



Your bridge to the world of private assets

Diversify your portfolio with private equity

Correlation between private and public equity

May 2017

Summary

- Private equity portfolios not only offer a source of attractive return, but also diversify investors' equity allocation when constructed properly
- Over the past 15 years, the average correlation between the European and US buyout markets and public equity has been 80%. Over the same period, the correlation of the European buyout market has been lower than that of the US buyout market
- Concentrated private equity portfolios exhibit lower correlation. With a deliberate fund selection process, over-diversification can be avoided
- We believe that the fundamental differences in the private and public equity investment models will remain, implying that the diversification benefits of investing in private equity will persist in the future

Diversify your portfolio with private equity

While research¹ has shown the outperformance of private equity over public equity, the role of the correlation of these two asset classes seems to attract less attention. However, modern portfolio theory suggests that each investment decision should not only be regarded on a stand-alone basis, but also in the context of the entire investment portfolio – this is where correlation plays a crucial role. When adding a new investment to the portfolio, it is critical to understand whether the returns of the new investment move in lockstep with the returns of the already existing portfolio or not. The measure to quantify these synchronous movements is correlation.

For the purpose of asset allocation, many institutional investors treat private equity as part of their equity allocation. Therefore, we focus on the correlation between private equity and public equity. Existing research on the topic of correlation between private and public equity by the European Private Equity & Venture Capital Association² asserts that a correlation figure for private equity and the MSCI World Index between 59% and 75% is appropriate. Another study by Prequin³ concludes that the LPX50⁴ is highly correlated (94%) to public equity. However, the LPX50 is not based on direct exposure to private equity – the constituents of the LPX50 are the 50 largest listed private equity companies around the globe, which fulfill certain liquidity requirements. These companies may be asset managers active in the private equity market or owners of portfolios of either private equity funds or private companies.

Private equity returns are certainly expected to show some correlation to public markets due to purchase and exit prices as well as valuations being influenced by the public market – but is it that high? To add new insight, we analyzed private equity data from Cambridge Associates and proprietary private equity data from Colmore, a global portfolio servicing company, with a three-tiered approach: portfolio level correlation, fund level correlation and company level correlation.

What is correlation?

Correlation is a measure of *linear* dependence between two variables and assumes values between -100% and 100%. A correlation of 100% between two assets means that if one asset continuously returns 5%, then the other asset will return a fixed positive multiple of 5%, plus a constant. In other words, as one asset moves, either up or down, the other asset moves in lockstep, in the same direction. A correlation of -100% means the fixed multiple would be negative. The fixed multiple is sometimes called *beta* and the constant is referred to as *alpha*, which is a measure of outperformance. Finally, a correlation of 0% means that there is no (linear) relationship between the returns of the two assets. In that sense, correlation is a measure of diversification, where a lower correlation indicates higher diversification.

Besides the qualitative interpretation of correlation as a measure of linear dependence, its importance stems from modern portfolio theory where an *efficient* portfolio is defined as a portfolio with a minimum level of risk for a given level of return. Risk can be defined as the mathematical *variance* σ^2 of the portfolio returns. For a portfolio consisting of two assets with variance σ_A^2 , σ_B^2 and correlation ρ , the variance σ^2 of the portfolio can be calculated as

$$\sigma^2 = \sigma_A^2 + \sigma_B^2 + \rho\sigma_A\sigma_B$$

From this formula, it is evident that the risk of a portfolio σ^2 can be minimized by combining assets with a low correlation ρ and/or low level of standalone risk σ_A^2 and σ_B^2 .

¹ *Private Equity Performance: What Do We Know?*, Robert Harris, Tim Jenkinson and Steven N. Kaplan, 2013
Private Equity Investments: Drivers and Performance Implications of Investment Cycles, Claudia Sommer, 2012
Private Equity Performance: Returns, Persistence and Capital Flows, Steve Kaplan and Antoinette Schoar, 2005
GLOBAL PRIVATE EQUITY REPORT 2015, Bain & Company, 2015

² *Assessing the risk parameters for private equity based on an expanded index*, European Private Equity & Venture Capital Association, 2012

³ *Listed Private Equity Highly Correlated with Traditional Closed-End PE Limited Partnerships*, Prequin, 2012

⁴ Please see <http://www.lpx-group.com> for more information on the LPX50 and the LPX Group, December 2016

Correlation and returns on the portfolio level

Based on Cambridge Associates data, the average correlation between the MSCI World Index and the European/US buyout market over the past 15 years has been 80%. The black line in Figure 1 depicts the evolution of the correlation over the last 15 years. The correlation is calculated based on a 3-year rolling window⁵. With a correlation below 100%, European/US buyout funds added diversification to a public equity portfolio. These diversification benefits were lower during the global financial crisis, as can be seen by the spike of the correlation (92%) in 2008/09 - rising correlation equates to reduced diversification. Macro movements overwhelmed any micro and fundamental factors during the financial crisis, thereby increasing correlation. From 2014 onwards, the correlation is on a downward trend (88% to 75%), underscoring the diversification benefits of private equity.

