ETF Transaction Costs Are Often Higher Than Investors Realize

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Exchange-traded funds (ETFs) and other exchange-traded products (ETPs) provide simple and efficient diversification and exposure to a wide range of asset classes. The equity markets where ETF shares trade are usually much more investor-friendly than the underlying market structures for other asset classes. Low bid–ask spreads combined with generally low fund expenses have made ETFs an extremely popular investment product—now accounting for approximately 28% of the value of U.S. exchange trading, according to Credit Suisse.\(^1\)

However, ETF transaction costs are not as low as they might seem. ETF prices can and do deviate from their Net Asset Values (NAVs), and an investor’s true transaction cost is the amount of the deviation from the contemporaneous NAV. Narrow bid–ask spreads can be a very misleading indicator of the true cost of trading ETFs. This paper examines how and why ETF prices can deviate from the NAV, along with some of the implications for investors. Investors need to be aware of these potential deviations when they place their orders. Market-on-close (MOC) orders, for example, are often much more costly than they appear.

ETF SHARE CREATIONS AND REDEMPTIONS—THE ROLE OF ARBITRAGE FORCES

ETF trading prices are set by supply and demand in the marketplace; there is no regulatory requirement that they be tied in any direct way to the underlying NAVs. Investors rely upon an arbitrage mechanism to keep ETF prices in line with the underlying portfolio values. When the price of an ETF is below the underlying portfolio value, arbitrageurs step in to buy the cheap ETF. They then hedge their risk in buying ETF shares, usually by selling the basket of underlying securities or a correlated proxy portfolio or index. This arbitrage activity normally pushes the price of an ETF into alignment with its underlying securities. However, this arbitrage activity only takes place when the ETF price has deviated enough from the underlying portfolio value to make arbitrage worthwhile. ETF prices will fluctuate within a band determined by the cost of arbitrage and the balance of supply and demand for the ETF’s shares among investors.

To unwind an ETF arbitrage position, an arbitrageur may reverse the original trade if the price discrepancy has reversed, or close out the position by creating or redeeming ETF shares in transactions with the issuer at NAV. As most investors in ETFs are aware, new shares of an ETF are created when investor demand for the shares is greater than the number of shares outstanding. In a creation, an Authorized Participant (AP)—a brokerage firm usually acting on behalf of a market maker—typically exchanges a specified basket of the fund’s portfolio securities for the ETF’s shares. If demand for the fund shares slackens and investors are selling shares on balance, an
AP will redeem ETF shares in kind by turning in shares of the ETF and receiving the basket of portfolio securities specified by the fund.\(^2\)

Exhibit 1 illustrates in a schematic way the nature and relationship of the various costs and prices associated with common stock and ETF trading and ETF share creations and redemptions. Point D denotes the current value of the ETF’s underlying stock portfolio, and Point E represents the value of the portfolio at the best ask price. However, the ask price is usually only good for a small number of shares. Because of market impact, a market maker’s cost of acquiring the ETF’s underlying holdings in creation unit size is higher (Point F). Furthermore, the creation process is not free; transaction fees push the market maker’s cost of actually creating shares up to Point G. For the market maker to make money by selling ETF shares in the market and then transacting with the ETF to create shares, the average price of the fund shares sold must exceed G.

Similar to creation fees, market makers pay transaction fees in connection with redemptions, which push the market maker’s proceeds from redeeming shares down to Point A. For a market maker to make money by buying ETF shares in the market and then transacting with the ETF to redeem the shares, the average price of the fund shares purchased by the market maker must be less than A.

An ETF’s price can fluctuate between A and G–and beyond in either direction. The actual location of an ETF’s trading price at any point in time will reflect the current balance of supply and demand for the ETF shares.

