A Method for Quantifying Concentration of Returns in Private Equity Portfolios

Andrew Conner, CFA

Alignment Capital Group
11940 Jollyville Road
Suite 330-N
Austin, TX 78759
512-506-8299 (Phone)
512-996-0970 (Fax)
www.alignmentcapital.com

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INTRODUCTION

Investors in private equity have long struggled to measure risk in the investments they manage. Inter-period return variability, the standard risk measure in public asset classes, is difficult to apply in the presence of frequent cash flows, estimated valuations, and stale pricing. In the absence of time series of returns from which to estimate variability, practitioners have turned to cross-sectional measures of risk, for example using the dispersion of outcomes as a proxy for risk.

In this research brief we present a method for measuring the risk of portfolios of private equity investments using another cross-sectional measure, the concentration of returns. Our methodology applies familiar techniques from the field of economics to create both graphical and statistical expressions of concentration, so that portfolio managers can evaluate risk both qualitatively and quantitatively. This enables decision-makers to evaluate portfolio risk against both intuitive standards and peer group and/or historical benchmarks.

DATASET

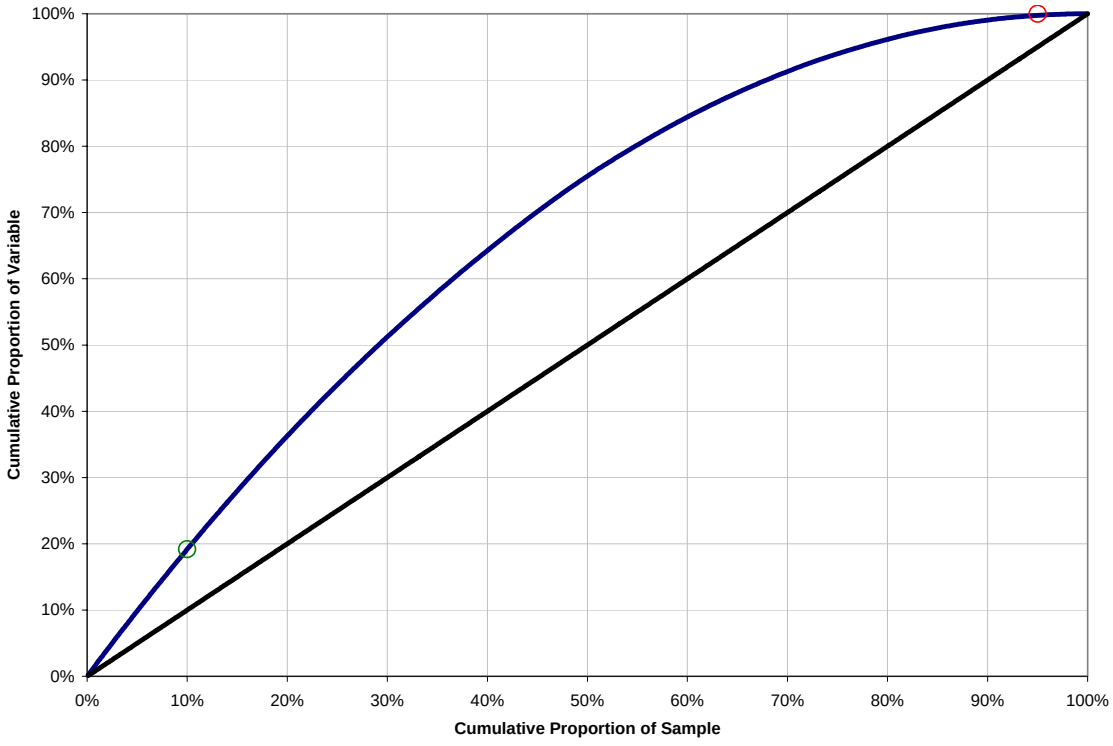
To demonstrate the methods described in this paper we used the publicly-available return data of a large institutional investor in private equity. This investor has committed to a total of 177 private equity funds, beginning in 1981. For the purposes of this report we analyzed only the domestic Corporate Finance funds (including leverage buyout, distressed, and mezzanine) and Venture Capital funds in the portfolio, and only included mature funds from vintage years 2000 and earlier. The effective date of this data was 6/30/2005.