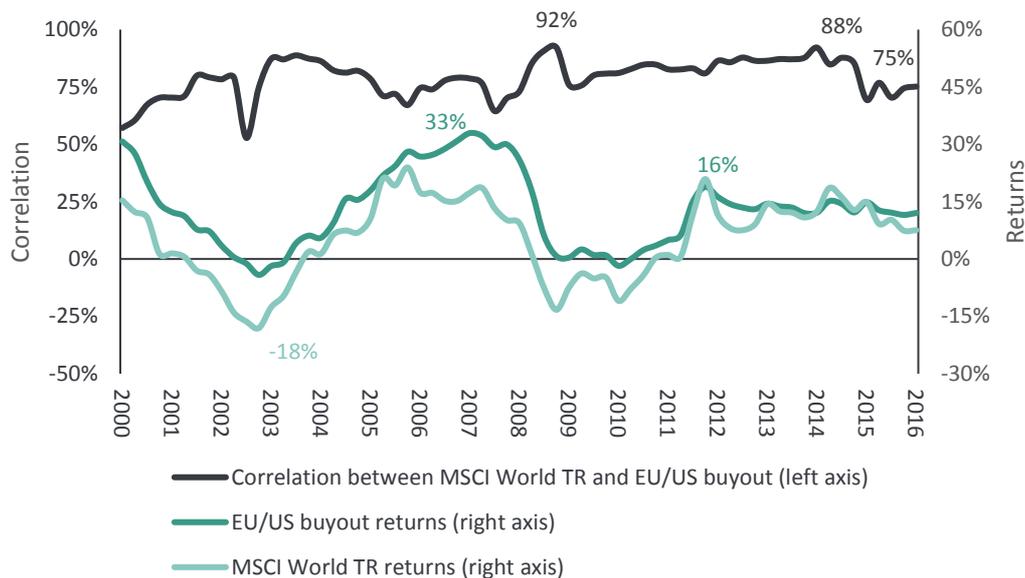


Figure 1: 3-year rolling correlation between quarterly returns of MSCI World TR and pooled quarterly returns of European/US buyout from Cambridge Associates over the last 15 years.

The dark and light green lines in Figure 1 show the performance of EU/US buyout and the MSCI World Index, respectively, over a 3-year rolling window⁶. Private equity has outperformed public equity during the period 2000-2009. Thereafter, public equity performed stronger than private equity during 6 of 25 periods, albeit at the cost of higher volatility on the public equity side after 2012. The outperformance of private equity over public equity throughout the boom and bust cycles of the 2000s underscores the ability of private equity to generate alpha irrespective of the market environment. The driving factors of the outperformance of private equity over public equity are linked to the fundamental differences in investment models of the two asset classes, as summarized in Table 1 below. Private equity investments are characterized by active ownership in the company with direct investors having full access to information about the company. Typically private equity enables an ownership structure that aligns the interests of investors and management of the company. In contrast, public equity investors' actions are restricted to buying and selling stocks, limited availability of information about the company and an inherent principal-agent conflict between the investors and the management of the company. Exploiting the inefficiencies of the private equity market further supports the outperformance of private equity over public equity. Public equity operates in a highly efficient market environment, while private equity is characterized by information asymmetry between private equity investors and the general public.

⁵ By a correlation calculated over a 3-year rolling window, we mean that the correlation at a given point t in time is calculated based on the twelve quarterly returns of private equity and public equity preceding time t , i.e. the correlation of 75% on June 30, 2016 is based on the pooled quarterly returns of European/US buyout and the quarterly returns of the MSCI World Total Return from June 30, 2013 to June 30, 2016.

⁶ By returns calculated over a 3-year rolling window, we mean the following: For European/US buyout the 3-year return at time t is based on the (annualized) IRR of the quarterly cash flows that occurred during the 3 years preceding t , the NAV at time t as a positive cash flow and the NAV at time $t-3$ as a negative cash flow. For the MSCI World Index, the 3-year return is the compounded annual growth rate between $t-3$ and t .