Unfortunately, too many investors assume that the midpoint between an ETF’s bid and offer prices in intraday trading is centered on or near the contemporaneous price (last sale or midpoint value of the ETF’s portfolio)–point D in Exhibit 1. In fact, transactions in ETF shares will persistently unbalance the midpoint of the quoted ETF bid–ask spread, and thus the midpoint need not straddle the underlying value. For example, if a wave of selling sentiment hits the market for the ETF’s shares, both the bid and ask prices could be pushed well below the fund’s current portfolio value. This was particularly evident on August 24, 2015, when many ETFs traded at extreme discounts to the value of their underlying assets.\(^3\)

Exhibit 2 illustrates a case in which selling sentiment pushes an ETF’s bid and ask prices below the fund’s current value almost to the level at which arbitrage will occur.

Note that the midpoint of the quoted spread (A to B) is not close to the current value of the ETF’s portfolio. Obviously, the scale of A through G will vary with the liquidity of the underlying instruments. An ETF whose constituents are actively traded domestic stocks will have a narrower range from A to G than an ETF whose constituents are illiquid foreign stocks that don’t trade during U.S. market hours.

The nominal spread between A and G is very large for some ETFs, such as the iShares MSCI Emerging Markets ETF (EEM). By simplifying only slightly, we can see that the maximum charge for market impact trading costs over NAV (generally calculated using last sale prices) on a cash creation of EEM shares is 3%, according to the EEM prospectus. The comparable maximum on a redemption is about 2%. The administrative fee is nominal relative to these amounts, which suggests a possible 5% round-trip cost, or $2 on a $40 share price. This maximum round-trip trading cost is obviously inconsistent with
any expectation of a one or two basis point spread in the intraday ETF exchange market.

ETF Trading Costs Are Best Measured by the Difference between the Price and the Contemporaneous ETF Portfolio Value

Investors traditionally view equity trading costs as a combination of bid–ask spread, market impact, and commission costs. That may well be the most useful measure of the cost of trading a stock, because the price of a stock is the best determinant of its current value.

But ETFs are different from stocks. Their value is derived from, and can be measured against, the value of the fund’s underlying holdings. Accordingly, ETF transaction costs are more accurately measured as the difference between the net purchase or sale price and the current value of the fund portfolio at the time the transaction is priced. That is the real cost to the investor of trading an ETF.

One might be tempted to dismiss fluctuations between ETF transaction prices and current portfolio values as random noises with an expectation of zero. And one might think that a buyer is just as likely to pay a price below the current value as a price above it. Such is not the case.

It is well known that investors tend to move in herds, trading overwhelmingly in the same direction. Traders acting as market makers take the other side of investor trades. The market makers, of course, charge accordingly, because they have costs to bear and expect to be paid for providing liquidity. When investors are net buyers of an ETF’s shares, they will push the price of the ETF above the current portfolio value. And when investors are net sellers of an ETF’s shares, they will push the price below current value. Thus, the average ETF investor can expect to pay more than an ETF is worth when buying—and receive less than the ETF is worth when selling.

This more correct view of ETF transaction costs has a startling implication: ETF bid–ask spreads tell investors nothing about the costs associated with buying or selling ETF shares.

The costs of buying or selling ETF shares are driven by the costs of trading the underlying securities. ETFs can have narrow spreads even when they are costly to trade.

WHAT IS THE COST OF TRADING ETFS?

Let us examine what we know about the relationship between bid–ask spreads in the underlying securities and the bid–ask spreads of ETFs. A 2013 publication from BlackRock (Golub et al. [2013]), the sponsors of the iShares family of ETFs, provides some comments on ETF trading costs and the information on trading in selected ETF holdings and the ETF markets illustrated in Exhibits 3 and 4 below. The exhibits show some very interesting price and volume relationships from Golub et al. for some of the iShares domestic and international ETFs, and their underlying indexes.

Exhibit 3 shows that the average daily U.S. dollar market value of the stocks in the five indexes that trade each day (the taller of each of the paired bars) is much greater than the dollar value of the ETF index shares that
ETF TRANSACTION COSTS ARE OFTEN HIGHER THAN INVESTORS REALIZE

Trade on the market each day (the shorter bars). Exhibit 4 compares the weighted bid–ask spreads for the baskets of underlying securities in each of the funds listed (the taller bars) to the bid–ask spreads in the market for the fund shares (the shorter bars) measured in basis points (one basis point = .01 of 1% = .0001). Regardless of how the bid–ask spread for the basket of portfolio securities is weighted, the spread for the average basket component is much wider than the bid–ask spread reported for the shares of the fund in every case, and the average bid–ask spreads on the shares of the iShares funds that Golub et al. selected for this examination are all less than three basis points.

