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中 文 摘 要 ： 公司收高益債券是私募基金進行融資購併交易時主要的資金來源。本研究使用Bessembinder et al. (2009)提出的方法檢測公司債券的超額報酬，發現私募基金債券之績效普遍不佳，此現象尤以信用評等Ba以下以及於熱市發行之私募基金債券為最。本研究也發現私募基金成立愈久，其債券績效愈差。投資銀行相關之私募基金債券績效也顯著劣於一般私募基金債券。本研究為機構投資人與私募基金管理者提供了債市的新觀點。

中 文 關 鍵 詞 ： 債券、績效、私募基金、融資購併、信用評等

英 文 摘 要 ： The bond market provides an important source of financing for Private Equity (PE) sponsored transactions. Using the methodology suggested by Bessembinder et al. (2009), we find that PE-sponsored bonds underperform comparable benchmarks. This is especially true for bonds with credit ratings below Ba or bonds issued in hot bond markets. Furthermore, bonds sponsored by more experienced PE groups underperform bonds associated with less experienced PE groups, while bonds backed by investment bank-affiliated PE groups underperform bonds sponsored by other PE groups. These findings provide new insights for institutional investors and policy makers about PE’s role in the bond market.

英 文 關 鍵 詞 ： Bonds, Performance, Private Equity, Leveraged buyouts, Credit Rating

The performance of bonds sponsored by private equity firms

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The performance of bonds sponsored by private equity firms

Abstract

The bond market provides an important source of financing for Private Equity (PE) sponsored transactions. Using the methodology suggested by Bessembinder et al. (2009), we find that PE-sponsored bonds underperform comparable benchmarks. This is especially true for bonds with credit ratings below Ba or bonds issued in hot bond markets. Furthermore, bonds sponsored by more experienced PE groups underperform bonds associated with less experienced PE groups, while bonds backed by investment bank-affiliated PE groups underperform bonds sponsored by other PE groups. These findings provide new insights for institutional investors and policy makers about PE's role in the bond market.

Keyword: Bonds, Performance, Private Equity, Leveraged buyouts, Credit Rating

JEL: G12, G24

1. Introduction

The credit boom and easy access to cheap debt fueled a record $1.4 trillion in leveraged buyouts (LBOs) in 2006 and 2007, followed by huge losses on subprime mortgages in the financial crisis that led to a flight to safety by money managers. The center of the concerns is the high pricing at issuance. For example, a Bloomberg article by Sridhar Natarajan on March 15, 2013 quotes a statement by a fund manager "Most bonds are trading at a pretty high premium and could face significant price erosion." The article further raises a warning sign by stating the following: "Investors holding almost $1 trillion of the lowest-rated U.S. investment-grade corporate bonds are at a greater risk of losses as the pace of buyouts surges to the fastest pace in six years because the debt offers few protections." Despite the economic significance of the high-yield bond market for private equity sponsored transactions, little research has systematically examined the post-issue performance of bonds to finance LBOs.

One exception is a clinical study by Dammon et al. (1993) that documents a pattern of large and persistent mispricing in the three high-yield bonds of RJR Nabisco after it was acquired by KKR during the peak of the junk bond market in the late 1980s. Our research is thus the first study to systematically examine the long-run returns of bonds issued by PE-sponsored companies. The post-issue performance of these high-yield bonds is of high relevance since many are issued at the market peak and they are often held by institutional investors such as pension funds, partially due to the lack of active secondary markets and partially due to the high risk.

Several studies (e.g., Harford and Kolasinki, 2014; Hotchkiss et al., 2014; Huang et al., 2015) raise a debate that PE sponsors may benefit themselves by expropriating other stakeholders such as debt investors via wealth transfer events such as special dividend payout, financial distress and cheap debt.[1] Different from the extant literature, our research directly addresses this important question by studying performance of PEG-backed bonds. The earlier literature provides some evidence that LBO transactions acted as bad news for debt investors. For example, Kaplan and Stein (1990) suggest that debtholders were not adequately compensated for the risk they bore in leveraged

[1] Guo et al. (2011) find that risk-adjusted return on total capital is high but they do not study bond return issued by PE-sponsored companies.

recapitalizations of 31 public companies in the 1980s. Asquith and Wizman (1990) find that pre-buyout bond investors suffer losses when their bonds have no covenants. Warga and Welch (1993) find that incumbent bondholders of target firms suffer significant losses when LBOs are announced. Recently Huang et al. (2015) find that PE-backed IPO firms have lower yield spreads on bonds issued after they go public. None of these papers systematically examine bond performance related to PEG-backed deals.

The lack of systematic studies on PEG-backed bonds is mainly due to data constraints and the difficulty of assessing bond returns. Unlike stock data, bond information is hard to find since many issuers are privately-held after being delisted through LBO transactions. We solve this data problem using two procedures: First, we collect data from Capital IQ on PEG-sponsored bond issuances and second, we merge it with bond pricing data from Lehman Brothers Bond Database (LBBD). We also try to enlarge our sample by including TRACE data but do not succeed because of the difference between LBBD and TRACE. To assess bond performance, our research follows the recommendations in Bessembinder et al. (2009) to calculate bonds' abnormal returns.[2] Our research is therefore the first to provide a comprehensive analysis of post-LBO bond (abnormal) performance for U.S. companies backed by Private Equity Groups. Compared to the sample period from 1993-2001 in Harford and Kolasinski (2014), our sample period is from 1991-2006. The financial crisis period is excluded in our sample. The 2006 cut-off year is chosen because the sample requires 3 or 5 years post-issuance bond return data.

We examine several hypotheses regarding the performance of the PEG-sponsored bonds. It is an empirical question whether private equity sponsors bring value to high-yield investors or they raise bond capital cheaply. Hotchkiss et al. (2014) find that PE-sponsored companies are no more likely to default than other high-yield issuers and conditional on default they conduct faster and cheaper debt restructurings. Our research thus compliments their study by examining post-issue performance of high-yield bonds issued by PE-sponsored companies. As most LBO-related bonds have junk bond credit

[2] Bessembinder et al. (2009) provide a caveat that the possibility of detecting a moderate price shock for a noninvestment grade company is extremely low unless the sample size approaches to 500 companies. This small sample issue works against our findings. Our result thus provides the lowest-bound evidence on the underperformance of PEG-sponsored bonds.

rating and they cannot easily be traded, what really matters to institutional investors who hold them is their long-run performance. Following Dammon et al.'s (1993) anecdotal study of bonds in RJR Nabisco, our research is the only work that systematically examines the post-issuance performance of bonds sponsored by PEGs.

We hypothesize that private equity groups are able to raise funds especially highly-risky bonds with low cost of debt capital. Empirically we test this hypothesis by examining whether PE-sponsored bond underperform other bonds with similar risk profile in general and also whether PE-sponsored bond underperformance is more apparent in bonds with lower credit ratings. Our second hypothesis is the market timing hypothesis, which states that PEGs are more likely to issue bonds when the market is hot and thus overpay for the bonds. Our third hypothesis is the PEG reputation hypothesis, which states that more reputable PEGs issue better-performing bonds. Finally, we posit that bonds sponsored by investment bank-affiliated PEGs underperform than other bonds since they can raise even cheaper bond capital.

We find that PEG-sponsored bonds on average have negative abnormal returns: they underperform comparable benchmarks following issuance, especially in the first post-issue year.[3] We thus provide solid evidence that high-yield bonds sponsored by PEGs are associated with overpricing. The findings suggest that PE can raise bonds with a cheaper financing cost. This evidence is consistent with the concerns that bond investors are concerned with great risk of losses related to buyout bonds.[4] Such empirical evidence of mispricing is also consistent with general theories that the market does not eliminate mispricing due to limits of arbitrage (Shleifer and Vishny, 1997) or investor's sentiment in high-yield bond markets (Nayak, 2010).

Consistent with the first hypothesis, we further find that bonds with ratings below Ba perform worse in the post-issuance period compared to bonds with a Ba rating. Our evidence suggests that the enduring power of private equity in LBOs is their ability to issue highly risky bonds with low returns for bondholders. This is consistent with Kaplan and Stein (1993) in the sense junk bonds investors misprice their debt by focusing too

[3] In Table 2, the risk-adjusted mean returns show consistent underperformance while median returns do not. This is probably due to the fat tail distribution of the bond returns. In the multivariate analysis, the underperformance result is robust.

[4] A recent article by Bloomberg on Mar 15, 2013 is titled "LBOs imperil $900 billion of US company bonds: Credit Market.

much on stated yields and past buyout successes, and pay too little attention to subtle capital structure details of the deals. Our new evidence confirms that most of the bad performance of buyout-related bonds is caused by those with lower credit ratings.

We find evidence to support our market timing hypothesis. PE-sponsored bonds issued during hot market periods perform worse than bonds issued during cold market periods. In this analysis, we sort each calendar month in our sample period into Cold or Hot bond markets based on the number of bond issues in our sample. Months with above median numbers are classified as hot markets, while those with below median are classified as cold markets. The results suggest that PE sponsors are good at exploiting windows of opportunity and sell bonds when there is a larger demand in the bond market. Bonds issued in these hot bond market periods then subsequently underperform.

We do not find evidence to support the PEG reputation hypothesis. Bonds sponsored by more reputable PE firms actually underperform those sponsored by less experienced PE firms. This is consistent with Demiroglu and James (2010), who find that borrowing costs are lower for buyouts sponsored by high reputation PE groups. Our results suggest that larger and older PEGs take advantage of institutional investors to raise cheaper bonds to finance LBOs especially when debt market is favorable, consistent with Axelson et al. (2013)'s conclusion that PEGs are able to borrow cheap.

Finally, our evidence is consistent with Ivashina and Kovner's (2011) finding that bank relationships formed through repeated interactions reduce inefficiencies from information asymmetry and allow private equity groups to receive favorable loan terms in financing LBOs. In addition, we divide PE sponsors according to their affiliation following Fang et al. (2013) and we find that bonds sponsored by investment-bank affiliated PEGs or independent PEGs under-perform bonds sponsored by commercial bank-affiliated PEGs.

The rest of the paper is organized as follows. Section 2 introduces the background of private equity activity, LBOs, and bond market related to LBOs. Section 3 describes our data selection and defines the variables used. Section 4 discusses the empirical findings, and Section 5 concludes the paper.

2. Background

Private Equity Groups (PEGs) such as KKR depend heavily on junk bond issuance to finance LBOs through "bootstrap debt financing." In bootstrap debt financing, PEGs first set up a new acquisition subsidiary to issue bonds or other debt instruments backed by the targets' assets and future cash flows, and then finance an acquisition of the target firms through a takeover. To complete LBO transactions, PEGs merge the targets with the indebted acquisition conduits so that the target companies become portfolio firms.