METHODOLOGY

The concentration of returns in a historical track record can be a useful indicator of the riskiness of a given investment strategy. Track records that contain a large number of write-offs in conjunction with a handful of big winners may be indicative of strategies that contain more risk than strategies that produce track records with more consistent performance from investment to investment. It is almost certainly true that, *for a given level of expected return*, a more consistent investment strategy is preferable to one where returns are concentrated in a small number of investments.

A useful tool which can be applied to private equity portfolios for intuitively measuring the concentration of returns in a track record is the Lorenz Curve. Invented by Max Lorenz in 1905, the Lorenz Curve has its origins in measuring the concentration of wealth in a particular economy. The curve itself if created by arranging observations of a given statistic in decreasing order and then plotting the cumulative value of the statistic (on the y-axis) against the cumulative proportion of the sample (on the x-axis). Exhibit 1 is a sample Lorenz Curve generated by simply using 1,000 randomly-generated values drawn from a uniform distribution with a minimum value of 0 and a maximum value of 1.

Exhibit 1: Example Lorenz Curve based on a Uniform Distribution



Source: Alignment Capital Group

In Exhibit 1 above, the Lorenz curve is plotted in blue. Also plotted, in black, is a 45-degree line that bisects the chart area. With positive variables the blue line will always reside in the upper-left portion of the graph.

Several observations about the example data set can be made using Exhibit 1. First, because the blue line is above the black line, this dataset contains some degree of concentration. If the data were perfectly uniform (i.e. each observation were equal), the blue line would reside directly on top of the black line. On the opposite extreme, if the blue line were to trace the y-axis and then the upper edge of the graph, it would indicate perfect concentration (i.e. every observation equal to zero except for one). In between these two extremes the degree of concentration can be determined by how far the blue line bows up and away from the black 45-degree line.

For application to private equity portfolios, we utilize the Times Money Earned (TME) ratio as our statistic of choice when measuring concentration of returns. The TME, also known as Distributed to Paid-In or D/PI ratio, is defined as the sum of distributions and the most recent valuation of a given investment, divided by the sum of capital invested. Using the TME ratio avoids any influence of the allocation of capital (the size of each investment) from the process of explaining returns and assessing concentration, resulting in a more pure measure of concentration. An alternative approach would be to use total dollars distributed, which would incorporate the amount of capital allocated to each investment.

Where the variable being plotted is investment return and the sample consists of investments made, a useful statement such as "the top *x*% of investments explained *y*% of total returns," can be made. For example, in Exhibit 1 the top 10% of investments explained 20% of returns, as indicated by the height of the blue curve on the y-axis where *x*=10% (this point is indicated by the green circle in Exhibit 1). Finally, the number of write-offs can be easily estimated where the blue line intersects the top of the graph. In this case the blue line tops out around *x*=95%, so approximately 5% of the investments were written off, contributing nothing to the total return (indicated by the red circle on Exhibit 1).

It is important, however, not to penalize investment managers for producing large winners. Obviously of more concern is the proportion of investments written-off. An otherwise consistent track record with a small number of "homeruns" is no more risky, from a downside perspective, than a consistent track record without big winners.

Much of the information contained in the Lorenz Curve can be captured in a single statistic known as the Gini Coefficient, invented by Corrado Gini in 1912. Where the TMEs are arranged in descending order, as they are for the Lorenz Curve above, the Gini Coefficient (*G*) is calculated as follows:

$$G = \frac{\sum_{n=1}^{N} (2n - N - 1) \times TME_n}{N \times \sum_{n=1}^{N} TME_n}$$

where *n* is the rank of TME_n, arranged in descending order, and *N* is the sample size.

