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Leveraged Buyouts: The Predictive Power of Target Firm Characteristics

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ABSTRACT

This paper utilizes a hazard model to predict the probability of leveraged buyout transactions for public firms. Rather than testing specific hypotheses, this paper incorporates all plausible predictors identified in existing literature to better delineate the effects of different characteristics. Largely confirming past results, I find that LBO transactions are more likely to occur for companies with more stable cash flows, less market visibility, lower market valuation, lower ownership concentration and lower costs of financial distress. By including LBO transactions from 1980 to September 2018, I find preliminary evidence that since the financial crisis of 2008 – 2009, private equity firms have modified their selection criteria when sourcing LBO deal targets.

I. INTRODUCTION

This year is shaping up to be the most active year in leveraged buyouts (LBOs) activity since the Great Financial Crisis (hereafter GFC), with the dollar volume of LBOs surging 44 percent year-on-year to $156 billion as of June 11.[1] It now appears that LBOs are back with full force from their dormant years since the GFC. While private equity (PE) takeovers and LBOs are not new to the financial markets and academia, it is worth re-visiting the motives behind such transactions in light of the GFC ten years ago. Perhaps surprisingly, not much attention has been devoted to more recent LBO transactions, with most studies focusing on deals prior to 2008 (Renneboog and Vansteenkiste (2017)).

The existing empirical literature in the United States focuses largely on the reasons behind companies undertaking LBOs. In particular, LBOs help alleviate the agency problems of the target company's management, through a combination of incentive realignment, more corporate control in the hands of PE sponsors, and debt-induced disciplines in free cash flow (FCF) distribution (see for example, Kaplan and Stromberg (2009) and Bharath and Dittmar (2010), and references therein). Evidence in the literature also suggests that companies are more

[1] Gottfried, Miriam, 2018, "LBO Volume Surges as KKR, Others Put $1 Trillion Cash Pile to Work", *The Wall Street Journal*.

likely to go through a LBO if the stock is undervalued or under-performing relative to its peers (see for example, Kieschnick (1989) and Billett, Jiang, and Lie (2009)). While there are studies investigating factors other than those theorized by the aforementioned main hypotheses (Renneboog and Vansteenkiste (2017)), the existing empirical literature generally has not attempted to incorporate all these factors into a single prediction model, which may potentially give rise to omitted variable biases. While it is important to examine the reasons behind private equity takeovers, the ability to make reasonable predictions of public-to-private (PTP) transactions has significant real-life implications in stock trading, corporate takeover defense, as well as mergers and acquisitions (M&A).

The purpose of this paper is to extend the existing literature by constructing a prediction model that incorporates all the plausible predictors from existing literature. Moreover, I extend the analysis period by examining transactions from 1980 to September 2018. Specifically, using the Thomson Reuters Eikon database, I first identify over 14,500 LBOs or PE-sponsored transactions during this time period. For those publicly traded target companies with sufficient data available, I then collect information on their company stock and financials to construct the predictor variables. Further, I obtain the same set of information for all other publicly traded companies during the same time period to serve as the comparison group of the LBO targets.

Using a hazard model to predict the probability of a firm being targeted for LBO by PE funds, I find that LBOs are more likely to take place for companies with more stable free cash flows, lower market-to-book ratio, lower pre-LBO ownership concentration, higher R&D expenses and less growth in analyst coverage. My empirical findings largely confirm the conventional theories that LBO target companies tend to experience poor growth and stock returns, and generate stable levels of free cash flow. In addition, my results provide more evidence for the market visibility theory first explored by Mehran and Peristiani (2010) and Bharath and Dittmar (2010), which states that LBO targets generally suffer from lack of market attention and coverage. Finally, by examining the 10-year sub-periods that preceded and followed the GFC, I find that during market booms, private equity firms seem to exhibit a higher risk appetite in selecting LBO targets with less stable levels of cash flows. This preliminary finding is consistent with the conventional wisdom that PE firms tend to tolerate higher risks in their investments in pursuit of returns in excess of the bullish equity market.

The remainder of the paper is structured as follows: Section II reviews the existing empirical literature and provides some insights into potential predictors of PE takeovers. Section III describes the construction of the data set. Section IV presents the empirical model and discusses the results. Section V concludes with suggestions for future work.

II. LITERATURE REVIEW

During the first wave of LBO booms in the 1980s, Maupin, Bidwell and Ortegren (1984) are among the first to examine the pre-existing characteristics of public companies that undergo private buyouts. The authors specifically investigate management buyout (MBO) transactions and compare the taken-private companies and their public counterparts. They find companies that go through MBOs tend to have higher pre-transaction managerial stock ownership, higher and more stable cash flows, lower price-to-book ratios, and higher dividend yields than their peers that remain public. Subsequent studies by Lehn and Poulsen (1989) and Kieschnick (1989) produced mixed results regarding Maupin, Bidwell and Ortegren's (1984) conclusion on higher cash flows and lower price-to-book ratios for LBO firms. Despite the inconclusiveness of these studies, they offer valuable insights on potential determinants of LBO transactions.

Since the earlier studies that use data from the 1980s, there has been a plethora of studies on the rationales behind LBOs using more recent data up to and including 2007. However, most of the studies focus on the sources of wealth gains from companies going private (see Renneboog and Vansteenkiste (2017) for a more detailed review). This literature is underpinned by a list of hypotheses that try to explain companies' going-private decision, including but not limited to: incentive realignment, free cash flow, corporate control, and undervaluation[2].

According to Renneboog and Vansteenkiste (2017), the incentive realignment hypothesis states that by increasing managerial ownership in the company during a LBO, shareholders can align the management's incentives for better performance post-LBO. Kaplan and Stromberg (2009) find support for the incentive realignment hypothesis from a median 16% increase in management equity ownership after LBOs. However, Halpern, Kieschnick and Rotenberg (1999) provide evidence that challenges this hypothesis. More specifically, the authors argue that pre-buyout managerial equity ownership is not a determinant of PTP buyout transactions, since firms with both high and low managerial ownership can be taken private via LBO, albeit under different processes.

Mixed evidence has also been found on the free cash flow hypothesis, which states that companies with higher and more stable FCF are more likely to go through a LBO because by exchanging equity for debt, management will be forced to pay out FCF (Renneboog and Vansteenkiste (2017)). While Halpern, Kieschnick and Rotenberg (1999) and Kieschnick (1989) fail to corroborate the FCF hypothesis, more recent studies have documented evidence in favor of the positive relationship between a firm's FCF and its probability of going private (Billett, Jiang, and Lie (2009) and Bharath and Dittmar (2010)).

