

Futures Are Still on a Roll With the Buy-Side

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EXECUTIVE SUMMARY

Futures Are Still on a Roll With the Buy-Side studies the selection process and perceived costs and benefits of replicating the Standard & Poor's 500 (S&P 500) index returns via equity index futures versus exchange-traded funds (ETFs) from a practitioner's point of view. This analysis extends the first paper of this series, published in May 2017, *Conversations With the Buy-Side: Futures and ETFs.*¹

Key takeaways from the study include the following:

- Trading desks continue to choose between futures and ETFs when replicating equity index returns. Factors such as liquidity, exposure size, and use of leverage tend to tilt the scales toward using futures. The operational complexity of the two products appears to be less of a concern in the selection process.
- Futures contracts offer investors ample liquidity as daily turnover continues to increase across indices. E-mini Nasdaq 100 and E-mini Dow Jones Industrial Average futures volumes have grown since Q1 2017 and are driven by investors looking for cost-effective means to gain access to the returns of correlated markets. The techheavy allure of the Nasdaq 100 has also played a role.
- Growth in ETF assets under management (AUM) has fostered liquidity. While substantial, liquidity is still far below futures and cash equity markets. For investors looking to trade in large size, ETFs may lack the depth of other instruments. Investors Aite Group spoke with point to having a more difficult time gaining exposure in large size without showing their hand.
- The implied financing level of the futures roll is one of the most important factors determining the total cost of ownership for a futures position. While the end of 2017 was marked by a substantial rise in the futures financing spread, the E-mini S&P 500 futures roll has averaged the London Inter-bank Offered Rate (LIBOR) plus 16.4 basis points during 2018. This was a substantial improvement given an average financing spread of 45.7 basis points was realized a year earlier.
- Futures contracts traded at the CME are margined using SPAN. The SPAN framework allows for the reduction in the overall margin requirement of portfolios due to offsetting exposures. For example, an investor that is long one E-mini S&P 500 futures contract and short one E-mini Nasdaq 100 futures contract would see a 75% reduction in the amount of required margin.

^{1.} See Aite Group's white paper *Conversations With the Buy-Side: Futures and ETFs*, May 2017.

INTRODUCTION

The overall strength of U.S. equity markets has continued to influence the use of futures and ETFs by investors seeking to replicate index returns. Over the course of 2018, the S&P 500 has been on a tumultuous ride, soaring to new highs before giving back gains. Futures and ETFs linked to the index have grown in popularity and continue to be commonly used by global investors looking to gain exposure using passive replication strategies as well as active managers seeking to take advantage of volatility in the market.

Some standout differences make 2018 an interesting year for financial markets. Early on, a volatility shock on February 5, 2018, sent the S&P 500 index 4.1% lower on a day that saw record options volume. Additionally, it became quite clear that by late 2017, the Federal Reserve would be on a steady path to normalize its benchmark rate. The hawkish path of the Fed coupled with geopolitical concerns and future uncertainty have pushed trading volume substantially higher, particularly during Q4 2018.

The purpose of this interview-based white paper is to learn how portfolio managers and traders perform the cost-benefit analysis when deciding between futures and ETFs for index replication. While futures have generally been the de facto instrument for gaining exposure, particularly for investors using leverage, increases in ETFs' AUM and liquidity have expanded investor opportunity sets. Responses are contrasted with discussions from Q1 2017 to better understand changes taking place in light of increased volatility, higher benchmark rates, and other factors. This effort seeks to bring objectivity to the debate and complement various industry studies as well as academic and trade publications.

There are several ways to gain access to index returns, including the use of over-the-counter swaps, cash instruments, futures, and ETFs. This survey focuses on the selection process between futures and ETFs only. 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, there really isn't a one-size-fits-all answer. Trends covering optimal solutions using futures and ETFs are explored through various scenarios throughout this white paper.

METHODOLOGY

This study utilizes three primary sources of data. Cost-comparison data was provided by CME Group and obtained from its own database and Bloomberg. In addition, Aite Group gathered qualitative information from interviews with subject-matter experts in the institutional asset management industry during Q4 2018. Lastly, data related to risk and margin were obtained from CME Group's clearinghouse.

WRAPPING EQUITY INDEX RETURNS

There are several ways institutional investors commonly gain exposure to an equity index without managing a basket of underlying stocks: equity index futures, ETFs, index swaps, and index options. Although instrument returns are correlated and may appear similar, the approaches to implementation vary and have significant implications for the investor in terms of performance drag, transaction cost, tax efficiency, leverage, and clearing and margin fees. The sections that follow focus exclusively on the use of equity index futures and ETFs for the purpose of replicating equity index returns.

In Aite Group's first report of this series, *Conversations With the Buy-Side: Futures and ETFs*,² the cash flows of futures and ETFs were compared to stocks. While both instruments use standardized structures offering investors index exposure at generally low costs, futures are instantaneously cleared and have limited, if any, counterparty risk compared to ETFs which may carry transactional risk given e.g., a T+2 settlement date. There are also some notable differences when comparing these futures and ETFs to the cash market. For example, holders of a long-only equity basket receive dividends, incur capital gains and losses, and have an opportunity for lending returns on their shares.

