
## DEPARTMENT OF ACCOUNTING AND FINANCE


# TOPICS IN PORTFOLIO MANAGEMENT


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## DECLARATION OF DOCTORAL CANDIDATE

The present doctoral dissertation was submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy of the University of Cyprus. It is a product of original work of my own, unless otherwise mentioned through references, notes, or any other statements.

Theodosis L. Kallenos

# ΠΕΡΙΛΗΨΗ ΔΙΑΤΡΙΒΗΣ

Αυτή η διατριβή αποτελείται από τρία κεφάλαια που εξετάζουν θέματα στη βιβλιογραφία διαχείρισης χαρτοφυλακίου.

Συγκεκριμένα σε μια σειρά ο εκθέσεων η διατριβή εξετάζει (α) τις στρατηγικές πίσω από την επιλογή του χρόνου δημοσιοποίησης πληροφοριών προς το κοινό σε σχέση με τα στοιχεία χαρτοφυλακίου από τους διευθυντές επενδυτικών εταιρειών κλειστού κύκλου (Closed-End Funds), (β) την απόδοση και τα, προσαρμοσμένα ως προς το ρίσκο, χαρακτηριστικά επενδυτικών εταιρειών ανάπτυξης επιχειρήσεων (Business Development Companies) αλλά και τη σχέση τους με παραδοσιακές επενδυτικές εταιρείες που επενδύουν σε ιδιωτικά κεφάλαια (γ) τη σχέση διαχειριστικής δομής με τις συγκρούσεις συμφερόντων στις επενδυτικές εταιρείες ανάπτυξης επιχειρήσεων.

Το πρώτο κεφάλαιο μελετά τη στρατηγική συμπεριφορά των διαχειριστών χαρτοφυλακίων σε σχέση με το χρονοδιάγραμμα της δημοσιοποίησης των στοιχείων του χαρτοφυλακίου. Η μελέτη περιλαμβάνει την ανάλυση ωφελημάτων αποτίμησης από την έγκαιρη δημοσιοποίηση, αλλά και την έμφαση στους λόγους που ωθούν τον διαχειριστή να καθυστερήσει ή επισπεύσει την δημοσιοποίηση. Τα αποτελέσματα δείχνουν θετική επίδραση στις τιμές των εταιρειών μετά από περιπτώσεις έγκαιρης δημοσιοποίησης και αρνητικά μετά από περιπτώσεις καθυστέρησης. Επίσης τα αποτελέσματα δείχνουν ότι ο διαχειριστές χαρτοφυλακίων χρησιμοποιούν την έγκαιρη δημοσιοποίηση των στοιχείων σαν μηχανισμό προστασίας από ακτιβιστές επενδυτές.

Η δεύτερη μελέτη επικεντρώνεται στις επενδυτικές εταιρείες ανάπτυξης επιχειρήσεων, στην ανάλυση της απόδοσης και τα, προσαρμοσμένα ως προς το ρίσκο, χαρακτηριστικά τους. Επίσης στην μελέτη χρησιμοποιώ τα ξεχωριστά χαρακτηριστικά των επενδυτικών εταιρειών ανάπτυξης επιχειρήσεων για εξαγωγή συμπερασμάτων για τον ευρύτερο τομέα των ιδιωτικών κεφαλαίων ο οποίος χαρακτηρίζεται από προβλήματα σε σχέση με την

αξιολόγηση της απόδοσης. Τα αποτελέσματα δείχνουν ότι οι επενδυτές μπορούν να εκθέσουν το χαρτοφυλάκιο στον τομέα των ιδιωτικών κεφαλαίων μέσω των επενδυτικών εταιρειών ανάπτυξης επιχειρήσεων. Επίσης τα αποτελέσματα δείχνουν ότι οι απόδοση της τιμής των επενδυτικών εταιρειών ανάπτυξης επιχειρήσεων μπορεί να χρησιμοποιηθεί ως μέτρο για την σύγκριση αλλά και των εγκυρότητα δεικτών απόδοσης ιδιωτικών κεφαλαίων που βασίζονται σε χρηματικές ροές και δεικτών απόδοσης που βασίζονται σε εκτιμήσεις.

Στο τελευταίο κεφάλαιο επικεντρώνομαι στην ύπαρξη συγκρούσεων συμφερόντων σε μια από τις δύο επιχειρηματικές δομές των επενδυτικών εταιρειών ανάπτυξης επιχειρήσεων. Τα αποτελέσματα, υποδεικνύουν ότι εταιρείες τις οποίες διαχειρίζονται εξωτερικοί διαχειριστές έχουν χαμηλότερη απόδοση από εταιρείες οι οποίες έχουν εσωτερική διαχείριση, χαρακτηρίζονται από σύγκρουση συμφερόντων. Επίσης τα αποτελέσματα δείχνουν ότι εταιρείες τις οποίες διαχειρίζονται εξωτερικοί διαχειριστές έχουν χαμηλότερη πιθανότητα να ανακοινώσουν την πρόθεση τους για επαναγορά μετοχών και να επαναγοράσουν μετοχές, σε σχέση με εταιρείες οι οποίες έχουν εσωτερική διαχείριση. Παράλληλα τα αποτελέσματα φανερώνουν ότι οι επενδυτές αντιδρούν θετικά στις προθέσεις των διαχειριστών που έχουν να κάνουν με την μείωση της σύγκρουσης συμφερόντων.

## Abstract

This dissertation consists of three chapters examining topics in the portfolio management literature.

In the first chapter, using a sample of equity closed-end funds, I document significant portfolio holdings disclosure valuation effects and strategic disclosure timing by portfolio managers. An event study analysis reveals statistically significant positive (negative) abnormal returns associated with early (late) disclosure. I find that the returns of a long-short arbitrage strategy portfolio become statistically significant exactly when the implementation of such a strategy is facilitated by the timely disclosure of portfolio holdings. The findings support the argument that managers of funds trading at high discounts are more likely to disclose earlier in order to reduce discounts and protect themselves from potential activist investor attacks. This is despite the documented strong motives for late disclosure stemming from copycatting and front-running threats shared with open-end fund managers. Overall our findings reveal the importance of fund disclosures to investors.

In Chapter 2 I use the universe of Business Development Companies (BDCs) for the period 1998-2017 to provide the first in depth examination of their performance and risk adjusted characteristics. More importantly, I exploit the existence of BDC daily market prices separately from appraisal based NAVs to provide a comprehensive comparison with traditional Private Equity (PE) appraisal based index returns as well as PE cash flow based indices serving as proxies of unavailable PE market based index returns. I find that a BDC traded factor, significantly explains the returns of the PE cash flow based indices of Ang et al. (2018), but not the returns of appraisal based PE indices, which however, are explained by the BDC NAV excess return. The findings reveal a significant relationship between the returns of BDCs and the time varying private equity premium confirming that BDC's provide PE investment access to individual investors and a credible benchmark for evaluating traditional PE investments as well as potential transaction based proxies of PE market returns.

The third and final chapter exploits the unique features of Business Development Companies (BDCs) to perform a comprehensive analysis of conflicts of interest in externally managed funds, relative to their internally managed counterparts along with the use of share repurchases as a mechanism to reduce agency costs. Using the universe of Business Development Companies for the period 2006-2017, I document that externally managed

BDCs, underperform relative to internally managed BDCs and are less likely to announce and execute share repurchases, an action that decreases their base management fee. I show that share repurchases result in positive valuation benefits only for externally managed BDCs, confirming that share repurchases constitute a managerial action that mitigates agency costs. Finally, an analysis of BDC discounts reinforces these results.

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**Dedication**

*To Andri and Katerina*

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# Introduction

The portfolio management industry has grown substantially over the last few decades, thereby generating increased interest among practitioners, regulators, and academics.[1] Studies in the fund management literature have focused on various topics, including the performance of the funds relative to the market, portfolio holdings disclosure, management compensation, management outsourcing and the agency costs arising from the separation of ownership and control (see Zheng, 1999; Nanda, Narayanan and Warther, 2000; Wermers, 2000; Bollen and Busse, 2001; Frank *et al.*, 2004; Kacperczyk, Sialm and Zheng, 2008 and Chen et al., 2013 among other

In my dissertation I focus on a specific type of investment companies, Closed-end funds (CEFs). Similar to traditional mutual funds (open-end funds), CEFs have a professional manager overseeing the portfolio of investments. However, unlike open-end funds that issue new stocks and redeem existing ones at the Net Asset Value, CEFs following their IPO trade in the stock exchange just like any other stock and can be bought or sold through secondary market transactions. As a result, the price of a CEF is determined by supply and demand forces and thus can vary significantly from the Net Asset Value.[2]

While CEFs are interesting to study on their own right, they can also be used to shed light on several of the issues associated with the broad portfolio management literature. I take advantage of the unique characteristics of the Closed-End Fund (CEF) structure to address important issues in the CEF literature as well as issues from the broader portfolio management literature. These include the timing of portfolio holdings disclosure, the performance of Private Equity Funds and the conflicts of interest associated with fund management outsourcing.

Chapter 1 extends the literature on fund industry disclosure by examining the timing of CEF manager's portfolio holdings disclosure decisions. Literature on traditional mutual funds, examines issues related to mutual fund holdings disclosure ranging from the ability of information in holdings disclosures to predict future fund returns (Collin-Dufresne and Fos, 2015; Kacperczyk *et al.*, 2008), the profitability of copycat strategies (Phillips *et al.*, 2014;

[1] According to the 2018 Investment Company Factbook the total net assets of worldwide regulated traditional mutual funds more than doubled from 2008 to 2017.

[2] These premiums/discounts in CEF prices constitute a long-standing puzzle in the finance literature. See Dimson and Minio-Kozerski (1999) and Cherkes (2012) for extensive surveys of the closed-end fund puzzle literature.

Verbeek and Wang, 2013; Brown and Schwarz, 2013; Frank *et al.*, 2004), and the threat of front-runners (Shive and Yun, 2013; Chen *et al.* , 2008). The CEF structure and the existence of a price, separate from the net asset value, allows for direct pricing tests to evaluate investor reaction to timely and late disclosures, something that is not feasible in the open-end fund disclosure literature. Furthermore, the presence of high discounts in fund prices relative to their NAVs gives rise to significant additional disclosure motives for CEF managers relative to those of open-fund managers.

I develop an argument that timely portfolio holdings disclosure can serve as a managerial action that could potentially have positive fund valuation effects reducing discounts. These positive valuation effects could arise from two sources. First, timely disclosure facilitates arbitrageurs to compete with activist investors because it reduces the cost and risk of implementing arbitrage strategies to take advantage of fund discounts. Second, through the positive valuation effects of disclosure quality argued in the corporate finance and accounting literatures.

The results suggest that CEF portfolio holdings disclosure has significant pricing effects with the direction of the valuation effects being significantly dependent on disclosure timing. Furthermore, the findings provide evidence that managers of funds trading at high discounts are more likely to disclose earlier in order to reduce discounts and protect themselves from activist investor attacks even in the presence of strong motives to delay disclosure because of copycatting and front-running concerns.

Chapter 2 focuses on Business Development Companies (BDCs), a certain type of closed-end investment companies, considered by market participants to be part of the general Private Equity universe. I examine the performance and risk characteristics of BDCs, evaluate the Private Equity status of BDCs and investigate whether the unique characteristics of BDCs can offer important insights regarding the general Private Equity (PE) literature and the performance of Private Equity Funds (PEFs).

Literature on traditional PEF performance has faced important challenges stemming from the lack of market based performance measures (see Phalippou and Gottschalg, 2009; Stucke, 2011; Jegadeesh, Kräussl, and Pollet, 2015; Kaplan and Sensoy, 2015 for more). BDCs on the other hand are publicly traded and thus have a price available directly from the markets. Moreover, BDCs are viewed as a window for individual investors to access the PE asset class since, unlike traditional Private Equity Funds (PEFs) who are typically open only

to accredited investors and qualified clients, BDC shares are publicly traded and are primarily held by retail investors.

This chapter exploits the CEF structure of BDCs, which provides daily market price data, as well as quarterly reported Net Asset Values (NAVs), to evaluate the Private Equity status of BDCs and examine whether BDCs can offer valuable information regarding the challenges faced in the PEF performance literature. The findings provide evidence of the private equity investment status of BDCs and suggest that individual investors can achieve exposure to the PE investment sector through the accessible BDC sector. Furthermore, the results highlight the limitations of the appraisal-based PE indices and provide support to the cash flow based PE indices as a reliable proxy of a transaction-based PE index. Finally, the findings reveal that, like the appraisal-based PE indices, BDC NAVs exhibit smoothing biases. Despite these biases a significant market reaction to quarterly BDC NAV disclosures is documented.

Chapter 3 extends the literature on management outsourcing and conflicts of interest. Studies on Open-End funds show that agency costs drive outsourced funds to underperform those run internally (see Chen et al., 2013 and Chuprinin, Massa, and Schumacher, 2015). Similarly, studies on real estate investment trusts (REITs)[3] suggest that a misalignment of incentives occurs in the case of externally managed REITs, since the management fee structure provides external managers with incentives that are not perfectly correlated with maximizing shareholder's wealth (see Sagalyn 1996; Capozza and Seguin, 2000 among other). In this chapter I exploit the presence of both internally and externally managed funds within the universe of BDCs along with their CEF structure to investigate conflicts of interest associated with fund management structure in conjunction with share repurchase decisions, a potential signaling tool of management alignment with investors interests.

The presence of both internally and externally managed funds within the same fund universe allows for a meaningful comparison of the two fund management structures with similar assets under management. Moreover, the CEF structure and the existence of daily market prices, allows for analysis of the valuation effects of share repurchases across internally and externally managed BDCs.

The findings of this chapter indicate that externally managed BDCs, associated with potential conflicts of interest mainly related with management fees, underperform relative to internally managed BDCs. The existence of these conflicts is identified by showing that

[3] REITs are companies that own, operate or finance income producing real estate in a range of property sectors. Most REITs are publicly traded and are listed in major stock exchanges.

externally managed BDCs are more reluctant to initiate and execute share repurchases suggesting that they seek to maximize their own utility rather than the value of the company. Furthermore, share repurchase announcements by externally managed BDCs result to positive valuation benefits for the funds while internally managed BDCs do not experience any significant valuation effects. The results suggest that the market reacts favorably to the actions of the manager to deal with the agency issues characterizing externally managed BDCs.

Chapter 1

# Strategic Timing in Closed-End Fund Portfolio Holdings Disclosure


## Abstract

Using a sample of equity closed-end funds, we document significant portfolio holdings disclosure valuation effects and strategic disclosure timing by portfolio managers. An event study analysis reveals statistically significant positive (negative) abnormal returns associated with early (late) disclosure. We find that the returns of a long-short arbitrage strategy portfolio become statistically significant exactly when the implementation of such a strategy is facilitated by the timely disclosure of portfolio holdings. Our findings support the argument that managers of funds trading at high discounts are more likely to disclose earlier in order to reduce discounts and protect themselves from potential activist investor attacks. This is despite the documented strong motives for late disclosure stemming from copycatting and front-running threats shared with open-end fund managers. Overall our findings reveal the importance of fund disclosures to investors.

## 1. Introduction

In this paper we examine the disclosure practices of closed-end fund (CEF) managers. We document strong valuation effects associated with portfolio holdings disclosure as well as strong evidence of managerial strategic behavior associated with the disclosure timing. To our knowledge this is the first paper in the literature that performs this analysis for closed-end funds even though there exists an extensive literature regarding open-end funds (see Wermers, 2001; Frank *et al.*, 2004; Verbeek and Wang, 2013; Shive and Yun, 2013 among other).

CEFs differ significantly from open-end mutual funds in that after an initial public offering, the fund shares trade on a stock exchange just like any other stock. Consequently, unlike open-end funds that stand ready to create new shares or redeem existing shares at the Net Asset Value (NAV) of their underlying assets, the price of CEFs is determined by supply and demand forces and can vary significantly from their NAV.[4] The unique institutional features of CEFs warrant a separate investigation of their disclosure practices from that of open-end funds.

First, the existence of a CEF price allows for direct pricing tests to evaluate investor reaction to timely and late disclosures, something that is not feasible in the open-end fund disclosure literature.[5] Second, the presence of high discounts in fund prices relative to their NAVs gives rise to significant additional disclosure motives for CEF managers relative to those of open-fund managers.

To identify these additional motives, we need to analyze how discounts affect CEF managers' benefits. While the manager's fee compensation, typically specified as a percentage of the fund's total net assets, is not directly affected, the manager's job security is likely affected by large discounts. Managers of high discount funds risk to be terminated through investor pressure or activist investors liquidating the fund, providing a strong motive for managers to take action to reduce CEF discounts. Existing literature argues that paying dividends and managed distribution policies (MDP) constitute such actions (see Bradley *et al.*, 2010; Cherkes *et al.*, 2014 and Johnson *et al.*, 2006).

[4] In fact, these premiums/discounts in CEF prices constitute a long-standing puzzle in the finance literature. See Dimson and Minio-Kozerski (1999) and Cherkes (2012) for extensive surveys of the closed-end fund puzzle literature.

[5] The open-end fund literature uses money flows to investigate investor reaction on disclosure. For example Ge and Zheng (2006) examine the relation between disclosure frequency and new money flows to study whether investors are attaching a greater value to more frequent portfolio disclosure.

We argue that timely portfolio holdings disclosure offers an alternative or complimentary managerial action that could potentially have positive fund valuation effects reducing discounts. Specifically, timely disclosure facilitates arbitrageurs to compete with activist investors because it reduces the cost and risk of implementing arbitrage strategies to take advantage of fund discounts.

The open-end fund literature, however, offers arguments against frequent and timely portfolio holdings disclosure suggesting that it could lead to several threats that would harm the institutions. More specifically, such threats could arise from professional traders that seek to exploit portfolio information by engaging in predatory trading practices such as copycatting and front-running. An extensive literature examines issues related to mutual fund holdings disclosures ranging from the ability of information in holdings disclosures to predict future fund returns (Collin-Dufresne and Fos, 2015; Kacperczyk *et al.*, 2008), the profitability of copycat strategies (Phillips *et al.*, 2014; Verbeek and Wang, 2013; Brown and Schwarz, 2013; Frank *et al.*, 2004), and the threat of front-runners (Shive and Yun, 2013; Chen *et al.* , 2008). Christoffersen *et al.* (2015) examine copycat and front-running threats as well as concealing voting power as motives for institutions to delay their portfolio holdings disclosure through 13F filings.

We derive and test five empirical hypotheses. The first two hypotheses relate to the early disclosure motives stemming from the CEF manager's efforts for self-preservation. First, early disclosure is associated with positive valuation benefits. Second, the higher the discount the more likely CEF managers are to disclose early. This early disclosure motive competes with the motives to delay disclosure that are shared with open-end fund managers and include the potential negative effects of free-riding by copycatters and front-runners, in light of the tendency of closed-end funds to hold illiquid assets (see Cherkes *et al.*, 2009; Lee *et al.*, 1991 and Lesmond and Nishiotis, 2016). This leads to hypotheses 3-5 of the paper. Third, managers that possess valuable information that is reflected in their trading activity are more motivated to delay the disclosure of their portfolio holdings to protect their information and avoid copycatting behavior by competitors. Fourth, managers who plan to actively trade immediately after the filing report period are more likely to delay disclosure of their portfolio holdings to avoid the threat of front-running. Fifth, the illiquidity of the underlying assets heightens the cost of front-running because of the high price impact of trading illiquid assets (Amihud, 2002). The illiquidity of underlying assets also increases the cost of an activist attack reducing its threat and the managerial benefit from early

disclosure. Therefore, the higher the illiquidity of the underlying assets the more likely it is for the manager to delay disclosure to avoid front-running.

We empirically test our hypotheses using a hand collected sample of detailed portfolio holdings of 54 equity CEF from 1995-2010 used in Lesmond and Nishiotis (2016), and the filing dates of their disclosure reports.[6] We define filing distance as the time between the report period-end date and the filing date. Our descriptive statistics indicate that the filing distance variable exhibits substantial variation both within funds and across funds. The within fund standard deviation ranges from a low of 3.42 days for the Templeton Dragon Fund to a high of 25.38 days for the Thai Capital fund. The average filing distance across all funds is 57.83 days with a cross-fund standard deviation of 8.2 days.

An event study analysis reveals statistically significant positive (negative) abnormal returns associated with early (late) portfolio holdings disclosure. These results hold for pure portfolio holdings disclosures without further accounting information, providing support for the arbitrage strategy facilitation argument as a source of the positive early disclosure valuation benefits. We find that a portfolio that is long the discount funds and short their NAV returns (underlying assets) yields a significant alpha exactly when the implementation of such a strategy is facilitated by the timely disclosure of portfolio holdings.

Consistent with the event study results of early disclosure positive valuation benefits, both multivariate regression and logit analyses show that managers of funds trading at high discounts are more likely to disclose earlier in order to reduce discounts. We also find that both protection from copycatters and protection from front-runners are strong motives to delay portfolio holdings disclosure. Finally, funds with more illiquid holdings delay disclosure more, indicating that illiquidity increases the costs of early disclosure.

Our study is the first to study the disclosure practices of closed-end fund managers providing an important inside into a significant dimension of portfolio manager behavior and contributing to an extensive CEF literature. The documented significant valuation effects reveal the importance of fund disclosures to investors.

The structure of the study is as follows: In the next section we present the institutional background of CEF disclosures. In section 3 we review the literature and develop our empirical hypotheses. The data and descriptive statistics are presented in section 4. Section

[6] We collect portfolio disclosure information from the following Securities and Exchange Commission (SEC) filing forms: N-30D, N-30B-2, N-Q, N-CSR, and N-CSR(S).

5 presents the disclosure valuation analysis and section 6 presents the analysis of the factors that affect the choice of a fund manager with respect to the timing of the portfolio holdings disclosure. The conclusion and a summary of key findings are presented in section 7.

## 2. Institutional Background of Closed-End Fund Disclosures

In this section, we review the regulatory background of investment companies' portfolio holdings disclosures.[7] Fund managers use different types of filing forms for portfolio holdings disclosure throughout the period covered in this study. These forms are listed in the appendix along with what information is contained in each report type, the filing frequency and the maximum filing delay allowed by the regulatory authorities.

Prior to May 2004 all registered investment companies were required to report their complete portfolio holdings in the reports delivered to their shareholders twice a year within 60-days from the period-end date. These semiannual filings had to be filed with the Securities and Exchange Commission (SEC) within 10 days from the transmission to the shareholders. The N-30D form[8] was filed until January of 2003, and the N-CSR and N-CSR(S) forms[9] are filed from January 2003 onwards. Some funds occasionally voluntarily filed quarterly disclosures through form N-30B-2, which being voluntary, had no file timing requirements.

On May 10th, 2004, following a debate between members of the fund industry asking for an improved disclosure regime for better monitoring[10] and fund groups arguing that increased disclosure would expose funds to the predatory practices of professional traders, the SEC adopted a new rule[11] regarding portfolio holdings disclosure. One of the main new requirements of the rule is the mandatory quarterly disclosure of portfolio holdings of every registered management investment company within a 60-day period from the period-end date.

[7] The majority of the information cited in this section can be found in both the proposed and final rule of the SECs "Shareholder Reports and Quarterly Portfolio Disclosure of Registered Management Investment Companies".

[8] Covered under Rule 30e-1 of the Securities Exchange Act of 1934.

[9] Covered under Section 30 of the Investment Company Act of 1940 and Sections 13 and 15(d) of the Securities Exchange Act of 1934. Investment Companies with fiscal annual and semiannual period ending on or before March 31, 2003 could choose either to file their holdings using form N-CSR or to continue to comply with the certification requirements of Form N-30D for that period.

[10] Specifically, proponents of improved disclosure argued that an increase in the frequency of portfolio disclosure would give investors the possibility to be more informed about the funds' portfolio holding changes, and as a result make more informed asset allocation decisions. In addition, the petitioners argued that more frequent disclosure would expose style drift and potential forms of portfolio manipulation.

[11] Final rule: Shareholder Reports and Quarterly Portfolio Disclosure of Registered Management Investment Companies https://www.sec.gov/rules/final/33-8393.htm#IIB

More specifically, as stated in the rule, a fund is required to file its complete portfolio schedule for the second and fourth fiscal quarters on Form N-CSR, and for the first and third fiscal quarters on new Form N-Q, within 60 days of the end of the quarter. As in the case of Form N-CSR, Form N-Q must be filed with the Commission on Electronic Data Gathering, Analysis and Retrieval (EDGAR). Furthermore, it is not required for Form N-Q to be delivered to shareholders, but it is available on the Commission's website for disclosure purposes.

The aforementioned rules and changes in regulation apply to fund level disclosures. A different disclosure regime exists for investment company level disclosures (13F filings). Agarwal *et al.* (2015) argue that investment company level disclosure is less informative relative to fund level disclosure, as the latter offers much more detailed information about the investments of mutual funds than that provided by the 13F form, which aggregates information for all funds held by a mutual fund company. Furthermore, form 13F is only filed by large investors, while fund level filings are filed by all funds. As a result, examining disclosure at the fund level allows for a much more detailed and in-depth analysis.

## 3. Literature Review and Hypothesis Development

The potential costs and benefits of timely disclosure in the fund industry are extensively examined in the literature typically in the context of open-end funds. In this section we develop new arguments stemming from the unique institutional features of CEF along with the arguments in the open–end fund literature to derive testable empirical hypotheses on the motives of closed-end fund managers to time portfolio holdings disclosure within the flexibility provided by disclosure regulation. Our objective is twofold. First, and more important, analyzing the disclosure practice of CEF managers and the corresponding investor reaction has unique interest for the broader CEF literature, which is dominated by the closed-end fund puzzle, one of the longest standing anomalies in finance. Second, we aim to shed new light to the general fund disclosure literature.

To uncover possible disclosure motives arising from CEF pricing, we turn to the CEF literature to analyze how premiums or discounts affect the CEF manager's actions. The manager's fee compensation, which is typically specified as a percentage of the fund's total net assets, is not directly affected by the premiums/discounts. However, the manager's job security is likely affected by large discounts. Managers of high discount funds risk to be terminated through investor pressure or activist investors liquidating the fund. As a result,

Cherkes *et al.* (2014) argue that fund managers of high discount funds are more likely to adopt shareholder value enhancing managed distribution policies (MDP) as a defense mechanism from activist investors[12] attempts to takeover and liquidate the fund. Johnson *et al.* (2006) also argue that CEF adopt explicit policies committing them to pay minimum dividend yields as deliberate attempts to reduce CEF discounts. We argue that timely portfolio holdings disclosure offers an alternative or complimentary managerial action that could potentially have positive fund valuation effects reducing discounts.

These potential valuation benefits arise from the fact that timely disclosure leads to a reduction in the cost and risk of implementing arbitrage strategies to take advantage of the high discounts. Pontiff (1996) shows how costly arbitrage affects the discount/premium in CEF prices. Arbitrage strategies rely on simultaneously purchasing the discounted fund and shorting its underlying assets. A big distance between the report date and filing date would make the disclosure of portfolio holdings obsolete and hamper the implementation of such a strategy. On the other hand, the closer the disclosure date is to the report date the more implementable such an arbitrage strategy is, other things equal. Both arbitrageurs and activist investors try to take advantage of the large discounts in CEF. However, there are critical differences in the type of information needed to implement each strategy and its impact on CEF managers' utility. Unlike the arbitrageur's strategy, the initiation of the activist investor's strategy does not critically depend on the prior knowledge of the exact portfolio holdings as it involves first taking control of the fund and then liquidating its underlying assets. At the initiation stage of such a strategy it is enough to know the discount and perhaps aggregate info on the underlying assets, like whether the fund tends to hold liquid or illiquid assets. The impact of the two investment strategies on the manager's utility is also drastically different. The arbitrageur's strategy does not impact the manager's compensation and could significantly reduce the discount, thus making a detrimental investor activist attack less attractive.

The aforementioned discussion leads to our two main empirical hypotheses.

H1: Early[13] disclosure is associated with positive CEF valuation benefits.

and

[12] Cherkes *et al.* (2014) state that "… holdings of CEF shares are generally dispersed and not held by institutions so that control contests tend to arise through block-holder activism (U.S. law prohibits the hostile acquisition of one investment firm by another)".

[13] In our empirical analysis we use two alternative definitions of early disclosure: filing is within the 60-day regulation requirement, or filing is in the first quartile of the filing distance variable.

H2: The higher the CEF discount the more likely CEF managers are to disclose early.

Existing literature on open-end fund portfolio holdings disclosure as well as industry responses to regulation changes involving more timely disclosures, identify copycatting and front-running as two major threats fund managers face when they disclose early. Closed-end fund managers could potentially be influenced by these motives for disclosure timing as well, and we therefore account for them in our empirical tests. Front-running refers to professional investors and speculators trading before an expected trade of an institution thus obtaining a better price. Wermers (2001) argues that more frequent portfolio disclosure arms front-runners with more timely and comprehensive information and gives the ability to take the right position in anticipating the fund's trades. As a result, the fund faces higher prices when the manager plans to invest in new securities, and lower prices when the manager plans to sell securities. These higher trading costs result in lower returns for the fund and its shareholders.

Christoffersen *et al.* (2015) use inflows and outflows to examine the impact of front-running on the fund manager's decision to delay its 13F filings. Their findings suggest that institutions delay more after large outflows than inflows. Shive and Yun (2013) find that institutions trade on, and profit from, the predictability of mutual fund flow-induced trading. Coval and Stafford (2007) show that front-running anticipated trades by distressed mutual funds is a profitable strategy, while Chen et al. (2008) provide evidence that Hedge Funds take advantage of this strategy. Similarly Ge and Zheng (2006) findings, indicate a cost to disclosure from front-runners.

Copycatting is another freeriding action usually taken by outside investors. Similar to front-running, copycatting is also driven by the information disclosed by funds or investment companies. More specifically, copycatting a fund is free riding on the choice of its portfolio by mimicking the investment strategy of the fund. As a result, outside investors benefit from the fund's research and investment strategies without incurring the costs.

Brown and Schwarz (2013) find that securities disclosed by target funds experience abnormal trading volume and positive returns immediately after hedge funds' 13-F filings disclosure, suggesting that market participants attempt to take advantage of hedge fund disclosures. Their findings show limited evidence that copycatters benefit from this strategy and that target funds might benefit from copycatting. Phillips *et al.* (2014) on the other hand, find that the performance of the target fund reverses following copying initiation. Frank *et al.* (2004) findings suggest that copycat funds earn statistically indistinguishable and

possibly higher returns than actively managed funds. Similarly Verbeek and Wang (2013) find that on average copycat strategies perform similar to their targets. They also show that the success increased significantly after 2004 and the mandatory quarterly disclosure rule by SEC.

Copycatting and front-running threats are expected to affect closed-end fund managers as well. We argue that the more valuable information a CEF manager has the more likely he/she is to delay portfolio holdings disclosure to protect his/her information reflected in the holdings of his portfolio from copycatters.

H3: The more valuable information a CEF manager has the more likely he/she is to delay portfolio holdings disclosure.

In the empirical tests, we use two different reporting period trading activity measures as proxies for the level of information a manager possesses. First, we use the return gap measure of Kacperczyk *et al.* (2008), which is defined as the difference of the actual closed-end fund (NAV) performance from the performance of a hypothetical portfolio that invests in the previously disclosed fund holdings. This is a measure of the impact of unobserved actions by the fund manager on the fund NAV return during the reporting period. The more positive this impact is, the more likely it is that the manager processes valuable information that she would want to protect and copycatters would want to imitate. We also use the total turnover measure, used in Christoffersen *et al.* (2015), as an alternative measure. Total turnover is estimated using the end of period holdings relative to the previous period reported holdings. Total turnover captures a manager's trading activity during a certain period based only on the beginning and ending positions. The average return gap captures this activity on a continuous basis and also measures whether this activity adds value to the portfolio.

