

# Conversations With the Buy-Side: Futures and ETFs

MAY 2017

Prepared for:



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## EXECUTIVE SUMMARY

*Conversations With the Buy-Side: Futures and ETFs*, commissioned by CME Group and produced by Aite Group, studies the selection process and perceived costs and benefits of replicating the S&P 500 returns via equity index futures versus exchange-traded funds (ETFs) from a practitioner's point of view. Interviews were held with buy-side portfolio managers and traders to seek their perspectives on the day-to-day influences into their decisions to trade futures and ETFs.

Key takeaways from the study include the following:

- The most enlightened trading desks ensure they use the right tool for the right job in the right market at the right time by calculatedly and deliberately choosing between futures and ETFs to implement a trade.
- It's hard to overstate the importance of liquidity. And while ETF volume and assets under management (AUM) have grown considerably, the liquidity available in the futures market for S&P 500 equity index exposure towers over the liquidity in comparable ETF listings.
- For some investor types and market scenarios, futures are always the more cost-effective option. The futures roll and interest rate variability are important factors in determining the total cost of ownership for a futures position. For the most sophisticated trading desks we interviewed, the temporal nature of futures was viewed more as a source of opportunity and potential alpha than a cost (or operational obstacle) for the trading desk.
- For investors depending on leverage, futures are really the only viable option.
- For firms unfamiliar with futures or lacking a back office to support the desk's trading of futures, ETFs appear to be a simpler and less complex solution with lower barriers, given their similarities to how equities trade and settle. However, once firms familiarize themselves with the way futures work, traders quickly shift their thinking such that futures have less operational and trading risk than do ETFs.

## INTRODUCTION

Both the S&P 500's excellent 2016 performance of approximately 12.3% (including price returns and dividends) and the poor results of active funds further hampered by extensive fees have caused investors to be increasingly interested in passive index replication strategies. But the ways in which institutional investors gain exposure to an equity index can vary greatly, and the considerations associated with trading and holding the basket of stocks, futures, and ETFs are quite different.

There has been much debate about the cost-efficiencies of exchange-traded futures versus ETFs. Futures have generally been considered the go-to instrument type to gain exposure managing equity index investments for the most sophisticated investors, such as insurance companies, pension funds, and other institutions. Still, ETFs have been on a roll with AUM and volume steadily increasing year over year.

The purpose of this interview-based white paper is to learn how portfolio managers and traders consider the trade-offs among the instruments in order to capture index returns without buying or selling an equity portfolio tracking a benchmark. This effort seeks to bring objectivity to the debate and complement various industry studies as well as academic and trade publications.

As we learned, there are several ways to gain access to index returns, but this survey focused primarily on investors selecting between futures and ETFs. These two instrument types are typically preferred for their liquidity, pricing, and ease of trading, relative to the alternatives. Still, given the large range of scenarios and possibilities, we discovered there really isn't a one-size-fits-all answer. There are, however, discernable themes and patterns pointing toward the optimal solutions in each type of scenario. These themes and patterns will be explored throughout this white paper.

## METHODOLOGY

This study utilizes two primary sources of data. Cost-comparison data was provided by CME Group and obtained from its own databases and Bloomberg. In addition, qualitative information was gathered from four interviews conducted by Aite Group with subject-matter experts in the institutional asset management industry during Q1 2017.

## WRAPPING EQUITY INDEX RETURNS

There are several ways an investor can gain exposure to the returns of an equity index without purchasing and managing the basket of stocks: equity index futures, ETFs, index swaps, and index options. While the returns might be similar for each, the approaches to implementation can be very different and may have significant implications for the investor in terms of performance drag, transaction costs, tax efficiency, and leverage.

We have chosen to focus on some of the risks, costs, and opportunities of equity index futures and equity index ETFs for this survey, but the analysis could be extended to cover a wider range of implementations.

Futures and ETFs have commonalities. Both utilize standardized structures and have limited, if any, counterparty risk, and they both offer investors index exposure at generally low costs. One way to think about these products is that they are wrappers to the 100% returns of the cash equity basket. While they both come very close, neither will ever provide a 100% return profile, but they do provide other benefits and opportunities that often outweigh the costs and risks associated with trading the underlying cash equity basket. And the investor, the strategy, the desired exposure, and the market environment will influence the decision about how best to implement the position.

Table A provides a brief overview of the cash flows for trading each.

**Table A: Cash Flows Compared**

Position/Exposure	Hypothetical cash flows
<b>Long equity-index basket</b>	Receive dividends  Capital gains/losses  Opportunity for lending returns (stocks)
<b>Long equity-index futures</b>	Earn interest income on cash collateral, offset the implicit financing cost (which may reflect lender returns) embedded in futures  Futures position gains/losses, including those coming from quarterly roll activities, as well as accrual due to dividends of underlying stocks
<b>Long equity-index ETF</b>	Receive dividends  ETF position gains/losses  Opportunity for lending returns (ETF)

Source: Aite Group

While futures and ETFs have the common goal of tracking a particular index, the price formation for each can differ. Table B summarizes some of the price dynamics attributable to each.

**Table B: Price Dynamics**

Instrument type	Summary
<b>ETFs</b>	<p>ETFs are investment vehicles managed by an investment company registered in a particular jurisdiction.</p> <p>The net asset value is published on a daily basis and audited periodically by independent entities.</p> <p>During market hours, investors may buy and sell shares at a price that reflects the current market value of the assets.</p> <p>Premiums and discounts can occur, reflecting supply and demand, ETF creation and redemption fees borne by authorized participants, which are typically banks, and the costs to replicate the index.</p> <p>Most ETFs have their indicative net asset values calculated and published every 15 seconds.</p>
<b>Futures</b>	<p>Futures are standardized derivative contracts between two counterparties whose performances are guaranteed by a clearinghouse.</p> <p>Futures prices are bracketed by the replication cost by the market-maker, which performs arbitrage among related instruments (e.g., the stock basket, related ETF, index options).</p> <p>Listed futures may be traded between two end users or between an end user and a market-maker—anonymous centralized trading ensures best available price, and as such, futures prices fall within the arbitrage bounds.</p> <p>Replication costs can differ among market-makers based on their particular situation (balance sheet, funding position, inventory, etc.). It is important to appreciate that buyers of futures contracts are implicitly paying sellers not only to replicate the index returns but also to do so with the sellers' own money so pricing reflects a component that represents interest charges on the "borrowed" funds.</p>