The iShares MSCI Emerging Markets Index Fund (EEM), which has a large fraction of portfolio securities that trade on stock markets largely outside U.S. stock exchange trading hours, has a bid–ask spread on the fund shares of less than the equivalent of $0.02 on recent share prices. With such a narrow average bid–ask spread, it is tempting to assume that the cost of trading EEM shares is so small that it is not worth worrying about. Perhaps some investors would believe it is better to place a market order or a marketable limit order than to allocate valuable time to learning more about how ETF trading costs work—unless this bid–ask spread is too good to be true.

One of the most important things our parents taught us is that if something seems too good to be true, we should take a very close look to see what is going on. We have written this paper because we believe that if one wants to understand and control the costs of buying and selling shares in these and other ETFs, there are things going on here that deserve attention.

Apparently tight nominal bid–ask spreads for trading ETF shares create an environment in which transaction costs are higher than they appear. A fund’s official end-of-day NAV is the best available contemporaneous measure of the value of the ETF portfolio at the market close. And we will see that these ETFs often trade much farther from the closing NAV than indicated by the average bid–ask spread.

Exhibit 5 compares average nominal (small transaction) ETF share bid–ask spreads to average underlying stock basket nominal bid–ask spreads for the funds highlighted in the BlackRock (Golub et al. [2013]) article. Larger purchases will often be at significantly higher prices and larger sales will often be at significantly lower prices; thus the Best Bid and Offer may not be a useful indicator of where any trade will be priced during the trading day. The first

**Exhibit 4**
ETF vs. Underlying Bid–Ask Spread

Table: Comparison of ETF Bid–Ask Spreads to Underlying Basket Bid–Ask Spreads (in basis points)

<table>
<thead>
<tr>
<th>ETF (symbol)</th>
<th>iShares Bid–Ask Spread (bps)</th>
<th>Bid–Ask Spread for Underlying Basket (bps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>iShares MSCI Emerging Markets (EEM)</td>
<td>2.4</td>
<td>24.8</td>
</tr>
<tr>
<td>iShares MSCI EAFE (EFA)</td>
<td>1.7</td>
<td>18.2</td>
</tr>
<tr>
<td>iShares CORE S&amp;P 500 (IVV)</td>
<td>1.2</td>
<td>2.7</td>
</tr>
<tr>
<td>iShares Russell 2000 (IWM)</td>
<td>1.1</td>
<td>24.3</td>
</tr>
<tr>
<td>iShares Russell 1000 Growth (IWD)</td>
<td>1.4</td>
<td>2.8</td>
</tr>
</tbody>
</table>

Source: Golub et al. [2013, p. 9]
The bid–ask spread data for other large, actively traded ETFs suggests that large, actively traded ETFs, particularly those based on equity portfolios, trade in a narrow nominal bid–ask range when, and only when, trading in the fund shares is extremely active (with volume measured in tens of millions or occasionally hundreds of millions of shares per day). Less actively traded ETFs often have much wider spreads. Unfortunately, even for the actively traded ETFs, time-coordinated measures of the depth and location of these fund bids and offers relative to current markets in the portfolio securities or proxies are not available to most investors. Consequently, the narrow posted fund spreads often mislead investors into mistakenly assuming that the contemporaneous value of the ETF share is “inside” or—at worst—at the other side of the posted spread, and they often rely on fund share spreads to estimate the cost of trading a specific ETF. The fact that posted ETF average spreads can mislead investors who want to control their cost of trading is worth every ETF investor’s careful attention.

