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CREDIT RATINGS IN THE PRIVATE EQUITY INDUSTRY

A STUDY OF TIMING EFFECTS AND IMPACT OF PRIVATE EQUITY SPONSOR OWNERSHIP ON CREDIT RATINGS

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ABSTRACT

This paper provides insight into the credit rating agencies' methodology for rating the senior debt used to finance leverage buy-out transactions. In particular, the study focuses on examining if the initial credit ratings of leverage buy-out are influenced by the financial strategies and reputation of the private equity sponsor managing the deal. We also examine whether ratings are impacted by the state of the business cycle around the transaction close date. Two independent samples are examined: the first consisting of credit ratings issued by Moody's between 1997 and 2008 and the second consisting of credit ratings issued by Standard & Poor's between 1994 and 2008. Using three different specifications of a probit regression model, we find evidence that the private equity sponsor's financial strategies do impact their portfolio companies' credit ratings issued by Moody's while the evidence for Standard & Poor's ratings is weak. We find no significant impact for the sponsor's reputation on the credit ratings for neither Moody's nor Standard & Poor's ratings. A fourth specification of a probit regression model examining the impact of the state of the business cycle on the credit ratings yields evidence that credit ratings of leverage buy-out debt is countercyclical: in economic upswings lower ratings are generally observed. This finding contradicts results from studies on credit ratings of US firms, which have found that initial credit ratings and investment grade credit ratings exhibit excessive procyclicality.

Key words: Credit rating, leverage buy-out, private equity, ownership, financial strategy, reputation, timing

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1. Introduction

Since the outbreak of the subprime crisis in mid 2007, credit rating agencies have been under increased public scrutiny. At the center of the criticism stands the lack of transparency regarding rating methodologies, deficient regulatory oversight and the apparent conflict of interest arising from the business model in which the debt issuer pays for the rating. Private equity sponsors have also been debated in the media lately. The vast increase of private equity sponsored companies' credit defaults, the sponsors' limited exit possibilities due to a depressed initial public offering (IPO) market and bank lending constraints have made people speculate in the death of private equity as an investment form (e.g. Creswell, 2008; Spenser, 2009).

Up until the start of the financial crisis in mid 2007, the private equity industry had experienced decades of tremendous growth and become a dominant force in the merger and acquisition market. Leverage buy-outs, where the leverage of the target firm is substantially increased, became the leading form of the private equity sponsors' takeover activities (Kaplan & Strömberg, 2009). Over the past 10 years, the targeted average debt-to-equity ratio in leverage buy-out transactions has increased (Axelson et al., 2008). According to basic financial theory, the financial risk of an entity increases when debt levels rise. Financial risk and sequentially debt levels are important parameters considered by the credit rating agencies in their rating assignment process (Standard & Poor's, 2008). The credit rating assigned to a leverage buy-out transaction is of great importance to the private equity sponsors as the credit rating impacts the return required by lenders, i.e. the interest rate on the debt instrument. Since the level of debt in a leverage buy-out transaction is high, the slightest change in interest rates results in a significantly higher interest expense. Differences in financial strategies across sponsors as well as reputation of the private equity sponsor could potentially impact ratings assigned. In turn, this might lead to differences in lending terms depending on the sponsor managing the transaction.

Credit rating agencies claim to apply a "through-the-cycle" rating approach suggesting that ratings should be insensitive to changes in the state of the business cycle. However, previous studies on US firms have shown that initial ratings and investment grade ratings are overly sensitive to fluctuations in the business cycle (Amato & Furfine, 2004). The credit rating of the debt used in leverage buy-out transactions is always an initial rating. In addition, the amount of completed leverage buy-outs is cyclical with more transactions carried out during boom periods when macroeconomic factors and credit markets are favorable.

The aim of this thesis is to provide further insight into the credit rating agencies' methodology for rating debt issues of private equity sponsors' portfolio companies. In particular, we focus on studying whether the private equity sponsors' financial strategies and reputation have an impact on the initial credit rating assigned to the senior debt used to finance a leverage buy-out transaction. Additionally, we examine if the

rating assigned is sensitive to the state of the business cycle at the transaction closing date. The purpose of this thesis can be summarized by the following research questions:

Are the initial credit ratings of leverage buy-out transactions influenced by the financial strategies and/or reputation of the private equity sponsor managing the transaction?

Are initial credit ratings of leverage buy-out transactions cyclical?

To our knowledge, no previous research has been carried out on the private equity sponsors' impact on the credit rating of their portfolio companies. As previously mentioned, studies on the existence of a timing effect incorporated in ratings have been carried out on samples of US firms. However, limiting the sample to ratings of leverage buy-out transactions is, to our knowledge, unique.

1.1 Outline

In Chapter 2 of this thesis, the basics of credit ratings and credit rating agencies are described. Chapter 3 presents the private equity industry briefly. The theoretical foundation, including an overview of private equity sponsor characteristics and previous research on the cyclicity of credit ratings is presented in Chapter 4. Chapter 5 describes the data collection process and the characteristics of our sample data. The methodology is presented in Chapter 6 and the results from the specified models are presented in Chapter 7. Chapter 8 provides a discussion of the robustness of our results and Chapter 9 features a discussion of the results. In Chapter 10 our conclusion is presented and Chapter 11 provides suggestions for further research.

2. Credit Ratings

A credit rating is an opinion on the general creditworthiness of a debt issuer or the debt issuer's creditworthiness for a specific debt security issue. The credit ratings are based on relevant risk factors and predictions of potential credit losses due to the obligor's delays in payments or default on its liabilities. A credit rating is not to be seen as an investment advice whether to purchase, sell or hold a financial obligation (Standard & Poor's, 2008). The ultimate goal of the credit rating agencies is to provide a through-the-cycle rating, i.e. a credit rating that is insensitive to short term fluctuations in the business cycle. Hence, credit ratings aim at measuring long term default risk and therefore experience a large degree of rigidity.

Moody's Investor Services (Moody's) and Standard & Poor's are the two agencies dominating the market for credit rating services. As a percentage of total industry revenue, Moody's and Standard & Poor's enjoy market shares of approximately 40% each. An additional credit rating agency, Fitch Investor Service which has a market share of 14% is also a significant player but can by no means be regarded as having a market position equal to the two market leaders.

For Moody's, the long-term credit ratings assigned in descending order of credit quality are: Aaa, Aa, A, Baa, Ba, B, Caa, Ca, C and D. Ratings from "Aa" to "Caa" is assigned a 1, 2 or 3 to show the relative standing within the major rating categories, where 1 is the highest standing (Moody's Investor Services, 2009). For Standard & Poor's the equivalent rating scale is: AAA, AA, A, BBB, BB, B, CCC, CC, C and D. Ratings from "AA" to "CC" may be modified by the addition of a plus (+) or minus (-) to indicate if the issuer or debt issue is at the upper or lower end of the rating category (Standard & Poor's, 2008). For both credit rating agencies, the rating D is assigned when the issuer is in default on its payment of interest or principal. An issuer or bond issue with a rating below Baa3 or BBB- is known as non-investment grade or junk bond, indicating its speculative status and substantial credit risks (Blume et al., 1998).

Over the years, the ratings of Moody's and Standard & Poor's have achieved wide acceptance as easy-to-use tools for assessing and differentiating credit quality. For the rating mechanism to work, it is crucial that credit rating agencies are judged as reliable and credible by the market. The agencies rely on their reputation and must be perceived as an objective source of information. This has become increasingly questioned in later years. Since the outbreak of the subprime crisis rating agencies have come under scrutiny after it was revealed that false rating standards intentionally were applied to subprime collateral debt obligations (CDOs) in order for them to achieve the highest credit rating (Financial Times, 2007).

3. The Private Equity Industry

The private equity industry emerged in the late 1940s and started to grow extensively during the 80s as leveraged buy-outs increased in popularity. The total amount of capital invested by private equity firms during a year peaked in 2007, as the value of the global industry exceeded USD 800 billion (Kaplan & Strömberg, 2009).

The private equity industry consists of two main investment clusters: venture capital and leverage buy-outs (Kaplan & Strömberg, 2009). In connection to the start-up of a company funding is needed for activities such as setting up the business, product development and initial manufacturing and marketing efforts (Jaffe et al., 2008), which is where venture capital plays an important role (Kaplan & Strömberg, 2009). When companies reach a mature stage and produce stable cash-flows, the need for financing changes as companies seek to expand or restructure (Jaffe et al., 2008). At this stage, funding can be provided through leverage buy-outs financed by private equity sponsors who are interested in extracting value from underperforming businesses (Gadiesh & Ormiston, 2002). This study will focus on the leverage buy-out cluster since use of leverage is a prerequisite for credit ratings. A typical leverage buy-out transaction is financed using 60 to 90 percent of debt. Venture capital deals, on the other hand, are mostly funded with equity and are therefore not of interest to our study (Kaplan and Strömberg, 2009).

Since the boom of leverage buy-outs in the 1980s, the number of transactions and total value of the industry has fluctuated over the years. In fact, Gompers and Lerner (2004) have found that the private equity industry and the leverage buy-out market in particular is procyclical, i.e. follows the development of the general economy.

In addition to the fluctuations in the amount of transactions, leverage buy-out characteristics have also transformed since the 1980s. At the inception, large buy-outs, often public-to-private deals, dominated. In the 90s secondary buy-outs became popular and the industry switched towards mid-size buy-outs. Lately, both public-to-private transactions and secondary buy-outs have become more and more common within the industry (Kaplan & Strömberg, 2009). Further, the investment focus in the industry follows trends (National Venture Capital Association, 2009).

3.1 Private Equity Sponsors

A private equity sponsor is an investment firm which raises money from institutional investors and wealthy individuals, mainly to invest in leverage buy-outs. Once the fund-raising is completed the private equity sponsor is responsible for finding investment opportunities and managing the fund of raised capital. On average, a private equity fund matures over 10 years and during the commitment period the first three to five years the sponsor identifies and invests in target firms where it sees growth and improvement potential (Kaplan & Strömberg, 2009). As the fund matures, it is possible that early investments are divested and new targets identified. This is exemplified by the fact that the average

holding period for buy-outs is slightly more than 3 years¹ (Sudarsanam and Nwaghodoh, 2005). When the fund expires, the initial capital provided as well as the return on investments is distributed to the investors. However, carried interest which normally amounts to 20 percent of the return is first charged by the private equity sponsor. Additionally, the private equity sponsors also charge an annual management fee of 1-2 percent of committed capital or capital employed (Kaplan & Strömberg, 2009).

¹ The study is based on a sample of 104 UK leverage buy-outs exited by the sponsors between January 1998 and June 2004.

4. Theoretical Foundation and Hypotheses

In this chapter the theoretical foundation is presented in order to clarify the relevance of our research questions. Firstly, a description of the characteristics of private equity sponsors is provided. Secondly, different theories on timing and their implications for ratings assigned to sponsor owned firms are discussed. At the end of each section our hypotheses are presented.

4.1 Characteristics of Private Equity Sponsors

To investigate whether private equity sponsors impact the credit ratings of their portfolio companies differently, it is required that there is heterogeneity across sponsors and that their individual characteristics are considered in the rating process.

Regarding the requirement of heterogeneity, it was mentioned in Chapter 3 that there are differences in the characteristics of private equity sponsors. Many sponsors nowadays have a particular investment focus specializing in acquisitions within certain industries. Further, the private equity industry first emerged in the United States, but in the 1990s, many firms started to establish in Europe and lately also in Asia (National Venture Capital Association, 2009). Differences in industry focus and country of origin are easily observable and can be evaluated separately in the rating process. As opposed to these characteristics, there are also other factors which are more difficult to assess objectively but still might impact the default risk of a leverage buy-out transaction. One such factor is the reputation of the private equity sponsor. Kaplan and Schoar (2005) find that high reputation sponsors show better investment performance and that this performance is persistent over time. However, in a special comment report by Moody's, senior credit analysts comment on the findings of Kaplan Schoar (2005) and question whether there actually is sufficient evidence to prove that higher returns provided by some private equity sponsors are driven by strong management teams (Padgett, 2007). Demiroglu and James (2007) conclude that high reputation private equity sponsors have a positive impact on the lender's perception of credit risk which lowers their cost for leverage buy-out borrowings. Since lenders perceive credit risk to be lower if the private equity sponsor is reputable, we find it interesting to investigate whether credit rating agencies share this view in their credit rating assignment. In addition, Diamond (1989) argues that the present value of rents from a good credit market reputation is significantly higher for firms with successful track records and that it is this that deters these firms from shifting risk to the detriment of lenders through risky projects. This provides another argument for why reputation could be taken into account in the credit rating process. In summary, theory about the private equity sponsor's reputational impact on returns and perceived credit risk suggest that an ownership effect might be incorporated in the portfolio companies' credit ratings arising from the reputation of the private equity sponsor.

In 2008, Moody's released a special report revealing that the rating agency monitors the financial policies of a number of private equity sponsors (Rogers, 2008). The report examines the financial strategies of the

14 largest private equity sponsors in deals closed between 2002 and 2007. The report finds differences in the aggressiveness of financial strategies among sponsors. For instance, sponsors differ in their propensity to pay out dividends from their portfolio companies. In addition, some sponsors are also keener on adding new financing for the purpose of additional acquisitions within existing portfolio companies (Rogers, 2008). Such activities could have a great impact on the financial standing of the portfolio company and it is therefore possible that credit rating agencies factor the historical financial strategies of the private equity sponsor into the credit rating assignment of the sponsors' following leverage buy-out transactions. In conclusion, an ownership effect might be incorporated in the portfolio companies' credit ratings arising from the aggressiveness of the sponsors' financial strategy.

Based on our discussion above we define one main hypothesis and two sub-hypothesis regarding sponsor ownership:

Hypothesis 1: *Credit ratings of private equity controlled firms are significantly influenced by the characteristics of the private equity sponsor*

Hypothesis 1.1: *Credit ratings of private equity controlled firms are significantly influenced by the reputation of the private equity sponsor*

Hypothesis 1.2: *Credit ratings of private equity controlled firms are significantly influenced by the financial strategy of the private equity sponsor*

4.2 Timing

Financial activity, including new bond issues and total bank lending, is higher during economic booms than during downturns. In upturns, high growth levels lead to higher values of collateral which loosens credit constraints and makes debt financing more easily accessible. Further, financial market participants behave as if risk is countercyclical, i.e. the risk is at its highest during economic downturns (Amato & Furfine, 2004). In this section, the timing effect of credit ratings in private equity transactions is discussed. In particular, arguments for a timing effect in excess of the effects caused by firm specific factors, such as fluctuating sales and margins, are highlighted. Arguments supporting both a procyclical timing effect, i.e. higher credit ratings during economic upturns, as well as a countercyclical timing effect are presented.

