PREDICTING DEBT LEVELS IN LEVERAGED BUYOUTS

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Abstract

Various factors contribute to the level of debt financing used in leveraged buyouts. This paper examines the relationship between levels of buyout debt with two different categories of determinants. These determinants are broken into factors exogenous and endogenous to leveraged buyouts. Exogenous factors include credit market conditions along with industry and region of the acquired firm, while endogenous factors are firm specific, such as profitability, operating efficiency, and previous capital structure of target firms. Previous literature found that credit market conditions are the only significant indicator of debt in leveraged buyouts. This paper uses quantitative methods to show that firm specific metrics do in fact have significant relationships with buyout debt and can predict debt levels in leveraged buyouts.

KEYWORDS: (Leveraged Buyouts, Debt, Leverage, Private Equity, Capital Structure)

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CHAPTER I

INTRODUCTION

In 2013, leveraged buyouts (LBOs) accounted for 8.7% of total mergers and acquisitions (M&A) deal volume in the United States and 10.3% globally (S&P Capital IQ, 2013). Around the world, $274 billion exchanged hands in leveraged buyout deals, with 36.2% of that occurring in the US (S&P Capital IQ). Within the M&A landscape, LBO activity has steadily increased since 2008 when credit markets crashed and private equity fundraising drastically declined. This occurred after LBO activity spiked in 2007, recording peaks as both a fraction of total M&A volume and in overall transaction values (Shivdasani & Wang, 2011). A leveraged buyout (LBO) refers to the acquisition of a company, using primarily debt financing along with a minor amount of equity capital from the buyer. The level of debt that the buyer uses to finance the transaction varies dramatically and is affected by various factors. Debt determinants have changed over time as LBO activity has increased and decreased since being used as a corporate acquisition strategy in the early 1980s (Kaplan & Stein, 1993).

This paper attempts to analyze and quantify the factors shaping debt levels in leveraged buyouts and how they have changed since the LBO's origination. Previously accepted as the only determinant of debt levels in buyouts, credit market conditions and their relationship with leverage have been extensively studied. This paper will dive deeper into determinants of debt levels, relating specifically to target firms, to

demonstrate that exogenous economic indicators like interest rates do not hold sole explanatory power. In this study, we will identify firm specific metrics, such as profitability, operating efficiency, and prior debt capacity, as predictors of debt levels in leveraged buyouts.

To show the relevant background, I will first explain the components of a typical LBO transaction and the financial incentives that each participating party expects. An LBO transaction involves three parties; the financial buyers (usually a private equity firm), the lenders, and the selling shareholders. To finalize a transaction, there must be a mutual agreement between the three parties over the terms of the deal. The seller must be satisfied with the overall purchase price of the company, the buyer must foresee an adequate rate of return from the transaction, and the lender must be comfortable with the risk.

The LBO market has had a short but storied history, starting with the inception of LBOs in the 1970s. Leveraged buyouts became extremely popular in the 1980s, before disappearing after the crash of the junk bond market in 1989. LBOs were revived in the 1990s and were again fueled by the upsurge in collateralized debt obligations (CDOs) in the 2000s. Obvious changes in the LBO landscape have driven the varying popularity of these transactions, and in order to understand the determinants of debt in leveraged buyouts, we must first refer to the empirical observations made over the past three decades.

Before examining the scholarly works on LBO transactions, I will demonstrate the desirability of participating in an LBO with a hypothetical example. A company is acquired by a financial buyer using 70% debt financing and 30% equity capital, a

common level of debt-to-equity in the LBO wave from 2003 to 2007 (Kaplan and Stromberg, 2009). We will suppose that the buyer will own the company for five years and subsequently sell it for the same price. Let us assume that a financial buyer expresses interest in arranging financing to acquire a hypothetical company called Tigers, Inc. The selling shareholders of Tigers, Inc. agree to the offer price of $100 million and hand over 100% of their company. Tigers, Inc. has no debt in the firm at the time of the transaction and predicts generating $8 million in free cash flows per year. At a purchase price of $100 million and stable cash flows of $8 million, Tigers, Inc. could be considered an undervalued cash cow and decent investment opportunity.

The financial buyer has now inserted $30 million of equity capital and arranged a combination of bank loans and subordinated loans to finance the remaining $70 million. The financial buyer now owns and oversees the operations of Tigers, Inc. Because Tigers, Inc. is a mature company generating stable cash flows consistent with its performance before the LBO, the buyer is able to use the company's free cash flow, or cash remaining after all operating and investing expenditures, to steadily pay down the $70 million of debt they are responsible for.

Moving forward to year five, the buyer now wants to sell the company to a different buyer who is willing to pay the same purchase price of $100 million. We also assume that over the past five years the original buyer has been using the free cash flows from Tigers, Inc. to diligently pay down $40 million of the initial debt. This leaves only $30 million of debt remaining and the rest being equity value for the initial buyer. Now, when Tigers, Inc. is sold for $100 million after five years, the $30 million of remaining

debt will be paid off and the $70 million will be the financial buyer's residual equity, an increase of two and half times from the original investment of $30 million.