Long-only index futures holders can expect cash flows that are guided by positional gains and losses as well as the effects of financing and leverage. Investors earn interest income on cash collateral, which may offset the implicit financing cost (which may reflect lender returns) embedded in futures contracts. Also, futures gains and losses include those coming from quarterly roll activities as well as accrual due to dividends of the underlying stocks. Turning to ETFs, a long-only investor would receive dividends, incur gains and losses relative to the position, and have an opportunity for lending returns of the ETF, which is similar in nature to stocks.

The price dynamics of futures and ETFs also differ. These differences were summarized in *Conversations With the Buy-Side: Futures and ETFs* and are included in Table A for convenience.

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^{2.} See Aite Group's white paper Conversations With the Buy-Side: Futures and ETFs, May 2017.

Table A: Price Dynamics

Instrument type	Summary
ETFs	ETFs are investment vehicles managed by an investment company registered in a particular jurisdiction.
	The net asset value is published on a daily basis and audited periodically by independent entities.
	During market hours, investors may buy and sell shares at a price that reflects the market value of the assets.
	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.
	Most ETFs have their indicative net asset values calculated and published every 15 seconds.
Futures	Futures are standardized derivative contracts between two counterparties whose performances are guaranteed by a clearinghouse.
	Futures prices are bracketed by the replication cost of the market-maker, which performs arbitrage among related instruments (e.g., the stock basket, related ETF, index options).
	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.
	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 interest charges on the "borrowed" funds.

Source: Aite Group

KEY FINDINGS

This section provides a summary of key observations gleaned from qualitative Aite Group interviews conducted during Q4 2018 with subject-matter experts in the institutional asset management industry. The results of these findings are compared to data collected in Q1 2017.

LIQUIDITY CONSIDERATIONS

Liquidity may be thought of in terms of how easy or difficult it is to obtain a desired position in the market without having an impact. Liquidity continues to be highlighted as one of the key considerations in the product selection process when weighing the use of futures, ETFs, or cash markets as a means for equity index exposure. In Q1 2017, traders acknowledged that liquidity will "go where it is needed". The symbiotic nature of the three markets continues to influence overall market health. While this sentiment hasn't changed, liquidity continues to shift over time.

As one asset manager explains, liquidity is a huge determinant of what a portfolio manager decides to do when choosing among instruments. For example, a manager who is focused on implementation shortfall is likely able to easily move US\$100 million of E-mini S&P 500 contracts through the market. Doing the same while using ETFs will take longer and will have more information leakage associated with the trade, which leads to additional market impact. Investors must focus on information leakage when considering whether an instrument is liquid and what the cost of trading will ultimately be.

Another respondent pointed to the deep, rich data history of futures as a reason for preferring their use versus an ETF. In this manager's opinion, his firm has more experience and expertise in futures trading—a quality investors link to the fund's value. This expertise is borne out of the long-lived reliability of futures contracts in terms of liquidity and transparency. Although the fund also uses ETFs for some relative value strategies, futures continue to be the dominant instrument for a variety of alpha-generating investments. Outside normal markets, this manager feels that some ETFs carry a higher liquidity risk than futures contracts.

Figure 1 compares the daily turnover of futures, ETFs, and stocks tied to four major U.S. equity indexes: The S&P 500, Nasdaq 100, Dow Jones Industrial Average (DJIA), and the Russell 2000.³ The liquidity advantage of futures contracts has remained relatively stable compared to ETFs. In

^{3.} S&P 500 includes E-mini S&P and S&P 500 index futures turnover versus State Street SPDR S&P 500 ETF (SPY), iShares Core S&P 500 ETF (IVV), and Vanguard S&P 500 ETF (VOO) combined; Nasdaq 100 includes E-mini Nasdaq 100 futures versus Invesco QQQ Trust (QQQ); Dow Jones Industrial Average includes E-mini Dow Jones Futures versus SPDR DJIA ETF Trust (DIA); Russell 2000 incudes Russell 2000 futures versus iShares Russell 2000 index (IWM) and the Vanguard Russell 2000 (VTWO) combined.

its initial study, Aite Group reported a liquidity advantage of six to 18 times when comparing the two instruments. In Q4 2018, this ratio ranged from three to 20 times.⁴





Source: CME Group

Futures continue to have a liquidity advantage over ETFs. One reason for this is the global nature of U.S. equity index futures, which can be traded nearly 24 hours a day. ETFs are generally limited to U.S. trading hours, similar to U.S. stocks. The need for managers to increasingly monitor risk and exposures has never been more important given the increased frequency of tail risks in recent years. Events such as the 2016 U.K. vote to exit the European Union (commonly known as Brexit), the U.S. general election, the February 5, 2018, volatility spike, and ongoing global political turmoil have supported the need to trade around the clock.

^{4.} In its initial study, Aite Group analyzed daily turnover of three major U.S. equity indexes: The S&P 500, Nasdaq 100, and Dow Jones Industrial Average (DJIA).