4.2.1 Procyclicity

Overall, leverage buy-out activity seems to follow the pattern of general economic and financial activity. When conditions on the credit markets are favorable and bank loan standards are lax, more leveraged buy-outs are carried out (Gompers & Lerner, 2004). Hence, private equity sponsors take advantage of mispricing in debt and equity markets to arbitrage from periods when the cost of debt is low compared to the cost of equity (Kaplan & Strömberg, 2009). Since financial market participants behave as if risk is countercyclical, one could also expect rating agencies to be more stringent during bust periods, when market conditions are weak. Thus, a transaction completed in a bust period could receive a lower rating

than an identical transaction carried out in an upturn because rating agencies are stricter in their rating assignment during such periods. In the same manner as for bank loan standards, one could expect private equity sponsors to choose to issue debt in periods when rating standards are lax if the rating assigned is of importance to them. The fact that sponsors complete more deals and issue more debt during upturns could consequently also be an effect of credit rating standards being less stringent during such periods. However, the credit rating agencies claim that they apply a “through-the-cycle” approach to ratings of debt and debt issuers, implying that temporary fluctuations in economic conditions should have little impact on ratings (Standard & Poor’s, 2008).

Several studies have investigated whether a “through-the-cycle” approach actually is applied by examining the cyclicity of credit rating standards. Amato and Furfine (2004) investigate whether ratings are excessively procyclical using a sample of US firms rated by Standard & Poor’s between 1981 and 2001. When testing whether the state of the US economy is a determinant of firm credit ratings after taking firm-specific factors into account, they find no evidence that credit ratings are excessively influenced by the business cycle. However, when the sample is restricted to investment grade firms, rating changes or initial ratings, evidence of procyclicality is found. Cantor and Mann (2003) use a sample of 83 years of US rating data provided by Moody’s and reach the conclusion that ratings do show evidence of procyclicality. Blume et al. (1998) report a tightening of rating agency standards between 1978 and 1995. More recent research further shows that between 1995 and 2006, rating agencies have become more generous in their assessment, i.e. assigned better ratings, which is likely to be due to increased competition from Fitch Ratings² (Becker & Milbourn, 2008).

To summarize, both Cantor and Mann (2003) and Amato and Furfine (2004) find a procyclical pattern, although the latter study is restricted to investment grade firms, rating changes and initial ratings. Considering that leverage buy-out transactions are assigned new ratings, our samples only consist of initial ratings. The empirical evidence presented above therefore suggests a positive timing effect for the credit ratings. Further support for a positive relationship between market conditions and credit ratings is provided by the fact that our sample is dominated by speculative grade firms, which are more sensitive to negative fluctuations in the business cycle. Although the rating agencies claim to look through the cycle, Standard & Poor’s admits that in situations with very low credit quality, cyclical fluctuations usually lead to rating changes (Standard & Poor’s, 2008). This might however be an effect caused by actual changes in firm specific factors, which actually increase the default risk, and is therefore not an argument supporting an excessive timing effect.

² Up until 1997, the rating industry was controlled by a duopoly between Standard & Poor’s and Moody’s. In 1997, Fitch Ratings started to increase its market share after being acquired by the French investor Fimalac. Becker and Milbourn claim that since the debt issuer pays for the rating service, increased competition led to rating agencies becoming friendlier when assigning ratings.

4.2.2 Countercyclicality

In contrast to the empirical findings presented in the previous section, there is also evidence suggesting that credit ratings of leverage buy-out transactions could follow a countercyclical pattern. Kaplan and Schoar (2005) find that private equity funds raised in upturns underperform funds raised in downturns. A fund's return is based on the performance of the portfolio companies which implies that companies held by funds raised in a downturn on average perform better than those owned by funds issued in an upturn. If we assume that the capital raised during a downturn also is used to acquire companies during the same period, an explanation for the better performance could be that limited access to capital during downturns reduces overinvestment. Since leverage buy-outs are highly levered and debt financing is constrained during downturns, only the best, least risky, investments will be funded. Hence, underinvestment might prevail due to stringent bank loan standards. In upturns, on the other hand, a pattern of overinvestment is observed (Kaplan & Strömberg, 2009). In order to explain why private equity sponsors undertake unprofitable projects in upturns, Axelson et al. (2008) argue that private equity sponsors hold an option-like stake in funds, suffering no loss from unsuccessful projects. Since there is no downside risk for the private equity sponsor, it has an incentive to undertake high risk projects since volatility increases the value of an option. Axelson et al. (2008) further find that debt in leverage buy-out transactions is driven by bank loan standards and implicitly the business cycle. Borrowings in public companies, on the other hand, are driven by other factors (Axelson et al., 2008). Based on this finding, one could suspect that the pattern of overinvestment during upturns is more common in leverage buy-outs. If credit rating agencies factor in that performance of leverage buy-out funds are better during bust periods, and if they consider this to impact the risk in excess of the firm's specific risk profile, there should be a negative timing effect on credit ratings assigned to leverage buy-out transactions.

4.2.3 Timing Hypothesis

Stating a hypothesis based on the discussion regarding pro- and countercyclicality in the previous section is an ambiguous task. Nevertheless, previous research, which argues for a positive timing effect, has included all rated US firms, whereas the argumentation for a negative effect is specific to private equity transactions. Since our data sample is limited to leverage buy-outs, we base our hypothesis on the countercyclical theory. Hence, the hypothesis regarding timing effects is:

Hypothesis II: *Credit ratings of private equity controlled firms follow an excessively countercyclical pattern, i.e. higher ratings are assigned in economic downturns*

5. Data Collection

The data for this study has been obtained from a number of different sources. We first want to thank our tutor, Ulf Axelson at the Swedish Institute for Financial Research (SIFR), for providing a dataset comprising information on approximately 6,000 private equity transactions between 1988 and 2008. We also received the original sources to parts of the dataset, namely transaction documentation from Dealscan/Reuters Loan Pricing Corporation (LPC). The information extracted from the dataset include transaction details such as firm name, private equity sponsor, transaction date, enterprise value at transaction date and Fama French industry. Further, the dataset provided the total debt amount and tranche details which were needed to calculate the implied interest cost. After excluding transactions with missing values, 1,050 of the 6,000 initial transactions remained. The original transaction documentation from LPC included data on the credit ratings and for each tranche of the debt of the transactions remaining of the initial sample, this data was collected. Approximately 40% were rated by Moody's and/or Standard & Poor's and after eliminating a few transactions due to inconsistent tranche ratings, the sample consisted of 392 observations.

In addition to the data extracted from the dataset and the LPC files, we also needed the sales and EBITDA figures closest to the completion date of each transaction. The LPC documents included this information, but when cross-checking against company filings, these figures in many cases turned out to be inaccurate. Therefore, annual sales and EBITDA figures for the financial year ended prior to the transactions were collected from annual reports, SEC filings and in a few cases databases such as Bureau van Dijk's Orbis and Factiva. Transactions where no data was available in these categories were excluded, which resulted in a sample consisting of 315 transactions, whereof 259 had a credit rating from Moody's and 292 a rating from Standard & Poor's.

Data to investigate the ownership effect was provided by the Private Equity International (a buy-out magazine) and Moody's. To examine the timing effect a number of statistics were collected like quarterly GDP growth from OECD and daily returns of the S&P500 from Datastream. A recession indicator from the National Bureau of Economic Research (NBER) and credit default rates by Moody's were downloaded. Additional information such as exchange rates, yearly inflation and consumer price index (CPI) were obtained from IMF. LIBOR and EURIBOR were downloaded from the homepage of the British Bankers' Association and the European Banking Federation respectively. Annual industry specific beta values were obtained from NYU Stern.

5.1 Data Descriptives

Since the sample data include transactions rated by two different credit rating agencies our analysis will be performed using two samples. The descriptive statistics below will be presented for the Moody's sample followed by the figures for the Standard & Poor's sample within brackets.

Combining the transactions rated by Moody's and Standard & Poor's, there are in total 78 different private equity sponsors in the sample. The private equity sponsor with the largest number of transactions is Kohlberg Kravis Roberts (KKR) which has completed 22 rated transactions. In contrast to KKR, there are also a number of sponsors with few completed transactions over the sample period. Since it will be hard to find a significant relationship between the credit rating and individual sponsors with few transactions, sponsors with less than 4 transactions were eliminated. Transactions in the banking and insurance business were also excluded since they usually are evaluated on other rating criteria. In total, 79 transactions in the Moody's sample were eliminated resulting in a final sample consisting of 180 transactions carried out by 25 different private equity sponsors. Similarly, in the Standard & Poor's sample 83 transactions were excluded leaving a total sample of 209 transactions divided between 27 sponsors. Table I in the Appendix presents a list over the private equity sponsors and the number of transactions completed by each sponsor.

Table II provides an overview of the number of transactions in each rating class over the sample period, which ranges between 1997 and 2008 (1994 and 2008) for the Moody's (Standard & Poor's) sample. Leverage buy-outs are dependent on high debt levels and should therefore, intuitively, receive lower ratings than non private equity backed firms. Comparing our data to the sample of Amato and Furfine (2004) who investigate credit ratings of 10,144 firms rated by Standard & Poor's, confirms this suspicion. 54% of their transactions belong to the rating categories between A and BBB. In our sample the most common rating category is B1/B2 (B+) thus, much lower than for the firms analyzed by Amato and Furfine. In addition to the number of transactions in each rating category, Table II also shows the division of transactions over time. Since the leverage buy-out market has grown tremendously over the last two decades, transactions before year 2000 only amount to 12% (17%) of the total sample. After year 2000, the number of transactions in the sample more or less increase year-on-year until 2007. The last transaction is completed in April 2008, which is why there are few transactions during this year.

Another characteristic of the sample is that the vast majority of the deals are carried out in the US, and prior to year 2000 the sample includes no non-US transactions. Further, the non-US deals are dominated by a few countries of origin, namely Canada, UK, Germany, France and the Netherlands.

In contrast to the limited geographical distribution, there are 18 different industries in the sample. 13.3% (13.9%) of the portfolio companies operate within healthcare and pharmaceutical products, 13.3% (9.6%) in the retail and restaurants industry and 9.4% (9.1%) in the service industry (see Table III). The average transaction size measured as enterprise value is USD 2.99 billion (USD 2.71 billion) (see Table IV). However, there is a large discrepancy between different years in the sample and average size seems to increase exponentially over time.

6. Methodology

In order to test whether credit ratings of leverage buy-out transactions are influenced by the reputation and financial strategy of the private equity sponsor and if there is a timing effect, we use an ordered probit model. An ordinary least square regression model is not applicable since using credit ratings as dependent variable would not yield BLUE (best linear unbiased estimator) estimators (Stock & Watson, 2003). One of the assumptions that has to be fulfilled for the OLS to yield BLUE estimators is that the dependent variable is continuous. Since credit ratings only take certain, discrete values this assumption is not fulfilled. Instead, a maximum likelihood estimation using a probit model is selected (Borooah, 2001).

Credit ratings are by nature discrete and ordered where Aaa (Moody's) or AAA (Standard & Poor's) represent the highest ranking on the scale and C corresponds to the lowest. Throughout this paper we will use two different classifications of the rating categories. Both classifications will be based on methods where the ratings are inherently ordered, by which the outcome associated with a better rating is assigned a higher value. The first method will give each rating category a numerical value, which results in a scale with numbers from 1 to 21. For the second method, we cluster the rating categories in order to lower the number of possible outcomes of the dependent variable. Instead of 21 categories, this method results in 9 different ratings classes. An overview of the different rating scales is found in Table V.

The ordered probit model is specified as follows. The dependent rating variable, R_i , take discrete values from 1 to 21 or 1 to 9 (recall discussion above). Further, an unobservable, continuous, variable, Z_i , organizes the values of the explanatory variables X_{ik} where $k=1, \dots, K$, into R_i . The values and categorization of R_i into the numerical values of 1-21 (1-9) is implicitly based on the values of the unobservable variable, Z_i , in conjunction with a number of threshold values. Z_i is a linear function of the explanatory variables and thus, the model can be described by the following equation:

$$Z_i = \sum_{k=1}^K \beta_k X_{ik} + \varepsilon_i \quad (\text{Equation 1})$$

To link the values of Z_i to the ratings variable R_i , the following threshold values are specified for the model with 21 rating categories:

$$R_{it} = \begin{cases} 1 & \text{if } Z_i(-\infty; \delta_1) \\ r & \text{if } Z_i(\delta_{r-1}; \delta_r) \\ 21 & \text{if } Z_i(\delta_{20}; \infty) \end{cases} \quad r = 2, 3 \dots 20 \quad (\text{Equation 2})$$

The estimated credit rating for each transaction in the sample depends on within which threshold the estimated Z -value for that specific transaction falls.

6.1 Variables

6.1.1 Dependent Variable

The initial credit rating on the senior debt of private equity controlled firms is used as the dependent variable. Previous studies investigating the determinants of credit ratings have used issuer rating, i.e. the overall firm rating (Blume et al., 1998; Amato & Furfine, 2004) instead of senior debt rating. This approach is however not applicable to our sample since most of the firms owned by private equity sponsors are not assigned an issuer rating. As the capital structure is remodeled in a leverage buy-out transaction and the new debt issued constitutes the total post transaction debt in the company, we consider the rating of senior debt to be a fair approximation of the overall default risk of the company. However, there is a concern regarding using senior debt credit ratings since private equity sponsors might actively tailor the company's capital structure in order to achieve a certain rating. Hence, the credit rating might to some extent be "chosen" by the private equity sponsor. A further discussion of this concern is provided in Chapter 8.2.

6.1.2 Explanatory Variables

To test our hypotheses a number of ownership and timing variables are specified. **Ownership** is firstly tested using individual sponsor dummy variables. Our hypothesis is that the private equity sponsor does influence the credit rating of its portfolio companies but whether the effect is positive or negative depends on the specific sponsor. Secondly, to test our first ownership sub-hypothesis and examine whether there is a positive effect of the private equity sponsor's reputation on credit ratings we exclude the sponsor dummies and include a single variable measuring reputation. As a proxy for reputation we use the total amount of capital investors have committed to the private equity sponsor since its establishment. We consider this to be a fair measure of reputation since repeatedly raising large amounts of capital from pension funds, financial institutions and high net worth individuals indisputably requires trustworthiness, integrity and a good reputation. Further, other studies (e.g. Gompers & Lerner, 2004; Kaplan & Schoar, 2005) use fund size as a measure of experience and reputation of the private equity sponsors. Since information about committed capital at the fund level is unavailable to us, we use an aggregate value of committed capital for each private equity sponsor provided by the buy-out magazine Private Equity International. Further comfort that committed capital is an appropriate proxy for reputation is provided by a study by Demiroglu and James (2007) who use the number of buy-out transactions completed as a measure of reputation and conclude that this measure is correlated to aggregated committed capital of the private equity sponsor. To investigate our second sub-hypothesis for ownership, if credit ratings of private equity controlled firms are influenced by the financial strategy of the private equity sponsor, a new variable is estimated. This variable consists of an index measuring the quality of the private equity sponsors' financial strategies based on data provided by Moody's. High values of the financial strategy quality index should result in better ratings which is why a positive sign of this variable is expected (see Table XIX in the Appendix for more information on the components and

calculation of the financial strategy quality index). Further, we disaggregate the financial strategy quality index into its different components (dividends within one year, large dividends, additional financing, downgrades and sale or IPO within three years) and run these variables in separate regression models in order to estimate each factors' impact on the credit rating. Lastly, to gain insight into each private equity sponsor's individual impact on the portfolio companies' credit ratings we again use dummies. This time the dummy variables are included one by one in separate regression models.