As in this simplified example, a successful LBO can be a very attractive venture for each of the three major players; the buyer, the seller, and the lender. This example is somewhat conservative because there is also a possibility that the financial buyer can sell the company for a higher price than it was purchased for or to improve operating margins and pay down the debt quicker, or potentially both. It is clear that the financial buyer will have an incentive to take on as much debt as possible in an LBO if they are confident that the target company is capable of sustaining steady cash flows to pay down their debt obligations.

In this study, I attempt to answer several questions regarding the determinants of debt in LBOs. Can leverage be explained by factors pertaining to the target company prior to a buyout, such as profitability, operating efficiency, and previous capital structure? Which measure of a target company's performance best predicts the debt levels of a deal and how does this vary with credit market conditions?

In the next section, we review the literature that has influenced this study, specifically work pertaining to debt levels and pricing in leveraged buyouts. Then, we create a theoretical model built upon prior literature to determine debt levels in LBOs, and present the data needed to support this hypothesis.

CHAPTER II

LITERATURE REVIEW

Empirical work on this topic indicates that debt levels in LBOs vary as the number of transactions fluctuates over time. Opler and Titman (1993) examine the factors contributing to LBO activity in the 1980s and early 1990s. Their research concludes that firms considering an LBO weigh the potential costs of financial distress against the prospective gains from realigning management's incentives. Opler and Titman find that, for a firm, the major benefit of an LBO is the improvement of management incentives by threatening of job loss due to poor performance and a more efficient use of excess cash flows by managers. They argue that the primary motive in using a large amount of debt in an LBO is that at a higher volume of the managers' incentives will be optimal and cash flow allocations will be improved. We will examine the performance of companies prior to acquisition to gain insight on Opler and Titman's management incentives.

To comprehend the causes of debt levels, we must also look at the purpose of debt in the M&A field. Guo, Hotchkiss, and Song (2011) explore whether leveraged buyouts create value over the period from 1990 to 2006 finding, much like Kaplan and Stromberg (2009), that transactions are less highly leveraged than in the initial 1980s LBO boom. In their sampling of 192 LBOs, they found a sample median of 70% Debt-to-Capital consistent with the decline observed from the 89.1% median Debt to Capital ratio by

Kaplan and Stein (1993). Guo et al.'s (2011) results also show median interest coverage ratios of 1.87 EBITDA/Interest, a 56% increase from the Kaplan and Stein study.

To understand the cyclicality of debt in buyouts we refer to the research of Steven Kaplan, the most published academic on the topic of leveraged buyouts. Kaplan and Stromberg (2009) describe LBO activity as experiencing two major boom and bust cycles, in which levels of LBO transactions sky-rocketed for several years and subsequently halted. According to Kaplan and Stromberg, the first wave began in 1982 and ended in 1989 and the more recent wave lasted from 2003 through 2007.

When looking at the typical leverage amounts in the two buyout waves, Kaplan and Stromberg note that in the 1980s wave, LBOs saw relatively constant levels of debt at 85% to 90% debt financing, while the second wave also saw relatively constant levels of debt, but at approximately 70%. In comparing the levels of debt between the two buyout waves they discover that interest coverage ratios are much higher in the second wave, potentially leading financial buyers to take on less debt. The coverage ratio measure that Kaplan and Stromberg use is Earnings Before Interest Taxes Depreciation Amortization (EBITDA) over Interest, measuring a company's ability to pay interest payments. A high ratio means that companies have a larger cushion, and buyers are less likely to default on loans, which Kaplan and Stromberg observed in the second buyout wave. This outcome demonstrates that there were clearly factors contributing to the buyouts of the 2000s taking on less debt than the preceding wave of the 1980s. To look further into the idea that leverage volume is related to interest rates we can look at the findings of Axelson, Jenkinson, Stromberg, and Weisbach (2012).

The work done by Axelson et al. (2012) is consistent with the findings of Kaplan and Stromberg (2009), noting that LBO activity is highly cyclical and the declines in leverage amounts coincide with negative macro-economic conditions, like the fall of the junk bond market and the housing collapse. In their research, they identify the relationship between buyout leverage and debt market conditions by regressing Debt/EBITDA levels in buyouts, against high-yield bond spreads. Findings show that debt levels in LBOs are strongly related to credit market conditions at the time of the transaction. In other words, leverage in buyouts decreases as interest rates rise.

Although it is clear that debt financing has a correlative relationship with interest rate conditions, this paper examines and discovers other effects that influence the variation in LBO leverage. Through Axelson et al.'s (2012) analysis, it is also apparent that easier access to debt financing leads to higher offering prices. When loans are more readily available, buyers are more willing to pay a premium for a company, which as Axelson et al. (2012) note may lead to overpriced acquisitions. This relationship may also be a cause for decreasing leverage because valuations will be declining towards market equilibrium, causing interest rates to decline.

The secondary finding of Axelson et al. (2012) claims that determinants of buyout leverage are unrelated to characteristics of standard capital structure theory, such as industry factors. In this study, I build upon their model of determining buyout leverage by adding explanatory variables pertaining to the target company prior to a buyout. These variables will have no connection to the credit market conditions that Axelson et al. (2012) identify as the only true determinant of buyout leverage.

