

The Long and the Short of It: The Quant Shorting Advantage

Driven by increased breadth in the viable investment opportunity set, along with investor demand for products with certain excess return/risk attributes, short selling is now common in several types of investment products – such as equity market neutral, equity long-short, and active extension. The lure of short selling for investors is that it can be a powerful tool to broaden the set of alpha opportunities, with some shorting enabled products even lowering overall portfolio risk and helping preserve capital during market drawdowns.

Short selling involves borrowing and selling shares of a stock that an investor believes will soon decline in price. If the stock does in fact decline, the investor can buy back the shares at a lower price, and deliver the shares back to the lender. The profit for the short seller, if they are correct in predicting a price decline, comes from the difference in price from the time the stock was sold to the time it was bought back.

While the concept of short selling is straightforward, proper implementation of a short selling strategy is not trivial. Because shorting comes with its own risks and costs, and involves the challenge of identifying attractive short selling opportunities, investors are best served with a disciplined and skilled manager at the helm.

Compared to traditional active managers offering equity long-short strategies, quantitative approaches have inherent advantages. We believe QMA's approach in particular is ideally suited for adding value through shorting.

Before exploring the advantages of quantitative approaches when it comes to short selling, it is worthwhile to discuss why shorting enabled products can unlock additional alpha opportunities and potentially deliver higher risk-adjusted performance.

Why Utilize Short Selling?

In a long-only portfolio, when an investor does not have a favorable view on a stock, the best they can do to reflect this view is to underweight or not purchase the stock. Therefore, not being able to short sell a stock means an investor cannot take full advantage of potentially key investment insights. Broadly, a long-only strategy would focus on alpha opportunities an investment manager finds attractive and underweight, or not hold, those stocks which are viewed as most unattractive. As a result, by not shorting stocks, alpha is left on the table. Relaxing the long-only constraint opens up opportunities to find alpha in often overlooked places, an increasingly important advantage in today's low-yield environment.

As Figure 1 illustrates, shorting allows an investment manager to expand the investment opportunity set, expanding the efficient frontier, and increasing the relative return potential at a given risk level.

Being able to fully utilize information possessed by an investment manager is only one benefit of short selling. Short selling stocks also provides managers with more capital to overweight those attractive stocks in the long-only component of the portfolio. In an active extension product, cash proceeds from the short sale of the stock can be used to extend holdings in attractive stocks, substantially increasing active exposures in a portfolio.

1/SHORT SELLING CAN IMPROVE THE RISK-RETURN TRADE-OFF

Relative Efficient Frontier

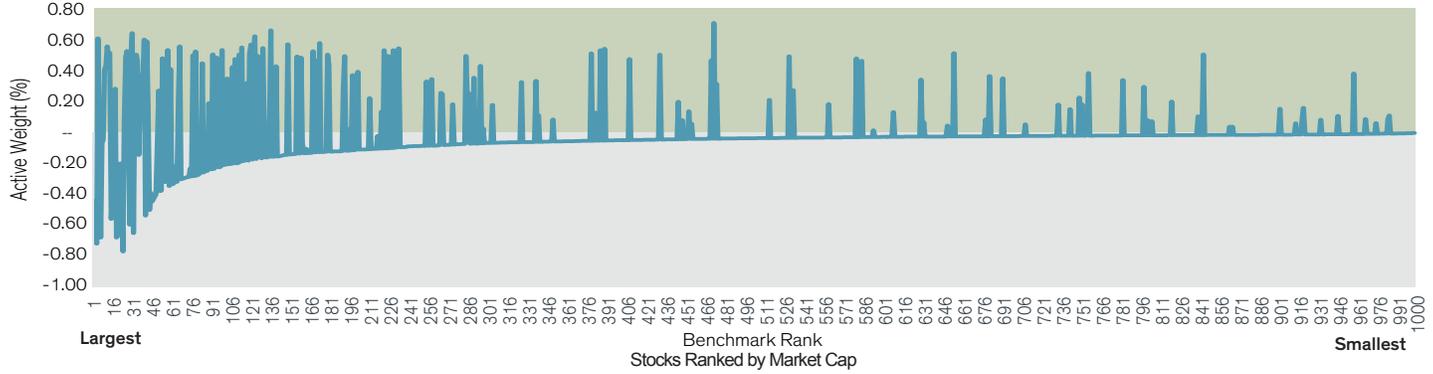


*Shown for illustrative purposes only and not indicative of any actual QMA portfolio. Source: QMA.