Timing is investigated with a number of different variables in separate models. Firstly, the cyclicity of the overall market is measured with the S&P500 market index. We use the return over three months since it reflects the current state of the economy at the same time as the period is long enough to exclude temporary movements. The second variable used to proxy market timing is the quarterly GDP growth during the quarter the transaction was closed. Just as the market index, this is a measure of the state of the economy but the reaction to changes on the market might differ in timing and magnitude. We use the US GDP growth since the vast majority of the firms in the sample operate in the US. Following the approach of Amato and Furfine (2004), a recession index provided by NBER is included as a third measure of timing. Recessions tend to be short-lived but have large impacts on the economic development. Hence, it might be that recessions have a more pronounced impact on credit ratings (Amato and Furfine, 2004). NBER's definition of a recession is based on a number of parameters such as personal income, industrial production, sales and employment (NBER, 2009). The recession index variable is set to -1 when a transaction is completed during a NBER defined recession and to 0 otherwise. Lastly, default rate data provided by Moody's is used to approximate the market timing. The data includes yearly default rates for speculative grade firms (most private equity deals are rated in this category, see Table II). Default rates increase rapidly during recessions, but in contrast to the recession index this variable is not binomial and therefore captures the magnitude of expansions. Considering our timing hypothesis (see Section 4.2.3) we expect a negative sign for all timing variables except for the default rate index which is specified oppositely and therefore is expected to be positive.

6.1.3 Control Variables

A number of control variables are included in the regression model to ensure that the explanatory variables are correctly specified. Both Moody's and Standard & Poor's state 11 key ratios considered in the analysis of general creditworthiness. These ratios include measures of interest coverage, total debt and profitability (Tennant, 2007; Standard & Poor's, 2008). Standard & Poor's also divide the rating criteria into financial and business risk factors. The financial risk factors assess the capital structure and financial ratios of the firm whereas the business risk take the country and industry specific risks into account as well as market position and overall strategy (Standard & Poor's, 2008). Our control variables consist of the most influential key ratios which could interfere with the timing or ownership variables. The following control variables have been selected:

The **Size** of the leverage buy-out transaction is incorporated as a control variable since it could interfere with both the ownership and timing variables. The largest sponsors, with big funds, are more likely to perform large buy-outs than newly established, small sponsors. Several studies have found that there is a positive relationship between credit ratings and firm size (Blume et al., 1998; Amato and Furfine, 2004). Hence, if size is a determining factor of credit ratings in leverage buy-outs, excluding this variable could yield results suggesting that larger sponsors get better ratings although it merely depends on the size of the target firms. Further, the size of portfolio companies varies with the trends of buy-out characteristics which could interfere with the timing effect. Firm size is measured as enterprise value inflated to the base year 2008 by the consumer price index of the particular country. Since several previous studies show that there is a positive correlation between size and credit ratings, the coefficient is expected to be positive.

The debt level of the transactions is a crucial factor for the analysis of financial risk. During expansion periods, lending standards are usually more lax and leverage buy-out transactions more levered as a consequence (Axelson et al., 2008). By controlling for debt, fluctuations in debt levels are eliminated from the timing variable. The debt issued in the transaction is assumed to constitute the total debt obligation of the firm and the variable is defined as **total debt to enterprise value**. This variable is expected to be negatively correlated with credit ratings.

The **EBITDA margin** is an indicator of a firm's ability to generate cash and a high EBITDA margin signals that the firm is profitable and can meet its debt obligations. Fluctuations in the EBITDA margin might influence the timing variable if it coincides with boom and bust periods, which is likely if the firm operates in a cyclical industry. Higher levels of EBITDA margin should lead to better ratings; hence, a positive sign is expected.

Interest coverage, measured as interest cost divided by EBITDA, might fluctuate over time since the interest expense is likely to depend on changing economic conditions and interest rate movements. If the difference in EBITDA between boom and bust periods changes less than the interest cost, the interest coverage will follow a cyclical pattern. The control variable diminishes the risk that this effect impacts the timing variable. A positive sign of this variable is expected.

Including **industry betas** controls for industry specific risk factors which could impact private equity sponsors with certain investment focuses. Also, cyclicity in certain industries could distort the timing variable. The beta value for different industries is obtained from NYU Stern. These values are calculated using an average of five years monthly returns for approximately 6,000 publicly listed companies within 90 different industries. To unlever the values, an average debt to equity ratio by industry is applied (Hamada betas). The industries specified by NYU Stern do not fully comply with the Fama and French industry index which was available in the original dataset. To make sure that every transaction is placed within the correct industry, the accuracy of the Fama and French classification was checked when assigning industry betas. This resulted in approximately 30 industry re-classifications. Table III provides

an overview of the industries based on the Fama and French industry index after the re-classifications. Also, most of the industries have been grouped into wider categories, since the original Fama and French index is very specific, consisting of 49 industry categories. The industry beta variable is expected to have a negative coefficient since higher betas are associated with increased risk. An alternative to using betas values to measure industry specific risk could be to use dummies for each industry. This approach is however ruled out due to multicollinearity among the variables (see Section 6.2).

The **maturity** of debt is an indicator of the potential need for re-financing and could therefore have important implications for the credit rating. Since the total debt obligations of the firms in our sample consist of several tranches, the average maturity of the senior debt tranches is used as approximation for debt maturity. The sign of the coefficient is expected to be positive since re-financing risk decreases with longer maturities.

Country risk could be an important measure of business risk. However, in our sample the country rating equals AAA in all but four cases. Therefore, we do not include this variable in our models.

6.2 Implications of the Probit Model

Before estimating the probit model as specified by Equation 1, a few characteristics of the model need to be mentioned. Firstly, in an ordered probit model there is no natural interpretation of the magnitudes of the coefficients which makes it difficult to assess the impact of the explanatory variables on the dependent variable (Blume et al., 1998). However, to provide some insight to the relevance of the coefficients, the product of the estimated coefficient and the standard deviation of each explanatory variable can be calculated. This figure is to be interpreted as the change in conditional expectation of Z_i in response to a change of one standard deviation in the explanatory variable. In our estimations, this value has been calculated and can be found in the rightmost column in the regression tables in the Appendix. Secondly, the probit model produces a pseudo R^2 which, in contrast to in an ordinary OLS regression, cannot be used to assess the goodness of fit of the model unless it has perfect explanatory power ($R^2=1$) or no explanatory power at all ($R^2=0$). Instead, to examine the goodness of fit of our model, the actual credit ratings of individual transactions can be compared to the most probable ratings predicted by the model. As stated in Equation 2, each rating class is associated with a threshold and by determining in which threshold each transactions' Z-value falls we can determine the most probable rating.

One assumption of the probit model is that the variable Z (Equation 1) is a linear function of the explanatory variables. To make sure that our model is correctly specified we investigate the skewness of each variable. All variables show normal values for skewness except for the size variable. The reason for the skewness is that the mean size for the Moody's (Standard and Poor's) sample is 2.99 billion (2.71 billion) whereas the median is only 1.31 billion (1.10 billion). This implies that there are a few high values causing the skewness. In order to adjust for this inconsistency we take the logarithm of size.

Another requirement for the model to yield reliable results is that the explanatory variables are independent. To determine if any of the control variables are correlated, we use Pearson's product-moment correlation coefficient. This test shows that there is no significant correlation between any of the control variables. However, between the fund dummies, and also when including industry dummies there are a number of cases of moderate correlation. This is likely due to the fact that some funds have an investment focus targeting specific industries. To determine the severity of this correlation, we calculate the variance inflation factor (VIF) for each variable. This value expresses the number of times the variance of the parameter estimate is increased due to multicollinearity. In case of no multicollinearity VIF equals one (Gujarati, 2003). By calculating the VIF values based on a regression including all control variables and the fund dummies, we detect that several variables show sign of collinearity. To solve this problem the dummy variables with the highest VIF-value is dropped and the model is re-estimated. To eliminate the potential problem of heteroscedasticity, the model is estimated using robust standard errors. Lastly, we also adjust the sample for outliers that deviates more than two standard deviations from the mean of each variable. A few transactions are eliminated since their debt to enterprise value or enterprise to EBITDA values are defined as outliers. Maturities and interest coverage that are classified as outliers are replaced with the average value of the remaining observations.

7. Results

The results discussed below are based on identical regressions run on two independent data samples - one containing leverage buy-out transactions rated by Moody's and the other containing leverage buy-out transactions rated by Standard & Poor's. On both samples we run a number of regressions under different model specifications using the ordered probit regression model. The ownership and timing effects are examined in separate regression models. Detailed results from the regressions can be found in Tables VI-XIX in the Appendix.

7.1 Private Equity Sponsor Ownership

7.1.1 Model 1: General Sponsor Impact

The first probit model, which we will refer to as Model 1, tests whether credit ratings of private equity controlled firms are influenced by the private equity sponsor (Hypothesis 1). This model includes dummy variables for each of the private equity sponsors to assess the potential impact of individual sponsors. In order to isolate factors impacting the rating that do not derive from the characteristics of the private equity sponsor, the control variables presented in Section 6.1.3 are included. Since dummies are used to estimate the effect of the private equity sponsors one of the sponsor dummies needs to be dropped in order to avoid perfect collinearity or multicollinearity among the dummies. The sponsor dummy with the highest value inflated index (VIF) value is dropped as this indicates which of the variables is impacting multicollinearity the most. For both of our samples, this sponsor is Kohlberg Kravis Roberts (KKR).

7.1.1.1 Model 1: General Sponsor Impact – Moody's

The result obtained when running Model 1 on the Moody's sample (157 observations) is found in Table VI, Panel A. As can be noted, only two of our seven control variables are significant at the 5% level. These variables are interest coverage and business cycle. As expected, the interest coverage variable has a positive sign, i.e. the higher the interest coverage the higher the likelihood of a better credit rating. However, the product of the coefficient and the standard error for interest coverage is quite small, implying that the magnitude of its impact on the credit rating is minor. The other significant control variable, business cycle, has a negative sign and the product of the coefficient and the standard error is large. Thus, the state of the business cycle seems to have a great negative impact on the credit rating. If a transaction is completed in a favorable state of the business cycle the credit rating is significantly lower than it would have been during a less favorable state of the economy. As mentioned, the remaining control variables are insignificant. When conducting a robustness check of our dummy variables by including the previously dropped variable for KKR and dropping another private equity sponsor dummy the signs, size of the coefficients, standard error and significance levels for the majority of the dummies change. It is therefore likely that there still is multicollinearity among the dummies causing the results to change even when making only minor adjustments (Gujarati, 2003). Consequently, the results for none of our sponsor dummies (regardless of whether they are significant or not) are reliable. We can therefore not

draw any conclusion regarding the impact of the private equity sponsors on the credit rating using a model specification with dummies for each sponsor. In order to obtain reliable results we need to re-specify the model and reduce the number of dummy variables. However, it should be mentioned that the problem with multicollinearity among our sponsor dummies does not affect the reliability of our control variables. The coefficients, significance levels and standard errors of these variables do not change materially when different sponsor dummies are dropped.

7.1.1.2 Model 1: General Sponsor Impact – Standard & Poor’s

The result obtained when running the probit model on the Standard & Poor’s sample (197 observation) using Model 1 as described above, is found in Table VI, Panel B. The results differ somewhat from the results obtained when using the Moody’s sample. As for Moody’s, the variables interest coverage and business cycle are significant at the 5% level and have the same signs. However, for the Standard & Poor’s sample the size variable is also significant. The sign is positive implying that the larger the enterprise value the higher the likelihood of a better credit rating. The difference in significance level between the samples could be due to many reasons, for instance the larger sample size for Standard & Poor’s or that Moody’s does not regard size as a factor in their rating methodology. The remaining control variables are insignificant. The problem with multicollinearity among the sponsor dummies exists also for the Standard & Poor’s sample. We can therefore not trust the results for the sponsor dummies for Standard & Poor’s either and need to run the regressions under a different model specification. The control variables, however, are robust.

7.1.2 Model 2: Ownership Effect

We specify a new model in order to investigate the factors potentially driving an ownership effect (Hypothesis 1.1 and 1.2). If one or more of these factors are proven to influence the credit ratings of private equity owned firms, we will also be able to indirectly confirm Hypothesis 1.

The impact of the reputation of private equity sponsors on credit ratings will be tested in Model 2a, using the amount of committed capital as the definition of reputation (recall discussion in Section 6.1.2). The information about committed capital is only available for 14 of the sponsors in the sample and Model 2a will therefore be regressed on transactions completed by these sponsors only. Model 2b will investigate if differences in the sponsors’ financial strategies impact credit ratings. The financial strategy quality index (see Table XIX in the Appendix for further explanation) will be applied for this purpose. In order to determine the impact of the specific factors in the quality index, each factor will be run in a separate regression in Model 2c. Due to high correlation among the factors causing multicollinearity, running a regression with all factors simultaneously will not yield reliable results. Data on the financial strategy factors are available for nine of the sponsors, which limits the sample to these sponsors. The factors taken into account are dividends within one year, large dividends, additional financing, downgrades and sale or IPO within three years. In all versions of Model 2 the control variables presented in Section 6.1.3 are used.

7.1.2.1 Model 2a: Reputation – Moody’s

The results from the regression under Model 2a for the Moody’s sample are presented in Table VII, Panel A. As can be seen in the table, the coefficient and standard error for many of the control variables have changed slightly compared to Model 1. More importantly, the significance levels have changed for many of the coefficients. However, the only variable that is significant at the 5% level is interest coverage, whose product of coefficient and standard error is of similar size as estimated in Model 1. The business cycle variable that was significant and large in absolute terms under Model 1 is still negative but the product of the estimated coefficient and the corresponding standard error has decreased and the variable is no longer significant. This is likely to be due to the decrease in sample size resulting from excluding sponsors lacking information on committed capital. The sample now consists of 121 observations for this model specification. The coefficient and standard error of the reputation variable are remarkably small and the product of the factors is approximately zero, indicating that reputation does not influence credit ratings. Additionally, the variable is far from significant (p-value 0.636), further strengthening that there is no effect of private equity sponsors reputation on portfolio companies’ credit ratings. Hence, Hypothesis 1.1 is not supported.

7.1.2.2 Model 2a: Reputation – Standard & Poor’s

The results from estimating Model 2a using the Standard & Poor’s sample, which now consist of 147 observations, are essentially unchanged compared to Model 1. The control variables, size, interest coverage and business cycle are still significant and their respective coefficients and standard errors are similar to the estimations in Model 1. The results are shown in detail in Table VII, Panel B in the Appendix. The result with regards to reputation is very similar to the estimated result using the Moody’s sample. The coefficient and standard error of the variable are small, resulting in a zero impact on credit ratings. The variable is also insignificant with a p-value of 0.697. Therefore, our results for Standard & Poor’s also do not support Hypothesis 1.1.