The scholarly works I have presented above discuss that leveraged buyout transactions have experienced a reduction in the amount of debt used over time and increased the cushion for repaying their debt since these transactions first appeared in the early 1980s. The empirical research converges to a general list of motives and explanations for the use of debt in leveraged buyouts. Guo et al. (2011) along with many of the scholarly authors, conclude that substantial debt in an acquired firm's corporate structure lead to increased operating performance and therefore incentivizes higher leverage. These operating gains are associated with management incentives through higher equity stakes, more discipline due to the level of risk associated with the debt, and improved monitoring and direction by the lenders and financial sponsors of the LBO firm.

To define the factors contributing to the variation of leverage in buyouts I will expand on the scholarly articles and research discussed here. To build on these works and enhance the accuracy of predicting future trends in buyout debt levels, I will examine trends among both private and public acquisitions from 1999 to 2013. This study will modify and build upon the work presented by Axelson et al. (2012), who performed a thorough examination of the determinants of debt and pricing in buyouts and how leverage corresponds to macroeconomic circumstances. Their application of capital structure theory to buyout leverage will be a spring board for my own analysis. The way in which my theory differs from Axelson et al. (2012) will be discussed in the next section.

CHAPTER III

THEORY

In this section, to support my empirical tests, I will construct the theoretical framework that will reflect the realistic factors contributing to debt in LBOs. The goal of this model is to examine the internal and external factors contributing to levels of debt in leveraged buyouts and determine the predictability of each. The words "internal" and "external" in this model refer to factors that are either endogenous or exogenous to the target company being acquired. Factors generated internally to the target companies in this model include measures of profitability, operating efficiency, and capital structure decisions made prior to the LBO. External factors surrounding the target companies include variables, such as credit market conditions, industry, and region.

In this paper, the model used for explaining debt levels is most closely related to that of Axelson et al. (2012) who examined whether LBO leverage is correlated to credit market conditions, along with measures of industry, region, and time. This model builds upon Axelson et al.'s and expands it by exploring whether variables such as profitability, prior capital structure, and operational efficiency are determining factors of buyout debt.

One explanatory metric of profitability will be Profit Margin or Net Income/Company Revenue. Capital structure decisions prior to a buyout will be measured by (Company Debt prior to LBO)/Enterprise Value. Operating efficiency will

be represented by the number of Full Time Employees (FTE) over EBITDA. These ratios will allow for comparability across deal sizes.

To gauge the efficiency of a company's operations, we will use EBITDA over the number of employees to determine how much cash flow is generated per worker, which can also serve as a proxy for operating leverage. These variables, along with measures similar to Axelson et al. (2012), will explain the determining factors of levels of debt financing in buyouts.

The model is defined by Equation 3.1

$$DPTV_i = \alpha + \beta_1 LIBOR_{i,t} + \beta_2 Log(EBFTE)_i + \beta_3 Log(DEV)_i + \beta_4 Log(TV)_i + \beta_5 EVSALES_i + \beta_6 PROFMAR_i + \beta_7 Cnsmr_i + \beta_8 Manuf_i + \beta_9 HiTec_i + \beta_{10} Hlth_i + \beta_{11} NorthAm_i + \beta_{12} Euro_i + \varepsilon_i \quad (3.1)$$

Where,

$DPTV_i$ = Debt as a percentage of total transaction value for transaction i

$LIBOR_{i,t}$ = 3 month Libor rate at time t

$$EBFTE_i = \frac{EBITDA}{Full\ Time\ Employees\ prior\ to\ buyout\ announcement}$$

$$DEV_i = \frac{Debt\ in\ Capital\ Structure\ at\ Announcement}{Enterprise\ Value}$$

$$TV_i = \ Total\ Transaction\ Value\ at\ Announcement$$

$$EVSALES_i = \frac{Enterprise\ Value\ prior\ to\ announcement}{Revenue}$$

$PROFMAR_i$ = Profit Margin = $\frac{Net\ Income}{Revenue}$

$NorthAm_i$ = Dummy variable to describe if the primary region for transaction i is North America

$Euro_i$ = Dummy variable to describe if the primary region for transaction i is Europe

$Cnsmr_i$ = Dummy variable to describe if transaction i is in the 'Consumer' industry

$Manuf_i$ = Dummy variable to describe if transaction i is in the 'Manufacturing' industry

$HiTec_i$ = Dummy variable to describe if transaction i is in the 'Technology' industry

$Hlth_i$ = Dummy variable to describe if transaction i is in the 'Healthcare' industry

A linear regression model is employed in this study because of its practical use for fitting a predictive model to our data set of one dependent variable and many independent variables. Aside from the prediction and forecasting applications of a linear model, this regression also quantifies the strength of correlation between LBO debt levels and our explanatory variables, identifying which variables provide the best predictive powers.

Before discussing the results of this study, I will present the expected relationship based on empirical literature and economic intuition. Based on Axelson et al.'s (2012) work we can be confident that our major exogenous variable, LIBOR will have a negative relationship with buyout debt, because debt will decrease as interest rates rise. The endogenous variables, relating to company performance should have positive

relationships with buyout debt, for the reason that well performing companies will appear capable of taking on more debt. These variables include Profit Margin, EV/Sales, and EBITDA/FTE. Company debt prior to acquisition will most likely be negatively correlated to buyout debt because a company with more debt already on the books is less likely to be capable of taking on additional loans of substance. The size of the deal will predict higher levels of debt because larger debt ratios in a buyout will inflate the overall transaction value. More debt creates larger deals. In the next section, this model's results will be shown and these theoretical expectations will be tested.