If an ETF holds only stocks traded in the U.S. and Canada and a professional trader wants to keep track of the current market for that ETF’s portfolio stocks, the trader can obtain data to calculate a share value based on the sizes and prices of bids and offers on all the stocks in the ETF portfolio. This is not a useful calculation if a significant fraction of the positions in the portfolio don’t trade during U.S. trading hours. The professional traders (whom we will refer to from here on as market makers because they are trading in the ETF market in an attempt to make a profit by taking the other side of investor trades) will manage the market risk of their firm’s trading book with positions in various futures, options, stock baskets, and ETF shares. A market maker will position the market-making firm’s bids and offers for an ETF’s shares to interact with the overall balance of public order flow in a way that will be profitable for the market-making firm.

ETF market makers are not indifferent to the pattern of ETF investor trading. When public investors are sellers, on balance, the market maker will usually try to bid for and buy shares in the ETF at or below the bid-side value of the securities in the portfolio creation/redemption basket. On the offer side of the quote, the market maker may sell ETF shares at a spread to its bid that is similar to the tight spreads we see in the first data column of Exhibit 5; but the spread will only be this narrow if there are not many buyers around. The posted spreads are tight, but as long as the preponderance of customer trades are sales to the market maker at a low bid, the market maker will be buying shares below the cost of redeeming them. A small buy order will be accommodated at the nominal offer price, but if the direction of order flow changes and buyers want to buy in size, the market maker will soon move the offer up to reflect the cost of creating more ETF shares.

Order flow in any ETF market is often predominantly in one direction or the other for hours or days at a time. When a large new order or other new information changes the direction of order flow, the market maker will typically adjust the posted quote quickly to provide liquidity to public buyers at a price where the market maker can fully cover the cost of accommodating these customers—plus a profit. The appropriate trading cost measurement for an investor is the difference between the transaction price and the contemporaneous value of the fund portfolio when the trade is priced. The true round-trip trading spread will be closer to (and probably greater than) the 24.8 basis points in the taller bar in the MSCI Emerging Market ETF in Exhibit 4 than to the 2.4 basis points in the shorter bar. To clarify these relationships, we will examine this issue from other perspectives (in both the text of this article and in the Appendix) and see why the costs of buying and selling EEM shares are often far higher than they initially appear.

**Transaction Costs Are Often Much Higher Than the Bid–Ask Spread for ETFs**

One common misconception is that all ETFs are inexpensive instruments to hold and trade. Although broad market U.S.-based ETFs such as the SPDR S&P 500 ETF Trust (SPY) and Vanguard Total Stock Market ETF (VTI) have rock-bottom expense ratios and usually relatively low trading costs, this is not true for all ETFs. Much more important than fund expense ratios in many instances is the largely “hidden” cost of trading ETFs—and that cost is the difference between the market price paid or received and the contemporaneous value of the ETF assets. Arbitrage activity minimizes this discrepancy for ETFs holding liquid securities that trade during U.S. market hours. However, many ETFs hold securities that do not trade during U.S. market hours, and this makes traditional arbitrage difficult. Investors and even market makers are often flying blind when they trade these funds.
To better understand the relationship between ETF valuation and ETF trading costs, let’s look more closely at the limited measurable ETF trading cost data available to us. Most investors are surprised to see how difficult it is to find useful trading cost data for ETFs and to see how large some ETF trading costs are when we can measure them in a useful way. The only method we can find to measure one-way investor trading costs for large numbers of shares is to calculate the difference between the closing price of an ETF’s shares and the fund’s daily NAV, which represents the fair value of its net assets at the U.S. market close—and the value at which creations and redemptions of fund shares are made.

Many investors inadvertently pay high transaction costs when they buy into an ETF at prices above its current value or when they sell below current value. For most ETFs, this difference is much larger than the bid–ask spread. Exhibit 6 illustrates the absolute percentage deviations in price between the closing price and NAV of the iShares MSCI Emerging Markets Fund (EEM) during 2014. The Triangles (Δ) indicate the absolute value of the percentage deviation in price between the closing price and the NAV for each day. The lower (darker) line indicates the percentage amount of the ETF’s bid–ask spread (the ETF column from Exhibit 4 or 5), and the upper (lighter) line indicates the average bid–ask spread for the fund’s underlying portfolio holdings (from Exhibit 4 or 5). This fund is actively traded and generally shows a one or two cent bid–ask spread, or about 3 basis points. This tiny spread looks like quite a bargain, considering that the bid–ask spread on the constituents in the underlying index is 24.8 basis points, as reported by Golub et al. ([2013, p. 9]). However, the closing price of EEM often deviates significantly from the NAV.