7.1.2.3 Model 2b: Financial Strategy Quality Index – Moody’s

Estimating the probit model with nine of the largest sponsors and including a financial strategy quality index for the Moody’s sample yields the results presented in Table VIII, Panel A. The total sample for this estimation includes 101 transactions. No large discrepancies among the control variables are identified compared to Model 2a. The financial strategy quality variable is significant at the 5% level. The sign of the coefficient is positive which implies that if the quality grade of the private equity sponsors financial strategy increases, the probability of a better credit rating for the portfolio company also increases. This supports Hypothesis 1.2 that the financial strategies of individual private equity sponsors do impact the credit rating of their portfolio companies. Consequently, Hypothesis 1 is also supported. The product of the coefficient and standard error of the quality index is however very close to zero. Model 2c, where the index is disaggregated, will determine whether the effect of a sponsor’s financial strategy is actually zero, or if this results from adding positive and negative factors in the same variable.

7.1.2.4 Model 2b: Financial Strategy Quality Index – Standard & Poor’s

Performing the same regressions as above but using the Standard & Poor’s sample leads to a few changes in the control variables compared to Model 2a. The results can be viewed in Table VIII, Panel B. Just as for Model 1 and 2a, the variables interest coverage and size are significant but the business cycle has turned insignificant. The same pattern was observed for the business cycle variable in the Moody’s sample. We believe that this, just as for the Moody’s sample, can be explained by a change in sample size. Compared to Model 1, the Standard & Poor’s sample has been decreased by approximately 80 transactions to a total of 115 observations.

The new variable included in the model to measure the effect of the private equity sponsors’ financial strategies has a positive sign just as for the Moody’s sample but the variable is not significant (p-value 0.177). Therefore, Hypothesis 1.2 is not supported for ratings assigned by Standard & Poor’s. There are several possible explanations for this factor being insignificant. Firstly, Standard & Poor’s might not track the private equity sponsors’ financial strategies in the same way as Moody’s (recall that the quality index derives from data provided by Moody’s). Secondly, it is possible that they weigh in other factors when assessing the quality of the financial strategies which are not taken into account in our grading. Lastly, Standard & Poor’s could simply disregard the private equity sponsors’ financial strategies when rating the portfolio companies’ debt.

7.1.2.5 Model 2c: Disaggregated Financial Strategies – Moody’s

Model 2c is estimated by running five separate regressions, each including one of the factors of the financial strategy quality index. Table IX in the Appendix provides the details of these regressions. The estimations of the control variables in these models are similar to previous models. When using the Moody’s sample, including transactions of nine of the largest sponsors, three of the factors in the quality index are significant at a 5% level. Firstly, the percentage of deals taking large dividends, amounting to more than 80 percent of the equity from the initial transaction, negatively impacts the ratings. A change of one standard deviation in this variable leads to a decrease of the estimated Z-value of 0.274 in absolute terms which could imply a downgrading of the rating. Secondly, the amount of downgraded transactions as a percentage of total number of transactions carried out by a specific sponsor over five years also negatively impacts the credit ratings of portfolio companies. A change of one standard deviation in downgrades leads to a negative impact of the Z-variable of 1.005 which implies a rating change. The last variable yielding significant results is the percentage of resold transactions or transactions exited through IPOs within three years of the initial rating. The coefficient of this variable is positive since exiting portfolio companies early releases capital and strengthens the equity capital base, thereby limiting the credit risk. Again, a change of one standard deviation would lead to a rating upgrade. The results above clearly show that the financial strategy of private equity sponsors do impact the rating assigned to their portfolio companies, which supports Hypothesis 1.2. Since the coefficients of the individual factors are large and significant, the zero impact of financial strategy found in Model 2b is caused by the inclusion of both positive and negative effects in the quality index.

7.1.2.6 Model 2c: Disaggregated Financial Strategies – Standard & Poor’s

The results from disaggregating the quality index to estimate the impact of the individual financial strategy factors on transactions rated by Standard & Poor’s differ substantially from the results obtained for Moody’s. These results are presented in Table X. None of the factors are significant at a 5% level. However, large dividends are nearly significant with a p-value of 0.055. The size of the product of the coefficient and standard deviation is large and a change of one standard deviation would lead to a rating downgrade. Considering the differences between the Moody’s and Standard & Poor’s samples, we can conclude that Standard & Poor’s does not seem to assess the financial strategies of private equity sponsors in the same manner as Moody’s. However, we cannot determine whether Standard & Poor’s are using other factors to account for financial strategies when assigning credit ratings to portfolio companies of private equity sponsors.

7.1.3 Model 3: Individual Sponsor Impact

In order to provide a deeper insight into the impact of the individual private equity sponsors on the credit rating of the portfolio companies we run an alternative version of Model 1 which we refer to as Model 3. In this model we replace the ownership variables used in Model 2, with a dummy for each private equity sponsor. The difference between this new model and Model 1 is that we run nine separate regressions, only including one sponsor dummy at a time. By doing so we avoid the multicollinearity problem that arose between the sponsors when all sponsor dummies were included in the regression at the same time. The sign of the estimated coefficient for each sponsor dummy can be compared to the financial strategy quality score to see whether it corresponds to what one would expect. The model divides the sample into nine different sub-samples where the number of transactions included in each regression is decreased. Naturally, this puts limitations on the significance levels since we will have considerably fewer transactions in each regression. We therefore find it reasonable to regard sponsor dummies as significant at a 10% level.

7.1.3.1 Model 3: Individual Sponsor Impact – Moody’s

The results for the regressions on the Moody’s sample under Model 3 can be found in Table XI. The signs of the coefficients are positive for four of the sponsors and negative for five. Three of the private equity sponsor dummies are significant at the 10% level. That six of the sponsor dummies are insignificant is likely to be explained by too few transactions for these sponsors. The coefficient of the sponsor dummy for *Kohlberg Kravis Roberts (KKR)* is positive and significant at the 10% level. A positive sign was expected since *KKR* is the highest ranked sponsor in our financial strategy quality assessment. *Texas Pacific Group* which ranks as the second best private equity sponsor in terms of quality also has a positive coefficient that is significant. *Madison Dearborn Partners* is rated in the median range in the quality evaluation and the coefficient for the dummy variable is positive and significant. Despite not being significant, many of the remaining sponsors have the sign one might expect based on their financial strategy quality ranking (see Table XIX). For instance, the coefficients for the two private equity sponsors that are positioned in the bottom two places of the quality ranking, *Thomas H Lee Partners* and *Welsb Carson*

Anderson & Stowe are negative. However, the results are not significant (p-value 0.471 and 0.671 respectively). The weak significance could potentially be due to a relatively small number of transactions for these sponsors, with 8 transactions for *Thomas H Lee Partners* and 10 transactions for *Welsh Carson Anderson & Stowe*. Further, the coefficient for the sponsor dummy for *Blackstone* is also negative and insignificant (p-value 0.184). Based on our quality rating, one would expect the coefficient for *Blackstone* to be negative since this private equity sponsor ranks among the bottom three sponsors. The coefficient for *Goldman Sachs Capital Partners*, which is ranked just below the median, is surprisingly positive but highly insignificant (p-value 0.826). The sponsor dummy for *Bain Capital Partners* is negative, implying that this private equity sponsor impacts the credit rating of its portfolio companies negatively. The coefficient is not significant at the 10% level (p-value 0.210) and based on the quality rating assigned it is difficult to make any presumption regarding expected sign as *Bain Capital Partners* lies in the middle of the quality rating scale of the nine funds. *Carlyle* ranks as the third best sponsor in our quality ranking, but the coefficient for this sponsor is negative. However, *Carlyle's* sponsor dummy is not significant (p-value 0.259). Finally, it can also be noted that the significance levels and signs for our control variables in the nine separate regressions are similar across both the separate regressions and the estimates obtained when running the regression in Model 2.

7.1.3.2 Model 3: Individual Sponsor Impact – Standard & Poor's

Since the variable financial strategy quality used in Model 2b was not significant for the Standard & Poor's sample, one would expect the coefficients for the sponsor dummies to be less significant than for the Moody's sample. In Table XII the results for the Standard & Poor's sample is presented. *KKR* is the only sponsor dummy significant at the 10% level (p-value 0.031). As for the Moody's sample, and as one would expect based on our quality ranking, this coefficient is positive. Although the sponsor dummies for the eight remaining private equity sponsors are insignificant, six of them have the same sign as in the Moody's sample. Only *Texas Pacific Group* which had a positive sign for the regression on the Moody's sample and *Thomas H Lee Partners*, which had a negative sign for the regression on the Moody's sample, have switched signs. However, the results for these two sponsor dummies for the Standard & Poor's sample are highly insignificant (p-values 0.898 and 0.948 respectively). Similar to the Model 2 regression, the only significant control variables are size and interest coverage.

7.2 Timing

To investigate if there is a timing effect incorporated in the initial credit rating of leverage buy-outs, i.e. if credit ratings are dependent on the state of the business cycle after taking firm specific factors into account, several alternations of our original ordered probit model are estimated. In order to use as large samples as possible, no measure of the ownership effect will be included in the timing models since this restricts the samples to transactions by nine sponsors only. Including all sponsors, the Moody's sample consists of 157 observations and the Standard & Poor's sample of 196 observations.

7.2.1 Model 4: Timing Effect

The model used to assess timing effects (Model 4) contains the same control variables as Models 1-3. The control variables are all expected to fluctuate over time due to changes in market conditions, hence capturing the firm specific timing effect. In order to check the robustness of the results Model 4 is estimated using four different measures of the state of the business cycle. Since the firm specific timing effect is captured by the control variables, each of the business cycle measures is intended to capture the excessive timing effect only, which is due to credit rating agencies' changed anticipation of risk. The four different specifications of timing variables are run separately in different versions of Model 4. The four different measures are:

- 1) The return of the S&P500 index for the three months preceding the completion date of the transaction
- 2) US GDP growth for the quarter in which the transaction is completed
- 3) NBER recession index for the month the transaction is completed
- 4) Default rates for non-investment grade bonds for the year the transaction is completed

7.2.1.1 Model 4a: S&P500 3 Month Returns

When the regression is run using the three month index return for S&P500 as the measure of the state of the business cycle the results presented in Table XIII are obtained. The coefficient of the variable sp5003m is negative for ratings issued by both Moody's and Standard & Poor's implying that during periods of high return of the S&P500 the probability of a high credit rating is lower than during periods of low return. In other words, the credit rating on debt used to finance leverage buy-out transactions are countercyclical. For the Moody's sample the sp5003m variable is nearly significant (p-value 0.071). For the Standard & Poor's sample the variable is significant (p-value 0.006). The product of the estimated coefficient and the corresponding standard error for the sp5003m variable is large for both samples indicating that the business cycle has a great impact on the rating.

7.2.1.2 Model 4b: US GDP Growth

Table XIV shows the results obtained when the regression is run using quarterly US GDP growth as the measure of the state of the business cycle. The coefficient of this measure is still negative but insignificant both for Moody's (p-value 0.125) and Standard & Poor's (p-value 0.470). Compared to the SP500 index which is updated daily the GDP growth is measured at a certain date at the end of each quarter. Therefore, we are unable to specify the exact GDP growth over the 3 month preceding the transaction. Due to this, the measure is not consistent over the whole sample and less exact than a market index. We believe that these characteristics could be responsible for making the GDP growth insignificant.

7.2.1.3 Model 4c: NBER Recession Index

Using the NBER recession index as the measure of the business cycle returns a negative coefficient for the variable that is slightly insignificant for Moody's (p-value 0.099) but highly significant for Standard & Poor's (p-value 0.001) (see Table XV). This implies that during recession periods, the probability of a better credit rating is higher than during expansion periods. This further strengthens the finding in Model 4a that ratings of leverage buy-out debt tend to be countercyclical. The poorer p-value of Moody's could

be due to the smaller sample size compared to Standard & Poor's. Since the recession index only takes two different values, -1 or 0, it is more sensitive to restrictions in the sample than measures based on a continuous variable such as in Model 4a.

7.2.1.4 Model 4d: Default Rates on Speculative Grade Debt

When running the regression using default rates for the deal year as the measure of the state of the business cycle the coefficient returned is positive for both samples. This is to be interpreted as when default rates are high, i.e. when market conditions are poor, the probability of a better credit rating is high. This result is in line with the findings in Models 4a, 4b and 4c. The results are highly significant both for the Moody's (p-value 0.007) the Standard & Poor's (p-value 0.000) samples (see Table XVI).

8. Robustness

In this chapter we will test the goodness of fit of the estimated regression models. We start out by testing the explanatory power by using one of the models to predict ratings. Secondly, we discuss certain characteristics of our samples which could impact the interpretations of the results.

8.1 Explanatory Power

As already mentioned, the R^2 value cannot be used to assess the goodness of fit of a probit model. Instead, the credit ratings of particular transactions can be compared to the most probable ratings predicted by the model. We find it sufficient to estimate predicted ratings for one of the models. Model 1 and 2a are inappropriate since they do not yield reliable results or contain insignificant explanatory variables. Therefore, Model 2b is used for the estimation of predicted ratings. An advantage of using Model 2b is further that the coefficients of the control variables in this model are mostly similar to those of Model 2c and Model 3.

8.1.1 Predicted Ratings

The predicted ratings for Model 2b are found in Table XVII. The results show that the model is not well fitted either for the Moody's or the Standard & Poor's sample. Although most of the ratings are predicted within one rating class from the actual rating, B2/B1 (B+) is the most probable outcome for all rating categories in the Moody's (Standard & Poor's) sample. This is a typical sign of low explanatory power since the model predicts most rating to be in the category with the largest number of observations. Since B1 (B+) is the average rating in the Moody's (Standard & Poor's) sample, high ratings are underestimated whereas the lowest ratings are overestimated.

The low explanatory power can partly be explained by the fact that the sample size is rather small at the same time as there are many outcomes of the dependent variable (i.e. many rating categories). Also, since few of the control variables are significant and their estimated impacts are small, it is very likely that there are omitted variables. In order to determine if the model is poorly specified, lacking control variables, or if the low explanatory power is due to too many rating categories, we re-estimate Model 2b after grouping the ratings, decreasing the number of rating categories from 21 to 9 (see Table V, Panel B for details on rating groups).

8.1.1.1 Re-estimation

The predicted ratings resulting from the re-estimated Model 2b using the Moody's sample and the new rating categories are presented in Table XVIII, Panel A. Comparing the coefficients of the re-estimated model to the original model a few changes appear. For instance, the financial strategy quality index becomes insignificant, possibly due to similar mean values but larger variances in each rating category. Compared to the original model, only four instead of nine actual rating categories remain. The rating categories questionable and poor constitute 90% of all transactions whereas adequate and good represents

the remaining 10%. In total, the re-classified Model 2b appears rather poor but the predictive power seems better than for the same model with the 21 initial rating categories. The number of correctly specified ratings increases from 25% to 53%. However, similar to the previous model all predicted ratings approach the most common rating signaling low explanatory power. As can be seen in Table XVIII, Panel B, a re-estimation of Model 2b with the Standard & Poor's sample exhibits the same pattern as the estimation with the Moody's sample. One of the variables changes as size becomes insignificant. The number of correctly specified ratings increases from 38% to 65% but the most common actual rating is still the most frequently predicted regardless of the actual rating category. Hence, the explanatory power is poor also for the Standard & Poor's sample.