[2] For a comprehensive list of hypotheses for public-to-private transactions and their underlying theories, please refer to Renneboog and Vansteenkiste (2017)

More consensus seems to have been reached regarding the control and undervaluation hypotheses. The control hypothesis is the idea that PE firms have concentrated ownership in post-LBO companies, thus are more incentivized to actively monitor the management. DeAngelo, DeAngelo and Rice (1984), and Maug (1998) both find evidence supporting this theory. The undervaluation hypothesis claims that companies with lower-than-average market valuation or stock performance are more likely to become targets of LBOs. Most studies on this hypothesis find supporting evidence (Maupin, Bidwell and Ortegren (1984), Kieschnick (1989) and Billett, Jiang, and Lie (2009)), while Lehn and Poulsen (1989) casts some doubt on the undervaluation hypothesis by challenging the premise that management has an informational advantage over the market, especially in the case of MBOs.

In addition to these hypotheses, some studies have also investigated other factors as potential determinants of LBO transactions. For example, using deals from the 1980s, Opler and Titman (1993) find strong evidence that the costs of potential financial distress is a deterrent of firms undergoing a leveraged transaction to go private. Billett, Jiang, and Lie (2010), on the other hand, focus on the change-in-control covenants and its impact on a company's probability of being an LBO target. The authors find that given the protection provided to bondholders, the existence of change-in-control covenants reduces the likelihood of a company being targeted in LBOs by half. Further, by examining deals up to 2007, Mehran and Peristiani (2010) and Bharath and Dittmar (2010) both find supporting evidence that companies are more likely to go private via PE-sponsored transactions when they fail to attract enough market attention, as measured by analyst coverage growth and institutional ownership.

This paper attempts to contribute to this topic in a numbers of ways. First, this paper examines LBO transactions from 1980 to 2018, which extends beyond the sample period used in most of the existing studies. The current literature mainly examines the first two waves of LBO booms: one in the 1980s and one in early 2000s before the GFC. By including more recent LBO deals, this paper seeks to add some insights on PE firms' choices of LBO targets post-GFC. The ultra-low interest rate environment since 2008 has allowed PE firms access to cheaper debt financing. Lower cost of debt, together with a sustained bull market over the past ten years, might have shifted the risk appetite of PE firms in selecting LBO targets. Second, conventional wisdom of the buyout market seems to suggest that LBO targets are usually more mature, but there has not been much efforts on formally examining the relationship between a company's age (i.e. years in existence) and the probability of an LBO. While this paper does not look to rigorously investigate this relationship, it seeks to provide some preliminary evidence on the effect of firm age. Third, instead of testing specific hypotheses, this paper includes all plausible factors as determinants and constructs a comprehensive prediction model for private equity takeovers. To the best of my knowledge, there has been no such attempt in the U.S. literature on PTP transactions to date. The inclusion of all plausible predictors better delineates the effects of individual factors by alleviating omitted variable bias. Moreover, while it is important to understand the rationales behind LBOs, an effective prediction model of PE takeovers would be valuable to portfolio managers and investment bankers alike.

III. DATA

The large number of leverage buyout transactions since 1980 (**Figure 1**) presents a valuable source for investigating the potential predictors of such transactions. I use data from Thomson Reuters Eikon to obtain the complete sample past LBO targets. This is the most comprehensive data set I can get without access to the Securities Data Corporation (SDC) M&A

database. The sample includes all LBO deals targeting companies in the United States, regardless of the deal status, from January 1st, 1980 to September 30th, 2018. Any transaction classified as "LBO" or "MBO" is included since these are the two most common forms of private equity-backed leveraged transactions. Since all LBO transactions, completed or not, are included in the sample, it should somewhat mitigate the survivorship bias in using only completed transactions. This sample selection approach identifies a total of 14,800 targets between 1980 and 2018 (see **Table 1**). As is common with M&A transactions, not all of these deals can be used in the analysis because often the targets are private companies with limited information, subsidiaries or subdivisions of public companies. Since private companies or subsidiaries usually do not have sufficient data available, they are excluded from the analysis. This sample restriction results in a total of 1,158 publicly traded LBO targets for the sample period. If the same company – as defined by the same Committee on Uniform Security Identification Procedures (CUSIP) identifier – underwent multiple LBOs in different years during this time period, it is treated as different targets since the target's financial status, ownership structure, among others, are usually quite different at the time of each LBO transaction.

Using the CUSIP identifier available from Thomson Reuters Eikon, I obtain the target firm's analyst coverage from Institutional Brokers' Estimate System (I/B/E/S), institutional ownership from Thomson Reuters' 13-F filings, stock and trading data from Center for Research in Security Prices (CRSP), and financials from Compustat. This list of transactions is further reduced due to data availability issues on the target company's financial and stock information. The databases either lack the data past 2017 or mid-2018, or have no records for some target companies. In addition to above constraints, I further restrict the sample by eliminating companies with minimal revenue (less than 1 million) and minimal total assets (less than 1 million) to mitigate the skewness caused by extremely large values of ratios and growth metrics, which will be discussed in detail below. I also eliminate companies with negative price-to-book ratios since a negative multiple is meaningless in a market valuation comparison. The final restricted sample consists of 781 LBO target companies with sufficient data.

I use an LBO dummy variable to indicate whether a given company in a given year is an LBO target. The companies identified during the initial sample selection are assigned a value of 1 for the years that they undergo LBOs. All the other public companies are coded as 0, which include public companies that are never targeted and the target companies before going private.

Similar to the existing literature (see for example, Opler and Titman (1993) and Bharath and Dittmar (2010)), I use the financials data from the Compustat database to construct Free Cash Flow to Firm (FCFF), which is calculated by subtracting capital expenditure and the change in net working assets from the after-tax EBIT (Earnings before Interest and Taxes) and then adding in depreciation and amortization expenses. I then calculate the FCF margin (FCFFpct), as a percentage of total revenue of the period, as well as the growth of FCF over prior years (FCFF_Grow1, FCFF_Grow2, and FCFF_Grow3). In addition, I also calculate the trailing 3-year standard deviation of FCFF for the same firm as an indicator of the stability of cash flows (FCFFvol). To examine the disciplinary effects induced by high leverage in LBOs (see Renneboog and Vansteenkiste (2017) and references therein), I use the pre-LBO fiscal year's debt-to-asset ratio (DebtAsset) and the EBIT interest coverage ratio (EBITCov) as measures of pre-existing leverage. An alternative set of metrics I use for leverage is debt-to-EBITDA (Earnings before Interest, Taxes, Depreciation and Amortization) and EBITDA after capital expenditure interest coverage (EBITDACov).

As suggested by past studies (see for example, Weir, Laing and Wright (2005) and the references therein), companies that choose to undergo LBOs tend to suffer from lower-than-average stock returns or valuations. The company's management may have an informational advantage regarding the valuation of its assets, thus incentivizing the decision to go private. Consistent with past research, I use the Price-to-Book Ratio (PtoB) and trailing twelve month returns prior to the LBO transaction announcement or rumor (ReturnTTM) as proxies for undervaluation of the target companies. In calculating the PtoB variable, I first use the monthly stock price data provided by the CRSP, and then divide it by the book value per share, computed from the Compustat financials dataset.

