07	4.01	2.71	0.59
	IPALCO Enterprises Inc.	IPL	19.60	1.32	1.15		
7/10/2000	Cytogen Corp	CYTO	8.31	9.60	3.10	2.28	0.63
	Advanced Magnetix Inc.	AVM	7.73	1.36	1.16		
7/7/2000	Invitrogen Corp	IVGN	62.74	168.06	12.96	-11.24	-0.21
	Dexter Corp	DEX	48.38	17.40	4.17		
6/23/2000	ConAgra Inc.	CAG	19.28	5.18	2.28	0.26	0.14
	International Home Foods	IHF	15.91	0.65	0.81		
6/12/2000	Northrop Grumman Corp	NOC	60.48	160.19	12.66	8.42	0.52
	Comptek Research Inc	CTK	15.22	1.64	1.28		
5/30/2000	WPS Resources Corporation	WPS	26.69	5.86	2.42	-1.08	-0.57
	Wisconsin Fuel & Light Co	WIFL	24.44	0.61	0.78		
5/16/2000	Terra Networks(Telefonica SA)	TRLY	87.89	631.45	25.13	166.13	0.53
	Lycos Inc	LCOS	62.77	157.61	12.55		
5/2/2000	Clarent Corp	CLRN	95.92	831.45	28.83	32.36	0.57
	ACT Networks Inc	ANET	10.17	3.93	1.98		
3/16/2000	eGain Communications	EGAN	42.69	73.41	8.57	8.20	0.64
	Inference Corp	INFR	5.88	2.25	1.50		
3/13/2000	CoreComm Ltd	COMM	36.63	21.57	4.64	3.15	0.46
	Voyager.Net Inc	VOYN	10.76	2.19	1.48		
3/6/2000	Applied Digital Solutions Inc	ADSX	6.91	8.33	2.89	1.30	0.66
	Destron Fearing Corp	DFCO	2.76	0.47	0.69		
2/14/2000	Computer Associates Intl Inc	CA	63.19	32.99	5.74	16.11	0.75
	Sterling Software Inc	SSW	26.48	13.94	3.73		
1/27/2000	Greater Bay Bancorp,California	GBBK	38.52	10.26	3.20	3.35	0.55
	Bank of Santa Clara	BNSC	31.77	3.61	1.90		

Date	Company	Ticker	Mean	Variance	Standard Deviation	Covariance	Correlation Coefficient
1/17/2000	ScanSoft Inc	SSFT	3.87	3.86	1.97	-0.18	-0.14
	Caere Corp	CAER	7.01	0.42	0.65		
12/9/1999	Titan Corp	TTN	15.97	35.63	5.97	5.35	0.70
	Advanced Communication Systems	ACSC	12.47	1.64	1.28		
12/1/1999	King Pharmaceuticals Inc	KG	35.22	30.33	5.51	2.07	0.26
	Medco Research Inc	MRE	24.16	2.10	1.45		
10/20/1999	Thermo Electron Corp	TMO	16.60	4.36	2.09	0.02	0.03
	Thermo TerraTech Inc	TTT	5.43	0.07	0.26		
10/15/1999	Genzyme Corp.	GENZ	52.12	39.22	6.26	1.38	0.13
	Cell Genesys Inc	CEGE	6.50	2.69	1.64		
10/13/1999	Consolidated Edison Inc	ED	44.13	4.54	2.13	-1.06	-0.71
	Northeast Utilities	NU	18.10	0.49	0.70		
10/7/1999	Intuit Inc	INTU	29.38	6.84	2.61	-0.55	-0.12
	Rock Financial Corp	RCCK	18.08	2.88	1.70		
10/5/1999	MCI WorldCom	WCOM	83.53	43.56	6.60	9.52	0.41
	Sprint Corp.	FON	51.39	12.15	3.49		
10/5/1999	UICI	UCI	27.12	1.39	1.18	-0.70	-0.74
	HealthPlan Services Corp	HPS	6.98	0.66	0.81		
10/4/1999	Summit Bancorp, Princeton, NJ	SUB	37.54	15.10	3.89	-1.75	-0.63
	NMBT Corp, New Milford, CT	NMBT	15.70	0.51	0.72		
9/28/1999	Alcatel SA	ALA	27.76	4.82	2.20	6.42	0.56
	Genesys Telecommun Labs	GCTI	28.15	27.10	5.21		
9/22/1999	City National Corp, California	CYN	35.88	7.52	2.74	1.32	0.63
	Pacific Bank NA, CA	PBSF	19.61	0.58	0.76		
9/15/1999	Photronics Inc	PLAB	24.94	5.01	2.24	0.88	0.63
	Align-Rite International Inc	MASK	13.68	0.39	0.63		
9/7/1999	Hilton Hotels Corp	HLT	13.71	1.02	1.01	1.91	0.62
	Promus Hotel Corp	PRH	28.15	9.45	3.07		