Front-running involves trading in front of an expected trade of an investment company seeking to trade at a lower price. CEF managers would likely be more concerned about front-running if they are in the middle of implementing a new investment strategy and thus plan to have significant trading activity after the end of the reporting period. In this case they would likely hold off from reporting their end of period position fearing that they might reveal their next moves.

H4: CEF managers are more likely to delay portfolio holdings disclosure if they are in the middle of implementing a new trading strategy.

We use the return gap measure estimated between the report date and the filing date as a direct proxy of the actual trading activity of the fund in the post report period. This measure captures situations where CEF managers are more likely to be in the middle of implementing a new trading strategy. The higher the return gap measure immediately after the report period-end the more likely it is that the manager is in the middle of implementing a new investment strategy and thus the concern about front-running will be heightened, while the manager will be less concerned about copycatting.

Another important dimension in the analysis of portfolio holdings disclosure in the fund industry is the effect of holdings illiquidity. Fund managers dealing with illiquid positions tend to employ sequential trading strategies to avoid a large price impact. The longer it takes to complete taking a position the higher the likelihood of free riders trading prior to the completion of the target funds position.[14] As a result, investing in illiquid securities may result in an amplification of the negative effects of front-running[15] leading fund managers to seek to delay the disclosure of illiquid positions.

Examining the effect of holdings illiquidity on the timing of CEFs disclosure is essential given the fact that, CEFs tend to hold illiquid assets.[16] We argue that the illiquidity of CEFs underlying assets has a direct impact on the threat of front-running. If the fund investment strategy is concentrated on illiquid assets, then the negative effects of potential front-running are heightened as the price impact of the front-runners' activity could prove devastating to the manager's strategy.

H5: The more illiquid the assets the more likely a CEF manager is to delay portfolio holdings disclosure.

To empirically identify the effect of holdings illiquidity on the CEF managers' disclosure timing decision, we use the holdings spread, which is the average bid-ask spread of the fund's holdings in the month of the report.

## 4. Data

Our analysis focuses on all-equity closed-end funds included in the 'Equity' and 'International Equity' categorizations by MorningStar, with an initiation date prior to 2000.

[14] See Keim and Madhavan (1997) and Shi (2017).
[15] See Parida (2016) and Aragon *et al.* (2013).
[16] See for example, Cherkes *et al.* (2009), Lee *et al.* (1991) and Lesmond and Nishiotis (2016).

Our sample consists of 2500 SEC filings filed by 54 closed-end funds trading in the US for the period 1995-2010.[17] The source of the holdings reports of each closed-end fund, is the EDGAR website. We focus on the period between the beginning of 1995 (the starting date of EDGAR) and the end of 2010. We use information from various fund-level report filings including the following: Form N-30D, form N-CSR, form N-CSRS, and forms N-Q and N-30B-2. The information used from these reports includes the reporting and the filing period dates, company names, industry, country, number of shares held and the value at the reporting date.

We used the same procedure used in Lesmond and Nishiotis (2016) to match the holdings data. The matching process was particularly challenging since there was no code identifier for the vast majority of the holdings, other than the company name. Datastream was the primary source used for the necessary data on the holdings. Funds that have been subject to a merger were excluded due to the very long periods of holdings disclosure delay and several inconsistencies in their EDGAR filings during the merger period. Our final sample consists of 16 funds focused on investing in US equities (U.S funds) and 38 funds focused on international equities (International Funds).

We use the reporting period for each fund to determine the total turnover, which is the percentage change in the shares traded across quarters, scaled by the total number of shares held in the prior reporting period. Bid and ask quotes for the funds and the U.S. equity holdings are taken from the Trade and Quote (TAQ) database and for foreign equity holdings from Datastream. Proportional bid-ask spreads are then calculated and averaged over the month.

The Center for Research in Security Prices (CRSP) database provides the closing price and number of shares outstanding used to determine the market capitalization of each closed-end fund. Datastream was used to gather the market index data. We collect the 12-month

[17] Our initial sample consists of the funds covered by Morningstar under the US equity and international equity group identifications in order to maximize the likelihood of success of the matching process and be as close to a 100% match as possible. Morningstar covered 100 funds in November 2008 in the groups US equity and international equity. We apply a filter on these 100 funds requiring that they have an initiation date before the year 2000 in order to guarantee a long lifespan, which left us with 57 funds. We also search for funds covered by Morningstar, which terminated before November 2008, but not before 2000 since EDGAR fund filings coverage begins on or after 1995. This search allowed us to add 15 more funds to the initial sample. Out of this sample of 72 funds, we accurately match the holdings for 54 funds. See Lesmond and Nishiotis (2016) for more details on the sample.

dividend yield from Bloomberg. We calculate the premium using daily NAV data from Lipper.

$Fdistance_{it}$ is the filing distance variable that measures the distance, in days, between the report period-end date and the report filing date. The Late filing dummy variable ($LateF_{it}$) dummy takes the value of 1, if the filing date is greater than 60 days after the report date, which is the period required by the SEC for public disclosure[18], and 0 otherwise. We also define an Early filing dummy variable ($EarlyF_{it}$) that takes the value of 1 if the filing is in the first quartile of the *Fdistance* variable and 0 otherwise.

$Average\ Discount_{it}$ is the average daily discount[19] in the period between the report date and one day before the filing date.[20] $Discount\ Dummy_{it}$ takes the value of 1 if the $Average\ Discount_{it}$ is hıgher than the median discount over all events and 0 otherwise.[21] We use the $Average\ Discount_{it}$ and $Discount\ Dummy_{it}$ to capture the effect of high discounts on the manager's decision regarding the timing of holdings disclosure. $Holdings\ Spread_{it}$ is the average bid-ask spread of the CEF holdings in the month of the report and is used as a measure of the holdings liquidity. $Frequency(D)_{it}$ is a dummy variable taking the value of 1 if the distance between holdings filings is a quarter and zero otherwise. Given that quarterly disclosure became mandatory from 2004 onwards, the frequency dummy variable captures both the effect of the regulation change and the effect of voluntary quarterly filings prior to the change. $Book\ Information(D)_{it}$ is a dummy variable that takes the value of 1 if the report contains additional information such as a statement of assets and liabilities, cash flow information and an income statement.[22] $Foreign\ Fund(D)_{it}$ is a dummy variable that takes the value of 1 if the fund is an international equity fund and 0 otherwise. $Fund\ Liquidity_{it}$, is the monthly bid-ask spread of the fund in the month of the report date, the $Number\ Of\ Holdings_{it}$ is the logarithm of the fund's number of unique holdings in a given report.

[18] 60 days for N-30D and N-CSR type forms to be transmitted to the shareholders and 60 days for N-Q forms to be filed with the SEC. Observations where the 60-day period end falls on a non-trading day and the fund disclosed its portfolio holdings on the next available trading day, take the value of 0.
[19] We calculate the CEF premium using the logarithm of the price divided by the NAV multiplied by 100. We multiply the premium by -1 to obtain the CEF discount.
[20] When the NAV is only reported on a weekly basis take the average over weekly discounts.
[21] The Median Discount is 10.40%.
[22] These are N-CSR, N-CSR(S) and N-30D, while in some cases N-30B-2 also include balance sheet and income statement information.

We also construct the average return gap measure, to capture the effect that unobserved portfolio changes have on the decision to delay or speed-up portfolio holdings disclosure, following Kacperczyk *et al.* (2008). Return Gap is measured as the difference between the reported fund return and the return on a portfolio that invests in the previously disclosed fund holdings. We create two variables estimated over two distinct periods. Our first measure is the average monthly return gap between two reports ($Average\ Return\ Gap(RR)_{it}$) and the second is the average monthly return gap between the report and the filing date ($Average\ Return\ Gap(RF)_{it}$).[23]

For the calculation of abnormal returns in our event study, we assign an index to each fund in our sample depending on the geographic region of the fund holdings. U.S. funds are assigned the S&P 500 index and each foreign holdings fund is assigned its corresponding country or regional index.[24]

### 4.1 Descriptive Statistics

Table 1, Panel A, presents the filing distance descriptive statistics for each of the filing forms used in this study. The average filing distance of N-30D filings (older forms, prior to 2003) is 59 days, while the corresponding distance for the two types of N-CSR filings (new forms) is at 62 days for 2nd quarter filings and at 64 days for 4th quarter filings. The filing distance of N-30D filings however, is more volatile. The mandatory first and third quarter filings (N-Q), adopted in May 2004, have a lower average filing distance. This is consistent with funds being allowed to file semiannual forms within 10 days from the transmission to the shareholders, effectively allowing for a maximum of a 70-day filing period if the transmission to the shareholders occurs on the 60th day. Around 6% of N-CSR filings, 2.2% of N-CSR(S) 7% of N-30D are filed after the 70-day period. On the other hand, 3.3% of N-Q filings exceed the 60-day period allowed by the regulation. N-30B-2 are voluntary filings and as a result are not subject to a filing time regulation. More than 60% of N-30B-2 filings are filed with a filing distance higher than 60 days and 12.5% with a filing distance higher than 70 days.

Table 1, Panel B, reports filing distance descriptive statistics across all events within different groups. U.S. funds on average report earlier (53 days) than international funds (61 days), but they have a higher standard variation (16 days vs 10 days, respectively). The large

[23] We include the filing month return gap in the calculation if the filing takes place in the second half of the month.

[24] We use the corresponding MSCI indices for 36 out of 38 foreign holdings funds, while for the Greater China Fund and the Taiwan Fund, we use the corresponding FTSE index.

standard deviations across events, especially for U.S. funds, indicate that funds tend to follow different strategies regarding the timing of their filings. Reports containing additional information, such as financial statements, (mainly N-CSR, N-CSR(S) and N-30D reports) delay disclosure by almost 8 days relative to reports with pure holdings information (i.e. N-Q filings). Finally, after the change in regulation in 2004 that required mandatory quarterly disclosures, the average filing distance is slightly reduced by 2 days.

Table 2, Panel A, reports filing distance descriptive statistics for each of the U.S. CEF in our sample, while Panel B, presents the same statistics for foreign CEFs. The figures presented in Table 2 indicate substantial variation in the timing of CEF filings, both within and across funds. The across fund average variation for US funds is 9 days, while for International funds it is 8 days. The within standard deviation of *Fdistance* ranges from 22 days for the Eagle Capital Growth fund to 5 days for the Latin America Discovery fund. Furthermore, for 46 out of 54 funds the *Fdistance* variable exhibits a negative autocorrelation indicating variation in the filing distance of consecutive periods. Finally, only 4 funds never delayed filing beyond 60 days.

Table 3, Panel A, displays the pairwise correlation coefficients of several variables used in the regression analysis. *Fdistance* is negatively correlated with *Average Discount*, consistent with our second hypothesis (H2). Both *Total Turnover*, and *Average Return Gap(RR)* are positively correlated with *Fdistance*, consistent with our third hypothesis (H3). *Fdistance* is also positively correlated with *Average Return Gap(RF)* consistent with our fourth hypothesis (H4). Higher holdings illiquidity as measured by the *Holdings Spread* is also positively correlated with *Fdistance*, indicating that managers are concerned about potential losses from front-running, consistent with our fifth hypothesis (H5).

Table 3, Panel B, presents the descriptive statistics of the main variables used to test the hypotheses.[25] The average *Fdistance* across all events is around 58 days with a standard deviation of around 13 days. The mean *Average Discount* is positive at 8.19%, while the median is at 10.4%. The mean total turnover is 39.66%, while the means of *Average Return Gap(RF)* and *Average Return Gap(RR)* are 0.27% and 0.56%, respectively. Finally, the mean *Holdings Spread* is 1.95% with a minimum of 0.07% and a maximum of 11.68%.

[25] *Fdistance* is winsorised at the top 1% while all remaining variables are winsorised at the top and bottom 1%.

# 5. Valuation Benefits of Timely Disclosure

## 5.1 Event Study Analysis

We begin our empirical analysis with an event study to capture the effects of disclosure on closed-end funds' returns and test our first main hypothesis (H1), that timely holdings disclosure is associated with positive CEF valuation benefits. We apply a short horizon event study analysis using the market model. We use daily fund, and local stock market index returns along with the filing dates of EDGAR reports.

We regress each funds' returns on the relative stock market index over an estimation window of [-260, -11] relative to event day 0. We use the coefficient estimates from those regressions to calculate the expected returns around the event (period [-10, +10]). Abnormal returns for the period [-10, +10] are then calculated as the difference between actual returns and expected returns. We use abnormal returns to calculate average abnormal returns and cumulative average abnormal returns for different windows.

We proceed to split our sample into early and late disclosure events and follow the same procedure. Late disclosure events are defined as events with filing distance greater than 60 days. We use two different classifications of early disclosures: the first includes events with a filing distance less than or equal to 60 days and the second includes events in the first quartile of the *Fdistance* variable.[26] We also run the analysis for filings that only include portfolio holdings disclosures and no additional balance sheet information.[27] This analysis allows for testing the valuation effects of pure portfolio holdings disclosures without any potential influence from disclosures of other accounting information.

We test for statistical significance using the Kolari and Pynnönen (2010) test that allows for both event-induced variance and cross-correlation across events simultaneously.[28]

Table 4 presents the cumulative average abnormal returns (CAARs) over different event windows for: the whole sample, the sample of events in the first quartile of *Fdistance*, the sample of events with filing distance less than or equal to 60 days and the sample of events with filing distance more than 60 days.

[26] The number of events for the whole sample is 2500, of which 1176 are in the late filing sample and 1324 are in the early filing sample. The number of events in the first quartile of *Fdistance* is 708.

[27] We run this analysis only for the two early disclosure categories since very few holdings only filings are disclosed later than 60 days. For example, as shown in Table 1 only 3.28% of the N-Q filings are disclosed later than 60 days.

[28] For a more descriptive analysis of the procedure used for the event study see the appendix of Michaelides et al. (2015).

The results for the whole sample show insignificant CAARs in almost all windows. In fact, only CAAR (0,10) is negative and statistically significant at the 10% level. The results, when we condition on timely disclosure, are much more telling and can explain the insignificance of our findings for the whole sample as they are in opposite direction for early and late disclosures. More specifically, CAARs for both early disclosure samples (events in the first quartile of *Fdistance* and events with filing distance less than or equal to 60 days) are positive and statistically significant for windows (0,1), (0,4) and (0,7) revealing the valuation benefits of early disclosure consistent with our first hypothesis (H1). Interestingly, CAARs are negative and significant in the pre-event window (-10,-1) indicating that managers might be reacting to deteriorating price returns associated with increasing discounts. On the other hand, CAARS for the late filing sample (events with filing distance more than 60 days) are negative and significant for event windows (0,4) (0,7) and (0,10).

This specific pattern is observed graphically in Figure 1, which presents the CAARs for the three groups around the event. We observe that after the announcement, early disclosure, represented by First Quartile events and events with *Fdistance* less or equal to 60 days, is associated with positive CAARs and an upward trend following the announcement, while delayed disclosure is associated with negative CAARs and a negative trend following the announcement.

It is important to test whether the positive abnormal returns documented above for early disclosures are driven by holdings disclosures and not by accounting disclosures.[29] The semi-annual and annual filings include both portfolio holdings disclosures and accounting disclosures, while the first and third quarter filings typically only include holdings disclosures. Table 4, Panel B, presents event study results using filings that only include portfolio holding disclosure without additional accounting information for the two early disclosure groups. The CAARs for both groups are positive and significant for event windows (0,1), (0,4) and (0,7) and negative and significant for the pre-event window (-10,-1). These findings show that portfolio holdings disclosure is the source of the positive early filing abnormal returns consistent with our argument that timely disclosure facilitates arbitrageurs to compete with activist investors because it reduces the cost and risk of implementing arbitrage strategies to take advantage of fund discounts.

[29] Several studies in the accounting and corporate finance literature highlight the positive effects from increased disclosure and transparency. These include Easley and O'Hara (2004), Verrecchia (2001) and Botosan (1997) among others.

To summarize our results, first we find that using the whole sample there appear to be no significant valuation effects associated with portfolio holdings disclosure. However, conditioning our event study analysis on timely disclosure by splitting the sample into events with early disclosure and events with late disclosure reveals opposing statistically significant valuation effects. We document significant positive abnormal returns following the event for the timely disclosure samples and significant negative abnormal returns for the late filing sample. Our results confirm our hypothesis that closed-end fund portfolio holdings disclosure has significant pricing effects (H1) with the direction of the valuation effect significantly dependent on disclosure timing. We further show that our documented valuation benefits hold for pure portfolio holdings disclosures without other accounting information, providing further support for the arbitrage strategy facilitation argument.

### 5.2 Long-Short Portfolio Strategy

In this section, we investigate further our argument that the early disclosure valuation benefits stem from the facilitation of the arbitrage strategy to take advantage the CEF discount. We analyze the performance of a portfolio going long the discounted fund and short its' underlying assets (NAV) around the early holdings disclosure. This analysis tests for significant CEF price returns over and above the corresponding NAV returns, which can also be interpreted as a reduction in the discount. Furthermore, the returns to this long-short portfolio represent the potential returns to an arbitrage strategy that takes advantage of fund discounts. We argue that managers strategically disclose early to facilitate such arbitrage strategies that could reduce discounts as a defense to potential activist investor actions that could prove detrimental to their survival. We therefore expect that the returns to the long-short portfolio will increase significantly after the portfolio holdings disclosure indicating a reduction in the discount. We apply an event study analysis around each filing and calculate the returns of the long-short portfolio in the [-10, +10] event window. The long-short strategy is facilitated after the disclosure of the most recent holdings at the event date (day 0), thus we focus our analysis in the post event period.[30]

For the purpose of this analysis we focus on the early disclosure events using our two different definitions of "early disclosure" defined above and only use the sample of events with daily NAV reporting around the event. In addition, we include only events for which $Average\ Discount_{it}$ is higher than 0, that is funds that trade at a discount.[31]

[30] Our sample contains international funds whose underlying assets trade at different time zones, thus we also look at post event windows starting at day +1, to control for time zone differences.

[31] This results to a sample of 748 events. Out of the 898 events with daily NAV data and timely disclosure only 150 events have an average discount less than or equal to 0.

Daily long-short returns (LSR) for event *i* and event day *t* are calculated using the following formula:

$$LSR_{it} = R_{it} - R_{it}^{NAV} \quad (1)$$

Where, $R_{it}$ is the CEF return of event *i* on day *t* of the event window and $R_{it}^{NAV}$ is the corresponding NAV return.

Cumulative Long Short Returns (CLSRs) for different sub periods $[t_1,t_2]$ are obtained by adding up the corresponding Long Short Returns over the event window.

$$CLSR_i[t_1, t_2] = LSR_{it_1} + \cdots + LSR_{it_2} \quad (2)$$

For the statistical significance of average CLSRs we use the cross-sectional variation of LSRs in the event window under the assumption that $LSR_{it}$ is independently and identically distributed following a normal distribution with mean zero (under the null) and variance $\sigma^2$. We use $s_t$ as an estimator for σ (N=number of events) to define our test statistic based on $CALSR_i$:

$$Z = \sqrt{N}\frac{CALSR_i[t_1, t_2]}{s} \sim N(0,1), \quad (3)$$

where the cumulative average long short return is

$$CALSR[t_1, t_2] = \frac{1}{N}\sum_{i=1}^{N} CLSR_i[t_1, t_2], \quad (4)$$

and the standard deviation is

$$s = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(CLSR_i[t_1, t_2] - CALSR[t_1, t_2])^2} \quad (5)$$

Table 5 presents the cumulative average long-short strategy portfolio returns (CALSRs) over different event windows for our new samples[32] using both definitions of early disclosure. A graphic representation of CALSRs is presented in Figure 2. The CALSRs for all post-event windows (0,1), (0,4), (0,7) and (0,10) are positive and statistically significant for both

[32] The samples here include only funds trading at a discount with NAV reporting at a daily basis. The positive and significant abnormal returns associated with early disclosure documented in the previous section are maintained when we re-run the analysis using this sample.

groups. On the other hand, all pre-event windows exhibit statistically insignificant CALSRs. The findings are consistent with our expectations and show that the returns of the long-short strategy portfolio become statistically significant exactly when the implementation of such a strategy is facilitated by the timely disclosure of portfolio holdings.[33] This is in line with our argument that managers strategically disclose early to facilitate such arbitrage strategies that could reduce discounts and thus act as a defense mechanism to potential activist investor actions.

## 6. Explaining Disclosure Timing

We proceed with the examination of the factors that affect the fund manager's choice with respect to the timing of portfolio holdings disclosure. We use the filing distance at time t, the *LateF*, and *EarlyF* dummies as dependent variables in our statistical analysis. The following multivariate and a logistic regression models are used to test our hypotheses (H2-H5) regarding strategic disclosure timing.

$$Fdistance_{it} = \beta_0 + \beta_1\, Discount_{it} + \beta_2 Manager's\ Information_{it} + \beta_3 New\ Strategy_{it} + \beta_4 Holdings\ Liquidity_{it} + \beta_5 Fund\ Liquidity_{it} + \beta_6 Fdistance_{it-1} + \beta_7 Frequency(D)_{it} + \beta_8 Book\ Information(D)_{it} + \beta_9 Number\ Of\ Holdings_{it} + \beta_{10} Dividend\ Yield_{it} + \beta_7 Foreign\ Fund_{it} + \varepsilon_{it} \quad (6)$$

$$\Pr(LateF_{it})\ /Pr(EarlyF_{it}) = F(\beta_0 + \beta_1\, Discount_{it} + \beta_2 Manager's\ Information_{it} + \beta_3 New\ Strategy_{it} + \beta_4 Holdings\ Liquidity_{it} + \beta_5 Fund\ Liquidity_{it} + \beta_6 LateF_{it-1}(EarlyF_{it-1}) + \beta_7 Frequency(D)_{it} + \beta_8 Book\ \ Information(D)_{it} + \beta_9 Number\ Of\ Holdings_{it} + \beta_{10} Dividend\ Yield_{it} + \beta_7 Foreign\ Fund_{it} + \varepsilon_{it}) \quad (7)$$

The linear regression equation sheds light on cross-sectional characteristics, which are important in explaining filing distance. We complement this analysis with a multivariate logit model, used to examine what factors affect the choice of filing late or filing early.

We use $Average\ Discount_{it}$ in the linear regressions and $Discount\ Dummy_{it}$ in the logit regressions to test our second hypothesis (H2).[34] Our second hypothesis implies that greater discounts are associated with lower filing distance. We therefore expect the coefficient for

[33] Results for windows (1,4) and (1,7) and (1,10), controlling for time zone differences in international funds, are also positive and statistically significant for both groups.

[34] For the second hypothesis (H2) we also used the $Discount\ Dummy_{it}$ as an alternative to the $Average\ Discount_{it}$ in Equation (6) and vice versa for Equation (7). In all cases the results are the same in terms of both sign and significance.

$Average\ Discount_{it}$ to be negative in the linear regression and the coefficient for $Discount\ Dummy_{it}$ to be positive in the $EarlyF_{it}$ logit regression and negative in the $LateF_{it}$ logit regression.[35] According to hypothesis (H3), we expect the manager's information to be associated with greater filing distance and late filing. We use two different proxies to estimate the effect of the manager's information on both $Fdistance_{it}$ and the probability to disclose late or early. These are $Total\ Turnover_{it}$, and $Average\ Return\ Gap(RR)_{it}$.

According to hypothesis (H4), if a manager is in the middle of implementing a new strategy, we expect a positive impact on the decision to delay holdings disclosure as the manager wants to avoid front-running. We use the average return gap variable, $Average\ Return\ Gap(RF)_{it}$, for the period between the report period end and the filing date as a proxy for $New\ Strategy_{it}$. Finally, the $Holdings\ Spread_{it}$ proxies for holdings illiquidity. According to hypothesis (H5), we expect the filing distance to increase with holdings illiquidity.

We use several controls in all models. These include: the lagged value of the dependent variable, the dividend yield, the fund's price bid-ask spread, the number of the fund's holdings, the foreign fund dummy variable, the filing frequency dummy, capturing the effect of quarterly instead of semiannually disclosure and the book information dummy variable capturing the effect of filings with additional information such as balance sheet, income statement and cash flow information.

Table 6 presents two versions of the linear regression model explaining the delay of portfolio holdings disclosure.[36] The first version (1) of Equation (6) uses *Total Turnover* as a proxy for manager's information and *Average Return Gap(RF)* as a proxy for implementing a new strategy. The second version (2) uses *Average Return Gap(RR)* as a proxy for manager's information and excludes *Average Return Gap(RF)* due to the high correlation between the two measures. Each version is estimated with and without year fixed effects.

[35] Some of the explanatory variables are used in the literature to explain the CEF discount. In unreported estimations we run the fixed effects versions of Equation (6) and (7) without the discount variables and find that the results for the rest of the variables remain qualitatively similar.

[36] As our dependent variable is a count variable econometric theory suggests that a Poisson or a Negative Binomial regression may be more appropriate. We run the same estimation using Poisson and Negative Binomial regressions and the results (not reported) are the same both in terms of direction and statistical significance of the coefficients.

*Average Discount* has a negative and statistically significant effect on *Fdistance* in all versions of the equation. This indicates that the higher the discount the more likely the managers are to disclose early consistent with our second hypothesis (H2). This finding along with our documented early disclosure valuation benefits and discount reduction findings in section 5.2 provide strong support for our argument that CEF managers of funds trading at high discounts strategically disclose early to reduce discounts and protect themselves from activist investor attacks.

We document strong evidence in support of the third hypothesis (H3) since both variables used to proxy a manager's information, *Total Turnover* and *Average Return Gap(RR),* have a positive and significant effect on *Fdistance.* This result suggests that the greater the information a manager has, the more likely the manager will choose to delay the holdings filings, as a protection from copycat threats.

We also find evidence in support of our fourth hypothesis (H4) that managers are more likely to delay holdings disclosure to avoid front-running if they are in the middle of implementing a new strategy. *Average Return Gap(RF),* measuring the trading activity between the report date and the filing date, is positive and statistically significant. This indicates that the manager delays portfolio holdings disclosure to avoid front-running in cases of higher planned trading activity between after the report date.

Illiquidity of holdings is positive and significant in our time fixed effects regressions, suggesting that illiquid holdings are associated with higher filing distance. This is consistent with a strong aversion on the part of CEF managers to the high costs of front-running (H5).

Turning now to our control variables, illiquid funds, as measured by the fund's bid-ask spread, tend to report earlier than more liquid funds. The lagged *Fdistance* variable has a positive and significant coefficient in both equation versions as does the Frequency variable. Reports containing book information are associated with more delay as do international funds relative to US funds. Finally, both dividend yield and Number of Holdings have a positive effect on the filing distance.

Table 7 uses the same explanatory variables as Table 6 in logit regressions with *LateF* in Panel A and *EarlyF* in Panel B as the dependent variables, except that in this case we use the *Discount Dummy* to test our second hypothesis. *LateF* takes the value of 1 if filing distance is greater than 60 days, and 0 otherwise. *EarlyF* takes the value of 1 if the filing is in the first quartile of filing distance and 0 if filing distance is greater than 60 days. There is significant difference in the interpretation of the results of the two econometric equations.

Equation (6) (Table 6) tests for the factors that affect the magnitude of delay, while Equation (7) (Table 7) tests for the factors that affect the choice to file late or early.

Results in Table 7, like those in Table 6, are consistent with our second hypothesis as the $Discount\ Dummy_{it}$ has a negative and significant effect on the probability to file late (*LateF*) and a positive and significant effect on the probability to file early (*EarlyF*) in all versions of the model in both Panel A and Panel B. These indicate that the higher the discount the more likely the managers are to disclose early. Marginal effects at means calculations indicate that the discount is both statistically and economically significant as CEFs with high discount ( $Discount\ Dummy_{it}$=1) have an 8.6% lower probability of delaying more than 60 days, relative to filing within 60 days from the period-end date, and a 7.07% to 7.92% higher probability to file within the first quartile of *Fdistance* relative to delaying more than 60 days.

*Total Turnover* is positive and significant in the *LateF* estimations (Panel A) and negative and significant in the *EarlyF* estimations (Panel B). *Average Return Gap(RR)* is positive and significant in Panel A, but insignificant in Panel B. The significant coefficient estimates are consistent with the CEF manager being more likely to delay disclosure to avoid copycatting when she has valuable information (H3).

The positive significant coefficient of *Average Return Gap(RF)* in Table 7, Panel A, and the negative significant coefficient in Panel B, indicate that a manager being in the middle of implementing a new strategy, and as a result more concerned about front-running threats, is more likely to choose to delay disclosure (H4).

Illiquidity of holdings has a positive and significant effect on the probability of a late filing (*LateF*) and a negative and significant effect on the probability of filing early (*EarlyF*) consistent with hypothesis (H5). Finally, all the control variables of Panel A are significant and in the same direction as in Table 6 and as one would expect, significant, but in the opposite direction in Panel B.

The marginal effects reveal that a small change in Total Turnover has a 0.09 and -0.1 percentage points impact on the probabilities of late and early disclosure in Panels A and B, respectively. Also, a small change in the *Average Return Gap(RF)* has a 0.49 and a -0.96 percentage point impact on the two probabilities respectively. The *Average Return Gap(RR)* marginal effect on *Pr(LateF)* is 1.05 percentage points. The *Holdings Spread* marginal effect is approximately 2.15% on *Pr(LateF)* and -2.15% on *Pr(EarlyF).*

In summary, the results indicate that managers of funds trading at high discounts are more likely to disclose earlier in order to reduce discounts and protect themselves from activist investor attacks even in the presence of strong motives to delay disclosure because of copycatting and front-running concerns. This finding corroborates the valuation benefits findings and the long-short arbitrage strategy findings in section 5.2.

## 7. Conclusion

In this paper we extend the literature on fund industry disclosure by examining the timing of closed-end fund (CEF) manager's portfolio holdings disclosure decisions. We first exploit the uniqueness of CEFs that provide a fund price separate from their NAV, by conducting an event study and revealing significant valuation benefits associated with timely portfolio holdings disclosure and negative valuation effects for late disclosures. We show that the valuation benefits are not driven by concurrent early disclosure of accounting information by documenting positive valuation effects for pure portfolio holding disclosures. Furthermore, we find that the returns of a long-short portfolio strategy to exploit fund discounts become positive and statistically significant exactly after the implementation of such a strategy is facilitated by the timely disclosure of portfolio holdings. Finally, we show that fund managers are more likely to disclose early in the presence of large discounts and that copycatting and front-running threats, as well as illiquid underlying assets, increase the probability to delay portfolio holdings disclosure.

We build an argument that managers strategically disclose early to protect themselves from activist investor attacks in the presence of high discounts. In this regard early portfolio holdings disclosure acts as an alternative and/or supplement to other value enhancement actions, like managed distribution policies (MDP), as a defense mechanism against activist investors. This is despite the strong motives for late disclosure stemming from copycatting and front-running threats shared with open-end fund managers.

