HOW TO REDUCE YOUR COST OF TRADING
EXCHANGE-TRADED FUNDS (ETFs)

A PERPETUAL DRAFT

BY
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TRADING COSTS OF ETFs ARE IMPORTANT AND OFTEN QUITE LARGE

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 structure for other asset classes. Low bid-ask spreads combined with generally low fund expenses have made ETFs an extremely popular investment product. They now account for approximately 28% of the value of U.S. exchange trading, according to Credit Suisse. However, ETF transaction costs are not as low as they might seem. ETF prices can and do deviate significantly from their Net Asset Values (NAVs), and the true transaction cost for an investor is the deviation of the transaction price from the contemporaneous NAV. Narrow bid-ask spreads can be a very misleading indicator of the true cost of trading ETFs. This and several subsequent sections examine how and why ETF prices can deviate from the NAV, along with some of the implications of trading costs 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 costlier than they appear.

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 the 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 in the direction of alignment with the value of 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.

In order to unwind an ETF arbitrage position, the arbitrageur may reverse the original trades if the price discrepancy later reverses, or close out the position by creating or redeeming ETF shares in transactions with the ETF 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

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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.\(^{2}\)

**ETF Share Creations and Redemptions – The Role of Arbitrage Forces**

Exhibit 1 on the next page 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. Due to market impact, the cost to a market maker of acquiring the ETF’s underlying holdings in creation unit size is higher, marked F. Furthermore, the creation process is not free. There are transaction fees involved, which pushes the cost to a market maker of actually creating shares up to G. For a 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.

As with creations, market makers pay transaction fees in connection with redemptions, which push the proceeds to a market maker of redeeming shares down to 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.

\(^{2}\) 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 transaction costs the fund will incur to buy or sell 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 do not always 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 in the calculation of a fund’s NAV are a mutual fund industry “Best Practice” made to treat all shareholders fairly. With greater use of actively managed ETFs, this policy will be a Best Practice for ETFs as well.
Unfortunately, too many investors assume that the midpoint between the bid and the offer prices of an ETF in intraday trading is centered on or near the contemporaneous 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. The midpoint of the quoted spread 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 asks prices below the fund’s current value almost to the level at which arbitrage will occur:

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Note that the midpoint or any other part of the “Quoted spread” in the lower left corner (approximately 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 actively during U.S. market hours.

The nominal spread between A and G is very large for some ETFs like the iShares MSCI Emerging Markets ETF (EEM). Simplifying only slightly, the maximum charge for market impact trading costs over NAV (generally calculated using last sale prices) on a cash creation of shares in EEM is 3% according to the EEM prospectus. The comparable maximum on a redemption is 2%. The administrative fee is nominal relative to these amounts, which suggest 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 basis point or two spread in the intraday ETF exchange market.

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4 EEM Prospectus, p. 33.
5 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 discussion indicates.
Why Should Investors Spend Time Considering the Cost of Trading ETFs?\textsuperscript{6}

I have deliberately left out a detailed discussion of the cost to various parties of trading traditional mutual fund shares, not because that trading is not costly, but because the cost of trading mutual fund shares is usually shared by all the ongoing investors in the mutual fund’s shares.\textsuperscript{7} One of the advantages of exchange-traded funds (broadly defined) is that ongoing holders of these funds’ shares are protected from the costs associated with trading in these shares in both the primary market (creations and redemptions of fund shares) and secondary market trading (trades of outstanding shares). The discussion that follows is intended to help investors who buy and sell ETFs reduce their cost of trading ETF shares in the secondary (exchange) market.

What is the Cost of Trading ETFs?

Let’s 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 in 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:

\textsuperscript{6} Most of this material on ETF Trading Costs is from James J. Angel, Todd J. Broms and Gary L. Gastineau, “ETF Transaction Costs are Often Higher than Investors Realize,” The Journal of Portfolio Management, Spring 2016, pp.65-75.

\textsuperscript{7} For a useful discussion of the impact of the trading costs initiated by investors entering or leaving a mutual fund, see Gastineau, Gary, “Protecting Fund Shareholders from Costly Share Trading,” Financial Analysts Journal, May/June 2004, pp.23-32. This paper stresses the fact that all shareholders in a mutual fund share in the cost of anyone’s purchase or sale of mutual fund shares while investors entering or leaving the mutual fund trade at the mutual fund’s NAV with a very small, if any, measurable transaction cost.
EXHIBIT 3
ETF vs. Underlying Average Daily Volume

Source: Blackrock, Trace, and Bloomberg via Golub (2013)
Exhibit 3 shows that the average daily U.S. dollar market trading value of the stocks in 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 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 3 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

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8 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.
hours,\(^9\) 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 these comments 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**
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>
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<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 (IIV)</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]*

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

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\(^9\) Some of the larger markets represented in EEM are China (including Taiwan), Korea, South Africa, Brazil and India.
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 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’s 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 share 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 that is slightly above this bid, 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 – and the bid may rise correspondingly if there are not many sellers at the time.

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 and see why the costs to buy and sell shares of EEM are often far higher than they initially appear to someone looking only at the bid/ask spread.

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 US-based ETFs such as the SPDR S&P 500 ETF Trust (SPY) and Vanguard’s 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 on the next page illustrates the absolute percentage deviations in price between the closing price and NAV of the iShares MSCI Emerging Markets Fund (EEM) during 2014.10 The triangles indicate the absolute value of the percentage deviation in price between the closing price and the NAV for each day. The (lower

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10 The NAVs for the ETFs are from the CRSP mutual fund database and the closing prices are from the CRSP daily stock file.
(darker) line indicates the percentage amount of the ETF’s bid-ask spread (the EEM 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. Exhibit 9 below provides an analysis of the deviations between market closing prices and NAVs for most of EEM’s trading history.

Exhibit 6
iShares Emerging Markets ETF % Difference between Closing Price and NAV, 2014

![Graph showing the percentage difference between market closing prices and NAVs for a 2-year period, with data points indicating significant deviations from the NAV. The graph has a Y-axis from 0.0% to 3.0% and an X-axis from Jan-14 to Dec-14.]

*Absolute % Difference Closing Price - NAV  ETF Bid-Ask Spread  Underlying ETF Portfolio Bid-Ask Spread*
For U.S. equity-based large cap ETFs, the arbitrage mechanism works much better than it does for EEM. Exhibit 7 displays the absolute values of the differences between the closing price and the NAV for the day for the venerable S&P 500 SPDR (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 or less, on 50% of the observations (nearly 75,000 observations) the deviation is 136 basis points (1.36%) or more on 5% of the observations.

11 This is based on data for all ETPs from the CRSP mutual fund and daily stock price files for which matching data were available.
Trading at the Market Close

While the 4:00 pm 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 transaction costs by ensuring that one gets the price from the closing auction.

The most appropriate measure of trading cost in 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 making the archived spread a quote midpoint vs. NAV comparison, usually understates 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.\textsuperscript{12} was

\textsuperscript{12}The 4:00 pm 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
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 the 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

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13 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 process for the fund.
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 maker(s) provided liquidity at the close and bought the shares 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 the 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 with available data. While intraday values are disseminated for each ETF every 15 seconds, they are generally based only on the ETF securities’ last sale prices, which can be quite stale. Most sentient market professionals calculate 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. If you compare a fund’s NAV and closing price for 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 in discussing ETF trading costs at the close 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. "Many ETFs rely upon the last sale price to value portfolio securities for the purpose of 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.

14 ETF NAV calculations 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 trade at or relative to the NAV determined at 4:00 pm) trade, the NAV calculations for these funds 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 pm 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 pm Eastern Time for several generations. While most ETFs do not use the sophisticated fair value NAV pricing methodology that conscientious U.S. mutual funds embrace, there is more focus on ETF trading costs and on the reliability of the NAV calculation with the introduction of NextShares. These funds should increase investors’ and fund managers’ focus on improving NAV calculations for all exchange-traded products, as both the breadth of ETP offerings and the focus on NAV will, appropriately, continue to grow.

All investors considering investments in ETFs should ask themselves, “Can You 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, the SPDR S&P 500 ETF, 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 non-transparent ETFs and, possibly, some other funds could be NAV-based trading, as currently used in trading NextShares. While a buy or sell order in either conventional ETF trading or NAV-based trading may lead to other orders or transactions that have an effect on the funds’ NAV determinations, these price linkages are not considered an obstacle to trading closed-end funds and open-end mutual funds and they should not be an issue in trading any exchange-traded products. Some ETFs and related products do not trade “fairly” to investors in their current markets.

**Discounts and Premiums on EEM**

Exhibit 9 shows, for the iShares Emerging Markets ETF (EEM), the average (absolute) daily differences between closing price on the NYSE Arca market and that day’s NAV for each year from the beginning of EEM’s second week of trading in 2003 through March 31, 2015.

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15 See http://www.nextshares.com
The NAV data behind Exhibit 9 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 are 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 the 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 cost of trading 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. Trading costs of this magnitude are difficult to justify.

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16 A similar analysis to Exhibit 9 reveals that EEM’s closest ETF competitor, the Vanguard Emerging Markets Stock Index Fund (VWO), displays a difference between its closing price and NAV which has been consistently less than 1/3 the percentages in Exhibit 9. Note that VWO is the larger fund by nearly 50% in terms of assets under
Interestingly, we made some other calculations that devotees of MOC trades should find of interest. 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 today seems likely to put the close below NAV, it might pay to wait for a better order pattern tomorrow.

References for this Trading Cost Analysis:


ETF.com analytical material: http://www.etf.com/etf-analytics/methodology-and-documentation.html

Some Suggestions for Navigating the Remainder of the Book Manuscript

- Links to additional information on a topic are in underlined blue font.

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- $$$before and after a link$$$ indicate that a click on the link will take you to a website where you can purchase the indicated reference material. All other links will take you to free material. In a few cases you will find that similar material is available both free and for a fee.

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- You may find that all these neat features are more distracting than useful, so don’t hesitate to just read the book or specific segments that interest you. If you encounter a “hang-up,” close the file and re-open it.
The purpose of this E-Book is to provide information that will help you reduce your cost of owning and, especially, of trading traditional transparent ETFs. You will not find suggestions on where to find lower ETF expense ratios, lower commission rates or commission-free trades. In most instances the fund’s expense ratio is a small fraction of the cost of owning an index ETF. You do not need help from me or anyone else to calculate the difference between two funds’ expense ratios. When you make that calculation, the expense ratio difference will usually represent a very small part of the difference in the cost of owning and, particularly, of trading the two funds. Similarly, the trading commission is usually a very small fraction of the cost of ETF trading; and many commission-free ETF trading offers are not particularly good deals. I don’t consider the statements in bold font to be controversial. If you agree with those statements, I believe you will find some of my other comments useful. If you initially disagree with these statements, I believe you will eventually conclude that these comments are useful information for anyone who wants to use ETFs effectively. I do not apologize for the fact that the “book” is focused primarily on ETFs in the United States. That is by far the largest ETF market and the ETF market I know best. If you have information on other markets that I should know about and incorporate, please let me know.

The book is divided into a number of separate segments which I have taken the liberty of referring to as “Chapters”. While the chapters are related, I have tried to give them titles and content that a reader will find useful either with or independent of other chapters. A word search of the entire “book” should help you find the information you are looking for.

Like most books, this one is organized to be read (more or less comprehensibly) from front to back. However, the greatest virtue of the e-book format is that I can insert links that let you jump directly to material on a topic that might interest you more at the moment than the material on the current page, whether the material that might be of more immediate interest is somewhere else in the book or on a different website. If you click on one of the links in a blue font and click on “Open Hyperlink” to jump from the text or the Table of Contents to another location in the book, you can press (Alt+Left Arrow) to return to the spot where you clicked. If you click to go to another website, you can close the window in that website and you should still be at the same spot in this book. At the end of this brief introduction, you will find a list of simple ETF Trading “Rules”.
You can use links as launch pads to the specific ETF trading topics that interest you most at the moment. The footnotes often have additional links and the bibliography citations usually have links to a free and/or purchasable copy of the cited item. Most of the bibliography items have their own references that will lead you to additional information. Because of this emphasis on linkages, you will find more overlap in a few places than a traditional book would have.

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I would like to enlist your help in updating the contents and correcting any errors for future readers. I ask any reader who comes upon an error or a statement that is not as clear or as current as it should be either in this E-book or in other material on the website, to e-mail me at gary@etfconsultants.com. I promise to address the issue promptly and respond to you personally.
SOME IMPORTANT CONVENTIONAL MARKET ETF TRADING “RULES”

Nearly Always:
- Use an **Immediate or Cancel Limit Order** as your first choice to buy or sell ETF shares in the Conventional ETF Market.
- Trade in the **Conventional ETF** market with most liquidity between 3:00 p.m. and just before 4:00p.m.
- Use **Major Benchmark Index ETFs** only for Temporary Asset Allocation trades.
- Hold **less popular branded index ETFs** or non-transparent ETFs for long-term investments.
- Consider all ETF costs, not just the costs that are easy to measure. The cost of a round trip trade in an index ETF’s shares on the exchange market will usually far exceed the ETF’s annual expense ratio. Look to **NAV-Based ETF Trading** to enable you to measure and reduce some ETF trading costs.
- When NAV-based Trading is available for an ETF that interests you, try resting limit orders that may give you an execution equal to or even better than NAV, especially if you enter the order early in the trading day and the fund has been in business for at least six months. Avoid resting limit orders in the Conventional Intraday ETF Market like you would avoid a plague. These resting limit orders are not likely to be hit unless you would not be happy with the trade.

Never Ever:
- Buy or Sell ETFs with **Market-on-Close** (MOC) Orders in the Conventional Intraday Market.
- Enter an ETF market order in the Conventional Intraday Market until you have checked the price and quantities on the other side of the market and the current value of the fund shares. Even then, a marketable limit order is a much safer choice.
A Very Brief History of ETFs

The first ETFs introduced for trading on the Toronto Stock Exchange in Canada and the American Stock Exchange in the U.S. were not developed to offer improved funds to investors. They were developed to provide a product to trade on the floors of these exchanges. ETFs began trading actively shortly after their introduction in the 1990s, but ETF trading volume exploded after 2005. Even a cursory look at the growth of trading volume in ETFs relative to other equity securities reveals that a number of ETFs are extraordinarily active trading vehicles. ETFs typically account for at least 25% of the dollar value of equity securities traded in the U.S. each day. Typically, between a quarter and half of the “stocks” on the Wall Street Journal’s daily “Most Active Stocks” list in the U.S. are ETFs.

The trading mechanism selected for the initial ETFs was the simplest possible modification of the traditional common stock trading mechanism in the U.S. and Canada. No one should have been surprised that ETFs with portfolios tracking major equity benchmark indexes published by S&P, Dow Jones, Russell, Nasdaq and MSCI would trade actively with ETF share volume stimulated by arbitrage links to active futures and options contracts on the same indexes that traded more or less contemporaneously in related markets. If the issuance of ETFs in the United States had been confined to funds tracking domestic equity benchmark indexes, there would probably have been no need for this e-book or for much discussion of the nuances of ETF trading.

ETFs have demonstrated their merit as investment (as opposed to trading) instruments. However, no one should be surprised that some of the most interesting ETFs (from an investment perspective) do not trade efficiently in the intraday, “just-like-a-stock” ETF market. Until recently there have been relatively few material changes in ETF trading. A few years ago, Nasdaq introduced a Market Quality Program (MQP) where the issuer or sponsor of an ETF could set aside a modest annual budget to be administered by Nasdaq to compensate ETF Market makers who meet specified market quality objectives. Other exchanges have developed similar market quality programs. More recent regulatory filings permit the shares of selected ETFs with non-transparent portfolios to trade on a new NAV-based ETF secondary market. These changes are revolutionary and they might eliminate many of the weaknesses of just-like-a-stock ETF trading in time.17

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17 In the interest of full disclosure, I have an economic interest in the success of this trading method.
By the time you finish reading this e-book, I believe you will be convinced that ETFs’ share of equity trading volume in the United States will increase significantly from current levels and that, in spite of the ETF’s origin as a product designed to be traded, the ETF structure usually offers investors the best pooled portfolio instruments for long term investment that are available in the U.S. and elsewhere. Until the ETF you are interested in offers NAV-based trading, you should read the discussion of “just-like-a-stock” ETF trading in today’s market with care and enter orders with caution.

A LOOK AT THE MECHANICS AND ECONOMICS OF ETF AND MUTUAL FUND SHARE TRADING TODAY

Many things have changed since ETFs first traded in the early 1990s. Stock exchange floors around the world are now used more for financial newscast background footage and evening cocktail parties than for securities trading. While the public trappings of the major U.S. stock markets have not moved from New York City, all or nearly all the computers where exchange trade executions actually take place are located outside Manhattan. ETF markets, like most other equity securities markets, are highly automated electronic markets. Professional traders, individual investors and even market makers sit in front of computer screens in ordinary homes and offices and send stock and ETF orders to brokerage and exchange computers. Raucous, low-tech equity trading rooms at brokerage firms and other financial institutions have largely disappeared.

Electronic order entry and position management is supplemented by voice communication at various times and places, but almost all except the very largest orders to trade ETFs and other equity securities meet inside computers where they are matched with orders on the other side of the market and executed. Representatives of two large investors might negotiate terms for the exchange of a large block of shares away from the electronic market and then use the facilities of the market to “print” the trade. This kind of direct negotiation is probably less common than it was a few years ago – and the terms of any large trade will be at least as strongly affected by the electronic marketplace as they were affected by floor trading activity in earlier years. Not surprisingly, the ultimate parties to a trade are less likely to know the name of their trading counterparty than they were in the days of active floor trading.

In today’s electronic markets, market makers have fewer of the special privileges that exchange Specialists enjoyed for many years. The term “Specialist” has essentially been retired by the Exchanges that used to have them. Today’s more modestly titled
“market makers” not only have fewer special privileges, they also have fewer “affirmative obligations” to risk their capital to maintain an orderly market. Market structures have changed year by year and they will continue to evolve, incorporating more structural stabilizers, trading halts and speed bumps to moderate the market impact of aggressive, disruptive or, simply, high speed orders and trades. Markets will depend more on the reliability of their electronics and their regulatory constraints and less on the willingness and ability of humans to prevent problems. Share price fluctuations are the essence of an efficient market, but investors and regulators now insist on trading “time-outs” when short-term price changes fall outside what is deemed a reasonable range.

At the end of April, 2016, Deborah Fuhr and her colleagues at etfgi.com reported that global ETF/ETPs listings exceeded US$3 trillion. There were over 6000 products.\(^\text{18}\) Most trading volume is in a relatively small number of funds based on popular benchmark indexes or holdings of precious metals.

The earliest, largest and still most of the actively traded ETFs are well-designed and equipped for active intraday trading – whether that trading occurs on an exchange floor or inside a computer. The most actively traded ETFs use popular benchmark indexes or commodities as their portfolio templates. Futures contracts, options and other financial instruments tracking the same index or commodity that the fund tracks are used to facilitate active arbitrage-based trading across the spectrum of financial instruments linked to a small number of popular “underlyings”. In addition to popular benchmarks, the most actively traded ETFs typically have lower nominal expense ratios than otherwise similar funds. The expense ratios are lower partly because of competition from mutual funds (or other ETFs often using the same or a similar underlying) and partly because fund managers have learned that well-known index brands will attract more investors to the fund and that a larger pool of assets will cover the fund’s fixed costs more quickly with a lower fee. Also, the benchmark index funds are often less costly to manage because trading a standard portfolio basket may reduce some investor costs that are not part of the fund’s expense ratio.

**Transparent Index Composition Changes Are Costly to Index Fund Investors.** In spite of lower operating expenses and lower basket trading costs, the benchmark index ETFs are likely to *underperform* ETFs based on less popular indexes in the intermediate or long run. This underperformance is likely for several reasons. Most obviously, the portfolio composition changes that must be made from time to time in index ETFs are publicly disclosed before funds tracking the index can trade to implement the index.

\(^{18}\) The website address is [http://www.etfgi.com/index/home](http://www.etfgi.com/index/home)
composition change. Prices of stocks added to an index (and to an index fund’s portfolio) often jump on the announcement, determination and/or implementation of the index change. Almost invariably, the shareholders of the fund will pay more to buy the shares added to the index than the stock’s price before the index change was determined and more than the same stock sells for shortly after the composition change is fully implemented by indexed portfolios. The cost of these often large and always highly transparent trades at prices affected by the transparency of the index change can reduce the returns received by the fund’s investors. To understand the effect of index composition trades, take a look at the behavior of most stocks added to the S&P 500 (e.g. Amazon.com in 2005) or consider the initial price effect on the shares of Apple Computer when the announcement was made that its weighting in the NASDAQ 100 index would be reduced in the Spring of 2011.

As a partial offset to the immediate transaction costs from index composition changes, there is evidence that, at least, the performance of S&P 500 index funds has benefited from growth in the assets benchmarked to that index since indexing began. Growth in S&P 500 indexed assets has removed at least 10-12% of the shares of index members from the “open” market. In the absence of continued growth in an index’s portfolio market share, the premium price that index fund shareholders pay when a stock joins the index will reduce the fund’s returns in future years. If the S&P 500’s popularity as a fund template wanes and assets benchmarked to the index decline, index member stocks will be sold from indexed portfolios and funds tracking the index will probably underperform otherwise similar portfolios.

Less Popular Index ETFs Offer the Prospect of Better Performance. Most of the more recently introduced ETFs are not based on traditional benchmark indexes. The newer ETFs usually do not have related index financial instruments and the shares of these ETFs trade much less actively than the shares of the major benchmark index funds. In contrast to the earliest ETFs that were based on the most popular benchmark indexes their creators could find and could license from index publishers, many newer ETFs have been designed with less emphasis on the name recognition of an index and more emphasis on providing a superior investment experience for the investor. Whether by design or by lack of opportunity to license a more popular index, at least some of the issuers of these newer funds appear to place less emphasis on tracking a popular index

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For a variety of reasons, the market impact cost of index deletions is usually less than the cost of index additions. See Gastineau (2007/2008) or Gastineau (2008). In addition to the issue of trading transparency (which is a trading cost issue), there is substantial evidence that many passive trading processes and many “true” active management processes add value for investors. See, for example, Cremers and Petajisto (2009).