Date	Company	Ticker	Mean	Variance	Standard Deviation	Covariance	Correlation Coefficient
8/30/1999	Guidant Corp	GDT	54.76	21.32	4.62	5.28	0.39
	CardioThoracic Systems Inc	CTSI	13.96	8.81	2.97		
8/27/1999	Medtronic Inc	MDT	72.46	12.33	3.51	6.83	0.47
	Xomed Surgical Products Inc	XOMD	45.57	17.11	4.14		
8/22/1999	Carolina Power & Light Co (Progress Energy)	PGN	37.74	2.84	1.68	1.29	0.51
	Florida Progress Corp	FPC	40.74	2.28	1.51		
8/13/1999	Provident Financial Group Inc	PFGI	42.27	3.61	1.90	-0.08	-0.14
	Fidelity Financial of Ohio Inc	FFOH	12.14	0.09	0.31		
8/9/1999	Gold Banc Corp,Leawood,Kansas	GLDB	13.83	1.21	1.10	-1.31	-0.70
	Union Bankshares Ltd,Denver,CO	UBSC	12.14	2.90	1.70		
8/4/1999	Carlisle Cos Inc	CSL	47.27	4.34	2.08	1.38	0.61
	Titan International Inc	TWI	9.64	1.19	1.09		
8/3/1999	Provident Financial Group Inc	PFGI	41.95	5.17	2.27	0.58	0.63
	OHSL Financial Corp,OH	OHSL	14.84	0.17	0.41		
7/27/1999	Cooper Tire & Rubber Co	CTB	22.52	3.33	1.82	4.01	0.65
	Standard Products Co	SPD	21.16	11.44	3.38		
7/23/1999	Texas Instruments Inc	TXN	118.49	274.86	16.58	83.91	0.91
	Unitrode Corp	UTR	21.27	30.87	5.56		
7/21/1999	Johnson & Johnson	JNJ	94.08	11.32	3.36	0.12	0.01
	Centocor Inc	CNTO	43.99	25.69	5.07		
7/15/1999	Eastern Enterprises	EFU	37.00	3.35	1.83	0.86	0.68
	EnergyNorth Inc	EI	28.00	0.47	0.69		
7/8/1999	Abbott Laboratories	ABT	47.45	7.47	2.73	-9.20	-0.54
	Perclose Inc.	PERC	40.42	38.30	6.19		
3/19/1999	Synovus Financial Corp,GA	SNV	23.44	0.78	0.88	-0.07	-0.16
	Merit Holding Corp,Tucker,GA	MRET	18.49	0.22	0.47		
3/17/1999	Global Crossing Ltd	GX	24.60	63.60	7.97	19.59	0.88
	Frontier Corp	FRO	34.19	7.85	2.80		

Date	Company	Ticker	Mean	Variance	Standard Deviation	Covariance	Correlation Coefficient
3/16/1999	Plexus Corp	PLXS	32.78	15.30	3.91	-7.78	-0.82
	SeaMED Corp	SEMD	10.24	5.91	2.43		
2/1/1999	America Online Inc	AOL	93.76	1575.21	39.69	154.58	0.95
	MovieFone Inc	MOFN	12.00	16.76	4.09		
1/26/1999	Warner-Lambert Co	WLA	73.88	11.63	3.41	-2.99	-0.10
	Agouron Pharmaceuticals Inc	AGPH	43.51	77.68	8.81		