Evidence has also been found that PE firms are more incentivized to actively monitor the post-buyout management due to the concentrated ownership (see for example, Maupin, Bidwell and Ortegren (1984)). In comparison, it may not be cost-effective enough for large institutional owners of public companies to actively monitor their holdings (see for example, DeAngelo, DeAngelo and Rice (1984), and Maug (1998)). To investigate the predictive power of the pre-LBO ownership structure, I use the Herfindahl – Hirschman Index of ownership concentration (AvgOwnConc), provided by Thomson Reuters Stock Ownership database. A higher AvgOwnConc number indicates a higher degree of concentration in the company's stock ownership.

Recent studies have brought attention to the effects of market visibility in a company's decision to undergo an LBO (Mehran and Peristiani (2010) and Bharath and Dittmar (2010)). I follow these two papers in using institutional ownership, analyst coverage growth and share turnover as measures for market attention. From Thomson Reuters 13-F filings database, I calculate the percentage of outstanding shares owned by institutional investors for a given company (AvgInstPerc). I/B/E/S collects the EPS (Earnings per Share) estimate that analysts give to a company for its fiscal year or quarter. To account for the varying degrees of coverage between analysts who only give one fiscal year estimate and those who give quarterly estimates, I construct the analyst coverage (Coverage) variable by totaling the number of EPS estimates given to a company over a calendar year. Thus, an analyst that issues four quarterly EPS estimates would represent 4 counts whereas one who issues only the fiscal year estimate would represent 1 count. Coverage growth is then calculated for each company over a one- to three-year period (CovGrow1, CovGrow2, and CovGrow3). With trading data from the CRSP database, the share turnover ratio (ShrTurnOver) is calculated by dividing the average volume traded for a stock by the average number of shares outstanding during a given year.

Opler and Titman (1993) investigate the potential financial distress costs as a deterrent for companies choosing a LBO as an exit strategy because of the high leverage, and thus risks, involved. In their paper, the authors use research and development (R&D) expenses and the level of diversification of a company as proxies for the potential costs of financial distress. Their rationale is that companies with more diversified operations are less prone to high costs of financial distress because their assets are not concentrated within a certain product line. On the other hand, companies with high R&D expenses tend to fall prey to higher financial distress costs due to the uniqueness of their product or services offering, as well as the difficulty for outsiders to monitor the progress of R&D. In addition, the authors point to the high growth nature usually associated with R&D-intensive firms, which does not conform to the conventional understanding of good LBO targets. In this paper, I also use the R&D expense as a percentage of total revenue to proxy for the potential costs of financial distress (RDpct). However, instead of following Opler and Titman (1993) in using the diversification index, I use the percentage of total assets in property, plant, and equipment (PPEpct) as a complementary measure for the potential financial distress costs. Since these assets tend to have higher recovery values in bankruptcy proceedings, a higher PPEpct should, at least to a certain extent, mitigate the loss of value during financial distress.

Due to limited data availability, the firm's age in this data set is calculated as the number of years that the firm has existed as a public company since its first year of the time series (Age). If a company is taken private via an LBO, reemerges as a public company, and then undergoes another LBO, it is treated as two distinct companies, thus the Age variable is recalculated for its second appearance as a public company. To control for the effect of firm size, I use the CRSP stock data to compute the natural log of market capitalization (lnMktCap). The full list of predictor variables and corresponding definitions is provided in **Table 2**.

Table 3 provides summary statistics for the main variables of interest by LBO status. Consistent with my expectation and traditional perception, companies that undergo LBOs have significantly higher and more stable levels of free cash flows. Also, LBO targets on average experience a trailing twelve month return that is about 4% lower than their public counterparts. Regarding market valuation, LBO target companies' average price-to-book (P/B) ratio is 1.94, which is about 24.7% lower than the 2.42 P/B ratio of their public counterparts. In addition, the LBO companies suffer from a statistically significant 2.1 percentage point differential in revenue growth as compared to non LBO target public companies. The three measurements together reaffirm the perception that buyout firms tend to target struggling companies, hoping to turn them around with restructured operations. Moreover, LBO target companies on average spend only 1.2% of their revenue on R&D whereas the comparison group spends an average of 2.1%. The statistically significant difference is consistent with the findings of Opler and Titman (1993).

The statistics on market visibility are, however, less clear. LBO targets on average see a 13.1% decline in analyst coverage over the one year period before going private, while other public companies experience an average 16.3% growth. Trading volume also seems to suggest a lack of market attention, with LBO company shares turning over about 6% less than the public group on average. Nonetheless, LBO companies do have a slightly higher institutional ownership than other public peers, which should supposedly bring more market attention.

Perhaps also surprising is the difference in firm age between the two groups. As discussed above, PE takeover targets are usually thought to be more mature. Nonetheless, the average age of LBO targets is about 12 years while the comparison group is almost 14 years old on average. Since companies that undergo multiple LBOs tend to stay public for a shorter period of time in between two LBOs, I then exclude such firms to eliminate the downward skewness caused by them. Yet, the LBO target group is still significantly younger than the comparison group by about 1.3 years. This might potentially be a sign of survivorship bias of some kind. As mentioned above, the companies that choose to LBO are most likely struggling and experiencing below-average stock returns while healthy and financially robust companies tend to stay public for a longer time. The same is found with respect to the difference in the average market value between the two groups of companies. LBO companies are roughly $250 million smaller as measured by market capitalization (MktCap), which could be a result of poor growth and mismanagement as compared to their longer-lasting public counterparts. However, this may also hint at the limited financing capacity of the PE sponsors. Given the high leverage used in typical LBO transactions, it is arguably easier to takeover smaller targets, although mega-deals (target MktCap greater than $10 billion) do happen from time to time. The largest LBO target on file is a rumored takeover of Home Depot in 2006, when its market value was about $86 billion.

The remainder of the paper formally analyzes the determinants of a company's likelihood of being targeted in an LBO transaction.

IV. EMPIRICAL STRATEGY AND RESULTS

To examine how changes in specific firm characteristics impact the probability of going private, I use a hazard model to predict the probability of a LBO for a given company in any given year during its public life. More specifically, I employ a logit model, which is commonly used to predict rare events, to investigate the predictive power of different firm characteristics on LBO transactions. Controlling for the fact that a company may be in public existence for a few years and go private at a later date, I treat each firm-year combination as a unique observation. The Age variable is then used to differentiate the different years of data for the same company. This allows the model to specifically account for the changing probability of LBO over time. As pointed out by Shumway (2001), the hazard model allows one to take time-varying covariates into consideration. This ability to control for changing company characteristics is important to my prediction model because certain characteristics may have changed over the years before a public company becomes an LBO target, (e.g. declining growth and market attention, poor public market returns, etc.). As a result, the hazard model allows me to simultaneously examine the difference in characteristics both across companies, as well as over time for the same company. Another advantage of the hazard model is that the inclusion of the Age variable delineates its effect, since as theorized above, a firm's age – as a measure of company maturity – could be a predictor of LBOs.

