CME Group

The Big Picture: A Cost Comparison of Futures and ETFs

For the Active Individual Trader

INTRODUCTION

This report quantifies the total cost of trading the S&P 500 via futures and ETFs for an *active individual trader* and compares CME E-mini S&P 500 futures (ES) with three U.S.-listed S&P 500 ETFs: SPDR S&P 500 ETF (SPY), iShares Core S&P 500 ETF (IVV) and Vanguard S&P 500 ETF (VOO). The analysis shows the cost advantage of futures across three investment scenarios, and highlights the superior liquidity and capital efficiencies afforded by futures.

COST ESTIMATES AND ASSUMPTIONS

The framework for the analysis is a hypothetical order of approximately $100,000 executed through a broker intermediary, or a broker-sponsored trading platform for three different individual investors: a fully-funded long, a leveraged long, and a short investor. Roughly speaking, one E-mini S&P 500 future or 500 ETF shares equate to $100,000 in notional value.[1] The total cost of index replication is divided into two components: transaction costs and holding costs.

TRANSACTION COSTS

Transaction costs are expenses incurred in the opening and closing of the position. These apply equally to all trades, regardless of the time horizon.

Commission: The first component of transaction cost is the commission, or fee, charged by the broker for the execution, which varies from client to client. This analysis assumes execution costs of $3.54 per contract (0.35bps) for E-mini S&P 500 futures and $0.08 per share (4.1bps) for each ETF.[2]

Market Impact: The second component of transaction costs is market impact , which measures the adverse price movement caused by the act of executing the order. Market impact[3] can be difficult to quantify and, given that an order of $100,000 represents less than 0.0001% of average daily notional value traded in the ES future ($173 billion) and 0.0004% of average daily notional value in SPY ETF ($25.3 billion), it is reasonable to assume minimal market impact beyond the cost of crossing the bid-ask spread. This analysis, therefore, estimates one tick increment for ES (1.25 bps) and SPY (0.5bps), and four ticks for IVV (2.0bps) and VOO (2.2bps).[4]

HOLDING COSTS

Holding costs are expenses that accrue over the time the position is held. These generally grow linearly with time (e.g. ETF management fees, which accrue daily) although there are some, which are discrete but recurring (e.g. execution fees on quarterly futures rolls).

The sources of holding costs for ETFs and futures are different, owing to the very different structures of the two products. Some, if not all, of the holding costs detailed below will apply depending on the investor.

ETFs:

- Investor must fully pay for the ETF (forgoing additional investments), finance the full notional value, or use margin power within the account at inception
  - Regulation T margin requirement of 50% at margin loan rates (maximum 2x leverage)
- Daily management fee charged by the fund
  - 9.45 bps per annum for SPY, 7bps for IVV, and 5bps for VOO
- Holder is entitled to receive dividends and could be subject to additional withholding tax if domiciled outside the U.S.

1 *Notional values as of March 11, 2016.*

2 *Transaction cost estimates are based on the average execution fees among the largest retail brokers.*

3 *In the simplest case – an unlimited market order sent directly to the exchange – the market impact can be accurately defined as the difference between the market price immediately prior to the order being submitted and the final execution price of the trade.*

4 *The market impact assumes a 1-lot for ES and a 500-lot for the ETF crosses the bid-ask spread for each.*

Futures:

- Initial margin requirement of 4.75%[5] (approximately 20x leverage)
- E-mini S&P 500 futures must be rolled on a quarterly basis, currently observed as Libor-25bps[6]

Unlike ETFs, futures do not carry management fees, but rather an implied financing cost embedded in the price. Since the buyer of futures is implicitly paying the seller to replicate the index returns with their own capital, the futures price will be adjusted to reflect the cost of these "borrowed" funds. This implied financing rate is most readily inferred in the futures roll cost.[7] Recall, the buyer of futures incurs only a nominal cash outlay of 4.75% for initial margin, and the remaining cash balance is available for deposit and will generate interest[8] to help offset the implied financing rate of the futures position. Comparing the implied futures financing rate with the corresponding USD-Libor rate over the same period, one can calculate the spread to Libor to determine whether the future is rolling "rich" (implied rate above Libor) or "cheap" (implied financing below Libor). For this analysis, the futures roll cost of 3-month USD-Libor (3mL) +20bps is used when futures are rich and 3mL -5.7bps is used when futures are cheap.[9]

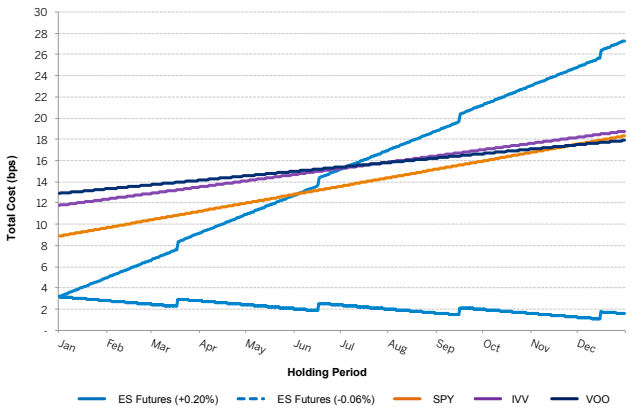
SCENARIO ANALYSIS

In each case, the total cost is computed for a holding period of 12 months. All scenarios assume the same transaction costs and market impact at both trade initiation and exit.