Figure 7 – General Statistics for Mergers without Collars

Date	Company	Ticker	Mean	Variance	Standard Deviation	Covariance	Correlation
1/25/1999	Regis Corp	RGIS	21.96	5.41	2.33	2.89	0.83
	Barbers Hairstyling for Men	BBHF	7.58	2.22	1.49		
9/21/1999	Peoples Bancorp Inc.	PEBO	24.72	1.04	1.02	-0.40	-0.49
	Three Rivers Financial Corp	THR	12.34	0.66	0.81		
9/28/1999	La-Z-Boy Inc.	LZB	22.49	1.42	1.19	0.40	0.35
	LADD Furniture Inc.	LADF	20.67	0.93	0.96		
3/15/1999	El Paso Energy Partners LP	EPN	21.89	2.44	1.56	2.08	0.68
	Sonat Inc.	SNT	27.37	3.83	1.96		
5/18/1999	Washington Mutual, Inc	WM	41.05	1.78	1.34	-0.15	-0.10
	Long Beach Financial Corp	LBFC	9.99	1.37	1.17		
6/21/1999	Weyerhaeuser Co	WY	62.35	39.60	6.29	7.31	0.91
	Macmillan Bloedel Ltd.	MMBL	12.04	1.61	1.27		
8/16/1999	GelTex Pharmaceuticals Inc.	GELX	16.84	4.50	2.12	0.16	0.24
	SunPharm Corporation	SUNP	1.53	0.09	0.30		
12/7/1999	RoweCom Inc.	ROWE	27.35	92.78	9.63	12.76	0.85
	NewsEDGE Corporation	NEWZ	9.03	2.44	1.56		
12/1/1999	Informix Corp	IFMX	8.04	1.88	1.37	-0.21	-0.07
	Ardent Software Inc.	ARDT	24.80	4.89	2.21		
8/23/1999	Centura Banks Inc.	CBC	57.13	6.16	2.48	-0.17	-0.20
	Triangle Bancorp	TGL	16.12	0.12	0.35		
4/26/1999	UTI Energy Corp	UTI	3.93	0.55	0.74	0.09	0.24
	Norton Drilling Services Inc.	NORT	1.46	0.23	0.47		
2/8/1999	Chubb Corp	CB	64.05	19.44	4.41	12.27	0.61
	Executive Risk Inc.	ER	49.64	20.81	4.56		
8/18/1999	Lucent Technologies Inc.	LU	59.31	26.70	5.17	18.00	0.87
	Excel Switching Corp	XLSW	25.53	16.20	4.02		

Date	Company	Ticker	Mean	Variance	Standard Deviation	Covariance	Correlation
9/28/1999	Global Crossing Ltd	GX	37.91	87.66	9.36	44.84	0.83
	Frontier Corp	FRO	51.89	33.50	5.79		
6/22/1999	Trenwick Group Inc.	TWK	28.66	3.28	1.81	1.13	0.23
	Chartwell Re Corp	CWL	17.61	7.29	2.70		
8/4/1999	Health Care Property Investors Inc.	HCP	29.15	2.39	1.55	0.75	0.50
	American Health Properties	AHE	19.43	0.92	0.96		
9/13/1999	Solelectron Corp	SLR	32.16	16.26	4.03	7.00	0.80
	Smart Modular Technologies	SMOD	18.54	4.75	2.18		
8/10/1999	Razorfish Inc.	RAZF	17.06	3.68	1.92	0.40	0.08
	International Integration Inc.	ICUB	21.04	6.27	2.50		
10/21/1999	Critical Path Inc.	CPTH	40.53	45.04	6.71	1.38	0.17
	Isocor	ICOR	7.23	1.49	1.22		
4/1/1999	CBS Corp	CBS	34.28	12.01	3.47	-0.64	-0.13
	King World Productions Inc.	KWP	27.75	1.90	1.38		
5/17/1999	Charter One Financial Inc.	CF	26.18	2.34	1.53	0.19	0.10
	St. Paul Bancorp Inc.	SPBC	22.62	1.52	1.23		
12/22/1999	Lakes Gaming Inc.	LACO	9.79	1.28	1.13	0.93	0.85
	Rainforest Café Inc.	RAIN	5.14	0.94	0.97		
7/13/1999	DoubleClick Inc.	DCLK	50.96	168.93	13.00	102.84	0.79
	Netgravity	NETG	27.89	100.65	10.03		
8/27/1999	SJNB Financial Corp	SJNB	30.23	7.58	2.75	3.04	0.92
	Saratoga Bancorp	SRTB	17.61	1.43	1.20		
3/5/1999	UtiliCorp United Inc.	UCU	23.94	0.35	0.59	0.16	0.77
	St. Joseph Light & Power	SAJ	17.63	0.13	0.35		
10/15/1999	May Department Stores Co	MAY	39.70	3.17	1.78	-3.52	-0.77
	Zions Cooperative Mercantile Institution	ZNCO	15.99	6.67	2.58		
12/1/1999	Informix Corp	IFMX	8.04	1.88	1.37	-0.21	-0.07
	Ardent Software Inc.	ARDT	24.80	4.89	2.21		