Private equity or LBO firms typically seek out equity investors such as pension funds or university endowments to fund approximately 30 percent of the cost of leveraged buyouts (LBOs), according to the Global Private Equity Report 2011 by Bain & Company. Typically, these funds raise equity from investors at the time the fund is formed. Additional, deal-level capital is raised in the form of high-yield debt and syndicates loans at the time of a specific transaction such as a leveraged buyout; these loans are in the target company's name. This debt almost always includes a portion that is senior and secured such as bank debt, and often includes a junior unsecured portion, such as high-yield bonds or "mezzanine debt" (see Kaplan and Stromberg (2009) for a more detailed view of the private equity market). Institutional investors are typically the major investors in these risky (junk) bonds or leveraged loans backed by Private Equity. These LBO-related or private equity backed bonds are often traded at a large discount[5] of 20-40%, hence attracting many yield-oriented hedge funds and institutional investors.

The LBO market in the U.S followed several waves. KKR's $25 billion hostile takeover of RJR Nabisco in 1987 marked the peak of the first LBO boom. After the collapse of Drexel Burnham Lambert and the crash of the junk bond market, leveraged buyouts almost disappeared after 1988. Andrade and Kaplan (1998) report that approximately 29% of 136 MBOs and leveraged recaps done in 1980s later failed. Although buyout activity was very low in the early 1990's, it recovered in the later part of the 1990's and reached record volume during the credit boom in 2006-2007, only to come to an abrupt end with the credit crisis in late 2007. While the earlier U.S. buyout industry was composed of a relatively small number of organizations, the LBO market

[5] For example, according to Trace, the bond-price reporting system of the Financial Industry Regulatory Authority, First Data's $2.4 billion of 11.25 percent notes due in 2016 fell 18.25 cents to 66 cents on the dollar on May 21, 2010.

underwent tremendous growth in both size and number of transactions in the 2000s. Large LBO funds and large deals started to emerge. Some of the largest transactions include purchases such as: Harrah's Entertainment ($27.4 billion) by Apollo and Texas Pacific; Freescale SemiConductor ($17.6 billion) by Blackstone, Carlyle, Permira, and Texas Pacific; and Hertz ($15 billion) by Carlyle, Clayton Dubilier & Rice, and Merrill Lynch. First Data Corp. is reported to issue up to $8 billion of junk bonds as part of $24 billion in debt financing for its leveraged buyout by Kohlberg Kravis Roberts & Co. According to the Private Equity Council[6], in 2007 alone private equity groups raised more than $516 billion in capital for LBO funds and completed 2,238 acquisitions and/or investments for a record $721 billion.

Credit Suisse in its 2006 Global Trend Report states that:

[D]ebt-financed corporate takeovers bring with them considerable risks, not least for owners of "old" bonds. An LBO is a problem for an existing or "old" bond because it involves a higher level of debt for the company taken over, and thus typically leads to falls in bond prices. Unless, that is, such takeovers come with a degree of protection offered by legally binding bond clauses or so-called "bond covenants". Moreover, these bonds are typically transferred to a holding company. By contrast, the newly issued securities aimed at financing the acquisition are placed at the level of the operationally active company. As a result, existing bonds find themselves structurally disadvantaged (subordinated). This in turn causes the credit rating to fall, perhaps even as far as the speculative rating category, where the price of affected bonds falls significantly.

Aside from the anecdotal evidence supplied by Dammon et al. (1993) on the mispricing of RJR Nabisco bonds after the KKR acquisition, little is known about the performance of PEG-sponsored bonds issued at or after LBOs. Recent studies such as Shivdasani and Wang (2011) suggest that LBO markets overheated due to the rapid growth of securitization of loans. In contrast, buyout-related junk bond market attracts little academic attention, despite the fact that high-yield bonds related to PEG-sponsored LBOs have great volume and are important to institutional investors such as insurance firms, pension funds or hedge funds.

[6] http://www.privateequitycouncil.org/private-equity-by-the-numbers/

3. Methodology

3.1 Firms with multiple bonds

Bessembinder et al (2009) note that in their sample, the majority of firms have a single bond outstanding. They advocate the firm-level approach to examine bond returns by treating each firm as a portfolio of bonds issued. This mitigates the primary concern with the bond-level approach, namely that results may be driven by a handful of firms with multiple bonds. However, PEGs manage a portfolio of firms with each firm issuing their own bonds. In general the level of debt in these firms is substantially higher than in other leveraged transactions. At the PE sponsor level, the average PE firm in our sample sponsors 8.7 public bonds in 3.3 different target companies. The average (median) LBO firm in our sample has 2.65 (2) public bonds outstanding. Since we examine sub-samples based on bond characteristics and since bonds can be issued at different points in time even for the same target firm, using the firm-level approach seems less appropriate. Consequently, we rely on the bond-level approach in our main analysis but also do robustness checks on our results at the firm level.

To evaluate bond performance at the firm level, we follow Bessembinder et al. (2009) and treat each target firm as a value-weighted portfolio. We employ both event time and calendar time approaches to compute the value-weighted average returns. In the event-time approach, as shown in equation (1), we first compute the average monthly return over the holding horizon H (H = 12, 24, or 36 months) for each bond from the event month 1 and then calculate the weighted average return across bonds within a firm, where the weight is inflation-adjusted market value of bond at the end of event month 0 or at the first available month-end, whichever is later. This approach is designed to put bonds in the event-time framework, a method similar to buy-and-hold returns in stocks. In the calendar-time approach, for each calendar month, we compute the firm-level bond returns using all bonds issued by the same firm with available returns in that month, where the weight is the market value of bonds in the prior month. For bonds eventual ending with default, we will include them until their return is not available. We then average the monthly firm-level returns over the sample period, as in equation (2), as long as there are bonds still within the holding horizon (12-, 24-, 36-months). This approach implicitly assumes a trading strategy based on bonds issued by the firm. As we employ a

value-weighting scheme, the investment strategy here is less subject to the concern of large transaction costs involved in returns.

$$FR = \sum_{i=1}^{N} w_i \left(\frac{\sum_{t=1}^{H} BR_{it}}{H} \right) \tag{1}$$

$$FR = \frac{1}{T} \sum_{t=1}^{T} \left(\sum_{i=1}^{N} w_{it} BR_{it} \right) \tag{2}$$

where FR is the firm-level return and BR is the bond-level return.

3.2 Measuring abnormal bond performance

We mainly follow the literature, especially Bessembinder, Kahle, Maxwell, and Xu (2009), to measure abnormal bond returns. Three approaches employed in our paper are the mean-adjusted model, the risk-adjusted model (or matching portfolio model), and the factor model.

The most popular approach in the literature to estimate abnormal bond returns is the mean-adjusted model. The abnormal return (AR) is the difference between the bond excess return (ER) and the expected excess return (EER). The bond excess return is the bond total return (BR) minus the return on a matched Treasury security (TR), and the expected excess return is the average of the historical excess returns. That is,

$$AR_t = ER_t - EER_t \tag{3}$$

where $ER_t = BR_t - TR_t$, and $EER_t = \left(\sum_{y=1}^{k} ER_{t-y} \right) \Big/ k$

We follow Bessembinder et al. (2009) and use a six-month window to estimate the expected excess return. We require at least three non-missing monthly returns during this six-month window.

The second approach we use to measure abnormal bond returns is the risk-adjusted model. This method aims to control for the major risk components of bonds with matching portfolios. We form matching portfolios on the dimensions of credit rating and time-to-maturity in order to control for default risk and maturity risk. We take all non-investment grade bonds with available data from the bond database and classify them into four rating categories (Ba, B, Caa, Ca) and three maturity groups, totaling 12 portfolios. The maturity cutoffs for ratings Ba and B are 0 to 6 years, +6 to 9 years, and +9 years.

For ratings below B, the maturity cutoffs are 0 to 5 years, + 5 to 8 years, and +8 years. We choose these cutoffs to generate portfolios with roughly equal numbers of bonds. In forming the benchmark for the risk-adjusted model, we apply both the equal- and value-weighted schemes to compute portfolio returns, since bond size might affect liquidity risk. The abnormal return is the sample bond return minus the return of the matching portfolio in the same month.

For the factor model, we rely on the four-factor model developed by Elton et al. (1995) and revised by Bessembinder et al. (2009) as follows:

$$R_{b,t} - R_{f,t} = \alpha + \beta_1(R_{m,t} - R_{f,t}) + \beta_2 R_{bond,t} + \beta_3 DRP_t + \beta_4 Term_t + e_t \quad (4)$$

where R_b is the bond portfolio return, R_m is the CRSP value-weighted stock index return, R_{bond} is the Lehman corporate bond index return, *DRP* is the default risk premium, and *Term* is the term premium. We form calendar time bond portfolios by including sample bonds that were issued in the past 1, 2, or 3 years, and then regress the time-series regressions as in equation (4). The abnormal return is measured by the regression intercept. To prevent smaller bond issues from dominating the regression estimations, we examine both equal-weighted and value-weighted bond portfolio returns. Moreover, since our sample bonds are not evenly distributed in time, the typical ordinary least square (OLS) regressions may assign inappropriately heavy weights to calendar months with few bond issues. This will generate a low power test (Loughran and Ritter, 2000). To correct this potential bias, we also report results based on weighted least square (WLS) regressions, where the weight is the number of bonds in the portfolio in a given month.

Among the three models we use to gauge abnormal bond returns, the risk-adjusted model with value-weighting (VW) scheme exhibits the best statistical features (Bessembinder et al. (2009)). In particular, the risk-adjusted model with the VW benchmark generates well-specified test statistics and higher power to detect abnormal returns compared to other models. While the mean-adjusted model is popular in the literature, it tends to over-reject in the lower tail of the distribution. The factor model tends to be well-specified, but has much lower power to detect abnormal returns.

The mean-adjusted model requires at least three non-missing monthly returns during the prior six-month window to estimate abnormal returns. However, the risk-adjusted model and the factor model do not rely on prior returns. As such, there exists an

inconsistency in the investment horizon between the mean-adjusted model and other two methods. Consequently, to ensure these three methods capture the abnormal performance over the same period, we define the one-year return as the return from month 4 to month 15 after bond issuance (i.e. the event month 1 in our return calculations is the fourth month after issuance), and the two-year and three-year returns as the returns over the post-issue month 4 to month 27 and month 4 to month 39, respectively.[7] To enlarge our sample size, we do not impose the prior three month return requirement on the sample bonds, except for the mean-adjusted model. However, our results for the risk-adjusted model and the factor model are very similar when the prior three month return requirement is imposed.

