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Drivers of the private equity market: evidence from the UK

Name Student: Thomas Sandbergen
Student ID number: 348116

Supervisor: Gryglewicz, S.
Second assessor:

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Preface

Abstract

There is limited research about the drivers of private equity activity, even with the significant growth in buyout volume as well as buyout value over the last 30 years. This paper examines the impact of the potential drivers that have been shown to influence buyout activity, the aggregate risk premium and credit market factors, using a panel of UK buyouts. First, the aggregate risk premium is negatively correlated to buyout activity, and including the credit market measures does not change it. Second, favorable credit market conditions do not necessarily lead to increased buyout activity in this research. Third, a closer look on the research period shows the impact of the factors have changed over the years. However, the risk premium retains its negative impact on buyout activity. This research highlights and confirms the important role of the risk premium for decisions in corporate finance in the UK.

Keywords: Private equity, risk premium, buyouts

Contents

1. Introduction

Since the 1980s, the mergers and acquisitions (M&A) activity has increased tremendously on a global level. Similarly, the global buyout value grew to $440 billion in 2017, which is about twelve times more than the $37 billion in 1996 (Bain & Company, 2018).

In 1989, Jensen saw the leveraged buyout (LBO) as the new, superior form of business organization. In his view, private equity (PE) firms were the best in restructuring and solving agency problems. Other ingredients necessary for this superiority include concentrated ownership, management compensation sensitive to performance and active investors. The increase in buyout activity over the past years indicates Jensen was at least partly right. Understanding the mechanisms behind buyout activity provide both explanations for the past booms and busts and tools to predict the next waves. In other words, as private equity is increasing in size and role, knowledge of the financial markets' intricacies is required when doing research on this aspect of the economy.

However, there is relatively sparse research conducted on the drivers of the private equity market. Of the little research available, the results and insights can be considered contradictory.

On the one hand, Axelson, Jenkinson, Strömberg, and Weisbach (2013) argue that the buyout activity heavily depends on the credit market conditions. This is because in buyouts about 70 percent of the enterprise value is covered by debt. In their research, the economy-wide credit conditions have the biggest influence on the quantity as well as the composition of debt in buyouts. A low cost of capital due to low interest rates could affect the valuation of a firm through the discount rate, mentioned later in this paper, and leads to more buyout activity. Their results include that none of the firm-specific characteristics, such as the profitability and cash-flow volatility, are consistently related to the leverage levels within LBOs. However, they find that the leverage decreases when the credit risk premium of leveraged loans increases.

Alternatively, Haddad, Loualiche, and Plosser (2017) argue the buyout waves are formed by changes in the aggregate risk premium. The risk premium influences the discount rates, which are essential to firm valuation, as the firm valuation leads to a buyout decision or not.

The discount rate affects both the present value of future cash flow improvements and the premium to compensate the investors for their illiquid investment, reflecting the benefits and costs of a buyout, respectively. The paper builds on these two channels. The cash flow improvements follow the Gordon growth model, described by Haddad et al. (2017) as follows:

“the gains of a buyout increase with the difference between the firm’s growth rate and the discount rate. The net present value of a cash-flow stream starting at X, growing exponentially at rate g and discounted at rate r is $X/(r-g)$” (p. 372). This means that a high risk premium increases the discount rate, which reduces the value of cash flow gains. Consequently, the likelihood of a deal shrinks. Economic growth occurs at the same moment as higher risk-free rates and higher risk-free rates lead, via the risk premium, to an increase of the discount rate to obtain the net present value of the cash flows.

The illiquidity channel on the other hand, deals with the differences of the valuation of the cash-flows under public and private ownership. Since they assume an illiquid and undiversified portfolio for the private owner, the private value is lower than the public value. In addition, firms with greater idiosyncratic risk are less likely targets. When there is a high risk premium, investors are less eager to invest in illiquid assets. Consequently, there are less deals in periods with high prices and a high risk premium.

Both these papers have different focus areas. In Haddad et al.(2017), the focus is only on the US market, and Axelson et al. (2013) use a sample of buyouts worldwide. This leads to a lion’s share of the sample in North America and the rest mainly in Western Europe. As there could be regional differences, this paper aims to find the main driver of the private equity market in the UK. The UK market has been chosen as it has a big, developed PE market on one hand, and it is still not widely-researched, compared to the US, on the other hand.

The present study indicates that the aggregate risk premium has a significant impact on buyout activity, confirming the results of Haddad et al. (2017) as it is negatively correlated. Similarly, the risk premium has a higher R^2 than the isolated credit market measures, meaning that the findings of Axelson et al. (2013) are not supported for the UK in this time period. The aggregate risk premium shows robustness with the inclusion of the credit market measures.

An interesting and noteworthy remark is that the role for credit market factors has increased over the years, because the regression results over the latest half of the research period show a significant, negative relationship between the high-yield spread and buyout activity, in line with the hypothesis. Furthermore, the impact of the relative price of equity compared to the price of high-yield debt on buyout activity is strong, significant and negative in both halves of the research period, which is not in line with the hypothesis. Over the entire research period, that impact almost completely disappeared.

The first section presents the different hypotheses and elaborates how they have been formed. In addition, it describes how the research is done. The next section consists of data description, which sources have been used and why, along with an overview of the development of the input factors throughout the research period. Subsequently, the results section presents the results and connects with the hypotheses. Lastly, the final section presents the conclusions based on the results, as well as the limitations of the present study and suggestions for future research.

2. Methodology and model

This section introduces the model that will be used to obtain information, to present the hypotheses with the theory supporting it and how the hypotheses will be tested, in order to find the potential drivers of PE activity in the UK and their impact. To discover the drivers of the UK private equity market, the PE activity in the period from 1987 until 2016 will be viewed. In this research, Stata has been used for regression analysis.

Firstly, it includes an overview of PE activity in the UK and the development of the several variables that impact the aggregate risk premium and credit market conditions. After that, the following questions can be answered:

- What are the main drivers of each? First, I lay the focus on the aggregate risk premium, then the measures for the credit market conditions.
- What are the effects of both market conditions?
- To what extent can the results be useful to predict future PE activity?

Based on the papers of Axelson et al. (2013) and Haddad et al. (2017), the preliminary hypotheses that can be formed are the following:

Hypothesis 1: *In periods with favorable equity market conditions, i.e., a low cost of equity, there is more PE activity.*

Hypothesis 2: *In periods with favorable debt market conditions, i.e., a low cost of debt, there is more PE activity.*

Before it is possible to test both hypotheses, a breakdown for both elements is necessary. In the following subsections, these hypotheses are more detailed and explained how they are formed.