Date	Company	Ticker	Mean	Variance	Standard Deviation	Covariance	Correlation
11/8/1999	Prodigy Communications Corp	PRGY	20.46	13.19	3.63	14.20	0.59
	FlashNet Communications Inc.	FLAS	14.57	43.51	6.60		
4/1/1999	Yahoo! Inc.	YHOO	71.94	224.58	14.99	368.68	0.89
	Broadcast.com Inc.	BCST	67.22	761.13	27.59		
1/13/1999	Casella Waste Systems Inc.	CWST	30.35	4.06	2.01	0.91	0.20
	KTI Inc.	KTIE	19.73	5.00	2.24		
6/11/1999	Humphrey Hospitality Trust Inc.	HUMP	8.51	0.12	0.35	0.08	0.43
	Supertel Hospitality Inc.	SPPR	9.68	0.25	0.50		
3/1/1999	Duke Realty Corporation	DRE	23.00	0.30	0.54	0.45	0.81
	Weeks Corp	WKS	28.01	1.05	1.02		
8/4/1999	Wells Fargo & Co	WFC	41.36	4.53	2.13	1.40	0.33
	Michigan Financial Corp	MFCB	30.21	4.01	2.00		
8/23/1999	Centura Banks Inc.	CBC	57.13	6.16	2.48	-0.17	-0.20
	Triangle Bancorp Inc.	TGL	16.12	0.12	0.35		
5/21/1999	Weatherford International Inc.	WFT	16.58	15.13	3.89	-0.12	-0.25
	Dailey International Inc.	DALY	0.50	0.02	0.13		
4/1/1999	BP Amoco PLC	BP	44.59	7.46	2.73	7.52	0.62
	Atlantic Richfield Co	ARC	62.60	19.80	4.45		
5/20/1999	Devon Energy Corp	DVN	27.71	13.25	3.64	5.08	0.74
	Pennzenergy Company	PZE	11.73	3.54	1.88		
3/31/1999	CBS Corporation	CBS	34.15	11.85	3.44	-0.91	-0.20
	King World Productions Inc.	KWP	27.73	1.82	1.35		
10/4/1999	Southern Union Company	SUG	18.99	0.68	0.83	0.09	0.11
	Fall River Gas Company	FAL	19.76	0.97	0.99		

Figure 8 – General Statistics for Mergers with Collars (using Lognormal Distribution)

Date	Company	Ticker	Mean	Variance	Standard Deviation	Covariance	Correlation Coefficient	Collar Type
7/17/2000	AES Corp	AES	3.734	0.009	0.094	0.003	0.592	Fixed Price
	IPALCO Enterprises Inc.	IPL	2.974	0.004	0.061			
7/10/2000	Cytogen Corp	CYTO	2.054	0.123	0.351	0.033	0.629	Fixed Price
	Advanced Magnetix Inc.	AVM	2.034	0.022	0.147			
7/7/2000	Invitrogen Corp	IVGN	4.118	0.043	0.207	-0.003	-0.158	Fixed Price
	Dexter Corp	DEX	3.875	0.007	0.086			
6/23/2000	ConAgra Inc.	CAG	2.952	0.014	0.120	0.001	0.130	Fixed Price
	International Home Foods	IHF	2.766	0.003	0.051			
6/12/2000	Northrop Grumman Corp	NOC	4.080	0.043	0.208	0.009	0.513	Fixed Price
	Comptek Research Inc	CTK	2.719	0.007	0.085			
5/30/2000	WPS Resources Corporation	WPS	3.280	0.008	0.089	-0.002	-0.569	Fixed Ratio
	Wisconsin Fuel & Light Co	WIFL	3.196	0.001	0.032			
5/16/2000	Terra Networks(Telefonica SA)	TRLY	4.436	0.081	0.285	0.037	0.583	Fixed Price
	Lycos Inc	LCOS	4.116	0.051	0.225			
5/2/2000	Clarent Corp	CLRN	4.520	0.087	0.296	0.028	0.493	Fixed Ratio
	ACT Networks Inc	ANET	2.300	0.038	0.195			
3/16/2000	eGain Communications	EGAN	3.735	0.038	0.194	0.026	0.598	Fixed Ratio
	Inference Corp	INFR	1.745	0.050	0.224			
3/13/2000	CoreComm Ltd	COMM	3.593	0.017	0.129	0.008	0.431	Fixed Ratio
	Voyager.Net Inc	VOYN	2.366	0.021	0.144			
3/6/2000	Applied Digital Solutions Inc	ADSX	1.808	0.305	0.552	0.069	0.546	Fixed Ratio
	Destron Fearing Corp	DFCO	0.988	0.053	0.229			
2/14/2000	Computer Associates Intl Inc	CA	4.142	0.008	0.092	0.011	0.776	Fixed Ratio
	Sterling Software Inc	SSW	3.266	0.022	0.149			
1/27/2000	Greater Bay Bancorp,California	GBBK	3.648	0.007	0.085	0.003	0.562	Fixed Ratio
	Bank of Santa Clara	BNSC	3.457	0.004	0.062			
1/17/2000	ScanSoft Inc	SSFT	1.225	0.261	0.511	-0.001	-0.017	Fixed Price
	Caere Corp	CAER	1.943	0.009	0.095			
12/9/1999	Titan Corp	TTN	2.709	0.116	0.341	0.020	0.591	Fixed Price
	Advanced Communication Systems	ACSC	2.518	0.010	0.101			