By using the time of closed-end fund holdings disclosure and detailed portfolio holdings data we demonstrate that managers strategically alter their portfolio holdings disclosure. Managers are likely to disclose early to mitigate threats regarding their job safety. At the same time, managers are more likely to disclose late in the case of potential freeriding costs. This latter result provides direct empirical evidence regarding the validity of fund managers concerns regarding more frequent disclosure, as these where expressed prior to the 2004

change in the regulation and suggests that more frequent disclosure is likely to come with a cost for the fund.

# 8. Appendix

**Forms used for portfolio holdings disclosure between 1995 and 2010**

This table presents a list of the filing forms used for portfolio holdings disclosure throughout the period covered in this study along with the information contained in the reports, the rules each filing is covered by, the filing frequency, the period each form was used, and the maximum filing distance allowed by the regulatory authorities. The source for the information is the Securities and Exchange Commission (SEC) Website.

| Form | Description | Information in Reports | Regulation | Frequency | Period Used | Maximum Filing Distance |
|---|---|---|---|---|---|---|
| N-30D | An annual and semi-annual report mailed to shareholders. Filed by registered investment companies | Schedule of Investments, letter to stockholders, statement of assets and liabilities, statement of operations, statement of changes in Net Assets, financial highlights, changes in portfolio securities, historical financial statistics, dividend payments schedule and the automatic dividend reinvestment plan | Covered under Rule 30e-1 of the Securities Exchange Act of 1934 | Filed twice a year (semi-annual) | Until January 22, 2003 | Must be transmitted to the shareholders within 60 days after the close of the period. Must be filed within 10 days of the transmission |
| N-30B-2 | Periodic and interim reports mailed to shareholders. Filed by registered investment companies. | In some cases, it contains the information included in N-30D filings and in other cases it includes only the schedule of investments | Covered under rule 30b2-1(b) of the Securities Exchange Act of 1934 | Voluntary | - | - |
| N-CSR and N-CSR(S) | Certified shareholder report | • A copy of the report to stockholders (Schedule of Investments, letter to stockholders, statement of assets and liabilities, statement of operations, statement of changes in Net Assets, financial highlights, changes in portfolio securities, historical financial statistics, dividend payments schedule and the automatic dividend reinvestment plan).<br>• A copy of the firm's code of ethics.<br>• The name of the firm's audit committee financial expert.<br>• Disclosure of principal accountant fees and services for the previous two fiscal years.<br>• Disclosure of audit committee of listed registrants or reason for exemption.<br>• Disclosure of proxy voting policies | Covered under Section 30 of the Investment Company Act of 1940 and Sections 13 and 15(d) of the Securities Exchange Act of 1934 | Filed at the end of the second and fourth fiscal quarters | Since January 22, 2003 | Must be transmitted to the shareholders within 60 days after the close of the period. Must be filed within 10 days from the transmission |
| N-Q | Quarterly schedule of portfolio holdings | Schedule of Investments | Covered under Section 30(b) of the Investment Company Act of 1940 and Sections 13(a) and 15(d) of the Securities Exchange Act of 1934 | Filed at the end of the first and third fiscal quarters | From May 10, 2004 onwards | Must be filed not later than 60 days after the close of the first and third quarters of each fiscal year |

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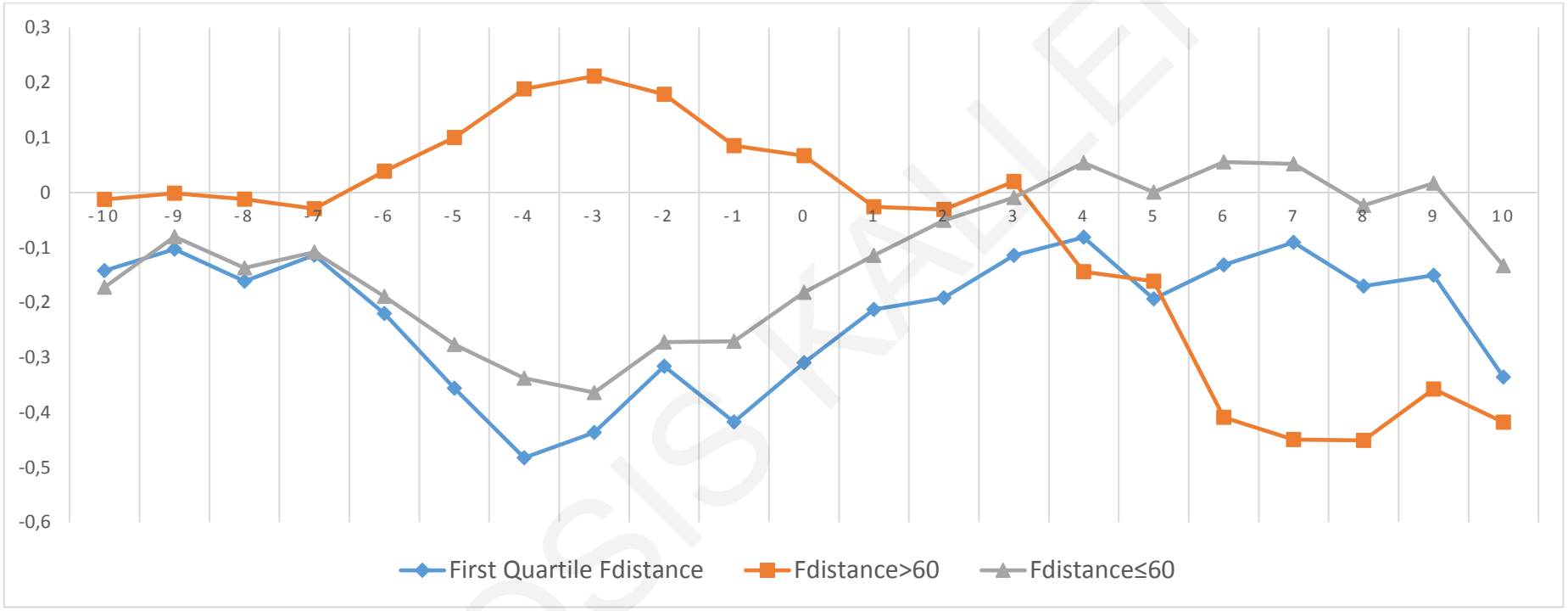


**Figure 1:** Cumulative average abnormal returns by filing distance. Depicted are the cumulative average abnormal returns for the [-10, +10] event window for 708 events within the first quartile of filing distance (Fdistance), 1176 events with filing distance more than 60 days (Fdistance>60) and 1324 events with filing distance within 60 days (Fdistance≤60). Fdistance is the difference, in days, between the report period-end date and the filing date.

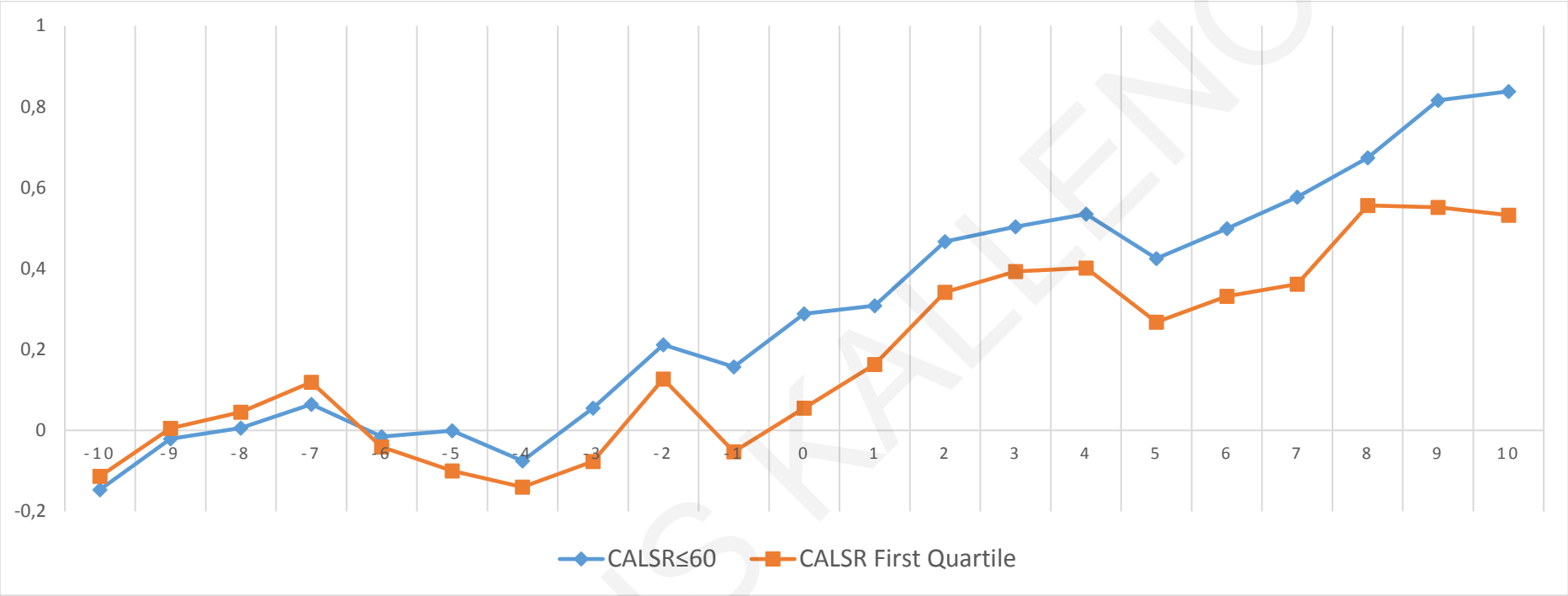


**Figure 2:** Cumulative average long-short portfolio returns. The graph shows cumulative average long-short portfolio returns for the sample that consists of 429 events where holdings were disclosed within the first quartile of filing distance (CALSR First Quartile) and the sample of 748 events with Fdistance being within 60 days (CALSR≤60). In both cases NAV reporting around the event is daily and Average Discount is greater than zero.

## Table 1 Filing distance descriptive statistics

Table 1, Panel A, presents the descriptive statistics for each of the forms used in this study. The number of observations, the mean Fdistance, the standard deviation of Fdistance, the minimum Fdistance, the 25% and 75% quantiles of Fdistance, the median and the maximum Fdistance for each form. Fdistance is the difference, in days, between report period-end and filing dates. Fdistance is winsorised at the top 1%. The last 3 columns present the percentage of events with filing distance greater than 60 days, between 60 and 70 days, and greater than 70 days, respectively. Panel B reports filing distance descriptive statistics for different groups. Statistics are presented over events for U.S. holdings and foreign holdings CEFs, all events before and after the new rule for quarterly reporting. We also present the statistics for reports with and without additional accounting (book) information (such as balance sheet information). Source: SEC EDGAR CEF filings.

**Panel A: For each filing form**

| Form | Observations | Mean | S.D. | Min | 0.25 | Mdn | 0.75 | Max | % Fdistance>60 | %Fdistance 61 to 70 | % Fdistance>70 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| N-CSR | 456 | 64.1 | 8.35 | 12 | 62 | 67 | 69 | 78 | 80.04 | 74.12 | 5.92 |
| N-CSRS | 358 | 62.41 | 9.68 | 16 | 61 | 65 | 68 | 78 | 79.05 | 76.82 | 2.23 |
| N-Q | 670 | 51.51 | 13.16 | 12 | 51 | 57 | 60 | 70 | 3.28 | 3.28 | 0 |
| N-30D | 769 | 59.11 | 11.86 | 12 | 57 | 61 | 66 | 78 | 54.72 | 47.61 | 7.12 |
| N-30B-2 | 247 | 58.68 | 14.01 | 14 | 56 | 63 | 67 | 78 | 61.29 | 48.79 | 12.5 |
| **Panel B: By category** | | | | | | | | | | | |
| U.S. Funds | 764 | 53.06 | 15.95 | 5 | 44 | 59 | 65 | 78 | 39.48 | 35.42 | 4.05 |
| Foreign Funds | 1736 | 60.72 | 10.03 | 4 | 58 | 61 | 67 | 78 | 54.2 | 49.02 | 5.17 |
| Holdings Information | 749 | 52.91 | 12.64 | 4 | 52 | 57 | 60 | 78 | 8.54 | 6.94 | 1.6 |
| Book Information | 1751 | 60.72 | 11.91 | 9 | 59 | 64 | 68 | 78 | 67.16 | 60.94 | 6.23 |
| Before the New Rule | 1126 | 59.46 | 12.2 | 9 | 57 | 62 | 67 | 78 | 58.09 | 50.31 | 7.78 |
| After the New Rule | 1374 | 57.5 | 12.94 | 4 | 56 | 60 | 67 | 78 | 42.79 | 40.39 | 2.4 |

## Table 2: Descriptive statistics for the distance between filing and report date

The table presents the descriptive statistics of filing distance (winsorised at the top 1%), measured as the distance between the report period-end date and the filing date. N stands for the number of observations, St.Deviation is the standard deviation, min is the minimum and max is the maximum value. % over 60 is the percentage of events with Fdistance greater than 60 days. AC is the autocorrelation of Fdistance. Panel A presents the data for U.S. Based Holdings CEFs, while Panel B presents the data for Foreign Holdings CEFs. Source: EDGAR CEF filings.

**Panel A: U.S. based holdings closed-end funds**

| Closed-End Fund | N | Average Fdistance | St. Deviation | min | median | Max | % over 60 | AC |
|---|---|---|---|---|---|---|---|---|
| Adams Express | 60 | 25.35 | 12.23 | 13 | 21 | 59 | 0 | -0.31 |
| General American Investors | 61 | 29.61 | 5.84 | 19 | 28 | 44 | 0 | -0.53 |
| Eagle Capital Growth | 10 | 31.3 | 21.64 | 5 | 33.5 | 58 | 0 | -0.69 |
| Central Securities | 38 | 31.39 | 5.66 | 20 | 33 | 41 | 0 | -0.35 |
| Blue Chip Value | 45 | 55.82 | 13.75 | 25 | 60 | 71 | 37.78 | 0.14 |
| Source Capital | 44 | 56.07 | 5.77 | 45 | 55 | 70 | 18.18 | -0.04 |
| Zweig | 63 | 56.35 | 10.98 | 34 | 59 | 72 | 34.92 | 0.49 |
| Cornerstone Strategic Value | 53 | 59.45 | 6.8 | 43 | 60 | 71 | 41.51 | -0.41 |
| Royce Value Trust | 45 | 59.62 | 6.81 | 38 | 61 | 70 | 57.78 | -0.35 |
| Royce Focus Trust | 45 | 59.67 | 6.27 | 45 | 61 | 70 | 55.56 | -0.41 |
| Boulder Total Return | 35 | 60.09 | 8.4 | 42 | 59 | 70 | 40 | -0.4 |
| Royce Micro Cap | 45 | 60.11 | 6.01 | 45 | 61 | 70 | 57.78 | -0.43 |
| Tri Continental | 63 | 60.19 | 8.86 | 32 | 60 | 76 | 47.62 | -0.29 |
| Gabelli | 61 | 63.05 | 8.68 | 35 | 65 | 78 | 67.21 | -0.09 |
| Liberty All Star Growth | 47 | 64.48 | 7.98 | 34 | 65 | 78 | 72.34 | 0.08 |
| Liberty All Star Equity | 49 | 64.91 | 6.65 | 51 | 65 | 78 | 73.47 | 0.05 |
| Across Funds Average | 16 | 52.34 | 8.89 | 32.88 | 52.91 | 67.25 | | -0.22 |

Table 2. Continued:

**Panel B: Foreign holdings closed-end funds**

| Closed-End Fund | N | Average Fdistance | St. Deviation | min | median | max | % over 60 | AC |
|---|---|---|---|---|---|---|---|---|
| Thai Capital | 34 | 42.53 | 25.38 | 6 | 58 | 72 | 35.29 | -0.7 |
| Singapore | 40 | 45.15 | 21.12 | 4 | 55 | 70 | 22.5 | -0.41 |
| Japan Equity | 42 | 45.6 | 21.12 | 4 | 55 | 71 | 23.81 | -0.42 |
| Argentina | 13 | 54.92 | 7.89 | 46 | 51 | 71 | 23.08 | 0 |
| Asia Tigers | 45 | 55.66 | 9.76 | 35 | 58 | 78 | 24.44 | -0.15 |
| Korea Equity | 37 | 56.35 | 12.54 | 28 | 60 | 73 | 48.65 | -0.51 |
| Japan Smaller Cap | 35 | 57.09 | 12.29 | 12 | 60 | 74 | 48.57 | -0.3 |
| India | 45 | 57.2 | 9.6 | 36 | 59 | 75 | 42.22 | -0.45 |
| Swiss Helvetica | 53 | 58.66 | 7.41 | 43 | 59 | 70 | 35.85 | -0.09 |
| Taiwan Greater China | 41 | 58.98 | 7.86 | 44 | 58 | 71 | 43.9 | -0.54 |
| Mexico | 59 | 59.78 | 5.98 | 42 | 60 | 76 | 44.07 | -0.06 |
| Brazil | 25 | 60.24 | 5.85 | 51 | 59 | 71 | 32 | -0.18 |
| Mexico Equity Income | 43 | 60.27 | 9.21 | 29 | 60 | 78 | 48.84 | -0.53 |
| Turkey | 57 | 60.7 | 8.16 | 29 | 59 | 77 | 45.61 | -0.29 |
| Aberdeen Indonesia | 41 | 61.07 | 6.24 | 45 | 62 | 68 | 65.85 | -0.6 |
| Central Europe Russia | 42 | 61.09 | 9.26 | 28 | 60 | 78 | 42.86 | -0.04 |
| Aberdeen Chile | 45 | 61.16 | 6.09 | 45 | 63 | 68 | 66.67 | -0.57 |
| China | 44 | 61.27 | 5.81 | 44 | 60 | 74 | 40.91 | -0.43 |
| Templeton Emerging Markets | 47 | 61.28 | 3.91 | 55 | 61 | 76 | 53.19 | 0.03 |
| Templeton Dragon | 48 | 61.4 | 3.42 | 56 | 61 | 71 | 52.08 | 0.08 |
| Korea | 45 | 61.56 | 5.52 | 47 | 61 | 71 | 53.33 | -0.41 |
| Templeton Russia Eastern European | 43 | 61.7 | 3.62 | 56 | 61 | 71 | 60.47 | 0.09 |
| New Ireland | 57 | 61.72 | 6.38 | 50 | 60 | 78 | 40.35 | -0.1 |
| JF China Region | 42 | 61.88 | 6.08 | 42 | 62 | 72 | 57.14 | -0.57 |
| Taiwan | 43 | 62.02 | 6.78 | 30 | 61 | 72 | 53.49 | -0.24 |
| New Germany | 40 | 62.63 | 5.28 | 55 | 61 | 78 | 50 | -0.45 |
| European Equity | 40 | 62.7 | 5.24 | 55 | 62 | 78 | 52.5 | -0.44 |
| Asia Pacific | 40 | 63.18 | 7.27 | 36 | 63 | 72 | 62.5 | -0.12 |
| Aberdeen Australia | 46 | 63.52 | 10.05 | 9 | 65 | 78 | 60.87 | -0.07 |
| Greater China | 43 | 64.3 | 4.76 | 55 | 65 | 73 | 69.77 | -0.25 |
| Spain | 45 | 64.33 | 5.37 | 54 | 65 | 74 | 68.89 | -0.34 |
| Morgan Stanley Eastern Europe | 54 | 64.94 | 5.08 | 55 | 66 | 78 | 70.37 | -0.19 |
| Latin America Discovery | 60 | 64.95 | 4.56 | 55 | 66 | 77 | 73.33 | -0.26 |
| Morgan Stanley India | 60 | 65.1 | 4.97 | 55 | 66 | 78 | 73.33 | -0.19 |
| Morgan Stanley Emerging Markets | 61 | 65.13 | 4.93 | 55 | 67 | 78 | 73.77 | -0.18 |
| Malaysia | 60 | 65.2 | 4.86 | 55 | 67 | 77 | 73.33 | -0.18 |
| Thailand | 60 | 65.2 | 5.95 | 55 | 67 | 78 | 73.33 | -0.16 |
| Morgan Stanley Asia Pacific | 61 | 65.25 | 4.9 | 55 | 67 | 77 | 73.77 | -0.16 |
| Across Funds Average | 38 | 60.15 | 7.91 | 40.95 | 61.21 | 77.26 | | -0.27 |

**Table 3: Pairwise correlations and descriptive statistics**

Table 3, Panel A, presents the pairwise correlation coefficients between the variables used to test the main hypotheses of this study. Panel B presents the descriptive statistics for the same variables. The descriptive statistics include the number of observations, the mean, the standard deviation, the minimum, the median and the maximum for each variable. Fdistance is the difference, in days, between report period-end and filing dates, collected from EDGAR reports. Average Discount is the average discount over the period between the report date and one day before the filing date. Total Turnover is the proportion of the fund's holdings that altered that quarter (reporting period) with both buys and sells. Holdings Spread is the average bid-ask spread of the fund's holdings for the month of the report. Average Return Gap(RR) is the average monthly return gap between the report dates and Average Return Gap(RF) is the average monthly return gap between the report date and filing date. All variables, except Fdistance are reported in %. Fdistance is winsorised at the top 1%, while all remaining variables are winsorised at the top and bottom 1%.

**Panel A: Correlation coefficients of main variables**

| Variable | Fdistance | Average Discount | Total Turnover | Average Return Gap(RF) | Average Return Gap(RR) | Holdings Spread |
|---|---|---|---|---|---|---|
| Fdistance | 1 | | | | | |
| Average Discount | -0.0877 | 1 | | | | |
| Total Turnover | 0.1237 | 0.0861 | 1 | | | |
| Average Return Gap(RF) | 0.0084 | -0.0090 | -0.0435 | 1 | | |
| Average Return Gap(RR) | 0.0421 | -0.0400 | -0.0317 | 0.2786 | 1 | |
| Holdings Spread | 0.1676 | -0.0329 | 0.0820 | 0.0297 | -0.0168 | 1 |

**Panel B: Descriptive statistics of main variables**

| Variable | N | Mean | S.D. | Min | Median | Max |
|---|---|---|---|---|---|---|
| Fdistance | 2500 | 58.38 | 12.65 | 4 | 60 | 78 |
| Average Discount | 2500 | 8.19 | 12.19 | -41.24 | 10.40 | 31.24 |
| Total Turnover | 2453 | 39.66 | 32.75 | 0.99 | 31.14 | 173.55 |
| Average Return Gap(RF) | 2427 | 0.27 | 4.57 | -18.84 | 0.36 | 16.75 |
| Average Return Gap(RR) | 2435 | 0.56 | 3.11 | -12.95 | 0.45 | 11.49 |
| Holdings Spread | 2494 | 1.95 | 2.07 | 0.07 | 1.4 | 11.68 |

**Table 4: Cumulative average abnormal returns**

The table presents the cumulative average abnormal returns for different windows around the event along with their corresponding test statistics. Panel A, presents the results for the whole sample, early and late filing samples. "First quartile" contains results for events with filing distance in the first quartile of Fdistance. "Within 60 days" contains events with Fdistance less than or equal to 60 days, while "More than 60 days" contains events with Fdistance greater than 60 days. Panel B, presents the events with filings that include only holdings information for the two early reporting categories. ***, ** and * denote significance at the 1%, 5% and 10% level, respectively. We test for significance using the Kolari and Pynnönen (2010) test.

**Panel A: CAARs for whole sample, early and late filing samples**

| Event Window | Whole Sample | | First Quartile | | Within 60 days | | More than 60 days | |
|---|---|---|---|---|---|---|---|---|
| | CAAR | TestKP | CAAR | TestKP | CAAR | TestKP | CAAR | TestKP |
| (-10,-1) | -0.1033 | -0.6916 | -0.4174*** | -2.6526 | -0.2706** | -2.2079 | 0.085 | 1.1688 |
| (-7,-1) | -0.0249 | 0.1267 | -0.2562* | -1.7106 | -0.1334 | -1.1095 | 0.0973 | 1.188 |
| (-4,-1) | -0.004 | 0.3831 | -0.0614 | -0.888 | 0.006 | -0.0804 | -0.0152 | 0.5987 |
| (-1,0) | -0.0044 | 0.8531 | 0.0066 | -0.0253 | 0.0907 | 1.3187 | -0.1115 | -0.0415 |
| (-1,1) | -0.0126 | 0.4731 | 0.1031 | 1.0633 | 0.1576 | 0.1363 | -0.2043 | -0.1451 |
| (0,1) | 0.0305 | 1.1878 | 0.2044*** | 2.6117 | 0.1560** | 2.2875 | -0.1109 | -1.1243 |
| (0,4) | 0.064 | 0.6244 | 0.3359*** | 3.0617 | 0.3246*** | 3.2416 | -0.2293** | -2.0431 |
| (0,7) | -0.0804 | -1.006 | 0.3268** | 2.2439 | 0.3228** | 2.378 | -0.5344*** | -3.2136 |
| (0,10) | -0.1640* | -1.7066 | 0.0816 | 0.5186 | 0.1372 | 0.6165 | -0.5031*** | -2.8855 |
| Events | 2500 | | 708 | | 1324 | | 1176 | |

**Panel B: CAARs for early disclosures of holdings only information**

| Event Window | First Quartile | | Within 60 days | |
|---|---|---|---|---|
| | CAAR | TestKP | CAAR | TestKP |
| (-10,-1) | -0.7066*** | -3.2682 | -0.4853*** | -2.5788 |
| (-7,-1) | -0.4555 | -2.1417 | -0.2623 | -1.4451 |
| (-4,-1) | -0.141 | -1.0506 | 0.0245 | 0.1404 |
| (-1,0) | 0.0202 | 0.177 | 0.0896 | 0.8226 |
| (-1,1) | 0.0683 | 0.7607 | 0.1852 | 1.5986 |
| (0,1) | 0.1851** | 1.8609 | 0.2132** | 2.153 |
| (0,4) | 0.3269** | 2.4332 | 0.3889*** | 2.9303 |
| (0,7) | 0.4766** | 2.5315 | 0.4818*** | 2.7146 |
| (0,10) | 0.1672 | 0.8045 | 0.1344 | 0.3647 |
| Events | 500 | | 698 | |

**Table 5: Cumulative average long short returns**

The table presents the cumulative average long short returns, from day -10 of the event window to day 10, their standard errors and the test statistic. The samples used consist of events where holdings were disclosed within the first quartile of filing distance from the period end (First Quartile) and events where holdings were disclosed within 60 days from the period end (Earlier or equal to 60 days). In both cases NAV reporting around the event is daily and the Average Discount is greater than zero. ***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

| Event Window | First Quartile | | Earlier or equal to 60 days | |
|---|---|---|---|---|
| | CALSR | Test Statistic | CALSR | Test Statistic |
| (-10,-1) | -0.0528 | -0.3399 | 0.1569 | 1.2234 |
| (-7,-1) | -0.0981 | -0.6706 | 0.1509 | 1.1925 |
| (-4,-1) | 0.0474 | 0.3604 | 0.1574 | 1.3971 |
| (-1,0) | -0.072 | -0.7386 | 0.0767 | 1.0736 |
| (-1,1) | -0.1799* | -1.9374 | -0.0548 | -0.8828 |
| (0,1) | 0.2159** | 2.4019 | 0.1510** | 2.2885 |
| (0,4) | 0.4542*** | 2.9479 | 0.3778*** | 3.573 |
| (0,7) | 0.4143** | 2.456 | 0.4198*** | 3.5327 |
| (0,10) | 0.5849*** | 3.1619 | 0.6810*** | 4.456 |
| Events | 429 | | 748 | |

**Table 6: Factors affecting the filing distance of holdings filings**

The table presents cross-sectional regressions using Fdistance (winsorised at the top 1%) as a dependent variable. Fdistance is the difference, in days, between the report period-end date and the filing date. Lagged Fdistance is the filing distance of the previous reporting period. Frequency(D) takes the value of 1 if the period between reports of the same fund (t and t-1) is a quarter (or less) and 0 otherwise. Average Discount is the average discount over the period between the report period-end date and one day before the filing date. Total Turnover is the proportion of the fund's holdings that altered that quarter (reporting period) with both buys and sells. Holdings Spread is the average bid-ask spread of the fund's holdings for the month of the report. Fund Liquidity is the average bid-ask spread of the fund itself for the month of the report. The Dividend Yield is the 12-month average dividend yield from the prior 12 months. Book Information(D) takes the value of 1 if the report filed contains extra information such as a balance sheet. Foreign Fund(D) is an indicator variable taking the value of 1 if the fund is foreign and 0 otherwise. Number of Holdings is the logarithm of the fund's number of unique firms for which the fund holds stocks in a given report. Average Return Gap(RF) is the average monthly return gap between the report and the filing date. Return Gap is measured as the difference between the reported fund return and the return on a portfolio that invests in the previously disclosed fund holdings. Average Return Gap(RR) is the average monthly return gap between two reports. We use robust standard errors in all columns and time fixed effects in the right columns of both (1) and (2). ***, ** and * denote significance at the 1%, 5% and 10% level, respectively. P-Values are in parentheses.

| | (1) | | (2) | |
|---|---|---|---|---|
| | Fdistance | Fdistance | Fdistance | Fdistance |
| Average Discount | -0.0642*** | -0.0452*** | -0.0636*** | -0.0454*** |
| | (0.000) | (0.002) | (0.000) | (0.002) |
| Total Turnover | 0.0146** | 0.0142** | | |
| | (0.034) | (0.040) | | |
| Average Return Gap(RF) | 0.0852* | 0.0798* | | |
| | (0.066) | (0.080) | | |
| Average Return Gap(RR) | | | 0.217*** | 0.206*** |
| | | | (0.000) | (0.000) |
| Holdings Spread | 0.113 | 0.212** | 0.0955 | 0.214*** |
| | (0.174) | (0.010) | (0.245) | (0.009) |
| Fund Liquidity | -0.706*** | -0.117 | -0.721*** | -0.0450 |
| | (0.000) | (0.697) | (0.000) | (0.882) |
| lagged Fdistance | 0.521*** | 0.522*** | 0.512*** | 0.513*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Frequency(D) | 3.325*** | 2.483*** | 2.848*** | 1.884*** |
| | (0.000) | (0.000) | (0.000) | (0.001) |
| Dividend Yield | 0.0611** | 0.0639** | 0.0570** | 0.0653** |
| | (0.030) | (0.030) | (0.037) | (0.023) |
| Foreign Fund(D) | 5.069*** | 4.720*** | 5.460*** | 5.111*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Book Information (D) | 13.25*** | 13.59*** | 13.39*** | 13.81*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Number of Holdings | 1.630*** | 1.800*** | 1.695*** | 1.884*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Constant | 6.225*** | 5.052*** | 7.161*** | 5.762*** |
| | (0.001) | (0.009) | (0.000) | (0.003) |
| Year Fixed Effects | NO | YES | NO | YES |
| N | 2393 | 2393 | 2427 | 2427 |
| Adjusted $R^2$ | 0.405 | 0.408 | 0.408 | 0.412 |

**Table 7: Factors affecting disclose timing**

The table presents logistic regressions using LateF (=1 if Fdistance >60, 0 otherwise) and EarlyF (=1 if the filing is in the first quartile of Fdistance and 0 if Fdistance>60) as dependent variables in Panels A and B, respectively. Fdistance is the difference, in days, between the filing date and the report period-end date. Lagged LateF (Panel A) and lagged EarlyF (Panel B) are the values of the dependent variables in the previous reporting period. Frequency(D) takes the value of 1 if the period between reports of the same fund (t and t-1) is a quarter (or less) and 0 otherwise. Discount Dummy takes the value of 1 if Average Discount is higher that the median discount and 0 otherwise. Average Discount is the average discount over the period between the report date and one day before the filing date. Total Turnover is the proportion of the fund's holdings that altered that quarter (reporting period) with both buys and sells. Holdings Spread is the average bid-ask spread of the fund's holdings for the month of the report. Fund Liquidity is the average bid-ask spread of the fund's price for the month of the report. The Dividend Yield is the 12-month average dividend yield from the prior 12 months. Book Information(D) takes the value of 1 if the report filed contains additional accounting information such as balance sheet information. Foreign Fund(D) is an indicator variable taking the value of 1 if the fund is foreign and 0 otherwise. Number of Holdings is the logarithm of the fund's number of unique firms for which the fund holds stocks in a given report. Average Return Gap(RR) is the average monthly return gap between two reports. Average Return Gap(RF) is the average monthly return gap between the report and the filing date. Return Gap is measured as the difference between the reported fund return and the return on a portfolio that invests in the previously disclosed fund holdings. We use robust standard errors in all columns and time fixed effects in the second column of both (1) and (2). In the third column of each of the two versions, marginal effects at means are presented for the year fixed effects models. ***, ** and * denote significance at the 1%, 5% and 10% level, respectively. P-Values are in parentheses.