4. Data

4.1 Bond return data

Our bond data are obtained from the Lehman Brothers Bond Database (LBBD).[8] LBBD offers month-end information on price, yield to maturity, credit rating, and returns for a comprehensive set of publicly traded corporate bonds. Bessembinder et al. (2009) show that LBBD contains very similar information compared with TRACE month-end transaction data. Elton et al. (2001) also find that bond pricing in LBBD is comparable to CRSP in accuracy.

We require that each corporate bond have available information on bond rating, issue size, issue date, maturity date, and coupon rate over the period of 1991 to 2006.[9] We drop zero-coupon bonds as well as puttable bonds due to the unique feature of

[7] Our event window starts with the fourth month after issuance due to the requirement of at least three non-missing monthly returns to compute the expected excess return in the mean-adjusted model (see equation (3)). For example, for the post-issue month 4, the expected excess return is the average of excess returns over post-issue months 1 to 3. For the post-issue month 5, the expected excess return is the average of excess returns over post-issue months 1 to 4. For the post-issue month 6, it's the average of excess returns over post-issue months 1 to 6. For the post-issue month 7 and onwards, the expected excess return is the average of excess returns in the prior 6 months.

[8] See Bessembinder, Kahle, Maxwell, and Xu (2009) for a comprehensive list of research in using LBBD. Although daily TRACE data has become increasingly popular, TRACE is unavailable for most of our sample period.

[9] Our return data stop in 2006 as this is the most recent data we can get from LBBD. However, LBO activity also declined significantly after 2006 due to the effects of the financial crisis and the drastic increase in spreads on high-yield bonds. For example, PE related deal flow fell from 24% of M&A activity during the peak of the PE boom in 2006 to 3% in 2009 ("Private Equity feeds on bite sized deals," Megan Davies and Simon Meads, Reuters, June 23, 2011).

convertibility[10]. Following Elton et al. (2001) and Bessembinder et al. (2009), we eliminate monthly observations with large return reversals where a 20% or higher return is followed by a 20% or larger return of the opposite sign. We further drop bond-months without bond market values and bond-months with zero total returns.

4.2 The sample

Our sample of bond issuances is obtained from Capital IQ, a Standard & Poor's subsidiary for financial data. Capital IQ provides comprehensive bond issuance information from U.S. companies that have financial sponsors after 1990. We define a bond issue as a PEG-sponsored bond based on the Capital IQ deal synopsis, which classifies deals according to the type of leading equity investor. We only keep those bonds issued in 2006 or earlier by firms that are sponsored by private equity groups, including LBOs, leveraged recapitalizations, and reverse LBOs that are backed by private equity. We keep only bond issuances with deal values greater than 5 million U.S. dollars to avoid the potential outlier effect due to small bond deals. Our sample is fairly consistent with other studies examining LBOs in terms of firm number or firm size (Axelson et al. (2013)). We match the monthly bond return data from LBBD with this sample of bond issues backed by private equity from Capital IQ. To ensure our sample bonds are not close to default, we eliminate bonds with credit ratings of C or below.[11] We further drop bonds where the issuance date is prior to the LBO transaction date; thus unlike Warga and Welch (1993), we are not examining the impact of the LBO on target firms' existing bondholders. This leaves us a final sample of 697 bonds issued by 312 firms. These 312 firms are sponsored by 96 different PE sponsors.

Table 1 reports the sample distribution and summary statistics. Consistent with the buyout market boom after 2000, our sample bond issuance clusters in the early 2000s, with 49% of our full sample issuance occurring in 2002-2004.[12] Approximately 75% of

[10] When they are included, our findings remain similar.

[11] Our results are very similar with the inclusion of C-rated bonds.

[12] Although the aggregate capital invested in LBOs peaks in 2006-2007, the number of observations in our sample declines in 2005 and 2006. There are two reasons for this. First, transactions completed in 2005 and 2006 will not be in our sample if there are no LBBD pricing data until after 2006. Second, as shown in Table 2 of Demiroglu and James (2009) and discussed in Shivdasani and Wang (2011), a substantial portion of financing during the LBO boom came from CLOs rather than corporate bonds. We find a similar decline in the number of bonds issued in 2005-2006 in the high-yield bond universe from LBBD.

the sample bonds are rated B at issuance. PEG age, defined as the difference between the PEG founding year and the bond issuance year, varies across bond issues. Most of bonds in our sample are sponsored by PE groups with an age ranging from 6 to 25 years. There are very few bond issues by very young or old PEs. The average bond issue size is about 285 million, with average 8.3 years to maturity and a 9.4% annual coupon rate.

5. Empirical Results

5.1 Long-run bond returns to PEG-sponsored bonds

In Table 2, we report the long-run returns of bonds sponsored by private equity groups. We analyze the long-run bond returns by examining cross-sectional bond-level returns, firm-level event-time returns, and firm-level calendar-time returns. Panel A reports the summary statistics for raw returns, Panel B the excess returns, Panel C the mean-adjusted returns, Panel D the returns adjusted by the equal-weighted portfolio matched on maturity and credit rating matching, and Panel E the returns adjusted by the value-weighted portfolio matched on maturity and credit rating matching. We report one year, two year, and three year post-issuance returns.

Across all bonds, PEG-sponsored bonds have a mean (median) monthly return of 0.20% (0.75%) in the three years post issuance. When we aggregate bonds at the firm level in event time (calendar time), PEG-sponsored bonds have a similar average return of 0.14% (0.23%) and a similar median return of 0.78% (0.78%). When PEG-sponsored bond returns are adjusted by the treasury rate in Panel B, mean excess returns are negative but insignificant while median returns are positive and significantly greater than zero. However, when PEG-sponsored bond returns are adjusted by mean historical excess returns (Panel C), their abnormal returns are negative and significant at the bond level. For example, the average (median) monthly mean-adjusted three-year return is -0.25% (-0.02%), which is significant at the 1% (10%) level. At the firm level, the mean returns are negative and significant, while the medians are generally insignificant. Since many bonds have different credit ratings or maturities, examining mean-adjusted returns may not fully control for the risks in these bonds. We therefore match PEG-sponsored bonds with the corresponding credit rating and maturity matched portfolios in Panels D and E, following the procedure in Bessembinder et al. (2009). Panel D reports abnormal returns

based on an equal-weighted benchmark while Panel E uses a value-weighted benchmark. The mean abnormal bond returns are consistently negative and significant regardless of whether they are calculated at the bond level or at the target firm level. The median returns are significantly negative in the first year at the bond level, but generally small in magnitude and not significant over longer horizons and at the firm level.

The cross-sectional analysis above shows that on average, PEG-sponsored bonds have significantly negative mean returns. The medians tend to be slightly negative and significant at the bond level, but insignificant at the firm level. PEG-sponsored bonds underperform bonds with similar credit rating & maturity profiles. As the mean returns may be sensitive to outliers, in Panel F we report the results by first winsorizing the monthly returns at the top and bottom 1% levels before summarizing these monthly returns. We find that mean returns are still negative and significant over the different horizons. These results suggest that the underperformance of PEG-sponsored bonds is not driven simply by a few outliers.

Table 3 presents the calendar-time portfolio regression analysis by forming calendar-time portfolios for the one year, two years and three years post issuance. The factor-adjusted analysis in the OLS regressions indicates that PEG-sponsored bonds underperform in the first year after issuance; the performance in the post-issue two and three years is negative but not significant. As the OLS regressions assign equal weights to both heavy and light issuance months and thus under-estimate the abnormal performance of bonds, we also show the results based on WLS regressions in which the weight is proportional to the number of bonds in a given month. The alphas, or intercepts of the regressions, are all negative and larger in magnitude than those in OLS regressions. The first year underperformance is statistically significant and robust across different weighting schemes and regression methods. Overall our results show that PEG-sponsored bonds exhibit poor long-run performance, suggesting no value creation for bond investors to finance PEG-sponsored transactions.

5.2 Univariate Results by bond, PEG, and credit market characteristics

5.2.a Bond Ratings

The prior analysis treats all bonds as homogenous, while in reality the performance of bonds may differ across bonds with different characteristics. For example, bonds with low credit ratings may behave very differently from those with high credit ratings. Therefore we divide the whole bond sample into two subsamples, bonds with ratings of Ba and bonds with ratings below Ba, since most PEG-sponsored bonds have ratings below Ba.

Panel A of Table 4 examines the mean-adjusted returns. The mean and median of the mean-adjusted returns for Ba bonds are negative but not significant. In contrast, bonds with below Ba ratings display significantly negative performance across all three post-issue periods; the medians are significantly negative in the one, two, and three years post issuance. The differences between the Ba and below Ba returns are not significant however.

Panels B and C show the risk-adjusted EW and VW returns, respectively. Both the EW and VW mean returns are negative and significant for both Ba and below Ba bonds, although the magnitude of the underperformance is more than twice large for the below Ba bonds. The differences in the mean abnormal returns between the Ba and below Ba groups are significant in the one, two and three post-issue years. Interestingly, the median returns are insignificantly negative for below Ba bonds, suggesting that a few of below Ba bonds severely underperform.

In the calendar-time portfolio analysis reported in Panel D, bonds with ratings of Ba that are sponsored by PE groups have insignificant alphas, while those with below Ba ratings have negative and significant alphas over the one and two years horizons.

In untabulated results, we examine alternative measures of credit risk, such as the spread between BAA and AAA bond returns, the spread between high yield bonds and the one month LIBOR rate, and the credit tightening variable (measured as the net percentage of domestic banks reporting a tightening of standards for commercial & industrial loans in the quarter prior to the bond issue). Bonds issued in the Low (High) credit spreads are assumed to have less (more) risk. We find that bonds issued when credit spreads or the credit tightening variable are high exhibit significantly negative performance. The median performance of bonds issued when credit spreads are high is

significantly more negative than the median performance of bonds issued when spreads are low. This is consistent with riskier bonds earning lower returns.[13]

5.2.b PEG reputation

Our PEG reputation hypothesis suggests that reputation is an important factor in determining performance or raising funds. Following Cao and Lerner (2009), we use PEG age to proxy for experience. We divide the sample of PEG-sponsored bonds into two subsamples, those with more experienced PE sponsors and those with less experienced sponsors, based on a cutoff of 15 years. The results are reported in Table 5.[14]

Overall, bonds sponsored by more experienced PE groups exhibit significantly lower risk-adjusted returns than those backed by less experienced PE groups, which is inconsistent with our reputation hypothesis.[15] Both the means and medians of risk-adjusted abnormal returns, using either the equal- or value-weighted benchmark returns, are significantly lower for the more experienced PE sponsors. This underperformance of bonds backed by more experienced PEGs persists for one, two, and three post-issuance years. For example, the mean (median) abnormal returns of bonds issued by more experienced PE firms are -0.75% (-0.09%), while the mean (median) abnormal returns of bonds backed by less experienced PE groups are -0.10% (0.09%) for the three post-issuance years (see Panel C of Table 5). Similar results are obtained when we examine equal- and value-weighted calendar time portfolio regressions. This new and important result suggests that more experienced PE sponsors may have the advantage of raising cheaper bonds to finance their investment activities, which has important implications for capital market and policy makers.