Date	Company	Ticker	Mean	Variance	Standard Deviation	Covariance	Correlation Coefficient	Collar Type
12/1/1999	King Pharmaceuticals Inc	KG	3.549	0.025	0.157	0.002	0.177	Fixed Ratio
	Medco Research Inc	MRE	3.183	0.004	0.059			
10/20/1999	Thermo Electron Corp	TMO	2.801	0.016	0.128	0.000	0.028	Fixed Ratio
	Thermo TerraTech Inc	TTT	1.690	0.002	0.048			
10/15/1999	Genzyme Corp.	GENZ	3.946	0.016	0.127	0.004	0.125	Fixed Price
	Cell Genesys Inc	CEGE	1.839	0.069	0.263			
10/13/1999	Consolidated Edison Inc	ED	3.786	0.002	0.049	-0.001	-0.724	Fixed Price
	Northeast Utilities	NU	2.895	0.001	0.037			
10/7/1999	Intuit Inc	INTU	3.376	0.008	0.089	-0.001	-0.121	Fixed Price
	Rock Financial Corp	RCCK	2.890	0.009	0.096			
10/5/1999	MCI WorldCom	WCOM	4.422	0.006	0.079	0.002	0.418	Fixed Price
	Sprint Corp.	FON	3.937	0.005	0.069			
10/5/1999	UICI	UCI	3.299	0.002	0.044	-0.004	-0.728	Fixed Price
	HealthPlan Services Corp	HPS	1.936	0.012	0.109			
10/4/1999	Summit Bancorp,Princeton,NJ	SUB	3.620	0.011	0.105	-0.003	-0.622	Fixed Price
	NMBT Corp,New Milford,CT	NMBT	2.752	0.002	0.046			
9/28/1999	Alcatel SA	ALA	3.320	0.007	0.081	0.009	0.620	Fixed Ratio
	Genesys Telecommun Labs	GCTI	3.321	0.033	0.181			
9/22/1999	City National Corp,California	CYN	3.577	0.006	0.077	0.002	0.622	Fixed Price
	Pacific Bank NA,CA	PBSF	2.975	0.002	0.039			
9/15/1999	Photronics Inc	PLAB	3.212	0.008	0.092	0.003	0.642	Fixed Price
	Align-Rite International Inc	MASK	2.615	0.002	0.046			
9/7/1999	Hilton Hotels Corp	HLT	2.616	0.005	0.073	0.004	0.574	Fixed Price
	Promus Hotel Corp	PRH	3.332	0.011	0.105			
8/30/1999	Guidant Corp	GDT	3.999	0.007	0.085	0.006	0.322	Fixed Price
	CardioThoracic Systems Inc	CTSI	2.614	0.043	0.208			
8/27/1999	Medtronic Inc	MDT	4.282	0.002	0.049	0.002	0.445	Fixed Price
	Xomed Surgical Products Inc	XOMD	3.815	0.008	0.089			
8/22/1999	Carolina Power & Light Co (Progress Energy)	PGN	3.630	0.002	0.045	0.001	0.525	Fixed Price
	Florida Progress Corp	FPC	3.707	0.001	0.038			