2.1 Aggregate risk premium

The model by Haddad et al. (2017) presents two channels: the performance channel and the illiquidity channel. The performance channel, also referred to as the cash flow channel, corresponds to the benefits of a buyout. These benefits are reached by increased performance through better management, leading to improved cash flows. Subsequently, these cash flows are discounted in order to obtain the net present value. However, a buyout also comes at a cost, represented by the illiquidity channel. The investor needs to hold an undiversified position and needs to be compensated for this risk. Consequently, the risk premium affects both channels.

The model by Haddad et al. (2017) predicts expected market excess returns in the economy, by using several factors that each predict excess returns in earlier research (Fama and French, 1988; Lettau and Ludvigson, 2001; Fama and French, 1989): the dividend yield, *cay* and the yield on a 3 month T-bill. *Cay* equals the log consumption-aggregate wealth ratio, consisting of consumption, asset holdings and labor income. However, as the numbers for *cay* are only easily available for the US, it is left out in this UK-focused research. The expected returns less the risk-free rate result in the expected excess returns, equal to the equity risk premium.

Prior to the calculation of the risk premium, a preliminary step needs to be made. To obtain the expected excess returns, the paper of Kellard, Nankervis, and Papadimitriou (2010) shows a method to predict the equity premia, derived from dividend ratios and they show that FTSE All-Share dividend ratios are a useful predictor for the UK equity premia. In line with this approach, the same method is applied in this research, to double-check the predictive capabilities and see if it also accounts for a different time period.

First of all, this method requires the use of log scales in these calculations, in order to emphasize the relative values instead of absolute numbers. Secondly, several variables are required, the equity premium being the most important. The equity premium is indicated by EQP_t and equals the risk-free rate, the yield on a three-month Treasury bill ($r_{f,t}$), subtracted from the stock market return ($r_{m,t}$). In addition, both the dividend-price ratio (*DP*) and the dividend yield (*DY*) are used. Either *DP* or *DY* instead of *x* is used in the following regression model:

$$EQP_t = \alpha + \beta x_{t-1} + \varepsilon_t$$

The use of DP and DY in this model leads to the lagged value of it: to what extent does the DP or DY of the same period last year predict the equity premium in this period? In order to assess the predictability, the lagged variables are created and a null hypothesis and alternative hypotheses are tested. The null hypothesis, stating there is no predictability, $\beta=0$, is tested against $\beta\neq0$, the alternative hypothesis of predictive ability. Moreover, the R^2 will be examined before jumping to conclusions, as it would not make sense to continue when there would only be a very small R^2.

The predicted outcome is corresponding with the results of Kellard et al. (2010): the dividend ratios have predictive power on the equity premium.

This prediction is based on a combination of earlier literature: the fact that the dividend yield and the dividend–price ratio are widely used in order to predict equity market returns (Lewellen, 2004; Fama and French, 1988; Campbell and Shiller, 1988), but less specifically at the FTSE All-Share Index, the index that is used in this research. Kellard et al. (2010) show predictive abilities of the dividend ratios for this index, albeit for a different time period.

Predicted returns

Before it is possible to determine what the impact is of the different factors that influence the expected excess market return, a regression is necessary. In the calculation of the dependent variable, expected excess market return, I've adopted the methodology applied by Haddad et al. (2017): the return over the next three years, annualized, minus the current yield on a three-month T-bill. For the return, the differences in total market value are used, instead of changes in the FTSE All-Share Index level. It should yield the same results, as the FTSE All-Share Index is a value-weighted index. However, there are slight differences and the market values appear to be more accurate.

The regression to predict the risk premia in each month of the research period, based on the different factors, *DY* and the risk-free rate, yields the following coefficients:

$$\textit{Excess market returns} = -0{,}23 + 1.04\ DY_t - 1{,}22\ (\text{T-Bill})_t$$

With the known values for DY and risk-free rate in a specific period, the expected return becomes known as well.

The use of the annualized return over the next three years can be explained, as investments within private equity are always for several years. Those longer-term investment horizons need to be captured as well.

This will be applied to the research period mentioned earlier in this paper, 1987-2016, in order to calculate the predicted market returns in these periods. Consequently, the values for the predicted risk premia, $\hat{rp}_{OLS}$, can be derived by subtracting the current yield on a three-month Treasury bill of that moment. The predictive factors that have led to the equity risk premium, $\hat{rp}_{OLS}$, an estimation of future returns on equity, are information that is available in the equity markets and, therefore, the information in equity markets should have explanatory power in the behavior of this predicted equity risk premium, $\hat{rp}_{OLS}$.

Hypothesis (1): *In times with a low risk premium, ceteris paribus, there is more activity: there is a negative relationship.*

This hypothesis builds the two channels: the illiquidity channel and the cash-flow channel. The first channel is relevant, because when there is a high risk premium, investors are less eager to invest in illiquid assets, because they should bear more risk and demand a higher compensation. As it becomes more and more expensive to compensate the investor for the increased risk through the higher risk premium, it makes a buyout decision less attractive.

The cash flow channel, on the other hand, is impacted as well by the risk premium, because the investors demand a return for their investments. In times of economic growth, the risk-free rates tend to be higher (Stock and Watson, 1999), which affects the risk premium when the Gordon growth model is followed. A high risk premium increases the discount rate, which reduces the value of cash flow gains and, therefore, affects the buyout decision in a negative way.

As the research of Haddad et al. (2017) show that the credit market conditions affect the buyout activity as well, the next part has a closer look on it.

2.2 Credit market conditions

The credit market condition is the main trigger of buyout activity according to Axelson et al. (2013). To determine whether the credit market conditions in this research are favorable or not, we have a closer look at the cost of debt. Debt plays a major role in the capital structure, in both the quantity as well as the composition, especially in leveraged buyouts, as about 70 percent of the enterprise value in buyouts is covered by debt. Therefore, the lower the cost of debt, the more favorable the credit market conditions and, according to Axelson et al. (2013), more buyout activity.

One of the reasons debt is a big part of the enterprise value in LBOs, is because of the tax shield, the tax savings from debt. The tax-deductibility of the relatively large amount of interest to be paid creates a higher return on equity. Although debt leverages the equity returns of a firm, a financing balance needs to be retained, considering a larger amount of debt means a reduction in flexibility to invest in further acquisitions or growth capex, more restrictive covenants and higher risk of going bankrupt. Although there are different views (Fernández, 2004; Cooper and Nyborg, 2006) on how to value the tax shields, it is clear that tax shields and therefore debt can be used to increase the firm value (Kemsley and Nissi, 2002).