[13] The results on spreads are inconsistent with the argument in Axelson et al (2013) that firms tend to borrow when the credit spread is low. To further examine this issue, we sort by both PEG age and by credit spread or tightening percentage. When using the BAA-AAA spread or tightening percentage, underperformance is driven by the older, more experienced PEG sponsors. This finding seems to suggest that when credit is easy, market timing does not matter. It is most relevant when credit is tight. Older PEGs seem to have an advantage in this.

[14] As in Cao and Lerner (2009), we also examine total capital raised by the PEG prior to the LBO date as a proxy for reputation, and find that firms with higher capital perform worse. The detailed results are reported in Appendix Table A1.

[15] It is also seemingly inconsistent with Demiroglu and James (2009), who find that reputable PEs are more active when credit spreads are low. However, Demiroglu and James also find that reputable PEs use less traditional bank debt but more overall debt. They suggest this is consistent with reputable PEs having less need for monitoring. It could also allow more experienced PEs to take advantage of bondholders to benefit stockholders.

5.2.c. Hot vs. cold bond markets

We next examine the market timing hypothesis. To do so, we sort each calendar month during our sample period into Cold or Hot bond markets based on the number of issuances of sample bonds.[16] Months with above median numbers are classified as hot markets, while those with below median are classified as cold markets. Bonds issued in a Cold (Hot) month are classified as the Cold (Hot) bond portfolio.

Table 6 shows that bonds issued during hot markets generate low returns.[17] In each method examined (mean-adjusted, risk-adjusted EW, and risk-adjusted VW), abnormal returns for bonds in the Hot portfolio are consistently negative and statistically significant. On the contrary, bonds issued during cold bond market periods do not suffer significantly negative abnormal returns; median abnormal returns are even positive, albeit insignificant. The differences in the risk-adjusted VW returns are significant for both means and medians and for all horizons we examine. These results suggest that PE sponsors exploit windows of opportunity and sell bonds when there is a larger demand in the bond market. Bonds issued in these hot bond market periods then subsequently underperform. These results are consistent with the model presented in Axelson et al. (2009) that PE sponsors are able to raise cheaper debt in hot bond market.

5.2.d PEG affiliation

Fang et al. (2013) examine whether PEGs with a bank affiliation may have certain advantages over other PEGs in investment due to superior information; their findings suggest that there are certain downsides or risks for investors in combining banking and PEG investing. We therefore ask a natural question in the context of bonds sponsored by PEGs, that is, whether bank-affiliated PEGs have an advantage in raising bond financing. To do so, we use Table II of Fang et al. (2013), which provides a list of 14 PEGs that are

[16] We also use prior bond market returns as an alternative way to classify Hot versus Cold bond markets. We find that bonds issued in the Hot market periods have lower long-run bond returns. The results are presented in Appendix Table A2.

[17] We also try calendar time regressions. The results for individual bond portfolios are similar. However, we sort into hot and cold groups based upon the month the bond was issued and these months tend to cluster together (i.e., hot market period is followed by hot market period). As a result, there are very few months with both 'hot' and 'cold' bonds in the same month so we lose half the sample in this approach. The difference between hot and cold bonds is much less meaningful.

bank-affiliated and 6 PEGs that are investment bank-affiliated.[18] We match those 20 bank-affiliated PEGs to our sample. When bonds have multiple sponsors, we define the bond as sponsored by a bank-affiliated PEG if their sponsors include one or more of those bank-affiliated PEGs; we divide bank-affiliated PEGs into the commercial and investment bank-affiliated groups. PEGs that are not bank-affiliated are classified as independent PEGs. We divide the sample of bonds into three sub-groups according to PEG affiliation, and report the performance in Table 7.[19]

We find that bonds sponsored by PEGs with commercial bank affiliation outperform bonds sponsored by independent PEGs. The difference in performance is robust to various measure benchmarks or estimation methods. Bonds sponsored by PEGs with investment bank affiliations significantly underperform bonds backed by PEGs with commercial bank affiliation. Among these three groups, the bonds sponsored by PEGs with investment bank affiliations have lowest performance. Since section 5.2.a finds that lower rated bonds perform worse, we compare bond ratings for the three bank-affiliation groups. Bonds sponsored by PEGs with commercial bank affiliations actually have slightly lower ratings than bonds sponsored by banks with investment-bank affiliations, so differences in bond ratings are not driving the results. This is consistent with Fang et al. (2013) that some risk has been under-estimated in bonds issued by investment bank-affiliated PEGs.

5.4 Regression analysis

We also use cross sectional regressions to analyze the bond returns. We pool all monthly observations from 1992 to 2006 to run regressions, and adjust t-statistics for the double clustering effect based on Petersen (2009). The dependent variable is the monthly risk-adjusted bond return using the VW benchmark matched on credit ratings and time-to-maturity. The independent variables include issue size, coupon rate, maturity, credit rating, PEG age, a dummy equal to one if the bond market is hot, and bank affiliation. The results are reported in Table 8. We also use alternative proxies of bond market

[18] Fang et al. (2013) define the following six PEs as investment bank-affiliated: Goldman Sachs Capital Partners, Lehman Brothers Merchant Banking, Merrill Lynch Capital Partners, Morgan Stanley Private Equity, DLJ Merchant Banking, and Wasserstein & Co.

[19] As the number of bonds sponsored by bank-affiliated PEGs, especially PEGs with investment bank affiliation, is relatively small, we do not use the calendar time approach to avoid the outlier effect.

conditions (e.g., prior bond market returns) and PEG reputation (e.g., PEG capital), and similar but slightly weaker results are documented.

The regressions give negative and significant coefficients for both PE age and a dummy for above median PEG age. Specifically, when bonds are sponsored by more experienced PE groups, the monthly bond returns are 0.49% lower over the 36-month post-issue period (Model 9). The low rating dummy (a dummy variable equal to one if bonds are rated B or below) is negatively associated with bond returns, especially in returns within the post-issue one-year and two-year windows. The hot bond market return dummy is consistently negatively associated with bond returns and significantly so in the two-year horizon.

The regression results suggest that PEG-sponsored bond returns are decreasing in lower credit rating, PEG age, and hot bond market. More experienced PE sponsors are actually generating lower (abnormal) returns for institutional investors who are major players in investing in LBO related bonds. Our evidence also suggests that institutional investors who are typically attracted by the high yields should think twice before investing in PEG-sponsored bonds with very poor credit ratings issued during the market peak, especially if the PE firm is affiliated with an investment bank. In untabulated results, we also add high credit spread and high credit tightening dummies to the analysis. The coefficients are negative but insignificant in general.

5.5 Robustness tests

Kaplan and Stein (1993) suggest that the drop in the LBO activity during early 1990s was due to poor performance of the deals made during latter part of 1980s. Since Table 1 shows that our sample is concentrated in 2002-2004, in untabulated results we separately examine deals issued during this period to see if the performance of bonds issued in these years drives our results. When we do so, both the bonds issued during 2002-2004 and the bonds issued in other years exhibit significant underperformance. The mean underperformance of the bonds issued in 2002-2004 is slightly worse, but the differences are not significant. The median underperformance of the bonds issued in 2002-2004 is significantly lower than that of bonds issued in other years, however. Consequently, we rerun the regressions in Table 8 after including a dummy equal to one

for bonds issued in 2002-2004. The coefficient on the dummy is negative but insignificant, indicating that after controlling for other determinants of bond returns, bonds issued between 2002-2004 do not perform worse than other bonds.

6. Conclusions

Bond market financing for LBOs or private equity related transactions is important. Institutional investors are important buyers of the "LBO bonds" or PEG-sponsored bonds. Most of these bonds are risky and carry "junk" credit ratings of below BB since LBOs are highly leveraged. Institutional investors increase their investment in these low rated bonds in return for high potential yields. Prior research has not provided empirical evidence on whether these investments are worthwhile. This research therefore fills the void by systematically studying the post-issuance performance of bonds backed by private equity in the US.

Following the new empirical methods on evaluating bond performance suggested by Bessembinder et al. (2009), we find that PEG-sponsored bonds actually underperform comparable bonds, both statistically and economically. Such underperformance is robust to cross-sectional analysis and also to calendar-time portfolio analysis. Most of the underperformance comes from bonds with credit ratings below Ba, bonds sponsored by more experienced PE groups, bonds by investment bank-affiliated PEGs, and bonds issued in hot bond market periods. Multivariate regressions also confirm such patterns.

The empirical evidence from this research suggests that institutional investors may not be able to fully incorporate the risks associated with PEG-sponsored bonds, especially those junk bonds with lower credit ratings. Investments in these PEG-sponsored bonds deliver poor long-run performance on average. This underperformance can be attributed to the ability or experience of PE groups who are better able to time the bond market. Alternatively, institutional investors may invest in these bonds for relationship purposes and they are subsequently compensated by other business from PE groups. Private equity sponsors seem to raise "cheaper" bonds to finance their LBOs or post-LBO transactions, consistent with the view that private equity has enduring power of financing deals with cheap debt. Our research thus provides new insights on the

performance of LBO bonds that are important for policy makers and institutional investors.

Our findings also suggest that there exists large and persistent mispricing or overpricing in high-yield bonds sponsored by PEGs, and also indicates there may be wealth transfer from bond investors to private equity sponsors. However, given that firms sponsored by PEGs are not public, there is no price information to directly test the wealth transfer story, which we will leave for future research.

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Table 1. Sample distribution and summary statistics

This table reports the distribution and summary statistics of sample bond issues. We collect bond issues from Capital IQ, and select bonds from firms that have private equity groups as their financial sponsors in US from 1991. We drop bonds with deal value less than 5 million. We require bonds with available maturity date, bond rating, issue size, coupon rate, and monthly returns from Lehman Brothers Bond Database. We further drop puttable bonds, zero coupon bonds, bonds with ratings of C or below, and bonds with big return reversals. *Rating* reflects the ratings from either Moody's or S&P. *PE age* is the number of years between PE founding year and bond issue year. *Issue amount* is the face value of bonds, expressed in millions. *Maturity* is the time-to-maturity in years. To be consistent with our return calculation, we report the ratings, maturity, and coupon rate at the fourth month after bond issuance month.