Investors should expect to hear more about this index fund performance issue. Some of the available papers include Morck and Yang (2001), Wurgler (2010), Belasco et al (2011), Nanigian (2011) and Petajisto (2011a).

I am not predicting either growth or decline in the S&P 500’s market share.
and more emphasis on providing efficient diversification into a specified market segment or investment process. In other writings I have discussed ETF features that encourage heavy trading volume and other features that might offer investors higher returns.\textsuperscript{23} ETF selection is within the scope of the present document only to the extent that some of the ETF’s other characteristics affect the way its shares trade and its portfolio composition trading costs. Be skeptical of any ETF evaluation approach that does not consider and attempt to evaluate both the fund’s internal trading costs and the investor’s cost of trading the ETF shares. Trading volume and assets under management (AUM) in a benchmark index ETF are overwhelmingly proportional to the popularity of the ETF’s index. The likely long-term performance of an index ETF is inversely proportional to the ETF’s annual index composition change trading costs.

\textit{The ETF Structure Offers Inherently Superior Long-Term Returns.} The inherent superiority of the ETF structure over the mutual fund structure from the perspective of a long-term investor often has a greater positive effect on shareholder performance than any adverse effect of composition change costs in indexed portfolios. The principal reason for an investor to use ETFs is not that the ETF’s shares trade actively or cheaply; it is that ETF shares will typically perform better as an investment than mutual fund shares from the perspective of the fund’s investors. The ETF structure\textsuperscript{24} should produce a better intermediate or long-term investment experience than a mutual fund – if the funds compared use a similar index or a similar investment process. To understand why the ETF should outperform the mutual fund, it is only necessary to understand the differences between the structure and method of operation and entry and exit of mutual funds and ETFs.

There is a transaction fairness issue in the way costs are allocated between short-term investors entering and leaving a fund and long-term investors who stay in a fund for a long period. The way mutual funds and ETFs allocate trading costs between traders entering and leaving the fund and investors who are not trading the fund’s shares is illustrated in Exhibits 10 and 11.

\textsuperscript{23} See \textsuperscript{3}$\textsuperscript{3}$Gastineau (2010)$\textsuperscript{3}$, Chapters 5-8, starting on page 101.

\textsuperscript{24} I generally use the term “ETF” broadly to include exchange traded products that use legal structures other than the investment company, such as grantor trusts, securitized commodity funds that are actually limited partnerships and exchange traded notes. The principles described here generally do not apply to these other structures even if shares or units are created or redeemed in kind or in some other way that assigns investor flow costs to entering and leaving holders, approximately as in the investment company example described in the text and illustrated in Exhibit 11. The tax deferral advantages of ETFs with an investment company structure are not available to all exchange-traded products (ETPs).
EXHIBIT 10
Cash Moves In and Out of a Mutual Fund: The Fund Trades Securities to Invest Incoming Cash or to Raise Cash for Redemptions

By transacting with its shareholders in cash and pricing all transactions in the mutual fund’s shares \textit{at the net asset value next determined}, as required by SEC Rule 22(c)1, the typical mutual fund provides \textbf{free} liquidity (essentially free fund share trading) to investors entering and leaving the fund. Mutual funds are permitted to impose both purchase fees and redemption fees on transacting shareholders of up to 2% of NAV. Such fees have generally been imposed upon redemptions only, and applied only to shares redeemed shortly (typically within 90 days) after purchase. In the absence of a mechanism to impose transaction costs on entering and leaving investors, \textit{all the shareholders in the mutual fund pay the cost of providing this liquidity, year after year.}

As Exhibit 10 shows, an investor purchasing mutual fund shares for cash gets a share of the securities positions already held by the fund. These shares are priced at net asset value. The new mutual fund investor typically pays little or no transaction costs in connection with a purchase of the fund’s shares. Furthermore, all the shareholders of the fund share the transaction costs associated with investing the cash from the new investor in portfolio securities. Similarly, when an investor departs the mutual fund after being an investor for a while, that investor receives cash equal to the net asset value of the shares when the NAV is next calculated after the investor gives notice of intent to sell. All the remaining shareholders in the fund share the cost of selling portfolio securities to provide this liquidity to the departing shareholder. To the entering or leaving mutual fund shareholder, buying and selling the fund shares is often essentially free. To the ongoing
shareholders of the fund, the liquidity given transacting shareholders is costly. Over time, the cost of providing this free liquidity to entering and leaving shareholders is a perennial drag on the mutual fund’s performance.

**EXHIBIT 11**

ETF Creation and Redemption is Largely In-Kind: Transaction Costs Are Paid by Entering and Leaving Investors

Comparing Exhibit 10 to Exhibit 11 should persuade you that an exchange-traded fund’s entry and exit process allocates costs differently than the allocation of a mutual fund’s sale and redemption costs for its shares. For exchange-traded funds, creations and redemptions of the fund’s shares are typically made in kind. Baskets of portfolio securities are purchased by the party creating the new fund shares and the baskets are deposited with the fund in exchange for fund shares. The composition of the baskets may not be identical to the ETF portfolio, but it is usually close. In a redemption, ETF shares are turned in to the fund in exchange for a basket of the fund’s portfolio securities. The creating or redeeming investor – in most cases a major securities dealer working with a market maker in the ETF shares – is responsible for the cost of investing in the portfolio

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25 Some Exchange Traded Products exchange cash or a mixture of cash and securities in creation and redemption transactions. Analysis of the allocation of entry and exit costs between ongoing and transacting investors will vary, case-by-case.
securities for deposit and for the cost of disposing of portfolio securities received in the redemption of outstanding fund shares.\textsuperscript{26} The market maker expects to pass these costs on to investors when he trades the fund shares. The cost of buying and selling ETF shares to enter or leave an ETF varies greatly over time and among ETFs. An investor should expect to pay the transaction costs of buying and selling any ETF’s shares.

It is important to emphasize the wide variations in the cost of trading ETF shares because the primary objective of this discussion is to help investors buy and sell ETF shares with the lowest possible total trading costs. The point of examining these two exhibits is to illustrate that an ETF investor pays costs associated with entering and leaving the fund only when that specific investor is entering or leaving. Each ETF investor pays his or her own fund share trading costs and only those costs of entry and exit. Mutual fund investors usually share the cost of all investor flow transactions that occur while they own the fund’s shares.

Interestingly, the comparison of the investor fund entry and exit processes and costs illustrated in Exhibits 10 and 11 demonstrate that, even though the original exchange-traded funds were designed to be traded throughout the trading day on an exchange, the ETF is a much better product than a conventional fund for the shareholder who does not want to trade because the ETF shareholder is protected from costs generated by fund share traders. Traders going into and coming out of an ETF do not cause the fund to trade in a way that imposes transaction costs on the ongoing shareholders in the ETF. Any fund “market timer” will tell you that a mutual fund is a better fund to trade than an ETF because (1) the mutual fund usually pays the market timer’s trading costs and (2) the timer is not a shareholder for long enough to be bothered by the fund’s costs of accommodating other traders.

The SEC has spent a great deal of time and effort trying to deal with the problem of market timing trades in mutual funds without successfully eliminating the free liquidity that ongoing shareholders in mutual funds give all shareholders entering and leaving the fund. A variety of operational “patches” have been made by some mutual fund companies when they attempt to restrict market timing trades. In connection with the imposition of its Rule 22(c)(2), the SEC has required limited implementation of a reporting structure with mandatory redemption fees on mutual fund transactions that are closed out within a short period. http://www.sec.gov/rules/final/2006/ic-27504.pdf. In the final analysis, the elimination of free liquidity – most easily through the exchange-traded fund in-kind creation and redemption process – is the only practical way to eliminate the deleterious effects of market timing trades without imposing unnecessary

\textsuperscript{26} The party initiating the creation or redemption transaction, called an Authorized Participant, also pays a creation or redemption fee to cover the fund’s administrative expenses associated with the creation or redemption.
costs on all mutual fund investors. Even if there will be no such thing as a mutual fund market timer in the future, long-term investors will fare much better in ETFs that protect them from the costs of other investors entering and leaving the fund than they will fare in mutual funds.

ETFs can be different from mutual funds in terms of the way they handle the economics of shareholder cash flows in another significant way. Unlike a mutual fund manager, an exchange-traded fund manager does not need to hold cash balances to accommodate cash redemptions of its shares. With in-kind creations and redemptions of its shares, an ETF can stay fully invested until a readily predictable amount of cash is needed to pay a dividend to the fund’s shareholders or to pay fund expenses. The performance experienced by ongoing shareholders in an ETF that stays fully invested should, over time, handily surpass the performance experienced by ongoing shareholders of a conventional mutual fund using the same investment process.27

How Costly Are Flow Transactions in Mutual Funds? A number of academics, most significantly Roger Edelen, now at the University of California, Davis - Graduate School of Management, have studied the cost of mutual fund “flow transactions” (purchases and sales of mutual fund shares by traders moving in and out of the fund) to the ongoing shareholders of the fund. The most recent and most comprehensive of these studies, Edelen, Evans, and Kadlec (2007)28, found that the cost of flow transactions to investors in the average mutual fund in a broad sample was approximately 75 basis points or ¾th of a percent per year during the period they studied (1995-2005). While the average mutual fund investor probably experiences at least a slightly lower cost of flow than 75 basis points per year in the aftermath of the 2003/2004 scandal-initiated reforms, the fact that mutual fund share buyers and sellers transact at net asset value and do not pay the trading costs the mutual fund incurs to buy and sell portfolio securities when they enter or leave the fund, continues – and will continue – to burden ongoing mutual fund shareholders. As Exhibit 10 illustrates, passing the cost of flow transactions on to all the shareholders in the fund is inherent in the mutual fund structure as nearly all U.S. mutual funds operate today.

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27 Ironically, many ETF portfolio managers hold unnecessary cash balances. Here is a link to text and a table The Lazy Portfolio Manager + Tracking Error, updated from $$Gastineau (2010)$$ that illustrates how the laziness of some ETF portfolio managers who failed to minimize fund cash balances, reduced shareholder returns in years of good market performance.

I want to note briefly that one of the frequent topics in discussions of ETF trading costs is the commission cost usually associated with the purchase and sale of ETF shares in the open market. A number of brokerage firms will trade the shares of certain ETFs without charging a commission (a practice which has its own costs and problems). Unless an ETF transaction is very small, the commission cost is usually immaterial.

The most significant cost of trading ETFs for most investors is measured by the difference between the per share value of an ETF portfolio and the share price at which the transaction takes place. Some of this difference is typically reflected in the bid-asked spread that is characteristic of all secondary market trades and much of the rest is the result of the market impact of trades and traders on the mid-point of the bid-asked range or the failure of the price to track the value of the ETF share closely. We will look at the difference between ETF share transaction prices and ETF portfolio values in more detail and from more perspectives as our analysis of ETF trading costs continues.

**COST ADVANTAGES OF ETFS OVER MUTUAL FUNDS**

To go into the virtues of the ETF structure, there are three principal advantages of Investment Company ETFs over mutual funds that are nearly always discussed by advocates of ETFs. They are usually referred to as Shareholder Protection, Tax Efficiency and Lower Operating Costs. Investors should make sure they understand what is behind these labels and how significant they are (or are not) in their own specific case.

*Shareholder Protection from the Cost of Flow Transactions.* The comparison of Exhibits 10 and 11 illustrates ETF shareholders’ typical protection from the cost of other investors’ entries and exits. *Every shareholder of a conventional mutual fund pays part of the cost of accommodating shareholders who enter and leave the fund.* ETF investors, as shown in Exhibit 11, pay the cost of their own entry and exit from an ETF; but *they are protected by the ETF structure and operating procedures from everyone else’s entry and exit costs.* Given that estimates of the cost of investor flow transactions to the average mutual fund may be as much as 75 basis points per year, the opportunity to avoid the

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29 A sale of a share by a corporation or a fund to a shareholder or a redemption is a primary market transaction because the issuer is also the seller or redeemer. A sale of the fund or corporate share by one shareholder to another shareholder is a secondary market transaction because the issuer is not a party to the transaction and the number of shares outstanding does not change. Transactions in the secondary market do not directly affect the assets or return of the firm or fund.

30 Some of these advantages apply to other exchange-traded product structures, but the explanation is often different.
ongoing burden of this mutual fund cost with an ETF should be attractive to all sentient long-term investors.

**Tax Efficiency.** The ability to defer capital gains taxes indefinitely in many ETFs is widely discussed – if not widely understood. In general, this kind of capital gains tax deferral is available until the shareholder sells his or her ETF shares. The tax deferral mechanism available only in ’40 Act ETFs\(^{31}\) provides greater trading flexibility to portfolio managers who are responsible for funds used in both taxable and tax exempt investor accounts. This tax advantage is valuable to both taxable and nontaxable investors in the ETF.\(^{32}\)

**Lower Operating Costs.** In addition to protecting ongoing fund shareholders from other shareholders’ trading costs, the costs of operating an ETF are typically lower than the costs of operating a mutual fund. Savings on (1) shareholder accounting, (2) portfolio position management (Some portfolio composition changes can be accomplished as part of the creation/redemption process), and (3) custody costs (Most holders of ETFs get a larger share of securities lending fees than holders of mutual funds receive and administrative fees paid by Authorized Participants may cover part of the custody charge). As Exhibits 10 and 11 illustrate, at least one of the ETF’s greatest cost advantages over a mutual fund – shareholder protection from the cost of flow transactions – is not reflected in the fund’s expense ratio. **In fact, any fund cost comparison that starts and ends with a comparison of fund expense ratios will usually be grossly misleading.**

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**INTRADAY TRADING OF ETFS IS NOT AN ADVANTAGE – IT IS A “FEATURE”**

Some marketers of products with unusual – and sometimes controversial – characteristics have learned to be careful not to describe such unusual characteristics as dramatic advantages over offerings by competitors – if the unusual feature is not an unequivocal improvement. If the characteristic is hard to ignore, smart promoters of such a product usually describe it as a “feature” and hope to move on...

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\(^{31}\) This is a reference to the Investment Company Act of 1940, the primary legislation governing the structure and operation of collective vehicles holding pools of securities offered to investors in the U.S. [Click for Investment Company Act of 1940.](#)

\(^{32}\) For a detailed discussion of the tax treatment of ETFs see [Gastineau (2010)]($$$Gastineau\ (2010)$$$ especially Chapter 4, pages 65-100. The explanation of the advantages of this tax efficiency is on pages 73-81. For most purposes, the tax efficiency of ETFs comes from the fact that a well-managed ETF will not distribute taxable capital gains to shareholders. A holder of the ETF will pay capital gains taxes only when ETF shares are sold. It is a good idea to read fund documents with care and to ask questions about taxation. 38
to the next topic without having to demonstrate that the feature is unequivocally an advantage. Many ETF enthusiasts have not been very smart in their discussions of intraday ETF trading. Considering that intraday ETF trading has been (incorrectly) considered essential to ETF distribution, ETF advocates have gone to extremes to make a virtue out of intraday trading. Note that the availability of intraday trading at a price “close” to an underlying intraday share value is not on my list of ETF advantages. It is not even available when an investor tries to trade some ETFs. There are other and arguably better ways to trade ETFs. As noted in the opening paragraphs of this e-book, intraday trading was a significant part of the raison d’être for creating and listing the original benchmark index ETFs for trading on stock exchange floors; but conventional intraday ETF share trading should be of future interest to investors if, and only if, it is the lowest cost way to get into and out of positions in an ETF’s shares.

If you are a day-trader or a risk manager for a hedge fund or for a securities dealer’s trading desk, intraday trading of benchmark index ETFs may be important to you. If you are an investor who wants to hold the ETF shares, being able to trade at the fund share’s value at noon should not be of interest to you under most circumstances. If you feel you have to trade at current prices to get into or out of the market immediately, your trading costs will probably be lowest if you use one of the major benchmark ETFs. Some of the comments in the next segment will be helpful to traders who need to trade quickly, but you should expect added costs, on average, if you have to trade immediately. When this segment of the e-book was first written, intraday trading, allegedly “just like a stock,” was still the only way to trade ETFs. We will look at the economics of ETF trading closely and consider another way to trade ETFs after we examine the economics of conventional ETF intraday trading.

**PRINCIPLES OF ETF TRADING IN TODAY’S INTRADAY MARKETS**

This book was written for readers who at least suspect that they can profit from studying the nuances of ETF trading. This suspicion is generally correct. The most actively traded ETFs, which are easiest to trade with narrow spreads, are usually less attractive investments than many of the ETFs that are less actively traded. The less actively traded ETFs are more attractive investments partly because they are not based on major benchmark indexes. With less actively traded ETFs, there are enough road hazards out there that just avoiding some obvious problems can reduce your trading costs. Apart from the hyperactive benchmark index ETFs, a market order of significant size can lead to at least part of an ETF order being executed at unsatisfactory prices. If you enter your own online order, the most common choice is between a market order and a limit order. Whether or not you can enter a specific type of limit order may be a function of

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your brokerage firm’s policies and, perhaps, how large and how confrontational a customer you are. You often have a lot more choices than you might expect to have.

Investors Trade ETFs Primarily Through Electronic Orders. Most readers willing to spend time assimilating the information offered here will be committed to understanding the conventional ETF trading process and using it as effectively as possible. Consequently, I describe the various possible approaches in some detail. Many ETF investors will enter their orders electronically through the facilities of an online discount broker. Other investors, advisors and institutional traders will either enter their orders in a similar way or by a conversation with a person on a trading desk. Once the order reaches the trading desk, it usually will be entered electronically, much like other investors enter their online orders on home or office computers. In most cases, a small order will be processed in much the same way, no matter how it enters the trading process. If you are entering an order with a sales trader on a trading desk, the individual taking your verbal instructions may have greater flexibility in the order types used and may have access to special order handling or routing services which are usually not available to investors entering online orders directly. On the other hand, I expect many readers to decide that they want to “manage” their own orders when they have carefully considered the possibilities.

To illustrate how brokerage firm practice varies, some order desks may not accept traditional limit orders for ETFs. Among the reasons suggested for this policy, the most reasonable one that I have heard is that ETF quotes change so frequently that it is impractical and unproductive for trading desks to enter and cancel a succession of limit orders as ETF quotes change. In any event, the relatively high frequency of ETF quote changes makes it sensible for an individual entering an online order to spend more time thinking about the effect of various order types on results and less time changing limit orders. When I emphasize the process of getting the order into the electronic marketplace, I do not mean to imply that there are no significant “high-touch” ETF orders. Some large ETF orders are handled by a living person who “calls around” (1) trying to find the other side of the trade and then (2) trying to find a way to print the trade that is consistent with (a) what the trading parties agree to and (b) the rules of the National Market System (NMS). Such ETF orders are usually handled differently than the way a stock trade would be handled and differently than a similar ETF order might have been handled a few years ago.

From the perspective of an individual investor, automated or semi-automated algorithmic orders are much more numerous than labor-intensive voice “block” orders. Many relatively large ETF orders are managed with algorithmic trading models originally designed to handle large stock orders with minimum labor costs. If your order is being
“managed” by an algorithm, you need to learn how the algorithm works. Algorithms designed to trade stocks may not deliver good ETF executions. Fortunately, you do not need to toss your ETF order into a giant shredding machine and hope for the best.

Once your online order is entered it will be handled in one of two ways: (1) The order may be sent to an exchange such as NYSE Arca or NASDAQ or to an alternative trading facility (ATF) such as an electronic communications network (ECN). These market centers maintain limit order books and accept a number of order types for various securities, including ETFs. They match buy and sell orders within the rules of the National Market System (NMS) and report executions directly or through a trade reporting facility (TRF) for publication on the Consolidated Tape. (2) Your order may be internalized by your broker or “sold” to a consolidating broker that handles a large number of internalized trades and executes them, as appropriate. Brokers who offer to trade ETFs without charging a commission are able to do so because of their own internalization operation or because of revenue from the sale of their order flow.33

When an order is internalized, a buyer will pay essentially the asked price quoted in the market and a seller will receive essentially the posted bid price. The order might or might not be exposed to public bids and offers in an attempt to obtain a better price. However, an internalized order must be treated in prescribed ways to protect investors who enter these orders from predation. An internalized market or limit order to buy or sell the shares of an ETF (or any other security for that matter) must be “price improved” from the National Best Bid or Offer (NBBO). The price improvement can be as small as $0.0001 per share. With an order for 100 shares, the required price improvement can be as little as a single penny on the entire order. While this negligible price improvement is marginally better than no improvement at all, the fact that internalized orders are not exposed to the market often causes the posted bid/asked spreads in heavily internalized securities to be wider than they would be if there was no internalization. If you doubt the potential for narrower trading spreads if trades that are now internalized were required to be exposed to the market, consider that internalization rates range from 20% to as much as 70% in some equity securities, including many ETFs. The subject of customer order internalization is very much in the sights of regulators and the rules for order internalization and handling may change in the months – or years – ahead.

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33 Investopedia defines internalization: “When a brokerage receives an order they have numerous choices as to how it should be filled. They can send it to an exchange, an ECN, market maker, a regional exchange or fill it by using the firm's own inventory of stock. Firms often internalize orders when they can because they profit from the spread.”

http://www.investopedia.com/terms/i/internalization.asp
With this limited background on just a few of the nitty-gritty issues of electronic trading, we will look first at trading the most actively traded ETFs and then at trading less actively traded funds. We will encounter additional nitty-gritty issues as we go along. The material in the next four segments applies primarily to actively traded ETFs that are trading in small quantities. If your trade is larger and/or the ETF is not actively traded, you need to consider a lot more things.

Trading Major Benchmark Index ETFs. This discussion of the major benchmark index ETF market applies to trading in the shares of a small percentage of the existing ETFs. These ETFs, however, account for close to two-thirds of ETF assets and as much as 90 percent of ETF share trading volume. Most of the major benchmark index ETFs have been around for 10 years or longer. In spite of high volume and narrow posted spreads, a few potential traps exist for unwary traders of these actively traded ETFs.