Date	Company	Ticker	Mean	Variance	Standard Deviation	Covariance	Correlation Coefficient	Collar Type
8/13/1999	Provident Financial Group Inc	PFGI	3.743	0.002	0.046	0.000	-0.139	Fixed Price
	Fidelity Financial of Ohio Inc	FFOH	2.496	0.001	0.025			
8/9/1999	Gold Banc Corp,Leawood,Kansas	GLDB	2.624	0.006	0.080	-0.008	-0.708	Fixed Price
	Union Bankshares Ltd,Denver,CO	UBSC	2.487	0.019	0.138			
8/4/1999	Carlisle Cos Inc	CSL	3.855	0.002	0.045	0.003	0.630	Fixed Price
	Titan International Inc	TWI	2.259	0.013	0.114			
8/3/1999	Provident Financial Group Inc	PFGI	3.735	0.003	0.056	0.001	0.633	Fixed Price
	OHSL Financial Corp,OH	OHSL	2.697	0.001	0.028			
7/27/1999	Cooper Tire & Rubber Co	CTB	3.111	0.007	0.084	0.009	0.687	Fixed Price
	Standard Products Co	SPD	3.039	0.026	0.160			
7/23/1999	Texas Instruments Inc	TXN	4.765	0.018	0.136	0.033	0.883	Fixed Price
	Unitrode Corp	UTR	3.020	0.076	0.276			
7/21/1999	Johnson & Johnson	JNJ	4.543	0.001	0.036	0.000	0.007	Fixed Price
	Centocor Inc	CNTO	3.777	0.014	0.118			
7/15/1999	Eastern Enterprises	EFU	3.610	0.002	0.049	0.001	0.677	Fixed Price
	EnergyNorth Inc	EI	3.332	0.001	0.024			
7/8/1999	Abbott Laboratories	ABT	3.858	0.003	0.057	-0.005	-0.553	Fixed Price
	Perclose Inc.	PERC	3.687	0.026	0.162			
3/19/1999	Synovus Financial Corp,GA	SNV	3.154	0.001	0.038	0.000	-0.162	Fixed Price
	Merit Holding Corp,Tucker,GA	MRET	2.917	0.001	0.026			
3/17/1999	Global Crossing Ltd	GX	3.159	0.083	0.288	0.020	0.884	Fixed Price
	Frontier Corp	FRO	3.529	0.006	0.080			
3/16/1999	Plexus Corp	PLXS	3.482	0.015	0.123	-0.023	-0.809	Fixed Ratio
	SeaMED Corp	SEMD	2.299	0.053	0.231			
2/1/1999	America Online Inc	AOL	4.453	0.175	0.418	0.128	0.956	Fixed Price
	MovieFone Inc	MOFN	2.432	0.102	0.319			
1/26/1999	Warner-Lambert Co	WLA	4.301	0.002	0.047	-0.001	-0.055	Fixed Price
	Agouron Pharmaceuticals Inc	AGPH	3.752	0.041	0.203			