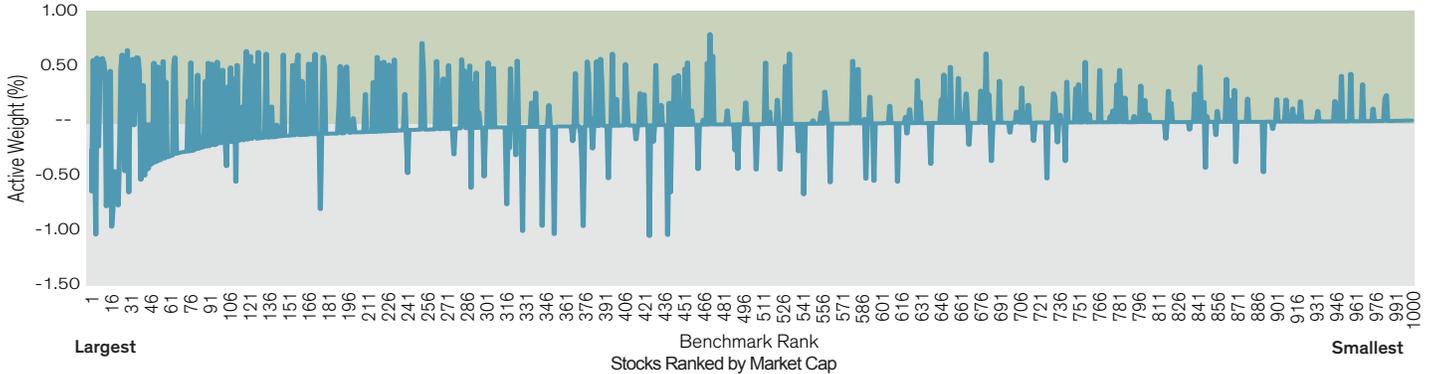
Figure 2 illustrates the additional long exposure for attractive names that can be achieved when shorting is simultaneously employed. Here, we see active exposures relative to the Russell 1000® Index for two hypothetical portfolios sorted by market cap rank in the benchmark. Both portfolios have 100% net market exposure. In other words, short selling allows an investment manager to transfer more investment insights into their portfolio, expanding the investment opportunity set, and increasing the possibility of better investment outcomes.

2/ ADDING SHORTS INCREASES EXPOSURE TO MOST ATTRACTIVE STOCKS

Long-Only Active Weights*



Long/Short Active Weights*



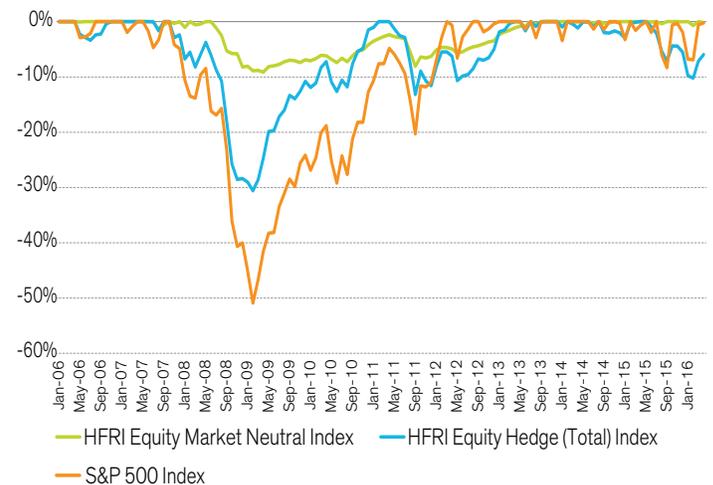
*As of 6/30/2016. Sources: QMA and FactSet. Shown for illustrative purposes only. Representative Russell 1000® benchmarked portfolio. Holdings are subject to change. The Russell 1000® Index is a trademark/service mark of Russell Investments. Russell is a trademark of Russell Investments.

Short selling also provides risk mitigation benefits – specifically allowing an investment manager to reduce the market exposure of a portfolio. The additional short names provide diversification benefits to the overall portfolio, adding value in various market conditions—particularly during times of falling prices, when gains from short positions can reduce overall portfolio volatility by offsetting losses from long positions and help preserve capital. To highlight this last point, Figure 3 shows the max drawdown over ten years for the Hedge Fund Research Index (HFRI) Equity Market Neutral Index, HFRI Equity Hedge (Total) Index, and the S&P 500 Index. For instance, during the financial crisis of 2008, the market was down over 50%, as represented by the S&P 500, whereas the Equity Hedge Index was down around 30% and the Market Neutral Index only declined approximately 10%. Across short strategies that target a beta exposure of less than one, the potential drawdown protection afforded by the ability to short sell is apparent.