The model to be estimated is given by:

$$L\left(t_i, X_{i,t}\right) = L(t_i, 0) + X_{i,t}\,\beta + \varepsilon_{i,t} \qquad (1)$$

where $L(t_i, X_{i,t})$ is the log likelihood of company *i* undertaking an LBO at time *t*, given the time-varying covariates $X_{i,t}$, which is a matrix of independent predictors used in the model. $L(t_i, 0)$ is the baseline log likelihood of company undertaking an LBO, without any information about its characteristics, while $\varepsilon_{i,t}$ is the error term. This model estimates the matrix of coefficients, β, which presents the effect of each independent variable on the predicted LBO probability. A positive coefficient on an independent variable *x* suggests that the probability of LBO increases with the value of *x*, whereas e^x reveals how much the probability would change for every one unit increase in the value of *x*, holding all other independent variables at their respective means.

Table 4 presents the regression results of the hazard model specified above. Overall, the results are similar across specifications tested. LBOs are more likely to happen for companies with more stable free cash flows, lower market-to-book ratio, lower pre-LBO ownership concentration, higher R&D expenses and less growth in analyst coverage. These findings largely confirm the consensus in existing literature regarding free cash flow, undervaluation, control, costs of financial distress and market visibility hypotheses (see Renneboog and Vansteenkiste (2017) and references therein). However, size itself does not seem to significantly predict the likelihood of an LBO. While it is a significant predictor in a few specifications, size loses its statistical significance once institutional ownership and ownership concentration are added in as separate predictors. Given the high correlations of market capitalization and these two variables (0.6082 with institutional ownership, and -0.6646 with ownership concentration), it appears that firm size simply picks up the effects of the other two variables.

Across all specifications tested, firm age is a consistently significant negative predictor of LBO probability. This differs from the intuition that LBO targets tend to be more mature (i.e. a longer period in existence). However, as elaborated above, this could be a result of survivorship bias in the comparison group, which includes all other public companies over the sample period. Since healthier and more financially outstanding companies tend to perform better in the markets, they naturally stay public longer than those that decide to go private via LBOs.

Contrary to some past studies (see for example, Opler and Titman (1993) and Mehran and Peristiani (2010)), it is the stability of free cash flows, instead of cash flow levels, that matters more in predicting LBO transactions. While counterintuitive at first, this result is more understandable when combined with companies' debt loads pre-LBO, as measured by debt-to-asset ratio. It appears that PE firms have a particular penchant for companies that already carry a relatively high debt load, which seems to suggest a larger debt capacity. In carrying out an LBO transaction for these targets, the PE sponsors are more concerned with the debt-servicing ability year on year, as opposed to the long term solvency of the target firm.

Table 5 presents the marginal effects on the probabilities of LBO transactions for a 1 standard deviation increase in each of the independent variables, holding all the other predictors at their respective means. I specifically examine Model (6) of **Table 4** because this specification is the most comprehensive of all. I deem it important to investigate the economic significance of these variables. At the 5% level, six explanatory variables are statistically significant negative predictors of the LBO probability: natural log of firm age, analyst coverage growth, ownership concentration, P/B ratio, R&D expense, and free cash flow volatility. Among these predictors, analyst coverage growth carries the highest impact on the LBO probabilities, with a one standard deviation increase in coverage growth resulting in a 0.85 percentage point decline in the LBO probability. This comes as a bit of a surprise since its economic significance exceeds those of traditional LBO determinants, such as the cash flow level. This finding suggests that PE firms are particularly good at sourcing targets that are flying under the radar of the investing public, which could potentially explain the outsized returns generated by private equity funds. However, this particular result is somewhat contradicted by institutional ownership percentage, which increases the likelihood of a LBO by 0.13 percentage point for a one-standard deviation increase at the mean. Mehran and Peristiani (2010) suggests that more analyst coverage and higher institutional ownership should both bring about more market visibility, but my results seem to confirm the effects of only the former. However, it should be noted that, in terms of measuring market visibility, analyst coverage is likely to be a better metric than institutional ownership. It may not always be the case that higher institutional ownership would bring more market attention to a company, but a larger degree of coverage by research analysts is more likely to help a company gain traction among the investing public.

Another interesting finding from the marginal effects analysis is the importance of R&D expenses in PE firms' LBO decisions. If a company's R&D expense as a percentage of total revenue is increased by one standard deviation (about 3.6 percent), the likelihood of this very company undergoing an LBO is reduced by 0.21 percentage point. This confirms Opler and Titman (1993) results that high potential costs of financial distress are a significant deterrent of the LBO decision. Granted, this result rests on the assumption that the R&D expense level is a good proxy for the potential costs of financial distress.

In addition, price-to-book ratio and free cash flow volatility both exhibit relatively significant impacts, with a one standard deviation increase in each lowering the LBO likelihood by 0.19 and 0.18 percentage point, respectively. These results largely confirm the conventional beliefs and consensus in past studies (see for example Weir, Laing and Wright (2005), Maupin, Bidwell and Ortegren (1984) and references therein) that companies targeted in LBO transactions tend to have lower market valuation and more stable cash flows.

Table 6 reports the regression results for two specifications (Models (5) and (6) in **Table 4**) over each of the four ten-year sub-periods in the sample period.[3] While a few independent variables retain significant predictive power on the LBO probability, most predictors lose their significance after 2010. The change in coefficients hints at the changing selection mechanisms used by PE firms when sourcing LBO targets.

Curiously, during the first wave of the LBO boom in the 1980s, the stability of free cash flows does not seem to bear much significance for PE firms. It only becomes a statistically significant predictor staring in the 1990s. In addition, the years preceding the 2008 GFC see a significant increase in LBO volume, largely attributable to the bullish, arguably irrational, financial markets. Coinciding with the boom years, LBO targets during this period produce less stable free cash flows than before. This could be a sign of elevated risk tolerance by PE sponsors in pursuit of investment opportunities. Therefore, they become more willing to take on positions in companies with below-optimal levels of cash flow stability. The same phenomenon is present for the most recent sub-period from 2010 to September 2018. Perhaps not so surprisingly, prolonged quantitative easing from multiple central banks during the past ten years of economic recovery provides an ultra-low interest rate environment. As a result, the cheap debt financing has arguably allowed PE sponsors to materialize these riskier investments.

The sub-period robustness tests produce mixed evidence regarding the market visibility hypothesis proposed and investigated by Mehran and Peristiani (2010) and Bharath and Dittmar (2010). Robust across all sub-periods, analyst coverage growth is a negative predictor of LBO probability. While a significantly negative predictor for the entire sample period, pre-LBO ownership concentration ceases to be a significant factor in the predicting model after the 1980s.

[3] I only include data up until September 30, 2018 for Panel D.