The predictions of Model 2b and those of the re-estimated model with fewer ratings clearly show that our models are poorly specified. When the rating categories are limited more ratings are correctly predicted compared to in the initial models. However, increased explanatory power is a natural consequence of limiting the outcomes of the dependent variable, which is why this result is not surprising. Since the most probable rating equals the most common outcome of the actual ratings, even when we re-estimate the model, we can conclude that the poor explanatory power is not likely to be due to too many rating categories, but to omitted variables. Further, the product of the coefficient and standard deviation of each explanatory variable is rather small implying that its impact on the rating is low. Hence, other factors which we have not considered are very likely impact the rating of private equity sponsor controlled companies.

8.2 Sample Characteristics

There are a couple of characteristics of the samples which could distort the interpretation of our results. Firstly, using credit ratings in private equity transactions could be problematic since credit ratings to some extent might be "chosen" by the private equity sponsor. Examining our data, the range of ratings is much more limited than in studies of ratings of diverse firms (e.g. Amato & Furfine, 2004). Further, the credit ratings in the sample are unevenly distributed where 30% (40%) of the transactions in the Moody's (Standard and Poor's) sample are rated B2 (B+). Other rating categories, especially the highest and lowest ones within the range, are represented by very few transactions. These observations could imply that private equity sponsors do tailor their portfolio companies' capital structures in order to achieve a certain rating. If this is the case, credit ratings are no longer exogenous to the private equity sponsors and examining how their financial strategies and reputation impact ratings might be a needless task.

Secondly, the timing variables are influenced by an uneven distribution of transactions over time. During the recession years 2001 and 2008, the number of transactions in our samples is far lower than for other years since fewer transactions are completed during such periods. A limited number of transactions increases the individual influence of each transaction and if these are with highly deviating values from the true average on the market (given by a larger sample), the investigation of a timing effect could be distorted.

Lastly, our sample is skewed toward large transactions which potentially interfere with the size variable. There are several reasons for this skewness. Firstly, the basic information extracted from LPC is only available for syndicated debt which is more likely to be used in large transactions. Further, additional transaction details such as EBITDA and sales tend to be easier to find for large transactions. Excluding sponsors that completed less than 4 transactions further strengthen the size bias. Table IV shows that the average transaction size increase from USD 2.28 billion to USD 2.63 billion as the sponsors with few transactions are excluded. Since size is positively correlated with credit ratings the average ratings in the samples might be higher than it would be if a larger number of transactions were included. A possible consequence of this bias is that the results in this study are inapplicable to all private equity transactions, i.e. only to those exceeding a certain size. The fact that we find no evidence for reputational impacts on credit ratings could further be an effect of a size bias. Our sample only includes the 14 largest and most renowned private equity sponsors. Considering that reputation is measured by committed capital, i.e. size, it might be that the differences in reputation among the sponsors are too small to distinguish a significant trend.

9. Discussion

The aim of this chapter is to interpret and explain the obtained results. Firstly, the private equity sponsors' impact on the credit rating of their portfolio companies is discussed and secondly explanations for the observed timing effect are presented.

9.1 Private Equity Sponsor Ownership

When running regressions under the specifications in Model 2 and Model 3 evidence are found supporting Hypothesis 1 that individual private equity sponsors do impact the initial credit rating of senior debt in leverage buy-out transactions. This impact is significant for Moody's ratings, whereas a statistically significant impact is found for only one private equity sponsor for Standard & Poor's ratings. The impact can be either positive or negative depending on certain sponsor characteristics. When closer examining which factors are causing the existence of the ownership effect observed for Moody's, we find evidence that the aggressiveness of the financial strategies' of private equity sponsors is one such factor. Further, when disaggregating the financial strategy quality index into its individual components we find that the propensity to pay large dividends and the amount of downgraded transactions have negative impacts on the credit rating. In addition, a strategy of exiting portfolio companies within three years of the initial rating impacts ratings positively. For Standard & Poor's, none of the factors are statistically significant but the sponsor's propensity to pay large dividends has an impact on the credit rating that is close to being significant (p-value 0.055). In contrast to our hypothesis, we find no evidence supporting that the reputation of private equity sponsors impact credit ratings.

Are our findings intuitive, rational and in line with theory? To start with, since numerous of private equity sponsors exist differences among them with regards to characteristics such as investment strategies, financial strategies and level of involvement in the operations of the portfolio companies are expected to exist. Many of these sponsor specific characteristics can directly affect both the operations and the financial standing of the portfolio company, which in turn are factors directly impacting the credit rating assigned.

From a credit risk perspective, our findings that the ownership effect is driven by the aggressiveness of the sponsor's financial strategies is reasonable. Aggressiveness of financial strategies directly drives credit risks. If for instance some private equity sponsors systematically, within the first year of ownership, pay out dividends from their portfolio companies large enough to remove almost all of the invested equity, it is rational that credit rating agencies take this into account when assigning credit ratings to following leverage buy-out transactions. Similarly, since other sponsors are notable for their lack of large dividend recaptures it is also rational that this is taken into account in the credit rating process. In conclusion, if the rating agency observes a pattern in the aggressiveness of the financial strategy in past transactions, it is likely that this insight is taken into account when rating future transactions of the private equity sponsor.

The financial strategy quality variable included in Model 2a is significant at the 5% level for Moody's ratings. However, for Standard & Poor's ratings the variable is insignificant. Also, when disaggregating the financial strategy quality index we find that only large dividends are nearly significant for Standard & Poor's (p-value 0.055). One explanation for this could be that the quality index was developed based on a study conducted by Moody's and that Standard & Poor's does not track the private equity sponsors in the same way. When running individual regressions for each private equity sponsor in Model 3 for the Standard & Poor's sample, only one out of nine sponsor variables is significant. This together with the weak impact of financial strategies suggest that either the number of transactions for the eight insignificant private equity sponsors is too low or that Standard & Poor's do not place as much weight on sponsor ownership as Moody's in their rating assignment of sponsor-backed company's debt. Since we have more transactions for all of the nine private equity sponsors in our Standard & Poor's sample than in our Moody's sample, we regard our latter explanation to be more probable.

We do not find any statistically significant evidence that the reputation of the private equity sponsor impacts the credit rating of its portfolio companies, which we find somewhat surprising. Our results suggest that the positive relationship Demiroglu and James (2007) find between the reputation of the private equity sponsors and lender perceived credit risk does not affect the credit rating agencies' rating assessment – at least not when using committed capital as the proxy for reputation. Rating agencies might not share the view of lenders, especially since Moody's question whether sufficient evidence exist to conclude that management teams impact the successfulness of private equity funds. However, the reason that we do not find a reputation effect could also have to do with the characteristics of our dataset. Our sample for testing the reputation hypothesis only includes the 14 largest and hence, according to our measure, the most reputable sponsors within the industry. Perhaps the differences in reputation (i.e. committed capital) across the sponsors in the sample are too small to distinguish a significant trend. In addition, our reputation measure consists of the total accumulated committed capital at the end of 2008 rather than a periodical measure of committed capital. It would be interesting to test the hypothesis measuring reputation in another way. For instance, the regressions could be re-estimated using committed capital at the fund level or number of past transactions carried out by the sponsor at the time of acquisition as the reputation measure. However, this data has not been available to us for this study.

If we look for explanations for the dissimilarities in the individual sponsors' impacts on ratings beyond the differences in the financial strategies and reputation, factors related to the credit rating agencies' business models can also be mentioned. As discussed heavily in the media since the outbreak of the financial crisis in mid 2007, credit rating agencies' business models give rise to an apparent conflict of interests since the debt issuer pays the rating agency to rate its issues of debt instruments. Even though competition among credit rating agencies for external ratings is limited, private equity sponsors are significant clients to the credit rating agencies and important to retain since their acquisition activities generate a steady flow of business. Potentially, some of the private equity sponsors' impact on the rating

could also be a result of personal relationships to frequently rated private equity sponsors, which might affect the rating positively for those sponsors. Ivashina and Kovner (2008) find that private equity sponsors' bank relationships explain cross-sectional variation in the loan interest rate and covenant structure. Two channels allow private equity sponsors' to receive favorable loan terms. Firstly, bank relationships formed through repeated interactions reduce inefficiencies caused by information asymmetry between the lender and the private equity sponsor. Secondly, banks price loans to cross-sell other fee-generating business. Similar to banks, potential for cross-selling exists since credit rating agencies except for rating assignments also offer services such as rating advisory on how to structure debt issues in order to achieve a certain rating. Also, credit ratings could be influenced by the rating agencies' dependency on the sponsor. More flexible conditions might be applied to private equity sponsors who are very active and generate more business to the credit rating agency than less active ones.

9.2 Timing

Previous research on cyclicity in credit ratings shows that rating standards are less stringent during economic upturns. Also, most private equity sponsored companies' ratings belong to the speculative grade rating categories, which according to the rating agencies are more sensitive to fluctuations in the business cycle. Combined, this suggests that ratings of leverage buy-out transactions should exhibit excessive procyclicality. However, studies focusing on private equity transactions have found a countercyclical pattern in the performance of leverage buy-out firms and in this study we hypothesized that credit ratings of private equity owned companies follow this pattern. The estimated models support this hypothesis, although it is not verified whether the ratings are actually *excessively* countercyclical.

The findings are robust to changes in the method used to approximate market timing. Regardless of whether the timing variable is estimated with the return of the S&P500 index, a recession index or the default rate of speculative grade firms, the impact of the timing variable remains negative. The first two measures are significant for Standard & Poor's ratings only, whereas the default rate variable is significant for both the Moody's and Standard & Poor's sample at a 5% level. If the accepted significance level were to be increase to 10% all measures of the business cycle would be significant for the Moody's sample as well. Considering that the Moody's sample contains 40 transactions less than the Standard & Poor's sample, we deem it possible that ratings assigned by Moody's to some extent are influenced by the state of the business cycle as well.

One reason why ratings of firms controlled by private equity sponsors are countercyclical whereas studies find ratings for all rated firms to exhibit excessive procyclicality could be that samples used in previous studies are dominated by public firms, where debt is driven by other factors than in the private equity industry. The key driver behind leverage in buy-out transactions is bank loan standards. These are less stringent during upturns leading to a higher level of debt in each transaction and a total higher number of completed deals during such periods compared to in downturns. A consequence of lax credit conditions is overinvestment, i.e. funding of unprofitable projects. If the rating agencies are aware of the

overinvestment and poor performance of transactions completed during upturns they might anticipate the risk of such transactions to be high compared to transactions with identical firm specific values completed under the reverse market conditions. Consequently, such an approach would result in excessively countercyclical ratings.

Following the reasoning above, one could expect private equity sponsors to time downturns when completing deals in order to obtain cheaper debt. However, since investors are more cautious in downturns, waiting might limit the sponsor's funding options. Empirical evidence shows that the activity in the leverage buy-out industry is procyclical, suggesting that private equity sponsors do not attempt to time downturns. The implication of this is that although our sample shows evidence of excessive countercyclicity, it does not implicitly mean that the state of the economy has a direct impact on credit ratings of private equity controlled firms. Instead, it is likely that this results from a selection bias arising from the conditions on the debt market. As mentioned, the leverage buy-out industry experiences overinvestment during upturns and unprofitable projects are undertaken. Since these are risky, low credit ratings are assigned. In contrast, during bust periods it is impossible to undertake such projects since no lender would grant a loan to a project with a high risk profile. Hence, projects seeking funding in downturns with identical initial condition as the average transaction in upturns, will most of the time not find investors, and therefore not be completed and included in our sample. Consequently, transactions which are funded in downturns have better risk profiles and automatically receive better ratings than the average transaction during an upturn. Such a selection bias should not necessary interfere with the excessive timing effect as firm specific control variables are supposed to capture differences in risk characteristics. However, due to a limited number of significant control variables and small size of the products of the coefficients and standard errors, it is likely that the estimated timing variables pick up risk specific factors related to omitted variables. Therefore, it cannot be ruled out that the excessive countercyclicity found in our estimated models is solely a reflection of fluctuation in firm specific factors and due to the way we have specified the model.

10. Conclusion

The aim of this thesis has firstly been to investigate whether private equity sponsors influence the initial credit ratings of senior debt in leverage buy-out transactions. In particular, the impact of private equity sponsor reputation and financial strategies were examined. Secondly, the thesis also aimed at determining if there is a timing effect in excess of fluctuations in firm specific factors incorporated in initial credit ratings.

Two independent data sets have been analyzed in order to find the answers to the research questions. The first sample consists of credit ratings assigned by Moody's, issued for senior debt used in leverage buy-out transactions between 1997 and 2008, and the second sample consists of the corresponding credit ratings issued by Standard & Poor's for transactions closed between 1994 and 2008. Three main specifications of a probit regression models were estimated to answer our research question related to the private equity sponsor's effect on credit ratings.

Under our first model specification, Model 1, dummies for each sponsor in the samples were used to measure the ownership effect. Due to multicollinearity between the sponsor dummies, the results obtained were not reliable for either the Moody's or the Standard & Poor's sample and no conclusions could be drawn.

The second model was divided into three sub-regressions. This enabled us to separate the ownership effect into two different main factors; reputation and financial strategies. Under the first sub-regression (Model 2a) we concluded that reputation measured as amount of committed capital does not impact credit ratings of private equity controlled firms. The estimation of Model 2b, which examined the impact of financial strategies using a quality index, showed that financial strategies significantly influenced ratings assigned by Moody's, whereas no such conclusion could be drawn regarding transactions rated by Standard & Poor's. The last sub-estimation, Model 2c, disaggregated the quality index used in Model 2b, in order to examine the magnitude and significance of the individual factors included in the index. Credit ratings of private equity transactions issued by Moody's were confirmed to be negatively impacted by the propensity to pay out large dividends and the number of previously downgraded transactions. Also, a positive impact was found for strategies focusing on divestments (through re-selling or IPOs) of portfolio companies within three years of the initial rating. For Standard & Poor's no conclusion from Model 2c could be drawn as the coefficient for the factors were insignificant.

Under the third model specification, Model 3, the individual impact of each private equity sponsor was examined by running separate regressions with a dummy for each of the nine largest private equity sponsors. For Moody's, significant coefficients for three private equity sponsors, Kohlberg Kravis Roberts, Madison Dearborn Partners and Texas Pacific Group, were obtained. All three sponsors affect their portfolio companies' credit ratings positively. For Standard & Poor's, Kohlberg Kravis Roberts was

the only sponsor with a significant coefficient. The impact of Kohlberg Kravis Roberts on the portfolio companies' Standard & Poor rating was also found to be positive.