Further, more sophisticated short sellers can also look to vary the level of short selling through time to correspond with different market conditions. If at times they expect a higher likelihood of a market decline, they may increase the level of short selling in their portfolio. At other times, they have the option to scale back their short selling. In this setting, short selling can be used to dynamically or tactically adjust a portfolio’s market exposure.

3/ MAX DRAWDOWN OF MARKET NEUTRAL AND EQUITY LONG-SHORT PRODUCTS

Comparison to Drawdown of S&P 500



As of 4/30/2016. Source: QMA, using data provided by Zephyr, Standard & Poor’s. Shown for illustrative purposes only. Hedge Fund Research Index (HFRI) returns were sourced through Zephyr. Zephyr is an outside vendor whose software has been used to create this exhibit. QMA pays a fee for this software. QMA has made efforts to confirm accuracy/reliability of the data provided by Zephyr but we disclaim responsibility for its accuracy or completeness. Universes: HFRI EH: Equity Market Neutral Index and HFRI Equity Hedge (Total) Index. Maximum drawdown is the peak-to-trough decline during a specific record period. Please see notes to disclosure for important disclosures. Subject to change. An investment cannot be made directly in an index.

It is important for an investor to understand that short selling is no free lunch. While short selling can give a significant alpha edge, there is an asymmetrical risk associated with such a strategy. When buying a stock, the maximum downside risk is 100%. In contrast, when short selling a stock the downside risk is theoretically infinite. As discussed later, quantitative managers generally have more tools at their disposal to diversify this downside risk of individual short positions.

How Is Shorting Used in Different Products?

There are three main categories of shorting enabled equity products, as shown in Figure 4. They vary based on the level of market exposure provided and expected alpha.

First are active extension products that offer complete market exposure, or in other words have a beta of one (or very close to one). These products may go by more specific names such as 130/30.

The premise of these strategies is to sell short a certain percentage of the portfolio, for instance 30%, and invest the proceeds from these short sales into additional long positions that take the portfolio's long positions to 130% of initial capital. On a net basis, the portfolio is still 100% long – with full market exposure – but it also has a gross exposure of 160% (130% in long positions and 30% in short positions), increasing the active exposures and the alpha opportunities.

The next category of shorting enabled products are referred to as equity long-short. These products will typically look to partially hedge market exposure, resulting in a net exposure that may range between 20% and 80%. The level of short selling will vary to deliver this net exposure target. This variation will be a

function of market conditions. The end result is ideally an equity-like return stream, but with less volatility.

The last category of shorting enabled products are equity market neutral portfolios, which seek to completely hedge market exposure (i.e., 0% net market exposure), with alpha being the sole driver of overall return. Ideally, they should generate a return stream that has low or no correlation with equity markets.

What Makes Each of These Shorting Enabled Products Attractive Today?

Each of these three products can be attractive for investors at any particular time given investors' varied investment objectives and needs. That said, each of the three categories of shorting-enabled products can help address distinct issues facing investors in the current environment.

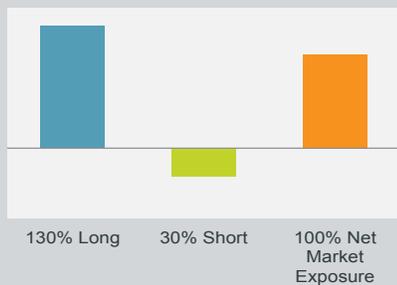
Starting with active extension strategies, there is a widely held view that we are in a low return environment with single digit returns on the horizon for equity markets. In this environment, any additional return is particularly valuable. Here, active extension strategies are attractive due to the higher return offered as a result of the increased active exposures in the portfolio.

Next, with respect to equity long-short strategies, while we are in a low return environment, there is also a heightened level of uncertainty stemming from events such as the Brexit and elections in the United States. Some believe that while the market could grind higher, there is a risk of a market drawdown. In these conditions, equity long-short strategies are attractive because they aim to deliver performance comparable to current equity return expectations, while offering downside protection in the event of a market pull back.

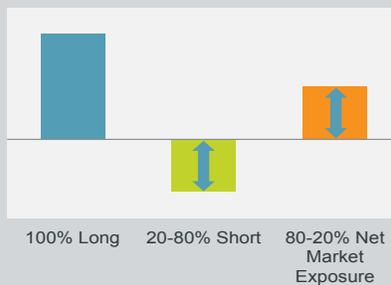
4/ COMPARING LONG-SHORT EQUITY EXPOSURES

Three Main Categories

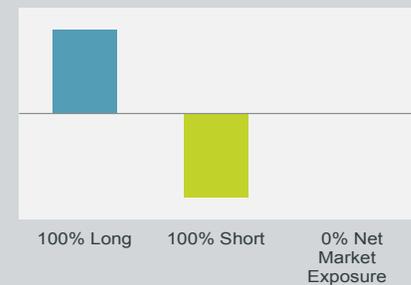
130 / 30



LONG / SHORT



MARKET NEUTRAL



	Long Only	130 / 30	Long/Short	Market Neutral
Equity Exposure "Beta"	1.0	1.0	Varies	0.0
Benchmark	S&P 500	S&P 500	Varies	Cash +
% Shorts	0%	30%	Varies	100%

Shown for illustrative purposes only.