Panel A: By year		
Issue year	N	%
1991	2	0.3
1992	10	1.4
1993	1	0.1
1994	1	0.1
1995	5	0.7
1996	17	2.4
1997	31	4.4
1998	69	9.9
1999	41	5.9
2000	28	4.0
2001	49	7.0
2002	79	11.3
2003	163	23.4
2004	106	15.2
2005	58	8.3
2006	37	5.3
All	697	100.0
Panel B: By rating		
Rating	N	%
Ba	90	12.9
B	525	75.3
Below B	82	11.8
All	697	100.0
Panel C: By PE age		
PE age	N	%
below 6	65	9.3
6 to 10	133	19.1
11 to 15	160	23.0
16 to 20	147	21.1
21 to 25	83	11.9
26 to 30	68	9.8
above 30	41	5.9
All	697	100.0

Panel D: Summary statistics					
	Mean	Median	Min	Max	Std
Issue amount (Mil.)	284.7	220	0.03	2400	213.4
Maturity (Years)	8.29	8.83	1.04	29.6	2.21
Coupon Rate (%)	9.42	9.5	4.38	14.5	1.74

Table 2. Long-run raw and abnormal monthly bond returns (%)

This table shows the long-run raw and abnormal average monthly returns for bonds backed up by private equity groups. *Bond level* means that all returns are first averaged across time for each bond, then summarize across bonds. Firm level returns treat each firm (not each bond) separately. *Firm level – Event Time* is obtained by first computing the average monthly return for each bond, then calculating the value-weighted return of bonds issued by the same firm where the weight is inflation-adjusted market value of bond at post-issuance month 3 or at the first available month-end, whichever is later. *Firm level – Calendar Time* is obtained by first computing the value-weighted monthly return for each firm with multiple bonds in each calendar month, and then averaging the monthly firm-level bond return over time. Numbers in parentheses are t-value for mean tests and p-values for median tests. All returns are in %. The detailed methods to measure abnormal returns are explained in the text. To ensure the three methods measure the abnormal performance over exactly the same period, we define the one-year return as the return from month 4 to month 15 after bond issuance (i.e. the event month 1 in our return calculations is the fourth month after issuance), and the two-year and three-year returns as the returns over the post-issue month 4 to month 27 and month 4 to month 39, respectively. To enlarge our sample size, we do not impose prior three month return requirement on sample bonds, except for the mean-adjusted model. ***, **, and * denote the significance level of 1%, 5%, and 10%, respectively. The numbers in brackets are the percentages of bonds (or firms in the event time approach) with positive returns.

	Bond level			Firm level					
				Event Time			Calendar Time		
Horizon	# of bonds	Mean	Median	# of firms	Mean	Median	# of firms	Mean	Median
Panel A: Raw returns									
1 year	680	0.205*	0.728***	310	0.175	0.767***	310	0.207	0.766***
	[75.88%]	(1.81)	(0.000)	[78.39%]	(1.08)	(0.000)	[78.71%]	(1.29)	(0.000)
2 years	689	0.216*	0.72***	310	0.138	0.767***	310	0.195	0.751***
	[81.13%]	(1.88)	(0.000)	[80.32%]	(0.82)	(0.000)	[82.90%]	(1.20)	(0.000)
3 years	697	0.198*	0.745***	311	0.139	0.776***	311	0.226	0.78***
	[81.78%]	(1.73)	(0.000)	[81.99%]	(0.81)	(0.000)	[84.89%]	(1.38)	(0.000)
Panel B: Excess returns (bond return - matched Treasury return)									
1 year	680	-0.186	0.314***	310	-0.246	0.371***	310	-0.19	0.37***
	[66.62%]	(-1.60)	(0.000)	[68.06%]	(-1.48)	(0.000)	[69.68%]	(-1.15)	(0.000)
2 years	689	-0.155	0.375***	310	-0.241	0.393***	310	-0.155	0.391***
	[72.86%]	(-1.32)	(0.000)	[71.94%]	(-1.40)	(0.000)	[77.10%]	(-0.93)	(0.000)
3 years	697	-0.18	0.389***	311	-0.243	0.431***	311	-0.132	0.43***
	[75.61%]	(-1.54)	(0.000)	[73.95%]	(-1.39)	(0.000)	[80.39%]	(-0.78)	(0.000)

Table 2 (continued).

	Bond level			Firm level					
				Event Time			Calendar Time		
Horizon	# of bonds	Mean	Median	# of firms	Mean	Median	# of firms	Mean	Median
Panel C: Mean-adjusted returns (bond return – average return in prior 6 months)									
1 year	667	-0.309***	-0.091*	310	-0.238***	-0.026	310	-0.187**	0.03
	[46.33%]	(-3.05)	(0.063)	[49.03%]	(-2.58)	(0.776)	[51.29%]	(-2.10)	(0.691)
2 years	683	-0.181*	-0.032*	310	-0.195**	-0.037	310	-0.172**	-0.023
	[46.27%]	(-1.93)	(0.056)	[46.13%]	(-2.13)	(0.191)	[46.77%]	(-2.10)	(0.281)
3 years	692	-0.253***	-0.024*	311	-0.215**	-0.043	311	-0.177**	-0.002
	[46.68%]	(-2.68)	(0.087)	[45.98%]	(-2.37)	(0.173)	[49.84%]	(-2.15)	(1.000)
Panel D: Risk-adjusted returns EW (bond return - EW rating/maturity matched portfolio return)									
1 year	680	-0.482***	-0.117***	310	-0.456***	-0.047	310	-0.404***	0.014
	[44.85%]	(-4.66)	(0.008)	[47.42%]	(-3.14)	(0.394)	[51.29%]	(-2.78)	(0.691)
2 years	689	-0.438***	-0.046	310	-0.465***	0.021	310	-0.379**	0.062
	[47.31%]	(-4.14)	(0.170)	[50.97%]	(-3.07)	(0.776)	[54.52%]	(-2.57)	(0.125)
3 years	697	-0.447***	-0.025	311	-0.437***	0.009	311	-0.335**	0.059**
	[48.35%]	(-4.24)	(0.405)	[50.80%]	(-2.84)	(0.821)	[56.27%]	(-2.25)	(0.031)
Panel E: Risk-adjusted returns VW (bond return - VW rating/maturity matched portfolio return)									
1 year	680	-0.452***	-0.082**	310	-0.437***	-0.041	310	-0.375**	0.042
	[45.29%]	(-4.35)	(0.016)	[48.39%]	(-2.98)	(0.609)	[51.94%]	(-2.56)	(0.532)
2 years	689	-0.404***	-0.027	310	-0.432***	0.048	310	-0.34**	0.095*
	[47.75%]	(-3.83)	(0.253)	[51.61%]	(-2.85)	(0.609)	[55.16%]	(-2.30)	(0.078)
3 years	697	-0.416***	-0.023	311	-0.411***	0.056	311	-0.303**	0.093***
	[48.35%]	(-3.95)	(0.405)	[52.09%]	(-2.67)	(0.496)	[57.88%]	(-2.04)	(0.006)
Panel F: 1% winsorized risk-adjusted returns VW									
1 year	680	-0.404***	-0.082**	310	-0.371***	-0.041	310	-0.324***	0.042
	[45.29%]	(-4.63)	(0.016)	[48.39%]	(-3.22)	(0.609)	[51.94%]	(-2.74)	(0.532)
2 years	689	-0.352***	-0.027	310	-0.386***	0.048	310	-0.304**	0.095*
	[47.75%]	(-3.99)	(0.253)	[51.61%]	(-3.11)	(0.609)	[55.16%]	(-2.45)	(0.078)
3 years	697	-0.366***	-0.023	311	-0.358***	0.056	311	-0.262**	0.093***
	[48.35%]	(-4.13)	(0.405)	[52.09%]	(-2.81)	(0.496)	[57.88%]	(-2.08)	(0.006)

Table 3. Calendar-time portfolio regressions

This table reports long-run monthly abnormal returns (in %) based on calendar-time bond portfolio regressions. The abnormal return is measured by the regression intercept. We use Elton, Gruber, and Blake (1995) factor model excluding the unexpected change in GDP and the unexpected change in consumer price index. *Rm–Rf* is the excess CRSP value-weighted stock index return, *R bond* is the return on the Lehman Corporate bond index, *DRP* is the default risk premium, and *Term* is the term premium. To avoid that smaller bond issues dominating the regression estimations, we examine both equal-weighted and value-weighted bond portfolio returns. Moreover, the regressions are conducted in both the ordinary least square (OLS) approach that assigns an equal weight to each calendar month and the weighted least square (WLS) approach that assigns the number of bonds in a given month as the weight. For OLS regressions, we require at least five observations in each month. ***, **, and * denote the significance level of 1%, 5%, and 10%, respectively.

Horizon	Intercept	Rm - Rf	R bond	DRP	Term	Adj R2
Panel A: OLS regressions						
Equal-weighted portfolio						
1 year	-0.281***	0.016	1.555	0.786	-0.335	0.71
	(-2.60)	(0.57)	(4.80)	(14.06)	(-2.37)	
2 years	-0.090	-0.050	1.567	0.835	-0.372	0.71
	(-0.91)	(-1.83)	(5.22)	(15.60)	(-2.77)	
3 years	-0.043	-0.031	1.557	0.826	-0.387	0.73
	(-0.48)	(-1.23)	(5.82)	(16.44)	(-3.20)	
Value-weighted portfolio						
1 year	-0.183*	0.015	1.951	0.735	-0.500	0.71
	(-1.71)	(0.54)	(6.07)	(13.25)	(-3.55)	
2 years	-0.053	-0.014	1.510	0.717	-0.338	0.74
	(-0.65)	(-0.60)	(5.94)	(15.82)	(-2.98)	
3 years	-0.038	-0.005	1.492	0.723	-0.340	0.77
	(-0.51)	(-0.22)	(6.73)	(17.38)	(-3.39)	
Panel B: WLS regressions						
Equal-weighted portfolio						
1 year	-0.319***	0.028	1.349	0.746	-0.267	0.72
	(-3.43)	(1.11)	(4.59)	(15.55)	(-2.09)	
2 years	-0.146	-0.036	1.363	0.765	-0.269	0.68
	(-1.58)	(-1.38)	(4.69)	(15.82)	(-2.12)	
3 years	-0.083	-0.019	1.431	0.754	-0.307	0.69
	(-0.91)	(-0.74)	(5.02)	(15.70)	(-2.46)	
Value-weighted portfolio						
1 year	-0.213**	0.021	1.799	0.710	-0.443	0.72
	(-2.33)	(0.83)	(6.23)	(15.09)	(-3.52)	
2 years	-0.096	-0.006	1.428	0.677	-0.283	0.72
	(-1.23)	(-0.27)	(5.82)	(16.56)	(-2.64)	
3 years	-0.072	0.007	1.446	0.668	-0.294	0.74
	(-0.97)	(0.32)	(6.19)	(16.98)	(-2.88)	

Table 4. Long-run abnormal monthly bond returns (%) sorted by bond ratings

This table shows the long-run abnormal monthly returns (in %) sorted by bond ratings. We classify bonds as *Ba* with ratings of Ba and *Below Ba* with ratings of B or below. Numbers in parentheses are t-value for mean tests and p-values for median tests. *Difference* is the difference between Ba and Below Ba. We measure abnormal returns based on three approaches, mean-adjusted model (Panel A), risk-adjusted model (Panels B and C), and factor model (Panel D). Both EW and VW benchmark returns are used in the risk-adjusted model. For the factor model, we run weighted least square regressions. The difference in the factor model is obtained by taking the difference in returns between the Ba portfolio and the below Ba portfolio and running regressions against factors. ***, **, and * denote the significance level of 1%, 5%, and 10%, respectively. The numbers in brackets are the percentages of bonds with positive returns.