**Panel A: Probability to file later than 60 days vs within 60 days (LateF)**

| | (1) | | | (2) | | |
|---|---|---|---|---|---|---|
| | Pr(LateF) | Pr(LateF) | Marginal Effects | Pr(LateF) | Pr(LateF) | Marginal Effects |
| Discount Dummy | -0.483*** | -0.360*** | -0.0857 | -0.458*** | -0.359*** | -0.0861 |
| | (0.000) | (0.002) | (0.002) | (0.000) | (0.001) | (0.001) |
| Total Turnover | 0.00373** | 0.00384** | 0.0009 | | | |
| | (0.042) | (0.042) | (0.042) | | | |
| Average Return Gap(RF) | 0.0213* | 0.205* | 0.0049 | | | |
| | (0.063) | (0.070) | (0.071) | | | |
| Average Return Gap(RR) | | | | 0.0469*** | 0.0436*** | 0.0105 |
| | | | | (0.003) | (0.005) | (0.005) |
| Holdings Spread | 0.0690*** | 0.0901*** | 0.0215 | 0.0650** | 0.0900*** | 0.0216 |
| | (0.008) | (0.001) | (0.001) | (0.010) | (0.000) | (0.000) |
| Fund Liquidity | -0.117** | -0.0318 | | -0.120** | -0.00830 | |
| | (0.012) | (0.615) | | (0.010) | (0.896) | |
| lagged LateF | 0.901*** | 0.892*** | | 0.894*** | 0.904*** | |
| | (0.000) | (0.000) | | (0.000) | (0.000) | |
| Frequency(D) | 1.069*** | 1.036*** | | 0.966*** | 0.874*** | |
| | (0.000) | (0.000) | | (0.000) | (0.000) | |
| Dividend Yield | 0.0175* | 0.0219** | | 0.0145 | 0.0208** | |
| | (0.084) | (0.041) | | (0.144) | (0.050) | |
| Foreign Fund(D) | 1.140*** | 1.158*** | | 1.187*** | 1.207*** | |
| | (0.000) | (0.000) | | (0.000) | (0.000) | |
| Book Information (D) | 4.406*** | 4.497*** | | 4.441*** | 4.589*** | |
| | (0.000) | (0.000) | | (0.000) | (0.000) | |
| Number of Holdings | 0.645*** | 0.684*** | | 0.650*** | 0.694*** | |
| | (0.000) | (0.000) | | (0.000) | (0.000) | |
| Constant | -8.153*** | -7.975*** | | -7.985*** | -7.390*** | |
| | (0.000) | (0.000) | | (0.000) | (0.000) | |
| Year Fixed Effects | NO | YES | YES | NO | YES | YES |
| N | 2393 | 2393 | | 2427 | 2427 | |
| Pseudo $R^2$ | 0.3263 | 0.3420 | | 0.3299 | 0.3450 | |

Table 7 continued:

**Panel B: Probability to file in the first quartile of Fdistance vs later than 60 days (Early F)**

| | (1) | | | (2) | | |
|---|---|---|---|---|---|---|
| | Pr(EarlyF) | Pr(EarlyF) | Marginal Effects | Pr(EarlyF) | Pr(EarlyF) | Marginal Effects |
| Discount Dummy | 0.451*** | 0.357** | 0.0792 | 0.395*** | 0.323** | 0.0707 |
| | (0.002) | (0.019) | (0.019) | (0.007) | (0.032) | (0.031) |
| Total Turnover | -0.0044* | -0.0046* | -0.001 | | | |
| | (0.059) | (0.056) | (0.055) | | | |
| Average Return Gap(RF) | -0.0441** | -0.0434** | -0.0096 | | | |
| | (0.013) | (0.013) | (0.013) | | | |
| Average Return Gap(RR) | | | | -0.0281 | -0.0250 | -0.0055 |
| | | | | (0.181) | (0.242) | (0.243) |
| Holdings Spread | -0.0727** | -0.0970*** | -0.0215 | -0.0683** | -0.0982*** | -0.0215 |
| | (0.021) | (0.002) | (0.002) | (0.029) | (0.002) | (0.002) |
| Fund Liquidity | -0.0487 | -0.133 | | -0.0335 | -0.141 | |
| | (0.513) | (0.260) | | (0.649) | (0.231) | |
| lagged EarlyF | -0.368** | -0.362* | | -0.350* | -0.341* | |
| | (0.047) | (0.071) | | (0.057) | (0.085) | |
| Frequency(D) | -0.972*** | -0.823*** | | -0.862*** | -0.671*** | |
| | (0.000) | (0.001) | | (0.000) | (0.004) | |
| Dividend Yield | -0.0221** | -0.0237** | | -0.0205* | -0.0234** | |
| | (0.040) | (0.045) | | (0.059) | (0.044) | |
| Foreign Fund(D) | -0.839*** | -0.776*** | | -0.879*** | -0.815*** | |
| | (0.000) | (0.000) | | (0.000) | (0.000) | |
| Book Information (D) | -4.532*** | -4.683*** | | -4.542*** | -4.710*** | |
| | (0.000) | (0.000) | | (0.000) | (0.000) | |
| Number of Holdings | -0.647*** | -0.663*** | | -0.652*** | -0.677*** | |
| | (0.000) | (0.000) | | (0.000) | (0.000) | |
| Constant | 7.042*** | 6.615*** | | 6.800*** | 6.563*** | |
| | (0.000) | (0.000) | | (0.000) | (0.000) | |
| Year Fixed Effects | NO | YES | YES | NO | YES | YES |
| N | 1862 | 1862 | | 1896 | 1896 | |
| Pseudo $R^2$ | 0.4332 | 0.4509 | | 0.4330 | 0.4506 | |

# Chapter 2

# Business Development Companies: Private Equity for Individual Investors


## Abstract

Using the universe of Business Development Companies (BDCs) for the period 1998-2017 we provide the first in depth examination of their performance and risk adjusted characteristics. More importantly, we exploit the existence of BDC daily market prices separately from appraisal based NAVs to provide a comprehensive comparison with traditional Private Equity (PE) appraisal based index returns as well as PE cash flow based indices serving as proxies of unavailable PE market based index returns. We find that a BDC traded factor, significantly explains the returns of the PE cash flow based indices of Ang et al. (2018), but not the returns of appraisal based PE indices, which however, are explained by the BDC NAV excess return. Our findings reveal a significant relationship between the returns of BDCs and the time varying private equity premium confirming that BDC's provide PE investment access to individual investors and a credible benchmark for evaluating traditional PE investments as well as potential transaction based proxies of PE market returns.

## 1. Introduction

Business Development Companies (BDCs) are investment companies structured as Closed-end funds and are considered by market participants to be part of the general Private Equity (PE) investment space.[37] A 2014 Reuters article labels BDCs as 'Private equity for ordinary folks', highlighting the fact that market participant's view BDCs as a way for retail investors to access the PE asset class.[38] Unlike traditional Private Equity Funds (PEFs), who are typically open only to accredited investors and qualified clients, BDC shares are traded on a stock exchange and are primarily held by retail investors.[39] The Thomson Reuters Institutional Holdings database reports an average institutional ownership of 29% for BDCs, lower than the average institutional ownership across all companies included in the database (33%), for the period 1998-2016.

While initially, BDCs existed under relative obscurity, the success of some BDCs in the mid-2000s has led the sector to a rapid growth both in terms of size and number of vehicles.[40] As a result, the BDC sector receives a lot of attention both in terms of the creation of financial products and indices following this segment and in terms of financial news coverage. Three BDC indices have emerged since the ignition of the BDC market along with several ETFs tracking these indices.[41] However, the BDC sector remains understudied by the academic literature.[42]

This paper fills a gap in the literature by examining the performance and risk characteristics of BDCs. More importantly, given that BDCs are classified by market participants as an easily accessible part of the private equity sector, we also examine whether BDC returns can explain traditional PEF returns. In doing so, we take into account the limitations associated with the

[37] A Closed-end fund is a publicly traded investment company. Unlike traditional mutual funds that create new shares and redeem existing ones, Closed-end funds trade in the stock exchange after the IPO.
[38] http://reut.rs/1rAU2AA
[39] In 2018 the majority of BDCs traded on NASDAQ, and the rest on NYSE.
[40] Our descriptive statistics show that the number of listed BDCs has increased from 17 to 56 from 1998 to 2017. The total market capitalization of the sector increased from $2.64 billion to $35.3 billion over the same period.
[41] Wells Fargo BDC Index launched in 2004, MVIS US Business Development Companies Index launched in 2007 and S&P BDC Index launched in 2013. ETFs tracking BDC indices or investing in the BDC sector include: UBS E-TRACS 2X Leveraged Wells Fargo Business Development Company ETN, E-TRACS Wells Fargo Business Development Company ETN, VanEck Vectors BDC Income ETF and the PowerShares Global Listed Private Equity Portfolio.
[42] With the exemption of Kleiman and Shulman (1992), who use a very small sample of 12 BDCs during the 1980-1990 period, to our knowledge no empirical study has been conducted to examine the performance and risk characteristics of BDCs.

lack of market-based valuations for traditional PEFs as well as the recent cash flow based PE indices introduced by Ang et al. (2018) to mitigate these limitations. We exploit the BDC's Closed-end fund structure, which provides daily market price data, as well as quarterly reported Net Asset Values (NAVs), regulated by the SEC. We analyze the market-based BDC returns relative to the cash flow based PE index returns and the BDC NAV returns relative to the industry appraisal-based PE index returns.

We first contribute to the literature by providing a detailed examination of the risk-return characteristics of publicly traded BDCs. Our data sample includes the universe of BDCs trading for the period of 1998-2017. Using various asset pricing models, including the Capital Asset Pricing Model (CAPM), the Carhart (1997) four factor model, the Pástor and Stambaugh (2003) four factor model and the Fama and French (2015) five factor model, we find that BDCs have an alpha statistically indistinguishable from zero, a market beta statistically indistinguishable from one, as well as statistically significant positive loadings on size (SMB) and value factors (HML) and a negative loading on the momentum (MOM) factor. The loadings on the liquidity (LIQ), profitability (RMW), and investment (CMA) factors are not statistically significant.

Our primary contribution stems from the analysis of the relationship between BDC returns and the traditional PE fund returns. First, we take advantage of the fact that BDCs trade in the stock exchange just like any other stock and introduce a new traded factor based on the BDC price returns, to the traded factors used in Ang et al. (2018) to explain PE returns. They derive historical PE returns using the cash contributions and distributions accruing to limited partners and decompose these returns into a component due to traded factors and a time-varying private equity premium not spanned by publicly traded factors. We find that the BDC traded factor significantly explains the cash flow based PE indices over and above other traded factors, suggesting a significant relationship between the returns of BDCs and the time varying private equity premium.

Second, we find that the BDC traded factor does not have a statistically significant explanatory power on the industry appraisal-based indices. The fact that the BDC traded factor, a direct market based performance measure, explains the cash flow based PE indices and not the appraisal-based PE indices, highlights the limitations of the appraisal-based indices and provides further support to the cash flow based indices as a reliable proxy of a transaction-based PE index.

Third, the existence of the NAV in addition to the price of BDCs allows for a separate analysis of the BDC NAV returns and a comparison with the appraisal-based indices that rely on the reported NAVs of PEFs. We show that BDC NAVs exhibit smoothing biases relative to the BDC price returns similar, albeit somewhat weaker, to those exhibited by the appraisal-based indices relative to the cash flow based indices. Consistent with the aforementioned similarities between the BDC returns and the appraisal-based indices, we further show that unlike the BDC price return factor, the BDC NAV excess return significantly explains the return of appraisal-based indices, over and above other traded asset pricing factors. Finally, an event study analysis reveals a significant positive market reaction to positive changes in reported NAV and a significant negative market reaction to negative changes in reported NAV.

The structure of the study is as follows: In the next section, we present the institutional background of Business Development Companies and compare BDCs with traditional PEFs. In section 3, we review the existing literature regarding the performance of BDCs and PEFs, in connection with the objectives of this study. Section 4 presents the data and descriptive statistics. In section 5 we present the results for the risk-adjusted performance and risk characteristics of BDCs. We proceed the analysis of the relation between BDC price returns and PE returns in section 6 and an analysis regarding the NAV return of BDCs in section 7. Finally, section 8 concludes.

## 2. Institutional Background

In this section, we report important information on the establishment and regulatory background of BDCs. We also provide a comparison of BDCs with traditional Private Equity Funds.

### 2.1 Establishment

Prior to the establishment of BDCs, several provisions of the Investment Company Act of 1940 created unnecessary disincentives to the formation of listed investment companies that focus on illiquid securities such as private equity investments. These limitations originated mainly from the Act's broad definition of an investment company and the fact that its provisions are directed primarily at investment companies that have liquid pools of securities.[43] Some of the limitations, as presented by Anson (2004), include the requirements regarding illiquid holdings and leverage

[43] See Thomas and Roye (1981) for more.

that investment companies faced under the Act of 1940 and compensation restrictions created by the Investment Advisers Act of 1940.[44]

As a response to these limitations, and with a primary aim to encourage investments in small businesses, by supplying them with capital sources previously unavailable, the U.S. Congress, created BDCs under the Small Business Investment Incentive Act of 1980 (also known as the 1980 Act), which was passed as an amendment to the Investment Company Act of 1940. As stated by President Jimmy Carter, the objective for the new law was to facilitate the financing of small businesses by providing needed reform of the Federal securities laws.[45]

## 2.2 Regulatory Background

BDCs are structured as Closed-end investment companies. Like traditional Closed-end funds, BDCs trade in the stock market following their IPO. Thus, the price of a BDC is determined by supply and demand forces and can vary significantly from its NAV. This important characteristic implies a distinction between the value of the fund's portfolio and the market price.

To qualify as a BDC, a fund must be a U.S. domestic company with SEC-registered securities that invests at least 70% of its assets in eligible investments. Eligible investments initially included companies purchased in transactions not involving any public offering, securities of eligible portfolio companies already controlled by a BDC and securities of certain financially distressed companies purchased in transactions not involving a public offering. In 2006, eligible securities were redefined as domestic operating companies not listed in an exchange and under certain conditions companies that met the definition of eligible portfolio company following the initial investment by the BDC.[46] In 2008, the SEC expanded the definition of an eligible portfolio company to include exchange-listed companies that have less than $250 million in market capitalization as a way to better align the investment activities of BDCs with the purpose the Congress intended.[47]

[44] As Anson (2004) argues, Open-end mutual funds are limited to investing only 15% of their assets in illiquid investments. In addition, the provisions of the Investment Advisors Act of 1940 contained several restrictions regarding profit sharing fees and management incentive fees.
[45] Source: Small Business Investment Incentive Act of 1980 Statement on Signing H.R. 7554 into Law.
[46] Source: https://www.sec.gov/rules/final/2006/ic-27538.pdf
[47] Source: https://www.sec.gov/rules/final/2008/ic-28266.pdf

BDCs are regulated by the Security and Exchange Commission (SEC) and like all U.S. listed companies have to disclose their financial statements in quarterly and annual reports (10-Q and 10-K filings). A BDC is required to report its NAV quarterly in the 10-K and 10-Q filings. SEC requires funds to use fair values in the case of investments with no market quotations available[48], as determined in good faith by the board of directors, which under the 1940 Act, is responsible to oversee and approve the fair valuation. The valuations are based, among other things, on the input of the Company's investment adviser and the audit committee. Also, many BDCs use independent third-party valuation firms to assist in the valuation of each portfolio investment. The valuation process is conducted at the end of each fiscal quarter.[49]

## 2.3 BDCs and Traditional Private Equity Funds

Market participants consider BDCs as a form of publicly traded private equity vehicle and a way for individual investors to access the PE sector.[50] Moreover, the literature on Listed Private Equity (LPE) considers BDCs as part of the LPE universe (Lahr and Kaserer, 2017).[51] In addition, BDCs are included in the constituents of major listed private equity indices including the LPX series of indices and the S&P listed private equity index.

Even though BDCs are classified as PE investment companies, they differ significantly from traditional PE vehicles. A primary distinction between the two groups is the fact that BDC shares trade on a stock exchange just like any other stock, unlike traditional PEFs, which are finite-lived and are open only to accredited investors and qualified clients.[52]

[48] Fair value according to ASC 820 is "the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date".
[49] See for example, the 10-Q filing of Ares Capital Corporation filed on October 31, 2018.
[50] In the United States, the existence of certain minimum wealth criteria implies that only large institutions and qualified investors are allowed to invest in traditional PEFs (Jegadeesh, Kräussl, and Pollet, 2015).
[51] LPEs are defined as publicly traded investment vehicles that focus on private equity investments. As Lahr and Kaserer (2017) suggest the LPE universe is generally heterogeneous in terms of legal and economic structure as opposed to the traditional PE universe, where funds are structured as limited partnerships. There are several categories of vehicles in the LPE universe including funds, funds of funds, firms and investment companies.
[52] The lifespan of a typical PEF is 10 years. Within the life of the fund first the fund manager raises capital for the fund, then invests that capital into private equity investments which is followed by the holding period and the liquidation, where the fund manager sells the assets under management and returns the capital to the investors. In the case of BDCs and LPEs in general, the proceeds from the sales of investments are recycled into new transactions.

The main market conception regarding BDCs is that this important distinction benefits both the fund management and the investors since it provides the management a permanent base of capital and retail investors the ability to invest in the private equity asset class.

Both BDCs and traditional PEFs face similar challenges in the case of investment valuations, which arise from the fact that Private Equity investments are assets with no observable inputs or measures such as market prices. Kaplan and Sensoy (2015) highlight this limitation pointing out that a key problem of PE portfolios is that there is no completely objective way to value PE investments unless an investment is made or exited. Similarly, Ang et al. (2018) argue that even though PEF investments are required to be fair market-valued the nature of PE investments implies that reported fund NAVs represent each fund manager's opinion about the portfolio assets. A similar argument is made in the case of BDCs in a 2013 Mercer Capital (business valuation and financial advisory firm) report. The authors state that "the inescapable consequence of fair value reporting is that the reported value of the largest asset on a BDCs balance sheet is subject to a healthy dose of judgement".[53]

On the other hand, the two groups face important differences in terms of regulations. As mentioned above, BDCs are monitored by the SEC and are required to report their NAV and financial statements quarterly. On the other hand, as stated by the SEC's Office of Investor Education and Advocacy's traditional PEFs are not registered with the SEC and do not face regular public disclosure requirements.[54] Similarly, Johan and Zhang (2016) argue that PEFs are arguably less regulated than other types of investment companies and do not face mandatory rules regarding performance disclosure (see also Cumming and Walz, 2010).

## 3. Literature Review and Objectives

In this section, we summarize the limited literature on BDCs as well as the literature on the performance of traditional PEFs and relate them to the objectives of our study.

### 3.1 Business Development Companies

BDCs have attracted very little attention from the academic literature. To our knowledge, only one study has examined the performance and risk characteristics of BDCs, back in the early

[53] Source: https://mercercapital.com/assets/Mercer-Capital-Business-Development-Companies-Whitepaper-2013.pdf

[54] Source: https://www.investor.gov/introduction-investing/basics/investment-products/private-equity-funds

90s.[55] Kleiman and Shulman (1992) compares the risk/return characteristics between 14 SBICs (Small Business Investment Companies) and 12 BDCs for the period 1980 to 1990.[56] Their findings indicate that BDCs underperformed the SBICs and the NASDAQ Index over the period of 1980-1986, and outperformed during the period 1986-1990. In addition, they find an average market beta of 1.07 for BDCs and 0.735 for the whole sample.

Given the scarcity of empirical research regarding the BDC sector, one of the aims of this study is to fill in the gap in the literature with an analysis regarding the performance and risk-adjusted characteristics of 97 publicly traded BDCs, trading from 1998 to 2017, using a variety of asset pricing models and thus a variety of risk factors.

BDCs are classified by the literature as publicly traded private equity funds and are considered by market participants as a way for individual investors to access the PE sector. On the other hand, the lack of empirical research in the sector of BDCs implies that no empirical evidence exists to suggest that an investment in BDCs is similar to an investment in traditional PEFs.

## 3.2 Private Equity Funds

In this section we present literature on the performance of PEFs, focusing on the challenges encountered by the literature over the years and the recent advancements to deal with these challenges. Furthermore, taking advantage of the unique characteristics of BDCs, we explain how we use these recent advancements to determine the relationship between BDC and PEF returns.

The nature of PEFs and more specifically the lack of market valuations and the uneven disclosure of information has led to mixed evidence regarding both the performance of PEFs relative to the public markets and the risk characteristics of PE investments. Ang et al. (2018), argue that the lack of transaction-based performance measures in the PE asset class greatly hampers the portfolio allocation choice. The authors show that appraisal based industry indices,

[55] Some other studies have used BDCs as part of a broad investment portfolio, for example Brophy and Guthner (1988) examine the risk reduction effect in a portfolio of listed Venture Capital funds that consists of 3 BDCs and 8 SBICs (Small Business Investment Companies).

[56] An SBIC is a privately-owned company licensed and regulated by the U.S. Small Business Administration (SBA). SBICs are not required to register with the SEC. Once capitalized SBICs invest in U.S. small businesses in the form of debt and equity to aid them grow. SBICs are funded by private investors and the SBA. For every $1 an SBIC raises from a private investor, the SBA will provide $2 of debt capital (subject to a cap of $150 million). Source: sba.gov.

such as the Cambridge Associates PE indices, which rely on reported NAVs exhibit smoothing biases, as indicated by high autocorrelations and relatively low volatilities, likely due to the appraisal process.[57] Cumming, Haß, and Schweizer (2013) suggest that smoothing is driven possibly from the methods used to determine the NAV of portfolio companies and argues that such issues are common for illiquid investments such as PE.

Jegadeesh, Kräussl, and Pollet (2015) argue that the samples used in the literature are based on self-reported data by General and Limited Partners, thus the estimated performance does not reflect the typical PE investor's experience. In addition, one of the most popular datasets previously used in the literature, Thomson Venture Economics, has been shown to have reporting issues leading to a downward bias in the returns (see Stucke, 2011 and Phalippou and Gottschalg, 2009).[58]

A recent study by Ang et al. (2018) mitigates the challenges faced by previous literature using a methodology that estimates a time series of PE returns using cash flows accruing to limited partners. The intuition behind their approach is that the PE index return is calculated by the discount rate that equates the present value of capital distributions with the present value of capital investments. They show that their cash flow based proxy bypasses the biases associated with industry appraisal-based indices. They proceed to decompose the PE returns into a component due to traded factors and a time-varying idiosyncratic component, the private equity premium, not spanned by traded factors.

BDCs are unique relative to PEFs in that they have readily available daily market prices along with a regulated appraisal-based quarterly NAV. These unique features along with the consensus among practitioners that BDCs are a part of the PE sector, allow for an analysis of a true BDC market-based performance measure and its corresponding appraisal-based measure (NAV returns) in relation to the cash flow and appraisal-based performance indices of traditional PE. The potential contribution of such an analysis to the existing literature is twofold. First, it can provide direct empirical evidence of the private equity investment status of BDCs, which has important implications for asset allocation decisions of individual investors. Second, and

[57] Ang et al. (2018) argues that NAVs are anchoring on prior appraisal values.

[58] Stucke (2011) shows that many funds in Thomson Venture Economics stopped being updated but were kept in the database. For these funds, no additional cash flows were recorded, and NAV was simply rolled forward resulting in an absence of outperformance and a significant downward bias of aggregated performances with up to 10 percentage points. Similarly, Phalippou and Gottschalg (2009), using the Venture Economics dataset find positive NAVs even after PEFs are officially liquidated.

more important for the PE literature, the BDC market based returns can serve as a benchmark to evaluate proxies for market-based performance measures of PEF along with the corresponding appraisal-based measures, providing valuable insights into the traditional PE investment space that is plagued by the lack of a true market-based performance measure.

We use the BDC market based returns to introduce a new traded factor based, to the methodology of Ang et al. (2018) and examine whether it significantly explains the performance of their cash flow based PE indices over and above their traded asset pricing factors, and thus, the private equity premium. Furthermore, the quarterly reported NAVs allow for a separate analysis of the NAV returns of BDCs and a comparison with the appraisal-based PE indices, which rely on reported NAVs of PEFs. We investigate whether BDC NAVs carry the same biases as appraisal-based indices and also measure the market reaction to BDC NAV reporting.

Previous studies establish a link between listed PE vehicles and traditional PE vehicles. Bergmann et al. (2009) argue that although LPEs and PEFs differ in terms of organizational structures, the two groups share the defining economic characteristics of private equity (investment styles and financing styles) and thus provide an innovative way to overcome the inherent difficulties associated with traditional private equity literature. Jegadeesh, Kräussl, and Pollet (2015) note that LPEs have similar opportunity sets as unlisted PEFs since they invest directly in private equity transactions and in addition have similar compensation structures (see also Bilo et al., 2005 and the 2012 Preqin/LPX Special report).

One major limitation of these studies is that the LPE vehicles are mainly listed outside the U.S. and focus on PE investments outside North America, which makes it challenging to draw conclusions about U.S. based private equity investments.[59] The fact that BDCs are U.S. based and invest in U.S. domestic companies allows us to focus on drawing inference regarding the U.S. PE sector, which captures the largest part of the global PE portfolio.

[59] Specifically less than 25% of the LPEs in terms of market capitalization in Bergmann et al. (2009) and Bilo et al. (2005) is listed in North America. Similarly the LPE sample used in of Jegadeesh, Kräussl, and Pollet (2015) has a limited geographical focus in North America of around 10% of which less than 5% are listed in the U.S. Finally, 40% of Jegadeesh, Kräussl, and Pollet (2015) Funds of Funds (FoFs) that focus in North America, are listed and traded outside North America (see Table A1 of the Appendix).

# 4. Data

In this section, we present the data collection procedure, the final sample, and descriptive statistics.

## 4.1 Sample

We begin our sample construction by identifying all the publicly traded BDCs that have filed either an N-54A or an N-6F form with the SEC from the EDGAR database. The filing dates of these forms along with N-54C filing dates and the central index key (CIK) are collected from EDGAR.[60] We use the CIK as an identifier to acquire daily, monthly and quarterly prices from Compustat. Our initial sample consists of 124 BDCs that traded in the period 1998 to 2017.

We determine a trading period for each BDC as the period between the filing of the N-6F or N-54A form and the date it withdraws its election (filing of N-54C) or the date of the last available trading price within the sample period. Given the fact that several companies have filed to withdraw their election to be traded as a BDC within a few months from their N-54A or N-6F filings, our final sample excludes companies that have operated as BDCs for less than 24 months. Our monthly sample consists of 97 BDCs and the sample period runs from April 1998 to December 2017.[61] To analyze the risk-return characteristics of BDCs we create a monthly rebalanced value-weighted portfolio.

For the analyses comparing the BDC sector with the traditional PE sector we create a quarterly sample including all the funds for which quarterly financial statement information is available through Compustat,[62] Thomson Reuters EIKON, and Morningstar. NAV is calculated as the difference between Total Assets and Total Liabilities divided by the total common shares outstanding. Using the same trading conditions as in the case of the monthly sample the resulting quarterly fundamentals sample consists of 93 BDCs.

Our source for the risk-free rate and the Small Minus Big (SMB), High Minus Low (HML), Robust Minus Weak (RMW), Conservative Minus Aggressive (CMA) and Momentum (MOM)

[60] Form N-6F is used by companies to state their intention to be elected as a BDC. Form N-54A is used to state the election to be regulated as BDCs. Form N-54C is used to state the withdrawal from being regulated as a BDC.
[61] Our sample begins in April 1998 since Compustat Security Monthly database first available shares outstanding information begins in April 1998, for the BDCs in our sample, Similarly Q2 of 1998 is the first quarter that Compustat Quarterly Fundamentals database has data available for the funds in our sample.
[62] Some of the BDCs covered from the Compustat Monthly Database, are not covered in the Compustat Quarterly Fundamentals database.

factors is Kenneth French's website. The source for the Pástor and Stambaugh (2003) liquidity (LIQ) factor is WRDS. We use the CRSP Value Weighted index as a proxy for the market portfolio.[63]

We collect the returns for the Cambridge Associates (CA) U.S. Private Equity Index from the Q4 2017 final reports on the Cambridge Associates website.[64] We collect the Preqin All PE index return from the Preqin website.[65] Both indices are calculated using the end of quarter NAVs and the cash flows during each quarter. While the CA benchmark is available for the whole period examined by our study, the Preqin benchmark is publicly available from Q1 2001 onwards from the Preqin website.

We obtain the quarterly Venture Capital (VC) and Buyout (BO)[66] cash flow based indices of Ang et al. (2018) from Ludovic Phalippou's website.[67] The indices are available from 1996 to 2014. We also construct the four traded factors using data from Datastream. The four factors are the Vanguard S&P 500 mutual fund minus the risk free rate, which captures the market excess return, the DFA US microcap mutual fund minus the Vanguard S&P 500, which captures the size premium, the DFA US value fund minus the Vanguard S&P 500, which captures the value premium and the T. Rowe High Yield index minus the Vanguard S&P 500, which captures the liquidity premium.

For our NAV disclosure event study analysis, we use the CRSP Value Weighted index as the market index and obtain the 10-K and 10-Q filing dates from the EDGAR filings of the BDCs in our sample.

[63] We use the CRSP Value Weighted index rather than the S&P 500 (which is used as the market proxy in many asset pricing studies) to bypass the issues of concentration characterizing the S&P 500 (see Phalippou, 2018).
[64] The Cambridge Associates (CA) US Private Equity Index is a horizon calculation based on data compiled from 1,455 US private equity funds (buyout, growth equity, private equity energy and subordinated capital funds), including fully liquidated partnerships. Data as of December 31, 2017.
[65] The Preqin All PE index is an international quarterly private equity index calculated for the PE industry as a whole. The index is value weighted index and uses fund-level cash flow transactions and net asset values for the calculation of the return. The index includes the main PE strategies such as buyout, venture, real estate, fund of funds and distressed private equity. Data as of 3 Oct 2018.
[66] Venture Capital and Buyout funds are the two main PEF categories examined by the literature on PEFs. Venture Capital funds (VC) acquire minority stakes in startups or small and medium enterprises with high growth potential. Buy-out funds (BO) acquire controlling stakes of mature cash flow stable companies. While early studies (Brophy and Guthner, 1988 and Kleiman and Shulman, 1992) classify BDCs as publicly traded VC funds, this is not supported by the BDC investment objectives, as these are presented in their SEC filings since, in general, BDCs follow a mixture of investment strategies.
[67] http://www.pelaidbare.com

## 4.2 Descriptive Statistics

Table 1 presents the number of BDCs for each year in our sample, the total market capitalization (graphically depicted in Figure 1) and the percentage change per annum from 1998 to 2017. Several interesting observations can be drawn. First, the number of actively traded BDCs has experienced a substantial increase (229%) over the sample period, from 17 BDCs in 1998 to 56 in 2017.