As the goal of this research is testing Haddad et al.'s (2017) outcome for the UK, the debt market conditions are reconstructed in the same way, as much as possible, to test the second hypothesis: *In periods with favorable debt market conditions, i.e., a low cost of debt, there is more PE activity*. Before it is possible to test the hypothesis, a breakdown of the elements of the debt market conditions is provided and each is tested for statistical power.

This includes measures that have been used by Axelson et al. (2013) as well, such as the high-yield spread ("HY spread"). Private equity firms can obtain the money for the buyout through the leveraged loan market, but also through high-yield bonds. A high amount of expensive, riskier junior debt is specific to LBO transactions. These kind of loans tend to have a lower quality and are frequently used in buyouts. Hence, the high-yield spread is used. The hotter the market for high-yield debt, the lower the spread, which suggests better financial conditions.

Hypothesis (2a): *In times with a low HY spread, ceteris paribus, there is more activity: there is a negative relationship.*

The measure for high yield spread is constructed by subtracting the risk-free rate, the yield on a three-month T-bill, from the yield on a high yield bond index that consists of several indices, based on the findings of Axelson et al. (2013). In their research, they show the Merrill Lynch High Yield Index less LIBOR, the US high-yield spread, is correlated with the market for leveraged buyouts.

Alternative measures of the credit market conditions in the research of Axelson et al. (2013) include, firstly, a calculation that measures the relative pricing differences between public equity and credit markets ("EBITDA spread"). The *EBITDA spread* is calculated by subtracting the high yield rate from the median EBITDA/EV ratio. The outcome of an earlier research by Kaplan and Strömberg (2009) showed a positive relationship of this measure to private equity fundraising. The reason behind this, is that the firm should be profitable and, therefore, the earnings yield should be higher than the high-yield interest rates. The choice for the use of the median value, instead of the average, can be justified as the median is not impacted by outlying values. Secondly, a credit tightening measure is applied in Axelson et al. (2013). This measure is obtained from a quarterly survey of the U.S. Federal Reserve. The combination of these measures capture both price as non-price aspects of the credit market conditions.

Unfortunately, from these two additional measures, only *EBITDA spread* will be highlighted further in this research. Any attempts to construct the second alternative measure for the UK, for the purpose of completeness of this research, were unsuccessful.

As mentioned before, by subtracting the high yield rate from the median EBITDA/EV ratio, *EBITDA spread* is constructed. The *EBITDA spread* covers the relationship of the median UK firm's ability to generate cash flows per dollar of market value and the interest rates at LBOs, as they are mostly financed with high-yield debt. The higher the *EBITDA spread*, the cheaper the equity is, relative to high-yield bonds, which is the foundation of the next hypothesis.

Hypothesis (2b): *In times with a high EBITDA spread, ceteris paribus, there is more activity: there is a positive relationship*.

There is one last measure for credit market conditions mentioned and used in the paper by Haddad et al. (2017): the excess premium in corporate bonds ("GZ spread"). As shown by the research of Gilchrist and Zakrajšek (2012), the GZ spread has predictive capabilities for macroeconomic activity. However, as the GZ spread requires data from the Center for Research in Security Prices (CRSP), it is not possible to create the GZ spread for the UK in the same way, as CRSP only has American stock and treasury data.

Lastly, both the aggregate risk premium and the credit market conditions will be combined in order to determine the drivers of PE activity in the UK and their impact and answer the main question of this research. After the factors are combined, the explanatory power as well as the statistical significance of the independent variables on the dependent variable will be compared. The relation between buyout activity and the discount rates is estimated with OLS and dummy variables have been created for the quarters, to check potential seasonality.

$$Activity_t = \beta_0 + \beta_1 \hat{r}p_t + \beta_2 \, HY \, spread_t + \beta_3 \, EBITDA \, spread_t + \varepsilon_{i,t}$$

As a control variable, the year-on-year growth rate of the real UK GDP per quarter ("GDP Growth") has been added, inspired by Haddad et al. (2017), who did it in a later phase of the research. Dittmar and Dittmar (2008) argue that growth in GDP reduces the cost of equity relative to the cost of debt through stock repurchasing and issuance activity. The changes in economic conditions might affect financing decisions.

The regressions are tested for autocorrelation and heteroskedasticity. The residuals show a normal distribution and a mean of 0, as can be seen in Appendix B, Figure 1, and the residual-fitted plot, Appendix B, Figure 2, seems to be robust as the distribution is symmetric around zero.

The independent variables will be checked for multicollinearity and if needed, omitted due to it as multicollinearity can cause problems when interpreting the results. To identify the correlation and its strength between the independent variables, the variation inflation factor (VIF) in Stata is used and the results can be found in Appendix B, Table 8.

2.3 Predictions and hypotheses

This section provides a brief overview of the hypotheses in order to answer the research question. The preliminary prediction to validate the predicted risk premium is the following:

The dividend ratios have predictive power on the equity premium.

The hypotheses are the following:

1) *In times with a low risk premium, ceteris paribus, there is more activity: there is a negative relationship.*
2) *In times with favorable credit market conditions, ceteris paribus, there is more activity.*
    a. *in times with a low HY spread, ceteris paribus, there is more activity: there is a negative relationship.*
    b. *in times with a high EBITDA spread, ceteris paribus, there is more activity: there is a positive relationship.*

Each of these hypotheses will be accepted or not, based on the result – rejection or not – of the null hypothesis. The null hypotheses are stating no statistical power and rejection leads to statistical power.

3. Data

In this section, the data used in this research is described. The data description consists of an overview of the numbers throughout the research period, how the usable numbers have been derived from a large amount of data, why these numbers have been chosen, from where they have been obtained and why the specific source has been chosen.

This section consists of five subsections: in the first subsection, the data necessary for testing the first hypothesis is described, the hypothesis about the predictive power of the dividend ratios on the equity premium. Second, the development of the risk-free rate is elaborated in this subsection. Third, the data required for the equity market conditions is highlighted in this section, consisting of the predicted risk premium. Fourth, the data for the credit market conditions is covered, consisting of *HY spread* and *EBITDA spread*. Last, the buyout data collection and the choices made in the data collection process are elaborated.