The large benchmark index ETFs are the favorite toys of high-frequency traders who buy and sell them in huge quantities. However, the depth of the markets in these shares may not be very great throughout the trading day or from day to day. An S&P 500 SPDR position worth, say, $10 million–$100 million can be established or liquidated efficiently on most days by a trader with modest skills. However, every trader should keep in mind that the volumes associated with high-frequency trading do not mean that huge bids and offers are regularly exposed in the market. In fact, anyone trying to trade in large size should look very carefully at the depth of the limit order book. Your trading terminal, the brokerage firm that handles your trades and even some free Internet sites will be able to provide various levels of information on the size of the best bids and offers and other bids and offers close to the current market. You will want to look at the number of shares bid for or offered. Look not only at the best bid or offer (BBO), but also at the size bid for at slightly lower prices and offered at slightly higher prices. Millions of shares may be trading every few minutes, but the posted order book may be thin at prices within a few cents of the last sale. When we examine the intraday pattern of ETF bids and offers in the conventional ETF market, we will see that the best time to trade most ETFs is usually during the last hour of trading for the day when bid/asked spreads tend to be tightest and bids and offers tend to be largest. Keep in mind that entering an order to buy or sell an ETF at the market on close (MOC) is often a very bad idea.35

34There will always be differences of opinion as to whether growth/value, sector and capitalization splits of indexes like the S&P 1500 and the Russell 3000 should be classified as benchmark indexes. The major capitalization splits (e.g., S&P 500, 400 and 600) usually trade more actively than the broader benchmarks (S&P 1500). Growth/value and sector splits vary widely in their trading characteristics. I would suggest that the most useful definition of a “benchmark” index should include a measure of the trading volume in the index’s ETF(s).

35See Angel, Broms and Gastineau, “ETF Transaction Costs Are Often Higher Than Investors Realize,” Journal of Portfolio Management, Spring, 2016 or the first 20 pages or so of this e-book for ample examples.
**Risks Associated with Leaving a Resting Order on the Limit Order Book.** One effect of today’s high-frequency trading is that the effective spread in the market for an actively traded ETF is typically no more than a few pennies. However, if you enter a limit order at a round penny, you may risk being “subpennied.” This term means that an aggressive trader can place his bid above your bid by, say, a hundredth of a penny on some electronic trading books. That trader can use your limit order as a “backstop”: His order has effective priority over yours. If he buys some shares and the price moves up he can sell the shares he purchased at a profit that is significant relative to the small risk he has taken – and your order will not be filled. If, on the other hand, a large seller comes in and the aggressive trader’s subpenny bid is filled, he can turn around before another seller arrives and hit your round penny bid, incurring a very small loss. You, on the other hand, may find yourself buying his shares just a moment ahead of an avalanche of sell orders.

Even if you see a resting bid or offer that is large enough to fill your order, it is usually best to enter a *marketable limit order* and cancel any part of the order that is not filled promptly, rather than use either 1) a market order or 2) a resting limit order. A marketable limit order is an order with a limit that appears to be at least partly executable at the time it is entered, given the bids or offers on the book. The limit will keep you from paying more or receiving less than the limit price. If the limit order book is thin, a market order can cause the price to move significantly more than a few pennies. You should carefully consider entering a marketable limit order as an *"Immediate or Cancel Order"* so that it does not become a resting limit order subject to subpennying.

If you are a retail investor or if your advisor domiciles his accounts at one of the major custody brokers, you and your advisor may not be given the opportunity to designate the trading book where your order will be sent; but, if you enter your limit order immediate or cancel, it is more likely to be routed to a trading facility where it can interact with other large orders. $$Dick (2010)$$ provides a readily understandable discussion of some of the perils of using resting limit orders in a decimalized electronic market. *Linnainmaa (2010)* also provides a useful discussion of the problems traders encounter when they use limit orders and additional material from Linnainmaa is also available.

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36Many trading facilities do not accept subpenny orders, but subpenny orders and trades on other trading facilities can still be competition for an investor who has a round penny limit order exposed on an NMS-linked trading facility that does not permit subpenny orders.  
37This is one kind of order that so-called “flash traders” use. Keep the common sense behind this order in mind the next time you hear bad things about flash trading. These professional traders usually know what they are doing.
Trading and Holding Cost Issues in ETF Selection. The best feature of the hyper-active benchmark index ETFs is that with reasonable care they can be traded in large size and at very low cost. Their greatest weakness is that the transparency of changes in their index composition reduces their returns and makes them relatively unattractive candidates for long-term investing—even with low expense ratios. Low expense ratios often attract “brand” conscious investors to popular benchmark index funds, increasing the market impact of index composition changes. Vanguard’s introduction of a 6-basis-point expense ratio on an ETF share class of their S&P 500 fund looks like a bargain on the surface. In 2016, many iShares funds reduced their expense ratios below some of Vanguard’s fees, indicating that price competition has not ended. In fact, there is no doubt that low ETF expense ratios have drawn and still draw assets to the S&P 500 index. Any increase in assets benchmarked to that index may slightly boost the performance of all S&P 500 index funds in the near term. On the dark side, however, as assets flow into S&P 500 funds, the S&P 500’s “index market share” will increase. Eventually – and already in this case – the impact of index composition change trades that front-run every change in the index fund will dwarf the short term effect of asset growth stimulated by a slightly lower expense ratio. See $$$Gastineau (2010)$$$, pages 101 – 129, $$$The Cost of Trading Transparency$$$, or The Cost of Trading Transparency working paper.

The major benchmark index ETFs have very useful short-term applications as portfolio transition positions. The fact that some of these ETFs trade with tight spreads and in large size without a large market impact makes them ideal candidates for temporary positions. Trading and holding benchmark index ETFs for a short time is relatively simple and, sometimes can be inexpensive. An advisor can change an investor’s asset allocation quickly and cheaply. The advisor can take temporary positions in benchmark index ETFs in appropriate asset classes and then move assets into ETFs with better long-term performance prospects in the same asset classes, slowly and carefully. In many cases, temporary positions in benchmark index ETFs have replaced index futures positions as the instrument of choice in many portfolio manager transition trades, as described in Ward (2011). See $$$Gastineau (2010)$$$, pages 265–272 for a more detailed discussion of short-term ETF applications.

Contrast Between Trading ETFs and Mutual Funds. Mutual fund investors and advisors who have used mutual funds for their clients for a number of years, often find it difficult to adapt to ETFs, unless the ETFs are hyper-actively traded. These investors and advisors, perhaps for the first time in their lives, have to pay attention to trading techniques and trading costs when they switch from mutual funds to ETFs. They will usually consider the size of the fund for the first time and they will almost be forced to consider the ETF’s share trading characteristics.
In my experience, the small size of a mutual fund is rarely a negative factor in an investment decision. Few individual investors or advisors are concerned about their ability to get into or out of small mutual funds. They buy the mutual fund’s shares at net asset value and the fund portfolio manager has the task of investing the cash in portfolio securities. When the advisor redeems the mutual fund shares for the client, the fund manager sells portfolio positions to raise money for the redemption. Most investors and advisors are willing to buy shares in a $10 million–$50 million mutual fund that has a sound investment process that meets their asset allocation objectives. The managers of these funds welcome the investment. If the investor or his advisor considers the impact of “flow” transactions on the fund’s performance, it is usually no more than a passing thought because mutual fund share trading – buying and selling mutual fund shares for cash at net asset value – is so simple from the investor’s or advisor’s perspective. The next time you consider “dumping” a lot of cash into a mutual fund with a high trading cost portfolio, you might consider what the manager of that fund has to do with your – or your client’s – money. Not every investor or adviser considers the effect of such a transaction.

INFORMATION AVAILABLE TO ETF TRADERS

You Do Not Need to See All the Information Available to Help You Trade S&P500 ETFs at a “Fair” Price. When an ETF tracking the S&P 500 (The Standard and Poor’s Depositary Receipt (SPDR or “spider”) ) began trading in 1993, the SEC knew that there was already active trading in each of the stock components of the index and in futures and options on the S&P 500 during the trading hours of the ETF. The SEC imposed a few special requirements on issuers of ETFs (e.g., publication of the value of the portfolio shares or an acceptable portfolio proxy every 15 seconds during the trading day; publication of the composition of the fund at the close each day; and daily creation and redemption of the ETFs). The SEC relied on these related markets and instruments to assure that investors would be able to trade the shares (ticker symbol SPY) on the American Stock Exchange close to their “fair” value throughout the trading day. The SPDRs were an enormous success and the race to launch a full range of ETFs was on.

Managing Orders in Less-Actively Traded ETFs. There were a wide range of ETFs launched in the wake of the original SPDRs. Few of them have created obvious or serious problems, but most of them have not been as trouble-free and as efficient trading and investment products as the S&P 500 ETFs. I expect the SEC or listing exchanges to require the issuers of many index ETFs to provide more precise and more frequent share value information to protect investors from costly trades. Although NAV-based trading for non-transparent funds has been introduced under the name NextShares (to be
discussed in more detail later), I do not expect this trading method to be used by traditional ETFs for a number of years. It will rarely, if ever, be as cheap for an investor to trade most ETF shares as it is to trade SPY. As a matter of policy, it should be relatively easy for all investors to measure the cost of trading any and all ETFs. The new NextShares and other exchange-traded funds with improved trading cost disclosure (transparency) should gain market share. Measuring the cost of the conventional intraday trading process in an inactively traded ETF is not simple, leading many advisors to avoid inactive ETFs because trading them takes more effort and often costs much more. Light trading volume and wide spreads put small ETFs at a distinct “optical” trading disadvantage relative to their larger (actively and more cheaply traded) ETF competitors and to most mutual funds; but some of these smaller and less actively traded ETFs offer decent prospects for long-term investment performance – as long as you don’t have to have trading liquidity and ultra-low trading costs. You might decide to urge the regulators to improve the intraday NAV information on these ETFs.

Trading carefully to take a position in one of the non-benchmark index ETFs can be worth the necessary effort. Of course, efficient trading can require considerable skill and care with today’s intraday ETF trading process. If you are considering a significant investment relative to the current assets of a small ETF, try to negotiate a price with a market maker that is close to the price where new shares could be created.

Consider that the median ETF in 2016 had about $50 million in assets, a substantial decrease from just a few years ago. Any linkage between assets and ease or cost of trading is limited, but there are both more actively traded and more less actively traded funds each year. Published estimates of average bid/ask spreads are not useful and it is difficult to compare the contemporary NAV with your trading price except for a trade at the market close.

Changes in trading procedures and order flow economics have reduced the profitability of some ETF market makers. The natural position of a market maker who does not have a long-term stake in the success of a particular ETF is to have as little exposure to the fund’s share price as possible. The market maker who is long the ETF shares may try to be short an equivalent value of positions that will track the creation basket. It is particularly hard for a market maker to be perfectly “flat” or perfectly hedged each day with conventional ETF intraday trading when trading volume is low.

Any investor or advisor who wants to use ETFs that routinely trade less than, say, $2 million worth of shares per day needs to understand the ETF market structure and the roles various ETF market participants play. You can accumulate or sell multimillion dollar positions in an inactively traded ETF, but you usually need to get to know some of
the key ETF market participants and work with them to accomplish this trading feat at a reasonable cost. The best single source for advice on how to trade the shares of a particular ETF cheaply is usually the issuer of that ETF. The issuer has a fund website (an SEC requirement) and, usually, has toll-free call-in numbers for individual investors and advisors. An e-mail or a call to the fund issuer will put you in touch with someone who really wants you to have a satisfactory experience trading and holding this ETF’s shares. The issuer’s support staff will offer suggestions and, if you ask, will usually put you in touch with a market maker or other trader who can help you execute an economically satisfactory transaction. If you are an advisor, you may prefer to ask your principal broker for an introduction to an ETF market maker who trades the fund that interests you.

In addition to market makers, a number of firms specialize in putting investors and advisors in touch with liquidity in less actively traded ETFs and you may want to have a conversation with one of them. Most of these firms act as intermediaries between someone who wants to trade an inactive ETF in size and a market maker or, much less frequently, a trade “internaliser.”

When you speak with market makers and other intermediaries, keep in mind that ETF market making is very different than stock market making. A brief discussion of the differences between stock and ETF market making is appropriate here.

In the market for a common stock, the supply of stock is limited to the number of shares issued by the company. Because of the limited supply of shares of a common stock, telling a market maker that you are interested in a stock may lead to a higher offer or a lower bid if the market maker knows you are a potential buyer or seller, respectively. In ETF markets, the price at which the fund shares trade is more or less closely related to the fund portfolio’s NAV, even if your order in the ETF market doesn’t specify that you want to trade at or relative to NAV, trading close to the value of the portfolio is an understandable objective. If you are a large enough trader to interest market makers, you can discuss this objective with an ETF market maker or a broker. Furthermore, in contrast to stock trading, the cost of trading an ETF is likely to decline at least slightly if you are patient and if you want to trade in size.

An ETF market maker enjoys economies of scale in many aspects of creating and redeeming ETF shares. Furthermore, no sensible advisor or investor is willing to pay a large premium for the liquidity services the market maker provides because the fund can usually grow or shrink without a large market impact on the prices of its portfolio securities, unless the portfolio securities are highly illiquid. Your dialogue will inform ETF market makers and/or other ETF market participants that a real investor has an
interest in the fund and has no intention (or hope) of trying to outwit them. Of course, the market maker is interested in making money on the spread when you trade, but he usually expects to be making a market in the ETF for a long time and will hope to do business with you again. For your part, you recognize that you should not have to pay a significant premium or absorb a significant discount to make the trade.

Not every market maker will try to be helpful, but most of them will. Market makers know that satisfied customers, especially satisfied advisors, can represent (1) repeat business and (2) favorable comments about the conduct of the market maker to other potential customers. If you open a constructive dialogue with the people who regularly trade in the shares of a small, less actively traded ETF, you might be able to get in or out without outrageous transaction costs. $$$See Gastineau (2010)$$$, pages 208 – 210.

If the size of your interest is not large, small and carefully placed marketable limit orders can sometimes work almost as well in these markets as in the markets for major benchmark index ETFs. After a brief discussion of some useful limit order variations we will look at thin ETF markets in greater detail and at market on close orders. Frankly, I don’t have a panacea for all ETF trading problems within the scope of today’s funds and market mechanism. Ultimately, we need better ETF share value information and/or better trading mechanisms. It should be easier for any investor to get a high-quality contemporary NAV value updated every 5 seconds or every second – in contrast to the often hard-to-find IIV posted at 15 second intervals today.

**SELF-CANCELING LIMIT ORDER TYPES**

Earlier, I described the **risks associated with leaving a resting limit order** to buy or sell shares in an electronic market where it can serve as a backstop for any aggressive trader who wants to use it for protection. An investor trading more than a few hundred shares of an ETF at a time may want to become familiar with the most important self-cancelling order types including **All or None Order**, **Immediate or Cancel Order** and **Fill or Kill Order**. Each of these order types has a different meaning and they will have different outcomes in various market environments. If you trade frequently and/or in large size, it may be useful for you to know how these order types work and to think about when they might be useful to you.

Not all brokerage firms, all electronic markets or all segments of each market support identical suites of order types. Not all of the conditional order types listed above, provide equal assurance to an investor that an execution will match the instructions he thought were embedded in the order. Ordinary market orders and simple limit orders are

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usually supported by online brokerage trading systems, but some specialized orders will not be “hard-wired” into the electronic order matching book in every market. In many cases, a human response or intervention is necessary to implement some of the contingencies of these orders. If the human element does not perform appropriately, the slightly more complex order may not achieve the execution the investor is looking for. Note carefully the significant, but sometimes subtle, differences in the order types described in the next three paragraphs. You should always check the definition of an order type on the trading system you are using. The available order types may not be identical to the definitions that follow:

**All or None Order**– An order to buy or sell a designated number of shares or units at or better than a specified limit price or under otherwise specified terms. The sale must be completed in its entirety or not at all. Unless a time limit is stated, the order will usually be good for the duration of the current trading session, i.e., a day order. The probable weakness in this order is that the order book may not show enough shares in your price range on the other side of the market. A nuance of this order is that, subject to market rules, this order may be in force until the end of the day if you have not given a time limit.

**Immediate or Cancel Order**– An order to buy or sell a designated number of shares or units (usually subject to a price limit) which must be executed immediately in part or in its entirety when it arrives at the market. Any part of the order not executed immediately is cancelled. More online order entry systems appear to support this order type than either all or none or fill or kill. If you have priced the order appropriately relative to the visible orders on the other side of the market, you should complete at least part of your transaction.

**Fill or Kill Order**– An order to buy or sell a designated number of shares or units which must be executed at or better than a stated limit or under other specified terms immediately and in its entirety or not at all. Generally the order expires if it can’t be filled completely and immediately, but you should check that interpretation with the market the order is going to.

**Stop Orders**– Another order type that is used by some risk averse investors who take ETF positions is the Stop Order. There are two principal stop order variations that ETF traders might use. With a Stop Loss Order the investor enters a sell order on a long position or a cover order on a short position with a stated stop loss Trigger Price. When the security trades at or through the stop loss trigger price for the first time after the order becomes effective, a market order to sell or cover will be entered to close out the position. The other important Stop Order variant is a Stop Limit Order where two target
prices are entered. The first target price is the *Stop Trigger Price* – the price at which the order is activated. The second price is the *Stop Limit Price* describing the lowest sale price or the highest purchase price that is acceptable to the trader. To use a simple example, the stop trigger price on an order to sell may be X and the stop limit price may be X-$1. When the declining price hits the trigger, X, a limit order will be entered to sell at X - $1. Some investors who had stop loss orders in place during the May, 2010 Flash Crash were stopped out at prices far below their trigger price. Many of those trades were cancelled in the aftermath of that event, but the Stop Loss orders clearly did not provide the kind of protection the investors who entered them were looking for. I personally have never used a Stop Order. I would never even consider using a Stop Order in an attempt to limit my loss on an ETF because even the most specialized ETF has a fair degree of diversification. Price moves large enough to prompt consideration of a Stop Order in a portfolio product are rare and are usually subject to cancellation by exchanges or regulators on the grounds that the trade was not fair.

**ETFs Don’t Trade “Just Like a Stock”**

By this point it should be clear that in some very important ways ETFs don’t trade “just like” stocks. In fact, the principal reason for writing an e-book about ETF trading is that ETFs don’t trade very much like stocks in a lot of ways. Only in a very superficial way does the intraday ETF market that started in 1993 operate similarly to the way the stock market operates. Exhibit 12 lists some stock and ETF market features and highlights some of the important similarities and differences between ETF and stock trading.
<table>
<thead>
<tr>
<th><strong>EXHIBIT 12 — HOW THE STOCK MARKET AND THE ETF MARKET COMPARE</strong></th>
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<tbody>
<tr>
<td><strong>Stocks</strong></td>
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<tr>
<td>Minimum Number of Shareholders for Listing</td>
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<tr>
<td>Minimum Market Value at Initial Listing</td>
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<tr>
<td>Median Asset Size</td>
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<tr>
<td>Role of Market Maker</td>
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<td>Share value published</td>
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<td>Share price published</td>
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<td>Share bids/offers published</td>
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<tr>
<td>Frequency of quote changes</td>
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<td>Capitalization</td>
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<tr>
<td>Role of market maker or Authorized Participant</td>
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<tr>
<td>Trading costs: intraday market</td>
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<td>Trading costs: market-on-close order impact</td>
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<td>Trading costs: NAV market</td>
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<td>Closing price determined</td>
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<td>Market-on-close (MOC) rules to offset order imbalances</td>
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<td>Share value determined</td>
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<td>Share price determined</td>
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</tbody>
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* NYSE Rules at time of listing  
** 3000th largest U.S. Company (Russell Fact Sheet, Sept. 30, 2009)  
*** Median 2010 Petajisto (2011a)  
**** Median 2016 ETF.com
The fact that ETFs and stocks trade in the same marketplace does not mean that they trade in the same way. Some interactions of market participants in the ETF market are quite different from the interactions of stock market participants. Even if your only interest is in day-trading one of the major benchmark index exchange-traded funds that trade more than 10 million shares (and in some cases more than 100 million shares) on some days, the market in ETFs is different from the market in common stocks in ways that can affect your trading results. If you trade ETFs that are not based on major benchmark indexes or that trade fewer than 10 million shares a day, ignoring the significant differences between ETF and stock trading can be very costly. With a little study, individual investors and investment advisors who trade ETFs for their clients can reduce their ETF trading costs – and trade in relative comfort and confidence.

While the examples in Exhibit 12 primarily reflect market practices in U.S.-listed ETFs holding U.S. common stock portfolios, most of these observations apply to other nations’ ETF markets and to U.S.-listed ETFs with other portfolio holdings. With the features listed in Exhibit 12 in mind, let’s examine the most important stock versus ETF trading similarities and differences. As we compare the stock market and the ETF market in more detail, the usefulness of approaching ETF trading in a different way than we approach stock trading will become increasingly apparent.

ETF Intraday Share Value Proxies are Unlike Anything We Encounter in the Stock Market. When trading began in the S&P 500 SPDR in 1993, the SEC required that the sponsors of the SPDR arrange for dissemination of an intraday share value proxy for the SPDR at 15-second intervals. These proxies were initially called the ETF’s “indicative optimized portfolio value” (IOPV). The requirement for publishing an IOPV every 15 seconds was extended to every domestic equity ETF launched since 1993 and, with modifications, to ETFs holding foreign equities, fixed-income instruments, commodities, and other financial instruments. In spite of improvements in quote and trade data collection and calculation technology and the introduction of ETF portfolios that hold infrequently traded securities, calculations of domestic equity ETF intraday value proxies are still usually based on the most recent trade (last sale) of each component of the ETF’s creation basket. Other names that have been used at times include intraday indicative value (IIV), indicative per share portfolio value (IPSPV), intraday net asset value (iNAV) and, simply, indicative value (IV).