Table 1: Drivers of private equity outperformance

Public equity	Private equity
Buying or selling only possible action	Active ownership of investment
Information limited to regulatory demands	Full access to information
No additional value	Value added on multiple levels ⁷
Principal-agent conflict	Alignment of interests
More efficient markets	Less efficient markets

Figure 1 displays the correlation between the pooled returns of European/US buyout and the returns of the MSCI World Index. Decomposing the former time series of returns by geography into European buyout and US buyout reveals unexpected results: European buyout and US buyout exhibit different correlation levels and patterns (Figure 2). With a few exceptions, the correlation of European buyout is lower than the correlation of US buyout during the 15-year time period in consideration. In other words, European buyout was a better diversifier than US buyout when added to a public equity portfolio focused on the same region⁸. A plausible explanation for this observation is that the US market is highly integrated and interconnected. With different currencies, political regimes and economies the European market seems to be more fragmented. Market fragmentation occurs when the market is not dominated by single forces, but instead smaller and local events drive the market. In a fragmented market, various forces may pull in opposite or different directions, which reduces correlation and increases diversification.

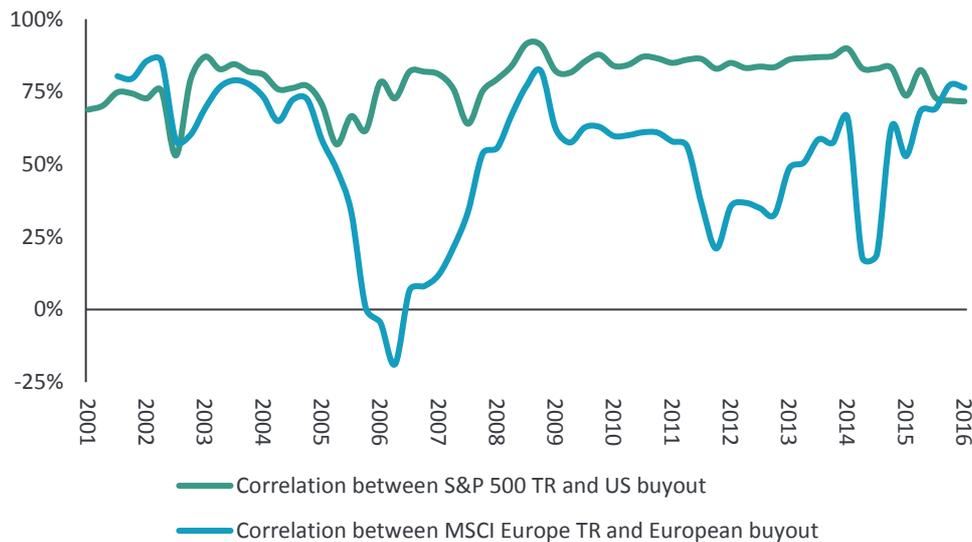


Figure 2: 3-year rolling correlation between S&P 500 TR and US buyout and between MSCI Europe TR and European buyout. European and US buyout data based on Cambridge Associates data as of June 30, 2016.

⁷ Private equity creates values through EBITDA growth, cash flow generation, market arbitrage, asset quality improvement and leverage. Source: Capital Dynamics.

⁸ According to Cambridge Associates, the pooled IRR for both US buyout and EU buyout was just about 12% for the aggregation of the 2001 to 2016 vintage year funds as of June 30, 2016. The two asset classes offered similar returns over the last 15 years, but EU buyout exhibited a lower level of correlation with public equity than US buyout.

Correlation on the fund level

We have examined the correlation at the portfolio level, meaning that the *pooled* quarterly returns of buyout funds from Cambridge Associates were compared with the returns of the public equity benchmark. In addition to portfolio returns, we can drill down to fund level returns and calculate the correlation between each fund with and its corresponding public equity benchmark before taking the average of the correlations. To go even one step further, we can measure the correlation between each private company and its corresponding public equity benchmark.

Since Cambridge Associates does not publish fund or company level returns, we need a more detailed dataset. The proprietary data from Colmore provides accurate return data at the fund level as well as for each company the fund is invested in. Over the last 15 years, Colmore’s dataset has captured more than 340 European and US buyout funds – these funds have invested in more than 5,000 companies. While the Colmore dataset is smaller than the 750 funds in the Cambridge Associates dataset, both datasets exhibit similar correlation figures at the portfolio level. This can be concluded from Figure 3, where the same analysis has been performed as in Figure 2, but with the Colmore dataset. In both figures the correlation peaks during the financial crisis. After the financial crisis, the correlation of European buyout drops significantly, while the correlation of US buyout remains high. Before the financial crisis, the pattern across European buyout was similar in both figures, while US buyout behaved slightly differently. Given the similarity in correlation, the diversification and the accuracy of the buyout data from Colmore, we believe it is fair to assume that its analysis can yield results representative of a typical private equity investor.