Source: Aite Group

## KEY FINDINGS

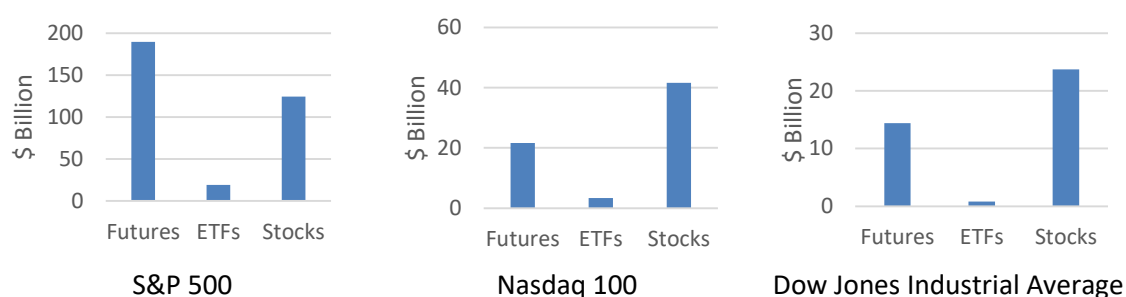
Below is a summary of key observations gleaned from four qualitative Aite Group interviews with subject-matter experts in the institutional asset management industry during Q1 2017.

### LIQUIDITY CONSIDERATIONS

Liquidity was repeatedly highlighted as one of most critical parts of the product selection process. Traders acknowledge that the liquidity will go where it's needed and that the symbiotic interrelatedness of the futures, cash, and ETF markets helps to ensure an overall healthy market to the benefit of all.

U.S. index futures are typically much more liquid than the corresponding ETFs, especially for benchmark indices. Futures daily turnover often dwarfs that of the corresponding ETFs and is comparable to the aggregate turnover of all constituent stocks throughout the entire National Market System. Figure 1 illustrates daily turnover of U.S. index futures compared to corresponding ETFs and shows that, on average, futures trade approximately six to 18 times the daily turnover of the ETFs.<sup>1</sup>

**Figure 1: Daily Q1 2017 Turnover of U.S. Index Futures, Corresponding ETFs, and Underlying Stock Basket**



Source: CME Group

In the case of S&P 500 index-linked products, it is generally acknowledged that the liquidity is much greater, and the depth of the order book for S&P 500 index-linked futures is much deeper (by approximately 10 times), than that offered via comparable ETFs/exchange-traded products (e.g., State Street SPDR S&P 500 ETF SPY, iShares Core S&P 500 ETF IVV, Vanguard S&P 500 ETF VOO) combined. Also, futures are available to trade virtually 24 hours per day, while the U.S. exchanges that list ETFs are only open from 9:30 a.m. to 4:15 p.m. Eastern Time.

1. For S&P 500, E-mini S&P and S&P 500 index futures turnover versus SPY, IVV, and VOO combined; for Nasdaq 100, E-mini Nasdaq 100 futures versus QQQ, QLD, and 1570 JP combined; for DJIA, E-mini Dow Jones Futures versus DIA.



And while it is acknowledged that even ETF volume has grown, the ETF market generally relies on liquidity in the futures market and not the other way around. So when a fund trades ETFs, the market-maker is sourcing liquidity in the futures market. One respondent commented that while the firm does have liquidity thresholds in terms of volume and size, it believes that a well-functioning market and the presence of arbitrageurs will provide liquidity in the instrument type where it's needed.

An example was provided by one firm: It explained that it maintains significant positions in some large index ETFs, and when it needs to transact in large sizes it knows its market-makers are relying on the underlying futures markets to make risk prices. It explained how liquidity in one market facilitates liquidity in the other, and it sees the availability of liquidity in both markets providing investors with multiple ways to execute.

Traders are clearly very conscious of larger traders when trading in the ETF market. One trader explained that he would not want to be managing a large US\$1 billion ETF order over the course of the day, trading with a volume-weighted average price target strategy, for fear of getting "picked off" throughout the life of the order among a fragmented equities market. The same trader explained he felt the futures market is more anonymous and his firm is able to interact with fewer dealers and find a risk bid/offer when/if necessary without having to reveal too much about the trade and to avoid getting "front run."

Dealers are helping their clients gain transparency into just how liquid the market is and where liquidity may be found. Some sophisticated, technology-enabled brokers are now providing clients with web-based dashboards so clients can observe the liquidity in the futures, ETF, cash, and options markets, and get a feel for how much notional can be traded and at what cost in each one of these venues.

## PRICE DISCOVERY

The discussion around price discovery provided some of the most colorful conversations, yet it left much to be debated. Much was made about pricing and "trading noise" associated with each product. Different respondents think quite differently about this aspect of the decision tree.

Some respondents explained how they believe ETF pricing is superior to futures. They argued the continued decrease in average bid-offer spreads for the most liquid ETFs and the increasing rates of turnover and volume put ETFs on par with or ahead of futures pricing.

The same respondents suggested that price discovery in the futures market is subject to fluctuations and greater deviations away from equilibrium prices, at least more so than ETFs. The common belief is that this is the result of changes to the supply side of the market provided by investment banks, and that the extreme richness of the futures roll,<sup>2</sup> particularly from December

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2. A future roll involves closing out of an expiring futures position and initiating a position in the next month's contract, usually done by trading a calendar spread that simultaneously executes both transactions.

2012 to June 2015, is the result of increased regulation, such as balance sheet charges and increased leverage ratios.

Still, other respondents feel differently. Here, the sense is that futures provide a simpler product for which “the price is the price,” whereas with ETFs there remain questions as to what drives price: the bid/offer on the screens, up to what size and what’s shown and hidden in the depth of book, and all sorts of other implied transaction costs.