Hougan’s article is on pages 5 and 10 of the cited issue.
sale calculation is probably reasonable for an ETF that holds frequently traded large-cap domestic equities. If the market is moving or if the ETF holds anything other than frequently traded large-cap domestic stocks, the IOPV is of limited utility at best – and it may be seriously misleading unless it is published more frequently and available more readily. I agree with this assessment and I would use this data with great reluctance – or not at all.

Professional ETF traders and market makers do not use the “official” every-15-second intraday value calculation to help them determine their ETF bids and offers – or for any other purpose. Professionals develop their own intraday valuation information or subscribe to real-time ETF value calculations based on contemporary bids and offers of the relevant portfolio positions rather than on the last sales of the ETF’s portfolio securities. The fact that they do not use the free IOPV calculation does not mean that these professionals lack faith in the calculations – in the sense that they suspect calculation errors. The simple facts are that the last sale is not a reliable indicator of contemporary values in many market situations and the 15-second interval between calculations is too long for the values to be consistently useful to any trader.

Because an ETF is a derivative security (even though they are predominantly investment companies, they derive their value from the value of their portfolio), the current value during a trading session can change every time the bid or offer for any material component of the ETF portfolio changes. The ETF value proxies used by professional traders are usually calculated from the midpoint of the bid and offer for each position in the ETF portfolio rather than the last sale. Furthermore, the value calculations made by and for professionals may consider the size of bids and offers and the pattern of “changes” in an attempt to anticipate short-term trends.

Exhibit 13 illustrates how a naive investor might attempt to use the “free” intraday indicative value information to develop a bid or offer for ETF shares. In Exhibit 13, the latest indicative value is represented by a dot at the beginning of each of the 15-second intervals illustrated. Investors might place limit orders at prices close to the most recent indicative value.
Columns A through E suggest how bids and offers entered at equal distances, respectively, below and above a sequence of these every 15-second indicative value calculations might become transactions – but not always the transaction that the investor entering the order hoped to achieve. An offer to sell the ETF’s shares slightly above the indicative value posted at the beginning of interval A would probably be lifted as the fund portfolio value rose through intervals A, B and C. The original offer was below the changing indicative value by the time that value was updated at the beginning of interval C – less than 30 seconds after the original order was entered. Given the subsequent changes in D and E, selling in C was a good outcome. Of course, some of the last-sale prices used to calculate each 15-second indicative value might be more than a few minutes old at the time a new calculation was made. In short, using the “free” every-15-second indicative values can be costly. However, even if investors had access to proxy values based on every-15-second midpoints of bids and offers and could enter orders as soon as the value was published, a lot can change before or shortly after the next indicative value is calculated and published. Professional market participants would know about any changes before anyone relying on the IOPV would know.

Many investors are aware of the existence of the every-15-second last-sale indicative values and a lot of them understand the frequency of ETF quote changes, but relatively few investors know how to find the indicative value for a particular ETF and even fewer think about how, if at all, to use it. It is probably a good thing that these indicative values are not widely used. Any attempt to use them to manage an order is

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**Exhibit 13 — Using the Every 15 Second Indicative Value to Determine Bids and Offers**

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<tr>
<th>A</th>
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<th>C</th>
<th>D</th>
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<tbody>
<tr>
<td>Offer</td>
<td>Bid</td>
<td>Indicative Value</td>
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<table>
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<tr>
<th>Time</th>
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<td>15sec</td>
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Price

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more likely to lead to disappointment than to a good execution. ETF investors have learned that ETF bids and offers in the intraday market usually change by relatively small amounts, but they change much more frequently than single stock bids and offers. These frequent changes in ETF bids and offers make some ETF investors uneasy. They see changes in ETF bids and offers and they know they do not have as much information as professional traders have about what the ETF price “should” be or when and how the ETF bid or offer might change next. In the years since the introduction of the first ETFs, the ability of financial markets to compile and distribute indicative values has greatly improved. The markets for many ETFs will be greatly improved by the introduction of IOPVs calculated more frequently, say every second. As long as “just-like-a-stock” trading prevails for most ETFs, the IOPV should be published every second or so and the historic data should be available in a standard format on ETF websites to let investors check the quality of their ETF transaction experiences. Time stamps of the execution and the contemporary IOPV/IIV should be on the confirmation for every trade.

ETF Quotes and High Frequency Trading. The information on share values, transaction prices, bids, and offers summarized in Exhibit 13 does not specifically or completely incorporate the facts (1) that a professional trader’s or market maker’s ETF share bid and offer updates are usually made by an auto-quote system every time any significant portfolio component’s bid or offer changes, a process that tends to make these ETF share bids and offers a much better indication of the current value of an actively traded ETF share than the every-15-second last-sale value calculation could ever be; (2) that the auto-quoted bid and offer are provided by the market maker who will probably be your counterparty on any sizable trade; (3) that you don’t always know who is behind any specific bid or offer (It may not be a market maker.); and (4) that you may not want to simply accept the reasonableness of a bid and offer at face value.

If the investor order flow that the market maker is seeing is preponderantly on either the buy side or the sell side of the market, there is no reason other market participants should assume that the market maker’s bids and offers are equidistant from the appropriately weighted collective mean of the portfolio bids and offers. If there is net investor demand for the ETF shares, the mid-point of the quote will often be higher than other factors might lead you to expect. If investors want to sell the ETF’s shares, the mid-point of the quote will often be lower relative to the underlying share value. In short, the ETF quotes you see, like the IOPV, do not necessarily contain any useful information about the contemporary value of the ETF portfolio, or even what your transaction price will be if you enter a market order to buy or sell shares in the ETF.

The posted ETF bids and offers do have the advantage of being something you can trade with if you get your order in immediately. (You cannot trade with the every-15-
second value calculation because it does not represent a bid or offer for the ETF shares.) An investor can be confident that, even if his market data vendor is a bit slower and updates quotes less promptly than the best data vendors, he will not be seriously disadvantaged relative to other retail market participants. Bids and offers for the most actively traded ETFs tend to be both tighter and to change more frequently than stock quotes during active trading periods. In active trading periods, consolidated market spreads are frequently a penny per share between the bid and offer for some of the most actively traded ETFs. These periods of active trading are often the best time to trade most ETFs in the intraday market. If trading is not active, the quotes in the market tend to reflect a wider spread between the bid and the offer and the actual quantities available at posted quotes are often difficult to predict.

Few individual investors have the kind of ETF valuation information that professional traders use or the capability to change their bids and offers as fast as the quotes on an ETF share change in common market situations. Professional traders and market makers not only calculate intraday bid/offer values for ETF shares continuously throughout the trading day, they use automated quote management systems that can change their ETF bids and offers in a millisecond, more or less, every time the bid or offer changes for any security in the ETF’s portfolio. The fact that regular session ETF trading volume is routinely measured in millions of shares per day is partly due to the speed of order entry and execution as high-frequency traders attempt to capture small changes in value in the most actively traded ETFs. The quest for speed of execution by some traders once led the NASDAQ market to boast “peak [round-trip] trading speeds of 250 microseconds.” As fast as that claim is, it is not nearly as impressive today as it was when it was first made. In today’s high-speed trading environment, time lags associated with information traveling even a few miles at approximately the speed of light confer a premium value on computer centers located within a few yards of an exchange order matching system.

The mainstream financial press was slow to undertake a comprehensive explanation of what high frequency trading (HFT) has meant for the performance of the financial markets. Record volumes became routine years ago, so volume reports have largely stopped making financial market headlines. Explanations of high frequency trading are often sparse and oversimplified. Milliseconds and microseconds are difficult for most people to conceptualize. Specialized publications like Wall Street and

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41 A millisecond is 0.001 of a second.
42 A microsecond is 0.001 of a millisecond or 0.000001 of a second.
43 The owners of computer servers located on or near the premises where the exchange matching engine is located pay a premium rental to the exchange for this “colocation.” Colocation is generally available on equal terms to all parties willing to pay for it. For an extensive, if inevitably dated, discussion of the physics and economics of collocation, see Flash Boys by Michael Lewis, W. W. Norton, 2014.

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Technology, Traders Magazine and Advanced Trading have done a good job of explaining what is going on, but they reach mostly “involved” readers. Dick (2010), Preece (2010) and Decovny (2010) appeared in a single issue of CFA Institute Magazine. That publication is not a major forum for trading technology but it is often a good indicator of the “hotness” of a topic. Urstadt (2010) took more of a market risk prospective and less of a technology perspective than readers of MIT’s Technology Review may normally expect to see. $$$Aldridge (2010)$$$ is the best comprehensive discussion of the hows and whys of electronic markets that I have seen. Aldridge focuses on the systematic trading aspects of HFT, as they might be practiced by a hedge fund. She does not emphasize best execution, as most investors and advisors might prefer. The book is not unnecessarily technical, but some familiarity with financial math is useful.

While microsecond electronic message speeds and multi-billion ETF share trading volumes had been building, they were not the stuff of headlines until, approximately, the summer of 2009. The lesson from the gradual awareness experienced by most observers is that anyone using the financial markets should check up on the state of the trading art from time to time.

Most investors have heard about high frequency trading (HFT) of stocks and ETFs in connection with high equity trading volumes. There is nothing inherently wrong with HFT from an investor’s perspective. In fact, HFT reduces the cost of trading for most investors relative to the market structures and trading procedures of five to fifty years ago. Market makers in actively traded ETFs use HFT and the order on the non-investor side of most benchmark index ETF trades is typically a high frequency order, even if the trader entering the order is not formally classified as a market maker. However, HFT in ETFs is not useful or relevant to ETF investors who want to trade shares in any but the most actively traded ETFs. High frequency traders only trade actively traded securities.

The orders entered by high frequency traders in actively traded stocks and ETFs are often referred to by traders as “low latency” orders. They are limit orders that are entered and, if they are not executed, may be cancelled within a few micro seconds. These low latency orders are another part of the reason that quotes for benchmark index ETFs change so frequently. A typical HFT order is for the purchase or sale of no more than a few hundred shares and it is either filled or cancelled in much less time than the blink of an eye. (To put things in perspective, I am told that the blink of an eye takes about 300 - 400 milliseconds.)

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44 Low latency is the other side of high frequency. It means that the order does not stay active on the limit order book for very long, i.e., that the order is changed with high frequency.
My conclusion, after reading a number of academic studies, regulatory inquiries and other reports, is that HFT is the almost inevitable result of the combination of trading technology advances and regulatory responses that have dominated the equity market structure and trading process in recent years. From the viewpoint of an individual investor or her advisor, HFT is (in large measure) a new market making function for actively traded equity securities. High frequency traders enter sequential and sometimes almost simultaneous orders that enable longer term holders of an actively traded stock or ETF to trade at lower cost and sometimes in greater (total) size than has been possible in the past. HFT has reduced transaction costs for most participants in the markets where high frequency traders have been active.

On the other hand, HFT contributed to the order imbalances behind the Flash Crash of May 6, 2010. The regulatory changes implemented by the SEC and CFTC since that date should prevent a repeat of that event, though not necessarily many other possible problems that might be attributed in part to HFT. Readers interested in more information on HFT should examine some of the following documents from links and listings available in the Bibliography: Angel, Harris and Spatt (2010), Brogaard (2010), Cartea and Penalva (2011), Menkveld (2011), Angel and McCabe (2010), Aldridge (2009), Hasbrouck and Saar (2010), Easley, Lopez de Pardo and O’Hara (February 25, 2011) and Easley, Lopez de Pardo and O’Hara (Winter 2011). Also see Regulatory Reports on the Flash Crash and the SEC Concept Release on Equity Market Structure and Comments on the Concept Release listed in the Bibliography.

Even if you do not have access to an institutional equity trading desk, you can see some of the effects of HFT on an active montage monitor of the best bids and offers from all the markets trading, say, SPY or QQQ during regular trading hours. I have not included a static illustration of the montage monitor display because a snapshot cannot convey a sense of the frequent and rapid changes in bid and offer prices and sizes. The montage monitor for one of the more actively traded ETFs looks a little like a time-lapse video of a beehive, if you can visualize prices as worker bees. You can use resources like Level 2 quote data that show this frenetic activity for yourself in real time. While the offerings change frequently, you should be able to watch the bids and offers update before your eyes. Sometimes the best time to do this is during regular trading hours; but some markets update for a while before and after regular trading hours and some of the brokerage sites use recorded videos to illustrate market dynamics.

The economic and regulatory obstacles that have restricted individual investors’ access to real time quote montages are gradually disappearing. If you are an active trader and/or have a large account, some brokerage firms will provide you with full access to Level II quotes on surprisingly favorable terms. The orders posted come from multiple
market participants, including market makers and individual and institutional investors (both directly and through order desks). Level II displays typically show two columns ranked by the best bid and the best asked price at the top of, respectively, the left and right of a pair of columns. If you scroll down each column, you can evaluate the tenor and depth of the current market for the specified equity security as you move down from the best bid and offer at the “top of the book.” After you have watched these prices update, you can decide if this level of quote service looks like it will be useful to you.

Don’t be surprised by the speed and frequency of ETF quote changes. Auto-quote systems that monitor the quotes in an ETF’s portfolio positions eliminate most of the need for hands-on attention by a market maker’s or professional trader’s staff. Consequently, even though the bid/offer spread is usually wider in a less actively traded ETF, the quote updates in moderately active ETF shares will often be considerably more frequent than quote updates in a similarly active common stock. The frequency of quote changes is usually linked to the number, size, and price volatility of positions in the ETF portfolio more than to the level of trading activity in the ETF shares.

While the quality of the brokerage firm quotation services readily available to online investors varies considerably, it is usually possible to get a current bid and offer, and the quantity bid for or offered at the best bid and offer for an ETF of interest, from online brokers. The size of bids and offers and the spread between them are the best indicators of how many shares you can trade easily and at what price you might expect to complete a transaction. As a price discovery and trading process, today’s ETF market structure is not like anything market microstructure analysts would have predicted before the introduction of ETFs. In retrospect, the manner of ETF operation made the beehive order book pattern almost inevitable for benchmark index ETFs.

Most investors shouldn’t expect to day-trade ETFs (or any other security) profitably, but individual investors may benefit from high-speed trading developments to the extent that such trading compresses bid/offer spreads and usually increases the quantities that can be traded close to an ETF’s current value with careful order management. Investors using actively traded benchmark index ETFs trade in a very efficient market with narrow spreads. Tightness of the spreads is at least partly a benefit of high frequency trading; but, if the ETF you want to trade is not an active trader, conventional intraday ETF trading may not work very well for you, especially if you want to trade the ETF in large size.
Exhibit 14– Daily Trading Volume Breakdown for 2010

The total trading volume (in $ million) is computed across all ETFs for each 5-minute interval during the day. The exhibit shows the average across all trading days in 2010.


The bar graph in Exhibit 14 shows ETF share volume in 5-minute intervals over the course of all the trading days during 2010. The relatively heavy trading volume in ETFs in the first half hour of the regular trading session both attracts and reflects retail
ETF orders. A similar volume pattern in stock trading is usually attributed to institutional trading.\textsuperscript{45}

Traders who are concerned about their trading costs, especially the bid/asked spread and their ability to trade in size with minimal market impact, will usually wait until the markets in all an ETF’s portfolio components are open and updated quotes are available\textsuperscript{46}. Spreads on ETF shares tend to be relatively wide right after the opening and the sizes of market maker bids and offers are sometimes small early in the day. Trading spreads on the most actively traded ETFs are usually tighter and the size of bids and offers are greater late in the day. Trading volume rises again in the last hour of trading after the pattern of bids and offers has had time to stabilize.

A number of organizations and websites publish information on “average” bid/offer spreads for specific ETFs. Most of the published information is based on data compiled by NYSE Arca, but it is usually industry rather than just listing exchange data.\textsuperscript{47} Depending on what time of day you check the bid and offer prices and sizes for a specific ETF, you may find that the published “average” spread is narrower than the spread you see on the quote screen. The spread you observe is likely to be wider than the reported “average” spread because the published “average” spreads are weighted by an undisclosed measure of the size and density of the bids and offers available at various times during the day. This weighting scheme means that a heavier weight is assigned to the spread at times when bid and offer sizes are larger. Large bid and offer sizes usually coincide with times when trading volume is highest and spreads are tightest—times near, but not necessarily at, the market opening or close. Posted average spreads should give you a reasonable indication of the relative spread at which you might trade various ETFs, but the bid-asked spread and the size behind the actual quotes at the time you are actually trading is what matters.

Trading volume in most ETFs is most active during the 3:55 p.m. to 4:00 p.m. interval as illustrated in Exhibit 14. Trading is, in fact, active during the closing minutes of the regular session, but a lot of the volume reported for this interval is from Market on Close trades that are priced at the end of the regular trading session at 4:00 p.m. Post close trades, largely reported for the period between 4:00 and 4:15 are often linked to end

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\textsuperscript{45} Individual investors probably follow similar trade patterns in stocks. The comments in this paragraph reflect conventional wisdom, not a systematic study of the underlying causes by the author.

\textsuperscript{46} These comments apply principally to ETFs holding domestic stock positions.

\textsuperscript{47} One of the early articles describing this data is \textbf{Hougan (2008)}; but also see the discussion of the \textit{insignificance} and \textit{uselessness} of information on bid/ask spreads in Angel, Broms and Gastineau (2016). This discussion of the insignificance of ETF spreads is covered on pp. 6 – 23 above. The website ETF.com and many ETF websites provide data on average spreads. When you visit that website, click on Analytics and Data and experiment with the tools. Don’t drink the Kool-Aid that the average spread attributed to an ETF is useful information.
of day futures trading. Bids and offers after the formal close of the regular trading session are often erratic. The futures-linked trading after 4:00 p.m. is not included in the data used to calculate the average spread because it is not part of the regular trading session – and including it would almost certainly make the reported average spread wider than it is during most of the regular trading session. The period between 3:00 p.m. and 4:00 p.m. is generally the time when the cost of a conventional intraday trade in an ETF is lowest. This period of high volume and large bid and offer sizes, largely determines the published “average” spreads. This period is when the average spread on the 500 SPDR will be less than a penny – temporarily “locked” or even “crossed” markets in the most actively traded ETF shares are common. Even if you are planning to trade shares in one of the most actively traded benchmark index funds which appear regularly on the most active list, the end-of-day period is almost certainly the best time to enter your ETF order, assuming that trading cost minimization is a significant objective of your trading plan and that you decide to use the conventional ETF trading process. As we will discuss in some detail below, you should avoid Market on Close orders, especially in thinly traded ETFs.

Thinly Traded ETFs Revisited – Marketable Limit Orders. Let’s look again at the intraday ETF trading process as it works – or sometimes doesn’t work – for inactively traded ETFs in the light of what we have learned in the preceding segments. If you jumped over the recently preceding material, read on and consider whether you need to double back and examine it more thoroughly.

Let’s start our re-examination of thinly traded ETFs with a relatively simple trade before we look at more of the things that can make ETF trading a challenge. If (1) you are trading no more than, say, 2,000 shares of one of the major benchmark index ETFs that trades more than 10 million shares a day, (2) the current price of the shares is consistent with your objectives and (3) the quote spread is close to the nominal and theoretical minimum of $.01 per share, entering a small market order after 3:30 p.m. is generally safe. However, I would personally recommend comparing the size of your order to the quoted size on the other side of the market immediately before you “push the button” to execute a market order. If the thought of entering a market order in a volatile

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48In a locked market, the bid and the offer are identical. In a crossed market, the bid is briefly above the offer. Locked and crossed markets are possible because there is not a consolidated limit order book in these securities. A bid that is higher than the best offer should be executed immediately at the offer price if the quantity offered is large enough to fill the bid and the bid and offer are on the same order book. However, a bid entered on NYSE Arca will not immediately interact with an offer on BATS or one of the other limit order books. The best available offer on NYSE Arca may be above the new bid and above the best available offer. Unless market makers on NYSE Arca fill the bid at a price equal to the best available offer on the other market, the bid will be re-routed to the market with the best offer and executed against that offer – eventually. If this market structure seems dysfunctional to you, I agree. The market should be a price and it should not matter where you place the order.
market environment unsettles you as much as it unsettles me, you can enter a marketable limit order. That is what I would do under almost all circumstances, even if I were trading, say, the S&P500 SPDR or the PowerShares Nasdaq 100. The wild share price swings in the relatively small number of flash crash or other market incidents we have experienced were generated by market orders, not by marketable limit orders. It is probably time for most investors to take the market order arrow out of their trading quiver.

A marketable limit order is any order to buy at the current offered price or at a slightly higher limit or to sell at the current bid price or at a slightly lower limit. Specifically, if SPY (the S&P 500 SPDR) is quoted at 134.80 bid and 134.81 offered. A marketable limit bid would be an order to buy at 134.81 or at any higher limit. If your purpose is solely to avoid the risk of entering a market order to buy that might be executed significantly higher than the current quote, not to wrangle over the last penny, you might make your limit, say, 134.83. As long as your buy order is not too large, most or all of it might be executed in this example. Given the rapid changes that are often characteristic of ETF bids and offers, there is always a risk that your limit order will not be a marketable order when it reaches the market and, consequently, that it will not be executed. You may want to compare the opportunity cost of failing to execute the trade to the risk of a worse price with a market order or a more liberal limit. If an ETF trades less than a million shares per day, take a close look at the current bid/offer spread, at the number of shares bid for and offered, and at recent changes in the bid and offer; then consider how to structure your marketable limit order – or read on for more discussion and more options.