This suggests that the potential value creation from PE firms' active monitoring as a concentrated shareholder has diminished over time. Although beyond the scope of this paper, financial regulations (e.g. Sarbanes-Oxley Act) that enhance disclosure requirements for public companies might be a relevant factor in the fading impact of concentrated ownership. Interestingly enough, however, the positive coefficient for percentage owned by institutional shareholders has experienced a gradual increase over the past four decades. According to the market visibility hypothesis (see Mehran and Peristiani (2010) and references therein), higher institutional ownership should correspond to higher visibility by investors. Nonetheless, this statement is not consistent with the results from analyst coverage growth. Although all firms in the sample have experienced a rise in institutional ownership over the past four decades (**Table 7**), LBO target companies on average have a higher growth than their public counterparts. It seems that PE firms are growing more and more interested in companies that are already held by institutional investors but somehow fail to generate enough attention from the sell-side research analysts.

The sub-period tests also reveal a declining deterrent effect of financial distress costs. Consistent with Opler and Titman's (1993) results, companies with higher levels of R&D expenses are much less likely to be targeted in LBO transactions during the period 1980 to 2009. However, this relationship fails to hold after 2010. Without further investigation, I could only offer some conjectures about this result. One possible explanation is that the rise of technology companies, most of which spend heavily on R&D[4], has attracted attention of not only typical equity investors but also that of buyout funds. **Table 8** reports the number of LBO targets that are classified as Information Technology (IT) companies by the Global Industry Classification

[4] S&P Global Market Intelligence Capital IQ

(GIC) Standard. It is obvious that IT companies have become more frequent targets of LBO transactions: the proportion of IT companies as a percentage of all LBO targets more than quadrupled over the last four decades. This result is consistent with perspectives from former and current investment professionals, which suggests an industry-wide increase in PE investment in IT companies, although they do not conform to the traditional perception of good LBO targets. In addition, I simply follow Opler and Titman (1993) in using R&D expense as a proxy for the potential costs of financial distress. Although their rationale for such a practice may have been reasonable during the time frame of their analysis, it could be the case that the cost of financial distress can no longer be accurately measured by R&D expense after 2010. However, this is beyond scope of current study and could be an area for future research.

Overall, the sub-period tests confirm the predictive power of several significant predictors, including firm age, analyst coverage growth, and cash flow stability. However, the changes in some coefficients since 2010 is worth further investigation.

Considering the increased use of share repurchases and the possibility of consecutive net losses, I conduct a robustness test of my model by including firms with negative book value of equity. The inclusion of negative book value companies increases the LBO target sample size by 57 observations. I create the dummy variable negPtoB, which assigns a value of 1 to firms with negative price-to-book ratio and 0 otherwise (price data for all observations is nonnegative). To delineate the effects of negative book value of equity on the LBO probabilities, I also create an interaction term, xiPtoB, for this newly generated negPtoB dummy and the actual PtoB ratio. **Table 9** reports the regression results for this robustness test across sub-periods. The inclusion of companies with negative book value of equity does not materially change the predictive power of any independent variables (including that of price-to-book ratio itself), and the results discussed above still hold. However, a negative book equity value appears to lower the likelihood of a LBO, at least when P/B ratio is a statistically significant predictor during the 1980s and 1990s. Amongst companies with negative book value, the results seem to suggest that PE firms prefer those with higher (i.e. less negative) P/B ratios as LBO targets. Nonetheless, this finding is not robust across the specifications tested during the sub-periods.

The robustness check on negative book value of equity suggests that while PE firms generally prefer companies with lower P/B ratios as LBO targets, they generally avoid those with negative P/B ratios. This finding is evinced by both the negative coefficient on the negPtoB dummy, as well as the limited number of LBO targets (only 57) that exhibit such characteristic. Possibly, negative book value companies are in so much distress that PE firms deem them incorrigible, as this particular firm characteristic usually arises after multiple years of net losses.

Finally, to examine the accuracy of my prediction model, I divide the restricted sample used in Models (6) of **Table 4** into deciles based on the predicted probability of LBO for each observation. The number of successful predictions in each decile is reported in **Table 10**. Out of 781 actual LBOs estimated in this regression, the predicted probabilities for 528 transactions are ranked in the top three deciles of all predictions. The top half of the model's predicted LBO likelihood contains 82.8% of all LBOs that take place in reality. While the model predicts actual LBOs with decent accuracy, it is much more challenging to predict *ex ante* which public companies will be targeted, since LBO is a rare event after all. With data and time constraints of this thesis, I do not have the opportunity to conduct out-of-sample tests, which should add more insights on the accuracy of my prediction model.

V. CONCLUSION

There are two main motivations for this paper. First, there has been a surge in leveraged buyout activities in the past two years, surpassing the level last seen before the Great Financial Crisis of 2008. Therefore, I deem it worthwhile to revisit this particular type of corporate action. Despite the extensive literature on LBO transactions, few studies have examined the characteristics of LBOs since 2008. The most recent work by Mehran and Peristiani (2010) examines LBO transaction data only up to 2007. In light of the changes in the financial markets after the crisis, this paper seeks to offer some preliminary evidence on PE firms' choices of LBO targets post-GFC. The second motivation for this paper is the lack of a model that investigates the predictive power of all the determinants simultaneously. Most studies on this topic test specific hypotheses, hence particular variables attached, regarding PE firms' motives for LBO transactions ((see Renneboog and Vansteenkiste (2017) and references therein). This gives rise to potential omitted variable bias, which this paper seeks to alleviate by its inclusion of all plausible predictors with sufficient data.

This paper employs a hazard model to predict the probabilities of a company being targeted for LBO by private equity firms. With LBO data spanning from 1980 to September 2018, I draw upon the existing literature to incorporate as many plausible predictors as practically possible and examine their impacts on the LBO decision.

Overall, LBO transactions are more likely to occur for companies with more stable free cash flows, less growth in analyst coverage, lower market-to-book ratio, lower pre-LBO ownership concentration, and higher R&D expenses. These findings are robust across specifications and for the three decades before 2010. They largely reaffirm findings in past literature on free cash flow, undervaluation, control, costs of financial distress and market visibility hypotheses (see Renneboog and Vansteenkiste (2017) and references therein). Particularly, market visibility, as measured by the growth in analyst coverage, appears to be the most important determinant of a company's probability of undergoing an LBO. Firm size, however, is not significant in my model, which hints at the omitted variable bias present in some of the earlier studies (see for example Billett, Jiang, and Lie (2009) and references therein). Specifically, the addition of ownership-related variables renders firm size statistically insignificant. It could be the case that firm size simply picks up the effects of these predictors in previous studies.

When examining the economic significance of various predictors, a younger firm with lower analyst coverage growth, pre-LBO ownership concentration, market-to-book ratio, potential costs of financial distress, and cash flow volatility in general experience a higher likelihood of LBO. One caveat that shall be noted regarding my findings is the use of R&D expense as a proxy for potential costs of financial distress, which is the same methodology used by Opler and Titman (1993). While this practice might have been reasonable at the time of its publication, it may not be as accurate today, given the rise of information technology firms. Thus, it would be a valuable contribution to the LBO literature if an alternative measure could be used for financial distress costs, such as the credit default swap implied recovery rate.