All respondents acknowledged that trading noise happens in both markets. But when prompted, respondents shared their sense that during times of major market moves or disruptions, price discovery is worse in the ETF market than in the futures market, at least until markets stabilize. The extreme volatility and associated mispricing situations attributed to ETFs that occurred on August 24, 2015, were still top-of-mind among almost all respondents. They acknowledged that during periods of market stress, such as August 24, 2015, they are likely to step back and wait until the market stabilizes but that if they had to get in or out of positions, they would turn to futures before ETFs.

## COSTS

We learned how cost-conscious firms closely monitor the inputs and their models to determine which instrument type will provide the lowest implementation costs to the portfolio. In terms of the costs associated with the futures roll, it very much depends on the type of investor, trade, time horizon, and market environment. But we also learned that for some types of trades, futures will always come out ahead (Table C). For fully funded investors, however, traders would be well-served to consider all their options and inputs.

**Table C: Cost-Effectiveness by Scenarios at a Glance**

Scenario	Futures roll is cheap (under 3-month USD-Libor [3mL])	Futures roll is rich (over 3mL)
<b>Fully funded investor</b>	Futures	Depends on holding period and richness
<b>Leveraged (2x, 8x) player</b>	Futures	Futures
<b>Short seller</b>	Futures	Futures
<b>International investor</b>	Futures	Futures

Source: CME Group

Table D describes the cheapness/richness of rolling futures via a calendar spread: an expiring E-mini S&P 500 futures contract rolling into the next nearest expiring contract as an interest rate spread to 3mL based upon the last eight quarterly rolls up to and including March 2017.

Appendix I outlines the four customer and trade scenarios with up-to-date assumptions to help the reader consider total costs of the trade. The cost comparison framework outlined in scenario one for fully funded investors, outlined in Appendix I, along with the cost inputs provided in

Table D, shows how E-mini S&P 500 futures are more cost-effective than ETFs for all investors when the roll cost trades at or below the calculated spread for the associated holding period.

**Table D: Roll Cost at a Premium to 3mL for Fully Funded Scenario**

	30 days	60 days	90 days	180 days	1 year	2 years	4 years
<b>Spread to 3mL</b>	+56bps	+28bps	+17bps	+8bps	+3bps	+1bps	0bps

Source: CME Group

There have been ample reports and discussions about the costs associated with the trading of ETFs and futures. Most, however, focus on only the costs that are obvious, point-in-time, and explicit. The reality is that each firm and its inputs are likely to be different. Explicit costs vary, as transaction costs, brokerage fees, financing, and tax considerations may differ from one firm to another and very much depend upon the particular arrangements investors have in place with their brokers.

Still, explicit transaction costs associated with futures tend to be limited in absolute terms, typically measured in single-digit basis points. Investors primarily concern themselves with tracking differences that are mostly driven by roll costs and the cash drag for fully funded investors. But according to the respondents interviewed, the temporal nature of futures is viewed more as a source of opportunity and potential alpha than as a cost (or operational obstacle) to the trading desk.

A consideration of costs also must take into account the performance of the product. Table E summarizes some of the key performance drivers investors should consider when choosing between the two instrument types.

**Table E: Performance Drivers**

Instrument type	Main costs and fees
<b>ETFs</b>	Bid-offer spreads, which result in real-time premiums and discounts to the fund's net asset values
	Transaction costs, which include brokerage fees and implied creation or redemption fees incurred by the ETF authorized participant and passed on to the investor
	Fund management fees and total expense ratio
	Dividend withholding tax considerations, resulting from the underlying index calculation assumptions and fund jurisdiction
	For short sellers, the prime brokerage cost associated with borrowed shares

Instrument type	Main costs and fees
<b>Futures</b>	<p>Futures transaction costs, usually limited and agreed between investors and their brokerage firms</p> <p>Roll costs, determined by whether futures are rolling “rich” or “cheap”—this calculation is performed by comparing the interest rate an investor earns by holding unused cash on deposit to the implied interest paid for holding the future (if the future is rolling cheap, it means that the implied funding is below the interest rate, whereas if it is rolling rich the implied funding is above the interest rate)</p> <p>Cash drag, which for fully funded investors is the performance of the unused cash allocation—depends on the basis between key rates on the relevant currency and the credit risk policy for the fund</p>

Source: Aite Group

Holding costs have a very large impact on the cost estimate calculation, as they increase linearly with the period of time a security is held. The size might be large and constant, such as a management fee, or discrete but recurring, such as executing fees. Depending on the product, they will come from different sources.

Futures are structured completely different from ETFs. There is an initial amount that is paid when the position opens, called an initial margin, which a buyer or seller must deposit at the exchange’s clearinghouse. This margin is typically in the range of a low single-digit percentage of the notional value, which is posted by both sides of the transaction to ensure obligations will be met. This initial margin does not have to be met in cash. High-quality, income-earning securities can be pledged as collateral. When posting cash collateral, interest is earned on the deposit as well.

Also, futures buyers do not need to pay a lump sum upfront for the notional amount of a futures contract, thereby deploying leverage. In exchange for this leverage, the buyer must pay an interest on these funds. The interest rate on the funding can be inferred by the trading price of the futures, but it is most readily inferred in the futures roll, therefore known as “roll cost.”

Calculating the spread between the implied interest rate and the 3mL over the same period allows one to determine if the rolling is rich or cheap (positive and negative spreads, respectively). This impacts fully funded investors, as the spread is the exact holding cost from futures replication by buying contracts and keeping the cash on hand to earn a deposit interest. The buyer must pay the futures seller the funding rate as compensation while receiving the deposit interest, which is assumed to be the 3mL, with such a spread being the cost of holding the futures position.

ETFs, on the other hand, incur most of their holding costs via management fees charged by the service provider. These comprise the replication efforts of rebalancing the underlying stock in the ETF's holdings. The ranges for ETF management fees are assumed to be between 4bps to 9bps.<sup>3</sup>

One respondent, the head trader at a U.S.-based global asset management firm, summed up the firm's decision process succinctly:

There are two parts to our process: The initial establishment of the position when cash comes in, and then managing the position on an ongoing basis. When you use futures, you're going to need to think about the futures roll. The roll, and the risks and costs associated with it, change depending on market conditions: supply/demand, positioning, regulations, and more. And there can be mispricing, or premiums and discounts. If the roll moves away from the price that we originally targeted, which can be a calculated price or an average level, then we will re-evaluate the roll and decide whether we want to continue the roll and hold at the current levels, or switch into something else that does not have the roll risk. We're constantly thinking about the costs and benefits. We also consider the holding period of the position, as it can impact the cost of trading it. If the benefits outweigh the costs, then we'll look at a possible implementation change, and we're always monitoring this closely.