As in the past, futures daily turnover has exceeded ETF and stock turnover tied to the S&P 500. The depth and liquidity of E-mini S&P 500 futures is generally acknowledged; however, daily turnover is also higher for Russell 2000 futures versus other instruments linked to that index. In the case of the DJIA, futures have the greatest liquidity advantage versus ETFS (20 times). Looking to the Nasdaq 100, futures turnover has grown at a faster rate than stocks, making the two nearly equal in terms of daily turnover. Investors looking for cheaper ways to go long the U.S. equity market have begun to more readily use highly correlated substitutes for the S&P 500. Additionally, the allure of the tech-heavy Nasdaq 100 has attracted more investment dollars as of late.

E-mini S&P 500 futures (ES) open interest (OI) has been stable and has seen moderate growth over the last decade (Figure 2, left axis). The resilience of the contract and respective liquidity is evident across varied volatility regimes. For example, during 2008 and 2009, when the VIX spiked above a value of 70 index points (right axis), E-mini S&P 500 futures OI continued to grow. Likewise, when the VIX reached its lows in 2017 near 10 index points, futures liquidity remained consistent.



Figure 2: E-Mini S&P 500 Futures Open Interest and Volatility

Source: CME Group

PRICE DISCOVERY

ETF and futures can be thought of as complimentary products. For example, ETF providers may use futures contracts to do cash management and some tracking. On the investment side, portfolio managers will often consider the relationship of all delta-one instruments when making their investment decision rather than looking to ETFs, futures, or swaps in isolation.

Academically speaking, the presence of arbitrageurs provides liquidity to the instrument type when it's needed, creating a well-functioning market environment. Thus, the interconnectedness of ETFs and futures plays a role in instrument pricing as the ETF market typically relies on liquidity from the futures market.

In Q1 2017, several respondents argued that ETF pricing was superior to futures (e.g., in some of the emerging markets indexes), driven by a decrease in bid-offer spreads and an increase in volume. While certain ETFs were simple to trade, futures and options tied to the same index suffered from low liquidity and opaque price transparency. Since that time, pricing has improved with volume in many futures contracts according to firms Aite Group spoke with. Over the last 18 months, and particularly during late 2018, there has been a tremendous pick up in futures contract volume. Compression in bid-offer spreads has accompanied the volume uptick—a development that has closed the gap between ETFs and futures by achieving wider participation in certain contracts. This has had a positive impact on spreads as well. With the volume increase, pricing, spreads, and market-making all improve.

As mentioned earlier, data availability and history favor futures investing in many contracts. One respondent remarked on the robustness of futures contracts in terms of pricing, volume, and other characteristics as being superior to available ETF data. For the purposes of analysis, such as back-testing, this investor finds futures to be more transparent for evaluating investment risk, particularly outside normal markets, compared to ETFs. Additionally, this firm points to the transparency and ease associated with using one central limit order book (e.g., at the CME) for transacting and market information.

Finally, one respondent did not feel price transparency was an issue for either ETFs or futures. This manager felt the fund was able to receive adequate information from brokers as well as from order books and screens. Greater concerns focused on ETF dislocations from Net Asset Value (NAV) in extreme circumstances. With the return of market volatility, another respondent pointed to two areas of concern when choosing between ETFs and futures: market-making and index replication. In calm markets, the replication process is easier—volatile markets test technique assuming spreads are comparable.

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Investment firms closely monitor inputs and their models to determine which instrument type will provide the lowest costs to the portfolio. In terms of the costs associated with the futures roll, it depends on the type of investor, trade, time horizon, and market environment. For some types of trades, futures will always be the more cost-effective option. For fully funded investors, however, traders would be well-served to consider all their options and inputs. Four scenarios detailing cost-effectiveness are summarized in Table B.

Table B: Cost-Effectiveness by Scenarios at a Glance

Scenario	Futures roll is cheap (under 3-month USD LIBOR)	Futures roll is rich (over 3-month USD LIBOR)
Fully funded investor	Futures	Depends on holding period and richness
Leveraged (2x, 8x player) investor	Futures	Futures
Short-seller investor	Futures	Futures
International investor	Futures	Futures

Source: CME Group

Costs tied to the trading of ETFs and futures vary. While point-in-time costs are most easily observed, explicit costs such as transaction fees, brokerage costs, and financing and tax considerations differ from firm to firm and depend upon arrangements investors have in place with their brokers. Investors' primary concern is focused on tracking differences that are mostly driven by roll costs and the cash drag for fully funded investors. Table C summarizes some of the key performance-drivers investors consider when choosing between the two instrument types.

Table C: Performance Drivers

Instrument	Main costs and fees
ETFs	Bid-offer spreads result in real-time premiums and discounts to the fund's net asset values.
	Transaction costs include brokerage fees and implied creation or redemption fees incurred by the authorized ETF participant and passed onto the investor.
	Fund management fees, tracking error, and the total expense ratio must also be taken into account.
	Dividend withholding tax considerations result from the underlying index calculation assumptions and fund jurisdiction.
	For short sellers, the prime brokerage cost is associated with borrowed shares.

Instrument	Main costs and fees
Futures	Futures transaction costs are usually limited and agreed between investors and their brokerage firms.
	Roll costs are 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.)
	Surplus cash – deals with the performance of unused cash. When employing leverage, an investor will have a capital surplus which may be reinvested in the money market earning LIBOR or possibly invested in a higher yielding asset to enhance returns. Uninvested cash would result in a lost opportunity to earn a return.