3.1 Dividend ratios

For testing the first hypothesis, monthly FTSE All-Share Index data have been obtained from Datastream. The datatypes from Datastream are only Dividend yield (DY) and Market value (MV). From these datatypes, the absolute amount of dividends paid each period were derived, which provided the possibility to obtain *DP* and $r_{m,t}$. The stock market return $r_{m,t}$ ultimately leads to the equity premium *EQP*, when $r_{f,t}$ is subtracted from it. As *DY* in every month was based on an annual basis, it first had to be reduced to monthly numbers, in order to obtain both the relative as well as absolute numbers of the corresponding month. The monthly data provides an opportunity to have a closer look at the predictability throughout the year. An overview of the results is shown in Table 3.

The FTSE All-Share Index has been selected for several reasons. Firstly, it is a better indicator than the FTSE-100 index due to the large amount of multinational companies in the latter. Those firms are generating a large part of the revenue outside the UK, therefore not fully showing the economic performance of the UK itself. Secondly, the FTSE All-Share Index represents 98% of the capital value on the LSE (FTSE Russell, 2019).

3.2 Development of the risk-free rate

The risk-free rate in this paper is equal to the current yield on a three-month Treasury bill, the same as in Haddad et al. (2017), except for the fact that UK T-bills have been used in this research. The monthly rates have been obtained from the Organisation for Economic

Cooperation and Development (OECD). The results show a maximum of 14.62% in April 1990 and was nearly 0% by the end of 2016. Figure 3 in Appendix B visualizes the decrease of the risk-free rate throughout the years.

3.3 Development of the aggregate risk premium, $\hat{rp}_{OLS}$

Monthly data of the FTSE All-Share Index is used for both the price index and dividend ratios and obtained from Datastream. This data covers the period January 1986 until December 2016. The use of monthly data creates the possibility to have a closer look at potential seasonality throughout the year.

Predicted equity risk premium

The 3-year-annualized market return minus the return on a risk-free three-month Treasury bill$(r_{f,t})$ leads to the risk premium.

The predicted equity risk premium in the research by Haddad et al. (2017), is calculated as follows: the annualized return over the next three years minus the risk-free rate, the current yield on a three-month T-bill. To make it fit for this UK-focused research, the annualized returns of the FTSE All-Share Index are used. The predicted equity risk premia vary a lot, from -12.1% in July 2000 to nearly 23% in February 2009, as is visualizes in Figure 4 in Appendix B.

3.4 Development of the credit market conditions

This subsection presents the data with regard to the credit market conditions, first measured as *HY spread* and, second, as *EBITDA spread*.

3.4.1 Development of HY spread

To obtain the data for this research to determine *HY spread*, a combination of two high-yield indices has been used, in order to capture the full period. Firstly, the Bank Of America Merrill Lynch High Yield 175 has been used for the period 1987 until 2004. Secondly, for the period 1998-2016, the ICE BofAML Euro High Yield Index has been used and the data are obtained from Datastream. These two indices have been used as they have been shown to be related to LBO activity in Axelson et al. (2013).

In the period 1998-2004, there is overlap between the high-yield indices and average numbers have been calculated.

The *HY spread* is calculated by subtracting the yield on a three-month T-bill, the risk-free rate, from the yield on the created, combined high yield bond index. As a result, *HY spread* in this research period had a minimum of only 4.6 base points in May 1989 and a maximum of 2407 base points in November 2008, during the financial crisis. The development is shown in Appendix B, Figure 5.

3.4.2 Development of EBITDA spread

For the calculation of *EBITDA spread*, the yield on the combination of high-yield bond indices is subtracted from the median EBITDA/EV ratio of the corresponding period. First, the EV/EBITDA ratios of each constituent of the FTSE All-Share Index per year are obtained through Datastream Worldscope. Secondly, the values have been converted to EBITDA/EV. Lastly, the yield from the combined high-yield bond indices is subtracted each month, in order to have a quarterly *EBITDA spread*.

This research deviates from Haddad et al. (2017). The latter uses a combination of annual data from Compustat and quarterly data from CRSP, of which CRSP makes it not applicable for this UK-focused research. It is likely that the different approach yields slight differences, but it is assumed the differences can be ignored.

As shown in Figure 6 in Appendix B, *EBITDA spread* was at its lowest point in February 2009, at -13.4%. The maximum *EBITDA spread* was reached a few years later, in May 2014, at a level of 6.64%.

3.5 Buyout data

For this research, the sample of UK buyouts comes from Thomson Reuters SDC. In an earlier stage of this research, it was limited to only public-to-private deals and only the 'going 100% private'. As this led to a small number of buyouts, 217 deals, the sample has been extended with private-to-private deals as well. There are several reasons why the number is expected to increase, as, on the one hand, a secondary buyout is one of the exit routes, whereby the company goes from one PE sponsor to another. On the other hand, other private companies include family businesses, that could be the target of a buyout.

Only the completed transactions where public as well as private companies were fully acquired by private firms for investment purposes are selected, with either the target or acquiror firm from the UK. This leads to a total of 7301 buyouts. Some of these do not show a "date effective" and are excluded for this reason, as the moment of the buyout cannot be determined. The number of buyouts remaining is 7054.

An explanation for the choice of the analysis starting from 1987, is that UK buyout activity is very limited prior to this year. In this research period, a minimum of 49 buyouts have occurred in 1987, a number that is in stark contrast with the highest amount of buyouts: 455 in 1999.

Table 1: Aggregate summary statistics

This table shows monthly statistics for buyout activity and the aggregate factors for 360 months, from January 1987 to December 2016. $\hat{rp}_{OLS}$ is the predicted market excess return using DY and the risk free rate. *HY spread* is the yield on the combined index of high-yield bonds minus the risk free rate. *EBITDA spread* is the difference between the median public firm EBITDA/EV and the yield on the combined index of high yield bonds.

	Obs.	Mean	Median	Std. Dev	Min	Max
Buyout activity						
Volume (number of deals)	360	19.59	17	10.55	0	52
Aggregate factors						
$\hat{rp}_{OLS}$ (%)	360	1.63	2.7	6.29	-12.09	22.98
HY spread	360	5.36	4.76	3.46	0.05	24.07
EBITDA spread	360	0.27	0.51	3.73	-13.38	6.64

Table 2: Correlations

This table shows the correlation coefficients between independent variables.