Scenario 1: Fully-Funded Long Investor

For a fully-funded investor, the total cost is the sum of transaction costs plus the pro-rata portion of annual holding costs. The starting point for each graph represents the round-trip execution costs: 3.18bps for ES, 8.9bps for SPY, 11.8bps for IVV, and 12.9bps for VOO. Most of the lines slope upward as time passes, reflecting the gradual accrual of the annual holding costs, with small jumps in the futures line due to the quarterly roll costs.

Figure 1: Futures Trading "Rich", Positive Spread to Libor – Fully-funded Investor, 12 months



5 *Margin amounts are subject to change. At the time of writing the margin requirement on E-mini S&P 500 futures is $4,750 on a contract notional of roughly $100,000.*

6 *Source: CME Roll Tool Analyzer as of March 11, 2016.*

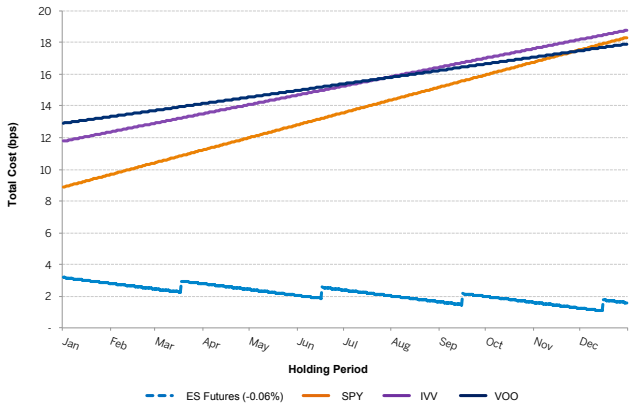
7 *Since futures expire on a quarterly basis, an investor wishing to maintain a futures position will realize this cost when "rolling forward" their positions by liquidating the nearby contract and re-establishing the position in the deferred month contract.*

8 *It is assumed interest earned on cash deposits will be on par with the baseline risk-free rate used to value futures; standard convention for U.S.-based equity products is to use a Libor-based risk-free rate.*

9 *The analysis uses the 2014-2015 average roll cost for the "rich" scenario and the H2-2015 average roll cost for the "cheap" scenario.*

When futures are rolling rich (3mL +20bps), ES is most cost efficient up until the sixth month. At the breakeven point (approximately 155 days), SPY becomes the cheaper alternative as the implied richness of futures becomes greater than the drag on performance generated by the management fee of the ETF.

Figure 2: Futures Trading "Cheap", Negative Spread to Libor – Fully-funded Investor, 12 months



When futures are rolling cheap (3mL -5.7bps), the cost of carrying futures continues to decrease over time as the fully-funded long investor captures the spread between interest earned on cash ($95,250[10] at 3-month USD-Libor) and the implied financing rate paid on the futures ($100,000 notional at sub-Libor). As evident in the below, there is no breakeven point and futures are the most cost-effective alternative in to perpetuity.

Scenario 2: Leveraged Investor

A major difference between futures and ETFs is the amount of leverage possible with each product. E-mini S&P 500 futures require an initial margin deposit of approximately 4.75%, resulting in over 20x leverage on the position. Meaning, a $100,000 notional position in futures requires roughly $4,750 at trade initiation.[11] For ETFs, the investor is required to deposit a minimum margin of 50% of the purchase price at trade initiation, resulting in a maximum of 2x leverage on the position.[12]

The leveraged investor is assumed to have $50,000 with which to take a $100,000 position. The holding cost for a 2x levered ETF position is therefore the same as the fully-funded position plus the interest expense charged on the $50,000 margin loan by the broker. Lending rates vary significantly by broker and loan amount, where at the time of this report margin loan rates ranged from 180bps to over 800bps. For the comparative framework in this report, the 180bps is used to not unintentionally overstate the savings of futures over ETFs. (Note: not all investors will be able to access this low-end margin in practice.)