CHAPTER IV

DATA DESCRIPTION

Data for this study relies primarily on the S&P Capital IQ database, which was used to construct a sample selection of 334 buyout transactions. The base sample contains mergers and acquisitions in Capital IQ classified as leveraged buyout, management buyout, or going private transactions from January 1999 to October 2013. Capital IQ began to specialize in tracking private equity deals in 1999, which is why the sample's time range begins in 1999. The sample was cut down from 45,536 deals over the 1999-2013 period to retain only buyouts that listed measurements of debt financing and transaction size, reporting earnings, revenue, enterprise value, full-time employees, primary region and industry, and the capital structure of each target company at the time of the buyout's announcement. This sample includes primarily large public-to-private leveraged buyouts because of limitations based on publicly disclosed information. Financial accounting information for the selling companies is crucial to my analysis since this study seeks to find the relationship between target companies' prior performance and the level of debt financing used to acquire those companies. Table 4.1 below show the descriptive statistics for all variables in this model and how they differ across industry.

In addition to these metrics, dummy variables to categorize the industry of each target company were comprised using the Fama-French 5 industry classifications, which sorted each deal (using SIC codes) into five industries: Consumer, Manufacturing,

Technology, Healthcare, and Other. The five industry classifications used in this model are a consolidated form of the widely used industry grouping system created by Fama and French (1997) that uses SIC codes to group companies into 48 industry categories. The sample for this study includes 100 buyouts from the Consumer industry, 57 from Manufacturing, 63 from Technology, 23 from Healthcare, and 91 deals from Other. A diagram of this breakout is shown in Figure 4.1. The 'Other' category includes mines, construction, building materials, transportation, hotels, bus services, entertainment, and finance. The five Fama-French industry classifications were used for this study, as opposed to the full 48 classifications, to allow for groupings large enough to have statistical weight in a sample size of only 334 buyouts.

Dummy variables to describe target firms' primary region of operation include three areas: North America, Europe, and Rest of the World. Of the 334 buyouts, North America accounts for 217, Europe for 66, and 51 from the Rest of the World, as described in Figure 4.2. Approximately 73% of the buyouts in our sample occurred between 2006 and 2012. This concentration is shown in Figure 4.5, and may be explained by the peak of the second LBO wave occurring in 2007 and rising popularity again in 2011 and 2012. Additionally, firms that disclosed all of the information that is required for my study are few in comparison to the total number of leveraged buyouts from 1999 to 2013, so it is probable that Capital IQ's ability to track LBO transactions have improved from the early 2000s.

To describe the dispersion of debt levels in my sample, a graph of the sample selection over time is shown in Figure 4.3. To measure credit market conditions in this sample, we use the three month LIBOR rate, which is the benchmark rate for most

syndicated loans. In this sample, LIBOR reached a high of 6.88% in May 2000 and a low of 0.25% in October 2013 (Figure 4.4). This rate fluctuates with macroeconomic events and has remained below 1.00% since May 2009.

With a sample size of only 334 transactions, sample bias is an apparent possibility and may be a cause for non-normality. This could have been avoided with more robust databases of transaction details or access to privately held transaction details. This is a larger sampling than some empirical studies, like Guo et al. (2011) using only 92 LBO transactions, but is smaller than Axelson et al. (2012), who's sample included over 1,000 LBOs. In a small sample size, such as this, cross-variable correlation may also be an issue but as we can see in Table 4.2 the independent variables show relatively low levels of correlation.

The data accessible for this analysis is limited because very few transaction details must be publicly disclosed. The information available for LBO transactions comes primarily from public to private deals because these deals are the only variety of LBO that must release information to the public. Before referring to public to private transactions as just one variety of LBO, I should first explain the different types of leveraged transactions and how these will affect my own analysis.

There are three varieties of LBO, the first being a public to private transaction, which denotes a publicly traded company whose outstanding shares are purchased by an investor group, turning the company into a privately held enterprise. This is done with the intent of reorganizing the company, paying down the debt with company cash flows, and reselling the company to another investor group or the public through a stock offering.

The second type of leveraged buyout indicates a spin-off, which usually deals with a company's subsidiary purchased in an LBO, using the sale of its assets to pay down the debt. This form of LBO involves different incentives for the buyer, who plans to sell off assets to earn a return on investment, instead of reorganizing the firm and using operating cash flows to pay down debt.

The final form of leveraged buyout is the one that was illustrated in the introduction. This form refers to a private corporation being purchased by a financial sponsor primarily with debt and a limited amount of equity investment. This form is the most common, but the most underrepresented in my sample because transaction details are rarely disclosed.

Because this data was constructed through information gathered by the Capital IQ database, deals in the sample tend to be larger, Public-to-Private transactions, as opposed to the Private-to-Private deals that account for the majority of LBOs in a given time period. Although this sample provides a diverse selection of buyout deals across different regions and industries, it is certainly weighted towards larger, public-to-private transactions that occurred in the past eight years in North America. Without access to other major business transaction data vendors, data collection for this study has been restricted by the limitations of the Capital IQ database.