	$\hat{rp}_{OLS}$	HY Spread	EBITDA Spread
$\hat{rp}_{OLS}$	1		
HY Spread	0.41	1	
EBITDA Spread	0.08	-0.59	1

4. Results

Table 3 below presents the results of the regressions, that were done to look for a relationship between the log equity risk premium and the lagged dividend-price ratio (DP_{t-1}) or lagged dividend yield (DY_{t-1}) and to what extent these ratios of the same period last year predict the equity premium in this period. The sample is split into two equal time frames, from 1987 until 2001 and 2002 until 2016, which provides the opportunity to discover potential differences in predictive powers of the ratios.

In the full sample, both the dividend-price ratio and the dividend yield show high t-statistics of 6.67 and 8.37, respectively, indicating statistical power, leading to rejection of the null hypothesis of no predictive capabilities. In addition, the statistical significance is also present in both the first and the second half of the sample period. Furthermore, both the unadjusted and adjusted R-squared are decent. This leads to the confirmation of prediction stating the dividend ratios have predictive power on the equity premium. In addition, it leads to the validation of the first hypothesis, as *DY* is used to obtain $\hat{rp}_{OLS}$.

Unsurprisingly, the predictive power of the lagged dividend ratios DY_{t-1} and DP_{t-1} are significant and in line with the paper by Kellard et al. (2010). However, comparing the differences within the research period, it is noteworthy that in the second half of the research period, from 2002 until 2016, the lagged dividend price ratio and especially the lagged dividend yield have increased impact on the log equity risk premium. Although the t-statistic for the lagged dividend-price ratio is slightly lower than in the period 1987 until 2001, it remains statistically significant.

Table 4 below shows the results of the regressions that are done to measure the impact of the several factors that potentially influence LBO activity. The risk premium has a negative correlation with UK buyout activity and the first hypothesis ‘in times with a low risk premium, ceteris paribus, there is more activity. There is a negative relationship’ can be accepted at a 1% significance level.

When only the first measure of the credit market conditions, *HY spread*, is picked, a negative but insignificant relationship with LBO activity is shown in Column (2). However, when the measure of the risk premium is included, Column (3), the high yield spread is positively correlated to LBO activity. The risk premium retains its negative relationship and both values are significant at the 1% level. The first hypothesis on the aggregate conditions, hypothesis 2a, ‘in times with low HY spread, ceteris paribus, there is more activity. There is a negative relationship' cannot be accepted due to the positive instead of hypothesized negative relationship.

The isolated *EBITDA spread* is negatively correlated to UK buyout activity, as shown in Column (4). However, the R^2 of 0.061 implies the model can only explain a fraction of the variance in the model.

The second hypothesis on the debt market conditions, hypothesis 2b, 'in times with high EBITDA spread, ceteris paribus, there is more activity. There is a positive relationship' is accepted, as the results in Column (5) show a negative correlation, significant at the 1% level. However, an important side note is that the opposite effect, namely, a positive relationship, was suggested.

When isolating the credit market conditions in Column (6), it is interesting to see that both credit market factors, *HY spread* and *EBITDA spread*, are negatively correlated to private equity activity in the UK, at a 1% significance level, as the theory supporting the hypothesis regarding *EBITDA spread* is suggesting the opposite effect.

The aggregate risk premium retains its explanatory power in the negative relationship, when combined with each debt market condition taken individually and combined as well, as Columns (3), (5), (7) and (9) show. In addition, to highlight the importance of the risk premium, each column with the risk premium included has an R^2 of 0.295 or higher. The column with the highest R^2 where the risk premium is excluded is only 0.118.

The aggregate risk premium and both debt market measures combined have a significant relationship to buyout activity and the model explains 34.5% of the total variation. The debt market condition *HY spread* has a positive relationship, significant at the 10% level, in contrast with the prediction. *EBITDA spread* has a negative relationship, significant at the 5% level and is not in line with the earlier mentioned hypothesis as well. The risk premium, however, as mentioned above, still has a negative relationship to UK buyout activity that is significant at the 1% level, when all the credit market conditions are present as control variables as well. This shows the robustness of the risk premium's coefficient estimates.

The addition of *GDP Growth* in Columns (8) and (9) leads to a small increase of R^2 and the aggregate risk premium and *EBITDA spread* are robust to the inclusion of it. There is still a negative relationship to buyout activity.

Table 3: results of the regression $EQP_t = \alpha + \beta x_{t-1} + \varepsilon_t$

x_{t-1}	α	β	R^2 %	R^2-adj.%
Full sample 1987-2016				
DP_{t-1}	0.462	0.176	11.04%	10.79%
t-stat	6.8	6.67		
DY_{t-1}	0.752	0.292	16.03%	15.80%
t-stat	8.27	8.37		
Sample 1987-2001				
DP_{t-1}	0.419	0.155	12.07%	11.58%
t-stat	5.17	4.94		
DY_{t-1}	0.404	0.153	7.35%	6.83%
t-stat	3.94	3.76		
Sample 2002-2016				
DP_{t-1}	0.54	0.21	11.43%	10.93%
t-stat	4.79	4.79		
DY_{t-1}	1.827	0.712	37.80%	37.45%
t-stat	10.4	10.4		

Table 4: Regression results

This table reports coefficient estimates from regressing monthly UK buyout activity on estimates of the aggregate risk premium and credit market factors from January 1987 to December 2016. Quarter dummies are included to account for seasonality. Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

	-1	-2	-3	-4	-5	-6	-7	-8	-9
$\hat{rp}_{OLS}$	-0.910***		-1.060***		-0.882***		-0.970***	-1.112***	-1.065***
	(0.074)		(0.079)		(0.072)		(0.087)	(0.087)	(0.098)
HY spread		0.120	0.670***			-0.878***	0.352*		0.257
		(0.161)	(0.144)			(0.187)	(0.196)		(0.200)
EBITDA spread				-0.716***	-0.599***	-1.195***	-0.396**		-0.332**
				(0.145)	(0.122)	(0.174)	(0.166)		(0.168)
GDP Growth								-1.138***	-0.639**
								(0.269)	(0.298)
Observations	360	360	360	360	360	360	360	360	360
R-squared	0.295	0.002	0.335	0.064	0.339	0.118	0.345	0.328	0.354

Table 5: Predictions and hypotheses overview

	Dependent variable	Independent variable	Expected relationship	Regression model #	Result	Relationship
P1	Equity risk premium	DY_{t-1}	+	1	Accepted	+
P1	Equity risk premium	DP_{t-1}	+	1	Accepted	+
H1	Buyout activity	$\hat{rp}_{OLS}$	-	2	Accepted	-
H2a	Buyout activity	HY spread	-	2	Rejected	
H2b	Buyout activity	EBITDA spread	+	2	Accepted	-

5. Conclusions and limitations

5.1 Conclusions

Using regression analysis on 7087 buyouts, the present study has aimed to investigate and evaluate the effect of equity and credit market conditions on private equity activity in the UK in the time period 1987-2016. The previous section has shown that several dividend ratios do have predictive capabilities with regard to the equity risk premium in the UK. Hence, it is used to predict equity risk premia in this research.

