

## DEMYSTIFYING

# STATISTICAL ARBITRAGE

*Innovation in computer processing power and machine-learning has brought about new ways to invest and extract alpha from the markets. Statistical Arbitrage (“Stat Arb”) is an investment strategy that was not available to most investors just 20 years ago. Investors should do their best to understand these different kinds of strategies and evaluate whether they could be a good candidate for portfolio inclusion. This whitepaper discusses stat arb as an investment strategy, compares it to other methods of quantitative investing, and briefly discusses including stat arb in a portfolio.*

## WHAT IS STATISTICAL ARBITRAGE?

The term Statistical Arbitrage describes a large set of quantitatively driven trading strategies that seek to exploit relative price movements across hundreds or thousands of instruments (usually equities) through a technique known as pairs trading. A pairs trade opportunity is based on the statistical relationship of two related assets, and is designed to take advantage of short-term deviations from their long-term established mean value. For example, the stock prices of two companies in the same sector (i.e.: Coca-Cola & Pepsi) should be driven by many of the same factors and thus, react together to changes in these factors (such as a change in the price of sugar). A pairs trader would observe the long standing statistical relationship of these two stocks, and initiate a trade when there is a disconnect in this relationship with the anticipation that this break in correlation is only temporary, and that the prices will revert to their historically normal mean. Holding periods could range from hours to days, weeks or longer. By

placing hundreds of pairs trades with positive expected returns across the portfolio, managers take advantage of diversification across stocks to potentially deliver a low-volatility investment strategy which has historically been uncorrelated with the market.

Over the years, stat arb managers have become increasingly sophisticated in their abilities to identify statistical relationships between assets beyond simple pricing relationships. There are managers who have developed models to analyze other stock attributes in what has become known as a multi-factor stat arb approach. Additional signals can be designed using factors such as corporate activity, short-term momentum, long-term valuation anomalies based on financial filing data, etc. These additional inputs can help managers identify multi-dimensional statistical relationships amongst a group of stocks, and basket-trade stocks in pair trade fashion.



## WHY SHOULD YOU CONSIDER INVESTING IN STAT ARB?

The strategy demonstrates several attractive attributes. These commonly include:

- 1) Potential to profit in any market environment, including sideways or bear markets
- 2) The overall exposure is usually market neutral, exhibiting a near zero market beta
- 3) Returns are historically uncorrelated to most other investment strategies and asset classes
- 4) A tendency to benefit in a rising volatility environment
- 5) The trade signals are systematic, rooted in statistics, and provide rules based decision-making – thus they can be applied in significant scale and can make for a very diversified portfolio

The broadly diversifying attributes of statistical arbitrage strategies can be an additive in the context of an overall portfolio, especially in volatile market environments. By seeking to exploit opportunities within a group of specific stocks and while maintaining neutrality from other broad market factors, *it is anticipated that the strategy would maintain a low correlation to a wide range of common factor exposures such as equity, credit, duration, etc.*

Thus, the strategy is designed to attempt to produce consistent returns with relatively low volatility and low correlation in a variety of markets, and its attributes are generally attractive regardless of broad equity market direction. AlphaCore advocates allocating to strategies that offer diversified returns and stat arb can be a thoughtful complement to broader equity exposure.

## WHAT DOES A PAIRS TRADE LOOK LIKE?

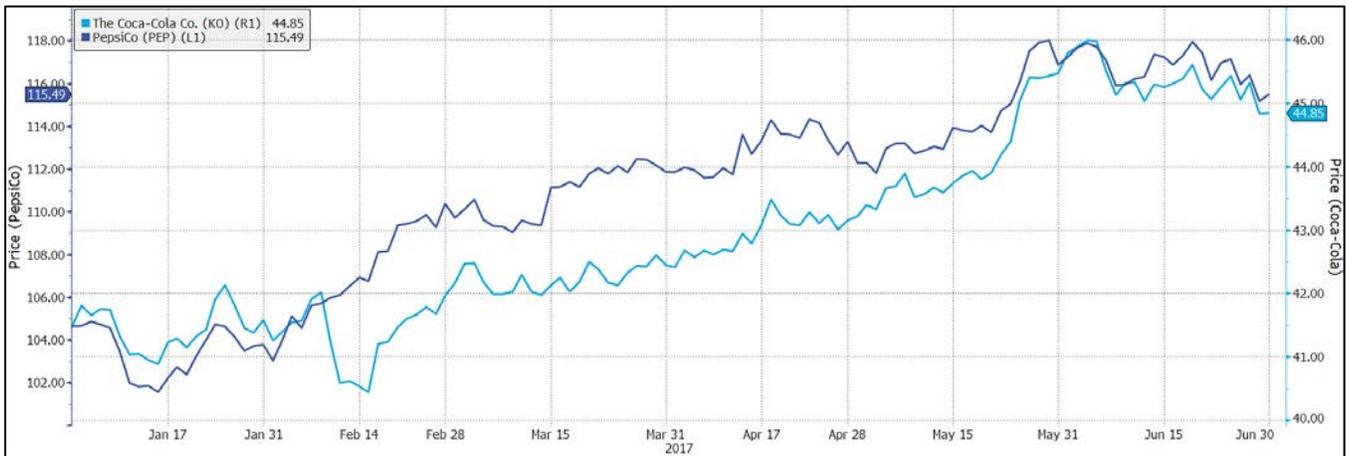
The example below is designed to illustrate the rationale and basic structure behind a pairs trade.