FIGURE 4.1

TRANSACTIONS BY INDUSTRY

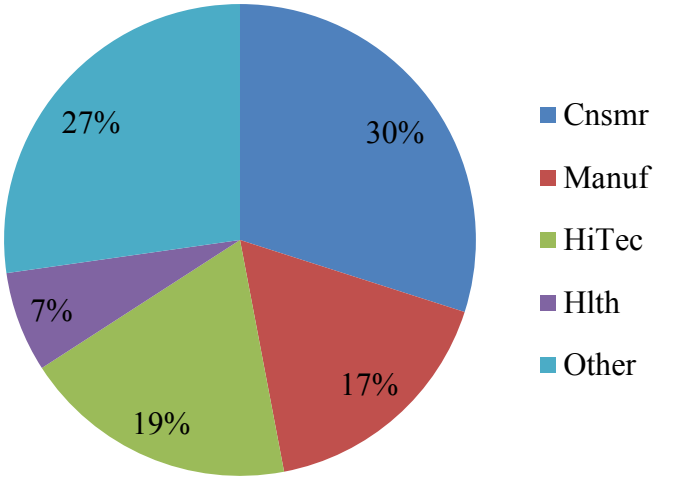


FIGURE 4.2

TRANSACTIONS BY REGION

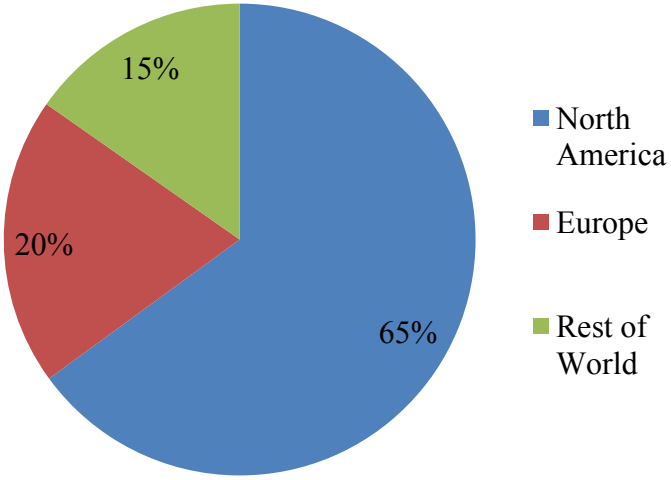


TABLE 4.1

STATISTICAL SUMMARY FOR SAMPLE AND BY INDUSTRY

	Overall				**Consumer**			
	Mean	Max	Min	Std.	Mean	Max	Min	Std.
DPTV	0.604	0.996	0.107	0.198	0.605	0.990	0.194	0.188
LIBOR	2.432	6.875	0.246	2.237	2.493	6.813	0.246	2.232
EBFTE	0.161	11.457	0.000	0.883	0.178	10.388	0.001	1.083
DEV	0.296	4.188	0.000	0.310	0.317	1.274	0.000	0.248
TV ($BN)	2.510	48.803	0.002	6.073	1.539	28.686	0.009	3.240
EVSALES	2.220	71.201	0.020	4.676	1.163	9.192	0.020	1.201
PROFMAR	0.081	1.935	0.000	0.147	0.056	0.592	0.000	0.082
	Manufacturing				**Technology**			
	Mean	Max	Min	Std.	Mean	Max	Min	Std.
DPTV	0.618	0.969	0.202	0.193	0.583	0.971	0.114	0.185
LIBOR	2.369	6.281	0.246	2.252	2.952	6.719	0.246	2.241
EBFTE	0.110	1.149	0.001	0.253	0.077	1.232	0.000	0.156
DEV	0.336	4.188	0.002	0.561	0.198	0.810	0.000	0.194
TV ($BN)	1.170	8.797	0.002	1.695	4.818	48.803	0.014	9.338
EVSALES	1.846	19.607	0.113	3.254	2.539	16.697	0.212	2.328
PROFMAR	0.099	0.889	0.003	0.165	0.100	0.833	0.002	0.121
	Healthcare				**Other**			
	Mean	Max	Min	Std.	Mean	Max	Min	Std.
DPTV	0.656	0.970	0.229	0.172	0.594	0.996	0.107	0.222
LIBOR	2.511	6.656	0.254	2.456	2.024	6.875	0.246	2.088
EBFTE	0.547	11.457	0.002	2.327	0.136	2.192	0.000	0.320
DEV	0.266	0.781	0.007	0.190	0.322	1.003	0.000	0.212
TV ($BN)	3.121	33.826	0.046	7.056	2.665	44.492	0.010	6.566
EVSALES	1.586	5.348	0.351	1.084	3.557	71.201	0.095	8.044
PROFMAR	0.063	0.159	0.007	0.039	0.090	1.935	0.000	0.207