Source: Aite Group

Holding costs have a 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 execution fees. Depending on the product, they will come from different sources.

Calculating the spread between the implied interest rate and the USD 3-month LIBOR (3mL) rate over the same period allows one to determine if the roll 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 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 vary as shown by Table D below.⁵ For example, ETF management fees linked to the S&P 500 index range from 4 basis points to 9.5 basis points. Management fees can be notably higher on some of the other indices such as the Russell 2000 and Nasdaq 100 (up to 20 basis points).

Index	ETF Description	Management Fee
S&P 500	State Street SPDR S&P 500 ETF (SPY)	9.5 basis points
S&P 500	iShares Core S&P 500 ETF (IVV)	4.0 basis points
S&P 500	Vanguard S&P 500 ETF (VOO)	4.0 basis points

Table D: Summary of ETF Management Fees

5. Management fees shown in the table correspond to the ETFs analyzed in this study.

Index	ETF Description	Management Fee
Nasdaq 100	Invesco QQQ Trust (QQQ)	20.0 basis points
Dow Jones Industrial Average	SPDR DJIA ETF Trust (DIA)	17.0 basis points
Russell 2000	iShares Russell 2000 index (IWM)	20.0 basis points
Russell 2000	Vanguard Russell 2000 (VTWO)	8.0 basis points

Source: CME Group

When deciding which instrument to use based on cost, respondents feel several factors are key to the decision-making process, such as the use of leverage. Investment horizon is also an important factor. One respondent suggests buy-and-hold investors would likely choose an ETF given the simplicity of the instrument (e.g., no need to roll every quarter). Conversely, for investors that need to go long and short and have a shorter exposure time, this investor feels futures make more sense.

The location of the fund also plays a role. Two respondents mentioned that the location where a fund is domiciled will have an impact on taxes and dividends when investing in ETFs. Regulations vary by jurisdiction, as certain types of funds are not permitted to invest in some asset classes, such as derivatives. Assuming a manager has access to a full range of instruments, bespoke nuances may often affect instrument cost and tend to sway investors toward one instrument or another when considered in tandem with liquidity and pricing dynamics.

The efficient use of collateral is another factor that came up in discussions with buy-side participants. According to one manager, the biggest driver of the decision to choose futures or ETFs is still leverage. However, to the degree that firms can do a better job with posted collateral (e.g., initial margin), outperformance stemming from collateral optimization likely trumps paying an upfront cash outlay for ETFs. For example, if this manager was to purchase an ETF for US\$10 million, the trade would require the full amount of cash upfront versus an initial margin posting of 3.5% of notional with ongoing variation margin requirements for a futures position. Thus, the importance of the opportunity cost lost to fully funding an ETF and the ability to withdraw positive variation margin on futures is considered in light of collateral use and efficiency.

One manager provides a detailed description of the various costs encountered when choosing ETFs or futures. The points below summarize this firm's considerations for each instrument. Ultimately, this investor chooses the least costly approach after reviewing a range of factors based on fund type, permissible instruments, location, and so on:

- ETFs
 - Bid-offer spread based on a two-way pricing quote given by the brokers, usually quoted in the form of NAV +/- basis points (rather than the market bidoffer spread)
 - ETF management fee
 - NAV tracking error

- Futures
 - Ability to invest in money market: Futures performance is based on spot plus cost of carry—estimated dividend yield. When buying a futures contract, it is crucial to know whether the mandate allows the fund manager to invest the excess margin into the deposit market earning the risk-free rates so that the economic benefit of buying a futures contract will be the same compared to an ETF. However, if a passive investor cannot invest excess margin into the money market, then holding a futures contract to replicate a benchmark will end up underperforming the benchmark by the cost of carry.
 - Roll cost: Richness or cheapness of the roll.
 - Currency consideration: Both futures and ETFs may expose an investor to currency fluctuations. When trading an ETF, an investor is potentially 100% exposed to currency risk which is tied to the underlying – likely requiring another FX trade in order to hedge. Using futures, however, minimizes currency exposure.

OPERATIONAL COMPLEXITY

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

Generally speaking, firms that prefer trading one instrument over the other will typically favor the perceived operational simplicity of that instrument. Likewise, firms that are regularly investing in both futures and ETFs are comfortable with the various operational components of both instruments and consider the differences a non-event. These firms assert that, at this time, their operations departments are comfortable with ETFs and futures, and the front office is the main decision-maker of instrument choice.

Responses to questions pertaining to operational complexity are similar to Aite Group's report findings in Q1 2017. For example, some respondents are of the opinion that ETFs bear much lower operational risk than do futures given trading simplicity and settlement. (ETFs trade and settle like plain-vanilla equities.) The fact that an ETF can be held indefinitely (relative to the monthly or quarterly roll required for futures) is also mentioned as a positive.

Respondents again share their concerns about the operational risks associated with trading ETFs and identify the higher rates of settlement failures when a large ETF creation or redemption is associated with the trade. As one respondent mentions, liquidity and trade settlement are top priorities.

Still, other respondents identify the use of derivatives as the starting point for their operating model and find them to be equally if not more straightforward than ETFs. For example, not having to deal with taxes and dividends is often mentioned in support of this opinion. Downsides include risks associated with the concentration of brokers and clearinghouses, which are prevalent in the futures market. Bespoke views continue to depend on the type of fund and the

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.