The greatest annual increase both in terms of percentage and number of BDCs has been experienced in 2004. The greatest decrease in the number of actively traded BDCs in our sample has taken place during the financial crisis with the decrease in the 2008-2009 period to be around 16%. In terms of the size of the sector, the figures presented reflect the large increase of the sector within the sample period, which begins with a $2.64 billion in 1998 and reaches $35.3 billion in 2017.

Table 2 presents the descriptive statistics for the 97 BDCs in our monthly sample in terms of different size categories. This includes the number of BDCs in the sample, the number of BDCs that are active until the end of the sample period and the number of BDCs that delisted or seized being regulated as BDCs within the sample period. At the end of the sample period, 57.7% of the BDCs in our sample remained active, most of them are BDCs with a market capitalization between 100-500 million. On the other hand, out of the 31 BDCs with a market capitalization less than 20 million, only 4 remain active until the end of the period.

Table 3 presents the pairwise correlation coefficients for the BDC price and NAV return indices constructed using the quarterly fundamentals sample, the CRSP VW index, the cash flow based PE indices, the All PE performance index by Cambridge Associates and the Preqin All PE International Index. Both the price and NAV BDC indices have a relatively high correlation with all the PE indices indicating a relation between the BDC and PEF sectors. The BDC price portfolio has a higher correlation with the cash flow based PE Indices ($\rho$=0.65 with the VC index and $\rho$=0.63 with the BO index), than with the data vendors' appraisal-based indices ($\rho$=0.51 with the Cambridge Associates' benchmark and $\rho$=0.48 with the Preqin index). The BDC NAV returns, on the other hand have a higher correlation with the appraisal-based indices ($\rho$=0.61 with the Cambridge Associates' benchmark and $\rho$=0.56 with the Preqin index) rather than the cash flow based indices ($\rho$=0.48 with the VC index and $\rho$=0.47 with the BO index).

Furthermore, the BDC price return experiences a higher correlation (ρ=0.69) with the CRSP VW index rather than the BDC NAV returns (ρ=0.2). These coefficients along with the relatively high correlation between BDC NAV returns and the appraisal-based indices, serve as an indication that BDC NAVs and appraisal-based indices, which are known to underestimate true volatilities and experience high serial correlations, maybe subject to similar biases.

## 5. Risk adjusted performance and risk characteristics

In this section, we present the models used to examine the risk adjusted performance and characteristics of BDCs, along with our estimates. Furthermore, we compare our findings with the estimates for the risk adjusted performance and characteristics of LPES and traditional PEFs by recent studies.

We use the monthly rebalanced value-weighted portfolio, as described in the data section to examine the risk-return characteristics of BDCs.

Risk-adjusted performance is estimated using Jensen's alpha measure given by:

$$R_{pt} = a_p + \sum_{k=1}^{K} \beta_{pk} R_{B_{kt}} + e_{pt} \quad (1)$$

Where $R_{pt}$ is the monthly excess return of portfolio *p* at time *t* over the risk-free rate. $R_{B_{kt}}$ captures the monthly return of factor k's at time t and $\beta_{pk}$ is the sensitivity of portfolio *p*'s excess return to the factor k. $a_p$ is the average return for portfolio *p* unexplained by the factors. A positive alpha indicates that the portfolio has outperformed the benchmarks, while a negative alpha indicates underperformance. $e_{pt}$ is the residual of portfolio *p* in period *t*.

We consider the following asset pricing models to evaluate the risk-adjusted performance of BDCs:

the Capital Asset Pricing Model (CAPM)

$$R_{pt} = a_p + \beta_p^M R_{mt} + e_{pt},$$

the Pástor and Stambaugh (2003) four-factor model with liquidity (PS4F)

$$R_{pt} = a_p + \beta_p^M R_{mt} + \beta_p^{SMB} SMB_t + \beta_p^{HML} HML_t + \beta_p^{LIQ} LIQ_t + e_{pt},$$

the Carhart (1997) four-factor model with momentum (C4F)

$$R_{pt} = a_p + \beta_p^M R_{mt} + \beta_p^{SMB} SMB_t + \beta_p^{HML} HML_t + \beta_p^{MOM} MOM_t + e_{pt},$$

and the Fama and French (2015) five-factor asset pricing model (FF5F)

$$R_{pt} = a_p + \beta_p^M R_{mt} + \beta_p^{SMB} SMB_t + \beta_p^{HML} HML_t + \beta_p^{RMW} RMW_t + \beta_p^{CMA} CMA_t + e_{pt}$$

Where $R_{pt}$ is the excess return of portfolio *p* in month *t* relative to the risk-free rate, $R_{Mt}$is the market excess return. *SMB* is the size factor, calculated by the return spread of small minus large stocks. *HML* is the value versus growth factor, calculated by the spread of high book-to-market minus low book-to-market firms. *MOM* is the factor capturing the one-year momentum calculated by the spread of the 12-month return of winner firms minus the 12-month loser firm return. *LIQ* is the Pástor and Stambaugh (2003) innovations in aggregate liquidity factor, where liquidity is measured as the price reversal caused by the temporary price impact of trading volume. *RMW* is the profitability factor calculated by the return spread of the most robust profitability portfolios minus the return of weak profitability portfolios. *CMA* is the difference between the returns of a portfolio that invests conservatively (low investment) minus a portfolio that invests aggressively (high investment).

Table 4 presents the estimates for the four asset pricing models. Our results regarding α, the constant, suggest that the risk-adjusted performance of BDCs is not significantly different from 0. This implies that BDCs do not outperform or underperform relative to the different benchmarks used.

The CAPM beta for BDCs is 1.11, while the corresponding estimate for the PS4F, C4F and FF5F models is 1.14, 1.02, and 1.07, respectively. In all cases, the coefficient is not statistically different from one.[68] The results are similar to the findings of Kleiman and Shulman (1992), who find an average market beta of 1.077 for a very small sample of 12 BDCs for the period 1980 to 1990.

The estimates for the PS4F factor loadings regarding the size and value factors are 0.36 and 0.641 respectively, while the liquidity factor loading is statistically insignificant. Similarly, the estimates for the C4F factor loadings on the size and value factors are positive and significant, at 0.41 and 0.55 respectively, while the momentum factor loading is negative and statistically

[68] We use the CRSP VW index as the market proxy. In tests using alternative market indices such as the S&P 500 and the NASDAQ composite index we find that the explanatory power of all four models decreases substantially.

significant at -0.19. As in the PS4F and C4F models, the FF5F estimates yield positive and statistically significant *SMB* and *HML* estimates at 0.41 and 0.76, respectively. The loadings for the profitability and investment factors are statistically insignificant.

The positive SMB coefficient is consistent with the fact that BDCs, by construction, invest in firms that are smaller than the average listed firm. The positive coefficient with respect to HML suggests the performance of BDCs serves as an indication that BDCs are investing in value rather than growth firms. Interestingly, the negative exposure to momentum suggests that the return of the portfolio is more sensitive to the returns of firms that have previously decreased in price relative to firms that have previously experienced a price increase. This result suggests that BDCs invest in companies that are relatively underperforming, or in distress.[69]

A comparison of our findings with the analysis of Jegadeesh, Kräussl, and Pollet (2015) for LPEs and Funds of Funds (FoFs)[70] reveals important similarities since, as in the case of BDCs, both types of vehicles have an insignificant alpha and a beta statistically indistinguishable from one.[71] Ang et al. (2018) examine the risk characteristics of traditional PEFs, and find an α close to zero for the whole sample, and an insignificant alpha in the case of the CAPM for VC funds, which turns negative as more factors are included.[72] For BO funds, Ang et al. (2018) find a positive CAPM α, but a negative α in the case of the PS4F and FF5F models. They also find market β estimates greater than 1, reaching 1.88 for all PEFs, 1.99 for VC funds and 1.60 for BO funds.

A comparison of the results for the rest of the factor loadings of the two studies with our estimates for BDCs reveals that when the coefficients are significant, they are typically of the same sign (see Table A2 in the Appendix).

## 6. BDC Market Returns and PEF returns

In this section, we examine the relationship between the price returns of BDCs and the returns of traditional PE indices. We incorporate a new BDC traded factor in the asset pricing models used in Ang et al. (2018). Following their procedure, the BDC factor is constructed by

[69] This is also stated in the SEC filings of several BDCs. See for example the investment objectives section of Prospect Capital Corp N-2 filing, August 31, 2018.
[70] Funds of Funds (FoFs) are listed investment companies that invest in traditional PEFs.
[71] Jegadeesh, Kräussl, and Pollet (2015) present the estimates for the CAPM and Carhart 4 factor model.
[72] Ang et al. (2018) estimate the factor loadings using the CAPM, the Fama and French 3 factor model, the Pástor and Stambaugh (2003) four-factor model with liquidity, and the Fama and French 5 factor model.

subtracting the Vanguard S&P 500 mutual fund return from the BDC portfolio price return. We examine whether this new factor can explain the PE index returns over and above their traded asset pricing factors.

We run the following regression model:

$$PEI_t^e = a + \beta^{BDC} BDC\_Premium_t + \beta' F_t + e_t \quad (2)$$

where $PEI_t^e$ is the private equity index excess return, $BDC\_Premium$ is the BDC traded factor and $\beta^{BDC}$ is the factor's coefficient and β is the loading on the traded factors, $F_t$.[73]

Table 5 presents the regression estimates of equation (2), where the dependent variable, PE performance, proxied by the cash flow based indices, (column 1 for the VC index and column 2 for the BO index) is regressed on the traded market excess return, the traded size, value and liquidity factors and the BDC traded factor. We also report the results using industry appraisal-based indices as the dependent variable, the CA U.S. PE Index and the Preqin Global All PE index in columns (3) and (4), respectively. We estimate two different regression models for each PE index. The first uses the traded asset pricing factors as independent variables, while the second adds the BDC traded factor.

The coefficient of the traded BDC factor is positive and statistically significant in the two cases where the two cash flow based indices are used as dependent variables, indicating that the BDC traded factor significantly explains the cash flow based indices of Ang et al. (2018) over and above their traded factors. This result suggests a significant relationship between the BDC returns and what Ang et al. (2018) define as time varying private equity premium. On the other hand, in columns 3 and 4, we observe that BDC traded factor does not have a statistically significant explanatory power on the industry appraisal-based indices.

These findings provide two important contributions to the literature. First, the finding that the BDC traded factor explains the cash-flow based PE index returns over and above other traded factors provides direct empirical evidence of the private equity investment status of BDCs. This has important asset allocation implications for individual investors who can achieve exposure

[73] For robustness, we run an analysis that replaces the BDC traded factor with the residuals of a regression where the BDC price excess return is regressed on the four traded asset pricing factors used in the analysis of Ang et al. (2018). The results (not reported) for the coefficient of the BDC excess return residuals are the same both in terms of direction and statistical significance.

to the PE investment sector through the accessible BDC sector. Second, this result also validates the use of BDC returns, a pure market-based performance index, as a benchmark for the evaluation of both appraisal-based PE index returns as well as proxies for transaction-based PE index returns, such as the cash flow based PE indices. The fact that the BDC traded factor explains the cash flow based PE indices and not the appraisal-based PE indices highlights the limitations of the latter and the usefulness of proxies for market-based PE indices. At the same time, it provides further support for the cash flow based PE indices as a good proxy for a market-based PE performance measure.

## 7. Analysis of BDC Net Asset Value returns

The existence of an NAV separate from the price of BDCs allows for a separate analysis of the NAV returns of BDCs in comparison with the appraisal-based PE indices. In this section we examine whether the BDC NAV returns face the same biases as the appraisal indices. Furthermore, we examine whether the BDC NAV returns, unlike the BDC traded factor, significantly explain the returns of the appraisal-based indices. Finally, we examine the market reaction to the quarterly BDC NAV disclosures.

### 7.1 BDC NAV returns and smoothing biases

BDCs, like traditional PEFs, invest in private equity and therefore face similar challenges in terms of portfolio valuations. We begin our analysis by examining whether the NAV of BDCs, exhibits the same biases of low volatility and high autocorrelation as the appraisal- based PE indices.

Table 6 presents the annualized mean, volatility, 25$^{th}$ and 75$^{th}$ percentiles and the quarterly autocorrelation coefficient of the BDC price and NAV returns, as well as the cash flow based and appraisal-based PE index returns for the period 1998 Q2 to 2014 Q4.[74] The appraisal-based indices have the lowest volatility and the highest autocorrelation. The BDC NAV returns, even though they have a slightly higher volatility and lower autocorrelation relative to the appraisal-based indices, they are far away from the corresponding values for the BDC price return and the cash flow based PE indices. More specifically, BDC NAV returns have about half the variance and double the autocorrelation of the corresponding values for the BDC price returns and the

[74]The Ang et al. (2018) benchmarks are only available until 2014 Q4. The Preqin Benchmark is only available from 2001 Q1 onwards. We estimate the statistics for all indices for the period 2001 to 2014 (not reported) and the findings are qualitatively similar.

cash flow based-index returns. These results indicate that BDC NAVs exhibit smoothing biases relative to the BDC price returns similar, albeit somewhat weaker, to those exhibited by the appraisal-based indices relative to the cash flow based indices. The somewhat weaker smoothing biases found for BDC NAV returns, especially related to the lower autocorrelation, could be associated with the stricter regulations and monitoring faced by BDCs relative to PEFs.

### 7.2 BDC NAV returns and Appraisal Based indices

We proceed to examine whether the BDC NAV returns explain the appraisal-based PE indices over and above the traded asset pricing factors we used in section 6. Equation (3) describes the model we use.

$$PEI_t^e = a + \beta^{NAV} R_t^{NAV} + \beta' F_t + e_t \quad (3)$$

where $\beta^{NAV}$ is the coefficient of $R_t^{NAV}$, the BDC portfolio excess NAV return relative to the risk-free rate.[75]

Table 7 presents the regression estimates. We report the results using the CA U.S. PE Index and Preqin Global All PE index as independent variables in columns (1) and (2), respectively. We estimate two different regression models for each PE index. The first uses only the traded asset pricing factors, while the second also includes the BDC NAV excess return. The results indicate that, unlike the BDC price return factor (Table 5), the NAV excess return explains the return of the industry appraisal-based PE indices over and above the traded asset pricing factors.[76] The coefficient estimates for the BDC NAV Excess Return are statistically significant at the 1% level in both columns at 0.335 and 0.306, respectively.

Our findings are consistent with the similarities between BDC NAV returns and the appraisal-based industry PE indices presented in section 7.1 and provide further evidence that the biases associated appraisal-based PEF indices exist also in the case of the BDC NAV returns. Moreover, this result, along with our findings that the BDC price return factor significantly

[75] Similar to Section 6, we run an analysis that replaces the BDC NAV excess return with the residuals of a regression where the BDC NAV excess return is regressed on the four traded asset pricing factors. The results (not reported) for the coefficient of the BDC NAV excess return residuals are the same both in terms of direction and statistical significance.

[76] In unreported results we find that, when the U.S. Venture Capital and U.S. Buyout Cambridge Associates appraisal-based benchmarks are used as dependent variables, the coefficient of the BDC excess NAV return remains positive and statistically significant.

explains the cash flow based PE indices in section 6, suggest a strong relationship between the BDC asset class and the traditional PEF.

### 7.3 Market reaction to NAV disclosures

We have established a relation between BDC NAV returns and the appraisal-based indices and have shown that BDC NAV returns exhibit the same smoothing biases characterizing the appraisal-based indices. An important question that arises is whether, despite these biases, the market considers the quarterly BDC NAV disclosure as valuable information. To answer this question we employ an event study analysis and examine whether the market has a significant reaction to positive and negative changes in the disclosed NAV.

We follow the methodology used in Kallenos, Lesmond and Nishiotis (2019) and apply a short horizon event study analysis using the market model, daily return data, daily stock market index returns and the 10-K and 10-Q filing dates from EDGAR reports. We regress each fund's returns on the stock market index over an estimation window of [-180, -11] relative to event day 0. We use the coefficient estimates from those regressions to calculate the expected returns around the event. Abnormal returns for the period [-10, +10] are then calculated as the difference between actual returns and expected returns. We test for significance using the Kolari and Pynnonen (2010) test that allows for both event-induced variance and cross-correlation across events simultaneously. Given that the estimation of cumulative average abnormal returns makes use of the average abnormal return over all funds, the results may potentially be driven by low-cap stocks. Thus, we exclude all funds with an average price less than $1 over the trading period. The resulting sample consists of 2194 filings.

We split the sample into events with good news and events with bad news depending on the change relative to the NAV of the previous quarter, where an increase in the NAV is considered as good news and a decrease in the NAV is considered as bad news.

Table 8 presents the cumulative average abnormal returns (CAARs) for events with a positive change in the NAV and events with negative change in the NAV. We find positive and statistically significant CAARs around the event for positive NAV changes and negative and statistically significant CAARs for negative NAV changes. A comparison of the magnitude and

the level of significance of the two categories implies that the market has a stronger reaction in the case of negative news.[77]

This specific pattern is observed graphically in Figure 2, which presents the cumulative average abnormal returns for the two groups around the event. We observe that after the announcement, disclosures with an increase in the NAV are associated with positive CAARs, while disclosures with a decrease in the NAV are associated with negative CAARs.

Our results provide evidence that despite the smoothing bias associated with the NAV of BDCs, the NAV information disclosed in the interim reports leads to a statistically significant market reaction.

## 8. Conclusion

In this study we shed light to the rapidly growing sector of BDCs and examine its relationship with the general private equity industry. We begin our analysis with the estimation of the risk adjusted performance and characteristics of the BDC sector. We find that BDCs do not outperform or underperform relative to the asset pricing factors used and that their beta is not statistically different from 1. Furthermore, the factor loadings suggest that BDCs on average invest in smaller than the average companies, in value rather than growth stocks and in companies that are relatively underperforming, or in distress.

We show that BDCs are unique relative to PEFs in that they have readily available daily market prices along with a regulated appraisal-based quarterly NAV. These unique features along with the consensus among practitioners that BDCs are a part of the PE sector, allow for an analysis of a true BDC market-based performance measure and its corresponding appraisal-based measure (NAV returns) in relation to the cash flow and appraisal-based performance indices of traditional PE.

Our findings provide two important contributions to the literature. First, we show that the BDC traded factor explains the cash-flow based PE index returns over and above other traded factors. This finding provides direct empirical evidence of the private equity investment status of BDCs and has important asset allocation implications for individual investors who can achieve

[77] The positive and significant abnormal returns around disclosures of positive NAV changes and the negative and significant abnormal returns around disclosures of negative NAV changes are maintained when we rerun the analysis using a sample that includes BDCs trading at an average price below $1.

exposure to the PE investment sector through the accessible BDC sector. Second, this result also validates the use of BDC returns, a pure market-based performance index, as a benchmark for the evaluation of both appraisal-based PE index returns as well as proxies for transaction-based PE index returns, such as the cash flow based PE indices. We show that while the BDC traded factor explains the cash flow based PE indices, it does not explain the appraisal-based PE indices. This highlights the limitations of appraisal-based PE indices and the usefulness of proxies for market-based PE indices. Our results also provide further support for the cash flow based PE indices as a good proxy for a market-based PE performance measure.

An in depth analysis of the BDC NAV returns reveals some additional important findings that corroborate the aforementioned results. First, we also show that BDC NAVs exhibit smoothing biases relative to the BDC price returns similar, albeit somewhat weaker, to those exhibited by the appraisal-based indices relative to the cash flow based indices. The somewhat weaker smoothing biases found for BDC NAV returns could be associated with the stricter regulations and monitoring faced by BDCs relative to PEFs. Second, we find that, unlike the BDC price return factor, the NAV excess return explains the return of the appraisal-based PE indices over and above the traded asset pricing factors. Finally, our results provide evidence that, despite the smoothing bias associated with the NAV of BDCs, the quarterly NAV disclosures are associated with a statistically significant market reaction.

# 9. Appendix

**Table A1: LPE studies and Investment in North America**

Table A1 presents the percentage of market capitalization of funds used in LPE studies, the proportion of funds with Geographical focus in North America and the proportion of funds listed in the U.S., as reported in the descriptive statistics section or the data section of each study.

| **Market Capitalization in North America** | | |
|---|---|---|
| LPE Study | Type of Fund | % |
| Bilo et al. (2005) | Listed Private Equity | 24.90% |
| Bergmann et al. (2009) | Listed Private Equity | 24% |
| **Funds with Geographical Focus in North America** | | |
| LPE Study | Type of Fund | % |
| Jegadeesh, Kräussl, and Pollet (2015) | Listed Private Equity | 10.10% |
| | Funds of Funds | 42% |
| **Funds listed in United States** | | |
| LPE Study | Type of Fund | % |
| Jegadeesh, Kräussl, and Pollet (2015) | Listed Private Equity | 4.70% |
| | Funds of Funds | 0% |

**Table A2: Comparison of factor loadings of other PE vehicles**

Table A2 presents a comparison of factor loadings of the BDC portfolio as presented in Table 5 with the factor loadings for All PEFs, BO and VC funds of Ang, Chen, Goetzmann and Phalippou (2018) (ACGP) and All Funds of Funds and LPES, BO and VC Funds of Funds and LPEs of Jegadeesh, Kräussl, and Pollet (2015) (JKP). The plus sign "+" indicates a positive and significant factor loading, the minus sign "-" indicates a negative and significant factor loading. "Insign." indicates an insignificant factor loading. We leave cases where a factor loading was not included in the analysis of a study blank.

| Asset Pricing Factors | BDC Portfolio | ACGP | | | JKP (LPEs) | | | JKP (FoFs) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | All PE | BO | VC | All LPE | BO | VC | All FoFs | BO | VC |
| SMB | + | + | Insign. | + | + | + | + | + | + | + |
| HML | + | Insign. | + | Insign or - | Insign. | + | Insign. | Insign. | Insign. | Insign. |
| LIQ | Insign. | Insign. | + | Insign. | | | | | | |
| MOM | - | | | | Insign. | Insign. | - | Insign. | Insign. | Insign. |
| RMW | Insign. | Insign. | + | Insign. | | | | | | |
| CMA | Insign. | Insign. | Insign. | Insign. | | | | | | |

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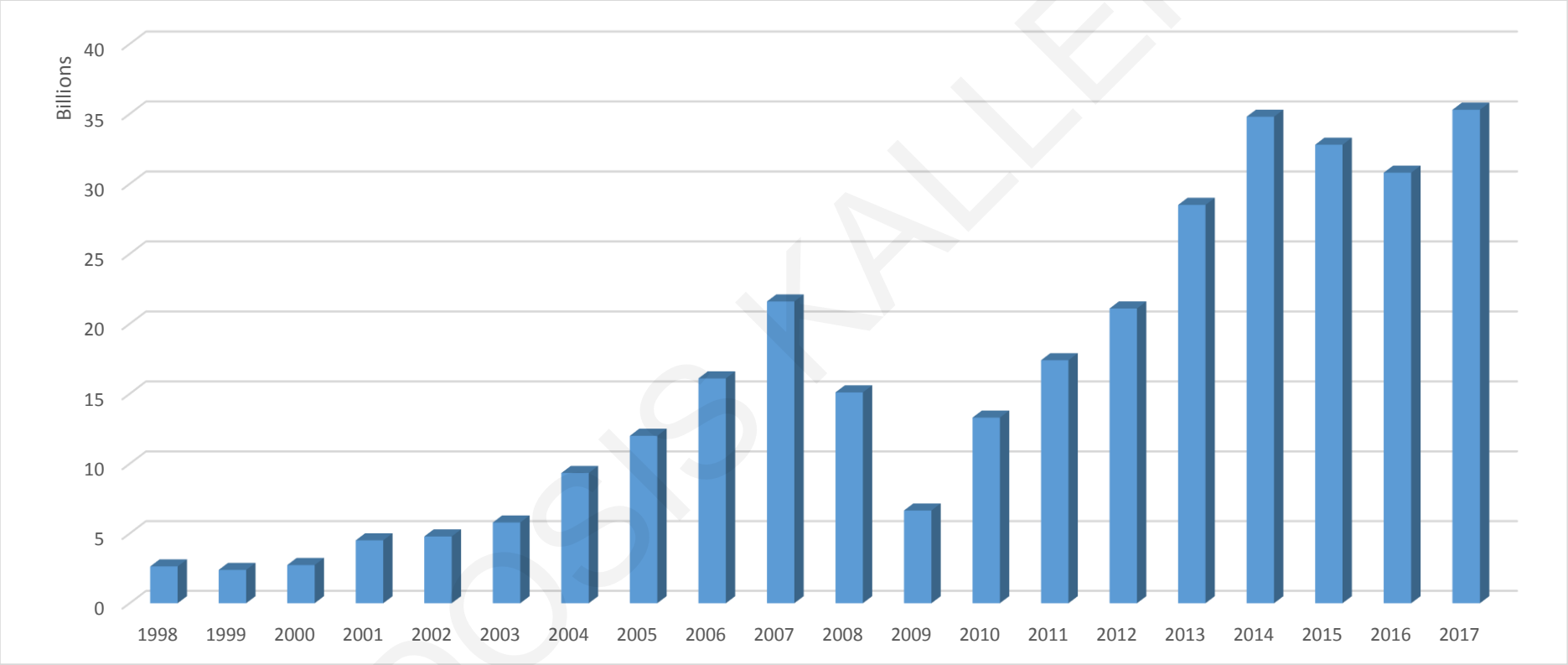


**Figure 1:** Total market capitalization over time. Depicted is the total market capitalization for the period 1998-2017 for the BDCs in our sample.

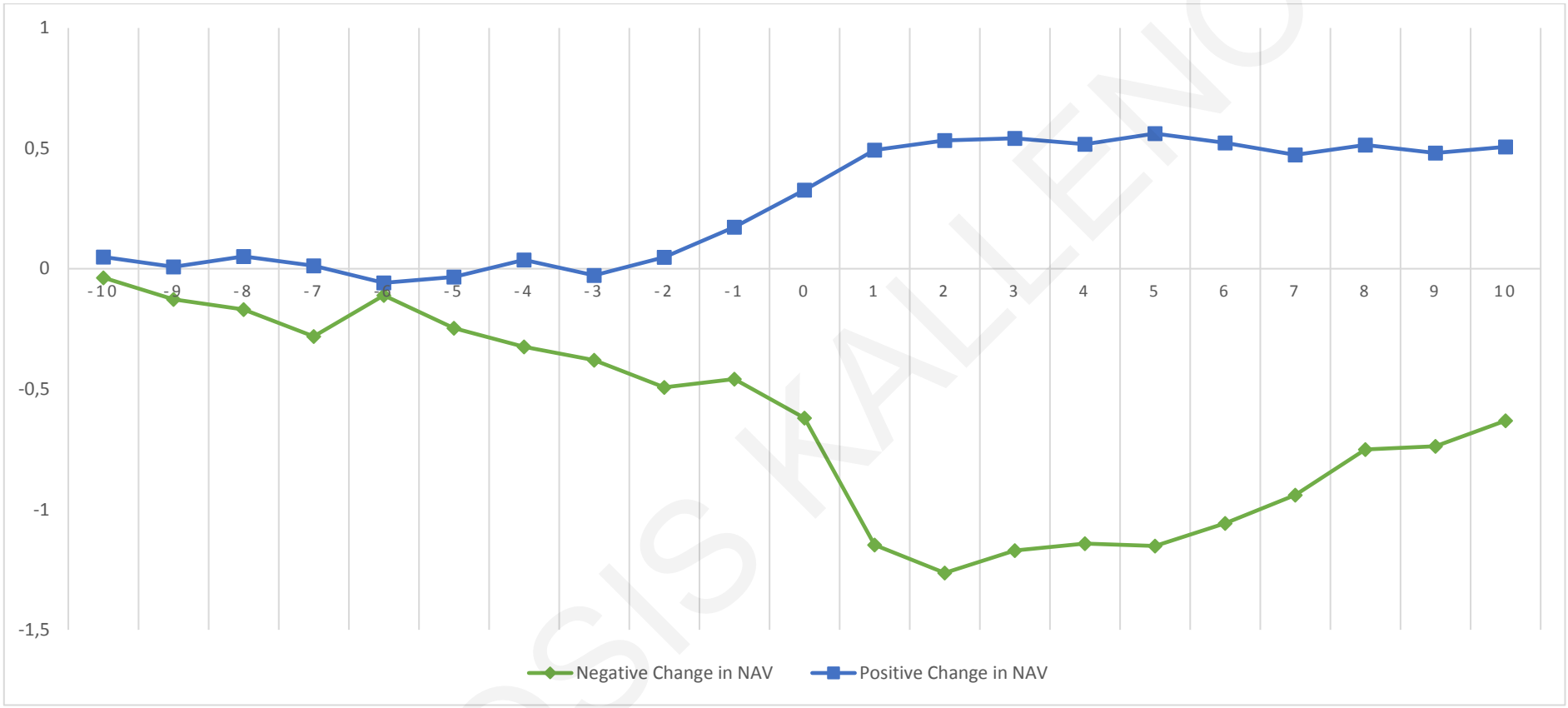


**Figure 2:** Cumulative Average Abnormal Returns around NAV disclosures. Depicted are the cumulative average abnormal returns for the [-10.+10] event window around 10K and 10Q disclosures for 949 events with positive NAV changes relative to the previous quarter and 1245 events with negative NAV changes relative to the previous quarter.