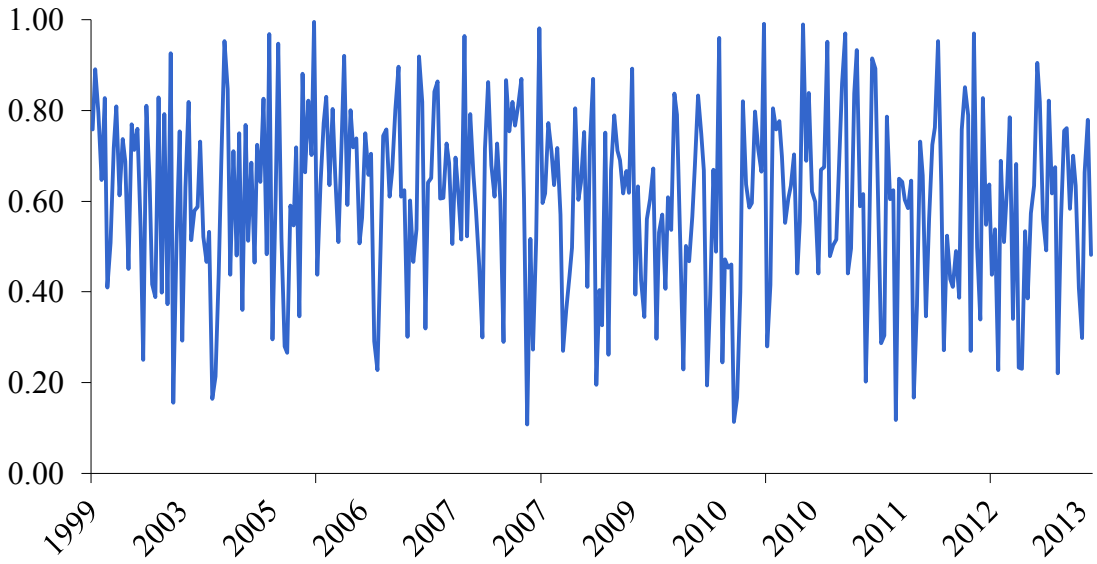
TABLE 4.2

CORRELATION MATRIX

	DPTV	LIBOR	EBFTE	DEV	TV	EVSales	ProfMar	NorAm	Euro	Cnsmr	Manuf	HiTec	Hlth
DPTV	1.000												
LIBOR	-0.639	1.000											
EBFTE	0.108	-0.075	1.000										
DEV	-0.127	0.000	-0.027	1.000									
TV	-0.081	0.142	0.027	-0.041	1.000								
EVSales	-0.076	0.138	0.024	-0.035	0.459	1.000							
ProfMar	-0.020	0.085	0.039	-0.065	0.434	0.421	1.000						
NorAm	0.064	-0.016	-0.134	-0.015	-0.058	-0.090	-0.092	1.000					
Euro	-0.010	0.025	0.167	-0.019	0.010	0.032	0.032	-0.676	1.000				
Cnsmr	0.008	0.016	0.012	0.046	-0.146	-0.148	-0.114	-0.060	-0.030	1.000			
Manuf	0.025	-0.007	-0.026	0.058	-0.039	-0.036	0.056	0.064	0.018	-0.295	1.000		
HiTec	-0.048	0.111	-0.046	-0.151	0.038	0.033	0.059	0.101	-0.029	-0.317	-0.217	1.000	
Hlth	0.073	0.009	-0.119	-0.026	-0.042	-0.037	-0.034	0.035	-0.106	-0.178	-0.123	-0.136	1.000