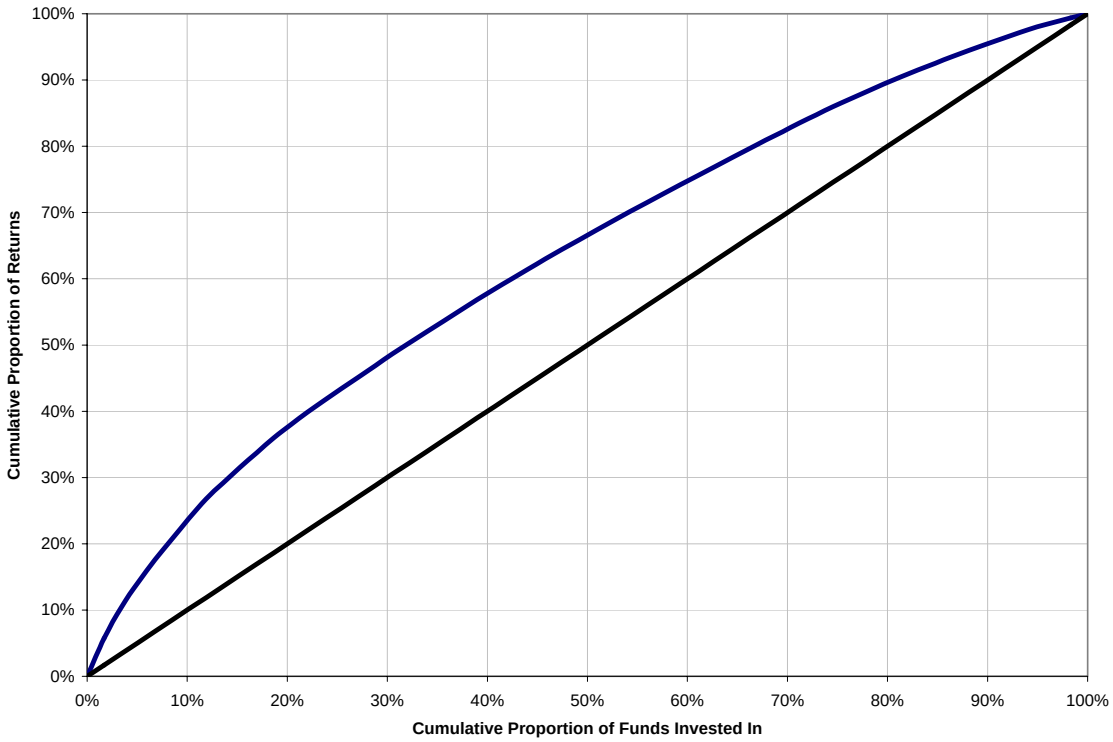
The Gini Coefficient's absolute value is bounded by 0 and 1 and, given the way we have arranged our TME ratios *G* will be negative in all of the examples in this report. In the case of perfect concentration described above *G* will equal -1 and in the case of uniformity *G* will equal 0. Within that range the Gini Coefficient describes the relative amount of concentration in a portfolio of private equity investments. The greater the negative value of *G* the more concentrated is the portfolio's returns. For the data shown in Exhibit 1 the Gini Coefficient had a value of -0.34.

RESULTS

To demonstrate the method described in this paper for assessing the degree of concentration in private equity portfolios, we created Lorenz curves and calculated Gini Coefficients using the publicly-available return data of a large institutional investor in private equity. This investor has committed to a total of 177 private equity funds, beginning in 1981. For the purposes of this report we analyzed only the domestic Corporate Finance funds and Venture Capital funds in the portfolio, and only included mature funds from vintage years 2000 and earlier. The effective date of this data was 6/30/2005.

Exhibit 2 contains the Lorenz Curve of the Corporate Finance Funds, including leveraged buyout, distressed, and mezzanine funds.