Colmore’s proprietary dataset

Over the past 15 years, Colmore’s dataset has captured more than 340 European and US buyout funds, which have invested in more than 5,000 companies. Both the fund and company level data offer a high degree of granularity and accuracy.

In terms of granularity, cash flows, quarterly valuations and various static data fields are available on the fund and company level. Accuracy is guaranteed by Colmore’s data sourcing process, which solely relies on data directly received from the fund’s general partners.

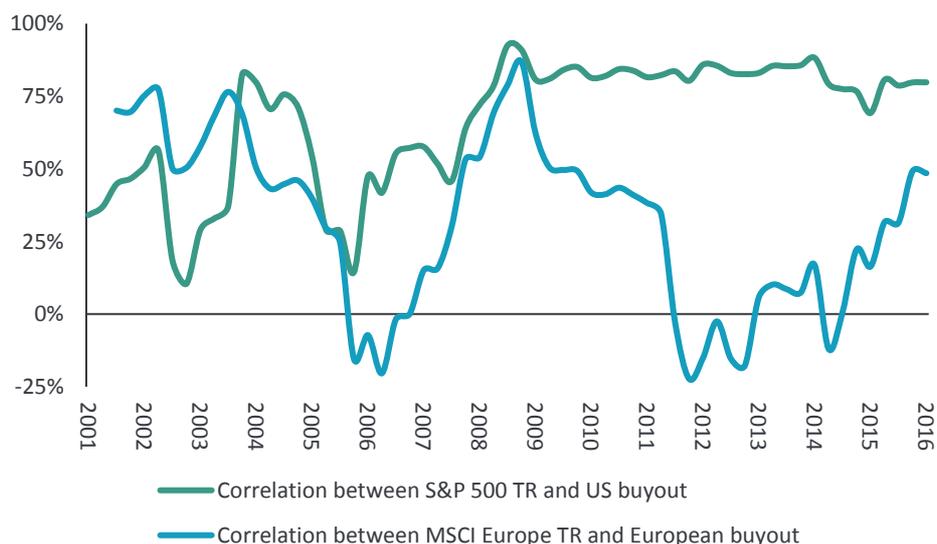


Figure 3: 3-year rolling correlation between S&P 500 TR and US buyout and between MSCI Europe TR and European buyout. European buyout and US buyout data based on Colmore data as of June 30, 2016.

Figure 4 depicts the average correlation between buyout funds and their corresponding public equity benchmark based on the Colmore dataset. Compared to the portfolio level returns (Figure 3), the average fund level correlation is generally much lower. A plausible explanation for the lower correlation is that at the portfolio level many of the fund-specific factors, such as industry-specific or geography-specific developments, net each other out and only common movements such as interest rates, FX rates or GDP growth rates remain in the portfolio. The fund-specific factors can be called *idiosyncratic* factors while the common movements are often referred to as *systematic* factors. At the portfolio level, both public equity and private equity returns are driven by the systematic factors leading to a strong correlation across the two asset classes. At the fund level, the idiosyncratic factors remain and reduce the correlation.

Idiosyncratic vs systematic factors?

Idiosyncratic risk factors are uncertainties that are specific to an asset such as a stock or a fund. Idiosyncratic factors can be mitigated by pooling several assets together. These factors often relate to microeconomic variables specific to the stock or the fund.

In contrast, *systematic* risk factors are factors that cannot be diversified away in an investment portfolio. They relate to macroeconomic variables such as GDP growth rate, unemployment rate or geopolitical events.

Other themes highlighted at the portfolio level repeat themselves at the fund level. Firstly, the correlation of US buyout funds is generally higher than the correlation of European buyout funds. Secondly, the fund level correlation peaks during the global financial crisis. During the crisis, idiosyncratic factors are overshadowed by macro events increasing the correlation at the fund level.