	Ba (1)			Below Ba (2)			Difference (1) - (2)	
Horizon	# of bonds	Mean	Median	# of bonds	Mean	Median	Mean t-stat	Median p-value
Panel A: Mean-adjusted returns (bond return – average return in prior 6 months)								
1 year	83	-0.211	-0.063	584	-0.323***	-0.108*		
	[45.78%]	(-1.51)	(0.510)	[46.40%]	(-2.83)	(0.090)	0.62	0.686
2 years	86	-0.147	-0.008	597	-0.186*	-0.039**		
	[48.84%]	(-1.25)	(0.914)	[45.90%]	(-1.75)	(0.049)	0.25	0.585
3 years	89	-0.146	-0.004	603	-0.269**	-0.033*		
	[48.31%]	(-1.21)	(0.832)	[46.43%]	(-2.52)	(0.087)	0.76	0.515
Panel B: Risk-adjusted returns EW (bond return – EW rating/maturity matched portfolio return)								
1 year	85	-0.253**	-0.17**	595	-0.515***	-0.083*		
	[36.47%]	(-2.54)	(0.017)	[46.05%]	(-4.38)	(0.059)	1.70	0.095
2 years	88	-0.143**	-0.124**	601	-0.482***	-0.019		
	[37.50%]	(-2.30)	(0.025)	[48.75%]	(-3.99)	(0.568)	2.49	0.191
3 years	90	-0.18***	-0.086**	607	-0.486***	-0.003		
	[37.78%]	(-2.73)	(0.026)	[49.92%]	(-4.03)	(1.000)	2.23	0.055
Panel C: Risk-adjusted returns VW (bond return – VW rating/maturity matched portfolio return)								
1 year	85	-0.229**	-0.21***	595	-0.484***	-0.059		
	[31.76%]	(-2.29)	(0.001)	[47.23%]	(-4.10)	(0.190)	1.65	0.082
2 years	88	-0.136**	-0.099**	601	-0.443***	-0.006		
	[37.50%]	(-2.16)	(0.025)	[49.25%]	(-3.68)	(0.744)	2.27	0.116
3 years	90	-0.174***	-0.091***	607	-0.451***	0.006		
	[34.44%]	(-2.66)	(0.004)	[50.41%]	(-3.75)	(0.871)	2.02	0.029
Panel D: Calendar-time portfolio regression (WLS)								
	# of months	EW	VW	# of months	EW	VW	EW diff	VW diff
1 year	151	-0.110	-0.121	155	-0.351***	-0.246**	0.282	0.19
		(-0.84)	(-0.81)		(-3.20)	(-2.22)	(1.49)	(0.93)
2 years	175	0.067	0.035	167	-0.18*	-0.137	0.222	0.153
		(0.68)	(0.30)		(-1.68)	(-1.53)	(1.55)	(1.12)
3 years	177	-0.080	-0.045	172	-0.08	-0.079	-0.041	-0.001
		(-0.56)	(-0.41)		(-0.83)	(-0.98)	(-0.28)	(-0.01)

Table 5. Long-run abnormal monthly bond returns (%) sorted by PE experience

This table shows the long-run abnormal monthly returns (in %) sorted by PE age. PE age is the number of years between PE founding year and bond issue year. We classify bonds as *Less experienced* with PE age equal to or smaller than 15 years and *More experienced* with PE age greater than 15 years. Numbers in parentheses are t-value for mean tests and p-values for median tests. *Difference* is the difference in returns between two PE age portfolios. We measure abnormal returns based on three approaches, mean-adjusted model (Panel A), risk-adjusted model (Panels B and C), and factor model (Panel D). Both EW and VW benchmark returns are used in the risk-adjusted model. For the factor model, we run weighted least square regressions. The difference in the factor model is obtained by taking the difference in returns between two PE age portfolios and running regressions against factors. ***, **, and * denote the significance level of 1%, 5%, and 10%, respectively. The numbers in brackets are the percentages of bonds with positive returns.

	Less experienced PE (1)			More experienced PE (2)			Difference (1) - (2)	
Horizon	# of bonds	Mean	Median	# of bonds	Mean	Median	Mean t-stat	Median p-value
Panel A: Mean-adjusted returns (bond return - average return in prior 6 months)								
1 year	342	-0.265**	-0.122	325	-0.354**	-0.079		
	[45.91%]	(-2.30)	(0.144)	[46.77%]	(-2.10)	(0.267)	0.44	0.635
2 years	350	-0.056	-0.033	333	-0.313*	-0.031		
	[46.00%]	(-0.57)	(0.149)	[46.55%]	(-1.92)	(0.228)	1.35	0.673
3 years	356	-0.184*	-0.028	336	-0.325**	-0.024		
	[46.35%]	(-1.81)	(0.185)	[47.02%]	(-2.01)	(0.300)	0.74	0.830
Panel B: Risk-adjusted returns EW (bond return - EW rating/maturity matched portfolio return)								
1 year	348	-0.198*	-0.019	332	-0.78***	-0.164***		
	[49.71%]	(-1.96)	(0.957)	[39.76%]	(-4.28)	(0.000)	2.79	0.003
2 years	352	-0.111	0.056	337	-0.781***	-0.128***		
	[54.26%]	(-1.08)	(0.122)	[40.06%]	(-4.19)	(0.000)	3.15	0.000
3 years	358	-0.122	0.085	339	-0.79***	-0.099***		
	[54.47%]	(-1.18)	(0.101)	[41.89%]	(-4.26)	(0.003)	3.15	0.000
Panel C: Risk-adjusted returns VW (bond return - VW rating/maturity matched portfolio return)								
1 year	348	-0.184*	-0.006	332	-0.732***	-0.138***		
	[49.71%]	(-1.83)	(0.957)	[40.66%]	(-3.98)	(0.001)	2.61	0.004
2 years	352	-0.09	0.091	337	-0.732***	-0.101***		
	[54.26%]	(-0.88)	(0.122)	[40.95%]	(-3.94)	(0.001)	3.03	0.000
3 years	358	-0.102	0.087*	339	-0.747***	-0.091***		
	[54.75%]	(-0.99)	(0.081)	[41.59%]	(-4.03)	(0.002)	3.04	0.000
Panel D: Calendar-time portfolio regression (WLS)								
	# of months	EW	VW	# of months	EW	VW	EW diff	VW diff
1 year	139	-0.081	0.039	170	-0.56***	-0.444***	0.697***	0.618***
		(-0.70)	(0.37)		(-3.99)	(-3.12)	(3.71)	(3.30)
2 years	151	0.072	0.086	175	-0.382***	-0.285**	0.668***	0.514***
		(0.64)	(0.90)		(-2.86)	(-2.40)	(3.90)	(3.30)
3 years	163	0.128	0.111	175	-0.321**	-0.265**	0.63***	0.5***
		(1.40)	(1.38)		(-2.32)	(-2.22)	(4.25)	(3.54)

Table 6. Long-run abnormal monthly bond returns (%) sorted by the number of sample bonds issued

This table shows the long-run abnormal monthly returns (in %) sorted by the number of sample bonds issued. We sort calendar months from January 1991 to December 2006 based on the number of sample bonds issued and classify them into Cold or Hot bond market portfolios. Months with above median numbers are classified as hot markets, while those with below median are classified as cold markets. Bonds issued in a Cold (Hot) month are assigned into the Cold (Hot) bond portfolio. Numbers in parentheses are t-value for mean tests and p-values for median tests. *Difference* is the difference in returns between Cold and Hot portfolios. We measure abnormal returns based on two approaches, mean-adjusted model (Panel A) and risk-adjusted model (Panels B and C). Both EW and VW benchmark returns are used in risk-adjusted model. ***, **, and * denote the significance level of 1%, 5%, and 10%, respectively. The numbers in brackets are the percentages of bonds with positive returns.

	Cold bond market (1)			Hot bond market (2)			Difference (1) - (2)	
Horizon	# of bonds	Mean	Median	# of bonds	Mean	Median	Mean t-stat	Median p-value
Panel A: Mean-adjusted returns (bond return - average return in prior 6 months)								
1 year	63	-0.015	0.064	604	-0.339***	-0.122**		
	[52.38%]	(-0.16)	(0.801)	[45.70%]	(-3.05)	(0.038)	2.23	0.250
2 years	66	-0.017	-0.029	617	-0.199*	-0.033		
	[42.42%]	(-0.20)	(0.268)	[46.68%]	(-1.92)	(0.107)	1.36	0.662
3 years	67	0.062	-0.002	625	-0.287***	-0.033*		
	[49.25%]	(0.86)	(1.000)	[46.40%]	(-2.76)	(0.078)	2.75	0.435
Panel B: Risk-adjusted returns EW (bond return - EW rating/maturity matched portfolio return)								
1 year	65	-0.023	0.016	615	-0.53***	-0.135***		
	[53.85%]	(-0.12)	(0.620)	[43.90%]	(-4.71)	(0.003)	2.30	0.076
2 years	66	0.044	0.176	623	-0.49***	-0.076**		
	[60.61%]	(0.28)	(0.109)	[45.91%]	(-4.23)	(0.045)	2.73	0.012
3 years	67	0.115	0.142***	630	-0.507***	-0.07*		
	[67.16%]	(0.67)	(0.007)	[46.35%]	(-4.41)	(0.073)	3.00	0.003
Panel C: Risk-adjusted returns VW (bond return - VW rating/maturity matched portfolio return)								
1 year	65	0.051	0.063	615	-0.505***	-0.097***		
	[56.92%]	(0.27)	(0.321)	[44.07%]	(-4.47)	(0.004)	2.57	0.037
2 years	66	0.101	0.17**	623	-0.457***	-0.043*		
	[63.64%]	(0.65)	(0.036)	[46.07%]	(-3.97)	(0.054)	2.88	0.012
3 years	67	0.145	0.156**	630	-0.475***	-0.05*		
	[65.67%]	(0.84)	(0.014)	[46.51%]	(-4.14)	(0.087)	2.99	0.004

Table 7. Long-run abnormal monthly bond returns (%) sorted by PE's affiliation as commercial banks or investment banks

This table shows the long-run abnormal monthly returns (in %) sorted by PE firm's affiliation as commercial banks or not. We classify bonds into 3 groups: bonds backed by non-bank affiliated PEs, commercial bank affiliated PEs, and investment bank affiliated PEs. Numbers in parentheses are t-value for mean tests and p-values for median tests. *Difference* is the difference in returns between two portfolios. We measure abnormal returns based on two approaches, mean-adjusted model (Panel A) and risk-adjusted model (Panels B and C). Both EW and VW benchmark returns are used in risk-adjusted model. ***, **, and * denote the significance level of 1%, 5%, and 10%, respectively. The numbers in brackets are the percentages of bonds with positive returns.