As one can see from Exhibit 6, the closing price often differs from the NAV by an amount far larger than the EEM’s average bid–ask spread or even the bid–ask spread on EEM’s underlying portfolio holdings. During 2014, the closing price deviated from the NAV by an average of 48 basis points, nearly one half of one percent. And that is just an average; on some days, it was much higher than that. Intraday deviations may be much higher. These deviations imply that many investors are unwittingly paying much higher transaction costs than they realize. The Appendix provides an analysis of the deviations between market closing prices and NAVs for nearly all of EEM’s history.

For U.S. equity-based large-cap ETFs, the arbitrage mechanism works much better. Exhibit 7 displays the absolute values of the differences between the closing price and the NAV for the day for the venerable SPY. One can see from this chart that the closing price is
usually quite close to the NAV. The cost of trading SPY is indeed low! The triangles and the two spread lines are not distinguishable at the same scale used in Exhibit 6.

Deviations such as those seen in EEM are not an anomaly. Once one gets out of the easily arbitraged and liquid U.S. equity-based ETFs linked to popular domestic stock indexes with exchange-traded futures and options, substantial deviations from NAV are more the norm than the exception. Exhibit 8 displays the absolute percentage difference between the NAV and the closing price for approximately 1.5 million daily observations. While the median is a mere 15 basis points, on 5% of the observations (nearly 75,000 observations), the deviation is 136 basis points (1.36%) or more.

**Exhibit 8**

Distribution of Difference between ETP Closing Price and NAV for all U.S. ETPs

<table>
<thead>
<tr>
<th>Percentile</th>
<th>Percentage Absolute Difference (ETP Closing Price - NAV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>99%</td>
<td>2.95</td>
</tr>
<tr>
<td>95%</td>
<td>1.36</td>
</tr>
<tr>
<td>90%</td>
<td>0.900</td>
</tr>
<tr>
<td>75% Q3</td>
<td>0.420</td>
</tr>
<tr>
<td>50%</td>
<td>0.152</td>
</tr>
<tr>
<td>25% Q1</td>
<td>0.056</td>
</tr>
<tr>
<td>10%</td>
<td>0.020</td>
</tr>
</tbody>
</table>

**TRADING AT THE MARKET CLOSE**

While the 4:00 p.m. calculations of ETF NAVs do not always meet the standards of mutual fund NAVs, ETF investors are often attracted to buying and selling ETFs at the market close. Placing an MOC order seems like an easy way of minimizing transactions costs by ensuring that one gets the price from the closing auction.

The most appropriate measure of trading cost for MOC transactions is the difference between the closing price of the ETF and its NAV calculated at 4:00 p.m. The closing price is published daily but the history of closing prices is not usually available on the fund website. Closing premiums and discounts available on fund websites are nearly always based on the difference between the midpoint quote and the NAV at the market close. But in making the spread a midpoint versus NAV comparison, we usually understate the premium or discount to NAV reflected in the closing price. Let’s look at some exemplary data.

**A Case Study: iShares MSCI Emerging Markets ETF**

On September 12, 2014, the consolidated trading volume in iShares MSCI Emerging Markets ETF (symbol EEM) was 83,094,024 shares. At the closing cross on its
principal market (NYSE Arca), 2,754,208 shares traded at $43.79. The NAV calculated at 4:00 p.m. was $44.06, and the midpoint of the market maker’s bid–ask spread at 4:00 p.m. was $43.81. The iShares website reported that the EEM discount from NAV for the midpoint of the spread was 56 basis points. It is more meaningful to use the difference between the NAV and the closing price (which is 61 basis points in this instance). Considering that nearly 3 million shares traded at the close on the principal market, the closing price was the price for a significant fraction of the day’s volume in EEM shares. The closing price discount of 61 basis points is far from the 2.4 basis point trading spread indicated in Exhibits 4 and 5.