## OPERATIONAL COMPLEXITY

We asked respondents to comment on any operational trade-offs (real or perceived) between trading futures versus ETFs.

In terms of any operational complexities associated with trading these instrument types, it is noteworthy just how varied opinions are. Some respondents are of the opinion that ETFs bear much lower operational risk than do futures. Comments ranged from the simplicity associated with trading and settling ETFs, since they trade and settle like plain-vanilla equities, to the ETF structuring as an open-ended vehicle to the fact that an ETF can be held indefinitely (relative to the monthly or quarterly roll required for futures).

Yet some respondents shared their concerns about the operational risks associated with trading ETFs and identified the higher rates of settlement failures associated with ETFs over plain-vanilla equities as well as the added complexity and potential for settlement failures with ETFs when a large ETF creation or redemption is associated with the trade.

Still, preferences for ETFs seemed anecdotal, as the more sophisticated (perceived or otherwise) respondents identified the use of derivatives as the starting point for their operating model and scoffed at the notion that futures represent additional operational complexity. It became clear that once a fund gets over the initial one-time leap to trading futures, ongoing concerns with operational complexity become a non-issue. For sure, this view will very much depend on the

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3. CME Group

type of fund and regulations the fund is subject to, whether its charter permits the use of derivatives, and whether it has a knowledgeable back office to support it.

In terms of product selection as it relates to operational complexity, one portfolio manager explained that the firm considers the ETF's ability to track the underlying index as a small but important source of concern since ETF managers have a small bit of discretion. Therefore, ETFs require additional due diligence, albeit at a high level—on the benchmark, on the ETF's composition, and on its historical tracking performance. Here, futures are considered a better choice since there is no portfolio manager overlay to consider.

## IMPORTANCE OF LEVERAGE

For traders who rely on leverage, particularly for short-term positioning, futures are extremely attractive. One respondent explained how the firm has an overlay on top of some of its funds, but that the overlay could not be implemented if it meant withdrawing 50% of the fund out of the market to set it aside for hedging with margin as it would have applied to ETFs. While some funds have considered the use of portfolio margining to achieve leverage, the respondent felt the exposure associated with a bank's willingness to extend credit and leverage this way made little sense, especially given the availability of futures.

One respondent shared a scenario in which one of their clients inquired about the use of ETFs in order to avoid complexities and costs associated with the richness of futures rolls. The fund manager walked the client through the trade-offs associated with both, and once it was clear how much extra cash would have to be posted for margin when using ETFs and how much of the portfolio would have to be liquidated, it was clear why futures were the superior choice.

One respondent explained, "I have not seen a case where the U.S. or global ETFs can compete with futures once you factor in the importance of leverage when someone needs it."

Leverage is generally unavailable when using ETFs. But leverage is available through the use of derivatives by implementing swap contracts linked to an equity index or an equity-index-based ETF. But these instruments are a sort of second derivative product that requires additional documentation such as International Swap Dealers Association agreements, which may or may not be in place and can take time and resources to implement, and added complexity to the trade. Futures are much easier as an alternative.

Another respondent offered a scenario in which they might consider switching to ETFs, which might be, for example, for an insurance client that is using a firm for its risk management strategies but does not want to hold derivatives. In that case, the firm avoids leverage since it is managing the portfolio by trading it dynamically and not going short but rather reducing long exposure. In this case, the client is a 40-Act fund with a prospectus that prevents the use of derivatives. Basically, the more retail-focused the product, the more likely are increased restrictions on the use of derivatives.

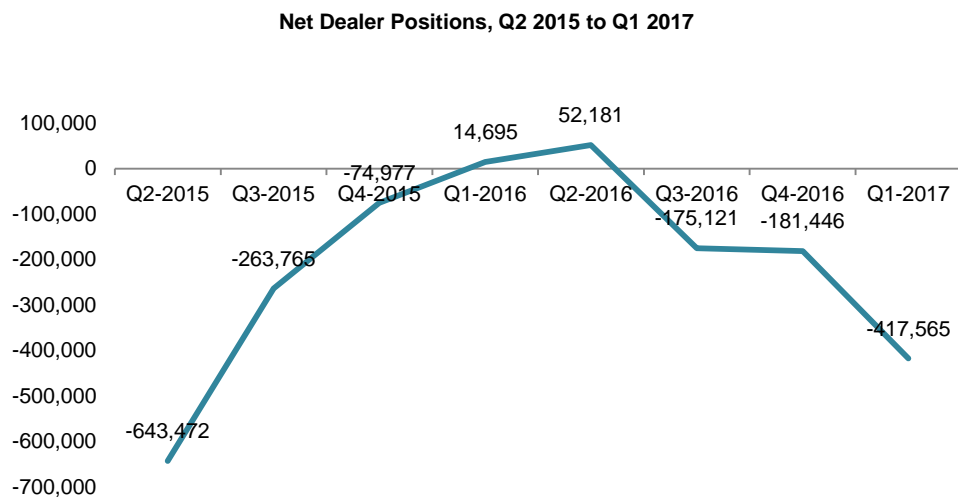
## OBSERVATIONS ON THE FUTURES ROLL

Aite Group interviewed subject-matter experts at CME Group in order to get a deeper understanding of how the S&P 500 futures roll has been performing in recent times. The following section discussed insights as explained by CME.