In summary, we concluded that the private equity sponsors do impact the rating of portfolio companies' issued by Moody's. This is due to the differences in financial strategies across private equity sponsors. For Standard & Poor's ratings, no conclusion could be drawn. Further, reputation of private equity sponsors was found not to impact the credit rating of portfolio companies. For the individual sponsors we could also conclude that Madison Dearborn Partners' and Texas Pacific Group's have positive impacts on Moody's ratings. The impact of Kohlberg Kravis Roberts is positive for both Moody's and Standard & Poor's ratings. We deem it likely that other sponsors also impact their portfolio companies' ratings (at least for Moody's ratings) and that the insignificant coefficients for the remaining sponsors is an effect of too few transactions per sponsor in the sample.

Our second research question aimed at examining whether there is a timing effect incorporated in the initial ratings of debt used to fund leverage buy-outs, i.e. if the state of the business cycle impacts the initial rating in excess to the impact of firm specific factors caused by market fluctuations. In order to examine this question, we specified a new model and four alternative versions. Each alternative regression used a different measure for the state of the business cycle; 1) the three month return for the S&P500 index, 2) US GDP growth for the quarter in which the transaction was completed, 3) the NBER recession index for the month the transaction was completed, and 4) the default rates for non-investment grade bonds for the year the transaction was completed. All regressions except the one including US GDP growth as a measure of the business cycle were significant at the 5% level for Standard & Poor's whereas the impact on Moody's was weaker. The sign of all business cycle coefficients implied that credit ratings of leverage buy-out debt are countercyclical, i.e. when the state of the business cycle is unfavorable better ratings are observed. However, due to low explanatory power we have not been able to rule out that the variables for measuring the state of the business cycle capture firm specific risk factors rather than an excessive timing effect.

11. Further Research

During the conduction of this study, we have identified a few areas of interest for further research as well as methods potentially improving the results obtained that require data unavailable to us.

Since many of our estimated coefficients of the control variables are rather small in magnitude and the explanatory power of our model is low, there is likely to be omitted variables. Hence, it would be interesting to re-estimate our models using other control variables to explain the credit ratings of leverage buy-out transactions. Further, since the reputation variable measured by the total amount of committed capital to the fund is insignificant, it would be interesting to re-estimate Model 2a using another measure of reputation. Suggestions for such measures are committed capital on the fund level, number of previous leverage but-outs completed, historical fund performance, etc.

Lastly, since the leverage buy-out industry still is rather young and the fraction of rated transactions is relatively low, the sample size of a study of this kind is limited. It would be interesting to carry out the same study again in a couple of years time with a larger sample of transactions (as more leverage buy-outs have been completed) to see how the results and significance levels change. With a larger number of transactions it might be possible to use dummy variables for private equity sponsors without encountering multicollinearity problems. Re-performing the study in a couple of years times would also be interesting with regards to the timing effect since the sample then will include a larger number of transactions completed during periods of recession in 2008 and 2009. More precisely, we would be interested in seeing if our findings of a countercyclical pattern for credit ratings of leverage buy-out debt can be re-confirmed.

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Table I

Number of transactions by private equity sponsors

This table provides an overview of the private equity sponsors included in the total sample before correcting for outliers. Also, for each rating agency, the number of rated transactions completed by each sponsor is displayed.

Private Equity Sponsor	Moody's		Standard & Poor's	
	Number of Transactions	Percent	Number of Transactions	Percent
AEA Investors	4	2.2%	4	1.9%
Apax Partners	6	4.4%	8	3.8%
Bain Capital Partners	16	8.8%	15	7.1%
Berkshire Partners	4	2.2%	n/a	n/a
Blackstone Group	14	7.7%	17	8.1%
Bruckmann Rosser & Sherrell	n/a	n/a	4	1.9%
CVC Capital Partners	4	2.2%	4	1.9%
Carlyle	13	7.1%	14	6.7%
Clayton Dubilier & Rice	6	3.3%	6	2.9%
Code Hennessy & Simmons	5	2.8%	4	1.9%
DLJ Merchant Banking	5	2.8%	7	3.3%
First Reserve	n/a	n/a	5	2.4%
Francisco Partners	4	2.2%	4	1.9%
GTCR Golder Rauner	5	2.8%	5	2.4%
Goldman Sachs Capital Partners	7	3.9%	7	3.3%
Hellman & Friedman	5	2.8%	6	2.9%
INVESTCORP Partners	4	2.2%	5	2.4%
JW Childs Associates	n/a	n/a	4	1.9%
Kelso & Co	5	2.8%	7	3.3%
Kohlberg Kravis Roberts	21	11.5%	21	10.5%
Leonard Green & Partners	4	2.2%	n/a	n/a
Madison Dearborn Partners	10	5.5%	10	4.8%
One Equity Partners	6	3.3%	6	2.9%
Permira Advisers	n/a	n/a	4	1.9%
Texas Pacific Group	6	3.3%	11	5.2%
Thomas H Lee Partners	8	4.4%	12	5.7%
Vestar Capital Partners	4	2.2%	5	2.4%
Warburg Pincus	4	2.2%	4	1.9%
Welsh Carson Anderson & Stowe	10	5.5%	10	4.8%
Total	180	100%	209	100%

Table II

Number of ratings by category and year

This table displays the number of transactions in each rating category by year. The total samples have been used before correcting for outliers. The sample period stretches between 1997 and 2008 for the Moody's sample whereas the sample period for the Standard & Poor's sample is 1994 – 2008.

Panel A: Moody's

Year	A1	A2	A3	B1	B2	B3	Ba1	Ba2	Ba3	Baa1	Baa2	Baa3	Caa1	Caa2	Total
1997	0	0	0	3	0	1	1	0	1	0	0	0	0	0	6
1998	0	0	0	2	1	0	0	0	1	0	0	0	1	0	5
1999	0	0	0	5	2	0	0	0	2	0	0	1	2	0	12
2000	0	0	0	1	3	0	2	0	1	0	0	0	0	0	7
2001	0	0	0	2	2	0	0	0	2	1	0	0	0	0	7
2002	1	0	0	4	1	1	0	0	3	1	0	0	0	0	11
2003	0	0	0	6	4	1	1	1	3	1	0	1	0	0	18
2004	0	0	0	10	7	2	1	4	2	0	0	0	1	0	27
2005	0	0	0	4	12	5	0	2	2	0	0	0	0	0	25
2006	0	0	0	8	8	3	1	1	2	0	0	0	2	0	25
2007	0	0	0	3	10	5	2	2	8	0	0	0	4	1	35
2008	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2
Total	1	0	0	50	50	18	8	10	27	3	0	2	10	1	180

Note: Rating categories above A1 (i.e. Aa3, Aa2 and Aa1) and below Caa2 (i.e. Caa3, Ca and C) are not included since there are no transactions with such ratings in the sample.

Panel B: Standard & Poor's

Year	A	A-	A+	B	B-	B+	BB	BB-	BB+	BBB	BBB-	BBB+	CCC	CCC+	Total
1994	0	0	0	0	1	1	0	0	0	0	0	0	0	0	2
1995	0	0	0	1	0	1	1	0	0	0	0	0	0	0	3
1996	0	0	0	0	1	1	0	1	0	0	0	0	0	0	3
1997	0	0	0	1	1	10	0	0	0	0	1	0	0	0	13
1998	0	0	0	0	2	3	0	2	0	0	0	0	1	2	10
1999	0	0	0	1	1	6	1	2	1	0	0	0	1	2	15
2000	0	0	0	1	1	2	0	2	0	0	0	0	0	0	6
2001	0	1	0	0	0	3	0	3	0	0	0	0	0	0	7
2002	1	1	1	1	1	6	1	2	0	0	0	0	0	0	14
2003	0	1	0	0	2	9	0	4	2	0	0	0	0	0	18
2004	0	0	0	6	2	7	0	6	3	0	0	0	0	0	24
2005	0	0	0	9	3	11	0	2	1	0	0	0	0	1	27
2006	0	0	0	11	6	10	2	0	0	0	0	0	0	0	29
2007	0	0	0	12	2	11	1	5	1	0	0	0	0	0	32
2008	0	0	0	0	0	2	2	2	0	0	0	0	0	0	6
Total	1	3	1	43	23	83	8	31	8	0	1	0	2	5	209

Note: Rating categories above A (i.e. A+, AA-, AA, AA+, AAA- and AAA) and below CCC+ (i.e. CCC, CCC-, CC and C) are not included since there are no transactions with such ratings in the sample.

Table III

Number of transactions by industry

The table below shows the industries in which the portfolio companies in the sample operate. The industries origin from the Fama French industry index, but has been modified slightly to lower the number of categories.

Industry	Moody's		Standard & Poor's	
	Number of Transactions	Percent	Number of Transactions	Percent
Agriculture & food	6	3.3%	7	3.4%
Aircraft & defense	4	2.2%	6	2.9%
Automobiles & trucks	4	2.2%	5	2.4%
Chemicals	11	6.1%	12	5.7%
Computers, software & electronics	10	5.6%	14	6.7%
Construction & fabricated products	13	7.2%	16	7.7%
Consumer goods	8	4.4%	9	4.3%
Energy	10	5.6%	11	5.3%
Entertainment	7	3.9%	8	3.8%
Healthcare & pharmaceutical products	24	13.3%	29	13.9%
Machinery	10	5.6%	13	6.2%
Measuring & control equipment	1	.6%	4	1.9%
Printing & publishing	8	4.4%	9	4.3%
Retail & restaurants	24	13.3%	20	9.6%
Services	17	9.4%	19	9.1%
Telecommunications	15	8.3%	17	8.1%
Textils	2	1.1%	2	1.0%
Transportation	6	3.3%	8	3.8%
Total	180	100.0%	209	100.0%

Table IV

Transaction Size

This table displays three different size measures: Enterprise Value, Sales and EBITDA. There are also four different samples, where the latter two corresponds to the samples used in the analyses after being corrected for outliers. All figures are inflated with the CPI for the corresponding year to express the value in 2007 (mUSD).

(mUSD)	Enterprise Value					Sales					EBITDA				
	Mean	Median	Max	Min	No. Trans.	Mean	Median	Max	Min	No. Trans.	Mean	Median	Max	Min	No. Trans.
All transactions	2280	941	44500	110	315	1510	694	27600	38.7	315	242	98.4	5670	12.9	315
Excluding few trans. sponsors*	2630	1080	44500	110	239	1750	788	27600	38.7	239	282	117	5670	12.9	239
Moody's rated	2990	1310	44500	110	180	2020	842	27600	38.7	180	326	122	5670	13.3	180
S&P rated	2710	1100	44500	140	209	1640	836	25500	38.7	209	290	122	5670	12.9	209

* Sponsors completing less than four transactions over the sample period have been excluded

Table V

Rating Scale

This table shows how the ratings of Moody's and Standard & Poor's have been translated into numerical values. Panel A gives each rating a numerical value, whereas in Panel B, the ratings have been clustered in order to limit the outcome of the dependent variable.

Panel A: All rating categories

Moody's	Standard & Poor's	Numerical rating scale
Aaa	AAA	21
Aa1	AA+	20
Aa2	AA	19
Aa3	AA-	18
A1	A+	17
A2	A	16
A3	A-	15
Baa1	BBB+	14
Baa2	BBB	13
Baa3	BBB-	12
Ba1	BB+	11
Ba2	BB	10
Ba3	BB-	9
B1	B+	8
B2	B	7
B3	B-	6
Caa1	CCC+	5
Caa2	CCC	4
Caa3	CCC-	3
Ca	CC	2
C	C	1

Panel B: Clustered rating categories

Rating category	Moody's	Standard & Poor's	Numerical rating scale
<i>Investment grade:</i>			
Exceptional	Aaa, Aaa1, Aaa2, Aaa3	AAA, AAA-, AA+	9
Excellent	Aa, Aa1, Aa2, Aa3	AA, AA-, A+	8
Good	A, A1, A2, A3	A, A-, BBB+	7
Adequate	Baa, Baa1, Baa2, Baa3	BBB, BBB-, BB+	6
<i>Speculative grade:</i>			
Questionable	Ba, Ba1, Ba2, Ba3	BB, BB-, B+	5
Poor	B, B1, B2, B3	B, B-, CCC+	4
Very Poor	Caa, Caa1, Caa2, Caa3	CCC, CCC-, CC+	3
Extremely Poor	Ca	CC, CC-, C+	2
Lowest	C	C	1

Table VI

Probit model results:**Model 1: General Sponsor Impact**

This table shows the results from the estimated probit model investigating the private equity sponsor ownership. The specifications for Model 1 have been used which includes dummy variables for the individual sponsors.

Panel A: Moody's

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.017	0.102	0.868	0.002
Debt to enterprise value	-0.142	0.408	0.728	-0.058
Ebitda margin	-0.229	0.771	0.767	-0.176
Interest coverage	0.058	0.021	0.006	0.001
Business cycle (S&P500 3m)	-2.930	1.486	0.049	-4.355
Maturity	0.016	0.009	0.081	0.000
Industrybeta	-0.178	0.199	0.371	-0.035
AEA Investors	-0.348	0.367	0.343	-0.128
Apax Partners	-0.370	0.789	0.639	-0.292
Bain Capital Partners	-0.667	0.355	0.060	-0.236
Blackstone Group	-0.759	0.408	0.062	-0.310
CVC Capital Partners	0.175	0.767	0.819	0.134
Carlyle	-0.668	0.399	0.094	-0.267
Clayton Dubilier & Rice	-0.689	0.616	0.263	-0.425
Code Hennessy & Simmons	-0.991	0.361	0.006	-0.358
DLJ Merchant Banking	-0.575	0.596	0.334	-0.343
GTCR Golder Rauner	-0.351	0.536	0.513	-0.188
Goldman Sachs Capital Partners	-0.222	0.525	0.673	-0.117
Hellman & Friedman	-0.506	0.494	0.306	-0.250
Kelso & Co	-0.281	0.410	0.493	-0.115
Leonard Green & Partners	-0.796	0.341	0.020	-0.272
Madison Dearborn Partners	0.290	0.333	0.383	0.097
One Equity Partners	-0.437	0.701	0.533	-0.306
Texas Pacific Group	0.376	0.399	0.345	0.150
Thomas H Lee Partners	-0.618	0.352	0.080	-0.218
Vestar Capital Partners	-0.296	0.332	0.372	-0.098
Welsh Carson Anderson & Stowe	-0.430	0.449	0.339	-0.193

Variable	Coefficient	Std. Err	P-value	Coefficient × variable std. Err
Size (log)	0.225	0.085	0.008	0.019
Debt to enterprise value	0.110	0.351	0.753	0.039
Ebitda margin	-0.533	0.763	0.485	-0.407
Interest coverage	0.062	0.021	0.004	0.001
Business cycle (S&P500 3m)	-3.432	1.456	0.018	-4.995
Maturity	0.006	0.008	0.511	0.000
Industrybeta	-0.142	0.172	0.408	-0.024
AEA Investors	-0.446	0.637	0.484	-0.284
Apax Partners	-0.034	0.604	0.956	-0.020
Bain Capital Partners	-0.892	0.392	0.023	-0.350
Blackstone Group	-0.725	0.435	0.095	-0.315
Bruckmann Rosser & Sherrell	-1.526	0.608	0.012	-0.928
CVC Capital Partners	1.294	0.853	0.129	1.104
Carlyle	-0.977	0.429	0.023	-0.419
Clayton Dubilier & Rice	-0.502	0.431	0.244	-0.216
Code Hennessy & Simmons	-0.898	0.527	0.088	-0.473
DLJ Merchant Banking	-0.791	0.528	0.134	-0.418
First Reserve	-0.549	0.386	0.155	-0.212
GTCR Golder Rauner	-0.213	0.496	0.667	-0.106
Goldman Sachs Capital Partners	-0.449	0.480	0.350	-0.215
Hellman & Friedman	-0.379	0.482	0.433	-0.183
INVESTCORP Partners	-0.185	0.405	0.647	-0.075
JW Childs Associates	-1.356	0.813	0.095	-1.103
Kelso & Co	-0.960	0.424	0.024	-0.407
Madison Dearborn Partners	-0.292	0.443	0.510	-0.129
One Equity Partners	-0.533	0.480	0.266	-0.256
Permira Advisers	0.517	0.470	0.271	0.243
Texas Pacific Group	-0.470	0.412	0.254	-0.193
Thomas H Lee Partners	-0.525	0.446	0.239	-0.234
Vestar Capital Partners	-0.457	0.534	0.393	-0.244
Welsh Carson Anderson & Stowe	-0.547	0.495	0.269	-0.271

Table VII

**Probit model results:
Model 2a: Reputation**

This table provides the estimates from the ordered probit model analyzing the impacts of private equity sponsors' reputation on the portfolio companies' credit ratings. Reputation is measured as amount of committed capital. These figures are provided by Private Equity International (PEI). PEI ranks a total of 50 private equity firms, whereof 14 of the firms in our sample are present. Therefore, the sample is limited to transactions by these 14 sponsors.

