



# *Private Equity Insight*

## *July 2019*

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### VARIANCE-TO-MEAN RATIOS OF ANNUALIZED CONTINUOUSLY COMPOUNDED RETURNS SINCE INCEPTION OF A REPRESENTATIVE SAMPLE OF U.S. BUYOUTS SHOW DISPERSION READINGS LOWER THAN THE PUBLIC MARKET BENCHMARK, PAVING THE WAY FOR ROBUST FORWARD-LOOKING MODELLING.

- ▶ Risk premium of U.S. buyout funds for the vintages 1995 through 2007 over the public market benchmark, namely the S&P 500 Total Return Index, show a stochastic pattern.
- ▶ The  $\pm 2$  standard error band of the mean quarterly excess log returns of a representative sample of U.S. buyout funds suggests low variation across the measurement period as the sample mean of the dataset is an accurate representation of the true population mean.
- ▶ Variance-to-mean ratios for the vintages 1995 through 2007 show under-dispersion of the distribution of annualized log returns of U.S. buyout funds compared to the public market benchmark, paving the way for robust modelling of private market returns.

*“Certain signs precede certain events”*, Marcus Tullius Cicero (106BC - 43BC).

### Insight into the Pattern of Private Equity Fund Returns

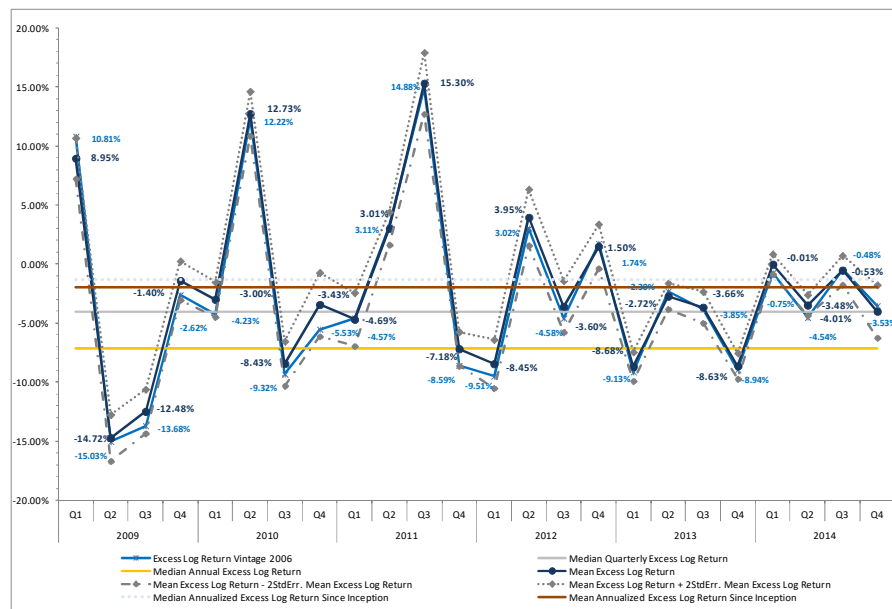
An analysis of log-returns across vintages applying the unlevered DaRC<sup>1</sup> methodology (Duration adjusted Return on Capital) to a proprietary dataset of U.S. buyout funds for the vintages 1995 through 2007 has shown a stochastic pattern of the risk premium over the public market benchmark, namely the S&P 500 Total Return Index.

Amongst others, as highlighted in figure 1, quarterly excess log return for the 4- through the 9-year investment horizons since inception for the vintage 2006 stayed in the +14.88%/-15.03% range (median values), or the +15.30%/-14.72% range when taking into account the mean readings. The  $\pm 2$  standard error band of the mean quarterly excess log returns (representing the standard deviation of the mean) showed low

<sup>1</sup> The DaRC (Duration adjusted Return on Capital) is an innovative and patented methodology (USPTO n. US 8,386,356 B2 and related PCT applications) for the performance valuation of closed-end private funds. For more information on the DaRC methodology please refer to Saccone M., "A Multi-Asset Standard Measure for Private Equity Returns", May 2019.

variation across the measurement period as the sample mean of the dataset was an accurate representation of the true population mean.

**Figure 1 Excess Log Returns - U.S. Buyout Vintage 2006 - vs. S&P 500 Total Return Index - Q1 2009-Q4 2014**



Source: XTAL Strategies own calculation on U.S. buyout sample data

The results of the analysis of the excess log returns based on the DaRC methodology across vintages appear promising and pave the way for

robust modelling of the stochastic pattern of the private equity risk premium.