	Non-Bank Affiliates (1)			Commercial Bank Affiliates (2)			Investment Bank Affiliates (3)			Difference (1) - (2)		Difference (3) - (2)	
Horizon	# of bonds	Mean	Median	# of bonds	Mean	Median	# of bonds	Mean	Median	Mean t-stat	Median p-value	Mean t-stat	Median p-value
Panel A: Mean-adjusted returns (bond return - average return in prior 6 months)													
1 year	563	-0.353***	-0.122**	68	0.154	0.195	36	-0.496	-0.117				
	[45.65%]	(-3.06)	(0.043)	[57.35%]	(0.92)	(0.275)	[36.11%]	(-1.26)	(0.132)	-2.49	0.023	-1.52	0.162
2 years	577	-0.224**	-0.045**	70	0.221*	0.023	36	-0.285	0.02				
	[45.06%]	(-2.08)	(0.020)	[51.43%]	(1.74)	(0.905)	[55.56%]	(-0.74)	(0.618)	-2.67	0.040	-1.26	0.875
3 years	585	-0.298***	-0.033*	71	0.159	0.008	36	-0.335	0.003				
	[45.98%]	(-2.76)	(0.057)	[50.70%]	(1.31)	(1.000)	[50.00%]	(-0.87)	(1.000)	-2.81	0.038	-1.22	0.800
Panel B: Risk-adjusted returns EW (bond return - EW rating/maturity matched portfolio return)													
1 year	574	-0.515***	-0.124***	70	0.025	0.077	36	-0.936**	-0.49*				
	[44.43%]	(-4.41)	(0.008)	[54.29%]	(0.14)	(0.550)	[33.33%]	(-2.03)	(0.065)	-2.48	0.055	-1.94	0.002
2 years	582	-0.489***	-0.055	71	0.101	0.151	36	-0.693	-0.227*				
	[46.91%]	(-4.07)	(0.147)	[57.75%]	(0.63)	(0.235)	[33.33%]	(-1.50)	(0.065)	-2.94	0.048	-1.62	0.020
3 years	589	-0.493***	-0.041	72	0.085	0.152	36	-0.758	-0.276				
	[48.05%]	(-4.11)	(0.365)	[56.94%]	(0.54)	(0.289)	[36.11%]	(-1.63)	(0.132)	-2.93	0.058	-1.72	0.012
Panel C: Risk-adjusted returns VW (bond return - VW rating/maturity matched portfolio return)													
1 year	574	-0.486***	-0.084**	70	0.071	0.092	36	-0.921**	-0.457**				
	[44.95%]	(-4.16)	(0.017)	[55.71%]	(0.36)	(0.403)	[30.56%]	(-1.99)	(0.029)	-2.41	0.076	-1.97	0.005
2 years	582	-0.453***	-0.026	71	0.131	0.098	36	-0.671	-0.196*				
	[47.77%]	(-3.78)	(0.300)	[54.93%]	(0.79)	(0.477)	[33.33%]	(-1.44)	(0.065)	-2.86	0.068	-1.63	0.028
3 years	589	-0.459***	-0.023	72	0.106	0.135	36	-0.742	-0.282*				
	[48.22%]	(-3.85)	(0.410)	[56.94%]	(0.67)	(0.289)	[33.33%]	(-1.59)	(0.065)	-2.85	0.069	-1.72	0.014

Table 8. Cross-sectional regressions

This table reports the pooled cross-sectional regressions. The dependent variable is the monthly risk-adjusted return using the value-weighted return of the portfolio matched on ratings and maturity as the benchmark. The t-statistics is based on the Petersen's (2009) time-series and cross-section double-clustering standard errors. *Coupon* is the bond coupon rate in percentage. *Maturity* is the natural log of years between issuance and maturity. *Rating* reflects the ratings from either Moody's or S&P: 4 for Baa (BBB), 5 for Ba (BB), 6 for B, 7 for Caa (CCC), and 8 for Ca (CC). *PE age* is the number of years between PE founding year and bond issue year. *High coupon dummy*, *High maturity dummy*, and *High PE age dummy* are one if the value of the corresponding variable is above the median, and 0 otherwise. *Low rating dummy* is 1 if the rating is B or below, and 0 otherwise. We sort each calendar month based on the number of sample bonds issued in the month and classify them into Cold or Hot market. *Hot market dummy* is equal to one if the issuing month for the bond is classified as the Hot market, and zero otherwise. *Commercial bank dummy* is one if a bond is sponsored by commercial bank affiliated PEs. *Issue amount* is natural log of face value of bonds. Coupon, maturity, and ratings are measured at the fourth month after bond issuance month. ***, **, and * denote the significance level of 1%, 5%, and 10%, respectively.

Horizon	1 year			2 years			3 years		
Model	1	2	3	4	5	6	7	8	9
Coupon	0.007			-0.015			-0.004		
	(0.10)			(-0.25)			(-0.07)		
Maturity	-0.518			-0.213			0.168		
	(-1.38)			(-0.82)			(0.61)		
Rating	-0.067			0.05			0.081		
	(-0.42)			(0.47)			(0.73)		
PE age	-0.021**			-0.022**			-0.018**		
	(-2.17)			(-2.42)			(-2.39)		
High coupon		0.087	0.058		0.066	0.038		0.117	0.094
dummy		(0.39)	(0.26)		(0.38)	(0.22)		(0.78)	(0.62)
High maturity		-0.073	-0.098		-0.104	-0.125		0.029	0.015
dummy		(-0.40)	(-0.53)		(-0.74)	(-0.89)		(0.23)	(0.12)
Low rating		-0.372	-0.394*		-0.324*	-0.345**		-0.22	-0.237
dummy		(-1.61)	(-1.70)		(-1.90)	(-2.00)		(-1.29)	(-1.37)
High PE age		-0.552**	-0.559**		-0.541***	-0.545***		-0.483***	-0.485***
dummy		(-2.43)	(-2.46)		(-2.92)	(-2.95)		(-3.13)	(-3.15)
Hot market	-0.378	-0.322	-0.33	-0.333*	-0.301*	-0.31*	-0.232	-0.206	-0.215
dummy	(-1.49)	(-1.27)	(-1.30)	(-1.85)	(-1.81)	(-1.85)	(-1.23)	(-1.14)	(-1.18)
Commercial bank			0.58**			0.499***			0.413***
dummy			(2.40)			(2.93)			(2.78)
Issue amount	-0.062	-0.051	-0.047	-0.06	-0.059	-0.058	-0.135	-0.135	-0.134
	(-0.50)	(-0.41)	(-0.38)	(-0.52)	(-0.52)	(-0.51)	(-1.34)	(-1.31)	(-1.30)
Intercept	2.524	1.166	1.112	1.502	1.381	1.37	1.273	2.09	2.082
	(1.21)	(0.71)	(0.67)	(0.85)	(0.94)	(0.93)	(0.85)	(1.58)	(1.57)
# of bonds	5388	5388	5388	9831	9831	9831	12957	12957	12957
Adj-R2	0.14%	0.26%	0.36%	0.11%	0.23%	0.30%	0.12%	0.22%	0.26%

Appendix Table A1. Long-run abnormal monthly bond returns (%) sorted by PE capital

This table shows the long-run abnormal monthly returns (in %) sorted by PE capital. PE capital is the cumulative fund, adjusted by CPI, of a PE from its founding year. We classify bonds as *Low PE capital* with CPI-adjusted PE capital below the median and *High PE capital* above the median. Numbers in parentheses are t-value for mean tests and p-values for median tests. *Difference* is the difference in returns between two PE capital portfolios. We measure abnormal returns based on three approaches, mean-adjusted model (Panel A), risk-adjusted model (Panels B and C), and factor model (Panel D). Both EW and VW benchmark returns are used in the risk-adjusted model. For the factor model, we run weighted least square regressions. The difference in the factor model is obtained by taking the difference in returns between two PE capital portfolios and running regressions against factors. ***, **, and * denote the significance level of 1%, 5%, and 10%, respectively.

	Low PE capital (1)			High PE capital (2)			Difference (1) - (2)	
Horizon	# of bonds	Mean	Median	# of bonds	Mean	Median	Mean t-stat	Median p-value
Panel A: Mean-adjusted returns (bond return - average return in prior 6 months)								
1 year	291	-0.477**	-0.076	291	-0.136	-0.06		
	[46.74%]	(-2.54)	(0.291)	[47.42%]	(-1.14)	(0.412)	-1.53	0.497
2 years	298	-0.353**	-0.071*	299	-0.063	-0.018		
	[44.30%]	(-2.01)	(0.056)	[48.16%]	(-0.57)	(0.563)	-1.40	0.303
3 years	302	-0.5***	-0.048**	303	-0.05	-0.002		
	[44.04%]	(-2.83)	(0.044)	[49.17%]	(-0.47)	(0.818)	-2.17	0.066
Panel B: Risk-adjusted returns EW (bond return - EW rating/maturity matched portfolio return)								
1 year	297	-0.472***	-0.025	296	-0.544***	-0.173***		
	[49.16%]	(-2.62)	(0.817)	[40.20%]	(-3.75)	(0.001)	0.31	0.012
2 years	301	-0.437**	0.044	301	-0.499***	-0.118***		
	[53.49%]	(-2.38)	(0.249)	[39.87%]	(-3.54)	(0.001)	0.27	0.002
3 years	305	-0.447**	0.029	304	-0.502***	-0.105***		
	[52.79%]	(-2.44)	(0.360)	[41.78%]	(-3.59)	(0.005)	0.24	0.001
Panel C: Risk-adjusted returns VW (bond return - VW rating/maturity matched portfolio return)								
1 year	297	-0.463**	-0.014	296	-0.494***	-0.15***		
	[49.49%]	(-2.56)	(0.908)	[40.54%]	(-3.43)	(0.001)	0.13	0.011
2 years	301	-0.426**	0.068	301	-0.443***	-0.104***		
	[53.16%]	(-2.31)	(0.299)	[41.20%]	(-3.19)	(0.003)	0.08	0.001
3 years	305	-0.436**	0.05	304	-0.453***	-0.084***		
	[53.44%]	(-2.37)	(0.252)	[41.12%]	(-3.27)	(0.002)	0.07	0.001
Panel D: Calendar-time portfolio regression (WLS)								
	# of months	EW	VW	# of months	EW	VW	EW diff	VW diff
1 year	138	-0.273*	-0.161	167	-0.387***	-0.182	0.314	0.134
		(-1.96)	(-1.37)		(-2.82)	(-1.44)	(1.60)	(0.80)
2 years	150	-0.14	-0.063	177	-0.188	-0.069	0.225	0.126
		(-1.18)	(-0.72)		(-1.62)	(-0.68)	(1.56)	(1.01)
3 years	161	-0.017	-0.011	177	-0.201	-0.1	0.328**	0.18*
		(-0.17)	(-0.13)		(-1.58)	(-1.03)	(2.41)	(1.66)