Let's revisit the classic pair of closely related stocks: Coca-Cola & Pepsi. Both stocks are in the same sector, run very comparable businesses, and are expected to react similarly to changing industry and market factors (see Exhibit 1). Any meaningful deviation from their historical pricing relationship could potentially create a pair trade opportunity. All else being equal, say in the event of a sharp rise in sugar prices, one would expect both stocks to react negatively from the increase

in input costs. Continuing with our example, let's say Pepsi stock decreases sharply in price, while Coca-Cola stock barely moves. For whatever reason, the market has not yet priced this factor change for Coca-Cola's stock. A pair trade would be initiated where a long position would be taken in Pepsi (stock B in green) stock, and a short position in Coca-Cola (stock A in red) stock (Exhibit 2). The expectation is that the price gap between these two stocks should revert to their historical mean spread. This same principle can then be applied to not just a simple pair of stocks, but simultaneously across a larger basket of similar stocks.

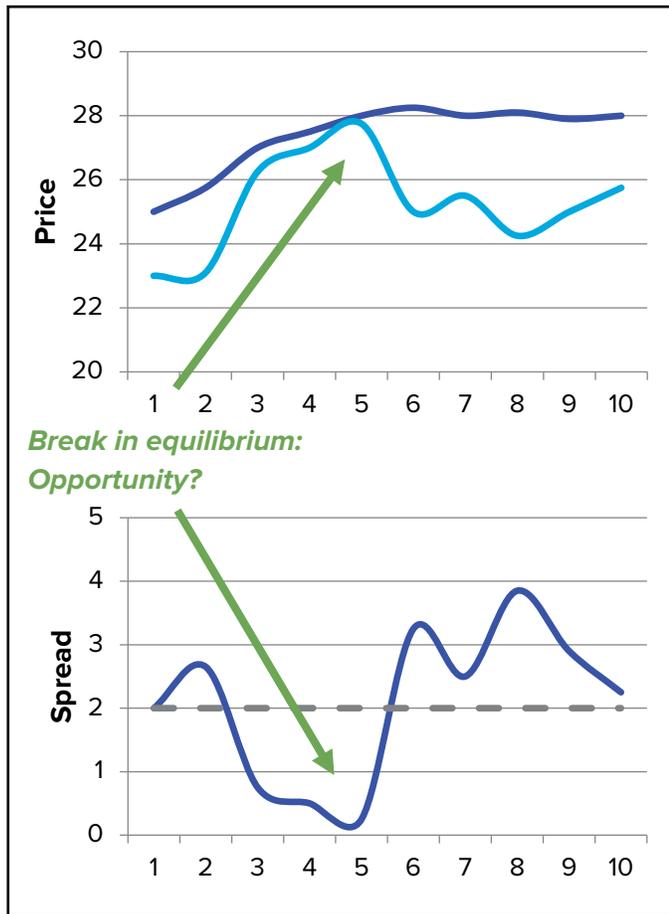


**Exhibit 1.** Price movement of KO (The Coca-Cola Co) and PEP (Pepsi) (1/26/2017 – 6/30/2017)



Source: Bloomberg, as of 6/30/2017

**Exhibit 2.** Illustrates a hypothetical sharp increase of production inputs that would cause a short-term deviation in the pricing relationship between Stock A and B. A pairs trade would attempt to capture the reversion of the spread back to equilibrium as shown by the dotted line below. These charts and example are for illustrative purposes only, and do not reflect an actual trade executed directly or indirectly by the Fund.



Ideally, the expected profits of the trade would be realized once the pair of stocks revert to their expected values, and each respective position is closed out. Of course, in practice, not all pair trades materialize as forecasted, and pricing deviations of a pair can move farther away from their equilibrium. By applying portfolio optimization, sizing each position prudently and diversifying trades across hundreds of stock pairs, the strategy can diversify away from many of the inherent stock specific risks associated with each individual pair trade.

*As mentioned earlier, the desirable traits of such a portfolio is the potential market neutrality of the portfolio, and excess return generation based on model-driven rules rather than the underlying fundamentals of a stock.* The trading approach involves going long on a certain stock while shorting another, in such a way that the resulting portfolio has no net exposure to broad market moves. From this perspective, the strategy could be described as market neutral.