Some interesting findings emerge from my sub-period test. While confirming the robustness of firm age, coverage growth and cash flow stability through time, the test reveals the fading significance of market-to-book ratio, pre-LBO debt load, and potential cost of financial distress since 2010. This finding offers some preliminary evidence that after the financial crisis of 2008 – 2009, there might have been a material change in the selection mechanisms that PE firms use when sourcing LBO deal targets.

To examine the accuracy of my prediction model, specifically Model (6) of **Table 4**, I divide the sample into deciles based on the predicted probability of LBO for each firm-year combination. Out of 781 actual LBOs estimated in this regression, the predicted probabilities for 528 transactions are ranked in the top three deciles, while the top half of the model's predicted LBO likelihood contains 82.8% of all LBOs that take place in reality.

Given the time and data constraints, I do not have the opportunity to conduct out-of-sample predictions to test the accuracy of my model. A decently accurate *ex ante* prediction model for LBO transactions of public companies bears great significance to both the existing LBO literature, as well as the development of a viable trading strategy. Therefore, a worthwhile project for future research could be to improve upon my results and test for out-of-sample prediction accuracy.

Finally, as discussed above, future research work on this topic could also delve deeper into LBO target selection criteria since 2009, which would be of great value to practitioners in the private equity and investment banking industry today. Other research extensions on this topic include the relation between market size and ownership-related variables, appropriate measurements of potential costs of financial distress, and other plausible predictors of LBO probabilities not addressed in this paper.

APPENDICES

Figure 1. LBO Deal Volume

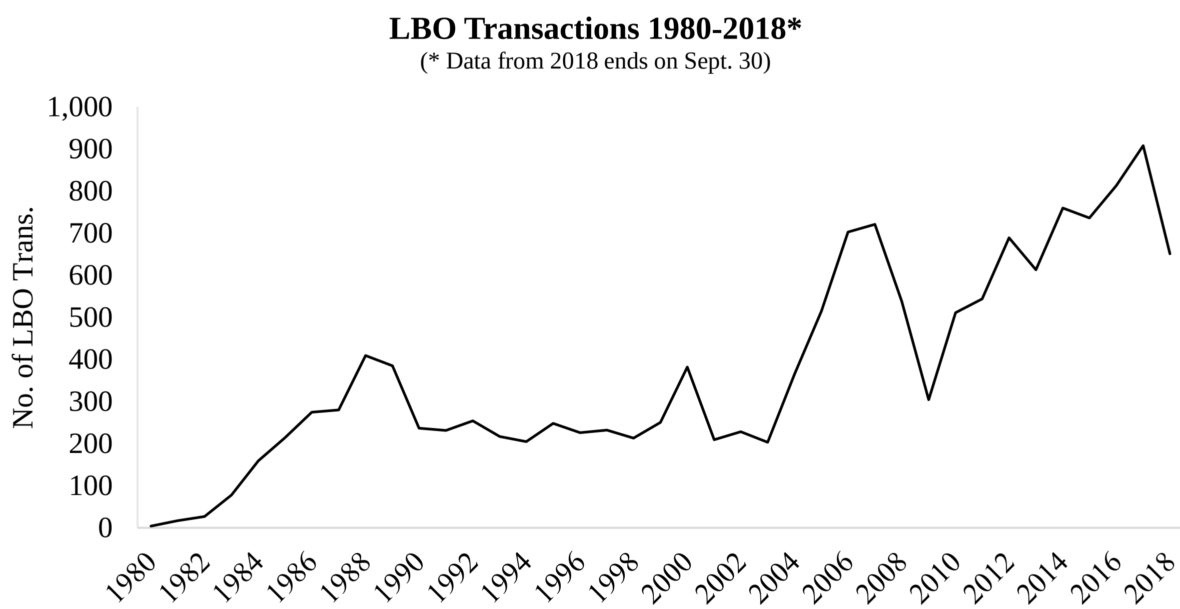

Table 1. Number of LBO Transactions, by Decade

Period	Total LBO Transactions	Public-to-Private (PTP) Transactions	PTP% of Total Transactions
1980-1989	1,968	419	21.29%
1990-1999	2,351	169	7.19%
2000-2009	4,240	362	8.54%
2010-2018*	6,241	208	3.33%
Total	**14,800**	**1,158**	**7.82%**

* Data for 2018 is only partial (01/01/2018 – 09/30/2018)

Table 2. Variable Definitions

Variable Name	Definition
Coverage	Total number of EPS estimates given to this company within a calendar year
CovGrow1	Growth of total number of EPS estimates over T-1 year
CovGrow2	Growth of total number of EPS estimates over T-2 year
CovGrow3	Growth of total number of EPS estimates over T-3 year
AvgOwnConc	Average Institutional Ownership Concentration - Herfindahl-Hirschman Index
AvgInstPerc	Average Institutional Ownership, Percentage of Total Shares Outstanding
ShrTurnOver	Share Turnover Ratio over the Year
ReturnTTM	Net Holding Period Return over Trailing 12 Months
lnMktCap	Natural log of Mkt Cap.
DebtAsset	Debt-to-Asset Ratio
DebtEBITDA	Debt-to-EBITDA Multiple
EBITCov	EBIT Interest Coverage
EBITDACov	EBITDA Interest Coverage, Net of CapEx
RevGrow1	Growth of Total Revenue over T-1 year
RevGrow2	Growth of Total Revenue over T-2 year
RevGrow3	Growth of Total Revenue over T-3 year
PPEpct	Property, Plant and Equipment, Percentage of Total Assets
TangApct	Tangible Assets (Current Assets + PPE), Percentage of Total Assets
FCFFpct	Free Cash Flow to Firm, Percentage of Total Revenue
FCFF_Grow1	Growth of FCFF over T-1 year
FCFF_Grow2	Growth of FCFF over T-2 year
FCFF_Grow3	Growth of FCFF over T-3 year
FCFFvol	Standard Deviation of FCFF, Trailing 3Yr
PtoB	Price-to-Book Ratio
lnAge	Natural log of Firm Age
LBO_dummy	1=LBO Target; 0=Otherwise

Table 3. Summary Statistics for LBO Targets and Non-LBO Target Companies

	(A) LBO Targets	(B) Non-LBO Targets	(A) – (B) Differences
Variable	**Mean**	**Mean**	**t-stat (z-stat)**
Free Cash Flow			
FCFFpct	0.024	0.015	1.93*
	(0.119)	(0.144)	
FCFFvol	45.95	58.38	-6.35***
	(54.20)	(63.14)	
DebtAsset	0.268	0.245	3.82***
	(0.169)	(0.165)	
EBITCov	9.16	11.32	-5.64***
	(10.60)	(11.83)	
Undervaluation			
ReturnTTM	0.094	0.135	-3.40***
	(0.338)	(0.357)	
PtoB	1.94	2.42	-10.73***
	(1.24)	(1.50)	
Control			
AvgOwnConc	0.118	0.116	0.39
	(0.114)	(0.112)	
Market Visibility			
AvgInstPerc	0.498	0.487	1.20
	(0.251)	(0.265)	
CovGrow1	-0.131	0.163	-19.61***
	(0.416)	(0.457)	
ShrTurnOver	1.07	1.14	-2.45**
	(0.75)	(0.83)	
Costs of Financial Distress			
PPEpct	0.326	0.332	-0.73
	(0.216)	(0.221)	
RDpct	0.012	0.021	-8.55***
	(0.028)	(0.036)	
Miscellaneous			
Firm Age	11.97	13.85	-9.59***
	(5.43)	(6.35)	
MktCap	663.3	911.0	-9.19***
	(746.3)	(871.9)	
RevGrow1	0.098	0.119	-3.66***
	(0.161)	(0.175)	
BidInterest	0.044	N/A	N/A
N =	**781**	**57,505**	