For a futures position, it is not a question about borrowing money, as the investor with $50,000 already has 10x the required initial margin. Rather it is a case of having less generating interest to defray the baseline financing cost (3mL) of the future. Meaning, in contrast to the fully-funded investor, the 2x leveraged investor's amount of cash to deposit is reduced by half and will only generate enough interest to offset half of the futures notional. As a result, the 2x leveraged investor will incur the implied financing on the remaining half of the futures notional plus the expense of the positive (or less the credit of the negative spread) on the full $100,000 contract value. Hence, his or her

10 Starting balance of 100,000 less initial margin of 4.75%

11 Margin amounts are subject to change. At the time of writing the margin requirement on E-mini S&P 500 futures is $4,750 on a contract notional of roughly $100,000.

12 Unlike futures, ETFs are subject to Federal Reserve Board Regulation T margin requirements.

holding cost can be viewed as the same as the fully-funded scenario plus the added interest expense of $50,000 at the baseline funding rate of 3-month USD-Libor.

Figure 3: Leveraged Investor, 12 months

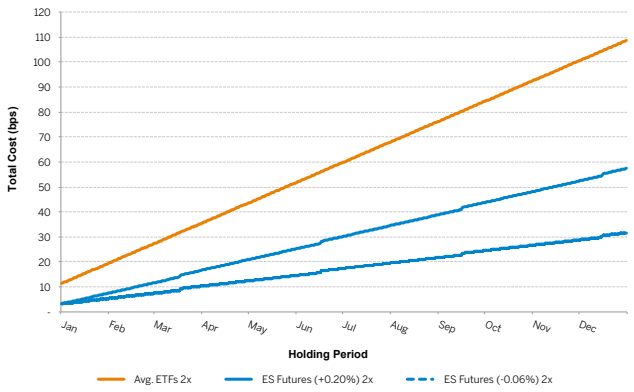


Figure 3 shows that as a function of leverage, the total cost associated with futures will never exceed that of the ETFs, making futures more economically attractive for the leveraged investor regardless if the roll is rich or cheap. To further underscore this point, when compared to the cheapest margin loan rate of 1.8%, the E-mini S&P 500 futures roll would have to trade in excess of the extreme level of 3mL +71bps – a level witnessed only once in December 2008 – for an entire year before the ETFs would enjoy any cost advantage over futures for the leveraged investor.

Scenario 3: Short Investor

The holding costs for short positions in futures and ETFs can be summarized below:

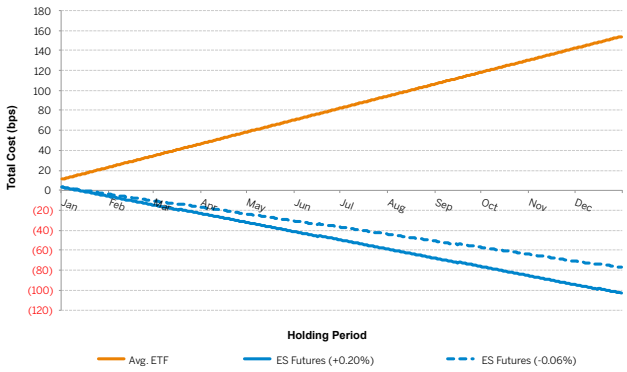
Futures:

- Receive implied financing rate[13]
- Receive 3-month USD-Libor on $50,000 cash deposit

ETFs:

- Receive the management fee of 5-9.45 bps per annum
- Cost of Stock Borrow: a short seller is required to pay margin loan rates on the full trade notional to their executing broker for the borrowed shares that cover the short sale delivery.[14]
- Buy to Cover Margin Power: a short sale requires enough funds (cash and/or purchasing power) to buy all the shares back at any time, regardless of stock price. Meaning, if the share price and the position's resulting market value increase from the $100,000, the 2x leveraged investor would have to increase the cash deposit in their account, or borrow funds at margin loan rates, to maintain the purchasing power to cover the stock (50% required of the current short market value).
- Receive interest on $50,000 cash balance[15]

Figure 4: Short Futures vs. ETF, 12 months



13 The short sale of futures does not require a loan of shares to sell short or pay the associated fee.

14 While some short sale proceeds can earn positive interest to defray margin loan expenses, it is not applicable to SPY, IVV or VOO at the time of this report as the carry negative rebates at the time of this report. Source: Interactive Brokers SLB tool, March 15, 2016.

15 This also varies significantly based on broker and the investor's account value.

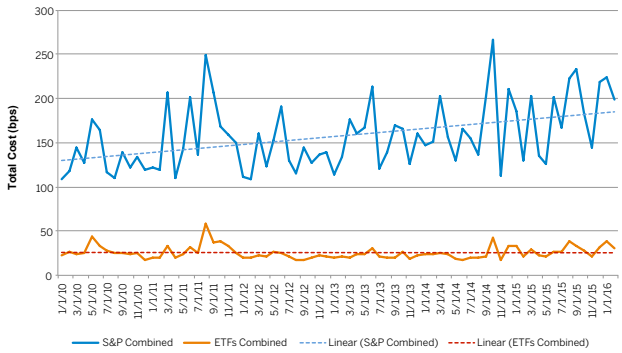
Figure 4 shows that the cost advantage of futures over ETFs for the short investor will apply for all time horizons, regardless of roll richness or cheapness. Even if an individual investor were charged more favorable funding spreads by the broker,[16] futures would still remain the cheaper alternative for the short investor.