Figure 9 Deals with Collars

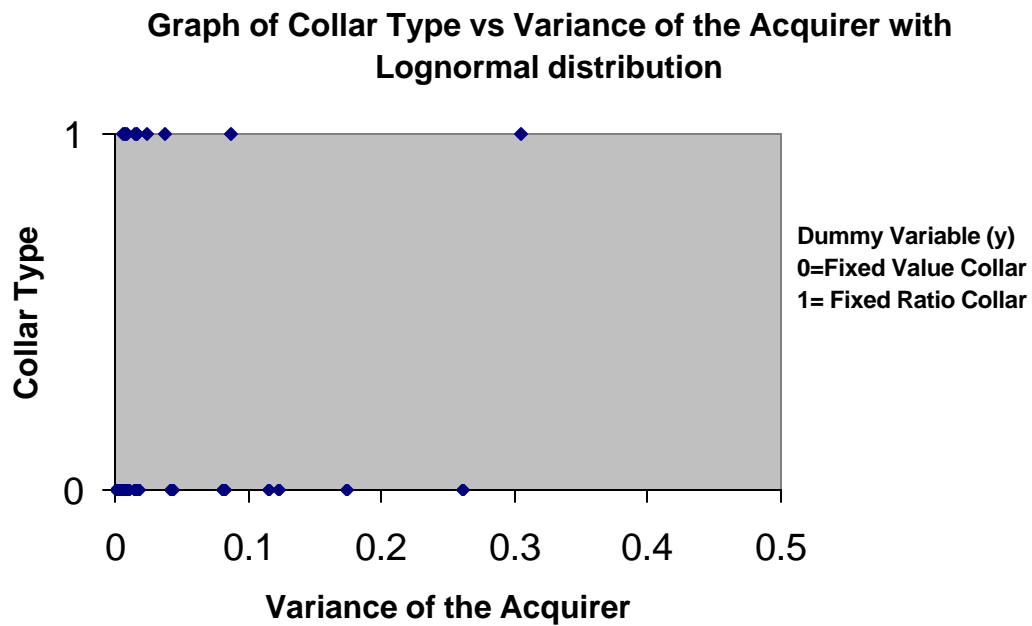


Figure 10 Deals with Collars

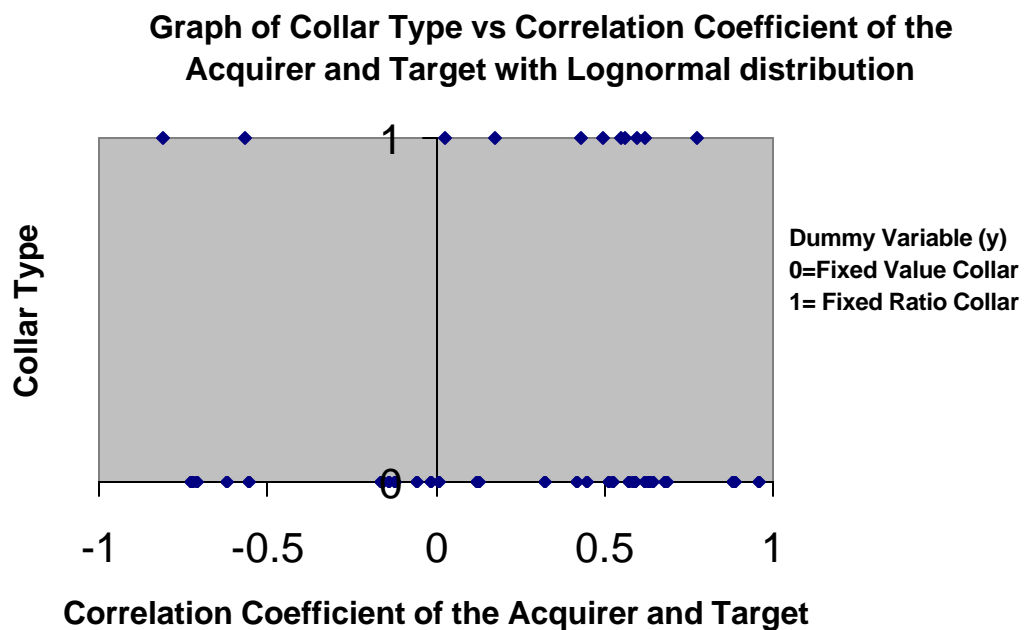


Figure 11 Control Data- Deals without Collars