This table presents firm characteristics for the LBO target sample (column A) and the non-LBO target sample (column B). All variables are winsorized at the 1% level.

t-stat (z-stat) reports the results of a test of difference in means between the two columns. ∗∗∗, ∗∗, and ∗ indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 4. Hazard Model Results for Probabilities of LBO Transactions

LBO_dummy	(1)	(2)	(3)	(4)	(5)	(6)	(7)
lnAge	-0.499***	-0.485***	-0.502***	-0.475***	-0.481***	-0.519***	-0.519***
	(-7.931)	(-7.685)	(-8.015)	(-7.591)	(-7.647)	(-8.389)	(-8.385)
lnMktCap	0.0108	0.0800**	0.168***	0.0903**	0.180***	0.0271	0.00634
	(0.332)	(2.146)	(4.064)	(2.420)	(4.279)	(0.514)	(0.123)
CovGrow1	-2.313***	-2.353***	-2.326***	-2.355***	-2.331***	-2.356***	-2.350***
	(-9.712)	(-9.799)	(-9.498)	(-9.805)	(-9.470)	(-9.204)	(-9.203)
AvgOwnConc						-1.500**	-1.523**
						(-2.469)	(-2.508)
AvgInstPerc						0.631***	0.644***
						(2.606)	(2.731)
ShrTurnOver						0.0509	0.0554
						(0.876)	(0.954)
PtoB			-0.205***		-0.183***	-0.163***	-0.160***
			(-5.309)		(-4.738)	(-3.821)	(-3.769)
ReturnTTM						-0.0459	-0.0350
						(-0.360)	(-0.274)
DebtAsset					0.633**	0.647*	0.469
					(2.245)	(1.801)	(1.341)
EBITCov						-0.00242	-0.00218
						(-0.437)	(-0.393)
RevGrow1					0.0916	0.0978	0.0967
					(0.352)	(0.368)	(0.364)
PPEpct						-0.395*	
						(-1.749)	
RDpct				-8.402***	-6.437***	-7.526***	-7.103***
				(-5.316)	(-3.912)	(-4.603)	(-4.447)
FCFFpct					0.191	0.0797	0.0483
					(0.512)	(0.213)	(0.132)
FCFFvol		-0.00316***	-0.00377***	-0.00327***	-0.00437***	-0.00366***	-0.00376***
		(-3.691)	(-4.195)	(-3.798)	(-4.648)	(-3.527)	(-3.619)
TangApct							-0.451
							(-1.494)
Constant	-3.154***	-3.431***	-3.435***	-3.375***	-3.650***	-2.751***	-2.371***
	(-14.75)	(-15.27)	(-15.02)	(-15.02)	(-13.94)	(-7.610)	(-5.298)
N =	**58,286**	**58,286**	**58,286**	**58,286**	**58,286**	**58,286**	**58,286**

Robust z-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 5. Marginal Effects of One Standard Deviation Increase at Means

Independent Variables	Standard Deviation	dy/dx at Means	Marginal Effects (+1 Stdev, in Pct. Pts)
lnAge	0.562	-0.00411	-0.23
lnMktCap	1.509	0.00021	0.03
CovGrow1	0.457	-0.01867	-0.85
AvgOwnConc	0.112	-0.01189	-0.13
AvgInstPerc	0.264	0.00500	0.13
ShrTurnOver	0.832	0.00040	0.03
PtoB	1.501	-0.00129	-0.19
ReturnTTM	0.357	-0.00036	-0.01
DebtAsset	0.165	0.00513	0.08
EBITCov	11.81	-0.00002	-0.02
RevGrow1	0.175	0.00077	0.01
PPEpct	0.221	-0.00313	-0.07
RDpct	0.036	-0.05963	-0.21
FCFFpct	0.143	0.00063	0.01
FCFFvol	63.05	-0.00003	-0.18

Table 6. Hazard Model Results for Probabilities of LBO Transactions, by Decade

	Panel A: 1980 – 1989		**Panel B: 1990 – 1999**		**Panel C: 2000 – 2009**		**Panel D: 2010 – 2018**	
LBO_dummy	(5)	(6)	(5)	(6)	(5)	(6)	(5)	(6)
lnAge	0.0428	0.139	-0.687***	-0.646***	-0.303***	-0.366***	-0.474***	-0.442**
	(0.227)	(0.811)	(-5.380)	(-4.265)	(-2.622)	(-3.021)	(-3.565)	(-2.567)
lnMktCap	0.157**	0.0672	0.340***	0.211	0.243***	0.0423	0.0960	-0.267*
	(2.560)	(0.723)	(3.609)	(1.574)	(3.054)	(0.383)	(0.907)	(-1.820)
CovGrow1	-1.965***	-2.111***	-2.507***	-3.019***	-2.556***	-2.721***	-4.279***	-5.327***
	(-5.483)	(-5.631)	(-4.655)	(-4.329)	(-6.146)	(-4.852)	(-5.385)	(-5.178)
AvgOwnConc		-1.461*		0.678		0.144		0.711
		(-1.866)		(0.562)		(0.111)		(0.396)
AvgInstPerc		0.266		1.844***		2.337***		3.063***
		(0.516)		(3.017)		(4.634)		(4.692)
ShrTurnOver		0.946***		0.245		-0.120		0.199
		(8.214)		(1.460)		(-1.153)		(1.375)
PtoB	-0.248***	-0.259***	-0.280***	-0.257**	-0.0941*	-0.0335	-0.0230	0.117
	(-3.538)	(-2.820)	(-2.866)	(-2.110)	(-1.805)	(-0.458)	(-0.376)	(1.405)
ReturnTTM		-0.214		-0.526		0.370		-1.149***
		(-0.945)		(-1.630)		(1.551)		(-3.313)
DebtAsset	0.768*	0.455	1.751***	3.895***	0.155	-0.234	0.0642	0.0553
	(1.693)	(0.764)	(2.907)	(4.509)	(0.342)	(-0.315)	(0.113)	(0.0558)
EBITCov		-0.00881		0.0457***		-0.00698		0.00913
		(-0.761)		(3.745)		(-0.626)		(0.722)
RevGrow1	0.147	-0.488	1.162**	0.715	0.298	0.426	-0.0117	-0.570
	(0.359)	(-1.047)	(2.329)	(1.159)	(0.764)	(0.865)	(-0.0269)	(-0.904)
PPEpct		-1.051***		0.162		-0.0442		-0.957
		(-2.576)		(0.308)		(-0.101)		(-1.619)
RDpct	-15.62***	-22.19***	-8.090**	-7.534*	-7.200***	-9.351***	2.796	0.0658
	(-4.415)	(-5.211)	(-2.200)	(-1.772)	(-3.699)	(-2.874)	(1.471)	(0.0256)
FCFFpct	-0.143	-0.297	0.704	0.237	0.964*	1.883**	1.481***	-0.113
	(-0.270)	(-0.508)	(0.823)	(0.230)	(1.883)	(2.205)	(3.041)	(-0.136)
FCFFvol	0.000602	-0.000461	-0.0109***	-0.00940**	-0.00382***	-0.00215	-0.00362**	-0.00114
	(0.335)	(-0.226)	(-3.002)	(-2.444)	(-2.740)	(-1.242)	(-2.185)	(-0.580)
Constant	-4.100***	-3.502***	-4.748***	-6.376***	-4.755***	-4.745***	-4.278***	-4.619***
	(-7.985)	(-4.938)	(-9.461)	(-7.174)	(-9.513)	(-5.826)	(-5.469)	(-3.465)
N =	**14,987**	**12,460**	**22,134**	**17,119**	**24,610**	**17,145**	**17,556**	**11,562**