The closing price is an extremely important piece of data: Approximately 2.75 million shares were traded at the close on the principal market on this day, and other markets trading an ETF typically price closing trades at the principal market’s close. Unfortunately, some ETF regulatory documents require the use of the midpoint quote before the closing price auction in calculating premiums and discounts at the end of the trading day. The midpoint quote before the close does not reflect an actual trade, but it is usually the only time series of premium and discount data found on fund websites. There is no use for this data item that would not be better performed by closing price data.

Using the discount from NAV reflected in the EEM’s September 12, 2014 closing price, we are ready to calculate the major element of trading cost for the EEM shares traded at the close. Nearly 3 million shares were sold at a discount of 61 basis points to NAV (calculated at the 4:00 pm close)—the best measure we have of the contemporaneous value of the portfolio; the same number of shares was purchased at this discount, providing the purchasers a negative transaction cost.

Clearly, the premium or discount is not randomly distributed. Market makers buy shares from investors when ETFs (or any shares) trade at a discount and sell shares at a premium when customers want to buy more shares than other customers want to sell. The location and size of the market makers’ bids and offers depend on the market makers’ business model, but it should be clear that a market-making firm could not survive if its average trading spread to NAV approached 2 basis points on this emerging markets ETF. Market makers profit on most of the trades they participate in throughout the day—and there is no reason to assume that the average transaction price over the course of the day is particularly close to the contemporaneous value of the fund shares.

Market makers usually carry inventories and they also have costs associated with the creation and redemption of ETF shares. They would not survive if they did not have negative transaction costs nearly all the time. The information we have at the close is not necessarily similar to the trading costs investors incur throughout the trading session, but the size of the average spread between the closing price and the NAV is very clear.

In the market for this ETF on September 12, 2014, one or more market makers provided liquidity at the close and bought the shares that investors wanted to sell at a discount of 61 basis points from NAV. There is absolutely nothing wrong with this. Market makers provide valuable services and deserve to be compensated in order to make a living. However, their living becomes part of an investor’s trading costs when market makers provide liquidity, and it is important that investors understand the cost of market makers’ participation.

The MOC to NAV comparison is the only systematic estimate of ETF trading costs we can make in the conventional just-like-a-stock ETF market. While intraday values are disseminated for each ETF every 15 seconds, they are generally based only on the ETF portfolio securities’ last sale prices, which can be quite stale. Most sentient market professionals create their own estimates of current portfolio values using adjusted real-time data.

Using MOC Orders Routinely to Buy or Sell ETFs Looks Like a Terrible Idea

The majority of investor ETF market-on-close orders are not likely to be executed at or better than NAV, and many MOC executions will not even be close to NAV. MOC orders can be executed at a much greater distance from the NAV than the reported premium and discount data indicate to investors. Anyone trading ETFs should understand how these orders work and how ETF MOC orders differ from stock MOC orders in important ways. If you compare a fund’s NAVs and closing prices over a few days, you will probably conclude that you do not want to use an MOC order—unless your comparisons suggest that, for some reason, other investors are predominantly selling when you buy or buying when you sell. At the least, you will conclude that the cost to trade most index ETFs is more than a few basis points.
ETF NAV QUALITY

One more question that we need to address is, “How good are ETFs’ NAV calculations?” The answer to this question is that the official closing NAV calculations for ETFs are reasonably good most of the time, but they are not up to mutual fund standards. They will be getting a lot more attention in the future, and most of the new ETFs started from now on will meet mutual fund standards. When NextShares (actively managed ETPs that will trade at or relative to the NAV determined at 4:00 pm) begin trading, the NAV calculations for these funds will fully meet the highest mutual fund standards. It will be interesting to monitor trading costs when all parties to the trade can enter their orders relative to the NAV—and all will know and control their transaction costs with a high degree of precision.