## WHAT ARE THE POTENTIAL RISKS?

Of course, there is always risk in investing. There is a risk that the pricing dispersions never converge back to their expected normal or that a specific historical relationship disappears entirely, reflecting a new relationship which could remain static for a substantial period. Thus, the relationship would lose money on both the long and short side of the trade. Sophisticated managers will attempt to address this risk by utilizing additional inputs such as corporate actions or newly available public information.

Model risk is a paramount consideration. The statistical relationships amongst a specific

group of underlying assets that a model is based upon may no longer hold. There is a reliance on the model to recognize and account for new information in calculating the expected pricing relationship.

Investors must also be aware of use of leverage in many statistical arbitrage strategies. Given the strategy's design of recognizing inefficiencies across hundreds or thousands of pairs trades, these opportunities can be relatively small. Managers may seek to magnify the effect of spread compression using leverage. Naturally, leverage will also magnify losses when spreads diverge further than initially forecasted.

## IS THIS A FORM OF HIGH FREQUENCY TRADING (HFT)?

Simply put, no. It's important that we distinguish the various types of quantitative investment strategies that exist today. Stat Arb is not HFT. HFT, is however a type of quant investing. Quantitative investing, developed and implemented by "Quants" (quantitative researchers that develop algorithmic trading strategies), are automated trading strategies whose rules are developed using computer systems and implemented using algorithms. Quant investing covers a variety of different trading strategies: fundamental quants, statistical arbitrage (stat arb), and high-frequency trading (HFT). The common feature shared by these underlying strategies is their computerized and automated execution feature. Various market participants each utilize their own strategies to serve their own unique market functions; this is what makes and promotes a healthy, functioning market. The obvious advantage behind quant trading strategies is their ability to scale trading decisions and execution quickly and efficiently at a much faster pace than any human ever could.

Exhibit 3 on the following page may help clarify some of the key differences amongst these strategies.

Fundamental quant investing applies fundamental analysis in a systematic way, and is therefore rooted in economic and fundamental theory. However, it applies statistical data analysis to help identify changes in the underlying fundamental data sets. Fundamental quant investing is a relatively slower turnover strategy given that the underlying fundamental model data is a slower changing data set. Turnover for these type of strategies is anywhere from a few days to months.

*Stat Arb is a strategy rooted in exploiting relative mispricing of closely related stocks.* Trades are implemented based on arbitrage pricing and statistical relationships, and therefore turnover of the portfolio is much faster than fundamental quant investing. Trading occurs over the course of a few hours to a few days. Capacity is also more constrained given the narrower universe of stocks with arbitrage



**Exhibit 3. Comparing Quantitative Investing<sup>i</sup>**

	<b>Fundamental Quantitative Investing</b>	<b>Statistical Arbitrage</b>	<b>High-Frequency Trading</b>	
	<b>Based on</b>	Economics, finance, statistics	Arbitrage relations, statistics	Statistics, engineering, information processing
	<b>Turnover</b>	Days to months	Hours to days	Instances to hours
<b>SLOWER</b>	<b>Capacity</b>	Higher	Moderate to Low	Lower
	<b>Who determines trade</b>	Strategy	Strategy, market-dependent	Market
	<b>Backtest</b>	Reliable	Transaction-cost estimate essential	Unreliable
				<b>FASTER</b>

spread opportunities. By and large, this is not high frequency trading like the trading depicted by Michael Lewis in “Flash Boys”.

Lastly, HFT is all about speed. Success of the strategy is heavily dependent on the speed of the information processing abilities of the systems, and the speed at which systems can reach exchanges. These strategies have incredibly high turnover, seeking to execute trades instantly. The emergence of high frequency trading has provided added market

liquidity. Often serving as market makers, HFT will submit both buy and sell limit orders to multiple exchanges, and letting the market hit the orders. The heavy negative press and coverage on high frequency trading from time to time is the result of the suspicious practices of a few market players involved in cases of front running, spoofing, and layering. In short, the deliberate and dishonest actions of a few individuals have given this incredibly common mode of trading a poor reputation in the public eye.

## CONCLUSION

Because of the unique return and risk characteristics of a statistical arbitrage investment strategy, we believe it is prudent for many investors to incorporate such an allocation

as a portion of their portfolios. The unique characteristics are not only complementary to traditional stock and bond portfolios but are also non-correlated to most other alternative



strategies. It is important to maintain vigilant oversight in order to remain confident that the specific pairs trading methodology utilized is robust and has not degraded. Although statistical

arbitrage is difficult to access we believe is a valuable diversification tool in an asset allocation process.

**Please contact AlphaCore Capital at 858-875-4100, or at [info@alphacorecap.com](mailto:info@alphacorecap.com) to learn more about statistical arbitrage and how it can be used in a portfolio.**

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<sup>1</sup> Elements of this exhibit were sourced from "Efficiently Inefficient: How Smart Money Invests & Market Prices are Determined," by Lasse Pedersen.