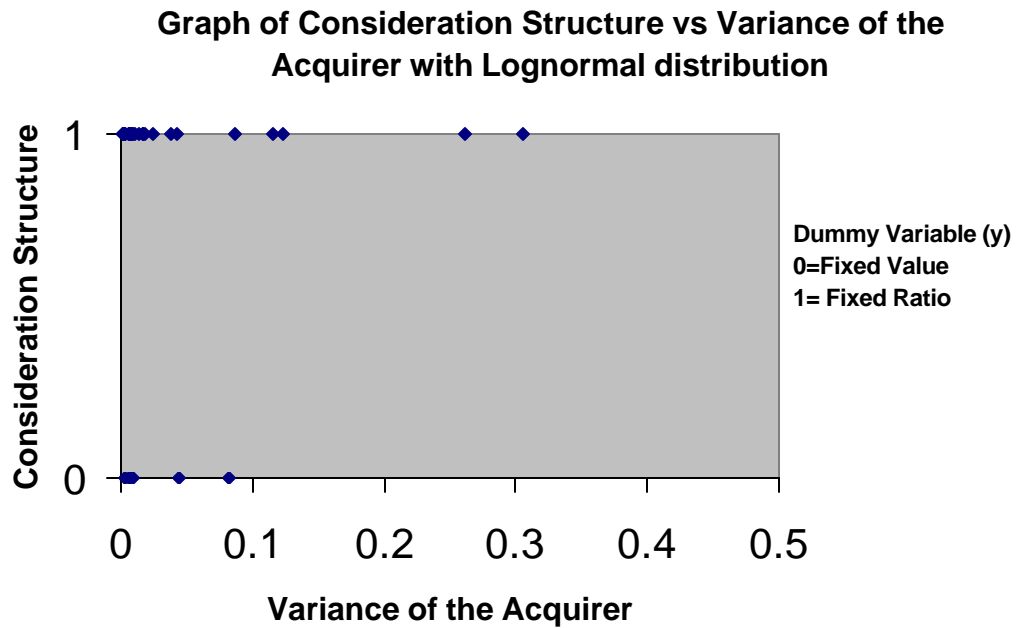


Figure 12 Control Data- Deals without Collars

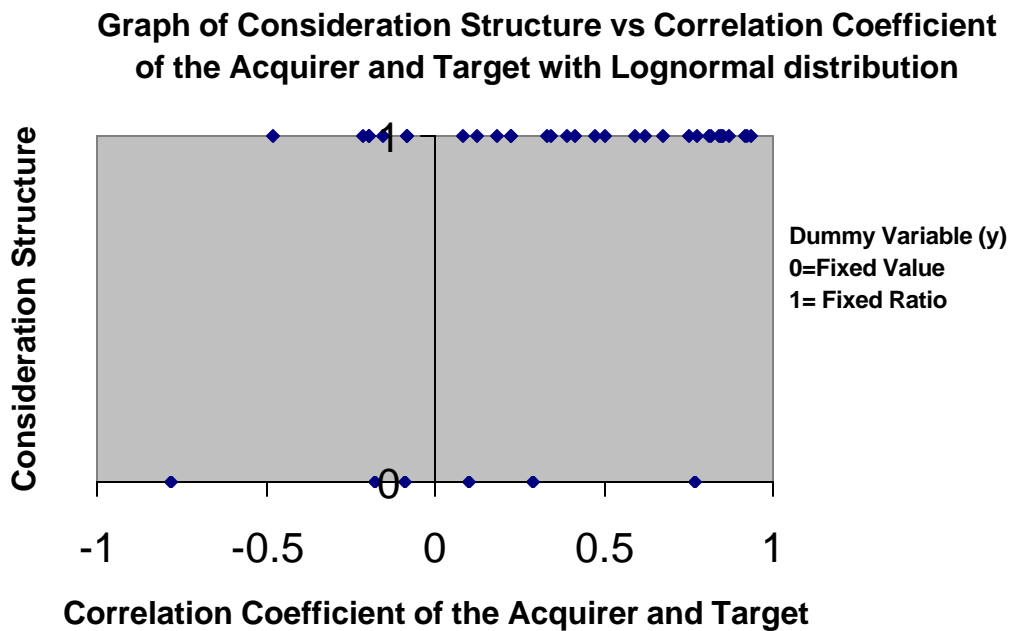


Figure 13

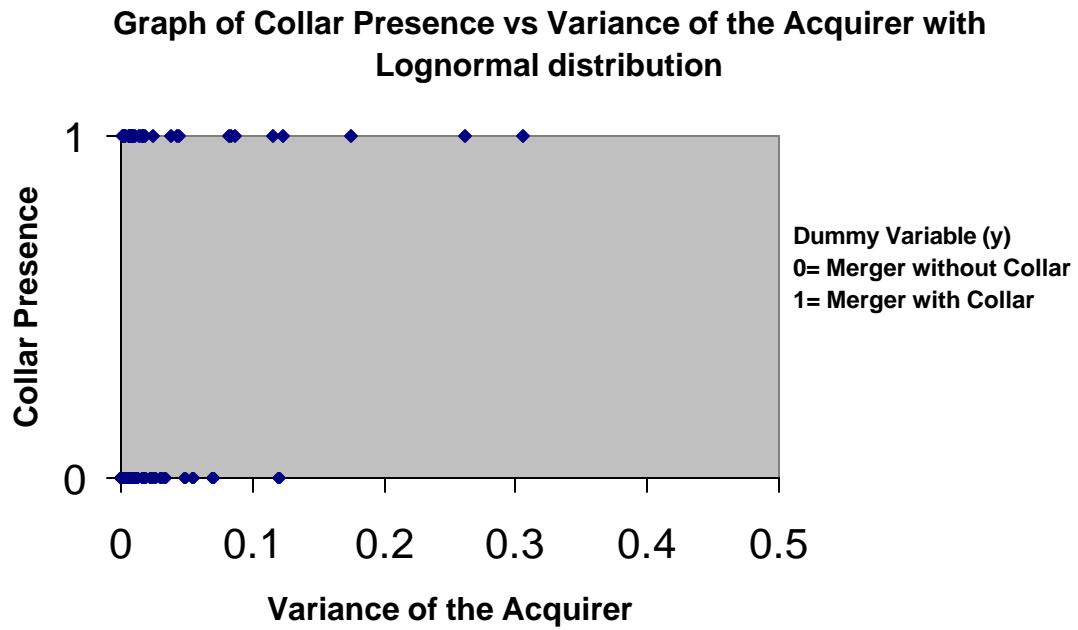


Figure 14