FIGURE 4.3

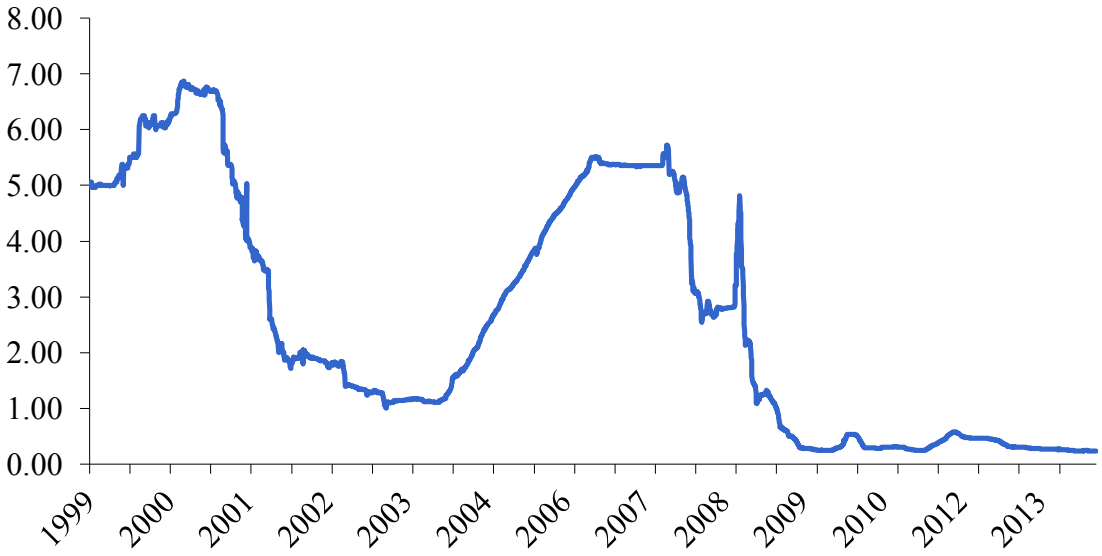
DEBT TO EQUITY RATIOS FOR SAMPLE



Source: S&P Capital IQ

FIGURE 4.4

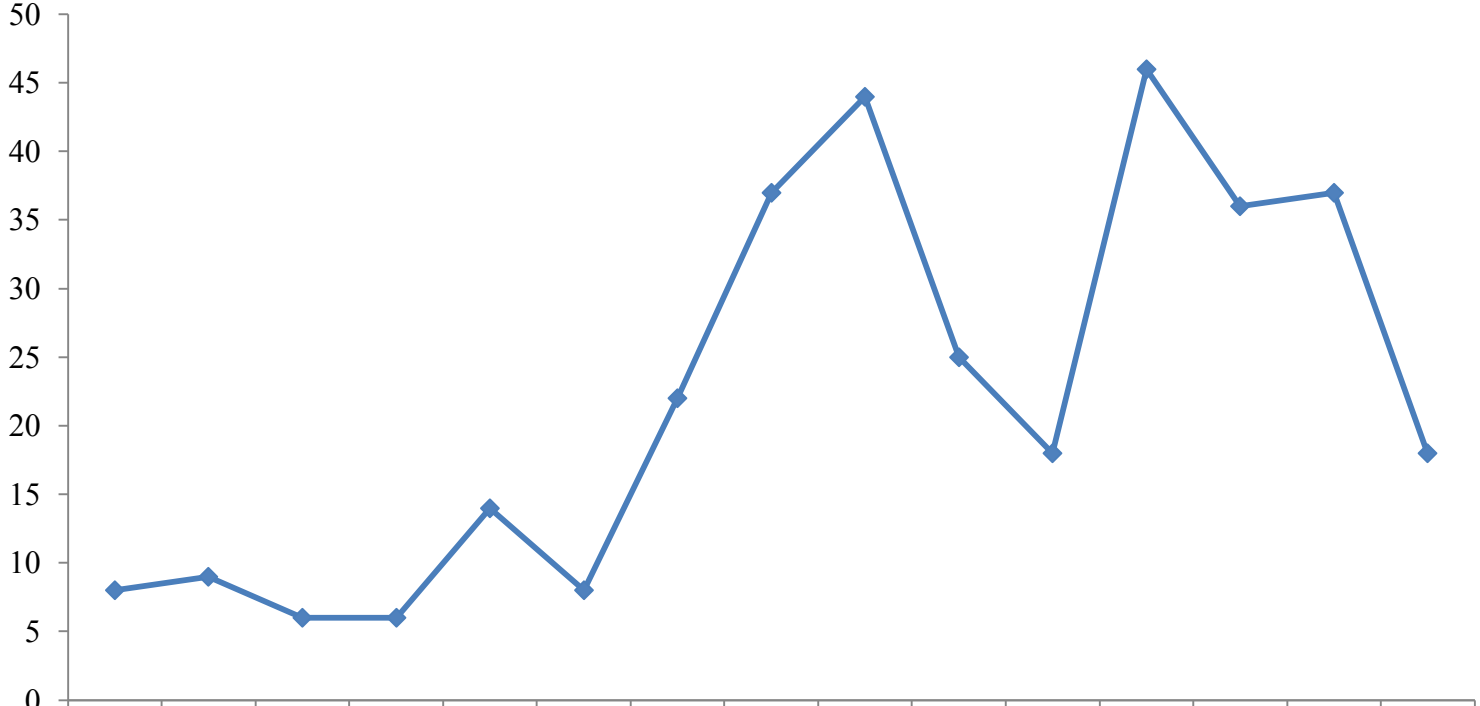
LIBOR – USD – 3 MONTH RATE



Source: British Bankers' Association

FIGURE 4.5

TRANSACTIONS PER YEAR



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Number of LBOs	8	9	6	6	14	8	22	37	44	25	18	46	36	37	18
Percent of Sample	2.4%	2.7%	1.8%	1.8%	4.2%	2.4%	6.6%	11.1%	13.2%	7.5%	5.4%	13.8%	10.8%	11.1%	5.4%

CHAPTER V

RESULTS

It appears that credit market conditions, represented by the three month LIBOR rate, remain the most accurate predictor of debt levels in leveraged buyouts. In this equation, LIBOR holds a negative relationship with buyout debt, and as the highest level of statistical significance of any explanatory variable. In this robust regression, the percent of debt used in a buyout is predicted to go down 5.8% as the LIBOR rate increases 1.0%, which is consistent with the findings of Axelson et al. (2012), who found that buyout leverage decreases significantly as the high-yield spread increases. The results of this regression are shown in Table 5.1.

Debt to Enterprise Value (D/EV) prior to a deal's announcement represents how much debt a company holds prior to being acquired. It's expected that this will affect how much additional debt a buyer will use to finance an acquisition of that firm. In this regression, Debt (as a percent of transaction value) decreases as D/EV increases, meaning that past capital structure decisions by the target firm do affect leverage amounts in buyouts. Because this model shows statistical significance for the explanatory powers of D/EV, valuable information may be gained from the observations our model makes.

TABLE 5.1

ROBUST OLS ESTIMATIONS

Variables	Debt as Percent of Transaction Value	
LIBOR	-0.058	***
		(-6.94)
Log D/EV	-0.014	**
		(-2.48)
Log Transaction Value	-0.011	**
		(-1.99)
EV/Sales	0.002	
		(1.16)
Log EBITDA/FTE	0.015	**
		(2.37)
Profit Margin	0.009	
		(0.28)
Consumer	0.047	*
		(1.85)
Manufacturing	0.042	
		(1.55)
Technology	0.033	
		(1.14)
Healthcare	0.09	***
		(3.15)
North America	0.06	**
		(2.07)
Europe	0.052	
		(1.64)
Constant	0.758	
		(5.77)
R-squared	0.4582	
Observations	334	

Note: ***: 1% **: 5% *:10%

This model also tests the explanatory power of LBO deal size on buyout leverage using the log of transaction value. From this regression, it is clear that deal size has a negative effect on debt levels in leveraged buyouts. This contradicts the observations of Alexson et al. (2012), who found that larger deals are significantly more leveraged than smaller deals. For our sample, as transaction value increases by one percent, debt as a percent of transaction value decreases 0.01 percent. Although the explanatory power of deal size is statistically significant, it has a minimal effect in the regression.