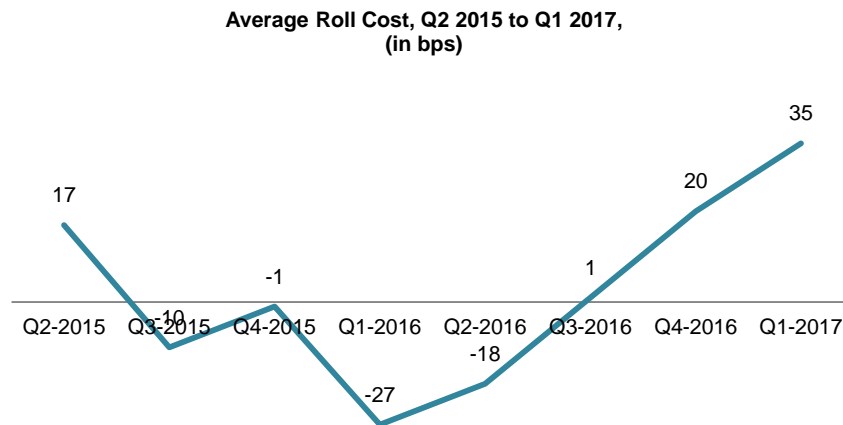
Futures' quarterly rolls dictate the cost of financing for the quarter following that in which the position is carried. This implied financing cost depends on the supply and demand of the long versus short position holder's need as well as other market participants' ability and willingness to absorb the residual position imbalance. For the most liquid futures contracts, this interest rate, as expressed in terms of spread to key benchmark interest rates, has historically been stable and lower than the comparable ETF management fees. From 2002 to 2012, the average futures roll cost on E-mini S&P futures was -2bps. Since 2012, with the advent of the new banking regulatory regime under the Dodd-Frank Act, there has been more appreciable volatility in this financing cost.

The persistent bull market since at least 2011 as well as the low volatility regime for the bulk of the period led to less hedging need—e.g., from providers of investment guarantee underwriters as well as other short hedgers. The long imbalance in the position holders led to richening of the financing in order to draw in arbitrageurs to fill the void. Figure 2 and Figure 3 show the net dealer position in S&P 500 Index futures from 2015 to Q1 2017 and the quarterly roll implied financing spread to 3mL.

**Figure 2: Net Dealer Positions**



Source: CME Group

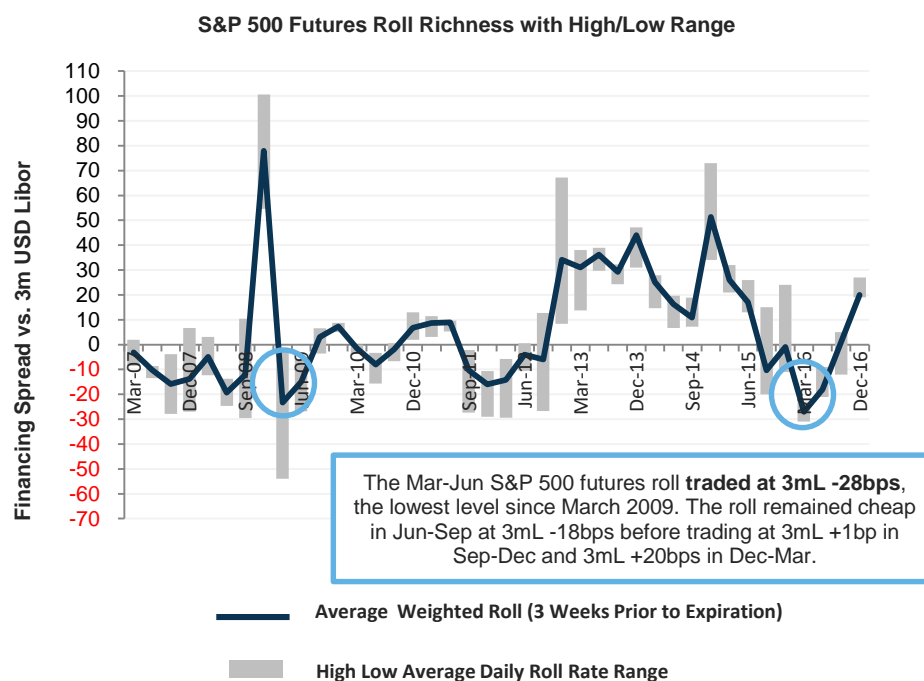
**Figure 3: Roll Financing Spread for S&P 500**

Source: CME Group

A bout of volatility changed this dynamic in the form of short hedgers returning to the market. The financing cost flipped in accordance with the balance of trade, trending toward a more equal hedging need on both sides.

This volatility manifests itself not in permanently higher cost, however. In 2016, the roll financing spread reached its lowest point since 2009, as seen in Figure 4. The spread remained in the negative territory until Q3, when it went back to 1bp. The ensuing quarter saw the spread climb to 20bps. Overall, the average for 2016 was -6bps, a sharp decline from 8bps and 26bps for 2014 and 2015, respectively. This negative spread contributed to futures' negative holding costs.



**Figure 4: S&P 500 Futures Roll Richness With High/Low Range**

Source: CME Group

Looking forward, this volatility might continue. Market participants could potentially exploit this phenomenon, especially those with balance-sheet flexibility and an ability to switch between instruments.

## CONCLUSION

- **Attention to detail pays.** Different investors, with different horizons and different funding needs, can have different optimal solutions in terms of achieving their indexed investment needs. If the choices are restricted to listed vehicles such as ETFs and futures, futures come out ahead in many of the scenarios.
- **Start the discussion with an expected holding period.** The expected holding period for a position is of crucial consideration. The key point to consider here is that the unilateral drag of the ETF's management fees must be considered versus the dynamic implied financing rates with futures—and time is a key input into the function to determine which one of these will win out. For short-term positions, futures seem to be the clear winner, since the upfront savings afforded by futures on commissions and market impact take time to erode, whereas ETFs' management fees are less than the spread to the financing rate embedded in the futures. Short-term trades are unlikely to be subjected to the variability of implied financing that may eventually cede the inherent advantages to ETFs.
- **Futures rolls can turn on a dime.** The equity bull market has arguably stretched to a full decade, with the benchmark indices seemingly making all-time highs every week, while volatility has stuck to near all-time lows. Any reversal or departure in this environment can result in a balance of roll demand tilting from long to short. It is worth following this situation closely, as roll cost could become much more advantageous for the long-position holders.
- **Anticipated future rate rise cycles (i.e., deflation) will normalize the yield curve of the U.S.** As the rate environment in the U.S. normalizes, there could be attractive alternative use for the cash reserves. Futures users could be better-positioned to take advantage of that as well.
- **Evaluate and prioritize.** ETFs and futures are similar in many ways and serve as important tools for the buy-side to manage its portfolio risks and exposures. Each instrument type does have unique advantages and disadvantages that must be considered, and one may outweigh all else—liquidity and leverage needs, cash management considerations, operational preferences, or fund-level instrument type restrictions.
- **Information is readily available.** Futures exchanges, brokerages, and delta-one desks have tools and data to regularly update their firms as to the most efficient way to gain equity index exposure, given the investor scenario, market conditions, and the trade-offs. Firms should actively engage with their providers to make sure they are obtaining and utilizing all of the information available to most effectively manage their portfolios.