**Table 1: Number of BDCs and size of the industry per annum**

Table 1 presents the number of funds in our sample, the total market capitalization (in $billion) per annum and the percentage changes, from 1998 to 2017. The total market capitalization is the sum of the average market capitalization over all BDCs within a year. Source: EDGAR, Compustat.

| Year | Number of Funds | % Change | Total Market Capitalization (in $billion) | % Change |
|---|---|---|---|---|
| 1998 | 17 | - | 2.64 | - |
| 1999 | 16 | -5.88% | 2.39 | -9.47% |
| 2000 | 15 | -6.25% | 2.74 | 14.64% |
| 2001 | 19 | 26.67% | 4.51 | 64.60% |
| 2002 | 20 | 5.26% | 4.79 | 6.21% |
| 2003 | 25 | 25.00% | 5.79 | 20.88% |
| 2004 | 35 | 40.00% | 9.34 | 61.31% |
| 2005 | 42 | 20.00% | 12.00 | 28.48% |
| 2006 | 45 | 7.14% | 16.10 | 34.17% |
| 2007 | 51 | 13.33% | 21.60 | 34.16% |
| 2008 | 44 | -13.73% | 15.10 | -30.09% |
| 2009 | 42 | -4.55% | 6.65 | -55.96% |
| 2010 | 42 | 0.00% | 13.30 | 100.00% |
| 2011 | 46 | 9.52% | 17.40 | 30.83% |
| 2012 | 48 | 4.35% | 21.10 | 21.26% |
| 2013 | 52 | 8.33% | 28.50 | 35.07% |
| 2014 | 57 | 9.62% | 34.80 | 22.11% |
| 2015 | 58 | 1.75% | 32.80 | -5.75% |
| 2016 | 56 | -3.45% | 30.80 | -6.10% |
| 2017 | 56 | 0.00% | 35.30 | 14.61% |

**Table 2: Average Size over the Sample Period (trading sample)**

Table 2 presents the descriptive statistics for 97 BDCs in our trading sample in terms of different size categories. The statistics include the number of funds in the sample, the number of BDCs that are active until the end of the sample period and the number of BDCs that delisted or seized being regulated as BDCs within the sample period. Source: Compustat, EDGAR.

| Size | N | % | Active | % | Inactive | % |
|---|---|---|---|---|---|---|
| <20 Million | 31 | 31.96 | 4 | 4.12 | 27 | 27.84 |
| 20-100 Million | 12 | 12.37 | 5 | 5.15 | 7 | 7.22 |
| 100-500 Million | 35 | 36.08 | 31 | 31.96 | 4 | 4.12 |
| 500-1000 Million | 10 | 10.31 | 9 | 9.28 | 1 | 1.03 |
| 1000-2500 Million | 6 | 6.19 | 6 | 6.19 | 0 | 0.00 |
| >2500 Million | 3 | 3.09 | 1 | 1.03 | 2 | 2.06 |
| Total | 97 | 100.00 | 56 | 57.73 | 41 | 42.27 |

**Table 3: Pairwise Correlations of BDC, Market and PE indices**

The table presents the pairwise correlations between the BDC price index return, the BDC NAV index return, the CRSP VW index return, the Ang et al. (2018) "ACGP (2018)" Venture Capital and Buyout index returns, the Cambridge Associates U.S. private equity index returns (CA U.S. PE), and the Preqin All Private Equity International index returns (Preqin Global PE). The BDC Price and NAV returns are constructed using the quarterly fundamentals sample. The returns for all indices are quarterly. The period is from 1998 Q2 to 2017 Q4 for the BDC, CRSP and Cambridge Associates returns, 2001 Q1 to 2017 Q4 for Preqin returns and 1998 Q2 to 2014 Q4 for the Ang et al. (2018) index returns. Sources: Compustat, Morningstar, EIKON, EDGAR, Ang et al. (2018), the Cambridge Associates website and the Preqin Website.

| | BDC Price Return | BDC NAV Return | CRSP VW Return | ACGP (2018) VC | ACGP (2018) BO | CA U.S. PE | Preqin Global PE |
|---|---|---|---|---|---|---|---|
| BDC Price Return | 1 | | | | | | |
| BDC NAV Return | 0.1988 | 1 | | | | | |
| CRSP VW Return | 0.6937 | 0.4577 | 1 | | | | |
| ACGP (2018) VC | 0.6463 | 0.4778 | 0.9626 | 1 | | | |
| ACGP (2018) BO | 0.6288 | 0.4699 | 0.8391 | 0.7908 | 1 | | |
| CA U.S. PE | 0.5077 | 0.6112 | 0.7772 | 0.7924 | 0.67 | 1 | |
| Preqin Global PE | 0.478 | 0.5581 | 0.7451 | 0.7349 | 0.6266 | 0.947 | 1 |

**Table 4: Asset Pricing Models – Monthly Sample**

Table 4 presents the results for the four asset pricing models presented in section 5. CAPM is the Capital asset pricing model, PS4F is the Pástor and Stambaugh four factor model with liquidity, C4F is the Carhart four factor with momentum and FF5F is the Fama and French five factor model. We use the CRSP Value Weighted index as the market portfolio to calculate the market excess return. SMB HML RMW and CMA are the Fama-French small minus big, high minus low, robust minus weak and conservative minus aggressive factors. MOM is the momentum factor and LIQ is the innovations in aggregate liquidity factor. The dependent variable is the excess return on the value weighted BDC portfolio. We use Newey-West standard errors with 12 lags. p-values in parentheses. * p<0.1, **p<0.05, ***p<0.01

| | CAPM | PS4F | C4F | FF5F |
|---|---|---|---|---|
| Market Excess return | 1.113*** | 1.144*** | 1.019*** | 1.067*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| SMB | | 0.358*** | 0.412*** | 0.406*** |
| | | (0.000) | (0.000) | (0.000) |
| HML | | 0.641*** | 0.553*** | 0.763*** |
| | | (0.000) | (0.000) | (0.000) |
| LIQ | | -0.101 | | |
| | | (0.112) | | |
| MOM | | | -0.188*** | |
| | | | (0.003) | |
| RMW | | | | 0.0233 |
| | | | | (0.847) |
| CMA | | | | -0.328 |
| | | | | (0.164) |
| Intercept | -0.0026 | -0.0044 | -0.0034 | -0.0038 |
| | (0.509) | (0.125) | (0.217) | (0.177) |
| $\beta_m \neq 1$ | No | No | No | No |
| N | 237 | 237 | 237 | 237 |
| Adjusted $R^2$ | 0.525 | 0.639 | 0.649 | 0.635 |

**Table 5: PEF returns and the BDC traded factor**

Table 5 presents the results for the regression of the PE indices on the four traded asset pricing factors used by Ang et al. (2018) and the BDC traded factor. The four factors are the Vanguard S&P 500 mutual fund minus the risk free rate which captures the market excess return, the DFA value fund minus the Vanguard S&P 500 which captures the size premium, the DFA value fund minus the Vanguard S&P 500 which captures the value premium and the T. Rowe High Yield index minus the Vanguard S&P 500 which captures the liquidity premium. Data for the construction of the four factors is from Datastream. The BDC traded factor (BDC Premium) is calculated by shorting the Vanguard S&P 500 return from the price return of our value weighted BDC portfolio. We run the analysis without (first column of each Index regression) and with the BDC traded factor (second column of each PE Index regression). The VC and BO indices are form Ang et al. (2018). The Cambridge Associates U.S. PE index is from the Cambridge Associates website. The Preqin All Private Equity International index (Preqin Global PE) is from the Preqin website. We use Newey-West standard errors with 4 lags. p-values in parentheses. * p<0.1, **p<0.05, ***p<0.01

| | (1) ACGP(2018) VC | | (2) ACGP(2018) BO | | (3) Cambridge Associates U.S. PE | | (4) Preqin Global PE Index | |
|---|---|---|---|---|---|---|---|---|
| Market Excess Traded | 1.520*** | 1.469*** | 1.160*** | 1.101*** | 0.485*** | 0.476*** | 0.445*** | 0.441*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Size Traded | 0.964*** | 0.965*** | 0.493*** | 0.494*** | 0.399*** | 0.399*** | 0.190 | 0.191 |
| | (0.000) | (0.000) | (0.002) | (0.002) | (0.000) | (0.000) | (0.146) | (0.140) |
| Value Traded | -1.145*** | -1.319*** | -0.377 | -0.578* | -0.356*** | -0.379*** | -0.300** | -0.306** |
| | (0.000) | (0.000) | (0.112) | (0.072) | (0.002) | (0.001) | (0.044) | (0.040) |
| Illiquidity Traded | 0.214 | 0.0860 | 0.467* | 0.319 | 0.202** | 0.180* | 0.149 | 0.142 |
| | (0.233) | (0.680) | (0.080) | (0.226) | (0.025) | (0.071) | (0.154) | (0.205) |
| BDC Premium | | 0.314*** | | 0.363*** | | 0.0468 | | 0.0142 |
| | | (0.002) | | (0.005) | | (0.241) | | (0.763) |
| Constant | 0.0107 | 0.00882 | 0.0238* | 0.0216* | 0.0237*** | 0.0235*** | 0.0170*** | 0.0170*** |
| | (0.236) | (0.312) | (0.074) | (0.083) | (0.000) | (0.000) | (0.005) | (0.005) |
| N | 67 | 67 | 67 | 67 | 79 | 79 | 68 | 68 |
| Adjusted $R^2$ | 0.757 | 0.784 | 0.431 | 0.476 | 0.533 | 0.532 | 0.469 | 0.461 |

**Table 6: Smoothing Biases in NAVs**

The table presents the annualized mean, volatility, 25th and 75th percentiles, and the quarterly autocorrelation coefficient. The indices are the BDC price index return, the BDC NAV index return, the Ang et al. (2018) (ACGP (2018)) Venture Capital and Buyout index returns and the Cambridge Associates U.S. private equity index returns (CA U.S. PE). The BDC Price and NAV returns are constructed using the quarterly fundamentals sample. The returns for all indices are quarterly. The period is from 1998 Q2 to 2014 Q4. The Preqin Benchmark is available from 2001 Q1 onwards. Sources: Compustat, Morningstar, EIKON, EDGAR, Ang et al. (2018), the Cambridge Associates website and the Preqin website.

| Variable | N | Mean | S.D. | 0.25 | 0.75 | AC |
|---|---|---|---|---|---|---|
| BDC Price return | 67 | 0.07 | 0.28 | -0.15 | 0.41 | 0.12 |
| BDC NAV Return | 67 | 0.02 | 0.14 | -0.11 | 0.17 | 0.23 |
| ACGP (2018) VC Index | 67 | 0.11 | 0.32 | -0.19 | 0.63 | 0.11 |
| ACGP (2018) BO Index | 67 | 0.14 | 0.27 | -0.28 | 0.63 | 0.09 |
| CA U.S. PE | 67 | 0.13 | 0.11 | 0.00 | 0.26 | 0.37 |
| Preqin Global PE | 56 | 0.08 | 0.10 | -0.04 | 0.22 | 0.58 |

**Table 7: Appraisal-based PE returns and BDC NAV return**

Table 7 presents the results for the regression of the NAV based PE indices on the traded asset pricing factors and the BDC NAV Excess Return. The four factors are the Vanguard S&P 500 mutual fund minus the risk free rate which captures the market excess return, the DFA value fund minus the Vanguard S&P 500 which captures the size premium, the DFA value fund minus the Vanguard S&P 500 which captures the value premium and the T. Rowe High Yield index minus the Vanguard S&P 500 which captures the liquidity premium. Data for the construction of the four factors is from Datastream. We run the analysis without the BDC Excess NAV return (first column of each Index regression) and with the BDC NAV return (second column of each PE Index regression). The Cambridge Associates U.S. PE index is from the Cambridge Associates website. The Preqin Global PE Index is from the Preqin website. We use Newey-West standard errors with 4 lags. p-values in parentheses. * p<0.1, **p<0.05, ***p<0.01

| | (1) Cambridge Associates U.S. PE | | (2) Preqin Global PE Index | |
|---|---|---|---|---|
| Market Excess Traded | 0.485*** | 0.391*** | 0.445*** | 0.352*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Size Traded | 0.399*** | 0.328*** | 0.190 | 0.140 |
| | (0.000) | (0.000) | (0.146) | (0.257) |
| Value Traded | -0.356*** | -0.263** | -0.300** | -0.253* |
| | (0.002) | (0.013) | (0.044) | (0.083) |
| Illiquidity Traded | 0.202** | 0.172** | 0.149 | 0.0895 |
| | (0.025) | (0.017) | (0.154) | (0.359) |
| BDC NAV Excess Return | | 0.335*** | | 0.306*** |
| | | (0.000) | | (0.008) |
| Constant | 0.0237*** | 0.0249*** | 0.0170*** | 0.0194*** |
| | (0.000) | (0.000) | (0.005) | (0.001) |
| N | 79 | 79 | 68 | 68 |
| Adjusted $R^2$ | 0.533 | 0.668 | 0.469 | 0.574 |

**Table 8: Cumulative Average Abnormal Returns**

The table presents the cumulative average abnormal returns for different windows around the event along with their corresponding test statistics. We present the results for the announcement of positive NAV changes, relative to the previous quarter and negative NAV changes. We test for significance using the Kolari and Pynnonen (2010) test. * p<0.1, **p<0.05, ***p<0.01

| Event Window | Positive NAV Change | | | Negative NAV Change | | |
|---|---|---|---|---|---|---|
| | CAAR | TestKP | Significance | CAAR | TestKP | Significance |
| (-10,-1) | 0.1731 | 0.1599 | | -0.4588 | -3.1261 | *** |
| (-7,-1) | 0.1225 | -0.4225 | | -0.2895 | -2.5087 | ** |
| (-4,-1) | 0.2075 | 0.3208 | | -0.2117 | -2.0910 | ** |
| (-1,0) | 0.2794 | 1.3919 | | -0.1278 | -2.1033 | ** |
| (-1,1) | 0.4457 | 2.4465 | ** | -0.6552 | -4.6102 | *** |
| (0,1) | 0.3200 | 2.2013 | ** | -0.6886 | -4.6365 | *** |
| (0,4) | 0.3444 | 2.0264 | ** | -0.6829 | -3.3793 | *** |
| (0,7) | 0.2994 | 2.2776 | ** | -0.4814 | -2.2820 | ** |
| (0,10) | 0.3336 | 2.0180 | ** | -0.1725 | -1.3418 | |
| Events | 949 | | | 1245 | | |

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# Chapter 3

# Fund Management Structure and Conflicts of Interest: Evidence from Business Development Companies

We exploit unique features of Business Development Companies (BDCs) to perform a comprehensive analysis of conflicts of interest in externally managed funds, relative to their internally managed counterparts along with the use of share repurchases as a mechanism to reduce agency costs. Using the universe of Business Development Companies for the period 2006-2017, we document that externally managed BDCs, underperform relative to internally managed BDCs and are less likely to announce and execute share repurchases, an action that decreases their base management fee. We show that share repurchases result in positive valuation benefits only for externally managed BDCs, confirming that share repurchases constitute a managerial action that mitigates agency costs. Finally, an analysis of BDC discounts reinforces these results.

*Keywords:* Investment Company Management Structure, Agency Costs, Share Repurchases, Portfolio Performance, Business Development Companies

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## 1. Introduction

In this paper we investigate the existence of conflicts of interests and their effects on share repurchase decisions in externally managed Business Development Companies (BDCs) relative to their internally managed counterparts. BDCs represent a growing but understudied investment company category, structured as Closed End Funds (CEFs)[78] and known to invest primarily in private equity.[79]

BDCs are managed either internally, by hiring their own staff and executives, or externally, by outsourcing the management task to a third party. An important difference between the two management structures is the manager's compensation structure. While internal managers are compensated through salaries and bonuses, external managers compensation is based on management fees conditional on the size of the fund and the fund's performance. Therefore, as recognized in the fund's own SEC filings, the fee structure of externally managed BDCs leads to potential conflicts of interest.[80] The following quote from the July 2016 N-2 filing by Ares Capital Corporation is telling: *"Our investment adviser's base management fee is based on a percentage of our total assets … consequently, our investment adviser may have conflicts of interest in connection with decisions that could affect our total assets, such as decisions as to whether to incur indebtedness or to make future investments."*

High potential conflicts of interest associated with managerial outsourcing in investment companies have been identified and studied in the literature for other fund types like real estate investment trusts (REITs) and open-end mutual funds. Capozza and Seguin (2000) argue that a misalignment of incentives occurs in the case of externally managed REITs[81], since management fees are structured so that external managers have incentives that are not perfectly correlated with maximizing shareholder's wealth. Similarly, Chen et al. (2013) find that management outsourcing by open-end funds leads to agency costs that make it more difficult for a mutual fund family to extract performance from an outsourced fund.

[78] Closed end funds, unlike traditional mutual funds that create new shares and redeem existing ones, trade in the stock exchange after the IPO. The Closed-end fund structure of BDCs implies that the BDC prices are driven by supply and demand forces and thus can vary significantly from the fund's NAV. The discount and premiums of Closed End investment companies constitute a long-standing puzzle in the finance literature. See Dimson and Minio-Kozerski (1999) and Cherkes (2012) for extensive surveys of the Closed-end fund puzzle literature.

[79] See Kallenos and Nishiotis (2019) for an analysis regarding the private equity status of BDCs and the rapid growth of the sector over the years.

[80] Conflicts of interest within externally managed BDCs have also been highlighted by the financial press. An example is a 2015 Financial Times article highlighting that the fee structure of externally managed BDCs leads to important agency issues.
https://www.ft.com/content/e99d528e-e431-11e4-9039-00144feab7de

[81] REITs are companies that own, operate or finance income producing real estate in a range of property sectors. Most REITs are publicly traded and are listed in major stock exchanges.

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The BDCs universe provides a unique setup to investigate conflicts of interest associated with fund management structure in conjunction with share repurchase decisions, a potential signaling tool of management alignment with investors interests (Del Guercio, Dann, and Partch, 2003; Bradley et al., 2010; An, Gemmill, and Thomas, 2012). We first exploit the presence of both internally and externally managed funds within the same fund universe allowing a meaningful comparison of the two fund management structures with similar assets under management. Second, we exploit another unique characteristic of BDCs relative to open-end funds, namely their CEF structure and the existence of daily market prices[82], which allows us to conduct an event study analysis for the valuation effects of share repurchases across internally and externally managed BDCs.

We derive empirical hypothesis and execute the comparison between internally and externally managed BDCs on three dimensions: fund performance, likelihood to announce and execute share repurchases and valuation effects of share repurchases. We use the universe of BDC for the period 2006-2017 which includes 46 externally managed and 18 internally managed funds. We expect the management structure of BDCs to affect their performance. Furthermore, we expect externally managed funds to be less likely to announce and execute share repurchases as share repurchases reduce the assets under management and the manager's compensation. Finally, we expect a higher market reaction to share repurchase announcements and executions by externally managed funds, if share repurchases signal a reduction in agency costs through the alignment of managerial actions with investor interests.

We begin our analysis by comparing the risk adjusted performance of two value weighted portfolios, one consisting of internally and one consisting of externally managed BDCs, using the Sharpe ratio, the Traynor ratio and Jensen's Alpha. The latter measure is estimated using various asset pricing models including the Capital Asset Pricing Model, the Pástor and Stambaugh (2003) four factor model, the Carhart (1997) four factor model and the Fama and French (2015) five factor asset pricing model. The results suggest that externally managed BDCs underperform when compared to internally managed BDCs since the portfolio of the former is found to have significantly negative alphas while the alphas of the latter are statistically insignificant, regardless of the asset pricing model used. This underperformance is also evident by the lower Sharpe and Traynor ratios of the externally managed BDC portfolio relative to their internally managed counterparts. The average fund discount across

[82] BDCs trade on a regulated stock exchange, typically on NASDAQ, just like any other stock.

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the two fund structures reinforces these findings. Externally managed funds on average trade at an 11.28% discount to their NAV, while internally managed funds on average trade a negligible discount of 0.3%. Our findings reveal that externally managed BDCs underperform relative to internally managed BDCs.

The results of an analysis examining the effect of the management structure on the probabilities that a BDC will either announce or execute share repurchases and the magnitude of shares repurchased, provide evidence in favor of the existence of conflicts of interest within externally managed BDCs. Consistent with our expectations, the result of our Logistic regressions and Tobit analysis suggest that, controlling for other motives for share repurchases and fund characteristics, externally managed BDCs have a 4.2% lower probability to announce and 14.7% lower probability to execute share repurchases than internally managed BDCs. In addition, externally managed BDCs have 0.18% lower magnitude of shares repurchased than internally managed BDCs.[83] An analysis within externally managed BDCs, provides additional evidence that the reluctance of external managers is associated with a misalignment of interests. We find that externally managed BDCs with increased monitoring, as proxied by analyst following and institutional ownership are more likely to repurchase shares.

Finally, an event study analysis reveals statistically significant positive abnormal returns associated with the repurchase announcements of externally managed BDCs and insignificant price effects for internally managed BDCs. Interestingly, the average fund discounts of internally and externally managed BDCs prior to the share repurchase announcement are not statistically different. Furthermore, the positive abnormal returns hold for both high and low discount externally managed BDCs, providing further support to the argument that the positive reaction is driven by the market reacting favorably to the actions of the manager that mitigate agency costs. A comparison of the discount prior and following repurchase announcements provides further evidence for this realization since we find that the announcement of share repurchases leads to a deterioration of the discount for externally managed BDCs, while the effect on internally managed BDCs is found to be insignificant.

Our study contributes to the literature in various ways. First, to our knowledge our study is the first to examine the effects of conflicts of interests and management structure on fund

[83] The magnitude of shares repurchased is calculated as the number of shares purchased divided by the shares outstanding at the end of the previous quarter. The 0.18% lower magnitude is considerably large, considering the fact that the average magnitude over all BDCs and over all quarters is 0.16% and 0.69% over the quarters where repurchases are executed.

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performance in conjunction with share repurchases in the sector of BDCs, a rapidly growing new segment of the U.S. Private Equity market.

Second, because of the unique features of BDCs we are able to perform a comprehensive analysis of the internal versus external fund management structure along with the use of share repurchases as a mechanism to reduce agency costs, that contributes to the broader portfolio management literature. Within a unified context, we document the negative effects of conflicts of interest associated with the external management structure on fund performance by reinforcing the traditional asset pricing results with a fund discount analysis. Our setup allows us to further reinforce and corroborate these findings by investigating share repurchases as a mechanism to reduce agency costs.

Our paper complements other papers in the portfolio management literature that investigate fund management outsourcing or share repurchases, but it differs significantly from them. The literature investigating management outsourcing in open-end funds is typically concentrated on fund performance across internally and externally managed funds within fund families (Chen *et al.*, 2013; Chuprinin, Massa and Schumacher, 2015). Within the CEF literature there are papers that similar to ours investigate share repurchases as a mechanism to reduce agency costs, but do not offer a comparative analysis of internally and externally managed funds (Del Guercio, Dann, and Partch, 2003; Bradley et al., 2010; An, Gemmill, and Thomas, 2012). Coles, Suay, and Woodbury (2000) highlights the usefulness of a comparison of internally and externally managed CEF, which is prohibited by the very small number of internally managed CEF.[84] Within the REIT literature papers also document the underperformance of externally managed REITs and link that under performance to agency costs (Capozza and Seguin, 2000; Ambrose and Linneman, 2001) but do not examine share repurchases. Brau and Holmes (2006) on the other hand, find evidence that the valuation benefits of share repurchase announcements in REITS are associated with firm undervaluation.

Finally, our study contributes to the corporate finance literature and studies that relate institutional ownership and analyst following with lower agency costs and better governance (see Jensen and Meckling 1976; Healy, Hutton, and Palepu 1999; and Doukas, Kim, and Pantzalis, 2000, among others). We show that higher institutional ownership and higher

[84] See also Khorana, Wahal, and Zenner (2002) where only 2 out of the 73 Closed-End funds used in their sample are internally managed.

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analyst following are associated with a higher probability of share repurchase execution and a higher magnitude of shares repurchased within externally managed BDCs.

The structure of the study is as follows: In the next section we present the institutional background of Business Development Companies, the two management structures and share repurchases in the US. In section 3, we review the literature and develop our empirical hypotheses. The data and descriptive statistics are presented in section 4. Section 5 presents the analysis for the performance of BDCs conditional on the management structure. Section 6 presents the analysis of the effect of the management structure on the decision to announce and execute share repurchases. Section 7 presents the analysis on the valuation effects from repurchase plan initiations while the conclusion and a summary of key findings are presented in section 8.

## 2. Institutional Background

In this section we present the institutional background of this study. We begin by presenting information regarding the two distinct management structures of BDCs and the potential conflicts of interest associated with externally managed BDCs. We then proceed with a presentation of the Security and Exchange Commission's (SEC) disclosure requirements for share repurchases.

### 2.1 Establishment, Management Structure and Conflicts of Interest

BDCs have been created by the U.S. congress under the Small Business Investment Incentive Act of 1980 (also known as the 1980 Act), with a primary aim to encourage investments in small businesses, by supplying them with capital sources previously unavailable.

BDCs are structured as Closed-End investment companies. Like traditional CEFs, BDCs trade in the stock market following their IPO. Thus, the price of a BDC is determined by supply and demand forces and can vary significantly from its NAV. This important characteristic implies a distinction between the value of the fund's portfolio and the market price.

BDCs have either an internal or external management structure. Internally managed BDCs hire their own employees such as analysts, managers and executives to handle the assets under management. Externally managed BDCs, on the other hand, outsource the task by hiring third party management.

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Outsourcing the management to a third party may generally have several advantages. According to Riess (2015) an important advantage of the external management structure is the fact that external managers presumably already have the infrastructure and the experience to satisfy the regulatory requirements of BDCs. In addition, an externally managed BDC consists only of its invested assets and as a result does not need to worry about using its own offices, managers, analysts or executives since it outsources everything to the external manager.[85]

The two structures have important differences in the way the managers are compensated. The externally managed BDCs' management fee typically consists of two components: a base management fee, usually based on the average net assets or the assets under management, and an incentive fee based on the net realized capital gains and the investment income.[86] On the other hand, the internal management's compensation is locked in instead of being subject to the fund's assets while stock options, warrants or rights are usually issued as performance based compensation.

The general market conception regarding externally managed BDCs is that they are plagued by potential conflicts of interests, typically linked to the management fees. This issue is also raised in many of the externally managed BDCs' SEC filings along with the board of director's inability to deal with these conflicts.

For example, Gladstone Capital Corporation's November 2017 10-K filing, highlights the conflict of interest associated with the fact that the base management fee is based on the fund's assets and states the following: "Given the subjective nature of the investment decisions made by the Adviser on our behalf, we will not be able to monitor this potential conflict of interest."

The agency issues associated with the base management fee of externally managed BDCs have also been emphasized by the financial press. In fact, a 2015 article in Financial Times titled "Investors lose out while interests conflict", provides examples of externally managed BDCs trading at higher discounts to the NAV than certain BDCs that are internally managed.

[85] Data from S&P Global Market Intelligence shows that the 44 out of 46 externally managed BDCs in our sample period have no full-time employees while the average number of employees for internally managed BDCs is 62.

[86] We identify several differences across BDCs in both the structure of the contracts and the basis that each fee is calculated. Data on BDCs, obtained from Closed-end Fund Advisors (CEFA), suggests that the average base management fee for 2016 is 2.75% of the average net assets. The incentive fee, as reported in the companies' filings, is usually 20% of the company's gains after a hurdle rate between 6-8%.

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According to the author of the article, a sensible reaction by an external manager, confident about the quality of the portfolio, would be to repurchase shares to take advantage of the undervaluation.[87] On the other hand the author highlights that the management compensation structure may affect the manager's decision since "Share repurchases shrink a BDC's assets under management, thus reducing the fees paid to an external manager".[88]

## 2.2 Share Repurchases Disclosure Requirements

In this section we present the regulations surrounding the disclosure of share repurchases in the U.S.

Prior to 2004 the disclosure of information regarding open market share repurchases was not mandatory (see Cook, Krigman, and Leach, 2003; Banyi, Dyl, and Kahle, 2008). Effective for the periods ending on or after March 15, 2004, Item 703 of Regulation S-K requires publicly listed companies in the U.S. to provide information regarding stock repurchases. This information includes the total number of shares purchased, the average price paid per share, the number of shares purchased as part of a publicly announced program and the maximum number of shares that may yet be repurchased under the program.

The total number of shares repurchased is generally disclosed as a sum within a certain period (usually a quarter and in some cases for each of the three months of the quarter) thus the exact date where repurchases executions have taken place is not publicly available. Furthermore, while the disclosure of the aforementioned information is mandatory, it must be disclosed with the SEC in the company's annual and quarterly reports (forms 10-K and 10-Q). This implies an important gap between the day that share repurchases are executed and the day that this information is made publicly available. For example, share repurchases that are executed at the beginning of the fiscal quarter are disclosed in the end-of-quarter filing. Moreover, these filings have a significant delay period. For example, a 10-Q form can reach up to 45 days after the fiscal quarter end, until it's filed with the SEC while the 10-K filing distance can reach up to 90 days after the fiscal year-end.[89]

[87] This opportunity is also highlighted in a 2015 BDC sector report by Fitch Ratings: "With many business development companies trading below their net asset values, there is a greater potential for BDC share buybacks over the near term."

[88] See https://www.ft.com/content/e99d528e-e431-11e4-9039-00144feab7de

[89] Form 10-K is due 60 days, 75 days and 90 days after the fiscal year end for large accelerated filers, accelerated filers and non-accelerated filers, respectively. Form 10-Q is due 40 days after the fiscal quarter end for large accelerated and accelerated filers and 45 days after the fiscal quarter end for non-accelerated filers.

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On the other hand, the adoption of new repurchase programs is typically announced through press releases or using Form 8-K. Thus, the repurchase plan announcements are timely available to the public.[90]

### 2.3 The role of the fund manager in share repurchases

Share repurchases by U.S. publicly traded investment companies are initiated by fund managers, while the board is responsible for the authorization and the approval of a new share repurchase program (An, Gemmill, and Thomas, 2012).

Furthermore, as indicated in several of the BDC repurchase program announcements, the execution and the timing of share repurchases is left on the managers discretion. For example, Golub Capital BDC's August 5, 2014 share repurchase program announcement states the following: "…the Company's Board approved a share repurchase program (the "Program") which allows the Company to repurchase up to $50,000 of the Company's outstanding common stock on the open market at prices below the Company's NAV as reported in its then most recently published consolidated financial statements. The Program may be implemented at the discretion of management."

## 3. Literature Review and Hypotheses development

### 3.1 Management Structure and Fund Performance

Prior fund management literature on both open-end and closed-end funds as well as on REITs links fund performance to management structure and offers agency costs associated with the external management structure as a potential source of performance differences. Chen et al. (2013) and Chuprinin, Massa, and Schumacher (2015) find that agency costs drive outsourced Open-End funds to underperform those run internally. Sagalyn (1996) argues that a misalignment of incentives exists for REITs that are managed externally, while, with internal management, the potential for conflicts of interest is reduced. Capozza and Seguin (2000), cites the misalignment of incentives as an explanation for the underperformance of outsourced REITs. Moreover, several studies in the CEF literature have shown that the existence of agency issues has a negative effect on CEF performance and the CEF discount (Chay and Trzcinka, 1999; Khorana, Wahal, and Zenner, 2002; Barclay, Holderness, and Pontiff, 1993).[91]

[90] According to Banyi, Dyl, and Kahle (2008) both NYSE and NASDAQ require listed companies to issue press releases when they establish buyback programs.
[91] CEF are typically externally managed (see Coles, Suay, and Woodbury, 2000).

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The parallel existence of the two management structures within the BDC universe allows for an examination of performance differences across the two structures and a further investigation of whether the potential conflicts of interest characterizing the external management structure, as stated in the funds' own filings, are the source of performance differences. The CEF structure of BDCs allows us to examine the differences in the performance of the two management structures using both price returns and the level of the discount.

**(H1)** The BDC management structure affects their performance

To empirically test this hypothesis, we estimate and compare the risk adjusted performance of two value-weighted BDC portfolios, one that invests in internally managed BDCs and one that invests in externally managed BDCs. Moreover, in a separate analysis we compare the level of the discount of internally and externally managed BDCs.

## 3.2 Management Structure and Share Repurchases

We proceed to investigate the effect of management structure on the fund's decision to announce and implement share repurchases, in order to assess the present of conflicts of interest in externally managed BDC's.