Panel A: Moody's

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	-0.010	0.095	0.914	-0.001
Debt to enterprise value	0.291	0.435	0.504	0.126
Ebitda margin	0.102	0.692	0.883	0.070
Interest coverage	0.067	0.024	0.004	0.002
Business cycle (S&P500 3m)	-1.965	1.896	0.3	-3.725
Maturity	0.016	0.010	0.088	0.000
Industrybeta	-0.274	0.190	0.149	-0.052
Reputation	0.003	0.006	0.636	0.000

Panel B: Standard & Poor's

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.209	0.077	0.007	0.016
Debt to enterprise value	0.369	0.351	0.293	0.130
Ebitda margin	-0.450	0.768	0.557	-0.346
Interest coverage	0.081	0.027	0.003	0.002
Business cycle (S&P500 3m)	-3.727	1.889	0.048	-7.038
Maturity	0.011	0.008	0.152	0.000
Industrybeta	-0.108	0.183	0.555	-0.020
Reputation	-0.002	0.005	0.697	0.000

Table VIII

Probit model results:**Model 2b: Financial Strategy Quality Index**

This table provides the estimates from the ordered probit model analyzing the private equity sponsor ownership using a financial strategy quality variable. The sponsors have been graded according to a report by Moody's including the 14 largest sponsors, whereof our sample includes 9. Hence, the sample has been limited to these 9 sponsors.

Panel A: Moody's

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.002	0.101	0.988	0.000
Debt to enterprise value	0.249	0.482	0.605	0.120
Ebitda margin	0.431	0.824	0.601	0.355
Interest coverage	0.076	0.026	0.003	0.002
Business cycle (S&P500 3m)	-0.415	1.986	0.834	-0.824
Maturity	0.003	0.009	0.732	0.000
Industrybeta	-0.186	0.234	0.428	-0.044
Financial strategy quality index	0.029	0.013	0.03	0.000

Panel B: Standard & Poor's

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.233	0.079	0.003	0.018
Debt to enterprise value	0.300	0.368	0.415	0.110
Ebitda margin	-0.451	0.924	0.625	-0.417
Interest coverage	0.069	0.025	0.007	0.002
Business cycle (S&P500 3m)	-1.699	2.222	0.444	-3.777
Maturity	0.000	0.010	0.971	0.000
Industrybeta	-0.155	0.278	0.576	-0.043
Financial strategy quality index	0.019	0.014	0.177	0.000

Table IX

Probit model results:**Model 2c: Disaggregated Financial Strategies – Moody's**

This table provides the estimates from the ordered probit model analyzing the individual components of the financial sponsor quality index and their respective impact on credit ratings of private equity sponsor owned firms. The components are extracted from a Moody's report on the 14 largest sponsors, whereof our sample includes 9. Therefore, the sample has been limited to these sponsors.

Panel A: Dividends within one year

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.042	0.099	0.672	0.004
Debt to enterprise value	0.396	0.475	0.405	0.188
Ebitda margin	0.704	0.841	0.403	0.592
Interest coverage	0.073	0.025	0.004	0.002
Business cycle (S&P500 3m)	-1.112	2.059	0.589	-2.290
Maturity	0.003	0.009	0.759	0.000
Industrybeta	-0.142	0.235	0.545	-0.033
Dividends within one year	-0.284	0.966	0.769	-0.274

Panel B: Large dividends

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.020	0.097	0.834	0.002
Debt to enterprise value	0.323	0.492	0.512	0.159
Ebitda margin	0.482	0.820	0.557	0.395
Interest coverage	0.069	0.025	0.006	0.002
Business cycle (S&P500 3m)	-0.964	1.950	0.621	-1.879
Maturity	0.002	0.009	0.825	0.000
Industrybeta	-0.192	0.235	0.414	-0.045
Large dividends	-2.561	1.076	0.017	-2.755

Panel C: Additional financing

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.057	0.097	0.559	0.006
Debt to enterprise value	0.425	0.475	0.371	0.202
Ebitda margin	0.916	0.852	0.282	0.780
Interest coverage	0.063	0.024	0.009	0.002
Business cycle (S&P500 3m)	-1.930	2.106	0.36	-4.064
Maturity	0.004	0.009	0.671	0.000
Industrybeta	-0.132	0.235	0.575	-0.031
Additional financing	0.686	0.442	0.121	0.303

Panel D: Downgrades

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.021	0.100	0.837	0.002
Debt to enterprise value	0.323	0.481	0.502	0.155
Ebitda margin	0.341	0.828	0.68	0.282
Interest coverage	0.074	0.025	0.003	0.002
Business cycle (S&P500 3m)	-0.578	1.968	0.769	-1.137
Maturity	0.003	0.009	0.762	0.000
Industrybeta	-0.201	0.232	0.387	-0.046
Downgrades	-1.551	0.648	0.017	-1.005

Panel E: Sale or IPO within 3 years

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.006	0.107	0.958	0.001
Debt to enterprise value	0.181	0.495	0.715	0.089
Ebitda margin	0.825	0.804	0.304	0.664
Interest coverage	0.065	0.025	0.009	0.002
Business cycle (S&P500 3m)	-1.311	1.929	0.497	-2.529
Maturity	0.005	0.010	0.571	0.000
Industrybeta	-0.131	0.238	0.582	-0.031
Sale or IPO within 3 years	3.328	1.650	0.044	5.490

Table X

Probit model results:**Model 2c: Disaggregated Financial Strategies – Standard & Poor's**

This table provides the estimates from the ordered probit model analysing the individual components of the financial sponsor quality index and their respective impact on credit ratings of private equity sponsor owned firms. The components are extracted from a Moody's report on the 14 largest sponsors, whereof our sample include 9. Therefore, the sample has been limited to these sponsors.

Panel A: Dividends within one year

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.252	0.078	0.001	0.020
Debt to enterprise value	0.390	0.347	0.261	0.135
Ebitda margin	-0.307	0.958	0.749	-0.294
Interest coverage	0.069	0.025	0.005	0.002
Business cycle (S&P500 3m)	-2.038	2.309	0.378	-4.705
Maturity	0.001	0.010	0.946	0.000
Industrybeta	-0.115	0.284	0.687	-0.033
Dividends within one year	0.108	0.908	0.906	0.098

Panel B: Large dividends

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.237	0.076	0.002	0.018
Debt to enterprise value	0.338	0.353	0.338	0.119
Ebitda margin	-0.505	0.913	0.58	-0.461
Interest coverage	0.064	0.026	0.014	0.002
Business cycle (S&P500 3m)	-2.072	2.202	0.347	-4.562
Maturity	0.000	0.010	0.969	0.000
Industrybeta	-0.163	0.264	0.536	-0.043
Large dividends	-2.140	1.115	0.055	-2.387

Panel C: Additional financing

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.252	0.078	0.001	0.020
Debt to enterprise value	0.383	0.343	0.264	0.131
Ebitda margin	-0.291	0.964	0.763	-0.280
Interest coverage	0.068	0.025	0.006	0.002
Business cycle (S&P500 3m)	-2.116	2.294	0.356	-4.854
Maturity	0.001	0.010	0.924	0.000
Industrybeta	-0.112	0.284	0.693	-0.032
Additional financing	0.117	0.480	0.807	0.056

Panel D: Downgrades

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.238	0.077	0.002	0.018
Debt to enterprise value	0.342	0.350	0.328	0.120
Ebitda margin	-0.512	0.923	0.579	-0.473
Interest coverage	0.066	0.026	0.009	0.002
Business cycle (S&P500 3m)	-1.783	2.253	0.429	-4.017
Maturity	0.000	0.010	0.991	0.000
Industrybeta	-0.160	0.276	0.562	-0.044
Downgrades	-1.078	0.648	0.096	-0.699

Panel E: Sale or IPO within 3 years

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.244	0.081	0.003	0.020
Debt to enterprise value	0.299	0.389	0.442	0.116
Ebitda margin	-0.295	0.957	0.758	-0.282
Interest coverage	0.066	0.025	0.009	0.002
Business cycle (S&P500 3m)	-2.012	2.281	0.378	-4.590
Maturity	0.001	0.010	0.895	0.000
Industrybeta	-0.118	0.284	0.679	-0.033
Sale or IPO within 3 years	1.022	1.498	0.495	1.530

Table XI

Probit model results:**Model 3: Individual Sponsor Impact – Moody's**

The tables below show the results from the probit model when estimating individual ownership impact using dummies. Nine different regressions are run, each with one individual sponsor dummy. The sample used is transactions rated by Moody's.

Panel A: Bain Capital Partners

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.052	0.100	0.605	0.005
Debt to enterprise value	0.453	0.475	0.341	0.215
Ebitda margin	0.711	0.824	0.388	0.586
Interest coverage	0.069	0.025	0.006	0.002
Business cycle (S&P500 3m)	-1.228	2.039	0.547	-2.503
Maturity	0.003	0.009	0.729	0.000
Industrybeta	-0.157	0.233	0.501	-0.037
Bain Capital Partners	-0.358	0.286	0.210	-0.102

Panel B: Blackstone Group

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.062	0.099	0.534	0.006
Debt to enterprise value	0.371	0.484	0.443	0.180
Ebitda margin	0.648	0.833	0.437	0.540
Interest coverage	0.072	0.025	0.003	0.002
Business cycle (S&P500 3m)	-1.186	2.009	0.555	-2.383
Maturity	0.002	0.009	0.819	0.000
Industrybeta	-0.201	0.236	0.395	-0.047
Blackstone Group	-0.443	0.333	0.184	-0.148

Panel C: Carlyle

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.026	0.101	0.793	0.003
Debt to enterprise value	0.344	0.472	0.466	0.162
Ebitda margin	0.809	0.800	0.312	0.647
Interest coverage	0.065	0.025	0.010	0.002
Business cycle (S&P500 3m)	-1.676	2.098	0.424	-3.518
Maturity	0.002	0.010	0.799	0.000
Industrybeta	-0.092	0.240	0.702	-0.022
Carlyle	-0.369	0.334	0.269	-0.123

Panel D: Goldman Sachs Capital Partners

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.044	0.098	0.652	0.004
Debt to enterprise value	0.419	0.486	0.388	0.203
Ebitda margin	0.748	0.848	0.378	0.635
Interest coverage	0.071	0.025	0.005	0.002
Business cycle (S&P500 3m)	-1.248	2.100	0.552	-2.620
Maturity	0.003	0.009	0.752	0.000
Industrybeta	-0.139	0.234	0.553	-0.033
Golman Sachs Capital Partners	0.103	0.468	0.826	0.048

Panel E: Kohlberg Kravis Roberts

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.020	0.099	0.836	0.002
Debt to enterprise value	0.377	0.487	0.438	0.184
Ebitda margin	0.431	0.834	0.606	0.360
Interest coverage	0.074	0.026	0.004	0.002
Business cycle (S&P500 3m)	-0.501	2.041	0.806	-1.023
Maturity	0.001	0.009	0.928	0.000
Industrybeta	-0.163	0.233	0.485	-0.038
Kohlberg Kravis Roberts	0.490	0.294	0.096	0.144

Panel F: Madison Dearborn Partners

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.043	0.099	0.663	0.004
Debt to enterprise value	0.377	0.482	0.434	0.182
Ebitda margin	0.937	0.849	0.270	0.796
Interest coverage	0.061	0.025	0.014	0.002
Business cycle (S&P500 3m)	-1.861	1.998	0.352	-3.718
Maturity	0.005	0.010	0.578	0.000
Industrybeta	-0.145	0.236	0.539	-0.034
Madison Dearborn Partners	0.616	0.221	0.005	0.136

Panel G: Texas Pacific Group

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.034	0.102	0.738	0.003
Debt to enterprise value	0.247	0.495	0.618	0.122
Ebitda margin	0.722	0.812	0.374	0.586
Interest coverage	0.071	0.025	0.005	0.002
Business cycle (S&P500 3m)	-1.366	2.014	0.498	-2.750
Maturity	0.004	0.009	0.694	0.000
Industrybeta	-0.142	0.237	0.549	-0.034
Texas Pacific Group	0.556	0.315	0.077	0.175

Panel H: Thomas H Lee Partners

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.043	0.099	0.662	0.004
Debt to enterprise value	0.404	0.477	0.397	0.193
Ebitda margin	0.691	0.848	0.415	0.586
Interest coverage	0.072	0.025	0.004	0.002
Business cycle (S&P500 3m)	-1.180	2.041	0.563	-2.408
Maturity	0.003	0.009	0.745	0.000
Industrybeta	-0.139	0.234	0.552	-0.032
Thomas H Lee Partners	-0.157	0.219	0.471	-0.034

Panel H: Welsh Carson Anderson & Stowe

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.033	0.104	0.748	0.003
Debt to enterprise value	0.385	0.485	0.427	0.187
Ebitda margin	0.757	0.848	0.372	0.642
Interest coverage	0.072	0.025	0.004	0.002
Business cycle (S&P500 3m)	-1.052	2.040	0.606	-2.146
Maturity	0.003	0.010	0.724	0.000
Industrybeta	-0.138	0.235	0.556	-0.032
Welsh Carson Anderson & Stowe	-0.160	0.378	0.671	-0.061

Table XII

Probit model results:**Model 3: Individual Sponsor Impact – Standard & Poor's**

The tables below show the results from the probit model when estimating individual ownership impact using dummies. Nine different regressions are run, each with one individual sponsor dummy. The sample used is transactions rated by Standard & Poor's.