## APPENDIX I: SCENARIO ANALYSIS

With assumptions about transaction and holding costs made, the next step is the estimation of the total costs of the replicating strategies in four different scenarios using the two mentioned products (i.e., futures and ETFs). The scenarios tested will be a fully funded investor (cash equals the full notional value of the position), a leveraged investor, a short-selling investor, and an international investor. The costs will be calculated over a period of 12 months, beginning in January.

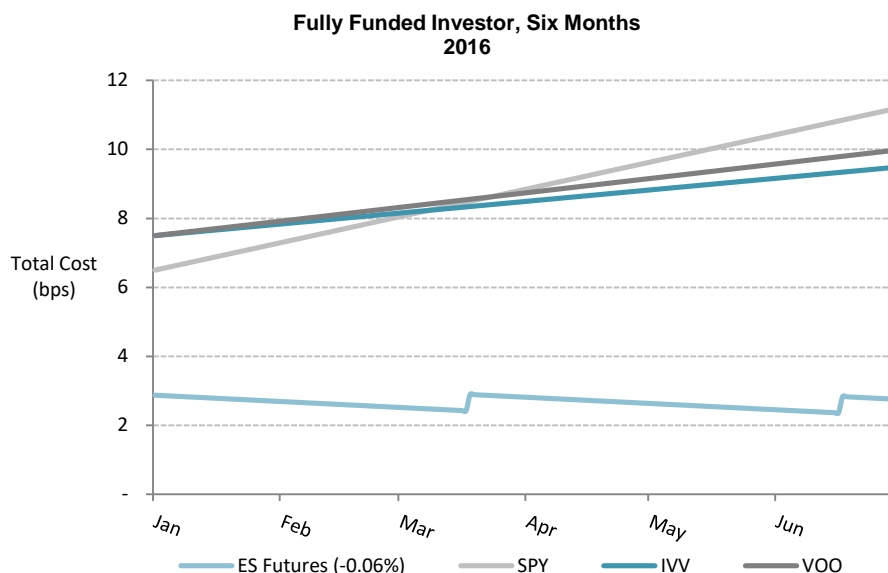
The four scenarios apply the same transaction costs, round-trip fees, and market impact when the position is opened. As the futures expire quarterly, the rolling costs were considered the week before expiry.

The roll costs are assessed on the Wednesday before every quarterly expiry. The carry calculations were adjusted for the margin deposited with the CME clearinghouse, and for the sake of conservatism, the scenarios assume margin deposits earn no interest. At current interest rates, the impact of the carry is 1.88bps per annum.

### SCENARIO ONE: FULLY FUNDED INVESTOR

In this simple scenario, the calculation of the total cost is simply the sum of transaction costs and the pro rata portion of the holding costs. The graphical representation of the costs of replicating an index with both ETFs and futures for a period of six months is shown in Figure 5.

**Figure 5: Fully Funded Investor, Six Months**



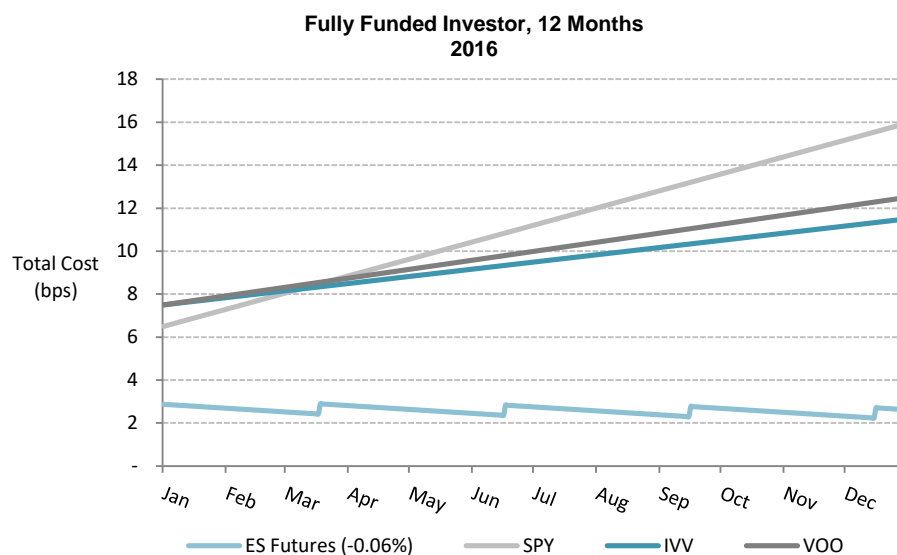
Source: CME Group

The first costs incurred in the round-trip execution are the market impact and the commission and clearing fees, which range from 2.9bps to 7.5bps. The rising slope in the ETFs' cost is caused by the accrued holding costs (management fees), while the futures costs jump quarterly due to the quarterly futures rolls. The futures rolls' implied cheapness compared to the ETFs' management costs is the cause for the downward slope. This premium is obtained from the rolling futures cheapness to Libor. The divergence means that, at the end of the six months, the futures are between 6.73bps and 8.43bps more effective in total cost.

In a six-month period, futures become a more interesting instrument for institutional investors looking at tactical asset allocations. The cost-efficiency of ETFs is hampered by the much higher transactions costs. For longer periods, depending on the financing costs of the futures (particularly if the futures are rolling rich), the efficiency might disappear.

Figure 6 expands the period to 12 months, and the case remains the same: Futures are more cost-effective than ETFs. With the futures roll at 3mL -6bps, the difference in total cost varies between 8.88bps and 13.3bps.