Enterprise value to sales (EV/Sales) prior to announcement is meant to measure the valuation of a company's sales. Generally, the lower EV/Sales the more undervalued a company will be. From the perspective of a private equity firm, the lower a company's EV/Sales, the more attractive they are for an LBO because their revenues will be high in comparison to existing enterprise value, signaling an ability to take on debt. However, EV/Sales does not show significance in explaining overall debt levels in buyouts.

Operating efficiency is a crucial characteristic for an attractive target company because the financial buyer must be confident that a future portfolio company can produce sufficient cash flow from operations. In this model, operating efficiency is measured by EBITDA to Full Time Employees (EBITDA/FTE), which describes how much profit is generated per employee and proxies for operating leverage, as opposed to financial leverage, or prior debt on the books. In my model, log of EBITDA/FTE displays a significantly positive correlation with debt as a percent of transaction value, meaning higher profit per employee correlates to a higher use of debt when a company is acquired.

In this model, profit margin shows no statistical significance in explaining debt levels in leveraged buyouts. This finding is consistent with those of Alexson et al. (2012), who writes that measures of profitability provide no reliable evidence for predicting debt in buyouts. Although this finding is consistent with previous literature, the discoveries of my model diverge from empirical works by showing that firm specific characteristics do, in fact, affect buyout leverage. By showing that Debt to Enterprise Value, Transaction Value, and EBITDA to FTE are all statistically significant indicators of debt levels in buyouts.

After performing White's test to establish whether the residual variance of variables in this regression were constant, it was clear that our sample regression contained heteroskedasticity. This refers to unequal variability of the dependent variable across a range of values for an independent variable. Robust standard errors were used in this equation to relax the OLS assumption that errors are both independent and identically distributed. The heteroskedastic errors in this regression could be associated with the wide range of deal sizes in this sample. A larger variance in error terms could be associated with larger deals, and those deals could be connected to data points much greater than the mean.

In addition to heteroskedasticity, this model suffers from a non-normal distribution of data. This conclusion was derived when a chi-squared value much higher than the null-hypothesis was calculated by running a Jarque-Bera normality test. For small samples such as this, chi-squared approximations are exceedingly sensitive with the distribution of p-values differing from a uniform distribution, causing a right skewed uni-modal distribution, which is apparent in my sample size.

The non-normality and heteroskedasticity apparent in our sample are most likely a result of data limitations associated with leveraged buyout transactions. Right side non-normality implies that the mean is greater than the median in the sample and could potentially be corrected with alternative specifications to the model. Information useful to this study was restricted to primarily large deals or public-to-private transactions. This led to a narrowed sample of 334 deals from 1999 to 2013 clustered mostly around the years 2006-2007 and 2010-2012. Although the biased nature of data collected for this study increased distortion of the regression through heteroskedasticity and non-normality, valuable findings have still been produced.

CHAPTER VI

CONCLUSION

This paper expands the empirical knowledge surrounding debt levels in corporate buyouts by building on the extensive work done by Axelson et al. (2012) in *The Determinants of Leverage and Pricing in Buyouts*. In their 2012 article, the authors conclude that credit market conditions are the only significant indicator of leverage amounts in buyouts. This stance is challenged by my paper's findings, which show that measures of firm profitability, operating efficiency, and previous capital structure can also be determinants of debt levels in leveraged buyouts. The results of the regression discovered a statistically significant relationship between previous capital structure and debt levels, and a strong relationship between operating efficiency and levels of leverage in buyouts.

These findings are not only meaningful to the academic field surrounding the study of private equity and leveraged financing but also to corporate managers involved in leveraged buyout transactions. Areas for further research on this subject are abundant and I encourage additional studies into the determinants of leveraged financing. With added resources like larger databases, a more expansive selection sample could be created and allow for a more robust study to be conducted.

Future work on this topic could include an in depth study of the types of debt used in highly leveraged acquisitions. A study could be done on buyouts with debt-to-equity

ratios of 70% or more. Then a regression testing the relationships between levels of buyout debt with senior, subordinated, and mezzanine debentures could shed light on the risk preferences of financial buyers. Another meaningful study that should be conducted would include a similar methodology to this paper but would examine a sample size of only private-to-private deals. Although private LBOs exhibit almost identical characteristics, circumstances surrounding non-publicly disclosed information could prompt different results than my own.

Previously, literature concluded that credit market conditions were the only statistically significant indicator of debt in leveraged buyouts. This paper show that firm specific metrics are also drivers of debt, more importantly that operating efficiency and previous capital structure can predict debt levels in leveraged buyouts. My results show the relationship between the way a firm operates and the way in which it raises capital. Understanding the complexity of this relationship requires more than a single study, making it an important topic for further research.

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