To the extent that an ETF traded in the U.S. holds securities that are not actively traded at 4:00 p.m. in New York, it is appropriate to take a very close look at the NAV calculation. It does not require rocket science: Mutual funds with all kinds of domestic and foreign securities portfolios have taken investors’ cash investments and redeemed fund shares for cash at 4:00 p.m. Eastern Time for several generations. Although most ETFs do not use the sophisticated fair value NAV pricing methodology that conscientious U.S. mutual funds embrace, the introduction of NextShares—with portfolios managed and NAVs calculated like actively managed mutual funds—will focus more attention on ETF trading costs and the reliability of the NAV calculation. The NextShares funds should prompt investors and fund managers to improve NAV calculations for all exchange-traded products—as both the breadth of ETP offerings and the focus on NAV will, appropriately, continue to grow.

CONCLUSION

All investors considering buying ETFs should ask themselves, “Can I trade ETFs efficiently?” With respect to most ETFs available today, our answer to most investors has to be an emphatic “no.” We can only answer “yes” for some of the major domestic equity benchmark index ETFs that sometimes trade hundreds of millions of shares each day. The just-like-a-stock trading method adopted for the first ETF, SPY, works well for the most actively traded, large-cap U.S. domestic equity index ETFs—and less well, in varying degrees, for other ETFs. A good trading solution for many ETFs could be NAV-based trading, soon to be introduced for NextShares. A buy or sell order in either conventional or NAV-based ETF trading may lead to other orders or transactions that have an effect on the fund’s NAV determination, just as bids or offers in any market affect related markets.

NAV-based trading is the only way to achieve transparency in trading costs—a far more important goal for protecting investors than daily portfolio composition transparency, which often increases fund or investor trading costs without delivering anything useful to investors. Just as most investors will be able to measure their trading costs only with NAV-based trading, most market makers will find it both easier and more economical to manage their risks with NAV-based trading.

NAV-based trading was conceived and developed to facilitate secondary market (exchange) trading of less-than-fully-transparent, actively managed ETPs. One of its features is that it enables an investor to know the cost of a trade at the time the NAV-based order is entered. However, given the extremely high apparent costs of MOC trading in EEM, it appears that investors’ average trading costs could be sharply reduced by introducing NAV-based trading for many index ETFs in which the underlying portfolio instruments do not trade during U.S. trading hours.

APPENDIX

Case Study: Discounts and Premiums on EEM

Exhibit A1 shows for the iShares Emerging Markets ETF (EEM) the average (absolute) daily differences between the closing prices on the NYSE Arca market and that day’s NAV from the beginning of EEM’s second week of trading in 2003 through March 31, 2015.

The NAV data behind Exhibit A1 is from Morningstar. The Yahoo EEM closing price data series is raw (unadjusted) data, but the supplementary text with the data and two very distinct share price changes make it easy to adjust for the pair of three-for-one stock splits. All these percentages represent the average daily premium or discount at the close, measured by calculating the average (absolute) daily percentage difference between NAV and the closing price for each year or shorter period since a week after the fund was launched. The figures are expressed as percentages of NAV, so 57% can be read as 57 basis points, if a basis point comparison is preferred.
Not surprisingly, many of the largest differences occurred during the financial crisis in 2008. More to the point, the average spread between NAV and closing price has been more than half a percent in most years since the fund was launched. The fact that the apparent transaction cost for the public side of this trade is this high suggests that the average investor’s trading cost for this fund is likely to be over 50 basis points. Daily spreads in excess of 100 basis points are common. Given the practical impossibility of determining their trading costs at any time other than the close, investors must resign themselves to high MOC trading costs in this fund if they use conventional ETF trading.\(^{16}\)

Interestingly, we made some other calculations that devotees of MOC trades should find interesting. The average change in NAV from day to day over the life of EEM was just under 1% per day. It was this high only because of some very large jumps in and around 2008. For the period from the beginning of 2014 through March 31, 2015, the average daily change in NAV was 0.61% (61 basis points), a little larger than the average difference between NAV and the closing price during this period. It is worth considering how to reduce transaction costs with a more patient trading policy. Specifically, the patient trader should be able to benefit by not trading on days when his order at the close would put the closing price on the “wrong” side of the expected NAV. If the trader is selling and the balance of orders at the close that day seems likely to put the close below NAV, it might pay to wait for a better order pattern tomorrow.