**Figure 6: Fully Funded Investor, 12 Months**



Source: CME Group

## SCENARIO TWO: LEVERAGED INVESTOR

Index futures imply the use of leverage in the position. By posting the margin while opening a position of around 4.8% total initial capital, investors leverage themselves by approximately 20x. Similarly, the ETFs might be bought on margin to increase their leverage. Market regulations dictate that the amounts to be lent for securities bought on margin are limited to two specific scenarios.

- **Federal Reserve Board Regulation T:** Investors can only leverage their position two times by the limit set on the amount borrowed at 50% of the purchasing price.

- **Federal Reserve Board Regulation U:** Expanding on Regulation T, the margin can be accessed through a prime broker if the investor is more sophisticated, always under a ceiling of eight times leverage.

The funding cost for the leverage is assumed to be 3mL (80bps) + 40bps (the standard lending rate from prime brokers) for a total cost of 120bps.

## 2X LEVERAGED INVESTOR

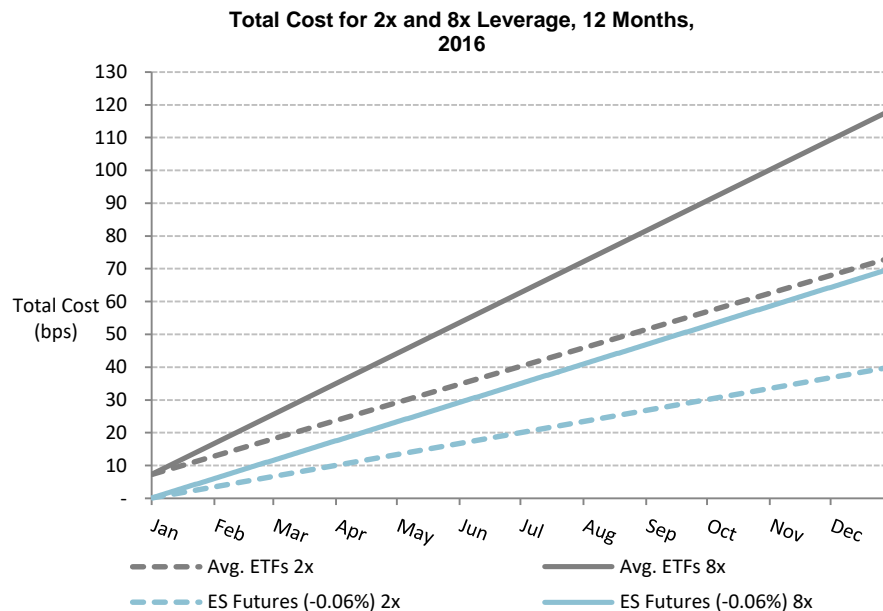
A 2x leverage implies the investor only employs US\$50 million of its cash, while using borrowed funds for the other half of the US\$100 million position.

The process for the ETF purchase begins with the investor borrowing US\$50 million to purchase US\$100 million in ETFs at the market price. The management fees still apply, but there is now the interest due at 120bps on the US\$50 million borrowed.

Equity index futures, on the other hand, are affected not by the management fees but rather by the opportunity costs from not being able to deposit the full amount of money and earn interest to counteract the 3mL funding costs. In scenario one, the fully funded investor would deposit the entire US\$100 million and earn interest on it to offset the futures financing cost, only to leave the spread to Libor as the cost of holding this futures position.

Since in scenario two the investor using futures will enjoy interest earnings on US\$50 million while effectively paying financing costs on the US\$100 million investment, the net financing is on just US\$50 million of the investment. In other words, leveraging via a futures position will be the same as the holding costs in scenario one, plus the full implied financing cost on the US\$50 million leveraged investment.

Figure 7 shows the ETFs' average costs for both an investor leveraged 2x and 8x, and the total costs for a 2x and 8x leveraged equity index futures position over a 12-month period. Even though an average was calculated, the individual component costs remain very close to the line drawn using average cost.

**Figure 7: Total Cost for 2x and 8x Leverage, 12 months**

Source: CME Group

Needless to say, the accrued costs are higher than those in scenario one (Figure 6) for all lines drawn, regardless of the product used to replicate S&P 500 returns. ETFs' holding costs have increased due to the interest paid on the borrowed funds, making them less cost-effective than futures throughout all time horizons.

### 8X LEVERAGED INVESTOR

This subscenario is based on the same cost assumptions as the others, with the difference being that in order to achieve the leverage, only US\$12.5 million in capital is deployed to get the full US\$100 million exposure. While obtaining the rest from a prime broker in the case of the ETF example, in the futures example the investor only needs to post this US\$12.5 million amount in deposits.

Again, in Figure 7, it is seen that with the need to borrow more from a prime broker to fund the ETF exposures, the overall holding costs increase. At the end of the period, with the 2016 average cost for the futures financing at -6bps, it becomes 33.4bps and 48.1bps more cost-effective for the 2x and 8x leveraged investor to hold index futures than ETFs.

## SCENARIO THREE: SHORT-SELLER INVESTOR

The short-seller investor aims to exploit the future negative performance of the index returns by short selling previously borrowed ETFs. This short sale is the reason the position will be leveraged, as cash is raised from the sale, which remains on deposit with the prime broker that lent the shares. The borrower will pay fees to the lending prime broker, which will be deducted from the interest earned on the cash obtained. For this scenario, the investor borrows shares

from the prime broker to sell short and receives cash from the sale, which is assumed to earn 3mL (80bps) less the prime broker borrow fee (40bps), resulting in a return on cash of 3mL -40bps. As this transaction requires collateral, the investor must post half of the notional amount of the trade to the prime broker as margin.

