Private equity benchmarks and portfolio optimization

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ABSTRACT

Portfolio optimization using private equity is typically based on one of three indices: listed private equity, transaction-based private equity, or appraisal value-based private equity indices. However, we show that none of these indices is fully suitable for portfolio optimization. We introduce here a new benchmark index for venture capital and buyouts, which is updated monthly, adjusted for autocorrelation (desmoothing), and available contemporaneously. We illustrate how our benchmark enables superior quantitative portfolio optimization.

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1. Introduction

Private equity (PE) has played an increasingly important role in the portfolios of institutional investors such as endowments, pension funds, insurance companies, and high net worth individuals (see, e.g., Keuschnigg and Nielsen, 2003; Kanniainen and Keuschnigg, 2004; Nahata, 2008; Groh et al., 2010a; Groh et al., 2010b; and Groh and Liechtenstein, 2011a, 2011b, 2011c). In fact, according to the Boston Consulting Group (2009), as of year-end 2009, approximately US $1 trillion was invested in PE. However, institutional investments in PE are both long-term and illiquid, and it is thus somewhat difficult to establish optimal portfolio weights, particularly relative to more liquid asset classes.

The importance of benchmarking PE investments in theory and in practice cannot be overstated. Recent work by Groh et al. (2012) focuses on benchmarking PE at a country level. This issue is followed closely by institutional investors worldwide,[3] who require representative benchmarks or PE indices in order to determine the optimal proportion of PE to be allocated to their portfolios (see, e.g., Woodward and Hall, 2003; Woodward, 2004; Tierney and Bailey, 1997; and Nesbitt and Reynolds, 1997). Moreover, suitable benchmarks are also needed to calculate risk exposures, such as value-at-risk (VaR) or conditional VaR, and risk capital requirements, such as those mandated under Basel III. Without appropriate benchmarks, institutional investors are at risk of misallocating their capital to the PE asset class as a whole, as well as among various PE funds.

Benchmarking, therefore, is fundamental to the entire PE market and all firms and stakeholders connected with it. It can be considered one of the most important aspects of PE research.

This paper addresses several interrelated issues. First, are institutional investors using the most appropriate PE benchmarks in portfolio optimization? Second, if not, what are the most appropriate benchmarks? And third, how large are the differences in portfolio construction for the appropriate versus inappropriate PE benchmarks?

Institutional investors generally use one of three concepts when constructing PE indices: (1) listed PE indices, (2) transaction-based PE indices, and (3) appraisal value-based PE indices. Each index has advantages and disadvantages for capturing PE risk/return profiles. In this paper, we show, however, that none of the indices fully captures appropriately input quantities for portfolio optimization or for risk models.

For example, listed PE indices contain up-to-date data, but are insufficient for portfolio optimization because they overestimate the volatility of the underlying investments, and hence underestimate the optimal percentage of PE to be allocated to a given

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portfolio. Transaction-based indices, on the other hand, use real-ized cash flows of prior PE transactions, but the time lag of their data availability is suboptimal, and they may thus misallocate portfolio weights, particularly during financial crises. Meanwhile, appraisal value-based PE indices use quarterly evaluations of the book value of PE portfolio companies, along with changes in actual cash flow. But they likewise feature a time lag in data availability, and may also have appraisal-smoothing problems. A mismatch in data timing and smoothed returns can create spurious portfolio optimization results.

Thus, none of the three index concepts currently in popular use is fully capable of capturing the risk/return profile of PE, and none provides the necessary input quantities for portfolio optimization or risk models. We elaborate on this point further in the first part of this paper. We also improve upon these methods by introducing a new representative benchmark for PE that specifically considers segments of the PE asset class for venture capital and buyouts as a means to more appropriately capture the risk/return profile.

Our new benchmark index works as follows. We first calculate appraisal value-based PE benchmarks using those indices. We re-scale quarterly returns to monthly returns by using Getmansky et al.'s (2004) method, which corrects for positive autocorrelation in returns (see also Koijen et al., 2009). Second, we use capital mar-ket information in a forecast model that includes listed PE and macroeconomic variables in order to close the quarterly time gap and obtain up-to-date performance. In our final step, we calculate a superior benchmark that features monthly frequency and con-temporary performance reporting.