The isolated risk premium as well as combined with credit market conditions is negatively correlated to buyout activity in the UK, supporting the hypothesis.

This research shows that private equity activity in the UK in the period 1987-2016 is correlated to both equity and credit market conditions. Each of the aggregate factors are significantly correlated to buyout volume, varying between the 1% and 10% level. However, the debt market conditions have shown an opposite relationship compared to the corresponding hypotheses.

In short, the findings of Haddad et al. (2017), that a lower aggregate risk premium increases the buyout activity, are in line with the findings in the present study: it does also apply for the UK. This research has shown that the impact of the various credit market conditions differ from the earlier work.

5.2 Limitations

One of the credit market measures used in Haddad et al. (2017) has not been reconstructed. With the GZ spread lacking, there are only two measures of credit market conditions applied in this research. Although the two measures used show a significant relationship, a third measure could provide a more complete picture, especially because one of the relationships was different than the expectation.

Furthermore, a somewhat different measure for *EBITDA spread* is used. It is assumed the differences are neglectable, but only the application of the same method can confirm that.

Next, due to technical constraints, activity is only measured in buyout volume only and not in value as well, which has been done by Haddad et al. (2017). In their study, it yields slightly different results, although the main message remains the same. It is assumed to be similar as well for this research.

Lastly, past performance is not indicative of future results. This research has shown several relationships between different factors and buyout activity, but it is not a tool to predict buyout booms or busts. Table 5 and table 6 in Appendix A show the differences between the first and second half of the research period. However, the aggregate risk premium retains its statistical power, but can only be used as a guideline for future buyout activity, as there are many more factors that can impact the buyout decision. In the entire research period, the R^2 of this model has a maximum of 0.354 when all the independent variables are applied. In other words, 64.6% is not explained by the model. For future activity, all the other factors should stay the same, which is difficult to reach in the real world.

5.3 Suggestions for further research

There has been a sharp increase in the use of covenant-lite loans, also known as cov-lite, in Europe. A large share of these cov-lite loans are going to the relatively high risk borrowers, including private equity firms executing LBOs. Back in 2011, the share of the new leveraged loans that were cov-lite loans was zero. In the first nine months of 2017, the number has already increased to 70%, which is also a more than three times the number in 2013 (Whittall, 2017). The effects of this emerging trend on a buyout decision would be an interesting subject to study.

Furthermore, events such as a potential Brexit can impact PE activity. The 2016 referendum and the decision to leave the EU could have had a large impact on the foreign exchange rates, interest rates in the UK, consumer confidence and many more factors with all its consequences, such as uncertainty with regard to the customs union. The final impact of the Brexit on the UK depends whether it will be a “soft” or a “hard” one, each with different consequences that might affect the UK private equity business. But for now, there is only uncertainty. However, it would already be interesting for future research what the impact of this period of uncertainty is on private equity activity in the UK and the EU.

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Appendix A: Regression results

Table 5: Regression results 1987-2001

This table reports coefficient estimates from regressing monthly UK buyout activity on estimates of the aggregate risk premium and credit market factors from January 1987 to December 2001. Quarter dummies are included to account for seasonality. Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

	-1	-2	-3	-4	-5	-6	-7	-8	-9
$\hat{rp}$	-0.968***		-0.929***		-0.910***		-0.910***	-1.117***	-0.896***
	(0.114)		(0.106)		(0.101)		(0.101)	(0.119)	(0.125)
HY spread		1.894***	1.712***			0.006	0.020		0.116
		(0.371)	(0.311)			(0.610)	(0.507)		(0.706)
EBITDA spread				-2.323***	-2.111***	-2.328***	-2.127***		-2.255***
				(0.354)	(0.295)	(0.606)	(0.504)		(0.825)
GDP Growth								-1.387***	0.121
								(0.413)	(0.619)
Observations	180	180	180	180	180	180	180	180	180
R-squared	0.288	0.128	0.392	0.195	0.448	0.195	0.448	0.331	0.448

Table 6: Regression results 2002-2016

This table reports coefficient estimates from regressing monthly UK buyout activity on estimates of the aggregate risk premium and credit market factors from January 2002 to December 2016. Quarter dummies are included to account for seasonality. Standard errors in parentheses. ***$p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

	-1	-2	-3	-4	-5	-6	-7	-8	-9
$\hat{rp}$	-1.090***		-1.397***		-1.228***		-0.358**	-1.300***	-0.360**
	(0.101)		(0.135)		(0.091)		(0.156)	(0.133)	(0.161)
HY spread		-0.648***	0.573***			-2.649***	-2.043***		-2.048***
		(0.159)	(0.172)			(0.166)	(0.310)		(0.321)
EBITDA spread				-0.520***	-0.866***	-2.675***	-2.283***		-2.282***
				(0.169)	(0.122)	(0.173)	(0.241)		(0.243)
GDP Growth								-0.843**	0.020
								(0.351)	(0.348)
Observations	180	180	180	180	180	180	180	180	180
R-squared	0.395	0.086	0.431	0.051	0.530	0.611	0.623	0.414	0.623