Admittedly, if the market surges higher, an equity long-short strategy will lag – but that is a reflection of the intentional lower market exposure.

As for equity market neutral strategies, in the current environment they are being viewed as an alternative to a fixed income allocation. With yields low in fixed income markets, equity market neutral offers a more stable equity derived return stream that has a low correlation to both equity and fixed income markets.

In General, When Are Shorting Enabled Products More Effective?

People normally think stock prices need to decline in value for short selling to be effective. That is ideal, but the reality is the number of stocks that decline in value varies greatly through time. For instance, during the financial crisis in 2008, 93% of stocks in the S&P 500 declined in value. In contrast, during the bull market in 2014, only 20% of stocks in the S&P 500 declined in value.

Any shorting enabled product aiming to profit from absolute price declines can face challenges through time, depending upon the number of stocks that decline in value. Many investment managers actually use short selling to capture value from insights on relative performance between two stocks, or groups of stocks, with certain attributes. For example, if in a market neutral strategy, an investor has insights on two stocks and thinks that Stock A will increase by 20% whereas Stock B will increase by 8%, the investor can buy A and short sell B to capture an expected return of 12% without exposure to the general market.

This idea can be extended to stock attributes. If cheaper stocks typically outperform expensive stocks, an investor can buy a basket of cheap stocks and short sell the basket of expensive stocks, capturing the return difference between the two baskets.

For shorting enabled products that aim to capture the relative performance between stocks, this approach is most effective when there is dispersion in stock returns – a meaningful spread in the return between the best performing stocks and worst performing stocks in the market.

Looking back over the past twenty years, there has typically been a reasonable level of dispersion within the market. This indicates that shorting enabled products that aim to profit from relative performance between stocks can be effective in most environments. In recent years, return dispersion, while still at reasonable levels, has been lower relative to history. In this environment, a manager's stock selection skill is increasingly important.

The Quant Shorting Advantage

When it comes to implementing a strategy involving short selling, a quantitative approach like the one developed at QMA has inherent advantages. These advantages relate to enhanced

stock selection, risk management, and cost control.

First, a quantitative stock selection strategy is typically symmetrical. This means that quantitative investors not only rank every stock in a universe, but that they may be equally effective at identifying profitable long and short selling opportunities. QMA has been successful at doing this over time. Figure 5 shows the 242 basis points per quarter spread between the lowest and highest ranked stocks in QMA's stock selection model, on an equal weight basis, since 1998.

5/ EXPANDING THE OPPORTUNITIES FOR ALPHA

Quarterly Excess Return (on Average)¹- US Stock Universe²



¹Based on the difference between each group of stocks' returns and the average of all stocks' returns. ²Average quarterly equal-weighted market-adjusted gross returns for all stocks in universe (largest 3,000 US stocks), 1/1/1998 through 6/30/2016. Source: QMA, using data provided by FactSet. Returns are gross of management fees and are only used to illustrate the information implicit in our stock selection methodology. Past performance is not a guarantee or a reliable indicator of future results.

What makes a quantitative process successful at identifying long and short opportunities is that it is a systematic implementation of an investment philosophy. On a daily basis, quantitative processes consume all relevant information on each stock across a broad universe to update each stock's ranking. This systematic approach means quantitative investors are not resource constrained in the task of identifying investment opportunities. Quantitative investors can identify the best and worst opportunities across the whole investment universe. With increased breadth, quantitative investment managers have more opportunities to apply their stock picking skill, increasing the likelihood of strategy success.

A further feature that facilitates return symmetry is the way information is processed. As information changes, the evaluation of a stock will change. Behavioral biases and human limitations do not interfere with the collection and processing of information. The systematic nature of a quantitative process allows for a quick, unemotional reaction to new information allowing for higher return capture for long and short opportunities.