Sooner or later, you will be limited by the trading options offered in the market. If you trade frequently enough, you will almost certainly find yourself in an ETF trading situation where you are entering and cancelling the unexecuted part of a discouragingly large number of marketable limit orders relative to the number of shares you are buying or selling. The risks – and probably some unsatisfactory results – from using resting limit orders will haunt you. You will long for a better way. You will conclude (correctly) that you don’t and can’t really know what your trading costs are. Indeed, part of the problem with the traditional intraday ETF trading model is that you **can’t estimate your transaction costs with any degree of reliability for any but the most actively traded ETFs. No calculation of your cost of ETF trading is meaningful unless it is related to the net-asset value of the fund share at the time the trade was priced.**

Most commentary on the cost of trading *stocks* suggests that the best way to measure the cost of the bid/offer spread in the purchase or sale of a stock is to assume that your cost of trading will include half of the bid/asked spread on the purchase and half of
the spread on the sale. That is a reasonable rule of thumb when you are trading common stocks in a size smaller than the posted bid and offer sizes. However, it is not safe to assume that an ETF’s current portfolio value is between the bid and offer for its shares in the intraday market or at the close. Most investor orders to buy or sell shares of an ETF at any given time will be on the same side of the market. If a fund has just been introduced, has enjoyed favorable commentary in the financial press and/or is being actively purchased by several advisors for their clients’ accounts, most investor orders will probably be on the buy side for days or weeks at a time. Correspondingly, if a particular market segment is out of favor or a fund has underperformed its peers, the predominance of investor orders for the fund will probably be on the sell side for long periods.

For very actively traded domestic large-cap equity benchmark index ETFs (where the spread during the last hour of trading will typically be a penny with large quantities available on both sides of the market), the location of the midpoint of the bid and offer will usually be close to the contemporary value of the ETF. Arbitrage forces may combine with heavy two-sided trading to achieve this closeness. In the case of less actively traded ETFs where cross-market arbitrage forces in the ETF market do not provide much pricing discipline, the midpoint of the spread will reflect the supply/demand pressures of investor purchases and sales of the ETF shares much more than the prices in the underlying portfolio securities markets. If you are an ETF investor trying to make the same trade as other investors, you should expect your trading cost to include more than half of the posted spread on your trades, particularly in less actively traded ETFs. We will have more to say about the effects of net investor purchases or sales at the mid-point of the bid and offer for ETF shares when we discuss NAV-based trading.

If an ETF trades less than, say, 100,000 shares a day, a modest increase in investor supply or demand may move the bid/asked range so that it does not come close to including the contemporary share underlying asset value most of the day. In other words, with modest net buying interest, the bid may be persistently above a contemporary NAV calculation and the spread to the true intraday NAV for a purchaser of the shares may be greater than the weighted bid/offer spread for the portfolio components. Arbitrage forces are undependable when the potential for an aggregate arbitrage profit is small due to low trading volume. If you are interested in an ETF that trades fewer than, say, 500,000 shares a day, trade only between 3:00 and 4:00 p.m. and don’t consider anything other

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49 The same statement can be made about mutual fund orders. Most orders that mutual funds receive on a typical day are on the same side of the market, but they are executed at the fund’s NAV. The closing ETF price will typically be determined by the balance of market on close orders to buy and sell. A balance of buyers will typically pay more than NAV and a balance of sellers will typically receive less than NAV. See the discussion on pages 6 - 23 above or in Angel, Broms and Gastineau (2016) for a more detailed discussion.
than marketable limit orders when you are trading in the conventional intraday ETF marketplace. If your order is larger than the number of shares quoted at your limit, expect to spend some time working the order – under the best circumstances.

**How Algorithmic Trading Works for ETFs – or Doesn’t.** If you are an active ETF trader or an advisor trading ETFs for a number of accounts, your broker may use (or give you access to) an algorithmic trading model that can manage bids or offers for you. Using this algorithm is probably somewhere between a bad and a very bad idea unless (1) the algorithm was developed especially for trading ETFs and (2) is driven by a “real time” analysis of bids and offers for the underlying securities in the ETF’s portfolio.

“All-purpose” equity trading algorithms are the algorithms usually offered for trading ETFs. These algorithms were developed to improve net stock trading results, generally by reducing the trading desk’s labor costs and to allow the brokerage firm to charge a lower commission rate. The trading costs that algorithms are most successful in reducing are (1) the cost of compensating a trained professional trader to handle your order and (2) the cost of amateur mishandling of an order. These are often large costs. However, if you use widely available stock algorithms to trade ETFs, you are implicitly assuming that the ETF is usually trading appropriately relative to the bids and offers for its underlying portfolio securities. That may be a tolerable assumption for SPY, QQQ and a few other hyperactively traded ETFs, but using stock trading algorithms can be very costly if the price of the ETF shares is not held close to the contemporary portfolio value by strong arbitrage forces.

The objectives and complexity of trading algorithms vary, but most “algos” do little more than attempt to reduce the labor cost of continuous order monitoring and cancellations and re-entry of orders by a human trader. If a specialized ETF algorithm is available, make sure that it does not increase the complexity of the trade in a way that is likely to increase your costs. It pays to ask how your “robotic trade manager” works before you enter an order. Don’t stop asking questions when someone says that the algorithm is proprietary. The proprietary computer coding is not your concern, but it is reasonable for you to know the essential trading “strategy” embedded in the algo. A human trader would not refuse to tell you how she plans to “work” your order.

A wide range of formal and informal surveys of buy-side traders and informal comments from algorithm vendors indicate that most trading desks use essentially the

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50Do not rely on the published IOPV or IIV for any purpose. Do not reference it in an algorithmic trading model, for example. NAV-based trading is a different story. We will discuss trading based on a negotiated price at or relative to a net asset value calculated at the end of the trading day or at some other time. I am not unbiased, but I expect this patented trading method to grow dramatically over the next decade – and after.
same volume weighted average price (VWAP) targeting algorithm for almost every algo order. A VWAP algorithm is designed to participate in trading over a specified period and to enter a sequence of small orders that will deliver executions of the entire order at a price approximating the VWAP of the trades that are made during the trading period. You should not expect and you are not likely to achieve highly favorable ETF trading results from this kind of trading automation which is designed to give you an average trade price, not an especially good one. Madhavan (2002) describes how various VWAP algorithms work. There have certainly been some increases in the variety of VWAP algorithms offered since his paper was written, but greater variety has not made the VWAP approach any more or less applicable to the trading of ETFs than it was in 2002.

It is useful to try to understand if and how the market maker can afford to make a tight market. If you see an ETF quote with a bid for a few hundred shares and a nearby offer of thousands of shares, the size pattern does not necessarily indicate that a market maker or a large investor is willing to sell a lot of inventory at the offer or at falling prices, it is rarely a good idea to read too much into such bid and offer size patterns in the ETF markets. The short-term investor demand for or supply of ETF shares can certainly have an effect on the size of posted bids and offers. On the other hand, transaction prices are more likely to be a function of (1) the market maker’s spread costs to create or redeem shares; (2) the market maker’s cost of holding and hedging a position in the shares and (3) the ongoing pattern of the ETF’s asset growth or decline. The implication of differences in the size of investor bids and offers for an ETF’s shares is that market maker share inventories may soon be smaller or larger than market makers prefer.

Even if dealer inventories are larger than the market maker wants them to be, however, a buyer may have to pay intraday value plus the cost of creation if the fund is growing. Bid/asked spreads will usually be very much narrower than the difference between the net cost to create and the net proceeds from a redemption. In these cases, the mid-point of the spread is more likely to be close to either the creation or redemption price than to the mid-point. The market maker makes more by selling at or above the creation price, buying at or below the redemption price and doing as little creating or redeeming as possible. When you see a comment that the spread including the cost of either creating or redeeming is 1% and the spread on the ETF share is a few basis points, the only explanation is that the market maker’s trading strategy is to keep the midpoint of the ETF bid and offer outside the creation/redemption spread as much as possible. Investors typically pay more than the cost of creation, on average, when they buy ETF shares; and investors typically sell ETF shares below the cost of redemption, on average.51

51 See pages 6-23 above or Angel, Broms and Gastineau, (2016) for an extensive discussion of the very limited relationship between ETF bid/ask spreads and transaction costs.
Market makers in the conventional intraday ETF market often have long-term positions in the fund shares because they have helped to seed the fund to get it started. With newer and more complex funds and growing use of NAV-based trading, I expect most future seeding to be financed by the fund issuer. The market maker will trade from a relatively neutral position unless net demand or supply provides an incentive for the market maker to create or redeem fund shares on a particular day. Modern electronic markets are remarkable things, but most ETF volume is, and probably will continue to be, in the shares of a small number of funds. Sometimes a simple inquiry asking the market maker to define the depth on each side of a thin market is the investor’s best approach.

I can understand how a reader might be discouraged by the obstacles I have been pointing out that limit the access of investors and advisors to low-cost ETF trades. After we take a close look at the risks and costs of market-on-close orders in ETFs, we will be essentially finished with our survey of the conventional ETF market’s problems and how to attempt to deal with them.

**MARKET-ON-CLOSE (MOC) TRANSACTIONS IN ETFs**

There is a great deal of misunderstanding about how market-on-close transactions in ETFs work. This section probably contains a great deal more information on these transactions than most investors will want, but any investor who considers using ETF market-on-close orders will find a careful reading of this section to be invaluable because MOC transactions in ETFs can prove extremely costly. The principal message of this section is that a market-on-close execution in an ETF will not necessarily be priced at or even close to either (1) the midpoint of the indicative closing bid and offer that will be published on the fund’s website or (2) the fund’s end-of-day NAV. To indicate the strength of my personal conviction about the risk of MOC orders, I try very hard never enter a market on close order to buy or sell shares of any ETF.  

**Reported ETF Premium and Discount Pricing.** As a prelude to an examination of market-on-close orders, it is important to understand what the information on premiums

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52The classic paper on the market on close order impact is Cushing and Madhavan (2001). Its examples are outdated and MOC rules have changed many times since they assembled their data; but the analysis and conclusions of this paper remain generally valid. MOC orders in ETFs only add a few features. The paper is worthwhile reading for anyone who considers use of MOC orders. Angel, Broms and Gastineau (2016) illustrates the potential for extremely unfavorable results from MOC orders in ETFs. It also illustrates, as the title suggests, that ETF MOC transaction costs are often higher than investors believe or assume.
and discounts published in ETF prospectuses and on ETF websites means and how the mere fact that this information is published is likely to increase the cost of your market-on-close ETF trade.

The Sad Secret Behind the Data on ETF Closing Premiums and Discounts.
The story behind the publication of today’s ETF premium and discount calculations began more than a decade ago. At that time, a self-styled “investor advocate” objected to a proposed SEC exemptive order that would permit an investment manager to launch a family of ETFs. The “investor advocate’s” stated objection was not specific to the new ETFs that would be issued under the exemptive order. He objected that the sales and registration literature for all ETFs indicated that ETF market prices would be consistently close to the contemporary net asset value of the fund shares even though there was no reliable evidence that ETF prices and values were, in fact, particularly close. His argument was valid, but the remedy the fund issuers adopted does not work at all well. The mid-point between the bid and offer at 4:00 pm, just before the closing price auction in the stock market, has no consistent relationship to the market on close (MOC) cross on an ETF that will generally be above the mid-point if investors are buying on balance at the close and below the mid-point if investors are selling on balance at the close. As new ETFs using less popular indexes were introduced, the arbitrage forces that may keep the price of an S&P500 SPDR close to its intraday portfolio value do not reliably protect investors from executions far from another, less actively traded, fund’s intraday or end of day asset value.

The investment manager that was the target of the objection had made elaborate plans for its new product launch. To avoid a costly delay, someone proposed that a simple daily comparison of the 4:00 pm. midpoint quote (defined as the market close for this purpose) and the subsequently published 4:00 pm net asset value calculated by the fund custodian would indicate how closing prices compared to NAV. This daily comparison of each fund’s 4:00 pm mid-point quote and its NAV became an industry-wide requirement. The product launch proceeded and issuers and regulators began working on ways to implement this dysfunctional disclosure requirement for all ETFs. A simple comparison of the ETF 4:00 pm quote mid-points to NAVs did not work very well ten years ago. At the time the requirement was first imposed, most ETFs traded until 4:15 pm, the closing time of regular session stock index futures trading. The futures markets were used by ETF market makers to hedge their positions; and futures traders, in turn, traded ETFs to hedge futures positions through the close of their own markets at 4:15 pm. Because of the 15 minute difference between the 4:00 pm fund NAV calculation and the closing time for ETF trading, ETF issuers began using the mean of the bid and offer quotes for the ETF at 4:00 pm as the “market close” and compared the mean of those quotes with the NAV. That (mean quote) price to closing portfolio (net asset) value
calculation method continues to the present day. It sounds superficially more reasonable after the change in the formal closing time for all ETFs and related futures trading to 4:00 pm near the end of 2008. Unfortunately, the 4 pm quote is not a price of anything.

As they have for a number of years, service providers for ETF issuers collect information on ETF share best bids and offers on the listing exchange each day at 4:00 p.m. and compare the midpoint of those quotes to that day’s net asset value (NAV) calculation for the ETF. Premium and discount tables or graphs reflecting these comparisons are published on ETF websites and summarized in ETF prospectuses and annual reports. The comparisons give investors and advisors inappropriate comfort that end-of-day ETF transactions are typically priced very close to net asset value. The quotes versus NAV comparisons do not indicate anything of that sort. The fact that this data is collected and published distorts the perception of trading costs and leads investors to trade with an unjustified degree of confidence that they are trading close to an ETF’s net asset value when they trade at the market on close. The 4:00 p.m. quote mid-point is collected at about the same time the MOC transaction occurs, but the two values can be very different.

Market makers in even the most thinly traded ETFs understand that the midpoint of their daily 4:00 p.m. quote will be preserved in prospectuses and on ETF websites for years as an indicator of the quality of the market in the ETF on each trading day. These market makers have a stake in attracting traders to the ETFs they make markets in. Consequently, market makers monitor the real-time bid/offer NAV calculations they use to support their market making operations very closely as 4:00 p.m. approaches. Even if they have to move, widen, narrow or otherwise change their spread for a few seconds, they will work to get the midpoint of their bid and offer as close to the expected 4:00 p.m. NAV\(^53\) as possible. Their 4:00 p.m. quote is the most widely scrutinized and least representative bid/offer of the day.

Publication of premium and discount information based on 4:00 p.m. ETF share quotes and the fact that investors and advisors link this information to the practice of buying and selling mutual fund shares at net asset value at the end of the trading day have led to overuse of market-on-close (MOC) orders, especially for some ETFs that are thinly traded. Most investors do not realize that MOC transactions in ETFs are not reflected in most ETF reported premiums or discounts in any way. Nonetheless, MOC orders are often used by individuals and defined contribution retirement plan investors who are

\(^{53}\)The best way to study how market makers adjust their quotes relative to the intraday NAV is to monitor the market maker’s bids and offers as the market nears the 4:00 pm close. The market maker will use proprietary share value calculations to estimate NAV, not the posted IOPV. Investors will do well to forget that the IOPV calculation even exists.
accustomed to mutual fund trades at net asset value and to MOC orders on stocks. Many investors do not distinguish between the closing price of a derivative instrument, like an ETF, that has a closing value derived from the value of the securities in its portfolio, and the closing price or value of a stock where the closing price and the closing value are identical and are determined by the market-on-close trade in the stock.

**Using MOC Orders for ETFs Is a Very Bad Idea.** The majority of ETF market-on-close orders are not likely to be executed at NAV and many executions will not even be close to NAV. MOC orders can result in executions at a much greater distance from the fund’s end-of-day net asset value than the reported premium and discount data indicates to investors. It is important that anyone trading ETFs understand how these orders work and how MOC ETF orders differ in important ways from MOC stock orders and ETF NAVs.

Market-on-close orders in both stocks and ETFs are integrated with the limit-order books for the securities. The hypothetical schedule of bids and offers (customer and market maker limit orders) for an ETF near the end of the trading day displayed in Exhibit 15 will help illustrate how this integration works. In this limit-order book, the best bid is for 2,000 shares at $24.90, and the best offer is at $25.10 for 2,000 shares. The market-on-close book will operate alongside this limit-order book as buyers and sellers enter market orders of various sizes for execution at the close. If the balance of the MOC orders is to buy 4,000 shares of the ETF at the market-on-close, and the limit-order book matches the table, all the MOC orders will be filled at $25.30, unless a market maker or a last-minute customer order improves on the $25.30 offer. The lowest price at which an MOC order to buy 4,000 shares can be filled is $25.30 and market rules require that all 4,000 shares trade at that price.
Exhibit 15 — Hypothetical ETF Limit Order Book at the End of the Trading Day

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When the official trading close for all ETFs was changed from 4:15 p.m. to 4:00 p.m. late in 2008, ETF MOC order rules were slightly different from stock MOC order rules. Now, MOC orders for most stocks and ETFs are virtually identical and they are described in the same NYSE Arca publication: https://www.nyse.com/publicdocs/nyse/markets/nyse-arca/NYSE_Arca_Auctions_Brochure.pdf

Other markets where closing auctions of ETFs are conducted have similar rules for determining the Closing Price for the ETF to those described in the balance of this paragraph. Typically, all MOC orders are accepted until an exchange-specified cutoff time for such orders (currently 3:59p.m. on most markets). After that time, no MOC orders may be cancelled and new orders to trade at the market-on-close will be accepted only on the side of the market that will reduce any trade imbalance. Specifically, if the balance of market-on-close orders is to buy 4,000 shares of the ETF, additional MOC buy orders will not be accepted after 3:59p.m. MOC sell orders will be accepted to reduce the imbalance. Most other types of orders that arrive after 3:59p.m. can interact with the limit-order book and ordinary market orders. Limit orders can be entered and limit orders can be cancelled until 4:00 p.m. For example, the 2000 shares for sale at 25.10 in Exhibit 15 could be purchased with a market or a marketable limit order just before the close. The limit order to sell 10,000 shares at 25.30 could be cancelled, for example.

Any coherent MOC rules will work reasonably well for very actively traded index ETFs because active trading in benchmark index-linked instruments often attracts...
arbitrage traders in large size. Spreads on the limit-order books for actively traded ETFs are usually tight and markets are deep because the orders on the books are typically managed by dealers’ auto-quote systems with links to multiple derivatives markets. However, MOC orders for less-active ETFs often lead to trades far from net asset value because investor resting limit orders are scarce and because market makers, as indicated earlier, tend to adjust their spreads just before 4:00 p.m. to get the midpoint of the quote as close as possible to the expected value of the official NAV. The bids and offers at 4:00 p.m. in these funds tend to be small. Furthermore, less actively traded ETFs are not subject to continuous monitoring by arbitrage-motivated traders. An ETF MOC order on an inactively traded ETF can enter a near vacuum.

In the numeric example of an ETF MOC trade with the limit order book represented in Exhibit 15, the net asset value of the fund is $25.00. The midpoint between the bid and offer on the limit order book at 4:00 p.m. is also $25.00. Yet, barring something like a last-minute MOC sell order or a new limit order to sell at least 2,000 shares at less than $25.30, all the market-on-close orders will be filled at $25.30, or 1.2 percent above the net asset value. The ETF’s premium/discount calculation for the day will show that the “market price” based on the best bid and offer at 4:00 p.m. on the limit-order book matched the net asset value at 4:00 p.m. Publication of a zero premium or discount based on 4:00 p.m. quotes relative to NAV encourages ETF investors who do not understand the transaction mechanism to assume that an MOC trade will be filled at or very close to NAV. Under this mistaken belief, too many ETF investors use market-on-close orders incautiously.54

While the premium/discount information published for ETFs is calculated by comparing the 4:00 p.m. quotes to the official NAV as the prospectus says it is, this calculation has led to unanticipated results for many investors. I can think of no reason why an investor or advisor should use an MOC order to trade any ETF if he or she understands how thin some of these closing markets are and how the MOC orders are filled.55

54Both the price of the daily closing trade and the net asset value for any ETF are easy enough to look up the next morning, but I am not aware of any cost-free and readily accessible source an investor or advisor can consult to find a time series of day by day comparisons. Requiring fund websites to provide daily data on closing prices and NAVs from the inception of the fund would be the most valuable and least costly requirement the SEC could impose to help investors calculate their ETF trading costs accurately on closing trades.

55Engle and Sarkar (2006) found that a group of ETFs holding domestic stocks had an end-of-day average premium of the closing price over the reported net asset value of just +1.1 basis points (a discount would be reported as a premium with a negative sign). However, this tiny average premium is misleading. The average standard deviation of the last trade premium was 42.1 basis points with a range of 17.6 basis points to 142 basis points for various funds. A 42-basis point standard deviation is more than four-tenths of a percent of the value of the fund share. Using this standard deviation as a rough indicator of the cost of a market-on-close execution neglects the effect of “last” transactions that occurred before or after 4:00 p.m. Nonetheless, the average bid-asked spread for these domestic
For actively traded ETFs, the intraday market in the last hour of trading operates extraordinarily well. Spreads are among the tightest and order books are among the deepest of any time during the day. For less actively traded ETFs and for investors who want a more easily managed and monitored trading option, the NAV-based market (described at length in the next segment) should deliver executions that are reliably closer to net asset value than either an intraday or an MOC execution. The availability of NAV-based secondary market trading for some ETFs will let an investor lock-in a price related to a specific net asset value calculation. Investors will be able to access liquidity available during the entire period that the NAV-based secondary market is open—a full daily trading session, at minimum. As we will see, when the calculation is made appropriately, NAV-based trading will also provide a reliable measure of an investor’s trading cost at the market close.

Many Market-on-Close Orders on ETFs Do Not Find Adequate Liquidity.

Petajisto (2011b) examined U.S. ETF markets in five minute intervals for 2009 and 2010. This constitutes most of the early period since U.S. ETF markets closed at the same time (4:00 p.m.) as ETFs’ net asset values are determined. Petajisto’s paper (forthcoming in the Financial Analysts Journal) is important reading for anyone trading ETFs, but Exhibits 16 and 17 and some of the summary statistics from Petajisto’s paper in Exhibits 18 and 19 offer particularly interesting background information for an evaluation of the risks and costs associated with using MOC orders to buy or sell ETFs.