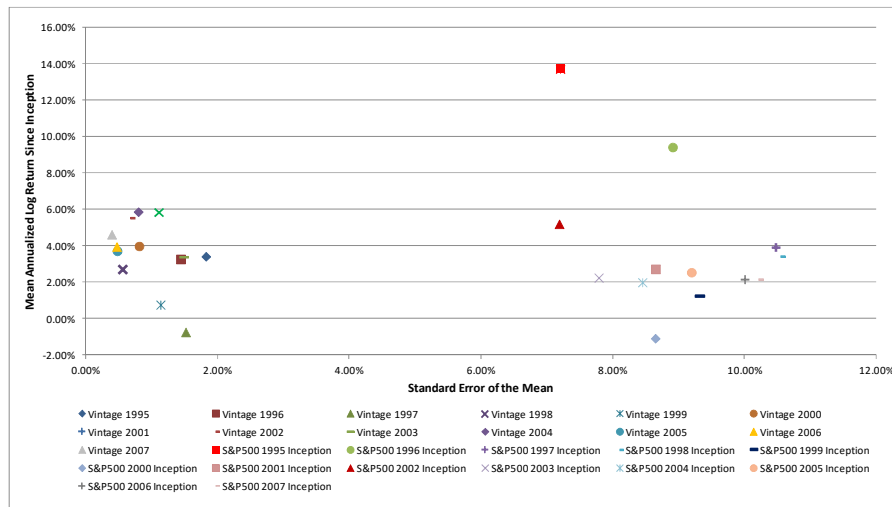
At the end of the ninth year since inception the median annualized excess log return of the 2006 vintage stood at a negative 1.30%, while the mean reading was slightly greater to a negative 1.98%. As summarised in table 1 below, median annualized excess log returns at the end of the ninth year since inception across vintages stayed in the -6.22%/+8.74% range.

**Table 1 Vintages 1995-2007 - Median Annualized Excess Log Return Since Inception vs. S&P 500 Total Return Index**

Vintage	9th Year since Inception Median Annualized Excess Log Return
1995	-6.22%
1996	-4.54%
1997	-3.05%
1998	0.46%
1999	2.31%
2000	8.74%
2001	5.95%
2002	2.97%
2003	-0.03%
2004	1.20%
2005	-1.33%
2006	-1.30%
2007	-0.19%

Source: XTAL Strategies own calculation on U.S. buyout sample data

**Figure 2 Mean Annualized Log Return 7th Year Since Inception vs. Standard Error of the Mean (Standard Deviation for S&P500 Total Return Index) - Vintages 1995-2007**



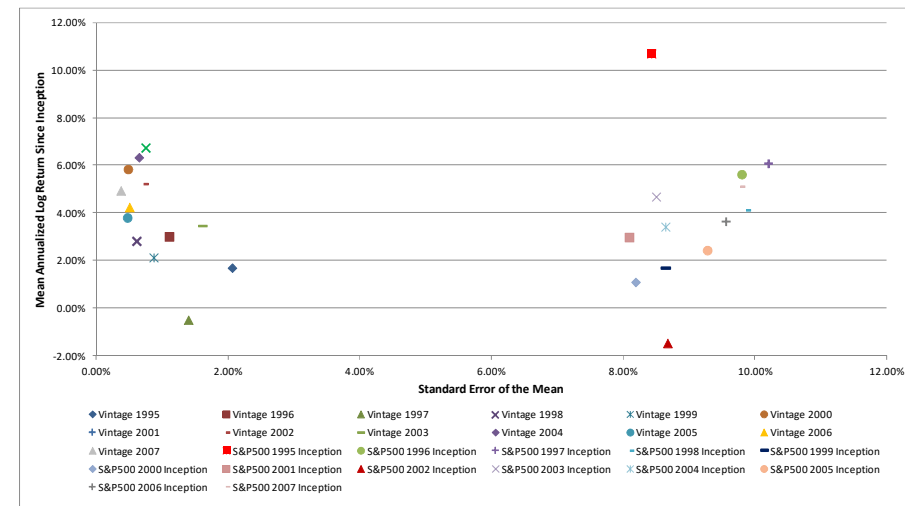
Source: XTAL Strategies own calculation on U.S. buyout sample data

Figures 2 through 4 show the mean annualized log returns (absolute) and the standard errors of the mean of the 7- through 9-year investment horizons for the vintages 1995 to 2007 and the S&P 500 Total Return Index (the standard deviation is used for the public market benchmark instead). The 7- through 9-year investment horizons out of the sample of U.S. buyout funds included in the XTAL's proprietary

dataset have been selected as they represent the sweet-spot range of a typical private equity fund duration.