Existing literature on share repurchases by CEFs considers share repurchases as a structural change used to eliminate discounts of CEFs and thus promoting shareholders' interests (Del Guercio, Dann, and Partch, 2003; Akhigbe, Kim, and Madura, 2007; An, Gemmill, and Thomas, 2012). Consistent with the literature, in almost all cases where the reasoning for the adoption of a plan is disclosed, the announcements of BDC share repurchase plans name the level of the fund's discount as the main reason for the establishment of the plan and express the directors' belief that the stock of the fund is undervalued, thus an investment in the fund's own stock is an attractive investment option.[92]

For example, the Capital Southwest's share repurchase plan announcement in June 12, 2008 states the following: *"This action by the Board signals its recognition of the value of our own stock at these present discounts to net asset value and demonstrates their commitment to deliver long-term value. We believe that acquiring our shares at prices below the*

[92] Similarly one of the main motives examined by the literature on conventional companies is the management's intention to signal that the stock is undervalued and that the management is confident about the company's prospects (see Comment and Jarrell, 1991; Dittmar, 2000; Liu and Ziebart, 1997; Vermaelen, 1981 among other).

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*Company's net asset value is both accretive to our reported net asset value per share and is a good use of available funds."*

On the other hand, share repurchases may result into a loss of management fees for external managers (An, Gemmill, and Thomas, 2012; Kim, Kim, and Song, 2013).[93] This is because base management fees are typically based on the fund's assets and repurchases shrink the assets of the fund. As a result, if fund managers seek to maximize their own utility rather than the value of the company, they may be reluctant to initiate share repurchases regardless of whether share repurchases will benefit the fund investors.

In our second hypothesis we relate the management structure with the decision to repurchase shares. We expect that, due to the aforementioned misalignment of interests, externally managed BDCs are less likely to announce and execute a share repurchase plan.

**(H2)** Externally managed BDCs are less likely to announce and implement a share repurchase plan, relative to internally managed BDCs.

In addition, in line with prior literature that shows a negative relation between increased monitoring and agency costs (see Jensen, 1986; and Boone and White, 2015) we argue that better monitoring is positively associated with the probability that externally managed BDCs announce and implement a share repurchase plan. We proxy monitoring using the level of institutional ownership and analyst following.[94]

**(H2a)** Better monitoring increases the probability that externally managed BDCs announce and/or implement a share repurchase plan.

We employ two logistic regression models to capture the effect of the management structure on the decision to announce and execute a share repurchase plan and a Tobit model to capture the effect of the management structure on the amount of shares repurchased. To examine the effect of increased monitoring, we use the sample of externally managed BDCs and examine whether higher institutional ownership and higher analyst following have a positive impact

[93] A similar argument is made by studies examining the dividend payout policies for Closed End Funds. Wang and Nanda (2011) argue that the adoption of a managed distribution policy by a Closed End Fund will lead to lower discounts but the managers have little incentive to reduce the assets under their control since they are directly related with the management fees.

[94] Several studies in the literature relate institutional ownership and analyst following with lower agency costs and better governance. See Jensen and Meckling (1976), Healy, Hutton, and Palepu (1999) and Doukas, Kim, and Pantzalis (2000) among other.

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on the decision to announce and execute a share repurchase plan using the same methodology.

In these models we control for other factors that might affect the decision for share repurchases drawing from the literature on share repurchases. These include the fund discount prior to the announcement (or the execution) of share repurchases, the liquidity of the company's shares (Cook, Krigman, and Leach, 2003; Akhigbe, Kim, and Madura, 2007; An, Gemmill, and Thomas, 2012) and dividends, as share repurchases can serve as a substitute for dividends (Grullon and Ikenberry, 2000; Dittmar, 2000). The fund's level of leverage could also play an important role in the decision to repurchase shares since BDCs, like traditional CEFs, face certain leverage restrictions by the SEC and share repurchases contribute to higher leverage ratios.[95] Generally, BDCs are restricted from issuing any class of senior security representing indebtness unless, following that issuance or sale, they maintain an asset coverage of at least 200%, which is equivalent to a maximum debt to equity ratio of 1:1.[96] Finally, we control for the amount of cash available as it could determine the ability to implement share repurchases and also BDCs, like industrial companies (see Dittmar, 2000; Grullon and Michaely 2004), may use share repurchases to distribute excess cash.[97]

## 3.3 Market Reaction to Share Repurchases

Finally, we develop arguments for the expected market reaction to share repurchases by both internally and externally managed BDCs. Studies examining share repurchases of traditional CEFs find that repurchase plan initiations lead to a positive market reaction in the form of an increase in the price of the fund and a decrease in the discount (Porter, Roenfeldt, and Sicherman, 1999; Del Guercio, Dann, and Partch, 2003; Akhigbe, Kim, and Madura, 2007; An, Gemmill, and Thomas, 2012).

Porter, Roenfeldt, and Sicherman (1999) argues that the positive market reaction reflected on the CEF prices around announcements can be explained by the fact that investors react positively to the potential arbitrage benefits from the fund purchasing its own stock at a

[95] This is highlighted by Fitch in an August 2015 article that states the following: "BDCs must carefully manage share repurchases in order to maintain regulatory asset coverage limitations." https://www.fitchratings.com/site/pr/989611

[96] See 15 U.S. Code § 80a-18 regarding the capital structure of investment companies and 15 U.S. Code § 80a-60 regarding the exemptions for BDCs.

[97] MCG Capital Corporation in a January 2012 repurchase plan announcement states that the adoption of a stock repurchase program provides an effective tool to manage the fund's unencumbered cash in the effort to enhance shareholder value.

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discount. Extending this argument to BDCs, it is evident that both internally and externally managed funds stand to enjoy similar arbitrage benefits from purchasing their underpriced shares.

There are however arguments in the literature associated with potential valuation benefits stemming from the fact that share repurchases provide a signal of managerial action leading to alignment with investor interests, thus reducing agency costs. These arguments stand to benefit externally managed BDC's that are prone to conflicts of interest because of their management compensation structure. An, Gemmill, and Thomas (2012) argue that, in the presence of agency costs, if the investors perceive the announcement of share repurchases as a signal of increased future performance, the positive price effects around the announcement will be heightened. Similarly, Del Guercio, Dann, and Partch, (2003) find that share repurchase announcements lead to a decrease in CEF discounts and Bradley et al. (2010) argues that the decrease of CEF discounts following share repurchases serves as evidence for the existence of agency issues. Share repurchases could also be associated with alleviating agency costs arising from potential misuse of free cash flow. The free cash flow hypothesis states that a firm uses share repurchases to distribute excess cash in the absence of attractive investment opportunities (see Vafeas and Maurice Joy, 1995; Nohel and Tarhan, 1998; Dittmar, 2000 and Grullon and Michaely, 2004).

Therefore, we expect share repurchase announcements by externally managed BDCs to lead to a positive market reaction, which in the presence of conflicts of interest is expected to be higher than the corresponding reaction to internally managed BDC share repurchase announcements. Similarly, we expect share repurchase announcements to reduce the fund discounts of externally managed BDCs by more than internally managed BDCs.

**(H3)** Share repurchase announcements by externally managed BDCs are associated with positive abnormal returns,

**(H3a)** In the presence of conflicts of interest we expect higher abnormal returns associated with share repurchase announcements of externally managed relative to internally managed BDCs.

We use event study methodology to examine the price effects around repurchase plan announcements by externally managed BDCs. In addition, to examine the effect of repurchase plan announcements on the BDC discount we analyze the difference between the pre-announcement premium and the post-announcement premium.

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We compare the results of both estimations with the results for internally managed BDCs. Taking in mind that internally managed BDCs do not face the same agency problems as their externally managed counterparts, such an analysis allows us to examine whether the effects following share repurchases are driven by the market reacting positively to the management's intentions to mitigate the conflicts of interest.

## 4. Data

In this section, we present the data collection procedure and descriptive statistics for our final sample.

### 4.1 Sample

We identify all the publicly traded BDCs that have filed either an N-54A or an N-6F form with the SEC from the Electronic Data Gathering Analysis and Retrieval System (EDGAR) database. The filing dates of these forms along with N-54C filing dates and the central index key (CIK) are collected from EDGAR.[98] We match the list of publicly traded BDCs from EDGAR with the list of investment companies in S&P Global Market Intelligence (S&P GMI). We determine a trading period for each BDC as the period between the filing of the N-6F or N-54A form and the date it withdraws its election (filing of N-54C) or the date of the last available trading price within the sample period. Our sample consists of 64 BDCs and the sample period runs from January 2006 to December 2017.[99]

We collect the announcement of a share repurchase program (dummy variable taking the value of one if a program was announced within the quarter) and the number of shares repurchased (number of stocks) within a given quarter from S&P Global market intelligence (S&P GMI). S&P GMI is also our source for cash and cash equivalents. We collect the exact date of share repurchase plan announcements using Lexis-Nexis and the funds' 8-K filings.

We distinguish between internally and externally managed BDCs using the information disclosed by the funds in their own 10-K and 10-Q filings. We also use the 10-K and 10-Q filings to identify whether a fund has exercised share repurchases within the period that the announced share repurchases plan was active, the quarter of the report along with the date

[98] Form N-6F is used by companies to state their intention to be elected as a BDC. Form N-54A is used to state the election to be regulated as BDCs. Form N-54C is used to state the withdrawal from being regulated as a BDC.

[99] While from 2004 onwards companies registered with the SEC are required to disclose detailed repurchase plan information, S&P GMI provides detailed data on share repurchases from 2006 onwards.

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that this report was filed with the SEC. The source for the 10-K and 10-Q filings is SEC's EDGAR.

We collect daily, monthly and quarterly BDC prices from Compustat. Compustat is also the source for the daily volume, the earnings per share and the dividends per share. We calculate the Net Asset Value of each fund as the difference between total assets and total liabilities divided by common shares outstanding, using data from Compustat, Thomson Reuters EIKON, and Morningstar. The fund's premium is calculated by the difference between the price of the fund and the Net Asset Value, divided by the Net Asset Value.[100]

Our source for the risk-free rate and SMB, HML, RMW, CMA, and MOM factors is Kenneth French's website. The source for the Pástor and Stambaugh (2003) liquidity factor is WRDS. We collect the returns for the CSRP Value-weighted index from CRSP.

We construct two value weighted portfolios, one constituting of externally managed BDCs and one constituting of internally managed BDCs, for the risk adjusted performance comparison.

We use three dependent variables to examine the effect of the management structure on the probabilities that a BDC will either announce or execute share repurchases and the magnitude of shares repurchased. $Magnitude_{it}$ is the magnitude of share repurchases in quarter *t*, calculated by the number of share repurchased divided by the shares outstanding in the previous quarter *(t-1)*. $Execution_{it}$ is a dummy variable that takes the value of 1, if share repurchases took place in quarter $t$ for fund $i$, and 0 otherwise. We also define an announcement dummy variable ($Announcement_{it}$) that takes the value of 1 if a share repurchase plan was announced in the fiscal quarter by the fund, and 0 otherwise.

We define $External_{it}$, as a dummy variable that takes the value of 1 if the fund is externally managed, and 0 if the fund is internally managed, to capture the effect different effects of the two management structures.[101] We use the lagged value of the management structure dummy in our models to account for the conditions prior to the management's decision to announce or execute share repurchases.

We use several variables to control for other motives for share repurchases. As in the case of $External_{it}$ we use the lagged values to capture the conditions before the decision of the

[100] The discount of the fund is calculated by multiplying the Premium by -1.
[101] We allow External to vary in time since a fund, Equus Total Return Inc., has switched from an external manager to internal management on June 30, 2009.

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manager to announce a repurchase plan or execute share repurchases. $Premium_{it}$ is the BDC premium. We control for the fund's leverage using $Leverage_{it}$, calculated by dividing total liabilities by total assets. $Cash\ and\ Cash\ Eq_{it}$ is the proportion of cash and cash equivalents over total assets, used to capture the excess cash distribution motive and the liquidity status of the fund. To control for the motive for increased price liquidity we use $Share\ Liquidity_{it}$ calculated by the average daily volume one month prior to the share repurchase announcement or execution. We use the fund's dividend payout ratio, $Payout_{it}$, calculated by dividing dividends per share by earnings per share, to control for the substitution for dividends motive.

We control for the level of monitoring using institutional ownership and analyst following. $InstitutionalOwnership_{it}$ is calculated as the number of stocks owned by institutions over the number shares outstanding collected from Thomson Reuters Institutional (13F) Holdings database. $AnalystFollowing_{it}$ is calculated by the number of analysts issuing at least one annual earnings forecast for the BDC in the quarter. We collect analyst information from Thomson Reuters IBES.[102]

Finally, we use $Age_{it}$, calculated as the number of years since the election to be regulated as a BDC, and $Size_{it}$ calculated as the logarithm of the fund's market capitalization, to control for fund characteristics.

## 4.2 Descriptive Statistics

Table 1 presents the number of BDCs and the size of the sector from 2006 to 2017. In addition, we split BDCs by management structure, internally and externally managed.

Overall Table 1 documents the large increase in the sector, both in size and number of funds and a tendency towards externally managed BDCs from the industry. The sector has experienced a dramatic increase over the period with a market capitalization of $15.5 billion in 2006 to $35 billion in 2017. The greatest decrease in the size of the sector has taken place during the financial crisis with the decrease in the 2008-2009 period reaching around 70%. The number of actively traded BDCs more than doubled over the sample period, from 23 BDCs in 2006 to 53 in 2017 and this increase has been driven by the increase in the number of externally managed BDCs. Figure 1 depicts graphically the number of internally and externally managed BDCs per annum in our sample. While the number of externally managed BDCs is lower than the number of internally managed BDCs at the beginning of

[102] All the continuous variables are winsorised at the top and bottom 1%.

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our sample period (11 relative to 12), throughout the period the number of externally managed BDCs has dramatically increased (in 2017, 42 out of the 53 BDCs in our sample are externally managed) while the number of internally managed BDCs has remained relatively stable over the period, ranging from 11 to 15 BDCs.

Table 2 presents a description of our sample in terms of share repurchase announcements and executions. 42 BDCs (31 externally and 11 internally managed) out of the 64 funds in our sample (46 externally and 18 internally managed) have announced share repurchases at least once throughout our sample period, while 35 of them (26 externally and 9 internally managed) have executed share repurchases at least once. 27 BDCs in our sample have announced a share repurchase plan more than once while 18 funds have executed share repurchases in more than one plans. The average magnitude of share repurchases over all funds and over all quarters in our sample period is 0.16% while the average magnitude over all quarters with repurchase executions is 0.69%. Comparing externally with internally managed BDCs, we observe that internally managed BDCs have a higher average magnitude of share repurchases both over the whole period and over repurchasing quarters, which is consistent with our second hypothesis (H2) that externally managed BDCs are less likely to repurchase shares.

Another important realization from Table 2 is that while several funds may execute repurchases in more than one plans, not all share repurchases plan announcements result into executions. In fact, throughout our sample period, 7 of the funds that have announced share repurchase plans did not execute.

Table 3 presents the number of share repurchase plan announcements and executions by year for the whole sample and for externally and internally managed BDCs separately. Our sample consists of 111 share repurchase announcements and 71 repurchase plan executions. The number of announcements varies per year, ranging from 1 announcement in 2006 and 2007 to 28 announcements in 2015. 67% of the announcements are from BDCs that are externally managed, while 33% are from internally managed BDCs. Moreover, out of the 111 share repurchase plans announced, 36% are without repurchase executions (around 35% of externally and 38% of internally managed BDCs).

The relatively high proportion of plans without executions, along with the fact that several funds do not implement their announced share repurchase plans, highlight the importance of examining the effect of the management structure separately on both the decision to announce and on the decision to exercise stock repurchases.

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## 5. Managements structure and performance

In our first analysis we test our first hypothesis, that management structure leads to performance differences in the sector of BDCs, by comparing the risk adjusted performance of externally and internally managed BDCs using monthly rebalanced value weighted portfolios as described in the data section.

We compare the risk adjusted performance of the two portfolios using the Sharpe ratio, the Traynor ratio and Jensen's Alpha.

The Sharpe Ratio is estimated by:

$$S_p = \frac{\overline{r_p} - rf}{\sigma_p} \quad (1)$$

Where $\overline{r_p}$ is the average monthly return of portfolio *p* over the period examined, $rf$ is the average monthly risk-free rate and $\sigma_p$ is the standard deviation of portfolio *p.*

The Treynor measure is estimated by:

$$T_p = \frac{\overline{r_p} - rf}{\beta_p} \quad (2)$$

Where $\beta_p$ is the beta of portfolio *p* calculated using the Capital Asset Pricing Model.

Jensen's alpha measure is given by:

$$r_{pt} - rf_t = a_p + \sum_{k=1}^{k} \beta_{pk} R_{B_{kt}} + e_{pt} \quad (3)$$

Where $R_{B_{kt}}$ captures the monthly return of factor k's at time t and $\beta_{pk}$ is the sensitivity of portfolio *p*'s excess return to the factor k. $a_p$ is the average return for portfolio *p* unexplained by the factors. $e_{pt}$ is the residual of portfolio *p* in period *t*.

To evaluate the risk adjusted performance of BDCs using Jensen's alpha we employ four different asset pricing models. These include the Capital Asset Pricing Model (CAPM), the Pástor and Stambaugh (2003) four factor model with liquidity (PS4F), the Carhart (1997) four factor model with momentum (C4F) and the Fama and French (2015) five factor asset pricing model (FF5F).

Table 4, Panel A presents the risk adjusted performance results using the Sharpe and Treynor ratios for the two groups. As one can observe internally managed BDCs outperform externally managed BDCs in both measures. Panel B of Table 4 presents the Jensen's alpha

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estimates using the four asset pricing models discussed above for internally and externally managed BDCs separately. Consistent with the findings in Panel A externally managed BDCs are found to underperform relative to internally managed BDCs since the alpha coefficient for externally managed BDCs is negative in all four asset pricing models while the alpha coefficient for internally managed BDCs is statistically insignificant regardless of the asset pricing model used.

Finally, we examine whether the underperformance is also visible on the premiums of externally managed BDCs. Table 5 presents the quarterly premium descriptive statistics for internally managed BDCs, externally managed BDCs and all BDCs over all the quarters in study. The table also presents the difference in the premium, between the groups. We test for significance using a t-test and the Wilcoxon rank-sum (Mann-Whitney) test. The mean discount over all quarters and all funds is 7.7%. Consistent, with our first hypothesis (H1), externally managed BDCs exhibit higher discounts, on average, relative to internally managed BDCs. Specifically, externally managed funds on average trade at an 11.28% discount to their NAV, while internally managed funds on average trade a negligible discount of 0.3% leading to a statistically significant difference of around 11% between the two groups.

Overall our findings reveal that externally managed BDCs underperform, relative to internally managed BDCs. As stated, the literature on management outsourcing by REITs and Open-end funds associate the underperformance visible in externally managed funds with the presence of conflicts of interest. Thus in the next section we examine the presence of conflicts of interest within externally managed BDCs using share repurchases.

## 6. Management structure and Share repurchases

We proceed to test our second hypothesis and examine whether externally managed BDCs are less likely to announce a share repurchase plan and execute share repurchases.

To examine the effect of the management structure on the probability that fund *i* will announce a share repurchase plan in quarter *t* we use the following logit model:

$$\Pr(Announcement)_{it} = \beta_0 + \beta_1\, External(D)_{it-1} + \beta_2 Premium_{it-1} + \beta_3 Liquidity_{it-1} + \beta_4 Cash\ and\ Cash\ Eq_{it} + \beta_5 Payout_{it-1} + \beta_6 Leverage_{it-1} + \beta_7 Age_{it-1} + \beta_8 Size_{it-1} + YearDummies + \varepsilon_{it} \quad (4)$$

where $\Pr(Announcement)_{it}$ is the probability that a share repurchase plan is announced by fund *i* in quarter *t*.

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We also employ a second logit model to examine the effect of the management structure on the management's decision to execute share repurchases:

$$\Pr(Execution)_{it} = \beta_0 + \beta_1\, External(D)_{it-1} + \beta_2 Premium_{it-1} + \beta_3 Liquidity_{it-1} + \beta_4 Cash\ and\ Cash\ Eq_{it} + \beta_5 Payout_{it-1} + \beta_6 Leverage_{it-1} + \beta_7 Age_{it-1} + \beta_8 Size_{it-1} + YearDummies + \varepsilon_{it} \quad (5)$$

where $\Pr(Execution)_{it}$ is the probability that fund *i* will buy back stock in quarter *t*.

Furthermore, to examine the effect of the management structure on the magnitude of share repurchases we employ a Tobit model:

$$\text{Magnitude}_{it} = \beta_0 + \beta_1\, External(D)_{it-1} + \beta_2 Premium_{it-1} + \beta_3 Liquidity_{it-1} + \beta_4 Cash\ and\ Cash\ Eq_{it} + \beta_5 Payout_{it-1} + \beta_6 Leverage_{it-1} + \beta_7 Age_{it-1} + \beta_8 Size_{it-1} + YearDummies + \varepsilon_{it} \quad (6)$$

We use lagged values of the independent variables to capture the conditions before the announcement of a share repurchase program in (Equation 4) and the execution of share repurchases (Equations 5 and 6).

Table 6 presents the results. Consistent with our second hypothesis (H2), controlling for the motives for share repurchases and fund characteristics, the coefficient of the management structure dummy variable ($External_{t-1}$) is negative and significant in all three models. These results suggest that externally managed BDCs are less likely to announce and execute share repurchases. The effect is also economically significant. The marginal effects at means estimations suggest that externally managed BDCs are 4.2% less likely to announce and 14.7% less likely to execute share repurchases than internally managed BDCs.[103] The marginal effects of $External_{t-1}$ in the Tobit model, reveal that the magnitude of share repurchases of externally managed BDCs is 0.18% lower than the corresponding magnitude of internally managed BDCs. This effect is considerably large, considering that the average magnitude of share repurchases across is 0.69% of shares outstanding Table 2).

Consistent with the vast majority of BDC repurchase plan announcements that name the level of the discount as a motive to repurchase shares, the coefficient of $Premium_{t-1}$ is negative and statistically significant in all three cases showing that funds that trade at higher discounts are more likely to announce and execute share repurchases. $Share\ Liquidity_{t-1}$

[103] In unreported results we estimate Equation (6) using the dollar volume of share repurchases divided by the prior quarters value of equity as the dependent following Dittmar (2000). We find that the results remain qualitatively the same.

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has a significant effect on both the magnitude of share repurchases and the probability to execute. The coefficient is negative implying that funds with illiquid stocks are likely to use share repurchase executions as a means to enhance share liquidity. $Leverage_{t-1}$ has a significant effect only in the case of the probability to announce share repurchases. The coefficient is negative consistent with the fact that BDCs have maximum leverage requirements and thus high leveraged funds are less likely to announce share repurchases. We find no evidence that funds use share repurchases to substitute for dividends since payout ratio ($Payout_{t-1}$) is statistically insignificant in all three models. Similarly, the ratio of cash and cash equivalents is found to be statistically insignificant in all three models. The age of the fund has a negative and significant effect (10% level) on the probability to announce a share repurchase plan and on the magnitude of share repurchases. Finally, $Size_{it}$ has a positive and statistically significant effect on the probability to execute share repurchases and on the magnitude of share repurchases.

### 6.1 Increased monitoring and share repurchases by external managers

We proceed to test hypothesis H2a and examine the effect of monitoring on the external managers' decision to repurchase stock. Using the sample of externally managed BDCs we estimate Equations (4), (5) and (6) and include $InstitutionalOwnership_{it-1}$ and $AnalystFollowing_{it-1}$ as independent variables to proxy monitoring.[104] Table 7 presents the results.

The results consistent with hypothesis H2a suggest that higher monitoring leads to an increase in the probability that a fund will implement share repurchases, as well as the magnitude. Monitoring has also a positive effect on announcement probability, but the effect is not statistically significant. Our marginal effects at means coefficients reveal that the impact of increased monitoring on repurchase executions is economically significant since a one point increase in analyst following prior to the execution will lead to an increase in the probability to execute by 1.3% and an increase in the magnitude by 0.0146%. Similarly, a 1% increase in the percentage of institutional ownership prior to the execution leads a 0.22 percentage point increase in the probability to execute share repurchases and 0.0941% increase in the magnitude.

To summarize our findings, consistent with our second hypothesis, managers of externally managed BDCs are more reluctant to initiate and execute share repurchases suggesting that they seek to maximize their own utility rather than the value of the company. This finding

[104] $External(D)_{it-1}$ is excluded from the models since we use the sample of externally managed BDCs.

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provides evidence regarding the existence of conflicts of interests within externally managed BDCs. Moreover, consistent with the funds repurchase plan announcements and the CEF share repurchases literature, we find that the level of the discount plays an important role on the manager's decision to repurchase shares, since high discount funds are more likely to announce and execute share repurchases. Additionally, we find that the larger the discount the higher the magnitude of share repurchases. Funds with greater share illiquidity are found to be more likely to execute share repurchases, while funds with higher leverage and higher dividend payout ratios are less likely to announce a new share repurchase plan.

Finally, we find that externally managed BDCs with increased monitoring, are more likely to repurchase shares. This finding provides additional evidence that the reluctance of external managers is associated with a misalignment of interests.

## 7. Market reaction to Share repurchases

We proceed to test hypotheses H3 and H3a and examine whether the repurchase plan announcements lead to positive valuation benefits for externally managed BDCs and whether, due to the existence of conflicts of interest, these valuation benefits are greater relative to internally managed BDCs.

To examine the price effects of share repurchase plan announcements we conduct a short horizon event study analysis using the Fama and French five factor model, daily return data and daily factor returns.

We split our sample into repurchase announcements by externally and internally managed BDCs and regress each funds' returns on the asset pricing factors over an estimation window of [-250, -20] relative to event day 0. We use the coefficient estimates from those regressions to calculate the expected returns around the announcement. Abnormal returns for the period [-10, +10] are then calculated as the difference between actual returns and expected returns. We use the estimated abnormal returns to calculate cumulative average abnormal returns for different windows and test for significance using the Kolari and Pynnonen (2010) test that allows for both event-induced variance and cross-correlation across events simultaneously. Table 8 presents the cumulative average abnormal returns (CAARs) over different event windows around repurchase plan announcements, separately for externally managed BDCs and internally managed BDCs. Consistent with hypothesis 3 (H3), the CAARs of externally managed BDCs around and following the announcement are positive and statistically significant, 1.86% and 1.9% respectively in the [-1,+1] and [0,+1] windows and reach 3.28%

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in the [0,+10] window.[105] Consistent with hypothesis H3a the CAARs of internally managed BDCs are lower than the CAARs of their externally managed counterparts and insignificant over the whole event window.[106]

The CAARs of the two management structures are graphically depicted in Figure 2. Externally managed BDC CAARs are negative prior to the event and exhibit a sharp increase from day -1 to day 1 of the event window and follow an upward trend thereafter. Internally managed BDCs also appear to exhibit an increase around the announcement, but the results in Table 8 indicate that this increase is not statistically significant.

As discussed in Section 3.3 the positive market reaction from share repurchase announcements could be driven by investors reacting positively to the potential arbitrage profits from purchasing the stock at a discount and, in the case of the presence of agency costs, the market reacting positively to a signal of managerial action that leads to the alignment with investors interests. Taking in mind the results in Table 5 and the fact that externally managed BDCs trade at significantly higher discounts than internally managed BDCs, over the whole sample period, a question that arises is whether the difference in the abnormal performance between the two management structures, documented in Table 8, is driven by differences in the discount and the market reacting to potential arbitrage profits. We shed light into this argument in Tables 9 and 10.

Table 9 presents the descriptive statistics for the premium one quarter prior to repurchase plan announcements for all funds and separately for internally and externally managed BDCs. We observe that, on average, both internally and externally managed BDCs trade at a discount (8% for internally and 12% for externally managed BDCs) prior to the announcement of a share repurchase plan and, unlike the results over the whole sample period (Table 5), the difference is not statistically significant.

Table 10 examines the effect of the discount on the announcement effects. We split the sample of externally managed BDCs into high discount and low discount events and classify events as "high discount" if the discount prior to the announcement is higher than the median

[105] The fact that the price effect persists until day 10 of the event window implies the repurchase announcement price effect for externally managed BDCs are not just immediate but continues to rise for some time, a result that has also been documented by Akhigbe, Kim, and Madura (2007) for traditional CEFs in the US and An, Gemmill, and Thomas (2012) for UK CEFs.

[106] In unreported results we estimate the CAARs excluding events where the premium one quarter before the announcement was positive. We find that the results remain qualitatively the same.

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discount prior to the announcement and "low discount" otherwise.[107] Our findings suggest both discount groups experience positive abnormal returns.

The insignificant difference in the average discount prior to the announcement for the two management structures, reported in Table 9, along with the positive abnormal returns for both high and low discount externally managed BDCs in Table 10, imply that the positive CAARs following share repurchases of externally managed BDCs and the difference in the CAARs when compared to internally managed BDCs, are not driven by the level of the discount. These findings provide further support to the argument that the positive reaction is driven by the market reacting favorably to the actions of the manager that mitigate agency costs.

Finally, we examine the effects of share repurchases on the fund's discount. Table 11 presents the difference between the premium prior the announcement and the first four quarters following the announcement for all BDCs and internally and externally managed BDCs separately. Our findings suggest that the premiums of externally managed BDCs experience a statistically significant increase in the third and fourth quarter[108] following repurchase plan initiations, while the effect on internally managed BDCs is insignificant.

To summarize our results, consistent with hypothesis H3 we find that share repurchase announcements by externally managed BDCs result to positive valuation benefits. Moreover, consistent with hypothesis H3a we find that the abnormal returns of externally managed BDCs are higher than the abnormal returns of internally managed BDCs. Our additional analyses regarding the level of the discount prior to the repurchase announcements and the valuation effects of high discount and low discount externally managed BDCs serve as further evidence that the difference in the CAARs of the two structures driven by the market reacting favorably to the actions of the manager that mitigate agency costs.

Our results for the discount following repurchase announcements, provide further support to the aforementioned findings. We find that externally managed BDCs experience a decrease in their discount following share repurchase announcements, while the effect on internally managed BDCs is insignificant.

[107] The median is calculated over all externally managed BDC announcements.
[108] The fact that the effect on the discount is not immediate is consistent with the findings of An, Gemmill, and Thomas (2012) who find that the discount decreases in the long-term.

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## 8. Conclusion

In this paper we exploit unique features of Business Development Companies to perform a comprehensive analysis of conflicts of interest in externally managed funds, relative to their internally managed counterparts along with the use of share repurchases as a mechanism to reduce agency costs.

Using the universe of Business Development Companies trading from 2006 to 2017 we find that externally managed BDCs, associated with potential conflicts of interest mainly related with management fees, underperform relative to internally managed BDCs.

We identify the existence of these conflicts of interest by showing that externally managed BDCs are more reluctant to initiate and execute share repurchases suggesting that they seek to maximize their own utility rather than the value of the company. Consistent with the fact that the reluctance of external managers to repurchase shares is driven by the existence of conflicts of interest, we show that among externally managed BDCs, funds with increased monitoring are more likely to execute share repurchases.

Furthermore, we show that share repurchase announcements by externally managed BDCs result to positive valuation benefits for the funds. On the other hand, internally managed BDCs do not experience any significant valuation effects. Our findings suggest that the market reacts favorably to the actions of the manager to deal with the agency issues present in externally managed BDCs.

Overall, the results of this study highlight the existence of conflicts of interests within externally managed BDCs and at the same time provide evidence that the introduction of new share repurchase plans alleviates these agency costs associated with externally managed BDCs.

Future research could focus on the reason for the rapid growth in the number of externally managed BDCs, relative to internally managed BDCs, even though externally managed BDCs clearly underperform relative to internally managed BDCs. Furthermore, it is interesting to examine the differences in the characteristics of the two management structures within the sector of BDCs and how these characteristics are associated with the findings of this study.