Appendix B: Figures

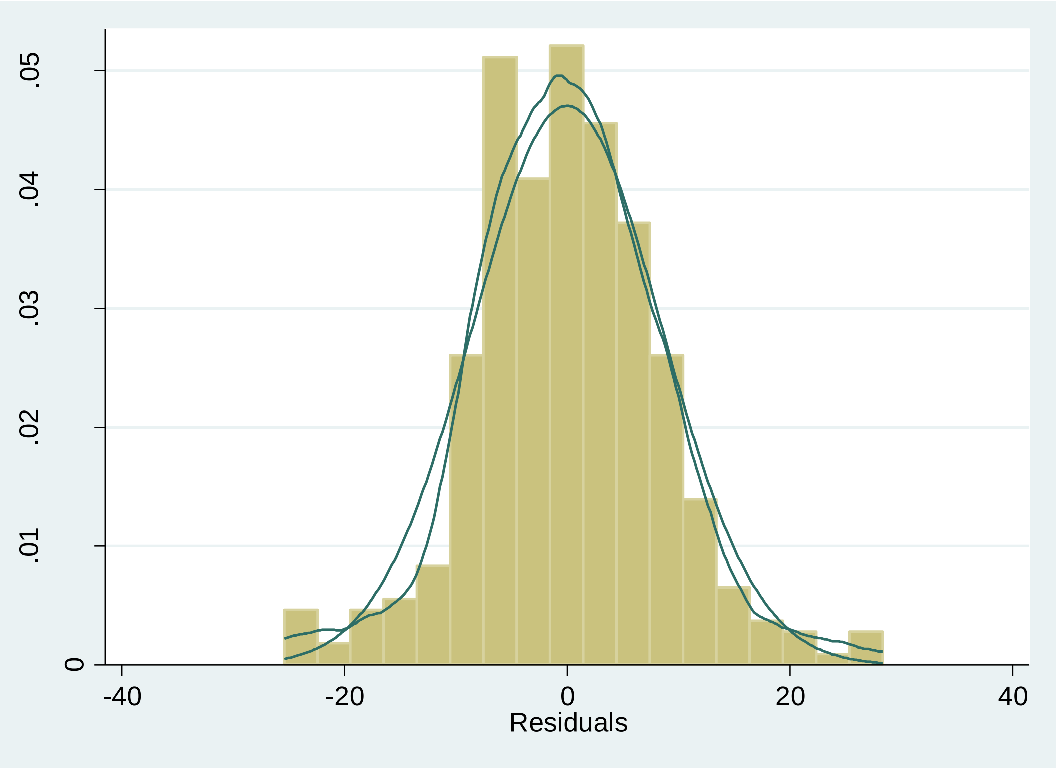

Figure 1: Histogram of the residuals

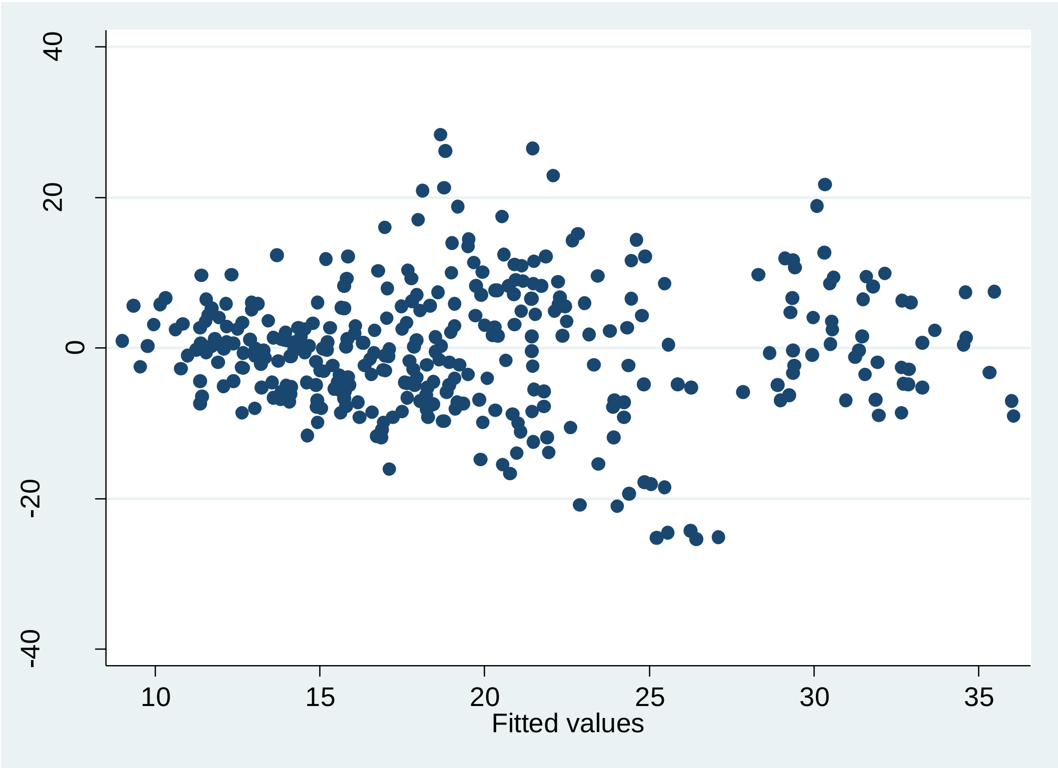

Figure 2: Residual-versus-fitted plot

Table 7: Test on heteroskedasticity

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
H_0: constant variance Variables: fitted values for buyout activity chi2(1)= 20.65 Prob > chi2 = 0.0000

Table 8: VIF

VIF calculates the centered or uncentered variance inflation factors for the independent variables specified in a linear regression model. If the VIFs are above the rule of thumb (4), the factor indicates serious multicollinearity problems (O'brien, 2007).

	VIF	1/VIF
HY Spread	2.36	0.423581
EBITDA Spread	1.94	0.514865
$\hat{r}pOLS$	1.86	0.537384
GDP Growth	1.81	0.553913
Mean VIF	1.99	