Panel A: Bain Capital Partners

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.254	0.078	0.001	0.020
Debt to enterprise value	0.393	0.338	0.245	0.133
Ebitda margin	-0.314	0.958	0.743	-0.301
Interest coverage	0.066	0.025	0.008	0.002
Business cycle (S&P500 3m)	-2.117	2.340	0.366	-4.955
Maturity	0.001	0.010	0.919	0.000
Industrybeta	-0.121	0.285	0.672	-0.034
Bain Capital Partners	-0.356	0.241	0.139	-0.086

Panel B: Blackstone Group

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.260	0.079	0.001	0.021
Debt to enterprise value	0.362	0.353	0.306	0.128
Ebitda margin	-0.349	0.954	0.715	-0.333
Interest coverage	0.069	0.024	0.005	0.002
Business cycle (S&P500 3m)	-2.117	2.284	0.354	-4.836
Maturity	0.000	0.010	0.961	0.000
Industrybeta	-0.139	0.287	0.628	-0.040
Blackstone Group	-0.199	0.295	0.499	-0.059

Panel C: Carlyle

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.241	0.077	0.002	0.019
Debt to enterprise value	0.334	0.351	0.342	0.117
Ebitda margin	-0.304	0.925	0.743	-0.281
Interest coverage	0.064	0.025	0.011	0.002
Business cycle (S&P500 3m)	-2.410	2.338	0.303	-5.637
Maturity	0.000	0.010	0.976	0.000
Industrybeta	-0.092	0.266	0.730	-0.024
Carlyle	-0.409	0.286	0.153	-0.117

Panel D: Goldman Sachs Capital Partners

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.251	0.077	0.001	0.019
Debt to enterprise value	0.395	0.351	0.261	0.139
Ebitda margin	-0.297	0.969	0.759	-0.288
Interest coverage	0.069	0.025	0.005	0.002
Business cycle (S&P500 3m)	-2.070	2.358	0.380	-4.881
Maturity	0.001	0.010	0.929	0.000
Industrybeta	-0.115	0.283	0.684	-0.033
Goldman Sachs Capital Partners	0.077	0.348	0.825	0.027

Panel E: Kohlberg Kravis Roberts

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.230	0.077	0.003	0.018
Debt to enterprise value	0.409	0.352	0.246	0.144
Ebitda margin	-0.690	0.905	0.446	-0.624
Interest coverage	0.069	0.026	0.008	0.002
Business cycle (S&P500 3m)	-1.531	2.211	0.489	-3.384
Maturity	-0.003	0.010	0.741	0.000
Industrybeta	-0.180	0.249	0.469	-0.045
Kohlberg Kravis Roberts	0.703	0.327	0.031	0.229

Panel F: Madison Dearborn Partners

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.249	0.078	0.001	0.019
Debt to enterprise value	0.364	0.347	0.294	0.126
Ebitda margin	-0.274	0.973	0.778	-0.267
Interest coverage	0.066	0.025	0.010	0.002
Business cycle (S&P500 3m)	-2.147	2.294	0.349	-4.925
Maturity	0.001	0.010	0.892	0.000
Industrybeta	-0.111	0.285	0.697	-0.032
Madison Dearborn Partners	0.161	0.289	0.577	0.047

Panel G: Texas Pacific Group

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.251	0.077	0.001	0.019
Debt to enterprise value	0.402	0.380	0.291	0.153
Ebitda margin	-0.311	0.961	0.746	-0.299
Interest coverage	0.069	0.025	0.005	0.002
Business cycle (S&P500 3m)	-2.014	2.302	0.382	-4.636
Maturity	0.001	0.010	0.952	0.000
Industry beta	-0.115	0.285	0.685	-0.033
Texas Pacific Group	-0.040	0.310	0.898	-0.012

Panel H: Thomas H Lee Partners

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.252	0.077	0.001	0.019
Debt to enterprise value	0.387	0.345	0.262	0.134
Ebitda margin	-0.309	0.962	0.748	-0.298
Interest coverage	0.069	0.025	0.005	0.002
Business cycle (S&P500 3m)	-2.023	2.309	0.381	-4.672
Maturity	0.001	0.010	0.948	0.000
Industry beta	-0.117	0.283	0.681	-0.033
Thomas H Lee Partners	0.020	0.302	0.948	0.006

Panel I: Welsh Carson Anderson & Stowe

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.250	0.084	0.003	0.021
Debt to enterprise value	0.384	0.355	0.279	0.136
Ebitda margin	-0.307	0.975	0.753	-0.300
Interest coverage	0.069	0.025	0.005	0.002
Business cycle (S&P500 3m)	-2.002	2.290	0.382	-4.583
Maturity	0.001	0.010	0.941	0.000
Industry beta	-0.117	0.284	0.681	-0.033
Welsh Carson Anderson & Stowe	-0.027	0.371	0.942	-0.010

Table XIII

Probit model results:**Model 4a: S&P500 3 Month Returns**

The tables below display the estimated probit models using the 3 month index return for S&P500 to measure the state of the business cycle and thereby analyze the timing effect.

Panel A: Moody's

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.051	0.084	0.539	0.004
Debt to enterprise value	0.012	0.392	0.976	0.005
Ebitda margin	0.026	0.666	0.969	0.017
Interest coverage	0.063	0.021	0.003	0.001
Business cycle (S&P500 3m)	-2.514	1.394	0.071	-3.504
Maturity	0.016	0.009	0.060	0.000
Industry beta	-0.170	0.172	0.323	-0.029

Panel B: Standard & Poor's

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.267	0.068	0.000	0.018
Debt to enterprise value	0.200	0.313	0.524	0.063
Ebitda margin	-0.302	0.691	0.662	-0.208
Interest coverage	0.066	0.021	0.002	0.001
Business cycle (S&P500 3m)	-3.752	1.364	0.006	-5.117
Maturity	0.011	0.007	0.117	0.000
Industry beta	-0.078	0.156	0.616	-0.012

Table XIV

Probit model results:
Model 4b: US GDP Growth

The tables below display the estimated probit models using the quarterly US GDP growth to measure the state of the business cycle and thereby analyze the timing effect.

Panel A: Moody's

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.029	0.084	0.730	0.002
Debt to enterprise value	-0.039	0.380	0.918	-0.015
Ebitda margin	-0.293	0.647	0.651	-0.190
Interest coverage	0.066	0.020	0.001	0.001
Business cycle (GDP growth)	-0.270	0.176	0.125	-0.048
Maturity	0.015	0.009	0.085	0.000
Industry beta	-0.161	0.176	0.360	-0.028

Panel B: Standard & Poor's

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.246	0.067	0.000	0.016
Debt to enterprise value	0.133	0.296	0.653	0.039
Ebitda margin	-0.607	0.712	0.394	-0.432
Interest coverage	0.068	0.020	0.001	0.001
Business cycle (GDP growth)	-0.111	0.153	0.470	-0.017
Maturity	0.009	0.008	0.225	0.000
Industry beta	-0.071	0.161	0.657	-0.011

Table XV

Probit model results:**Model 4c: NBER Recession Index**

The tables below display the estimated probit models using a recession index provided by the National Bureau of Economic Research (NBER) to measure the state of the business cycle and thereby analyse the timing effect.

Panel B: Moody's

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.045	0.084	0.587	0.004
Debt to enterprise value	-0.019	0.382	0.961	-0.007
Ebitda margin	-0.167	0.668	0.802	-0.111
Interest coverage	0.066	0.020	0.001	0.001
Business cycle (NBER)	-0.571	0.346	0.099	-0.198
Maturity	0.018	0.009	0.052	0.000
Industrybeta	-0.153	0.175	0.380	-0.027

Panel B: Standard & Poor's

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.256	0.067	0.000	0.017
Debt to enterprise value	0.137	0.299	0.646	0.041
Ebitda margin	-0.628	0.736	0.393	-0.462
Interest coverage	0.071	0.020	0.000	0.001
Business cycle (NBER)	-0.854	0.251	0.001	-0.214
Maturity	0.010	0.008	0.178	0.000
Industrybeta	-0.077	0.153	0.616	-0.012

Table XVI

Probit model results:**Model 4d: Default Rates on Speculative Grade Debt**

The tables below display the estimated probit models using the default rates for non-investment grade bonds to measure the state of the business cycle and thereby analyse the timing effect.

Panel A: Moody's

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.098	0.086	0.253	0.008
Debt to enterprise value	0.071	0.387	0.855	0.027
Ebitda margin	-0.284	0.684	0.678	-0.194
Interest coverage	0.055	0.021	0.008	0.001
Business cycle (Default rate index)	0.105	0.039	0.007	0.004
Maturity	0.016	0.009	0.072	0.000
Industrybeta	-0.058	0.186	0.755	-0.011

Panel B: Standard & Poor's

Variable	Coefficient	Std. Err	p-value	Coefficient × variable std. Err
Size (log)	0.348	0.072	0.000	0.025
Debt to enterprise value	0.289	0.293	0.323	0.085
Ebitda margin	-0.813	0.776	0.295	-0.631
Interest coverage	0.054	0.019	0.004	0.001
Business cycle (Default rate index)	0.168	0.035	0.000	0.006
Maturity	0.009	0.008	0.230	0.000
Industrybeta	0.131	0.163	0.421	0.021

Table XVII

Predicted versus actual ratings

The tables below present the ratings predicted, under Model 2b estimations, as well as the actual ratings given by the rating agencies. Reading across the table shows the number of transactions predicted to belong to each rating category and on the vertical axis the number of transactions actually rated in each category is displayed. Panel A presents the results for the Moody's sample and Panel B presents the same results for the Standard & Poor's sample.

Panel A: Moody's

Actual Ratings	Predicted Ratings														Total
	A1	A2	A3	Baa1	Baa2	Baa3	Ba1	Ba2	Ba3	B1	B2	B3	Caa1	Caa2	
A1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Baa1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	2
Baa2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Baa3	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Ba1	0	0	0	0	0	0	0	1	1	4	0	0	0	0	6
Ba2	0	0	0	0	0	0	0	0	0	6	1	0	0	0	7
Ba3	0	0	0	0	0	0	0	1	1	10	5	0	0	0	17
B1	0	0	0	0	0	0	0	0	2	13	9	0	0	0	24
B2	0	0	0	0	0	0	0	0	1	18	11	0	0	0	30
B3	0	0	0	0	0	0	0	0	0	3	6	0	0	0	9
Caa1	0	0	0	0	0	0	0	0	0	3	2	0	0	0	5
Caa2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	2	6	59	34	0	0	0	101

Panel B: Standard & Poor's

Actual Ratings	Predicted Ratings														Total
	A+	A	A-	BBB+	BBB	BBB-	BB+	BB	BB-	B+	B	B-	CCC+	CCC	
A+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A-	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2
BBB+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BBB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BBB-	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
BB+	0	0	0	0	0	0	0	0	0	5	0	0	0	0	5
BB	0	0	0	0	0	0	0	0	1	3	0	0	0	0	4
BB-	0	0	0	0	0	0	0	0	1	18	1	0	0	0	20
B+	0	0	0	0	0	0	0	0	2	39	3	0	0	0	44
B	0	0	0	0	0	0	0	0	0	16	4	0	0	0	20
B-	0	0	0	0	0	0	0	0	0	12	4	0	0	0	16
CCC+	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2
CCC	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Total	0	0	0	0	0	0	0	0	4	98	13	0	0	0	115

Table XVIII

Re-estimated predicted versus actual ratings

The tables below present the same results as table XVII, but the model has been re-estimated so that the ratings are grouped to limit the number of outcomes of the dependent variable. Reading across the table shows the number of transactions predicted to belong to each rating category and on the vertical axis the number of transactions actually rated in each category is displayed. Panel A presents the results for the Moody's sample estimated with Model 2b, whereas Panel B presents the same results for the Standard & Poor's sample.

Panel A: Moody's

Predicted Ratings							
Actual Ratings	Excellent	Good	Adequate	Questionable	Poor	Very Poor	Total
Excellent	0	0	0	0	0	0	0
Good	0	0	0	2	0	0	2
Adequate	0	0	0	7	0	0	7
Questionable	0	0	1	33	14	0	48
Poor	0	0	0	23	21	0	44
Very Poor	0	0	0	0	0	0	0
Total	0	0	1	65	35	0	101

Panel B: Standard & Poor's

Predicted Ratings							
Actual Ratings	Excellent	Good	Adequate	Questionable	Poor	Very Poor	Total
Excellent	0	0	0	0	0	0	0
Good	0	0	0	2	0	0	2
Adequate	0	0	0	6	0	0	6
Questionable	0	0	0	65	3	0	68
Poor	0	0	0	28	10	0	38
Very Poor	0	0	0	1	0	0	1
Total	0	0	0	102	13	0	115

Table XIX

Financial Strategy Quality Index

The table below shows the values of the financial strategy quality index used to assess ownership effects.

Private Equity Sponsor	Financial Strategy Quality Score
Kohlberg Kravis Roberts	36
Texas Pacific Group	33
Carlyle	26
Madison Dearborn Partners	24
Bain Capital Partners	24
Goldman Sachs Capital Partners	23
Blackstone Group	19
Welsh Carson Anderson & Stowe	12
Thomas H Lee Partners	12

This index is calculated based on the data provided in the report "Private Equity: Tracking the Largest Sponsors" published by Moody's. The report investigates the post leverage buyout financial management of 14 private equity sponsors, over a time period of five years (2002-2007). Nine of these sponsors are included in our sample, and the index is therefore constructed for these. The process of estimating the quality index score can be described in three steps:

Step 1.

Five key factors of financial strategy are extracted from the report and used to compile the quality index. These factors are:

1. Number of deals that have been downgraded after the initial transaction was rated
2. Number of deals that have taken a dividend (i.e., required a separate financing to fund) within one year of the initial rating
3. Number of deals that have taken a large dividend, or dividends, that removed 80% or more of the equity from the initial transaction
4. Number of deals that have undertaken acquisitions that required a separate financing from the initial transaction or triggered a rating change
5. Number of deals that have been resold or underwent IPOs within three years of the initial rating

All factors are divided by the total number of rated deals financed by a certain private equity sponsor between 2002 and 2007, in order to get a percentage value for each sponsor of each factor.

Step 2.

For each factor, the percentage values of the different sponsors are ranked from 1-9 (since we have nine sponsors in total). Nine represents the highest quality and one the lowest. For factor 1-4, higher values are associated with lower financial strategy quality whereas higher values of the 5th factor are associated with higher quality. If the factor value is equal for several sponsors, these receive the same ranking.

Step 3.

For each private equity sponsor, the ranking values for all five factors are added together and the total score represents the quality of the sponsor's financial strategy.