Petajisto evaluates the characteristics of ETF markets from two useful perspectives. First, he weights the data from all funds equally – a perspective that generally illustrates the wide spreads, thin limit order books and relatively inactive trading for most ETFs. Second, he weights specific data items by each fund’s trading volume or total assets – a perspective that reflects the tight spreads and relatively large posted orders for the largest and most actively traded ETFs. The results for the equal weighted evaluation are representative of the largest number of ETFs that have relatively few assets and trade less actively. The results for the volume or value weighted evaluations are more representative of the small number of very large ETFs that account for most ETF assets and an even larger share of ETF trading volume. To put the asset

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stock ETFs at the close was 37.7 basis points. Neither this spread nor the reported premiums and discounts provide a useful indication of the price an investor should expect on a market-on-close transaction today. This study was based on a set of data that ended in September 2000, when trading volume in these ETFs had barely started to develop. Also, the procedures for trading ETFs around the market close have changed in a number of ways since then. The specific domestic stock ETFs that Engle and Sarkar studied now trade an average of tens of millions of shares daily, but today’s less actively traded ETFs still display variable premiums and discounts similar to those in the earlier data. As we will see in Exhibits 18 and 19, the closing prices for many ETFs are much further from the NAV than the bid ask spread or the mean of the bid and the offer would lead us to expect.
differences and trading volume differences in perspective, SPY traded about $24 billion in share value each day in 2010 compared to a median ETF trading value of about $1 million per day. SPY has about 1000 times the assets of the median fund, but its average daily trading volume is about 24,000 times as great.

Exhibit 16—Average ETF Bid/Asked Spreads in 2010

The average bid/asked spread (in basis points) is computed across all ETFs for each 5-minute interval during the day. The exhibit shows both the equal-weighted and volume-weighted (heavily weights actively traded funds) for all trading days in 2010.

Source: Petajisto (2011)b
Quotes before 9:30 a.m. or after 4:00 p.m. are not relevant to most investors or advisors, so my comments are directed to quotes posted during the regular daily trading session. Exhibit 16 shows that the volume-weighted average bid/asked spreads are pretty consistent at 5-6 basis points from roughly 9:45 until the end of the trading day when the volume-weighted spreads decline slightly and the sizes of the average bids and offers (Exhibit 17) increase. On the other hand, the equal-weighted average spread does not drop to 50 basis points (0.5%) until mid-day when the trading volume pattern illustrated in Exhibit 14 tells us that trading volume is at its lowest level for the trading session. The equal-weighted spread rises slightly as volume rises through the end of the day. Interesting to some traders will be a supplementary chart in Petajisto’s paper that shows the equal-weighted fund spreads rising erratically on Friday afternoons.
Exhibit 17– Average Bid and Asked Size in 2010

The average size (in shares) of the best bid and offer is computed across all ETFs for each 5-minute interval during the day. The vertical lines show both the equal-weighted and volume-weighted (heavily weights more actively traded funds) averages across all trading days in 2010.

Source: Petajisto (2011)b

Exhibit 17 illustrates the intraday patterns of the average bid and asked size for both the equal weighted and volume weighted averages. While the depth of the market measured by the size of the bid and offer grows over the course of the trading day, a comparison of the volume-weighted and equal-weighted patterns in Exhibit 17 clearly indicate that the increase in the bid and offer size is most pronounced in the most actively-traded (volume-weighted) funds at the end of the trading day. Obviously, the
spread and the size of the bid and offer that matter are those for the specific fund you want to trade, when you want to trade; but the spreads are usually tighter and the sizes available are bigger for the larger and more actively traded funds.

Petajisto found that the average difference between either the closing price or the mean closing quote and the NAV was generally no more than a few basis points. The average differences were close to zero for diversified U.S. equity funds. Petajisto also calculated other fund trading statistics that suggest market on close orders often had quite poor executions relative to what the mean difference between the closing price and the NAV and the median closing bid ask spread would lead us to expect. Exhibit 18 focuses on just two statistics, (1) the standard deviation of the difference between the closing price and the fund’s NAV and (2) the median closing bid ask spread. The table shows these data items with both equal and volume weighting for all U.S. traded ETFs and for several domestic portfolio ETF categories. These aggregate trading quality statistics include only funds with trades between 3:55 and 4:00 (when a market-on-close order would be executed) on the day the difference was measured. While the data for all U.S.-traded funds in the last data line of Exhibit 18 includes funds holding securities with primary markets outside the U.S., the standard deviations and spread measures for the domestic equity and government bond funds on the first three lines reflect much higher average differences between the closing price and the net asset value than we would expect with the observed closing bid ask spread. If we take the standard deviation as including one third of the transactions both above and below the NAV, the other one third of transactions will be further than one standard deviation from the NAV. The only explanation consistent with the data that I can think of is that a number of MOC orders result in transaction prices far from NAV, probably as a result of a net MOC order imbalance greater than the size of the bid or offer it traded through, as illustrated in Exhibit 15 and the related text.

The likely market impact of an MOC order with a thin limit order book will be to push the closing price in the opposite direction from where the investor hopes to transact. To illustrate the effect of MOC orders, consider the data in Exhibit 18. The standard deviation of the difference between the market close and the NAV for a U.S. Equity Sector ETF on the value-weighted side of the table indicates that the difference was greater than 28 basis points about one-third of the time in 2009 and 2010. If a buyer enters an MOC order to buy the shares, the closing price will usually be above the NAV because the resulting execution will usually be at least on the offer (ask) side of the market. If the size of the best offer on the limit order book is small, the market clearing price may be above the best offer and the execution for the domestic equity sector ETF may be greater than 28 basis points above the NAV. With a bid ask spread of only 9 basis points, we would expect a price much closer to the NAV without the MOC order impact.
Conversations with investors and advisors lead me to believe that the average ETF investor using MOC orders expects to transact very close to NAV and assumes that the bid/ask spread will either disappear at the close or that, at worst, he will pay the whole spread (9 basis points). The available data does not let us separate the impact of MOC orders from other orders in the market near the close, but comparing the equal-weighted bid/ask spread (30 basis points) to the equal-weighted standard deviation for Equity Sector ETFs (47 basis points) suggests that many investors are paying more than the entire posted spread. It will be interesting to compare these results with trades in the net asset value based market as that market develops.

In Exhibit 18, we see that the standard deviation of the difference between the closing price and the NAV is substantially larger than the median closing bid/asked spread in all categories and weightings. The size of the standard deviation of the difference between the closing price and the NAV suggests that late arriving orders, most likely MOC orders, will often lead to an execution that is substantially farther from the net asset value than the location of the quote midpoint and the size of the bid/ask spread would suggest.

### Exhibit 18
Comparison of (Closing Price minus NAV) Variability to (Closing Bid Ask Spread) for Selected ETF Categories (1/2009 through 12/2010)
(all values in basis points)

<table>
<thead>
<tr>
<th></th>
<th>Funds Equally-Weighted</th>
<th>Funds Value-Weighted</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean Closing Price Minus NAV</td>
<td>Standard Deviation of Closing Price Minus NAV</td>
</tr>
<tr>
<td>U.S. Equity Diversified</td>
<td>-1</td>
<td>23</td>
</tr>
<tr>
<td>U.S. Equity Sectors</td>
<td>10</td>
<td>47</td>
</tr>
<tr>
<td>U.S. Bonds -</td>
<td>11</td>
<td>23</td>
</tr>
<tr>
<td>Government</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All U.S. Traded ETFs</td>
<td>15</td>
<td>53</td>
</tr>
</tbody>
</table>

Source: Petajisto (2011b), Tables II and IX
Exhibit 19 shows percentile comparisons of closing quote “midpoint” and closing price premiums and discounts to NAV. These differences are less dramatic than the data in Exhibit 18, but they also suggest a larger departure of the closing prices from the NAV than published data on closing quotes indicates.

**Exhibit 19**
Equally-Weighted Quote Midpoint and Closing Price Premiums and Discounts to NAV (basis points)

<table>
<thead>
<tr>
<th>Fund Category</th>
<th>Closing Quote Midpoint Percentiles</th>
<th>Closing Prices Percentiles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5  25  50  75  95</td>
<td>5  25  50  75  95</td>
</tr>
<tr>
<td>U.S. Equity Diversified</td>
<td>-20 -6 -1 3 14</td>
<td>-29 -9 0 6 23</td>
</tr>
<tr>
<td>U.S. Equity -Sectors</td>
<td>-41 -7 0 7 67</td>
<td>-51 -10 0 13 77</td>
</tr>
<tr>
<td>U.S. Bonds – Government</td>
<td>-14 -1 4 12 53</td>
<td>-19 -1 5 15 58</td>
</tr>
<tr>
<td>All U.S. Traded ETFs</td>
<td>-60 -7 1 17 115</td>
<td>-66 -10 3 23 118</td>
</tr>
</tbody>
</table>

Source: Petajisto (2011b), Table III

**Market-on-Close Orders from ETF Traders are Interpreted by Market Participants Differently than MOC Orders from Common Stock Traders.**

At first glance, the risk of knowledgeable market participants “taking advantage” of small investors who place unwise market-on-close orders might look the same for ETF and for common stock MOC orders. However, the differences between stock and ETF markets are significant. There are a number of reasons why the ETF and stock late-day markets are different and why the ETF MOC trade pattern is a cause for concern.

Returning to the notion that ETFs do not trade very much like stocks, we find plenty of examples when we look at the factors affecting MOC transaction prices. ETFs typically have a much smaller market “footprint” than a stock. Ordinarily a stock listed
on the New York Stock Exchange must have at least 400 round-lot\(^56\) shareholders and a total capitalization market value of $100 million at the time of listing.\(^57\) A newly-issued ETF often has assets of less than $5 million and just one shareholder – the Authorized Participant that made the initial creation deposit or the market maker that bought that position from the AP. As the number of new ETFs has grown, the size of the typical fund has declined. The median asset size of the U.S. ETFs in Petajisto’s sample for 2010 was only $91 million, down from more than $125 million in 2006.\(^58\) The median size of U.S. ETFs in late 2016 was only $50 million.\(^59\) To put ETF capitalizations in a stock market perspective, the median market capitalization of the stocks in the Russell Microcap Index was about $160 million as of July 2011.\(^60\) This median microcap company had about twice the market capitalization of the median ETF at that time, yet it was only the 3,000th largest market cap company in the United States. Some of these comparisons of the market in ETFs with the market in stocks, and a note on the different role of the market maker are summarized in Exhibit 12 above.

The participants in ETF markets are different in some important ways from the participants in stock markets. All funds start with seeding investments by their issuers or, in the case of most of the early index ETFs, by their market makers. Since there are few, if any, individual shareholders immediately after the launch of an ETF, market makers will be the principal sellers of the ETF shares. Until a number of investors are significant shareholders, market makers will usually be frequent buyers as well. Trading reports routinely show that market makers participate in a much larger share of ETF trades than their share of stock trades. This pattern of relatively heavier market-maker participation applies even to the most actively traded ETFs. While the role of ETF market makers is further enhanced by index arbitrage effects and price linkage to other index instruments, market makers and the portfolio trading desks that work with market makers are and will be responsible for ETF share creations and redemptions for new generations of ETFs that will have less and less in common with benchmark index ETFs. Market makers will continue to be consistently the most important traders in all or nearly all traditional ETF shares, partly because trading these funds is highly profitable to market makers.

Stock trading typically operates very differently from ETF trading, particularly in terms of the role of the market maker for a number of additional reasons as well. After

\(^56\) A round lot in most stocks is 100 shares.  
\(^57\) Exceptions to the market capitalization rule are made for IPOs, Spin-offs, Carve-Outs, and Affiliates, which must have a capitalization of $40 million (see NYSE Listing Standards).  
\(^58\) Petajisto (2011b).  
\(^59\) ETF.com.  
\(^60\) Russell Microcap Fact Sheet
the initial distribution process for a stock, there are usually enough existing and would-be investors in the typical publically traded stock to ensure that investor bids and offers largely determine the share price and trading volume. Market makers serve as intermediaries and facilitators in stock trading, but they rarely hold significant stock positions for long periods. All stock market participants know that there is a fixed supply of a common stock, unless or until the company undertakes new financing. If there is a lot of investor interest in buying the stock, the price will almost inevitably go up. If investor interest declines, the stock price will decline. The fixed supply of stock shares is allocated by the prices that market participants are willing to pay to own the shares. Unlike the ETF, there is no value for a common stock at which an extremely large number of new shares can be created or redeemed without a material impact on the share price. Market makers in a stock will sell shares (sometimes as short sales) when there is investor demand to buy shares quickly and when the buying does not seem to reflect a fundamental change in the company’s fortunes. Accommodating investors’ demands for liquidity has been profitable for market makers for centuries. Market makers do not ordinarily hold large or long-term stock positions (long or short). They make relatively consistent trading profits; but most market makers in the stock market try to avoid holding significant long or short stock positions overnight – and certainly not for weeks or months at a time.

As long as arbitrage forces are active, even strong investor interest in buying the shares of an ETF will not push its share price up more than a few pennies above the value of the portfolio underlying the fund shares unless the buying interest is shared by investors who are taking positions directly in the ETF’s portfolio securities. The market price impact of demand for the ETF’s shares on the value of the ETF’s portfolio securities is not likely to be material, even in the long run. The ETF’s demand for the securities in the portfolio will be spread over the entire portfolio, with relatively little impact on the price of an individual portfolio component. What someone is buying when they buy shares in an ETF or any other fund is a way of participating in a particular market segment or investment process. They are not buying into the fortunes of a single business enterprise with a fixed capitalization.

Markets in small ETFs are sometimes characterized by wide bid/asked spreads. Yet, even if the spreads are wide, the size of the intraday bids and offers posted by market makers are often very large. The large bids and offers are often at prices sufficiently above or below the fund’s contemporary net asset value to reflect the cost and

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61 The initial distribution can take place by way of an underwritten IPO, a spin-off to a parent’s diverse shareholder base, or simply expansion of an initially private company’s shareholder base as the company grows over a number of years. In all these cases, the IPO of a stock usually will be spread among more investors than the first days of trading an ETF.
risk of fund share creation or redemption. In contrast to the market in a typical small-cap stock, the number of customer limit orders on the book in most ETF markets at any time is relatively small – and customer orders entered at a price inside the market makers’ quotes may not be visible because the firm handling the customer order may need to execute the customer’s order at a “better” price to cover its costs. When you examine quotes, keep in mind that the ETF share value, and to a large extent the ETF price, is derived from the value of the portfolio. Investors presume that they will buy or sell at a price very close to the contemporary net asset value, but the conventional ETF market does not reliably deliver that expected result, especially when a market or market-on-close order is used, as our ETF MOC trade discussion illustrated.

Market-on-close orders are often used to trade the common stocks of large capitalization companies, especially on days when standard options expire and futures contracts settle. The investors or portfolio managers behind most of these MOC trades have learned that the volumes traded at the close and the MOC order handling procedures cannot provide assurance that the closing price will not be affected by relatively small trades. Consequently, they enter MOC orders for stocks with more care than the casual approach ETF investors typically take in using MOC orders. High overall volume up to and at the market close can ensure that the MOC rules operate as they are designed to operate in actively traded stocks, but users of this market for stocks understand the rules and the risks. If an MOC order in a stock leads to an execution away from the rest of the day’s trading range, other market participants tend to assume that the trader whose bid or offer moved the stock price had access to information that justified the price change. In the case of a common stock there is no net asset value calculation independent of the stock market price discovery mechanism and there is no obvious reason to expect the price to reverse after the stock MOC trade is posted. Any MOC stock order might reflect knowledge of an economic or corporate development that will cause the stock to continue to move further during the next trading session.

An MOC trade in an ETF carries different and much clearer information to other market participants. If one trader has good information on the contemporary net asset value of an ETF share, that trader may be able to purchase shares below that net asset value, or sell them higher than that net asset value, to fill someone else’s unwisely entered market-on-close (or other type of) order. The probability is high that the informed trader can close that ETF position out at a profit on the following day – or even in afterhours trading on the same day – because the value of the underlying portfolio determines the value of the ETF share. The value of the portfolio components will not be materially affected by the market-on-close transaction price in the ETF share. The fact that an unwise MOC purchaser or seller caused the ETF price to close away from NAV is unlikely to persuade anyone that the value of the ETF shares has changed or that the
MOC execution is going to lead to changes in the prices of the ETF’s portfolio securities tomorrow. The usually carefully calculated NAV is a much more realistic measure of the value of an ETF share than the MOC price, which is subject to variation if the end-of-day limit order book or the MOC net bids or offers change even slightly.

With the characteristics of the conventional market for ETFs and the problems with MOC trading of ETFs clarified, it is time to examine how NAV-based trading of ETFs will work and how it might eventually solve a lot of investors’ ETF trading problems. This trading mechanism is only available to funds using the brand NextShares under a patent license.

**INTRODUCING NAV–BASED TRADING IN EXCHANGE-TRADED FUND SHARES**

Orders to trade ETF shares at or relative to the current day’s official NAV are the essence of a relatively new market and a new trading method used initially by Exchange Traded Managed Funds (ETMFs) licensed by NextShares that lets buyers and sellers express their bids and offers relative to a contingent net asset value calculation. The transaction cost to buy or sell an ETF share in the NAV-based market is the sum of any fees and commissions plus (or minus) any difference between the execution price and the NAV. With a limit order stated relative to a specified NAV calculation, an investor can both know and control trading costs by this measure, whether the ETF is thinly or actively traded. To illustrate with a simple numerical example how this works, assume an investor wants to buy shares of an ETF that is quoted for trading in the NAV-based market at a proxy bid price of 99.99 and a proxy offer price of 100.01. (Alternatively, the bids and offers could be expressed as a penny per share above and below the ETF’s net asset value for the day.) Assume further that the investor purchases shares at the offer price. In the parlance of NAV-based trading, 100 stands for the ETF’s next-determined net asset value per share, generally calculated as of 4:00 p.m. Eastern Time each business day. A proxy price of 99.98 indicates a price per share two pennies below the reference NAV and 100.02 indicates a price per share two pennies above that NAV. If the reference NAV posted after the close is $30.00, and the trade is executed at a proxy value of 100.01, or a penny over NAV, the transaction price will be $30.01 per share. The investor who bought the shares paid a transaction cost equal to the premium over NAV of $0.01 per share, plus any commission or other fee that applies. The seller of the shares probably paid a commission or fee, but she made a $0.01 profit per share over

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62 NAV-based trading is subject to U.S. patents 7,444,300 and 7,496,531 and a number of other pending and issued patents. The author of this e-book has an economic interest in the revenue generated from licensing these patents.
NAV before the commission or fee. Of course, one of the parties to the transaction was probably a market maker who made a profit from providing liquidity to one or more market participants.

Measuring the cost of an intraday ETF transaction relative to a contemporary intraday NAV is not possible in today’s markets because investors do not have access to accurate intraday ETF portfolio values and, more importantly, they are not currently offered the opportunity to trade at or relative to an intraday value. They can only trade in today’s intraday market using bids and offers stated in currency that may be close to the fund portfolio’s contemporary value – or may be an unknown distance away from it63.

As described near the beginning of this e-book, one of the compelling advantages of ETFs for long-term investors is that each shareholder pays only the cost of his or her own fund share transactions and is protected by the ETF structure from the cost of other investors’ purchases and sales of the fund shares. Secondary market net asset value (NAV) based trading in ETF shares preserves this protection from other investors’ fund share trading costs while enabling investors to buy and sell ETF shares at a price related to—and no farther than a predetermined distance from—a given day’s net asset value. In contrast to trading cost uncertainty in the intraday trading of ETF shares that really do not trade “just like a stock,” NAV-based trading makes it possible for investors to know and control their ETF transaction costs with minimal order monitoring.

Once NAV-based trading in an ETF is established, investors will be able to check current bids and offers in the NAV-based market before entering any orders for those ETFs. The NAV-based quotation in a relatively actively traded actively managed ETF might be stated as “10,000 Bid at 99.99, 20,000 Offered at 100.01,” reflecting buy orders totaling 10,000 shares at one penny below the end-of-day net asset value and sell orders totaling 20,000 shares at one penny above the end-of-day net asset value for the ETF. It may be possible for investors to buy ETF shares below the NAV or to sell them above the NAV, depending on the bids and offers available in the market over the course of the

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63 An Exchange market trades established index ETFs more or less close to the most recently reported IIV proxy price for that ETF. The proxy price is inherently a stale calculation and this trading method exposes investors to significant risk of inappropriate execution prices. Market professionals have better information on the quality of such intraday calculations than a typical investor has. Trading at or relative to a yet-to-be-determined NAV is inherently fair because the investor is not at an obvious disadvantage and the market professional has generally good knowledge of her costs to create or redeem ETF shares relative to the next computed NAV.

It is feasible to calculate the NAV of a fund share a number of times during the daily trading session. I would not be surprised to see experiments with multiple daily NAV calculations and publications – and trading relative to a number of such daily calculations. There may be demand for such trading with prices set at a number of times during the trading day in the future.
trading day. Because market makers will continue to play an important role in this market, as described below, there will certainly be a net spread cost (in addition to commissions) for investors as a class.

An important attraction of NAV-based trading is that it is inherently a low intensity and high latency\textsuperscript{64} trading process, in contrast to most ETF trading today. NAV-based trading will allow ETF investors to transact at known and reliably closer spreads to NAV than conventional trading. As described below, NAV-based trading provides market makers with a simpler, less time-sensitive and more reliable arbitrage profit opportunity than that afforded by conventional trading of non-benchmark ETFs. Easier, less risky arbitrage should attract incremental market maker activity and capital. Competition among market makers should lead to smaller premiums/discounts and lower trading costs for ETFs trading in NAV-based markets as compared to conventional intraday ETF markets. Consider the discussions above of the frequent changes of market makers’ bids and offers in the intraday market for trading ETFs as bids and offers for the ETF’s portfolio securities change over the course of the day. Many individual investors and their advisors are not comfortable trading ETF shares in that kind of market. They do not want to trade in a market where they feel that other participants know much more than they do about the current value of a fund’s shares. They want to know and control what it costs them to trade relative to the fund share value and they want to trade at a “fair” price relative to that value. Cost transparency is a fundamental right of every investor – as the SEC and the Department of Labor have stressed recently in dealing with mutual fund and retirement account expenses. Trading cost transparency is easy to understand and trading costs are easy to compute with NAV-based trading. Trading cost transparency is an impossible dream with conventional intraday ETF trading.