Another respondent details the ongoing maintenance required for both instruments, including tax treatment and margin postings. On the futures side, rolling needs to be dealt with. Investors must bear in mind position limits and margin management among their day-to-day tasks. On the tax side, futures are straightforward, as they do not have dividend taxation like a distributing ETF. This respondent comments that investors need to "think about what to do" with the income from an ETF, especially if the index is broad and international with many countries contributing to the dividends. Once received, how should they be taxed? The tax treatment is considered this firm's main focus when selecting an ETF.

Firms continue to monitor an ETF's ability to track an underlying index during periods of heightened volatility. Dislocations from NAV and fair value are top-of-mind, as market volatility has crept higher. For ETFs, additional due diligence is required given an ETF manager's discretion—a feature not present in the futures world. As stated earlier, it's easy to replicate an index when the market is calm, but better technique is required otherwise.

IMPORTANCE OF LEVERAGE

One of the de facto reasons for using futures contracts is access to leverage. All respondents point to this advantage as their primary reason for selecting futures over ETFs. Secondary reasons include the depth and transparency of the instruments and the electronic trading environment.

While there is no one-size-fits-all reason to prefer one instrument over another, respondents have their opinions on what some of the general guidelines might look like. For example, one respondent comments that hedge funds probably prefer futures because they like using leverage and the ease of shorting. Likewise, active managers and long-only funds that look to take a fundamental view to outperform an index might turn to ETFs.

The use of leverage is a key feature for futures investors. 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, which is discussed in detail in the next section.

The leverage of a futures contract can be thought about by dividing the value of the contract by the margin requirement. For example, if a contract is worth US\$90,000, a US\$5,610 deposit required to trade one contract results in 16 times leverage. Initial margin is required at the inception of the trade, while variation margin is adjusted daily during the life of the position.

According to recent U.S. Commodity Futures Trading Commission (CFTC) data, the amount of initial margin collected by U.S. futures commission merchants (FCMs) has mostly risen over the

past five years and has recently reached US\$158 billion (Figure 3).⁶ This rise is driven by increases in futures open interest (Figure 2) – as more investors use futures contracts, more margin is collected as a result.





Source: CFTC

The financing aspect of futures investing has become quite transparent according to one respondent. The posting of initial margin and subsequent daily posting of variation margin has become mostly automated and is considered "one round" compared to the ongoing tax and dividend implications of ETFs. This has facilitated the preferred use of leverage at this firm from both an investment and an operational perspective. This participant mentions transparency around financing as being one of the advantages futures also have over using an over-the-counter swap.

The use of leverage is an important element of portfolio hedging in addition to investment strategies. As one manager mentions, in order to do the hedging that the firm needs to do given its budget, leverage is a huge factor and drives a lot of hedging activity. From a short perspective, the leverage of futures makes them attractive. When working with an ETF, leverage isn't involved—investors trying to achieve leverage through a portfolio margining account are at the mercy of the bank to continue to extend that credit and leverage. Simply put, this respondent believes futures are the best way to go for dynamically adjusting exposures.

Finally, cash management also factors into the decision of using leverage or not. The risk of the futures roll cost is influenced by several factors and is constantly monitored by futures investors.

^{6. &}quot;Cleared Margin Reports," U.S. CFTC, November 2018, accessed January 7, 2019, https://www.cftc.gov/MarketReports/ClearedMarginReports/index.htm.

One respondent tracks premiums and discounts, and the variation away from estimated price. When the futures roll becomes very rich or cheap, the decision to invest in futures or ETFs is reevaluated. However, the cost-benefit analysis of which instrument to invest in is also influenced by the need to manage cash coming in and out of the fund. When cash is needed, this manager may switch back to futures to take advantage of leverage rather than outlaying the cash needed for an ETF position.

FUTURES ROLL OBSERVATIONS

Aite Group interviewed subject-matter experts at CME Group to get a deeper understanding of how the E-mini S&P 500 futures roll has been performing. This section discusses insights as explained by CME Group.

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 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 of E-mini S&P 500 futures was -2 basis points. Since 2012, with the advent of the new banking regulatory regime under the Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank), there has been more appreciable volatility in this financing cost. Further, the rising interest rate environment has influenced the cost of funding relative to benchmark rates.

Figure 4 reflects asset manager positioning in E-mini S&P 500 index futures in which the dealer position is the other side. Over the last years, the buy-side community has been long. This is unsurprising given the persistence of the bull market in U.S. stocks. Since every position has two sides, the short futures position is warehoused by the sell-side and delta-one desks. When this happens, dealers need to fund their positions (e.g., short futures versus a long hedge using a basket of stocks or ETFs to create a matched position) using scarce balance-sheet real estate.



Figure 4: Net Dealer Positions

Source: CME Group

Futures generally trade close to LIBOR but dislocate during extreme positioning periods. If bank balance sheets become too stretched, banks will begin to charge higher funding rates to compensate for use of this scarce resource. The uptick in short dealer positions in December 2017 (-838,374), shown in Figure 4, represents a stretched level, which translates into a higher funding level for futures, shown in Figure 5. During this time, financing fees rose to 75 basis points over 3mL. The richening that occurred at year-end persisted until capacity constraints were alleviated or some positions were reversed. By mid-year 2018, the use of the balance sheet was freed up, bringing funding levels closer to LIBOR flat, which is precisely where 2018 ended.