Robust z-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 7. Change in Average Institutional Ownership

	Average Institutional Ownership	
Period	**LBO Targets**	**Non-LBO Targets**
1980-1989	34.6%	31.1%
1990-1999	45.1%	41.4%
2000-2009	64.8%	57.4%
2010-2018*	71.5%	65.1%

* Data for 2018 is only partial (01/01/2018 – 09/30/2018)

Table 8. Number of Information Technology (IT) LBO Targets, by Decade

	Model (5)			Model (6)		
Period	**IT Targets**	**Total LBO Targets**	**IT% of Total**	**IT Targets**	**Total LBO Targets**	**IT% of Total**
1980-1989	24	351	6.8%	17	323	5.3%
1990-1999	20	127	15.7%	15	137	10.9%
2000-2009	68	284	23.9%	33	214	15.4%
2010-2018*	53	185	28.6%	30	107	28.0%
Total	**165**	**947**	**17.4%**	**95**	**781**	**12.2%**

* Data for 2018 is only partial (01/01/2018 – 09/30/2018)

The table above only includes LBO transactions used in Model (5) and (6) of **Table 4**, since these two specifications are the basis for sub-period test results discussion

Table 9. Hazard Model Results for Probabilities of LBO Transactions (incl. negative book value firms), by Decade

	Panel A: 1980 – 1989		Panel B: 1990 – 1999		Panel C: 2000 – 2009		Panel D: 2010 – 2018	
LBO_dummy	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
lnAge	-0.0671	0.0323	-0.693***	-0.689***	-0.256**	-0.351***	-0.448***	-0.426**
	(-0.384)	(0.198)	(-5.349)	(-4.347)	(-2.226)	(-2.905)	(-3.368)	(-2.531)
lnMktCap	0.103*	0.0164	0.239**	0.147	0.199**	-0.0360	0.109	-0.287*
	(1.649)	(0.178)	(2.362)	(1.070)	(2.559)	(-0.312)	(1.026)	(-1.959)
CovGrow1	-1.963***	-2.117***	-2.515***	-3.111***	-2.559***	-2.766***	-4.295***	-5.329***
	(-5.710)	(-5.815)	(-4.840)	(-4.461)	(-6.293)	(-4.998)	(-5.573)	(-5.283)
AvgOwnConc		-1.479*		0.548		0.142		0.532
		(-1.905)		(0.448)		(0.110)		(0.293)
AvgInstPerc		0.315		1.900***		2.507***		2.873***
		(0.619)		(3.135)		(4.960)		(4.590)
ShrTurnOver		0.899***		0.270*		-0.119		0.221
		(7.860)		(1.645)		(-1.185)		(1.559)
PtoB	-0.359***	-0.315***	-0.314***	-0.331**	-0.0932	-0.0346	-0.0200	0.0707
	(-3.919)	(-2.821)	(-2.800)	(-2.399)	(-1.622)	(-0.456)	(-0.305)	(0.791)
negPtoB	-1.572**	-0.984	-1.188**	-2.439***	-0.436	-0.444	-0.426	-1.685
	(-2.564)	(-1.537)	(-2.227)	(-2.868)	(-1.178)	(-0.956)	(-0.837)	(-1.533)
xiPtoB	1.649*	0.937	1.113	2.513**	0.515	0.385	0.878	1.878
	(1.938)	(1.055)	(1.438)	(2.135)	(0.934)	(0.550)	(1.178)	(1.208)
ReturnTTM		-0.339		-0.706**		0.273		-1.128***
		(-1.460)		(-2.166)		(1.199)		(-3.213)
DebtAsset	0.598	0.0419	1.506**	3.901***	0.140	-0.139	0.183	0.394
	(1.307)	(0.0645)	(2.529)	(4.521)	(0.314)	(-0.193)	(0.338)	(0.407)
EBITCov		-0.0140		0.0441***		-0.00587		0.00968
		(-1.286)		(3.554)		(-0.535)		(0.768)
RevGrow1	0.170	-0.312	1.069**	0.617	0.339	0.483	-0.00308	-0.538
	(0.414)	(-0.665)	(2.246)	(1.025)	(0.899)	(1.009)	(-0.00733)	(-0.871)
PPEpct		-1.050***		0.221		-0.0604		-0.982*
		(-2.621)		(0.425)		(-0.142)		(-1.691)
RDpct	-16.12***	-22.70***	-9.256**	-7.687*	-7.417***	-9.174***	2.728	-0.0405
	(-4.648)	(-5.428)	(-2.506)	(-1.810)	(-3.899)	(-2.886)	(1.476)	(-0.0159)
FCFFpct	-0.192	-0.364	0.595	0.311	1.124**	1.926**	1.562***	-0.219
	(-0.376)	(-0.635)	(0.781)	(0.308)	(2.236)	(2.339)	(3.258)	(-0.270)
FCFFvol	0.00200	0.000867	-0.00789**	-0.00855**	-0.00344**	-0.00144	-0.00420**	-0.00145
	(1.093)	(0.421)	(-2.241)	(-2.279)	(-2.527)	(-0.817)	(-2.560)	(-0.713)
N =	**15,240**	**12,573**	**22,889**	**17,504**	**25,518**	**17,604**	**18,298**	**11,950**

Robust z-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 10. Number of Successful Predictions by Decile

Decile	Successful Predictions
1	29
2	27
3	13
4	33
5	30
6	49
7	67
8	85
9	125
10	323
Total	**781**

Total number of observations for Model (6) in **Table 4** is **58,286**

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