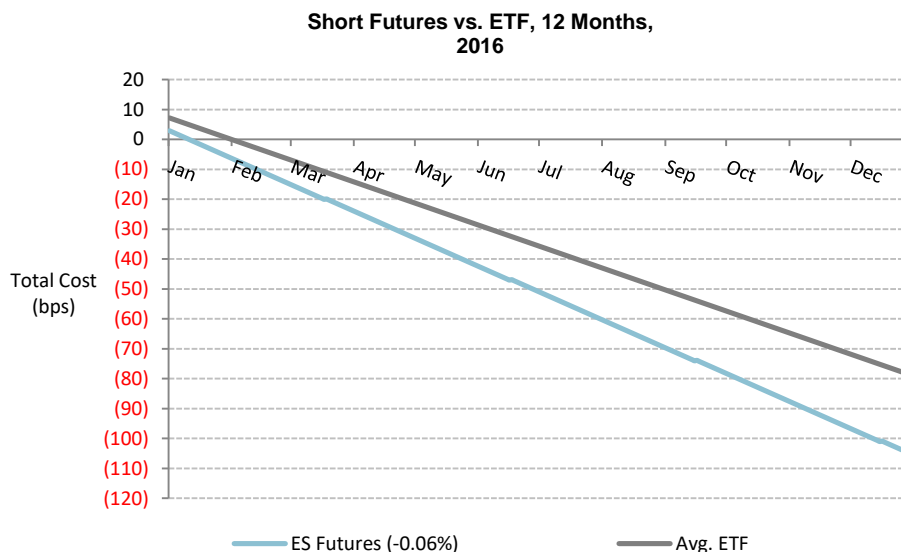
The futures short seller will not need to borrow shares and pay borrowing charges for such, as equity index futures are leveraged derivatives. The process of selling it is the same, with the same margin posted to the clearinghouse.

Since in this case the investor is short selling, the investor will benefit from not needing to pay the holding cost when the holding cost of futures is rich to Libor:

- **Futures:** In the event futures are rolling rich, the advantage goes to the short seller. Also, the investor receives the interest via the implied financing of the future and generated interest on the retained cash on hand. An investor using futures is also able to deploy the US\$50 million less initial margin.
- **ETFs:** The ETF investor, (1) receives management fees, (2) receives 3mL -40bps from US\$100 million raised from short sale, and (3) receives 3mL on US\$50 million cash balance posted to the prime broker as margin. The short seller will receive the management fees plus interest less the stock borrow/prime broker borrow charges on the cash raised from selling US\$100 million worth of ETFs and on the cash (US\$50 million) deposited with the prime broker.

These cause the holding costs to become negative, as seen in Figure 8. In relative terms, the four replication strategies will have a better performance than the S&P 500, given that the index returns go negative. This is a benefit for the short seller.

**Figure 8: Short Futures vs. ETFs, 12 months**



Source: CME Group

Futures are again more cost-effective than ETFs, regardless of the future rolls in all time horizons.

## SCENARIO FOUR: INTERNATIONAL INVESTOR

Foreign investors willing to enter the U.S. equity markets will be subject to a dividend withholding tax at a rate of 30% if those dividends are paid by a U.S. corporation. This reduces the dividend to a maximum of 70% of what a local investor would receive.<sup>4</sup> This tax is also effective in ETFs paying fund distributions (distribution of dividends received on the equities held by replicating the index), and it takes place quarterly. For this analysis, the historical dividend yield of the S&P 500 is assumed to be 2.03%, adding up 60.9bps each year to the holding costs for international ETF investors.<sup>5</sup>

Futures don't pay dividends, but these are priced on the market price, approximately on a full-dividend-yield basis. As there is no cash distribution, there is no withholding tax<sup>6</sup> increasing the holding costs.

The costs incurred over a period of 12 months is seen in Figure 9. The quarterly steps on the ETF line are the representation of the dividend withholding tax; by the end of the period, the cost difference is 71.6bps.<sup>7</sup> No tax reclaims have been assumed for this scenario. If the investor were able to reclaim taxes, the size of the steps would decrease but not significantly enough to improve its cost-efficiency. It is immediately seen that futures are once again more cost-effective, regardless of the time horizon.

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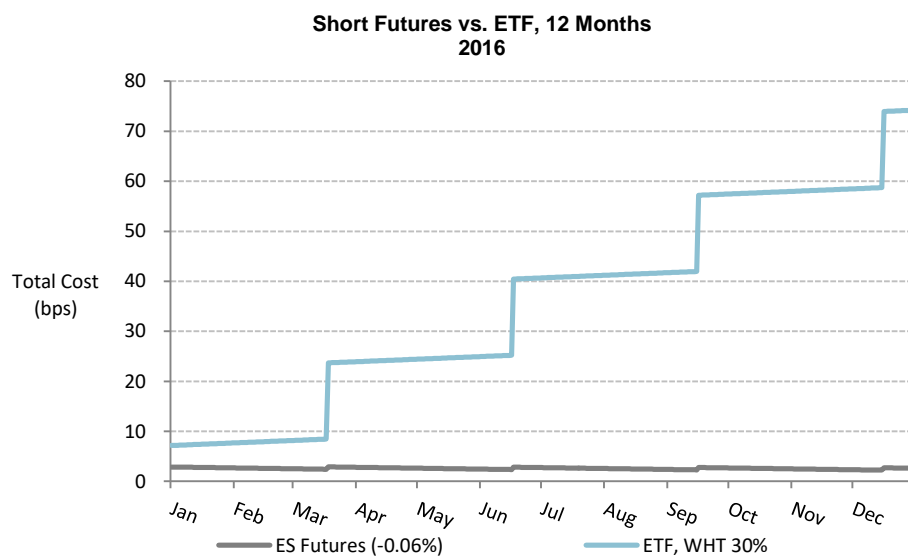
4. Aite Group and CME Group do not provide tax advice. Investors should consult their own advisors before making any investment decisions.

5. CME-provided figures

6. CME-provided figures

7. For non-U.S. investors, futures on qualified indices are not subject to a dividend withholding tax per IRS Rule 871(m). The S&P 500 Index itself is a qualified index, so non-U.S. investors are exempt from withholding tax on their E-mini S&P 500 futures positions.



**Figure 9: Foreign Investor (30% Withholding Tax), 12 months**

Source: CME Group

## ABOUT AITE GROUP

Aite Group is a global research and advisory firm delivering comprehensive, actionable advice on business, technology, and regulatory issues and their impact on the financial services industry. With expertise in banking, payments, insurance, wealth management, and the capital markets, we guide financial institutions, technology providers, and consulting firms worldwide. We partner with our clients, revealing their blind spots and delivering insights to make their businesses smarter and stronger. Visit us on the [web](#) and connect with us on [Twitter](#) and [LinkedIn](#).

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