Figure 5: Roll Financing Spread for E-mini S&P 500 Futures

Source: CME Group

Figure 6 offers a longer look at the history of E-mini S&P 500 futures roll dynamics. Over time, financing spreads have varied. For example, extreme stress in the aftermath of the financial crisis pushed December 2008 average funding levels as high as 78 basis points over 3mL as shown by the line chart. The corresponding high/low range (gray bars) was wide and volatile during that period. However, by March 2016, levels had again reached their lowest points since seven years earlier.

The buildup of positions and balance sheet constraints reached a tipping point of 75 basis points at year-end 2017 before eventually normalizing to LIBOR flat by mid-2018. Despite a richening in September, funding levels reverted to 0 basis points at year-end. The E-mini S&P 500 futures roll has averaged LIBOR plus 16.4 basis points over the last year. This marks an improvement over 2017 when an average financing spread of 45.7 basis points was realized.

Figure 6: E-mini S&P 500 Futures Roll Richness History



E-mini S&P 500 Futures Roll Richness with High/Low Range Q1 2007 to Q4 2018 (in bps)

Looking forward, volatility may continue. Market participants could exploit this phenomenon, especially those with balance-sheet flexibility and an ability to switch between instruments. As one investor mentions, even with market volatility and the potential for wider bid-offer spreads, futures are the preferred choice because of their robustness and liquidity—even outside normal markets. The ability to tactically go long and short the market is straightforward and can't be replicated using ETFs.

Source: CME Group

RISK AND MARGIN

The Standard Portfolio Analysis of Risk (SPAN) system was developed by CME Group in 1988 to assess risk on an overall portfolio basis. SPAN is used to calculate the performance bond (margin) requirements for various contracts traded at the CME as well as other organizations. The CME SPAN methodology is used in over 50 global exchanges, clearing organizations, service bureaus, and regulatory agencies. End users of CME SPAN software range from FCMs to investment banks, hedge funds, research organizations, risk managers, brokerage firms, and individual investors.⁷

HOW SPAN WORKS

Futures contracts traded at the CME are margined using SPAN. The SPAN framework is a marketbased value-at-risk (VaR) system that has been approved by jurisdictional regulators and global participants. It has a variety of inputs and parameters that a margin-setting authority, such as the CME, provides to calculate the maximum likely loss—or scan risk—of a portfolio. This process drives the level of initial margin required.

Simulating the potential for various market moves lies at the core of SPAN risk analysis. The SPAN framework utilizes 16 scenarios containing different price and implied volatility stresses, known as SPAN risk arrays. Products are run through the framework to arrive at a worst-case loss scenario. A specific magnitude of loss is assigned to each contract. For example, the E-minj S&P 500 contract has one value while the E-mini Nasdaq 100 has a different value. Thus, the resulting estimated profit and loss will vary from contract to contract.

SPAN groups together financial instruments with the same underlying for analysis. For example, equity index futures and equity index options would be in the same group. Likewise, long and short E-mini Nasdaq 100 futures positions would be paired. The framework looks over a historical period to assess how correlated products are (i.e., how much they do or do not move in lockstep) to formulate a margin offset. The CME has thousands of spread combinations in its suite. Each product is called a combined commodity. Using a two-step analysis, SPAN uses set parameters to evaluate a portfolio as follows:

- **Step 1:** SPAN analyzes the risk of each combined commodity in isolation of other combined commodities.
- **Step 2:** SPAN seeks risk-reducing offsets between combined commodities.

Figure 7 describes how the SPAN framework is used to arrive at a maximum likelihood loss figure for a portfolio. In this case, an investor holds one futures contract and one call options contract on the S&P 500, which has a price scan range of US\$22,500 (or 90 points) and a volatility scan range of 7%. As each of the 16 price and volatility shocks is applied, the corresponding gain or

^{7. &}quot;CME SPAN Methodology Overview," CME Group, accessed October 26, 2018, https://www.cmegroup.com/clearing/risk-management/span-overview.html.

loss of each position (stacked bar chart) is calculated to arrive at the largest potential loss for the portfolio, represented by the line chart. The scan risk of this portfolio is US\$13,115.



Figure 7: Portfolio Maximum Likelihood Loss

Source: CME Group

A summary of each scan array is presented in Table E. The underlying price move of the S&P 500 index is described in each scenario. The resulting impact is presented for the futures position, the options position, and the combined portfolio.