**NAV-Based Resting Limit Orders.** In NAV-based trading, I expect many orders to be high latency orders. I believe investors, advisors – and even market makers – will enter orders relative to the end of day NAV. Of course, it remains to be seen just how the NAV-based market will be used by investors and advisors as the market develops; but it is interesting to consider the possibilities. In the example above, I alluded to an NAV-based market with 10,000 ETF shares bid for at a penny under and 20,000 shares offered at a penny over NAV. In many respects this is not an exaggerated expectation. The sizes of these hypothetical bids and offers may be conservative guesses at what we will see in the actual markets because investors using the NAV-based market will no longer be subject to the short-term risks associated with resting limit orders in the intraday market. The indicated $.02 spread between the bid and the offer may be a realistic estimate at times for some ETFs. The spread for most funds will likely be larger most of the time.

\textsuperscript{64} A high latency order is an order that an investor feels comfortable leaving on the order book for, perhaps, hours or even days at a time.
NAV-based trading spreads will be driven by a number of factors. Putting the factors in order of importance is a matter of conjecture at this stage, but they certainly include: (1) the volume of investor demand to buy or sell the shares; (2) the ability of (and cost to) market makers to manage overnight inventory risk in ETF shares; (3) the ability (and cost) for market makers to trade in basket securities at better-than-closing prices; (4) the level of fund-imposed creation and redemption fees that apply; (5) the level of competition among market makers and their individual profit-maximization and risk-control strategies; (6) the direction of an investor’s trade in relation to the prevailing retail demand and supply; and (7) the market maker incentive structure. Some of the NAV-based bid/ask spreads for less actively traded ETFs will certainly be wider than the example suggests. On the other hand, it is realistic to expect that some ordinary investors will trade at prices better than NAV, if they trade patiently or if they are buying when other investors are selling and vice versa. In NAV-based trading, market makers are not the only market participants that might occasionally buy shares below NAV or sell them above NAV.

Even if a standing limit order to sell below NAV is not available in the marketplace when a buyer checks the quote, the buyer can place his own bid below net asset value and that bid may be hit by an order to sell during the course of trading. If other investors are selling the shares and/or if a market maker has excess inventory, a bid slightly below NAV might look very attractive to some sellers at some times. Limit orders on the NAV book can be cancelled and new limit orders can transact with other limit orders. Transactions may occur throughout the regular trading session at or relative to the NAV to be calculated from 4:00 p.m. prices and the dollar execution price for each trade will be known when the NAV is published, sometime after 4:00 p.m. I expect after-hours trading relative to both the current day’s and the next day’s NAV to be possible in time.65 Most investors and advisors know they can’t control or predict market prices, but many of them will be pleased that they will be able to know and control their trading costs, particularly when they understand that their NAV-based trading costs might be significantly – and demonstrably – lower than trading costs in today’s intraday ETF markets.

After initial orders are entered at the beginning of an NAV-based trading session, some new buyers will come in and other buyers will increase, modify or withdraw their bids. Some new sellers will arrive and others will leave or change their offers. The trading volume in some of today’s less actively traded ETFs may increase from the modest levels characteristic of intraday trading in less active ETFs. One of the most

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65 Many parties will be interested in a retail after-hours market and a market relative to the next day’s NAV is a natural for foreign portfolios and, most importantly, for more comprehensive market maker risk management.
important results of introducing the new trading method will be that trading volumes may increase and the cost of trading ETFs that offer the prospect of better than benchmark index performance will decline. Keep in mind that NAV-based trading removes virtually all need for portfolio transparency to achieve tight trading markets in ETF shares, as long as a trusted party (e.g., the fund’s pricing agent) is considered an appropriate referee.

A Comparison of Conventional and NAV-Based Trading

Exhibit 20 — Entering Bids and Offers in NAV-Based and Intra-day Markets Relative to End of Day NAV or Relative to a Series of NAV Proxy Values

The diagrams in Exhibit 20 (with an acknowledged debt to Exhibit 12) compare limit orders in the NAV-based market (where largely unchanged limit orders relative to the end-of-day NAV may be appropriate for most or all of the trading day) with a sequence of limit orders in the intraday ETF market (where the appropriate level for a bid or offer can change more quickly than most investors can react). The right-hand side of Exhibit 20 illustrates the variability in the intraday value of a conventional ETF and highlights the limit order management problem that most investors face in that market as fund share values change. As noted, an investor’s order can trade only with bids and offers that are available in the market. Those orders will be relatively stable in the NAV-based market all day without concern that the order will be "picked off" by a trader with better information. You will know and control your transaction cost relative to the closing net asset value of the shares if the order is executed.
based market, with investors taking comfort that making their bid or offer more aggressive by a penny or two a share might assure them of an execution at a known and acceptable trading cost. Investor orders will continue to change frequently in the conventional intraday market as traders try to bracket the intraday value of the shares in the conventional market. A typical investor is most likely to make a transaction in the traditional ETF market when ETF price or value changes have made the transaction unattractive to her. Traders in the NAV-based market can adjust their bids and offers as conditions – and their determination to transact – change, but they do not have to monitor their orders throughout the day to know and control their trading costs. NAV-based trading is a very different and easier to manage trading process than anything else available in secondary market trading of securities anywhere in the world.

**Trading Cost Transparency.** Locating the midpoint of the bid/offer range in the traditional ETF market relative to an intraday ETF net asset value estimate is not remotely possible for most investors and advisors. Even if an investor has ready access to intraday NAV proxy calculations based on contemporary bids and offers for an ETF’s portfolio securities, the portfolio value of many ETFs can change by much more than the typical bid/offer spread in just a few seconds. In conventional ETF trading, most investors cannot be confident that their execution will be as close to a contemporary value as they intend. In the NAV-based market, offered for funds licensed by NextShares, orders are entered and executed at or relative to the official, carefully calculated and checked, end-of-day NAV. All market participants can enter orders that fit their own risk management and inventory requirements. In early (relatively low volume) NAV-based trading, some market makers have been informally making variations on the basic trading model to let an investor manage the dollar amount of a purchase to avoid the possibility of spending more than the investor has available.

An investor entering a buy order and receiving an execution at a penny over NAV will be able to calculate her trading cost exactly relative to NAV. It is this cost transparency, not daily portfolio composition transparency that is most useful in evaluating the economics of your investment in the fund. You will certainly be able to monitor the composition of your fund’s portfolio closely, even though the most important application of NAV-based trading will be to facilitate the introduction of ETFs with non-transparent portfolios. The current requirement for mutual fund portfolio disclosure is quarterly publication with a 60 day lag. In practice, most funds report their portfolios monthly with a 30 day lag. Either of these standards provides adequate and appropriate portfolio transparency for any thoughtful investor. The much more important cost transparency that is missing in traditional ETF markets will be available to all ETF investors that have access to NAV-based trading.
A Digression on Portfolio Transparency. I have never understood the passion with which otherwise sensible investors embrace the notion that daily transparency in the composition of ETF or other fund portfolios is desirable. These investors don’t read and memorize the portfolio listing in the fund’s annual report or in the periodic updates available on the fund website. Most index fund shareholders have no more knowledge of the portfolio than the name and, maybe, the general design of the fund’s template index or, in the case of an actively managed portfolio, the manager’s objectives. At a randomly selected moment, the people who designed or manage the index that serves as the index ETF’s template or the portfolio manager who “optimizes” the portfolio or simply rounds the index weights to the nearest whole share in each component probably could not recite all the names, let alone the proportions, of the securities in the portfolio. More important, few investors in any of these funds can see any advantage to themselves in knowing how much of the fund’s uninvested cash is sitting in the bank and how much interest the fund is earning on it. Most observers will agree that investors benefit when active managers are able to delay reporting portfolio changes until the change is complete to prevent front-running of the fund’s trades. How does the index fund investor benefit from ETF transparency?

The reason there is so much emphasis on index ETF transparency is the same reason that intraday ETF trading is embraced: Portfolio Transparency and Intraday Trading are related ETF “features” with limited value at best. They are not necessarily product advantages. For index ETF shares trading in the conventional intraday market, a high level of portfolio transparency is critical to maintain a close relationship between the current price of the ETF’s shares and the current value of its underlying assets. Unless they know its holdings, an ETF’s market makers cannot hedge the market exposure they take on when they build long or short inventory positions in the ETF’s shares in the conventional market. As explained elsewhere, one of the great advantages of NAV-based trading is that it effectively removes all need for full portfolio transparency and achieves tight trading markets in ETF shares.

In NAV-based trading, an ETF market maker who holds long or short positions in the ETF’s shares takes on no intraday market exposure and can eliminate its overnight market exposure by transacting with the ETF to create or redeem the number of creation units corresponding to the amount of its net sales or purchases of ETF shares over the course of the day. Frequently, market makers in the NAV-based market for ETF shares finds that they can offer a specified dollar value of shares priced quite close to NAV, a service that investors find attractive. The fact that all this ETF’s pricing is based on NAV is what makes investor accommodation possible. I see no need to discuss the flexibility of these funds in dealing with rapid growth in fund assets, but there are simple ways of coping with rapid fund growth that seems to avoid threatened swamping of the manager’s
investment process. There are ways to manage fund growth without unduly penalizing the fund’s performance.

If you have no other way than today’s conventional way to trade ETFs, you have to have portfolio transparency. If you have to have it, you might as well promote both the intraday trading and portfolio transparency “features” as “advantages”. As the next segment describes, NAV based trading licensed by NextShares has some real advantages.

**HOW WILL VARIOUS MARKET PARTICIPANTS FARE WITH NAV-BASED TRADING?**

Exchanges and firms with ETF trading operations will continue to benefit from the development of new products that require the services of their trading “engines”. In fact, the technological/business model that has been at the center of securities trading in the United States for more than half a century has combined new products and new customers with new trading methods and new trade processing technology to deliver lower costs and better value to its customers, almost year after year. Standing still has not been an option in the past and it will not be an option in the future. NAV-based trading is a radical departure in trading methodology, but it is totally consistent with the inexorable trend to increased trading volumes and reduced trading costs in financial markets.

Professional traders and market makers understand that the economics of their business is based on continued growth in the volume of trades they participate in and on their ability to manage risks. The astute observers among them welcome the introduction of NAV-based trading because it will (1) substantially increase trading volume in categories of funds that are not actively traded today; (2) facilitate the development of a whole new category of non-transparent, actively managed exchange-traded funds that will, over time, largely supplant the existing actively managed mutual fund structure, with its $7 trillion of current net assets (with no secondary market trading of these mutual fund shares) and (3) introduce a new trading paradigm with potential application to a broad range of financial markets. These market professionals know that year after year their firms have consistently earned more total income from trades that have usually grown in number much more rapidly than the revenue per trade has declined.

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66 For example, the introduction of this trading method for single stock futures (SSF) markets will reduce SSF transaction costs, make the transaction costs more transparent and expose more investors to the intriguing economics of SSFs on ETFs. This variation of NAV-based trading is the subject of US patent 8,332,307 B1.
ETF market makers are practically certain to benefit greatly from the introduction and extensive use of NAV-based trading. They will continue to participate in the creation and redemption of ETF shares. They will be key figures in the NAV-based market, posting bids and offers that will facilitate investor and advisor trading.

ETF market makers will post bids and offers and supply liquidity as they do in today’s conventional ETF markets. Their spreads will sometimes be narrower, but their trading volumes will be more than correspondingly greater. If more shares are needed to meet demand, the midpoint between the bids and offers will rise a bit and market makers will arrange for creation of more shares of the ETF. If demand for an ETF falls, the midpoint between the bid and the offer will decline slightly and market makers will buy ETF shares from investors and arrange to redeem the shares. The investors entering and leaving the fund will pay the costs of their entry and exit as described in the text and illustrated in Exhibit 11, many electronic pages ago. Market makers will continue to facilitate the creation and redemption process and they will facilitate trades throughout the day, earning relatively consistent profits from buyers and sellers trading in the NAV-based market. Their aggregate profits will increase substantially from what they now earn from trading small volumes of a number of inactive ETFs in the intraday market.

The benchmark index ETF market maker buys and sells ETF shares at a small spread to the net asset value of the fund shares that will be determined at 4:00 pm and manages market risk, usually by taking or closing appropriate positions at or near the market close.

Of course, the market maker’s risk in the NAV-based market is smaller and much easier to measure and to manage than the risk of market making in the stock market or the index ETF market because the NAV-based ETF market maker can create or redeem inventory each day at NAV plus or minus expenses.

The net asset value calculation at each day’s market close provides a much more objective measure of an appropriate price for an ETF share than any value estimate the market maker might make for a common stock position. In contrast to the fixed capitalization of a company, the size of the ETF can be changed to reflect investor demand, subject to a (readily calculable) cost to create or redeem standard baskets of the fund shares at NAV.

The cost of creation or redemption will be reflected in the market maker’s bids and offers relative to net asset value throughout each trading day. There are other differences between stock and ETF NAV-based market making, but they generally make the risks of ETF NAV-based market making dramatically less than the risks of either stock market
making or ETF market making in the conventional intraday ETF market. For example, in the most likely deployment format, the market maker’s maximum overnight notional market risk need never exceed one-half the value of a single creation unit.

Historically, market makers, like nearly every other participant in the securities markets, have earned larger total profits as trading costs per share have declined, because trading volumes have increased far faster than costs have declined. Simplifying an example I have developed in more detail elsewhere, over (roughly) the past 50 years, the cost of a retail equity (stock or ETF) trade has dropped by a factor of 10, from about 2% to about 0.2% of the value of the trade. Trading volume over this period increased by a factor of about 500. Dividing the 500 times increase in volume by the 10 times decrease in trading costs, we find that the folks who handle equity trading now collect about 50 times as much total revenue as their predecessors collected 50 years ago. The trading skill set and infrastructure that generated a large income 50 years ago is very different from the skill set and infrastructure that earns a large income today. Not every market participant has benefited from the change; but, in the aggregate, we would be much better off if other economic endeavors had combined this degree of cost reduction and revenue growth!

I doubt very much that equity trading costs will decline from 0.2% to 0.02% of the value of a trade over the next 50 years, but they don’t have to drop anywhere near that much to stimulate substantial growth in equity trading revenue. Furthermore, declining trading costs were not the only reason for the 500 times increase in “equity” trading volume. A significant fraction of the trading revenue increase since ETFs were introduced in 1993 came from growth in ETF trading, not just ordinary stock trading. ETF share volume accounts for about 30% of U.S. equity trading, up from 0% at the beginning of 1993. Furthermore, the ETF market is just getting started. U.S. ETF assets passed $1 trillion only at the end of 2010. Allowing for modest stock price appreciation and assuming that all mutual fund assets will not move to the ETF structure, I estimate that at least $10 trillion in mutual fund shares that do not trade in the equity market today, will trade as ETFs within 10 or 15 years. Most of these new actively managed ETFs will not trade as actively as the benchmark index ETF shares trade today, but I encourage you to make your own assumptions and do the math for yourself. We will certainly not have to pass the hat to take up a collection for adaptable ETF market makers.

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For less actively traded index ETFs and for all non-transparent ETFs, including silent (non-transparent) index and non-transparent actively managed ETFs, I believe NAV-based trading will eventually become the dominant trading mechanism. Conventional intraday trading of fully transparent index ETFs will likely continue to be available and, in many cases, the same market makers will participate in both trading mechanisms. For non-transparent index and actively managed ETFs, NAV-based trading will likely be the only significant trading mechanism.

It is important to recognize that market makers in the typical non-transparent ETF will probably not maintain a significant overnight inventory position in the shares of most funds in which they make markets. The initial seeding of new ETFs is being done increasingly by the issuer of the fund or a party engaged by the issuer, not by market makers. Historically, most mutual funds have been seeded by their issuers, so this is nothing new for actively managed fund managers.

The ETF market maker will post bids and offers relative to a net asset value proxy (say, 100.00) or relative to NAV in cents per share along with bids and offers posted by investors. The market maker will enter bids and offers from the opening and adjust bids and offers throughout the day to reflect changes in inventories and experience with (1) customer orders that arrive on each side of the market throughout the trading session, (2) the liquidity of the securities in the underlying ETF portfolio, (3) the cost of creating or redeeming various numbers of creation units of the ETF’s shares, and (4) the rules for market maker order entry.

Astute market makers will experiment with bid and offer prices and sizes and analyze the behavior of investors to develop profitable bid and offer patterns and policies. Ultimately the market maker’s trading and position management strategies will probably be relatively simple. The mid-point of the market maker’s bid and offer might be moved to manage its daily ETF share inventory. Market maker strategies will be subject to change during periods of, for example, unusually heavy or unusually light trading volume. However, the market maker’s most important task will be to monitor the impact of net purchases or net sales over the course of the day and to attempt to end the day either flat or with a position that will be flat after creating or redeeming one or more creation units of the ETF shares or hedging in some other manner. To the extent that a market maker holds long or short positions in ETF shares overnight, the market making firm will need to factor this into its overall market exposure and hedge strategy. The fact that a market maker’s net overnight positions in ETF shares should normally be limited.
to, at most, long or short one-half a creation unit of shares means that the effect on the market maker’s overall market exposure is, at worst, a small rounding error that can readily be addressed with a minor tweak in the firm’s net hedge position.

It is possible that NAV-based market makers will find it appropriate to “invest” in the development of this new type of market making activity by moderating their short-term market making profit expectations for a period of time to attract order flow. This is nothing new. Successful market makers have “invested” in this manner in most new trading books over the long history of market making.

There are a couple of potential ways to eliminate the cash coverage risk associated with NAV-based trading in a fixed number of shares. I have already noted that market makers have informally offered to trade dollar amounts with investors in the NAV-based markets. This suggests possible interest in a supplementary NAV-based market that is designed to accommodate purchases and sales of a fixed dollar amount of ETF shares, rather than buying or selling just a fixed number of whole shares as usually happens in exchange ETF transactions. A dollar-based purchase and sale market for ETF shares would be essential for defined contribution retirement accounts, such as 401(k)s. These accounts can’t make a transaction that would require more cash than the account has to invest and they sometimes need to liquidate fixed dollar amounts to cover required distributions. Dollar-based purchases and sales may also be attractive to financial advisors and their clients who are accustomed to transacting in mutual funds on that basis and wish to continue doing so as they transition to using ETFs. While a number of solutions are possible, I do not believe a complex structure will be necessary.

A retirement plan administrator or broker-dealer firm that makes dollar-based purchases and sales of ETF shares available to its clients would aggregate its dollar-based and share-based customer orders to buy and sell shares, and would transact on the exchange to buy or sell in the NAV-based market the required number of whole ETF shares to fill its customer orders. All customer buys and sales on a given day could be based on the same average transaction price (NAV +/- spread), adjusted for a transaction charge assessed by the program sponsor. The transaction charge will reimburse the program sponsor for its processing costs and potential ETF inventory management costs and risks incurred in connection with managing the program.
The principal effect of most structural changes in the financial markets over at least the past 50 years – and the principle effect of NAV-based trading – have been and will be to reduce per unit transaction costs for investors. The dramatic growth in trading volume over this period – with significant operational chaos only in 1968 – is the result of changes in the economics of trading and in the facilities and hedging instruments available to traders. The computerization of both trading and back office operations has sharply reduced operating costs, leading to cuts in commissions and in trading spreads for small trades and for trading baskets of securities. The costs of large trades in a single stock have not declined much, if at all, because their largest cost element is the price of the liquidity – the market impact in trading a single stock.

NAV-based trading – like negotiable commissions since 1975, stock index futures and program trading since the 1980s and the growth of ETFs from 1993 – will be a major engine of growth for financial instrument trading volume over the next decade and beyond. The key to this growth is that NAV-based trading will unlock a major new market for trading portfolios at lower cost than any other trading method.

Given modest total asset growth in pooled investment products and recognizing that all mutual fund assets will not shift to the ETF structure overnight, I believe at least $10 trillion in funds will be exchange tradable within a dozen years of this writing. As discussed earlier and elsewhere, the properly managed ETF structure is inherently less expensive to operate, protects fund investors from flow-related trading costs and unnecessary tax realizations and, consequently, will usually deliver better investment results than traditional mutual funds. If most pooled assets migrate into exchange-traded structures, including investment companies, grantor trusts, securitized futures funds, security futures products and open-end notes, “equity” trading volume will continue to grow dramatically. There is every reason to believe that the long historic pattern where arithmetic reductions in unit transaction costs have led to exponential growth in total trading revenues will continue with major revenue and profit gains for most market participants and, most importantly, improved results for investors. See Gastineau (2010) for a more detailed discussion of the history of equity transaction costs.
A BRIEF SUMMARY OF THE CASE FOR NAV-BASED TRADING

While the conventional intraday ETF market usually works well for investors who know how to use it to trade the largest and most actively traded benchmark index ETFs, it simply does not serve investors in less actively traded funds or in non-transparent funds very well. Trading costs are high and hard to measure in the conventional market for less actively traded ETFs. Because their inventory risk is difficult and cumbersome to manage, market makers expect to be compensated for taking positions in portfolios. The greater average premiums and discounts call for better risk management and capital control.

In an extension of NAV-based trading services, I anticipate the availability of executions based on dollar amounts and fractional shares to be provided by financial intermediaries to simplify trading for advisory accounts, defined contribution plans, and other accounts that now use the mutual fund NAV purchase and sale mechanism. The importance of making all manner of ETF shares available to retirement accounts is widely recognized. Secondary market NAV-based trading is the only approach that can provide retirement account access to ETFs at low cost. This access will be achieved by using many of the systems that have been developed to manage mutual fund flows and transactions for these accounts.