Figure 3: Development of the risk-free rate

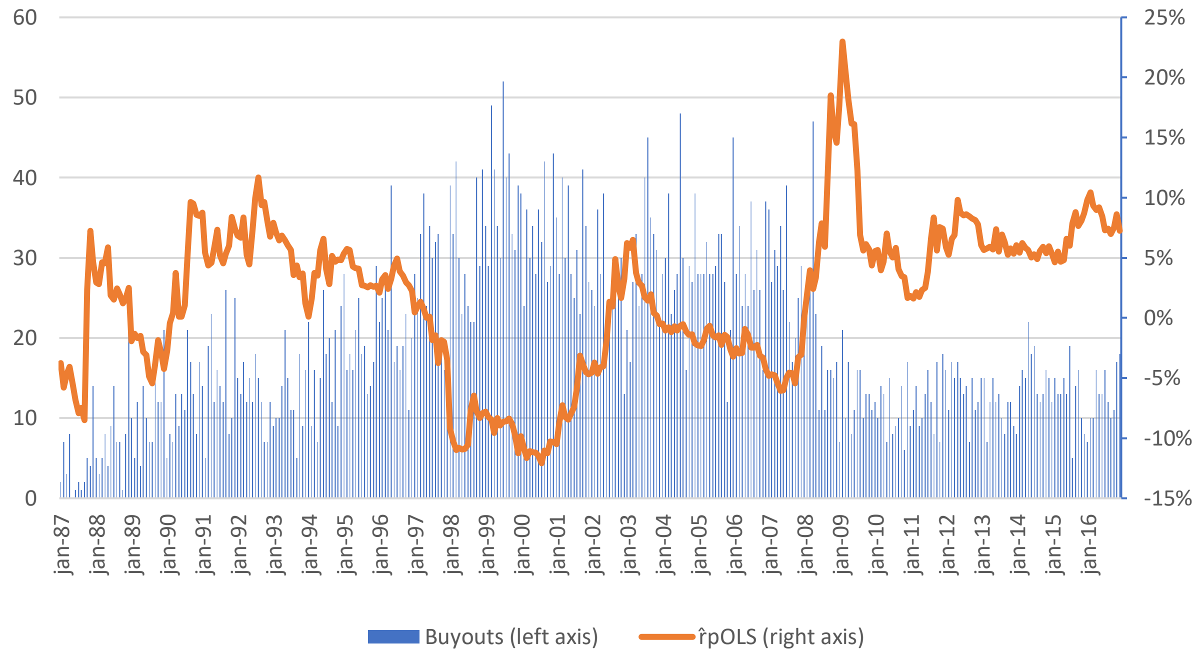

Figure 4: $\hat{rp}_{OLS}$ *and buyout activity per month*

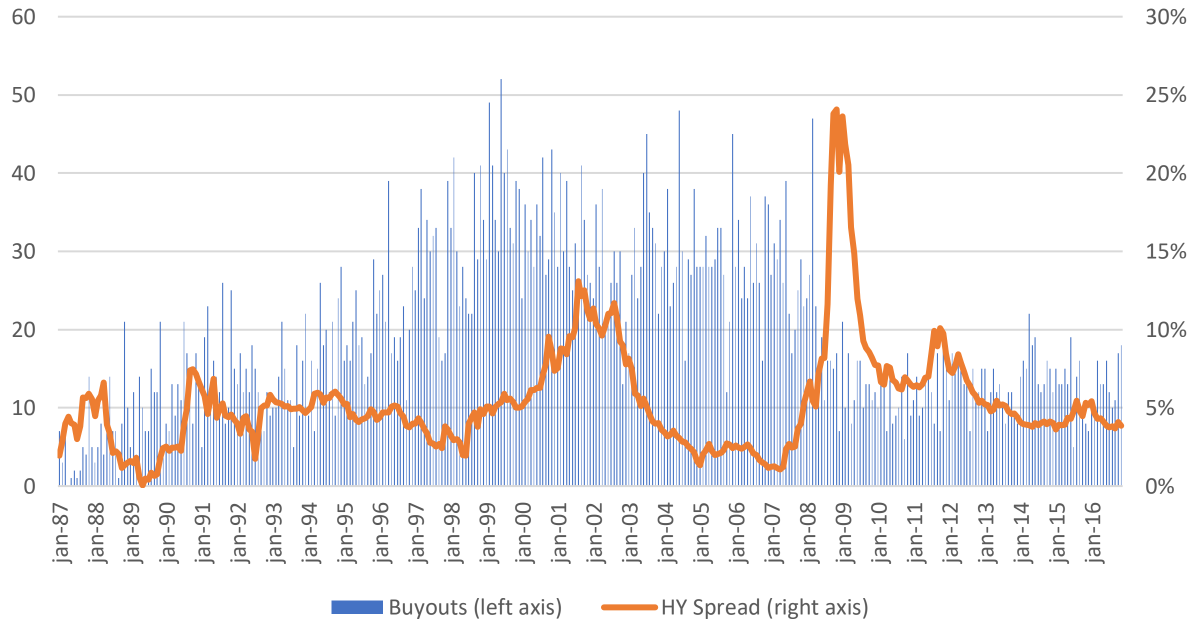

Figure 5: HY Spread and buyout activity per month

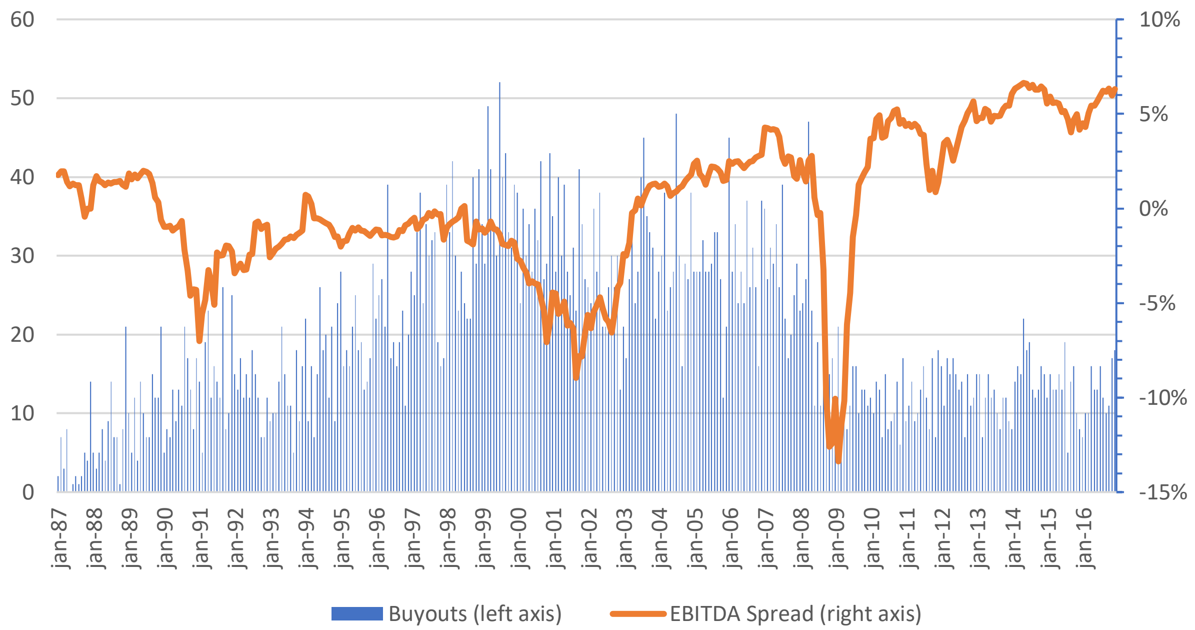

Figure 6: EBITDA Spread and buyout activity per month