Table E: CME SPAN Scan Risk Example

Scenario	S&P 500 underlying price move	Volatility move	Futures contract gain/loss (In US\$)	Options contract gain/loss (In US\$)	Portfolio gain/loss (In US\$)
1	Unchanged	Up	\$0	\$1,807	\$1,807
2	Unchanged	Down	\$0	-\$1,838	-\$1,838
3	Up 33%	Up	-\$7,499	\$7,899	\$400
4	Up 33%	Down	-\$7,499	\$5,061	-\$2,438
5	Down 33%	Up	\$7,499	-\$3,836	\$3,663

Scenario	S&P 500 underlying price move	Volatility move	Futures contract gain/loss (In US\$)	Options contract gain/loss (In US\$)	Portfolio gain/loss (In US\$)
6	Down 33%	Down	\$7,499	-\$8,260	-\$761
7	Up 67%	Up	-\$15,001	\$14,360	-\$641
8	Up 67%	Down	-\$15,001	\$12,253	-\$2,748
9	Down 67%	Up	\$15,001	-\$8,949	\$6,052
10	Down 67%	Down	\$15,001	-\$13,980	\$1,021
11	Up 100%	Up	-\$22,500	\$21,107	-\$1,393
12	Up 100%	Down	-\$22,500	\$19,604	-\$2,896
13	Down 100%	Up	\$22,500	-\$13,455	\$9,045
14	Down 100%	Down	\$22,500	-\$18,768	\$3,732
15	Up 300%	Unchanged	-\$22,275	\$21,288	-\$987
16	Down 300%	Unchanged	\$22,275	-\$9,160	\$13,115
		Largest potential	loss = SPAN risk	\$13,	,115

Source: CME Group

The result of the scanning process for each combined commodity is to produce an estimate of market exposure. To recognize the risk-reducing characteristics of portfolios that include offsetting positions in highly correlated instruments, SPAN forms intercommodity spreads. These spreads allow for the reduction in the overall performance bond or margin requirement. For example, an investor that is long one E-mini S&P 500 futures contract and short one E-mini Nasdaq 100 futures contract would see a 75% reduction in the amount of required margin, as shown in Table F. This reduction would translate into a savings of US\$9,375.

Table F: SPAN Margin Offsets

Combined commodity	Position	Outright margin requirement (In US\$)	Margin requirement without offset (In US\$)	SPAN requirement with 75% offset (In US\$)
201812 E-mini S&P 500 future	Long 1	\$6,000		
201812 E-mini Nasdaq 100 future	Short 1	\$6,500	Ş12,500	\$3,125

Source: CME Group

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CONCLUSION

- Liquidity of the instrument and cost of trading drive instrument choice. Investors rely on deep robust markets, particularly during periods of market stress and volatility. Although futures carry roll risk, respondents point to the resiliency of futures when transacting larger trades and the ability to better control information leakage as a strong positive.
- Leverage is still king. Several respondents assert their preference for using leverage versus paying full freight for an ETF upfront. The decision often comes down to opportunity cost. For those managers who can optimize their collateral efficiently, investing in futures contracts is typically the way to go. Fund cash management is also found to influence the decision of instrument choice: If a fund needs more cash, the dependence of leverage increases.
- Operationally speaking, futures and ETFs are on more common ground than in the past. While clear differences remain in the operational requirements of futures versus ETFs, the majority of buy-side firms interviewed view these variants as a non-event. Given today's technology, operations departments have automated much of this process, alleviating most limitations, as instrument choice falls squarely to the front office.
- Futures volume in traditionally less liquid contracts is on the rise. In the past, respondents indicated that ETFs were the most efficient means to gain exposure to certain markets. However, over the past 18 months, and particularly in 2018, futures volume has increased dramatically. This has closed the liquidity gap between futures and ETFs as pricing, spreads, market-making, and transparency improve, and as many more market participants turn to derivatives.
- The futures exchange model is preferred. Several respondents point to advantages of using a futures exchange, including a single, deep order book for transacting and measuring liquidity. The availability of data was also cited as an advantage. On the clearing side, the presence of portfolio margining capabilities to produce offsets and reduce margin expense is seen as a key consideration when choosing between futures and ETFs.

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 scenarios using the two mentioned products—futures and ETFs. The scenarios tested will feature 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.

The four scenarios consider the CME E-mini S&P 500 (ES) contract to represent the futures position. The ETF position is a combination of the State Street SPDR S&P 500 ETF (SPY), iShares Core S&P 500 ETF (IVV), and Vanguard S&P 500 ETF (VOO). The same transaction costs, round-trip fees, and market impact are applied in each scenario 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. Using a one-year average, the cost of carry is 16.4 basis points per annum.

SCENARIO ONE: FULLY FUNDED INVESTOR

In this first scenario, the calculation of the total cost of replicating equity index returns over a 12month period is simply the sum of transaction costs and the pro rata portion of holding costs. The graphical representation incorporates both ETFs and futures and is shown in Figure 8.





Source: CME Group

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The first costs incurred in the round-trip transaction are the market impact and the execution (commission and clearing) fees. These fees are represented in Figure 8 where each series touches the Y axis and ranges from 2.45 basis points to 7.50 basis points, favoring the use of futures contracts in terms of cost-efficiency. Holding an instrument over time increases cost as time elapses along the X axis. When considering total holding costs, ETF investors must take into account management fees and tracking error. Likewise, futures investors incur financing fees. ETFs presently have lower holding costs of 12.3 basis points compared to financing fees of 16.4 basis points associated with futures contracts.