**ENDNOTES**


\(^{2}\)For many ETFs, part or all of a creation or redemption transaction may be made for cash with a correspondingly higher creation/redemption fee to cover the fund’s transaction costs in buying or selling portfolio securities. The last or closing sale prices of portfolio securities in each of their primary trading markets are the dominant element in most ETFs’ NAV calculations; unlike most mutual funds, ETFs typically do not adjust their NAVs to reflect changes in value of foreign holdings between local market closes and the time of the NAV calculation. Fair value price adjustments are a mutual fund industry best practice made to treat all shareholders fairly. See Driebusch et al. (2015).

\(^{3}\)EEM Prospectus, p. 38.

\(^{4}\)Although a 5% round-trip spread is onerous, unusually strong or weak demand for an ETP’s shares might be reflected in occasional spreads even wider than this analysis indicates.

\(^{5}\)As is common with most discussions of transaction costs, we stress the costs directly associated with different types of trades and neglect commission charges for simplicity.

\(^{6}\)This is consistent with market microstructure theory. Because an individual stock has a large amount of idiosyncratic risk, along with the risk of informed trading, market makers quote a wider spread. An index has less idiosyncratic risk and a lower risk of informed trading, so market makers can usually safely quote narrower spreads on index products, but not necessarily as much narrower as these charts suggest.

\(^{7}\)Some of the larger markets represented in EEM are China (including Taiwan), Korea, South Africa, Brazil, and India.

\(^{8}\)The NAVs for the ETFs are from the Center for Research in Security Prices (CRSP) mutual fund database and the closing prices are from the CRSP daily stock file.

\(^{9}\)This is based on data for all ETPs from the CRSP mutual fund and daily stock price files for which matching data were available.

\(^{10}\)The 4:00 p.m. portfolio price is based on adjustments to the most recent trade on home markets, which are not open in most cases for the emerging markets represented in this fund. Fair value NAV calculations and other features designed to improve the usefulness and reliability of NAV calculations are discussed in the text. The method of NAV calculation described in the EEM prospectus differs from the best mutual fund fair value calculations. This is an important topic for further inquiry.

\(^{11}\)The percentage of daily volume traded at the close varies greatly among funds and over time. We have not attempted a study of the pattern for EEM shares, but casual checks from time to time indicate that the closing trades for EEM shares typically account for a significant fraction of the total trading volume. MOC trades away from the listing market are often priced at the listing market close because that is usually the only market with an organized closing auction for the fund.
Many ETFs rely upon the last sale price to value portfolio securities for determining fund NAVs, even if the home market for that security closes before 4:00 pm Eastern time. Mutual funds generally use fair value pricing, adjusting the valuation of foreign holdings from local market closing prices to reflect post-close trading in related securities and instruments.


Two of the authors, Broms and Gastineau, have a financial interest in licensing of NAV-based trading patents.

A similar analysis to Exhibit 8 reveals that EEM’s closest ETF competitor, the Vanguard Emerging Markets Stock Index Fund (VWO), displays a difference between its closing price and NAV that has been consistently less than 1/3 the percentages in Exhibit A1. Note that VWO is the larger fund by nearly 50% in terms of assets under management and has lower operating, creation, and redemption costs and smaller creation/redemption units. Yet EEM is by far the more actively traded of the two, in spite of higher trading costs when measured against NAV. Trading at the close volume is relatively light in VWO. VWO is a share class of a mutual fund that uses high quality fair value accounting in its NAV calculations. While VWO is clearly the “eating sardine” in this pair, it is puzzling that EEM is still the “trading sardine” in spite of its much higher trading costs. (For a discussion of trading sardines, see Gastineau [2010], pp. 245-6.)

REFERENCES


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