The most important economic reasons behind the development of NAV-based trading are:

(1) NAV-based trading will sharply reduce the cost of trading shares in existing low volume ETFs and in virtually all portfolio products.
(2) The use of standing limit orders by market makers and investors will enable all parties to calculate and control their cost of trading relative to NAV (and in the case of market makers, their gross and net spreads to the cost of creating or redeeming) with an unprecedented degree of precision.
(3) Market makers will take much less inventory risk, and incur lower costs per trade. Because of higher volumes, market makers will earn more total trading revenue from NAV-based trading than from conventional intra-day trading of non-benchmark index linked ETFs.
(4) NAV-based trading is essential for the efficient development of non-transparent ETFs that will offer non-transparent index and full-function actively managed strategies in the investor-friendly ETF structure.

Investors in most existing ETFs are penalized by the costs of “front-running” from transparent index portfolio composition changes. As described and referenced earlier, the
ETF structure protects shareholders from the cost of other investors’ fund share purchases and sales, promotes tax efficiency and reduces fund operating costs at least as well in an actively managed fund, in a non-transparent passively-traded fund, or in a basket of instruments, as it does in a benchmark index fund. NAV-based trading enables these less actively traded baskets to compete with the most actively traded index funds.

This book is offered to help ETF investors and the advisors who serve them find and stand on the level stretches of the ETF playing field where professional traders and individual investors have equally secure footing—and avoid slippery slopes. Once you understand how the ETF market works, and how trading ETFs differs from trading stocks, you will be able to trade ETF shares confidently and efficiently. In fact, with the introduction of net asset value (NAV)-based trading in ETFs, trading ETFs can be much simpler and less stressful than trading any other complex financial instrument that I can think of.
APPENDIX A - MISCELLANEOUS ETF TRADING AND PRICING ISSUES

**Fair Value Fund NAV Calculations.** To a greater or lesser extent, mutual funds have been required to value their shares at fair value since enactment of the Investment Company Act of 1940. See, for example, [http://www.sec.gov/divisions/investment/noaction/1999/ici120899.pdf](http://www.sec.gov/divisions/investment/noaction/1999/ici120899.pdf). Since the mutual fund market timing and late trading scandals of 2003-2004, the fund industry, with strong urging from the SEC, has placed increased emphasis on fair value pricing for the calculation of fund net asset values as of 4:00 p.m. each day. Fair value fund pricing largely involves improving “raw”, unanalyzed, or simply “stale” portfolio component value information by adding price information from a variety of sources to calculate a more accurate NAV. In essence, the purpose of fair value pricing calculations is to update the valuations of portfolio components that are traded in principal markets where the regular trading session closes earlier than the 4:00 p.m. closing of equity markets in the U.S.  

Many mutual funds and ETFs hold securities that are not traded regularly during the regular equity trading session in the fund’s home market. For example, the NAV calculated today for a U.S.-based mutual fund or ETF holding Japanese or Chinese securities would not accurately reflect the value of the underlying portfolio at the end of U.S. trading hours if the portfolio was priced using no information other than closing prices from the Japanese and Chinese market sessions that closed before the U.S. markets opened this morning. Many of the securities that U.S. funds hold trade infrequently, if they trade at all, during U.S. equity trading hours. Fair value pricing services use a wide range of techniques to calculate fair prices for portfolio components that are not trading actively as the time for a fund’s NAV calculation approaches. The techniques vary, but the objective of fair value pricing is to use the most current and most informed pricing information available.

The widespread adoption of fair value pricing for daily fund NAV calculations has given financial market participants increased confidence in the quality of NAV calculations for a wide range of funds. Fair value accounting for corporate or other financial statements can sometimes be controversial, but I am not aware of any vocal opposition to the use of fair value fund pricing to protect both transacting and ongoing fund investors from transactions at inappropriate prices.

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68There is a substantial body of literature covering problems associated with the use of stale prices in fund NAV calculations. Some examples covering different aspects of the issue are Ciccotello et al, Haddad (2008), Zitzewitz (2003) and Gastineau (2004).
Few studies of the fair value fund pricing methods in use since the renewed emphasis on fair value pricing that followed the mutual fund market timing and late trading scandals of 2003-2004 have been published. One analysis that has been published, Haddad (2008), indicates that daily use of fair value NAV pricing substantially reduces the daily tracking error in international fund prices. Most observers expect other studies published over the next few years to confirm the usefulness and “fairness” of fair value NAV pricing.

When I first began working on NAV-based trading, I expected it to be useful primarily for domestic (U.S.) equity ETFs. With the maturation of fair value fund pricing techniques, I now believe NAV-based trading is the most appropriate trading method for investors to use when they buy or sell all or nearly all varieties of ETF shares. I have no illusions that NAV-based trading should or will be introduced for all ETFs; but I expect NAV-based trading to dominate trading for all but the standard benchmark domestic equity index ETFs within a dozen years – as fair value pricing continues to improve and to dominate ETF pricing.

The first ETFs to use NAV-based trading were funds with domestic equity portfolios, which have no significant pricing or valuation adjustment issues under most circumstances. The first ETFs to use NAV-based trading were funds with domestic equity portfolios, which have no significant pricing or valuation adjustment issues under most circumstances. Most positions held by domestic fixed income funds are securities and other financial instruments that trade in markets that nominally “close” earlier than 4:00 p.m. Fair value pricing usually adjusts these closing prices forward for a 4:00 p.m. NAV calculation without significant controversy.

**NAV Calculations for Fixed Income Funds.** There is a valuation issue that will affect NAV-based trading of domestic fixed income funds, but it is more a problem with the definition of NAV for these funds, rather than a problem with the quality of available security price data. The majority of fixed-income mutual funds and ETFs calculate their NAVs on the bid side of the fair value closing quote, in continuation of a tradition of “conservative” valuation of securities traded in dealer markets. In recent years, some fixed income funds have begun to use the mid-point of the fair value-adjusted 4:00 p.m. bid and offer in fixed income dealer markets in their NAV calculations, but many funds still use bid-side pricing. These differences create at least two obstacles for NAV-based trading. The most important obstacle is that the bid- and mid-pricing standards will

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69 Even these funds use fair value pricing for illiquid, infrequently traded, or other unusual portfolio positions.

70 The large number of small debt issues that trade infrequently or not at all will keep the quality of fixed income pricing data from approaching the quality of domestic equity pricing, but electronic trading and improved analytics and price reporting show great promise of eventually improving the quality of pricing in fixed income markets.
produce different NAVs for the same portfolio. The mid-value will always be higher than the bid-value and NAV-based pricing is easier to understand with mid-prices because the mid-value is closer to what most investors expect the average ETF share price or value to be. A second obstacle is that very few funds emphasize their policy on the “bid” vs. “mid” choice because there is no requirement to actively publicize it. It will be unnecessarily difficult for investors to understand and use NAV-based trading unless a fund (1) uses mid-pricing and (2) emphasizes that it uses mid-pricing.

While it is certainly possible to continue to accommodate two different NAV calculation standards, dual standards will confuse many investors if secondary market trading is based on the NAV calculation. NAV-based trading of ETFs is designed to improve and clarify the cost of ETF executions for investors, not to contribute confusion.

Over the next few years, U.S. and international accounting and valuation standards are supposed to converge. Ideally, one feature of convergence would be standardization of all fixed-income fund NAV calculations at either the “bid” or, more likely, the “mid”. Such standardization is not inevitable because currently used valuation standards are almost a “religious” issue in many quarters and standards convergence appears to be stalled. If there is no agreement to standardize at mid, explaining NAV-based trading clearly to all investors will be more difficult than it needs to be. I can only guess that NAV-based trading may not be offered for funds that do not price on the mid rather than the bid, lest the lower valuation lead to unnecessary confusion about where the ETF shares “should” trade. This topic is likely to be widely discussed over the next few years, but the marketing advantages for fixed income ETFs that use NAV-based trading are likely to be so great that pressure for fixed income ETFs to use NAV-based trading will be overwhelming.

**NAV Calculations for Funds Holding Foreign Securities.** Foreign equity funds with everyday fair value pricing seem to meet an appropriate standard for cash transactions at or relative to NAV better than funds that do not use fair value every day. Since creations and redemptions for these funds are largely in kind, the pricing of transactions between the fund and the Authorized Participants who create and redeem ETF shares already follows carefully developed rules. NAV-based trading of ETFs at or relative to the fair value NAV seems an improvement for all cash transactions among secondary market traders in shares of these funds.

The additional issues for funds holding fixed income securities trading on principal markets outside the U. S. are similar to the issues affecting domestic fixed income funds. Other types of fund portfolios may require further analysis, but there is no need to introduce NAV-based trading on every ETF immediately.
**Mutual Fund T+1 Accounting.** U. S. mutual funds and ETFs usually calculate their daily NAVs using the fund portfolio composition as of the close of trading on the prior business day (Day T). The prices used in the NAV calculation are the Fair Value prices for the day the calculation is being made (Day T+1). Tufano et al (2006 and 2012) have analyzed the effect of this valuation convention on daily mutual fund NAV calculations. They found that this pricing convention affects the fund NAV calculation only if the fund has made transactions during the current day’s trading session. Typically, using yesterday’s portfolio and today’s prices does not affect the NAV calculation by more than a penny per share. Furthermore, any effect on the NAV is random and not predictable. The first and most comprehensive of the Tufano et al papers (2006) has been circulating without generating a ground swell of support for a change in this methodology. I mention this issue in the interest of covering as many bases as possible, not because I expect a change in ETF valuations. In any event, any change in the share valuation process is unlikely to have a material effect on ETF trading.

**ETFs and Flash Crashes.** In early May, 2010, I received a panicked call from a college roommate I had not spoken to for several years. He wanted to know what was going on with his ETFs. ETF (and other equity prices) had collapsed briefly in what has been described by the pundits as a “Flash-Crash”. My friend was not a happy investor even though the prices of his ETFs recovered quickly. A subsequent report from SEC and CFTC staffs Findings Regarding the Market Events of May 6, 2010 explained the mechanics of the Flash Crash pretty clearly. An expert panel provided Recommendations Regarding Regulatory Responses to Market Events of May 6, 2010 and a number of academic and industry studies have described and analyzed the forces behind this Flash Crash and have provided some useful recommendations to the regulators to help prevent a recurrence. Some of the recommended changes have been made and others are likely to be implemented in the future.

It is not realistic to expect any set of regulations developed from lessons learned in a past market hiccup to prevent all future market problems. We learn enough from each unsettling market event to insure that the next market problem will at least be different in some significant ways from its predecessor. However, even if the best and brightest of our market sages and our most prescient regulators understand a specific weakness in market operations or structure, a great many people who do not understand markets in general and a specific market problem in particular must be persuaded before some of the most desirable changes can be made.

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71 At the end of fiscal reporting periods, both the portfolio and the prices will usually be determined at the close of the last business day.
The CFTC and SEC now impose temporary trading halts on securities and futures contracts that have experienced large intra-day price changes. These trading halts are an appropriate response to events like those of May 6, 2010. More fundamental changes including (1) eliminating broker-dealer internalization of orders from individual investors (the expert panel recommended that “the SEC conduct further analysis regarding the impact” of internalization)\(^{72}\) and (2) allowing NAV-based trading as the principal market for non-benchmark ETFs and as a supplementary market for other ETFs may go a long way toward preventing future flash crashes and similar events\(^{73}\).

The May 6, 2010 Flash Crash might have been less dramatic if investors had been able to choose NAV-based trading for ETFs as an alternative to conventional “just like a stock” trading. As an alternative trading mechanism for actively traded ETFs, it could moderate ETF price fluctuations in turbulent market environments. If you are skeptical that NAV-based trading will help prevent market meltdowns, consider that very few investors would enter an order to sell their shares in an ETF materially below the NAV to be calculated for the current day. Correspondingly, few market professionals could resist the temptation to enter purchase orders slightly below today’s yet-to-be-calculated NAV. NAV-based trading would help repair any “delinking” of the prices of the ETF’s holdings from the price of the ETF shares. With NAV-based trading, most price discovery will take place in the underlying securities markets – where it belongs.

**ETFs and 401(k) Plans.** As of this writing a relatively small number of defined contribution retirement plans (largely 401(k) plans) offer ETFs to their investors. One of the regulatory developments that has both stimulated and constrained the introduction of ETFs to these accounts is a Labor Department requirement that the costs associated with positions in funds held by 401(k) investors must be disclosed. To the extent that the cost transparency requirement is implemented appropriately, the only way 401(k) plans will be able to achieve competitive and transparent costs of trading most ETFs may be to use NAV-based trading. The cost of any NAV-based fund transaction can be measured relative to the net asset value of the fund on the day the defined contribution plan transacts. While it is possible to use market-on-close orders in these accounts and to calculate the transaction cost as the difference between the aggregate transaction price and the net asset value, it is not possible to control the account’s transaction cost or to predict the transaction cost accurately in advance of trade execution if NAV-based trading is not available.

\(^{72}\)http://www.sec.gov/spotlight/sec-cftcjointcommittee/021811-report.pdf

\(^{73}\)A so-called “mini Flash Crash” on March 31, 2011 affected reported prices for a small number of newly launched ETFs. On that day, a market maker apparently entered a combination of orders that led to a drop in the market price of some of these ETFs by more than 90 percent. This rather modest event, almost certainly primarily due to human error, seems to have little long term significance.
With no-load mutual funds, the traditional fund holdings in defined contribution accounts, the fund’s net asset value is the transaction price. With ETFs, the investor cannot count on buying fund shares precisely at net asset value. In general, an ETF purchase in the NAV-based market will be at a price above net asset value by a few pennies per share and an ETF sale usually will be correspondingly below net asset value. If the plan administrator is buying and selling the same security on a given day for different accounts, offsetting orders can be crossed at the average transaction price - plus or minus a fee – to the benefit of all parties. With NAV-based trading, the ETF transaction cost will usually be lower and will always be much more controllable and predictable than if market-on-close trades are used. The combination of measurable and controllable ETF share trading costs and the absence of flow costs from other investors’ trades should eventually lead to dominance of the 401(k) fund market by ETF shares.

**Market Microstructure Has Changed Greatly in Recent Years.** One of the most significant areas of research in finance over the past 20 years has been financial market microstructure. O’Hara (1995), Harris (2003) and Hasbrouck (2007) are the classic market microstructure texts for U.S. equity markets. These books and the papers cited in them and in the more recent work of Chacko, Jurek, and Stafford (2008) are relevant to many aspects of trading in ETFs. Hasbrouck and Saar (2009 and 2011) and the articles cited earlier will also help you understand today’s markets. The development of high-frequency trading and the current rules for order internalization and implementation of the National Market System (NMS) are a dramatic departure from the traditional exchange model which stressed a single specialist or primary market maker and a dominant exchange’s limit-order book where most long latency orders resided and where lower latency orders came to seek a trading counterparty. The greater flexibility of the NASDAQ electronically linked dealer market and changes in the National Market System (NMS) rules have created a new “consolidated” market model.

Volume in today’s high-frequency trading environment has exploded. Exchange transaction charges and rebates and allocations of market data revenue have

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74 Low latency orders are an important feature of high frequency trading. Because ETF quotes change frequently as quotes for the ETF’s underlying portfolio securities change, most ETF bids and offers are relatively low latency orders, even if they are not changed as part of a high frequency trading strategy. As noted, many orders in the NAV-based markets for ETF shares will be relatively stable, i.e., they will be almost inherently high latency orders.

75 Hasbrouck and Saar (2009) has a good description of this market.

76 Exchange revenue and expense business models vary greatly and affect how an order is executed in significant ways. Brokers typically pay a fee to the exchange for transactions, but the broker may get a rebate from the exchange for execution of a resting limit order (providing liquidity) and a credit for some of the tape (transaction reporting) revenue the exchange (or another transaction reporting venue) collects. In today’s minimal commission
revolutionized the way market and limit orders from various sources interact at high speed. ETF related information on NAV-based trading, market microstructure, high frequency trading (HFT) and other aspects of ETF trading will be among the topics I will be updating as this e-book ages. You might keep the italicized phrases in the previous sentence in mind for your own Internet inquiries.

Small orders increasingly dominate equity trading. A few years ago the average stock transaction dropped below 400 shares. Today, the average trade is not much larger than 100 shares\(^7\), but the number of shares per transaction may not be significant in today’s electronic markets. Large stock trades can still be completed but they are more frequently broken up into very small pieces. Most of the traditional block-positioning firms no longer make principal bids to buy large blocks of stock. “Dark pools,” which are sometimes characterized as a new name for a modified form of what once were called crossing networks, still play a significant role in trading some large positions.

ETF primary market transactions (a.k.a. creations and redemptions) are often linked to portfolio trades and to the portfolio trading desks of the major broker-dealer firms. These securities dealers serve as Authorized Participants in the creation and redemption of shares in most ETFs as service providers to market makers. These and other market elements are important remnants of earlier market structures, but few features of the securities markets operate in the way they operated as recently as 2005. Readers interesting in learning more about present and prospective market microstructure issues should read the SEC’s Concept Release on Equity Market Structure and the comments the Commission has received on this Concept Release from various parties in SEC Comments on Concept Release.

If you are going to use the hyperactively traded benchmark index ETFs more than occasionally, you will want to learn more about high frequency trading (HFT). With HFT, low latency orders are cancelled in milliseconds, or even in microseconds, if they are not executed immediately. Executions are in smaller parcels than in the past and the number of separate transactions continues to grow. In spite of vocal criticism from quarters where HFT is at least partly misunderstood, HFT reduces the average bid/ask spread in an electronic market. Consequently, HFT reduces the average transaction cost incurred by small investors. On the other hand, HFT probably increases transaction costs for most institutional investors, especially if they are trying to trade a single stock.

\(^7\)Many sizable positions are broken into odd lots (less than 100 shares).
position in large size. HFT discussions often generate more heat than light, but there are
a number of good studies that, combined with your own research, should give you a
useful perspective. See especially, SEC Comments on Concept Release and my earlier
discussion of high frequency trading for references.

APPENDIX B - SPECULATION ON HOW NAV-BASED ETF TRADING WILL CHANGE INVESTING IN SECURITIES

That NAV-based trading of most ETFs will greatly enhance the usefulness of
these pooled investment vehicles for investors seems inevitable, but there are
other changes that NAV-based trading seems likely to make possible, and even
inevitable. It seems useful to speculate briefly on some of the most important
possibilities and their probable impact.

I have already suggested that the deployment of NAV-based trading will be a
useful supplement to the other steps that regulators have taken to deal with the kinds of
market disruptions that have emerged with the recent evolutionary changes in market
structure. For the most part, NAV-based trading will help limit the magnitude of
disruptions associated with high frequency and high volume trading.

Fixed income ETFs may grow more rapidly than other asset classes in the ETF
format as a result of relatively greater potential trading cost savings for the typical
investor in the underlying fixed income markets as well as the fund share trading cost
reductions NAV-based trading will make possible. We will hear less in the future about
high retail bond trading costs and about bonds that never trade between the day they are
issued and the day they mature or are called. The cost of trading fixed income securities,
particularly for retail investors, has been significantly higher than the cost of trading
equities.\textsuperscript{78} Electronic trading has much further to go in the markets for bills, notes and
bonds than in equity and commodity markets. The troubled history of money market
funds, changes in money market fund rules and procedures, the upward slope of the
“normal” yield curve, new ETF market infrastructure that will serve the special needs of
small investors and defined contribution retirement plans, and the growing role of
investment advisors who provide a wide range of increasingly sophisticated financial
services and support to affluent (not just wealthy) clients will lead to major product and
service developments centered around lower bond trading costs and NAV-based trading
of fixed income funds.

\textsuperscript{78} See, for example, Ciampi and Zitzewitz (2010).
There are far more distinct fixed income instruments than equities; but most fixed income portfolios are more suited to quantitative analysis and systematic risk management than equity portfolios.\textsuperscript{79} Electronic trading, including NAV-based ETF trading, and the advantages of the ETF structure will probably have more future impact on the structure of fixed income markets and on fixed income trading costs than on equity trading relative to where these two markets stand today.

The active management versus indexing debate has no constructive role in the development of improved fixed income ETFs. What kind(s) of management can deliver results in a fund portfolio with a few hundred positions when the appropriate investment universe includes tens of thousands of securities, many of which trade rarely or not at all? The answer is that this can be both an actively managed fund and an index fund.\textsuperscript{80}

With NAV-based trading, balanced funds holding mixtures of debt and equity securities can be valued, operated and risk managed more effectively and with fewer flow cost problems than has been possible with either mutual funds or first generation ETFs. Balanced funds may be more practical and more popular in the ETF format with non-transparent portfolio changes and NAV-based fund share trading. One potentially important application of balanced or changing composition funds should be tax-efficient versions of some of the risk-changing or target date asset allocation products developed for retirement planning applications.

NAV-based trading will encourage use of more specialized portfolios with, for example, narrower or broader mandates for investment coverage and geography. Some of the most popular ETFs to date have been based on indexes that include securities traded in diverse time zones. With largely in kind creations and redemptions and continuous intraday trading at a price based on an often vague notion of the contemporary portfolio value, there has been little reason to reflect on the different processes for price discovery and settlement in the principal underlying markets represented in the fund’s portfolio. We need to do better in trading ETFs holding positions that trade in markets that close before the 4:00 p.m. standard for valuation in the U.S., such as domestic fixed income, agricultural commodities or a coherent mix of foreign securities. Traditional ETF trading does not work well enough for, say, a global emerging market equity fund with holdings traded on primary markets that close more or less around the clock.\textsuperscript{81} NAV-based trading may lead ETF issuers to rationalize their product offerings to take better advantage of this trading mechanism.

\textsuperscript{79} In this context, there is reason to expect radical changes in bond analysis and evaluation with emphasis on changes in the role played by credit and bond rating organizations.

\textsuperscript{80} See Gastineau and Lazarian (2007).

\textsuperscript{81} As discussed above, the intraday trading spread in the market for such funds is often tight, but the mid-point of that spread may not appropriately reflect contemporary values in the diverse underlying markets.
Without NAV-based trading, defined contribution plans like 401(k)s and advisors accustomed to buying and selling mutual funds at net asset value have tended to use MOC orders for ETF transactions. The deviation of market-on-close executions from NAV may increase as these plans and advisors make greater use of ETFs, especially less actively traded ETFs.
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