Appendix Table A2. Long-run abnormal monthly bond returns (%) sorted by prior market returns

This table shows the long-run abnormal monthly returns (in %) sorted by prior bond market returns. Prior bond market return is the LBBD bond market index return cumulative over past 24 months. We classify each calendar month from January 1992 to December 2006 into Low or High prior return portfolio. Numbers in parentheses are t-value for mean tests and p-values for median tests. *Difference* is the difference in returns between two prior return portfolios. We measure abnormal returns based on two approaches, mean-adjusted model (Panel A) and risk-adjusted model (Panels B and C). Both EW and VW benchmark returns are used in risk-adjusted model. ***, **, and * denote the significance level of 1%, 5%, and 10%, respectively.

	Low prior market return (1)			High prior market return (2)			Difference (1) - (2)	
Horizon	# of bonds	Mean	Median	# of bonds	Mean	Median	Mean t-stat	Median p-value
Panel A: Mean-adjusted returns (bond return - average return in prior 6 months)								
1 year	239	-0.23*	0.072	426	-0.353**	-0.176***		
	[53.56%]	(-1.68)	(0.301)	[42.49%]	(-2.55)	(0.002)	0.63	0.071
2 years	241	0.115	0.053	440	-0.344**	-0.092***		
	[53.94%]	(1.13)	(0.246)	[42.27%]	(-2.57)	(0.001)	2.73	0.000
3 years	246	0.013	0.043**	444	-0.401***	-0.057***		
	[56.50%]	(0.13)	(0.048)	[41.44%]	(-2.94)	(0.000)	2.47	0.001
Panel B: Risk-adjusted returns EW (bond return - EW rating/maturity matched portfolio return)								
1 year	242	-0.357**	0.036	436	-0.554***	-0.17***		
	[52.89%]	(-2.36)	(0.403)	[40.37%]	(-4.02)	(0.000)	0.96	0.008
2 years	244	-0.271*	0.056	443	-0.532***	-0.093***		
	[54.51%]	(-1.84)	(0.179)	[43.34%]	(-3.72)	(0.006)	1.27	0.005
3 years	248	-0.272*	0.089*	447	-0.546***	-0.073**		
	[55.65%]	(-1.86)	(0.086)	[44.30%]	(-3.82)	(0.018)	1.34	0.006
Panel C: Risk-adjusted returns VW (bond return - VW rating/maturity matched portfolio return)								
1 year	242	-0.336**	0.062	436	-0.519***	-0.143***		
	[52.48%]	(-2.24)	(0.480)	[41.28%]	(-3.73)	(0.000)	0.90	0.015
2 years	244	-0.245*	0.093	443	-0.493***	-0.067**		
	[54.10%]	(-1.72)	(0.224)	[44.24%]	(-3.42)	(0.017)	1.22	0.016
3 years	248	-0.251*	0.101	447	-0.509***	-0.05**		
	[54.03%]	(-1.77)	(0.228)	[45.19%]	(-3.54)	(0.047)	1.27	0.023

科技部補助專題研究計畫執行國際合作與移地研究心得報告

日期：104 年 10 月 1 日

計畫編號	MOST 102-2410-H-004 -026 -MY2		
計畫名稱	私募基金與高收益債券長期績效		
出國人員姓名	湛可南	服務機構及職稱	國立政治大學財管系 教授
出國時間	104 年 8 月 31 日至 104 年 9 月 5 日	出國地點	舊金山
出國研究目的	□實驗 □田野調查 □採集樣本 ■國際合作研究 □使用國外研究設施		

一、 執行國際合作與移地研究過程

本次應美國聖塔克拉大學(Santa Clara University)會計系 Dr. Siqi Li (李教授)邀請，至舊金山進行學術交流與訪問。聖塔克拉大學(Santa Clara University)位於加州舊金山海灣(San Francisco Bay）南端的聖塔克拉拉市（Santa Clara)，曾連續 15 年獲得「美國新聞世界報導雜誌」(U.S. News & World Report）評為美國西部大學排名第二名，是西部最有價值的學校之一。

李教授的研究領域橫跨財務與會計，發表多篇論文於頂級期刊上，研究的議題包含破產風險、資金成本、新股發行、CEO 誘因、企業社會責任等等。由於本計畫是有關私募基金與債券價格

的關係，而債券資金成本的議題也是財務與會計頂級期刊的熱門話題，因此李教授的研究專長對本計畫在各方面的討論，例如理論模型、實證方法設計、實證結果等，都相當有幫助，我也因李教授的建議而做了計畫的微幅調整與論文的修改。

二、 研究成果

在與李教授進行詳盡的討論後，覺得計畫的實證有加強的必要，以增加計畫成果的嚴謹性。另外，李教授也提供了一些政大商學院缺乏的資料，希望日後可以在財務與會計的領域上合作。另外，我們針對其他議題進行討論，像是台灣的股票質押，李教授建議可與會計的議題(例如: 盈餘管理)相結合。由於李教授在研究上非常積極並有傑出成果，如有合作計畫產生，應該具有相當的學術價值。

在聖塔克拉大學訪問期間，有幸和幾位學者的交流討論，得到不少寶貴的意見，也拓展了未來與國際學者合作的機會。

三、 建議

與國際學者交流討論對於學術研究有相當大的幫助，感謝科技部提供差旅經費，促進台灣學術界的國際化。

四、本次出國若屬國際合作研究，雙方合作性質係屬：(可複選)

□分工收集研究資料
□交換分析實驗或調查結果
■共同執行理論建立模式並驗証
□共同執行歸納與比較分析
□元件或產品分工研發
□其他 (請填寫) _____

科技部補助計畫衍生研發成果推廣資料表

日期:2016/01/18

科技部補助計畫	計畫名稱: 私募基金與高收益債券長期績效
	計畫主持人: 湛可南
	計畫編號: 102-2410-H-004-026-MY2　　學門領域: 財務

無研發成果推廣資料

102年度專題研究計畫研究成果彙整表

計畫主持人：湛可南	**計畫編號：**102-2410-H-004-026-MY2
計畫名稱：私募基金與高收益債券長期績效	

成果項目			量化			單位	備註（質化說明：如數個計畫共同成果、成果列為該期刊之封面故事...等）
			實際已達成數（被接受或已發表）	預期總達成數（含實際已達成數）	本計畫實際貢獻百分比		
國內	論文著作	期刊論文	0	0	100%	篇	
		研究報告/技術報告	0	0	100%		
		研討會論文	1	0	100%		
		專書	0	0	100%	章/本	
	專利	申請中件數	0	0	100%	件	
		已獲得件數	0	0	100%		
	技術移轉	件數	0	0	100%	件	
		權利金	0	0	100%	千元	
	參與計畫人力（本國籍）	碩士生	0	0	100%	人次	
		博士生	1	0	100%		
		博士後研究員	0	0	100%		
		專任助理	0	0	100%		
國外	論文著作	期刊論文	0	0	100%	篇	
		研究報告/技術報告	0	0	100%		
		研討會論文	0	0	100%		
		專書	0	0	100%	章/本	
	專利	申請中件數	0	0	100%	件	
		已獲得件數	0	0	100%		
	技術移轉	件數	0	0	100%	件	
		權利金	0	0	100%	千元	
	參與計畫人力（外國籍）	碩士生	0	0	100%	人次	
		博士生	0	0	100%		
		博士後研究員	0	0	100%		
		專任助理	0	0	100%		

其他成果（無法以量化表達之成果如辦理學術活動、獲得獎項、重要國際合作、研究成果國際影響力及其他協助產業技術發展之具體效益事項等，請以文字敘述填列。）	無

	成果項目	量化	名稱或內容性質簡述
科教處計畫加填項目	測驗工具(含質性與量性)	0	
	課程/模組	0	
	電腦及網路系統或工具	0	
	教材	0	
	舉辦之活動/競賽	0	
	研討會/工作坊	0	
	電子報、網站	0	
	計畫成果推廣之參與（閱聽）人數	0	

科技部補助專題研究計畫成果報告自評表

請就研究內容與原計畫相符程度、達成預期目標情況、研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性）、是否適合在學術期刊發表或申請專利、主要發現或其他有關價值等，作一綜合評估。

1. 請就研究內容與原計畫相符程度、達成預期目標情況作一綜合評估
   ■達成目標
   □未達成目標（請說明，以100字為限）
   　□實驗失敗
   　□因故實驗中斷
   　□其他原因
   說明：

2. 研究成果在學術期刊發表或申請專利等情形：
   論文：□已發表 ■未發表之文稿 □撰寫中 □無
   專利：□已獲得 □申請中 ■無
   技轉：□已技轉 □洽談中 ■無
   其他：（以100字為限）

3. 請依學術成就、技術創新、社會影響等方面，評估研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性）（以500字為限）
   The bond market provides an important source of financing for Private Equity (PE) sponsored transactions. Using the methodology suggested by Bessembinder et al. (2009), we find that PE-sponsored bonds underperform comparable benchmarks. This is especially true for bonds with credit ratings below Ba or bonds issued in hot bond markets. Furthermore, bonds sponsored by more experienced PE groups underperform bonds associated with less experienced PE groups, while bonds backed by investment bank-affiliated PE groups underperform bonds sponsored by other PE groups. Our findings suggest that there exists large and persistent mispricing or overpricing in high-yield bonds sponsored by PEGs, and also indicates there may be wealth transfer from bond investors to private equity sponsors. Our paper provides new insights for institutional investors and policy makers about PE's role in the bond market.