Exhibit 2: Lorenz Curve of Corporate Finance Fund Investments

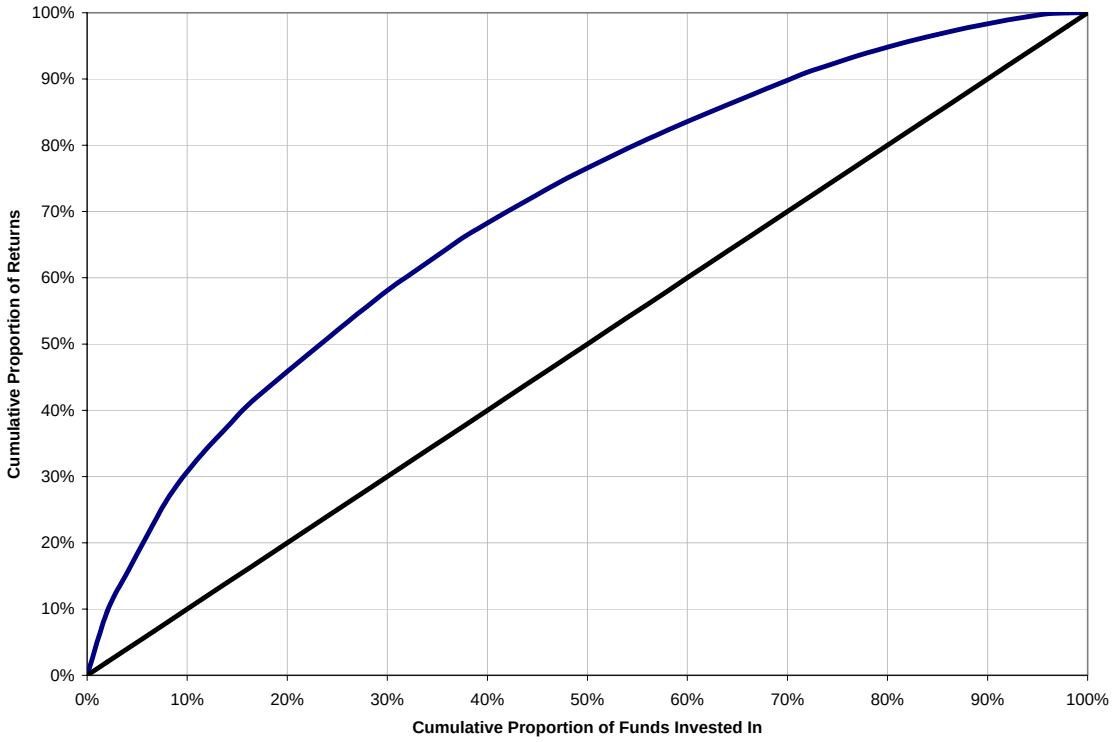


Source: Alignment Capital Group

This investor had no total write-offs in the corporate finance portfolio. The top 10% of funds explained about 24% of total returns. The Gini Coefficient of this portfolio, which included a total of 59 corporate finance funds, was -.26, which means returns were not highly concentrated in a small number of funds and, more importantly, few funds experienced significant losses.

Exhibit 3 contains a similar Lorenz Curve for the same investor's Venture Capital portfolio, which contains a total of 50 funds.

Exhibit 3: Lorenz Curve of Venture Capital Fund Investments



Source: Alignment Capital Group

Visually it is clear from the larger area under the blue line that the returns of the venture capital portfolio are more concentrated than the returns of the corporate finance portfolio. The top 10% of venture capital funds contributed just over 30% of returns, while 4% of the investments were written-off entirely. The Gini Coefficient of -.40 confirms what is shown in the graph and what intuition would support, which is that the venture capital funds are riskier than the corporate finance funds as measured by the concentration of returns.

While the data used to illustrate our method was drawn from a portfolio of private equity funds, this method is also very much applicable to private equity funds themselves. We regularly assess general partner historical track records using the concentration of portfolio company returns as one proxy for the investment risk present in an investment strategy. When analyzing the concentration of portfolio company returns, we have also found that the typical venture capital fund has returns that are more highly concentrated than that of the typical buyout fund, a result of the fundamental difference between investing in earlier-stage fledgling companies versus

buying more established enterprises. However, within both venture capital and leveraged buyouts there are certainly track records that are more or less concentrated than average, which can be indicative of a specific investment style.

CONCLUSION

In this research brief we present a systematic method for quantifying the concentration of returns in private equity portfolios. Our results show that, for one representative investor in private equity funds, venture capital returns tend to be more highly concentrated than corporate finance fund returns. Our method includes both graphical and statistical tools to summarize the concentration of returns, which we use as an indicator of investment risk.

The method presented herein is applicable to both portfolios of funds as well as to portfolio companies within funds. By calculating the concentration of returns when examining the historical track records of potential fund managers, the portfolio manager can gain a stronger familiarity with the trade-offs between return and risk, develop a sense for how much risk is acceptable, and potentially make more informed investment decisions.

Alignment Capital Group is a full-service private equity consulting firm based in Austin, Texas. The firm's mission is to understand private equity as an asset class in a portfolio context, and thus to assist our clients in making optimal investment decisions.

Andrew Conner is an Associate with Alignment Capital Group. His responsibilities include performing due diligence on investment managers, providing strategic portfolio management advice, and conducting original research.

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