The rising slope in the ETFs' cost is caused by the accrued holding costs, while the futures costs jump quarterly due to the quarterly futures rolls. The futures rolls' implied richness compared to the ETFs' management costs is the cause for the upward slope. When futures are trading rich (3mL +16.4 basis points), the E-mini S&P 500 (ES) contract is most cost-efficient for the first three months. ETFs become cheaper beyond that point, as the implied richness of futures becomes greater than the drag on performance generated by the management fee as well as the ETF tracking error.

Several factors contribute to the richening of the futures roll. Buy-side positioning has remained long, sending sell-side net dealer positions to -444,646 by year-end 2018 (Figure 4). However, this level of net dealer positioning translates into a funding level of 3mL flat (Figure 5). Since the first study, it is also notable to mention that interest rates have increased in the U.S., pushing 3mL from a level of 0.008% in Q1 2017 to 2.680% in Q4 2018. Should expectations of higher rates in the future prevail, 3mL will continue to rise.

In summary, Figure 8 shows that over a 12-month period, a fully funded investor would find futures to be the most cost-effective means of replicating the returns of the S&P 500 for roughly three months. From the fourth month, this advantage would disappear. Although all three instruments show increases in total costs, the cost increase in futures contracts is more severe.

SCENARIO TWO: LEVERAGED INVESTOR

Index futures are designed with leverage in mind. By posting the margin while opening a position of around 4.79% total initial capital, investors can leverage themselves by approximately 20 times. Similarly, ETFs can also be bought on margin to increase their leverage. However, 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 (2.680%) plus 0.40% (the standard lending rate from prime brokers), for a total cost of 308 basis points.

THE 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 interest due at 308 basis points 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 (Figure 8), the fully funded investor would deposit US\$100 million (less initial margin fees) and earn interest on it at LIBOR 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 (less initial margin fees) 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 9 compares total costs borne by investors for both ETFs and futures. Two scenarios are cast for each instrument over a 12-month period: 2x leveraged and 8x leveraged. In all four instances, accrued costs are higher in the leveraged example versus the fully funded example described by Figure 8. ETFs are linked to higher total costs versus futures in each scenario as a result of interest paid on borrowed funds.



Figure 9: Total Cost for 2x and 8x Leveraged, 12 Months

Source: CME Group

8X LEVERAGED INVESTOR

Although the 8x leveraged scenario is predicated on the same assumptions as the 2x leveraged example above, in order to achieve higher leverage an investor would deploy only US\$12.5 million in capital to gain the full US\$100 million exposure. For ETFs, the balance would come from a prime broker. In the case of futures, only the initial margin is required and the remainder of the \$12.5 million of capital is free to reinvest elsewhere (e.g., earning LIBOR).

The cost relationship for the 8x leveraged investor is similar to the 2x leveraged case. The need to borrow more from a prime broker to fund ETF exposures again increases the investor's overall holding cost beyond that of the futures investor, as shown by Figure 9. At the end of the 12-month period, given the average cost of futures financing, it becomes more cost effective to hold futures rather than ETFs for the 2x and 8x scenarios by 34.97 basis points and 50.01 basis points, respectively.

SCENARIO THREE: SHORT-SELLER INVESTOR

An investor shorting the market aims to exploit the future negative performance of 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. In 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 (268 basis points, or 2.680%) less the prime broker borrow fee (40 basis points), resulting in a return on cash of 3mL -40 basis points. As this transaction requires collateral, the investor must post half of the notional amount of the trade to the prime broker as margin.

Since equity index futures are leveraged derivatives, the E-mini S&P 500 futures short seller will not need to borrow shares and pay borrowing fees. The same initial margin is required when buying or selling futures (before any margin offsets are applied). When shorting the market, this investor will benefit from not needing to pay the holding cost when the holding cost of futures is rich to LIBOR:

- ETFs: The ETF investor, (1) receives management fees, (2) receives 3mL -40 basis points 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.
- **Futures:** In the event that futures are rolling rich (Figure 5), 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. An investor using futures is also able to deploy the US\$50 million less initial margin.

The aforementioned points cause holding costs to become negative, as seen in Figure 10. In relative terms, the four replication strategies will have a better performance than the S&P 500, given that the index returns go negative, a benefit for the short seller. Futures are again more cost-effective than ETFs, regardless of the future rolls in all time horizons. At the end of the 12-month period, futures have an advantage of 41.24 basis points over ETFs.





Source: CME Group

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.⁸) 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 12-month dividend yield of the S&P 500 is assumed to be 2.14%, adding up 64.2 basis points each year to the holding costs for international ETF investors.⁹

^{8.} Aite Group and CME Group do not provide tax advice. Investors should consult their own advisors before making any investment decisions.

^{9.} These are CME Group-provided figures. The 12-month dividend yield is taken from Bloomberg and includes all dividends taken from the previous 12 months divided by the current index price.

Futures, by comparison, do not pay dividends; however, the market price reflects an approximate full dividend-yield basis. As there is no cash distribution, there is no withholding tax¹⁰ increasing the holding costs.

Figure 9 describes costs incurred over a period of 12 months in this scenario. The quarterly steps on the ETF line represent the dividend withholding tax; by the end of the period, the cost difference is 48.13 basis points.¹¹ 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.





Source: CME Group

^{10.} These are CME Group-provided figures.

^{11.} 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.

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