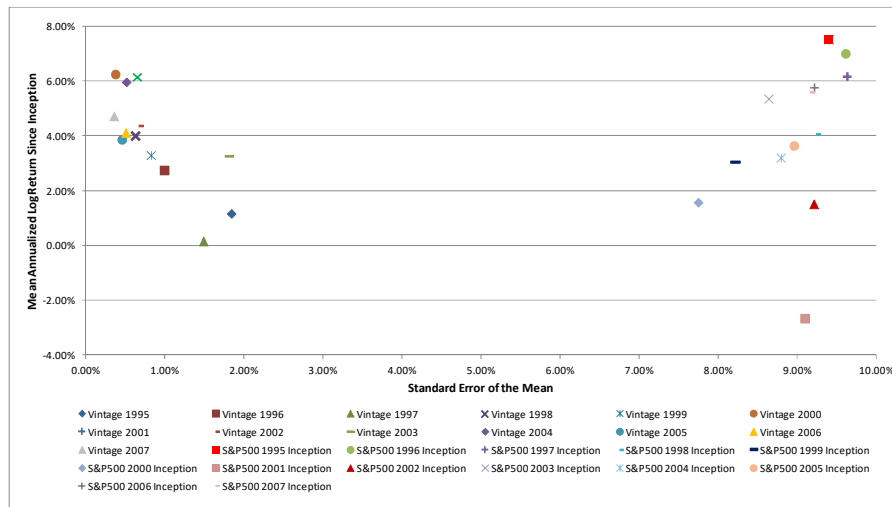
Across the investment horizons, results show standard errors of the mean of acceptable and narrow magnitude suggesting sound reasons for inferring the sample mean annualized return of the dataset as an accurate representation of the true population mean.

**Figure 3 Mean Annualized Log Return 8th Year Since Inception vs. Standard Error of the Mean (Standard Deviation for S&P500 Total Return Index) - Vintages 1995-2007**



Source: XTAL Strategies own calculation on U.S. buyout sample data

**Figure 4 Mean Annualized Log Return 9th Year Since Inception vs. Standard Error of the Mean (Standard Deviation for S&P500 Total Return Index) - Vintages 1995-2007**

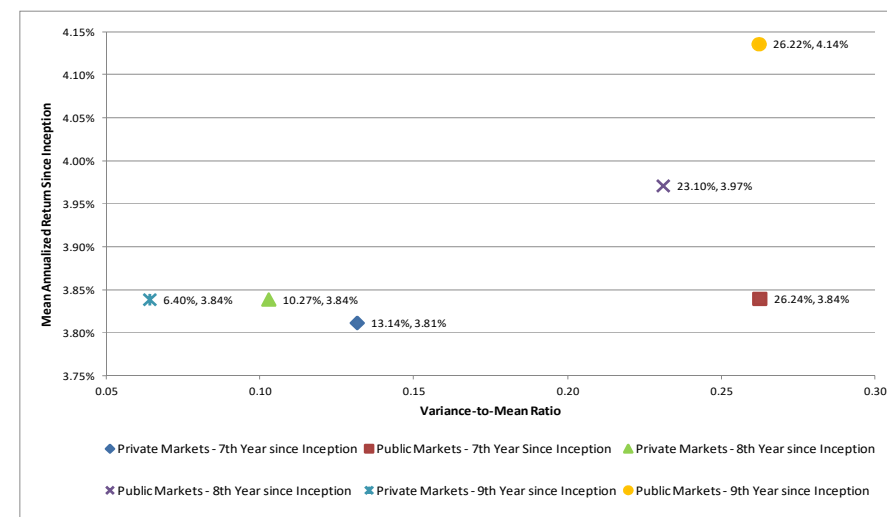


Source: XTAL Strategies own calculation on U.S. buyout sample data

In figure 5, mean annualized returns since inception are then matched to a normalized measure of dispersion, the variance-to-mean ratio, to infer on the degree of dispersion of the return distribution. In statistics, variance-to-mean ratio is used to measure how dispersed or clustered a set of events are, in a given interval of time or space.

Results show under-dispersion of the distribution of annualized log returns of U.S. buyout funds compared to the public market benchmark, paving the way for robust forward-looking modelling.

**Figure 5 Private vs. Public Markets, 7th, 8th, and 9th Year since Inception - Mean Annualized Log Returns Since Inception vs. Variance-to-Mean ratios - Vintages 1995 through 2007**



Source: XTAL Strategies own calculation on U.S. buyout sample data

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