For the active individual investor, who is more short-term and tactical in their trading approach than the long-term "buy-and-hold" investor, the roll costs should not factor in as much as the liquidity advantages and capital efficiencies extended by futures.

LIQUIDITY

For SPY, the average daily turnover is $23.1 billion, and the average holding period is currently 7.1 days.[17] For the E-mini S&P 500 future, average daily turnover is $173 billion and average holding period is 1.7 days.[18] Given that the liquidity of the E-mini S&P 500 future is nearly 7x that of SPY and more than 130x that of IVV and VOO combined, the level of liquidity should be considered by an active individual investor.

S&P 500 Futures vs. ETFs ADVT($) (Monthly)



Please consult a qualified attorney or accountant for up-to-date tax advice that is applicable to your situation.

CAPITAL AND OPERATIONAL EFFICIENCIES

E-mini S&P 500 futures may provide distinct capital advantages over SPY and other ETFs due to differences in how each is classified under the tax code.

60/40 treatment. E-mini S&P 500 futures are section 1256 contracts with a blended U.S. capital gains treatment of 60% long-term and 40% short-term. This means that at the end of the year, the net capital gain or loss from futures trading will be divided into 60% long-term and 40% short-term, regardless of how long the contracts were held.

Currently, the maximum capital gains tax rates are 15% for long-term and 39.6% for short-term. Due to the 60/40 treatment of futures may allow active traders to achieve a net maximum blended tax rate of 24.8%.

By comparison, ETF positions are taxed according to holding period. Positions held for more than one year will be treated as long-term capital gains while positions held for one year or less will be taxed as short-term capital gains. In general, an active individual investor will not hold positions long enough to qualify for long-term capital gains.

16 *This assumes the individual investor pays margin loan rates on the full notional of borrowed stock and no additional interest earned on the short sale proceeds.*

17 *Source: Bloomberg 2015 average*

18 *Source: Bloomberg 2015 average*

Example A

Assume an investor has a net gain of $20,000 in E-mini S&P 500 futures for 2015. At the end of the year $12,000 will be taxed at the lower, long-term capital gains rate and $8,000 will be taxed at the higher, short-term capital gains rate:

$12,000 X 15%	**=**	**$1,800**	**(60% at long-term rate)**
$8,000 X 39.5%	**=**	**$3,160**	**(40% at short-term rate)**
$1,800 + $3,160	**=**	**$4,960**	**(24.8% of $20,000)**

Example B

Assume an investor has a net gain of $20,000 in SPY for 2015. At the end of the year the entire amount would be taxed at the higher, short-term capital gains rate since the holding period one year:

$20,000 X 39.5% =	**$7,900**	**(100% at short-term rate)**

Carry-back losses. Investors can use futures losses to offset gains in previous years, and are allowed to carry back these losses up to three years . This may allow the investor to receive a refund on taxes paid in prior years.[19] Conversely, if any unabsorbed losses still remain after the carry-back, these losses can be carried forward.

Wash sale rule. Unlike ETFs, futures are also not subject to the wash sale rule, which basically states that if an investor liquidates a position at a loss (in order to receive a tax deduction) and reestablishes the position within a certain timeframe thereafter (30-days before or 30- days after the liquidation), the investor will be denied a current tax deduction of that loss (the tax benefit of that loss is deferred). Instead, all open futures positions are marked-to-market at the end of the year; all realized and unrealized gains and losses receive 60/40 treatment.

Operational simplicity: The ease of year-end filing is another advantage for futures. Trading SPY requires investors to keep track of every transaction for the year, which can be time-consuming to enter on the tax return. Trading E-mini S&P 500 futures, however, does not require detailed transaction recordkeeping and reporting. Instead, futures investors receive a 1099-b form from their broker that shows a single line item: the net gain or loss. If an investor made $20,000, for instance, the 1099-b form will show $20,000 and nothing else.

CONCLUSION

While this report highlights the cost advantages of E-mini S&P 500 futures relative to the most liquid S&P 500 ETFs, investors are reminded that the analysis rests on a number of stated assumptions and encouraged to use this framework for computing the cost for their situation.

For questions or comments about this report or CME Equity Index products, contact **equities@cmegroup.com**

19 Losses being carried back cannot exceed the net gains of the previous year, nor can they increase or produce a net operating loss for that year.

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