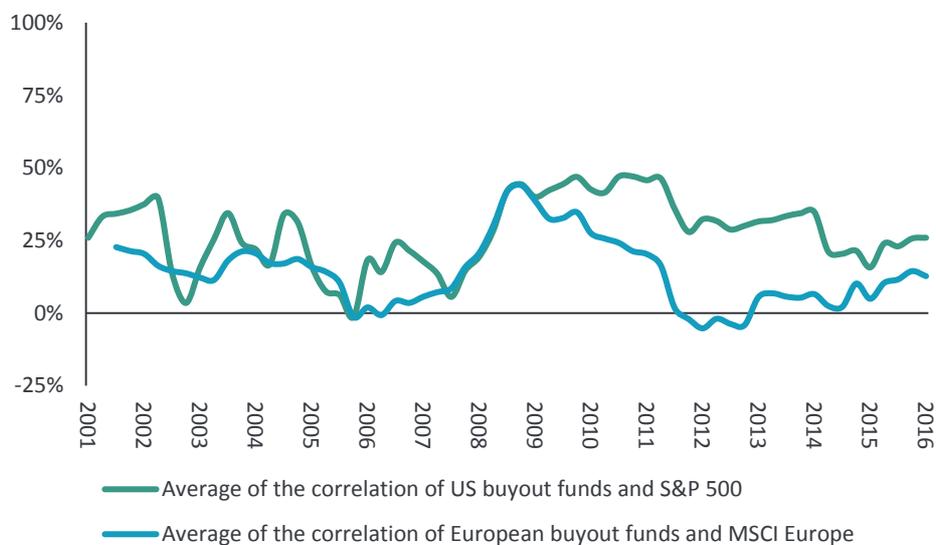


Figure 4: Average of 3-year rolling correlation between US buyout funds and S&P 500 TR and average of 3-year rolling correlation between European buyout funds and MSCI Europe TR; analysis based on Colmore data as of June 30, 2016.

Correlation on the company level

From the fund level, we can drill down to company level returns. Figure 5 depicts the average of the 3-year rolling correlation between the quarterly returns of buyout companies and their public equity benchmark. Compared to the fund level correlation, the company level correlation is even lower. This decrease in correlation is likely due to the same reasons as the decrease in fund level correlation compared to portfolio level correlation – returns from a single company are driven by company-specific developments, which are not mirrored by the general public market. At the fund level, some company-specific factors cancel each other out, thereby increasing correlation.

For the public equity benchmark, we have taken the S&P 500 and the MSCI Europe for US buyout and European buyout companies, respectively, as shown in Figure 5. We refined the analysis by selecting an index that does not only match the geography of the company, but also its GICS classification. The level and pattern of the correlations do not change significantly as a result of the enhanced public index benchmark.

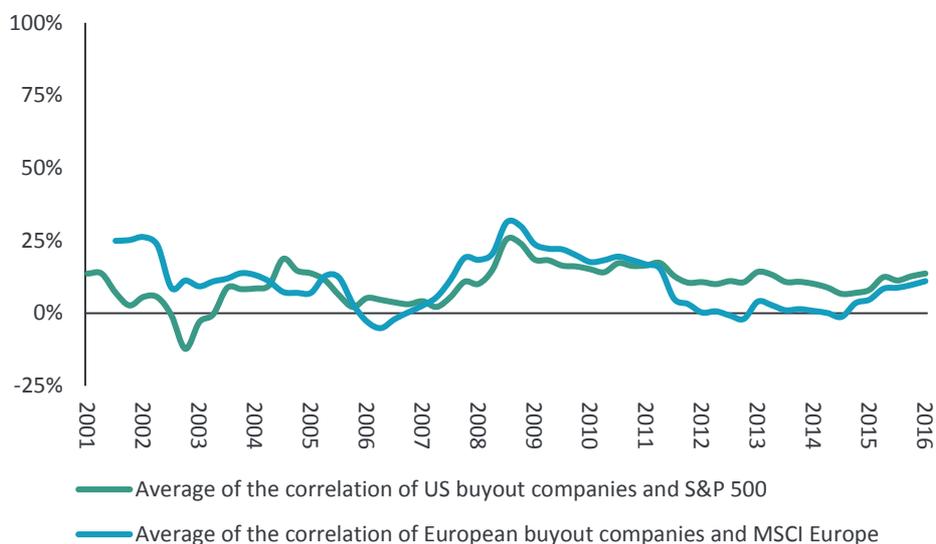


Figure 5: Average of 3-year rolling correlation between US buyout companies and S&P 500 TR and average of 3-year rolling correlation between European buyout companies and MSCI Europe TR; analysis based on Colmore data as of June 30, 2016.