We demonstrate that our new benchmark is suitable for use in portfolio optimization and risk models. Because portfolio optimiza-tion varies in an economically significant way in relation to index choice, we find that our new index provides a quantitative improvement. Furthermore, by using a Monte Carlo simulation and historical US returns from the January 1999-December 2008 period, we show that the portfolio exhibits statistically signifi-cantly higher levels of risk when listed PE is used as a proxy than when our modified appraisal value-based benchmark is used. We also find lower stated Sharpe ratios when using listed PE than when we use our modified appraisal value-based benchmark. This choice could cause disproportionately low levels of new capital in-flows compared to peers that use the appropriate PE benchmarks for performance assessment. Overall, our results confirm that our new index improves risk management for PE limited partners, thus facilitating the flow of funds into the PE industry.

The remainder of this paper is structured as follows. Section 2 describes the different index concepts. Section 3 introduces our methodology for constructing the appraisal value-based PE bench-marks, and presents the results of the forecast model. Section 4 demonstrates the impact of index selection on the resulting asset allocation. Section 5 concludes, and provides a summary of our most important findings.

2. Alternative private equity performance indices

This section describes the various indices used for portfolio optimization in more detail, as well as the data sources used for constructing these indices.

2.1. Listed private equity indices

Listed PE indices track listed indirect private investment com-panies ("funds of funds"), listed direct private capital investment companies, and listed PE fund managers (Bergmann et al., 2009). Data on listed PE are available from stock exchanges and from the Listed Private Equity Association (see Appendix A for more details).

Listed PE indices have the liquidity advantage of reflecting cur-rent values because they feature daily trading. However, this advantage can also be a point of criticism for index construction. With daily trading comes daily price changes. Because the expecta-tions of market participants affect pricing, especially during times of crisis, listed PE indices can be more volatile than actual PE val-uations. Moreover, listed PE vehicles are not necessarily represen-tative of the entire PE universe, because the decision to list is not random, and the type of investors attracted to listed PE differs from those attracted to, e.g., limited partnership PE vehicles (Cumming et al., 2011).

In contrast, actual PE valuations are typically carried out on an annual basis, although a small percentage of funds conducts semi-annual valuations (Cumming and Walz, 2010). Actual PE valuations are based not only on realized investments that have been exited (e.g., by IPO, acquisition, secondary sale, buyback, or liquidation), but also on unrealized valuations on unexited investments. It typ-ically takes 3–5 years from the date of first investment to exit an investment (see Nahata (2008) for venture capital, Hege et al. (2009), Giot and Schwienbacher (2007), Metrick and Yasuda (2010b), and Schwienbacher (2008) for venture capital and buy-outs, and Cao (2011) and Cao and Lerner (2009) for buyouts).

Moreover, private entrepreneurial firms are valued on the basis of long-run performance expectations, and thus their valuations do not fluctuate with daily market swings (Metrick and Yasuda, 2010a). Therefore, PE fund managers do not carry out daily valua-tions. However, non-daily pricing in actual PE investments is not the same thing as stale pricing. Rather, actual PE valuations change only when substantial new information exists that would influence long-run expectations. In the case of entrepreneurial firms, this substantial change is typically attributable to something that would not be related to a daily swing in public stock markets but is a material event that is important to shareholders, such as the hiring of a key employee or the attainment of a patent or a strategic alliance (see Anand and Khanna, 2000).[4] The correct frequency for PE pricing therefore reflects actual practice: Typically once or twice per year, as well as during the period of the announcement of mate-rial information, fund managers report to their institutional inves-tors any information that could result in a change in expected valuationTherefore, listed PE indices are insufficient for portfolio optimization because the volatility from the underlying stock mar-ket fluctuations is greater than the more episodic realization of cash flows from illiquid alternative investments. Listed PE indices would tend to underestimate the optimal portfolio share for PE due to the overestimation of risk.

2.2. Transaction-based private equity indices

Cumulative cash flows of portfolio companies from non-listed PE funds or limited partnerships (as described in Metrick and Yas-uda, 2010a) are used to determine transaction-based index perfor-mance. Transaction-based PE indices are available commercially from organizations such as Cepres (Appendix A). And, because they are based on realized cash flows, they avoid the problem of risk overestimation.

The calculation of monthly Ceprex indices is straightforward. As soon as a portfolio company in any fund is sold (exited), or a distri-bution is made, the resulting performance is distributed over the

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[4] Because all private equity funds are listed on stock exchanges, they are subject to certain disclosure requirements. For example, in the US, managers of listed private equity funds must disclose any material event that would be important to shareholders or the United States Securities and Exchange Commission in an 8-K filing, which is available to investors in the EDGAR database.