Second, quantitative investors are better equipped to manage the unique risks inherent in employing a strategy that incorporates shorting. Instead of making fewer, larger short sales, quantitative investors maintain a highly diversified portfolio of short positions across sectors and industries to

neutralize unintended portfolio risk. By holding numerous short positions, quantitative approaches provide the advantage of lessening the impact of one or a few losing short positions. Additionally, by minimizing unintended exposures in the portfolio - exposures or effects that are sensitive to macro shocks and to changes in risk sentiment that can produce unpredictable performance – quantitative investors are further able to control the asymmetric risks inherent in short selling.

Third, integration of shorting costs is a natural extension of the quantitative portfolio construction process. For both long and short positions, costs of trading can be integrated to determine a “cost adjusted alpha” before investing. With shorting, the additional costs associated with borrowing stock can be seamlessly taken into consideration and carefully analyzed before transacting. This ensures that quantitative investors identify not only the most attractive long and short alpha opportunities, but also alpha opportunities that can actually be realized in a portfolio.

It is important to note that fundamental and quantitative investors will typically aim to identify short sale candidates that have similar attributes – unattractive valuations, fundamental weakness, along with deteriorating growth prospects and sentiment. The main difference comes down to implementation – how each investor goes about processing information and translating that into a risk and cost controlled portfolio.

In Short...

Because shorting enabled strategies come with their own costs and risk, investors are best served with a disciplined and skilled manager at the helm. At QMA, we have extensive experience implementing successful shorting strategies. Our well-tenured teams of portfolio managers and traders have implemented shorting strategies for over a decade, including throughout 2008’s financial crisis. This track record combined with the accumulated knowledge and expertise our investment team has gained from navigating multiple market cycles allows for a distinctive and grounded approach for managing long-short portfolios.

Our combination of symmetrical stock selection, cost-aware implementation, risk management, and experience has led QMA to successfully manage a suite of shorting enabled equity portfolios, each designed to address different investment challenges.

- **US Core Equity 130/30** provides additional long and short exposures while maintaining a 100% net equity exposure.
- **US Long/Short Equity** is designed to achieve equity like returns with lower than market volatility. The strategy is long 100% equity, and short anywhere between 20-80%. The “net long” is adjusted based on our market outlook.
- **US Market Neutral Equity** holds equal proportions of long and short positions resulting in a 0% net equity exposure, with portfolio performance a pure function of alpha. The strategy targets 3-5% long-term volatility.
- **US Market Neutral Levered Equity** also holds equal long (levered) and short positions resulting in 0% net market exposure, but more than twice the active exposure of the US Market Neutral Equity strategy. The strategy also targets a higher long-term volatility of 6-10%.

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For more information

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About QMA

Since 1975, QMA has served investors by combining experienced judgment with detailed investment research with the goal of capturing repeatable long-term outperformance. Today, we manage approximately \$112 billion* in assets globally for a worldwide institutional client base, including corporate and public pension plans, endowments and foundations, multi-employer pension plans, and sub-advisory accounts for other financial services companies.

*As of 6/30/2016.

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The **S&P 500 Index** is an unmanaged index of 500 common stocks, weighted by market capitalization, representing approximately 75% of the New York Stock Exchange. The value-weighted index represents about 75% of the NYSE market capitalization and 30% of the NYSE issues.

HFRI Equity Market Neutral Index – Equity Market Neutral strategies employ sophisticated quantitative techniques of analyzing price data to ascertain information about future price movement and relationships between securities, select securities for purchase and sale. These can include both Factor-based and Statistical Arbitrage/Trading strategies. Factor-based investment strategies include strategies in which the investment thesis is predicated on the systematic analysis of common relationships between securities. In many but not all cases, portfolios are constructed to be neutral to one or multiple variables, such as broader equity markets in dollar or beta terms, and leverage is frequently employed to enhance the return profile of the positions identified. Statistical Arbitrage/Trading strategies consist of strategies in which the investment thesis is predicated on exploiting pricing anomalies which may occur as a function of expected mean reversion inherent in security prices; high frequency techniques may be employed and trading strategies may also be employed on the basis on technical analysis or opportunistically to exploit new information the investment manager believes has not been fully, completely or accurately discounted into current security prices. Equity Market Neutral Strategies typically maintain characteristic net equity market exposure no greater than 10% long or short.

HFRI Equity Hedge (Total) Index – Equity Hedge: Investment Managers who maintain positions both long and short in primarily equity and equity derivative securities. A wide variety of investment processes can be employed to arrive at an investment decision, including both quantitative and fundamental techniques; strategies can be broadly diversified or narrowly focused on specific sectors and can range broadly in terms of levels of net exposure, leverage employed, holding period, concentrations of market capitalizations and valuation ranges of typical portfolios. EH managers would typically maintain at least 50% exposure to, and may in some cases be entirely invested in, equities, both long and short.

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