The preceding analysis shows that more concentrated private equity portfolios exhibit lower correlations with their public equity peers. One may draw a naïve conclusion from this which leads to a pitfall that investors should hold highly concentrated private equity portfolios in order to construct more *efficient*⁹ overall portfolios. While assets with low correlations are desirable, the correlation alone is not the only contributor to the overall volatility of the portfolio. The standalone volatility of the assets together with the correlation between these assets define the volatility of the portfolio. Therefore, a highly concentrated and hence a highly volatile private equity portfolio is likely to increase the overall volatility of a portfolio. As a result, adding a concentrated private equity portfolio yields a less efficient overall portfolio, assuming that the incremental amount of volatility is not compensated for by the additional return generated by the highly concentrated private equity portfolio. Investors need to balance expected correlation, volatility and returns to build efficient portfolios. Focusing on any single component may result in subpar risk-adjusted portfolio performance.

⁹ An efficient portfolio is a portfolio that offers the highest level of expected return for a given level of risk. It is a part of Markowitz’s modern portfolio theory.

Conclusion

Private equity not only offers attractive returns, but also diversifies an investor's equity allocation. The study has shown that over the past 15 years the average correlation between European/US buyout funds and public equity has been 80% at the portfolio level. At the fund and company level, the correlation has decreased due to idiosyncratic factors driving the fund and private company returns. These idiosyncratic factors not only constitute the fundamental differences in investment models between private and public equity, but also contribute to the outperformance of private equity over public equity. Private equity ownership can drive growth and operational improvements as well as ensure close alignment of interest between the GP and management of the company. Additionally, the active ownership model in private equity plays a major role in outperformance. Furthermore, private equity firms can obtain unique access to internal information of their investment targets during the due diligence process and exploit inefficiencies in private markets. Moreover, the much larger universe of private companies compared with quoted companies provides more investment opportunities. Enhanced investment selection, exit timing and negotiation skills provided by private equity managers help create outperformance over public equity. These fundamental differences suggest that a continuation of such outperformance can be expected.

About the Authors



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Rainer is a Senior Associate in Solutions at Capital Dynamics. He has over four years of experience in private equity portfolio risk management, portfolio construction and modelling of secondary transactions. During his studies he gained initial work experience as Quantitative Engineer and Financial Analyst. Rainer holds a Master's degree in Mathematics from the Swiss Federal Institute of Technology (ETH). Rainer holds the professional designation of Financial Risk Manager (FRM) and Chartered Financial Analyst (CFA).



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About Capital Dynamics

Capital Dynamics is an independent, global asset manager, investing in private equity and clean energy infrastructure. It is client-focused, tailoring solutions to meet investor requirements. It manages investments through a broad range of products and opportunities, including separate account solutions, investment funds and structured private equity products. Capital Dynamics currently has USD 27 billion in assets under management/advisement¹⁰.

The firm's history dates to 1988. Its senior investment professionals average over 20 years of investing experience across the private equity spectrum¹¹. It believes that its experience and culture of innovation give it superior insight and help it deliver returns for its clients. It invests locally while operating globally from its London, New York, Zug, Tokyo, Hong Kong, San Francisco, Munich, Birmingham, Seoul, and Scottsdale offices. More information about Capital Dynamics is available at www.capdyn.com.

About Colmore

Colmore is an independent portfolio servicing company with clients around the world. Launched in January 2017, Colmore is comprised of the former portfolio servicing function within private asset manager Capital Dynamics, and builds on over 25 years of experience. Colmore services assets valued at over USD 27 billion.

¹⁰ Capital Dynamics comprises Capital Dynamics Holding AG and its affiliates; assets under management/advisement, as of September 30, 2016, include assets under discretionary management, advisement (non-discretionary), and administration across all Capital Dynamics affiliates. Investments are primarily on behalf of funds managed by Capital Dynamics.

¹¹ Average years of experience held by Capital Dynamics' 20 most-senior investment professionals.

Headquartered in Birmingham, UK, and with offices in Switzerland and the US, Colmore offers performance monitoring and financial reporting services. Colmore's clients benefit from a state-of-the-art client web portal offering an unparalleled, real time look-through of portfolio assets and access to advanced analytical tools. This secure, progressive technology platform is custom-built to service private asset investments.

The Colmore team has a wealth of experience in delivering to a wide range of clients from large institutions to individual investors. Professionals at Colmore follow internationally recognized control processes within an audited framework, possess detailed knowledge of asset classes and continuously invest in cutting-edge technology; equipping Colmore to meet the most demanding portfolio servicing requirements.

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