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# 9. Appendix

**Table A1: Descriptive statistics for factors determining the probability to announce and execute share repurchases**

The Table presents the number of observations, the mean, the standard deviation, median and 25th and 75th percentiles of the variables used as determinants of the decision to announce and execute share repurchases. All variables are winsorised at the top and bottom 1%. Magnitude is calculated by the percentage of share repurchases in the fiscal quarter relative to the shares outstanding in the previous quarter. Premium is the funds premium calculated by the difference between the fund's price and the fund's NAV divided by the fund's NAV. Share Liquidity is calculated by the average daily trading volume of the fund's stock. Leverage is calculated by dividing Total Liabilities with Total Assets. Payout is the dividend payout ratio calculated by dividing Dividend per share by Earnings per share. Cash and Cash Equivalents % is calculated by the ratio of Cash and Cash equivalents over Total Assets. Age is the number of years the fund has been trading as a BDC. Size is calculated by the logarithm of the fund's market capitalisation. Institutional ownership is calculated as the number of stocks owned by institutions over the number shares outstanding. Analyst following is the number of analysts issuing at least one annual earnings forecast for the BDC in quarter t-1. All variables except Magnitude, are lagged.

| Variable | n | Mean | S.D. | 0.25 | Mdn | 0.75 |
|---|---|---|---|---|---|---|
| $Magnitude_{it}$ | 1805 | 0.16 | 0.52 | 0 | 0 | 0 |
| $Premium_{it-1}$ | 1743 | -0.07 | 0.31 | -0.24 | -0.09 | 0.05 |
| $Share\ Liquidity_{it-1}$ | 1807 | 0.59 | 0.47 | 0.27 | 0.47 | 0.76 |
| $Leverage_{it-1}$ | 1896 | 0.36 | 0.18 | 0.26 | 0.4 | 0.47 |
| $Payout_{it-1}$ | 1632 | 0.59 | 2.16 | 0 | 0.6 | 1.05 |
| $Cash\ and\ Cash\ Eq_{it-1}$ | 1868 | 0.09 | 0.13 | 0.02 | 0.04 | 0.11 |
| $Age_{it-1}$ | 2018 | 29.19 | 23.58 | 11 | 23 | 42 |
| $Size_{it-1}$ | 1805 | 19.05 | 2.01 | 18.56 | 19.22 | 20.22 |
| $Institutional\ Ownership_{it-1}$ | 1788 | 0.3 | 0.2 | 0.13 | 0.29 | 0.45 |
| $Analyst\ Following_{it-1}$ | 1151 | 5.53 | 3.56 | 3 | 5 | 8 |

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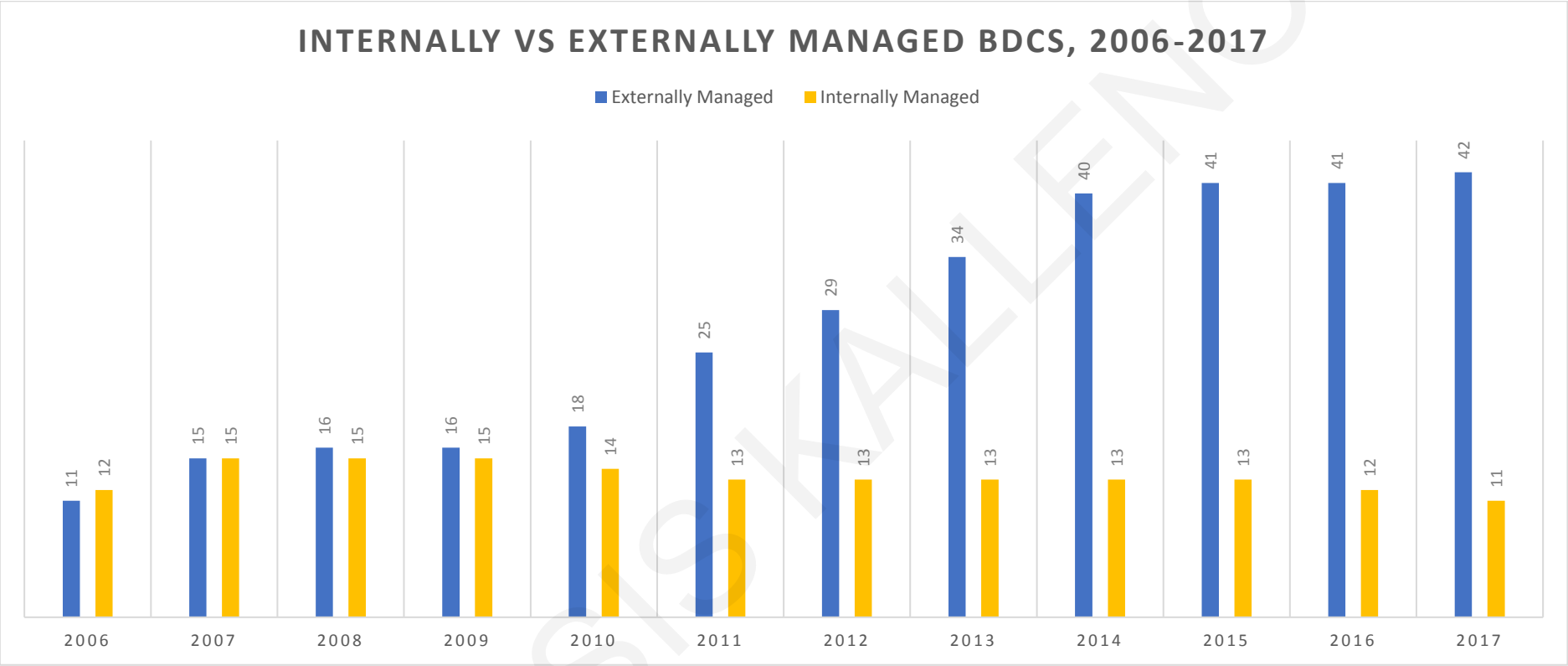


**Figure 1** depicts graphically the number of internally and externally managed BDCs in our sample, from 2006 to 2017.

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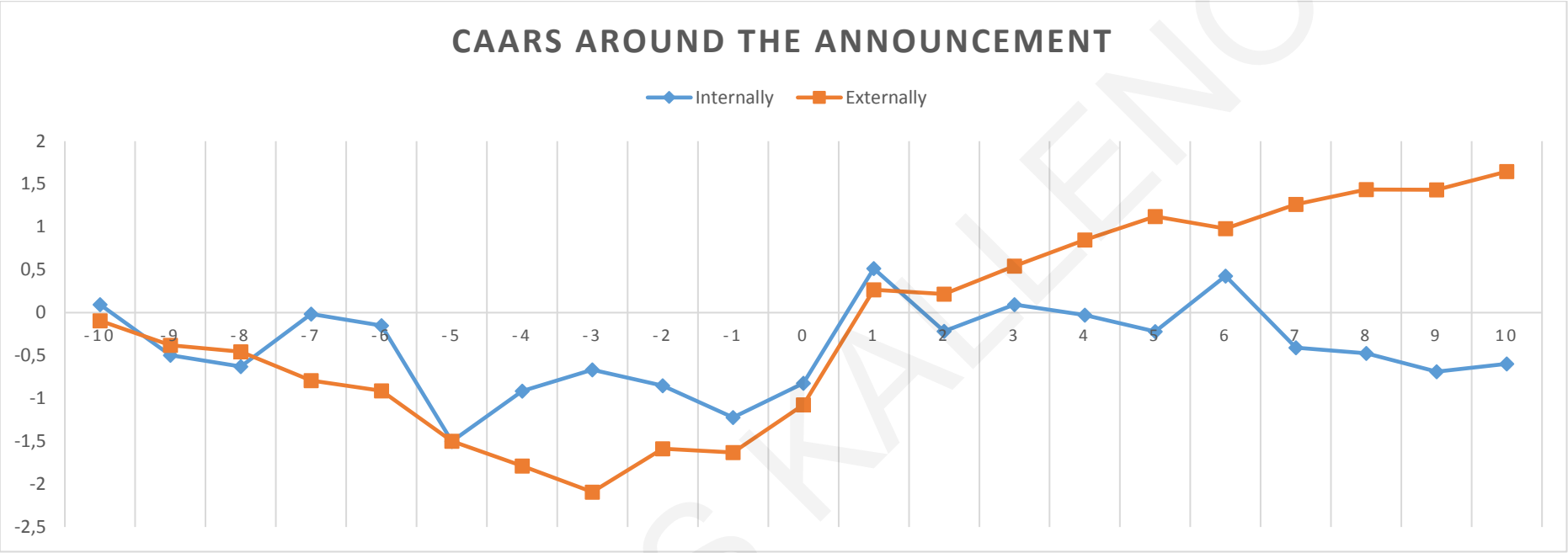


**Figure 2** Presents the Cumulative average abnormal returns for internally and externally managed BDCs around the announcement of share repurchases.

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**Table 1: Number of BDCs and Size of the market**

Table 1 presents the number of funds and the market capitalization for the BDCs in our sample for each year from 2006 to 2017 for the whole sample, internally managed BDCs and externally managed BDCs. The market capitalization is reported in billions of dollars. Source: EDGAR, Compustat.

| Year | Al BDCs | | Internally Managed | | Externally Managed | |
|---|---|---|---|---|---|---|
| | Number of Funds | Market Cap | Number of Funds | Market Cap | Number of Funds | Market Cap |
| 2006 | 23 | 15.50 | 12 | 12 | 11 | 3.5 |
| 2007 | 30 | 21.06 | 15 | 14.8 | 15 | 6.26 |
| 2008 | 31 | 14.71 | 15 | 9.15 | 16 | 5.56 |
| 2009 | 31 | 6.34 | 15 | 2.52 | 16 | 3.82 |
| 2010 | 32 | 13.04 | 14 | 3.86 | 18 | 9.18 |
| 2011 | 38 | 17.04 | 13 | 5.54 | 25 | 11.5 |
| 2012 | 42 | 20.71 | 13 | 6.61 | 29 | 14.1 |
| 2013 | 47 | 27.95 | 13 | 8.65 | 34 | 19.3 |
| 2014 | 53 | 34.22 | 13 | 8.82 | 40 | 25.4 |
| 2015 | 54 | 32.28 | 13 | 8.18 | 41 | 24.1 |
| 2016 | 53 | 30.52 | 12 | 7.82 | 41 | 22.7 |
| 2017 | 53 | 34.98 | 11 | 4.88 | 42 | 30.1 |

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**Table 2: Share repurchases information**

Table 2 presents the number of funds in our sample, the number of funds that have announced at least one share repurchase program, the number of funds that have implemented share repurchases at least once throughout our sample period, the number of funds that have announced a share repurchase plan more than once and the number of funds that have implemented share repurchases in more than one plans. Average Magnitude (whole sample) is the percentage of shares repurchased over the number of shares outstanding, on average, over all funds and all quarters in our sample period. Average Magnitude (repurchasing quarters) is the average magnitude over all funds and all quarters with repurchasing executions.

| Category | All BDCs | EM BDCs | IM BDCs |
|---|---|---|---|
| Number of Funds | 64 | 46 | 18 |
| Number of Funds Announced at least once | 42 | 31 | 11 |
| Number of Funds Executed at least once | 35 | 26 | 9 |
| Number of repeat announcers | 27 | 20 | 7 |
| Number of repeat repurchasers | 18 | 13 | 5 |
| Average Magnitude (whole sample) | 0.16% | 0.13% | 0.22% |
| Average Magnitude (repurchasing quarters) | 0.69% | 0.61% | 0.83% |

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**Table 3: Share Repurchase Plans per annum**

Table 3 presents the number of share repurchase plan announcements for each year in our sample and the number of plans with executions. The table also presents the total number of plan announcements and total plan executions within our sample and the percentage of plans with repurchases executed for each group. Source: EDGAR filings, Lexis-Nexis, S&P Global Market Intelligence.

| | All BDCs | | EM BDCs | | IM BDCs | |
|---|---|---|---|---|---|---|
| Announcement Year | Plan Announcements | Repurchases Occur | Plan Announcements | Repurchases Occur | Plan Announcements | Repurchases Occur |
| 2006 | 1 | 0 | 0 | 0 | 1 | 0 |
| 2007 | 1 | 1 | 0 | 0 | 1 | 1 |
| 2008 | 10 | 5 | 3 | 2 | 7 | 3 |
| 2009 | 4 | 2 | 1 | 1 | 3 | 1 |
| 2010 | 3 | 3 | 1 | 1 | 2 | 2 |
| 2011 | 6 | 1 | 4 | 0 | 2 | 1 |
| 2012 | 7 | 4 | 4 | 2 | 3 | 2 |
| 2013 | 6 | 5 | 4 | 4 | 2 | 1 |
| 2014 | 11 | 8 | 6 | 3 | 5 | 5 |
| 2015 | 28 | 25 | 21 | 19 | 7 | 6 |
| 2016 | 23 | 14 | 19 | 13 | 4 | 1 |
| 2017 | 11 | 3 | 11 | 3 | 0 | 0 |
| Total | 111 | 71 | 74 | 48 | 37 | 23 |
| Repurchases Occur % | 63.96% | | 64.86% | | 62.16% | |

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**Table 4: Risk adjusted performance estimates**

Panel A presents the Sharpe Ratio and Treynor Ratio for internally and externally managed BDCs separately. Panel B presents the Jensen's alpha and the p-value estimates using various asset pricing models. CAPM is the Capital asset pricing model, PS4F is the Pástor and Stambaugh four factor model with liquidity, C4F is the Carhart four factor with momentum and FF5F is the Fama and French five factor model. We use Newey-West standard errors with 12 lags. * p<0.1, **p<0.05, ***p<0.01

**Panel A Sharpe and Treynor Ratios**

| Performance Measure | Internally Managed | Externally Managed |
|---|---|---|
| Sharpe Ratio | 0.0611 | 0.0054 |
| Treynor Ratio | 0.0035 | 0.0003 |

**Panel B Jensen's Alpha**

| Model | Internally Managed | | Externally Managed | |
|---|---|---|---|---|
| | alpha | P-Value | alpha | P-Value |
| CAPM | -0.00526 | (0.331) | -0.00780** | (0.017) |
| PS4F | -0.00308 | (0.578) | -0.00607** | (0.028) |
| C4F | -0.00325 | (0.558) | -0.00614** | (0.018) |
| FF5F | -0.00137 | (0.785) | -0.00583* | (0.062) |

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**Table 5: Premium over all quarters**

Table 5 Presents the number of observations, the mean quarterly premium, the standard deviation, median and 25th and 75th percentiles of the quarterly premium for internally managed, externally managed and all BDCs. The statistics are presented over all quarters. Premium is winsorised at the top and bottom 1%. The Difference (Means) column presents the difference in the mean premium between internally and externally managed BDCs and its p-value in parenthesis. The MW Prob>|z| collumns present the p-value of the Wilcoxon rank-sum (Mann-Whitney) test. * p<0.1, **p<0.05, ***p<0.01

| Category | Observations | Mean | S.D. | 0.25 | Mdn | 0.75 | Difference (Means) | MW Prob>\|z\| |
|---|---|---|---|---|---|---|---|---|
| Internally Managed | 575 | -0.003 | 0.4441 | -0.2937 | -0.0916 | 0.2187 | 0.1098*** | 0.003*** |
| Externally Managed | 1198 | -0.1128 | 0.2018 | -0.2258 | -0.092 | 0.0164 | (0.00) | |
| All Funds | 1773 | -0.0772 | 0.3067 | -0.2421 | -0.0916 | 0.0464 | - | |

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## Table 6: Management Structure and Share Repurchases

The table presents two Logistic regressions using Announcement (=1 if a share repurchase plan is announced in the fiscal quarter, 0 otherwise) and Execution (=1 if share repurchases have been executed within the fiscal quarter and 0 otherwise) and a Tobit regression using the Magnitude of share repurchases calculated by the percentage of share repurchases in the fiscal quarter relative to the shares outstanding in the previous quarter. All independent variables are lagged. External takes the value of 1 if the fund is externally managed and 0 if the fund is managed internally. Premium is the funds premium calculated by the difference between the fund's price and the fund's NAV divided by the fund's NAV. Premium is winsorised at the top and bottom 1%. Fund Liquidity is calculated by the average daily trading volume of the fund's stock in the month prior to the announcement quarter (first column) or the execution quarter (second and third columns). Leverage is the ratio of Total Liabilities to Total Assets. Payout is the dividend payout ratio calculated by dividing Dividend per share by Earnings per share. Cash and Cash Equivalents % is calculated by the ratio of Cash and Cash equivalents over Total Assets. Age is the number of years the fund has been trading as a BDC. Size is the logarithm of the fund's market capitalisation. We use year dummies and robust standard errors in all estimations. We also present the marginal effects for the coefficients that have been found to be statistically significant. p-values in parentheses. * p<0.1, **p<0.05, ***p<0.01

| | $Pr(Announcement)_{it}$ | | $Pr(Execution)_{it}$ | | $Magnitude_{it}$ | |
|---|---|---|---|---|---|---|
| | *Coefficient* | *Marginal Effect* | *Coefficient* | *Marginal Effect* | *Coefficient* | *Marginal Effect* |
| $External_{it-1}$ | -0.785*** | -0.0422 | -0.909*** | -0.1466 | -0.841*** | -0.1809 |
| | (0.006) | (0.006) | (0.000) | (0.000) | (0.000) | (0.000) |
| $Premium_{it-1}$ | -1.237** | -0.0665 | -0.893*** | -0.1441 | -1.510*** | -0.3248 |
| | (0.011) | (0.01) | (0.001) | (0.001) | (0.000) | (0.000) |
| $Share\ Liquidity_{it-1}$ | -0.0269 | | -0.574*** | -0.0926 | -0.285** | -0.0612 |
| | (0.934) | | (0.002) | (0.001) | (0.026) | (0.026) |
| $Leverage_{it-1}$ | -1.341** | -0.0720 | 0.546 | | 0.0740 | |
| | (0.039) | (0.039) | (0.178) | | (0.809) | |
| $Payout_{it-1}$ | -0.0441 | | 0.00204 | | -0.00377 | |
| | (0.416) | | (0.951) | | (0.868) | |
| $Cash\ and\ Cash\ Eq_{it-1}$ | -0.0248 | | -0.0362 | | 0.522 | |
| | (0.973) | | (0.950) | | (0.257) | |
| $Age_{it-1}$ | -0.0106* | -0.0006 | -0.00280 | | -0.00495* | -0.00106 |
| | (0.072) | (0.069) | (0.453) | | (0.071) | (0.071) |
| $Size_{it-1}$ | 0.137 | | 0.396*** | 0.0639 | 0.342*** | 0.0735 |
| | (0.192) | | (0.000) | (0.000) | (0.000) | (0.000) |
| $Constant$ | -4.269** | | -9.993*** | | -0.0805*** | |
| | (0.035) | | (0.000) | | (0.000) | |
| $N$ | 1499 | | 1564 | | 1564 | |
| $Pseudo\ R^2$ | 0.0625 | | 0.088 | | 0.0822 | |

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## Table 7: Decision to repurchase shares by externally managed BDCs

The table presents the results of logistic regressions using Announcement and Execution as dependent variables and Tobit regressions using Magnitude as a dependent variable. All independent variables are lagged. External takes the value of 1 if the fund is externally managed and 0 if the fund is managed internally. Premium is the funds premium calculated by the difference between the fund's price and the fund's NAV divided by the fund's NAV. All continuous variables are winsorised at the top and bottom 1%. Fund Liquidity is calculated by the average daily trading volume of the fund's stock in the month prior to the announcement (first column) or the execution (second and third columns). Leverage is calculated by dividing Total Liabilities with Total Assets. Payout is the dividend payout ratio calculated by dividing Dividend per share by Earnings per share. Cash and Cash Equivalents % is calculated by the ratio of Cash and Cash equivalents over Total Assets. Age is the number of years the fund has been trading as a BDC. Size is calculated by the logarithm of the fund's market capitalisation. Institutional ownership is calculated as the number of stocks owned by institutions over the number shares outstanding. Analyst following is the number of analysts issuing at least one annual earnings forecast for the BDC in quarter t-1. We use year dummies and robust standard errors in all columns. p-values in parentheses. * p<0.1, **p<0.05, ***p<0.01

| | $Pr(Announcement)_{it}$ | | | $Pr(Execution)_{it}$ | | | $Magnitude_{it}$ | | |
|---|---|---|---|---|---|---|---|---|---|
| | *Coeff.* | *Coeff.* | *Mar.Ef.* | *Coeff.* | *Coeff.* | *Mar.Ef.* | *Coeff.* | *Coeff.* | *Mar.Ef.* |
| $Premium_{it-1}$ | -1.584 | -1.468 | | -2.456*** | -3.110*** | | -1.455*** | -2.676*** | |
| | (0.192) | (0.271) | | (0.005) | (0.000) | | (0.000) | (0.000) | |
| $Share\ Liquidity_{it-1}$ | 0.329 | 0.483 | | -0.0883 | 0.0337 | | -0.0195 | 0.0120 | |
| | (0.496) | (0.226) | | (0.778) | (0.922) | | (0.515) | (0.790) | |
| $Leverage_{it-1}$ | -1.327 | -0.145 | | -0.294 | -0.142 | | 0.422*** | -0.299** | |
| | (0.411) | (0.927) | | (0.741) | (0.903) | | (0.000) | (0.015) | |
| $Payout_{it-1}$ | -0.0599** | -0.0557* | | -0.0420* | -0.0467** | | -0.0220*** | -0.0304*** | |
| | (0.034) | (0.084) | | (0.073) | (0.043) | | (0.000) | (0.000) | |
| $Cash\ and\ Cash\ Eq_{it-1}$ | -2.852 | -5.321 | | -1.274 | -2.034 | | 0.318** | 0.340* | |
| | (0.212) | (0.143) | | (0.294) | (0.136) | | (0.030) | (0.082) | |
| $Age_{it-1}$ | 0.00252 | 0.00214 | | 0.0241*** | 0.0419*** | | 0.00878*** | 0.0268*** | |
| | (0.833) | (0.893) | | (0.001) | (0.000) | | (0.000) | (0.000) | |
| $Size_{it-1}$ | 0.139 | -0.0583 | | 0.101 | -0.265 | | 0.0587*** | -0.210*** | |
| | (0.473) | (0.795) | | (0.445) | (0.160) | | (0.000) | (0.000) | |
| *Institutional Ownership* | 0.837 | | 0.0311 | 1.522** | | 0.2202** | 0.492*** | | 0.0941*** |
| | (0.458) | | (0.449) | (0.049) | | (0.039) | (0.000) | | (0.001) |
| $Analyst\ Following_{it-1}$ | | 0.0492 | 0.0019 | | 0.107*** | 0.0134*** | | 0.0816*** | 0.0146*** |
| | | (0.415) | (0.401) | | (0.007) | (0.006) | | (0.000) | (0.000) |
| *Constant* | -5.404 | -1.927 | | -5.337** | 1.449 | | -8.428*** | -4.365*** | |
| | (0.113) | (0.633) | | (0.035) | (0.668) | | (0.000) | (0.000) | |
| $N$ | 794 | 747 | | 805 | 795 | | 825 | 812 | |
| $Pseudo\ R^2$ | 0.1029 | 0.0849 | | 0.1256 | 0.1424 | | 0.1004 | 0.1109 | |

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**Table 8: Cumulative Average Abnormal Returns around repurchase plan announcements**

The table presents the cumulative average abnormal returns for different windows around repurchase plan announcements along with their corresponding p values. The table presents the results separately for externally and internally managed BDCs. The source for the daily prices is Compustat, the source for the Fama and French five factors used in the estimation window is Kenneth French's website. We identify the management structure using the SEC filings from EDGAR. We test for significance using the Kolari and Pynnonen (2010) test. * p<0.1, **p<0.05, ***p<0.01

| Event Window | Externally Managed | | Internally Managed | |
|---|---|---|---|---|
| | CAAR | P Value (KP) | CAAR | P Value (KP) |
| (-10,-1) | -0.0163* | 0.0955 | -0.0122 | 0.3005 |
| (-7,-1) | -0.0118* | 0.0466 | -0.006 | 0.6112 |
| (-4,-1) | -0.0013 | 0.4104 | 0.0028 | 0.75 |
| (-1,1) | 0.0186*** | 0.0099 | 0.0136 | 0.9971 |
| (0,1) | 0.0190*** | 0.004 | 0.0174 | 0.4003 |
| (0,4) | 0.0248*** | 0.0006 | 0.0119 | 0.6052 |
| (0,7) | 0.0289*** | 0.0004 | 0.0082 | 0.6343 |
| (0,10) | 0.0328*** | 0.0002 | 0.0063 | 0.797 |
| Events | 74 | | 37 | |

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**Table 9: Premium before the announcement**

Table 9 presents the number of observations, the mean, the standard deviation, median and 25th and 75th percentiles of the quarterly premium one quarter prior to the announcement of a share repurchase plan for internally managed, externally managed and all BDCs. Premium is winsorised at the top and bottom 1%. The Difference (Means) column presents the difference in the mean premium between internally and externally managed BDCs and its p-value in parenthesis. The MW Prob>|z| columns present the p-value of the Wilcoxon rank-sum (Mann-Whitney) test. * p<0.1, **p<0.05, ***p<0.01

| Category | Observations | Mean | S.D. | 0.25 | Mdn | 0.75 | Difference (Means) | MW Prob>\|z\| |
|---|---|---|---|---|---|---|---|---|
| Internally Managed | 37 | -0.0795 | 0.2287 | -0.2454 | -0.1071 | 0.0411 | 0.0398 | 0.5993 |
| Externally Managed | 74 | -0.1193 | 0.1704 | -0.2262 | -0.1001 | 0.0035 | (0.3050) | |
| All Funds | 111 | -0.1061 | 0.1917 | -0.2291 | -0.1002 | 0.0079 | - | |

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## Table 10: Cumulative Average Abnormal Returns for Externally Managed BDCs

The table presents the cumulative average abnormal returns for high discount and low discount externally managed BDCs. We classify events as high discount if the discount one quarter prior to the announcement is higher than the median discount prior to the announcement over all externally managed BDC announcements and low discount otherwise. The source for the daily prices is Compustat, the source for the Fama and French five factors used in the estimation window is Kenneth French's website. We identify the management structure using the SEC filings from EDGAR. We test for significance using the Kolari and Pynnonen (2010) test. * p<0.1, **p<0.05, ***p<0.01

| Event Window | High Discount | | Low Discount | |
|---|---|---|---|---|
| | CAAR | P Value (KP) | CAAR | P Value (KP) |
| (-10,-1) | -0.0277* | 0.0804 | -0.0049 | 0.6884 |
| (-7,-1) | -0.0185 | 0.1483 | -0.0050 | 0.1789 |
| (-4,-1) | -0.0041 | 0.6021 | 0.0014 | 0.5226 |
| (-1,1) | 0.0286** | 0.0333 | 0.0085 | 0.1831 |
| (0,1) | 0.0310** | 0.0126 | 0.0070 | 0.1730 |
| (0,4) | 0.0359*** | 0.0089 | 0.0137** | 0.0231 |
| (0,7) | 0.0456*** | 0.0044 | 0.0122** | 0.0374 |
| (0,10) | 0.0509*** | 0.0034 | 0.0147** | 0.0149 |
| Events | 37 | | 37 | |

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**Table 11: Share repurchases and the BDC premium**

The table presents the level of the premium (%) in the quarter prior to share repurchase announcements, and the first four quarters following share repurchase announcements, the difference between the premiums following the announcement with the premium prior to the announcement and the p-values of the difference. The results are presented separately for externally and internally managed BDCs. * p<0.1, **p<0.05, ***p<0.01

| | **Externally Managed** | | | **Internally Managed** | | |
|---|---|---|---|---|---|---|
| **Quarter** | Premium | Difference | P Value | Premium | Difference | P Value |
| $Premium_{q-1}$ | -14.10 | - | - | -7.40 | - | - |
| $Premium_{q+1}$ | -13.41 | 0.69 | 0.62 | -9.83 | -2.44 | 0.43 |
| $Premium_{q+2}$ | -13.33 | 0.77 | 0.66 | -9.55 | -2.15 | 0.53 |
| $Premium_{q+3}$ | -10.63 | 3.47* | 0.07 | -9.99 | -2.59 | 0.54 |
| $Premium_{q+4}$ | -7.55 | 6.55*** | 0.00 | -10.92 | -3.52 | 0.47 |
| N | 62 | | | 34 | | |

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# Conclusion of Dissertation

This dissertation focuses on a specific type of investment companies, Closed-end funds (CEFs). I take advantage of the unique characteristics of Closed-end funds to address issues associated with the Closed-End fund literature and at the same time shed light on several of the issues associated with the broad portfolio management literature.

In Chapter 1 I take advantage of the uniqueness of CEFs that provide a fund price separate from their NAV and the fact that Closed-End funds tend to hold illiquid assets and examine the motives of CEF managers to delay or speed-up portfolio holdings disclosure. Furthermore the existence of a price allows for pricing tests to evaluate investor reaction to early or late portfolio holdings disclosure. The findings reveal significant valuation benefits associated with timely portfolio holdings disclosure and negative valuation effects for late disclosures. Furthermore, the findings suggest that the returns of a long-short portfolio strategy to exploit fund discounts become positive and statistically significant exactly after the implementation of such a strategy is facilitated by the timely disclosure of portfolio holdings. Finally, I show that fund managers are more likely to disclose early in the presence of large discounts and that copycatting and front-running threats, as well as illiquid underlying assets, increase the probability to delay portfolio holdings disclosure.

Chapter 2 sheds light on Business Development Companies (BDCs), a certain type of closed-end investment companies, considered by market participants to be part of the general Private Equity universe. I examine the performance and risk characteristics of BDCs, evaluate the Private Equity status of BDCs and investigate whether the unique characteristics of BDCs can offer important insights regarding the general Private Equity (PE) literature and the performance of Private Equity Funds (PEFs).

I find that BDCs do not outperform or underperform relative to the asset pricing factors used and that their beta is not statistically different from 1. The results from the analysis examining the relation between BDCs and traditional PEFs provide evidence of the private equity investment status of BDCs and suggest that individual investors can achieve exposure to the PE investment sector through the accessible BDC sector. Furthermore, the results highlight the limitations of the appraisal-based PE indices and provide support to the cash flow based PE indices as a reliable proxy of a transaction-based PE index. Finally, the findings reveal that,

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like the appraisal-based PE indices, BDC NAVs exhibit smoothing biases. Despite these biases a significant market reactions to quarterly BDC NAV disclosures is documented.

Chapter 3 exploits the presence of both internally and externally managed funds within the universe of BDCs along with their CEF structure to investigate conflicts of interest associated with fund management structure in conjunction with share repurchase decisions, a potential signaling tool of management alignment with investors interests. The findings of this chapter indicate that externally managed BDCs, associated with potential conflicts of interest mainly related with management fees, underperform relative to internally managed BDCs. The existence of these conflicts is identified by showing that externally managed BDCs are more reluctant to initiate and execute share repurchases suggesting that they seek to maximize their own utility rather than the value of the company. Furthermore, share repurchase announcements by externally managed BDCs result to positive valuation benefits for the funds while internally managed BDCs do not experience any significant valuation effects. The results suggest that the market reacts favorably to the actions of the manager to deal with the agency issues characterizing externally managed BDCs.