



Exchange-traded funds: Clarity amid the clutter

Vanguard Commentary

February 2019

- Over the past decade, exchange-traded funds (ETFs) have become popular among investors in building investment portfolios. Although sometimes portrayed as unique instruments, ETFs are overwhelmingly similar to mutual funds, from both a regulatory and a structural standpoint.
- Investors have also used ETFs in a manner similar to the way they frequently use mutual funds, namely to create low-cost, broadly diversified investment portfolios, especially when implementing index-based strategies.
- ETFs provide important benefits that stem from the way investors transact in fund shares. The secondary-market trading of ETFs is an additional source of intraday liquidity for market participants, and intraday market prices reflect valuable information about market conditions.

Exchange-traded funds (ETFs) have become a sought-after option for U.S. investors, with U.S.-listed ETF assets totaling \$3.5 trillion. Although this was much less than the \$14.9 trillion in total assets held by mutual funds, ETF assets grew at an annualized rate of 19.4% over the last ten years, versus 7.4% for mutual funds over the same period. (Data in this paragraph are from Morningstar, Inc., as of June 30, 2018.)

ETFs' remarkable growth has been driven largely by two trends. The first is that financial advisors—who were among the early adopters of ETFs and who manage substantial assets held by affluent investors¹—have been conducting more of their business on a fee basis, rather than a commission basis. According to Cogent Wealth Reports (2014 and 2018), the percentage of advisor compensation from asset-based fees grew from 45% in 2007 to 61% in 2018. The second trend is the financial industry's emphasis on low-cost investing. Bennyhoff and Walker (2016) noted that low-cost funds have received the majority of investor assets, in large part because of the popularity of index funds.

Most ETFs share characteristics with mutual funds: They offer investors access to a particular market or investment strategy; they are pooled investment vehicles whose investors own a pro-rata share of fund assets and receive valuable benefits in return (e.g., diversification, economies of scale, professional money management, and convenience); they are primarily regulated by the same laws; and they issue new shares and redeem existing shares to meet investor demand.

Despite many similarities with mutual funds, however, there are differences. Most notably, when mutual fund investors buy and sell shares, they transact directly with the fund and receive the end-of-day net asset value (NAV) price. ETF investors typically transact with each other through an exchange and receive an intraday market price, usually the moment the order is placed.

In this research commentary, we first highlight the similar regulatory regime for ETFs and mutual funds. We then discuss how investors use ETFs in the same ways as mutual funds when constructing portfolios. Finally, we describe some of the benefits ETFs provide that result from their exchange-traded nature.

ETFs and mutual funds: A shared regulatory environment

The vast majority of ETFs (98% of assets as of June 30, 2018, according to Morningstar, Inc.) are organized and regulated as registered investment companies under the United States Investment Company Act of 1940 (1940 Act), the same legislation that governs mutual funds.² The 1940 Act provides a host of investor protections, including those related to organizational structure and investment activities. This makes ETFs that are subject to the 1940 Act among the most stringently regulated investment products available in the United States.

To begin operations, ETFs and mutual funds must be registered with the U.S. Securities and Exchange Commission (SEC). Each fund typically maintains a

Notes on risk

All investing is subject to risk, including the possible loss of the money you invest. Past performance is no guarantee of future returns. Be aware that fluctuations in the financial markets and other factors may cause declines in the value of your account. There is no guarantee that any particular asset allocation or mix of funds will meet your investment objectives or provide you with a given level of income. Investing in ETFs may incur brokerage commissions and investors may pay more than net asset value when buying and receive less than net asset value when selling. Diversification does not ensure a profit or protect against a loss.

¹ According to Spectrem (2017), 69% of mass-affluent investors (i.e., \$100,000 to \$1 million in household net worth), 75% of millionaires (\$1 million to \$5 million), and 81% of ultra-high-net-worth investors (\$5 million to \$25 million) use a professional advisor.

² Although the terms ETF and exchange-traded product (ETP) are sometimes used interchangeably, an ETF is a type of ETP. ETPs constitute a broad class of exchange-listed financial products that seek to provide investors with exposure to financial instruments, financial benchmarks, or investment strategies across many asset classes. ETPs include both exchange-traded notes (ETNs) and ETFs. ETNs are not funds, but, rather, unsecured debt instruments not subject to the robust protections associated with the 1940 Act. ETFs constitute a diverse class of financial products that may be regulated by the 1940 Act (e.g., as an open-end investment company or unit investment trust) or may not be regulated by the 1940 Act (e.g., as a grantor-trust ETF or partnership ETF). Since, as with mutual funds, most ETFs are structured as open-end investment companies, the regulation discussion in this paper refers explicitly to ETFs that are regulated by the 1940 Act as open-end investment companies.

board of directors composed primarily of independent directors—elected by shareholders—who act as fiduciaries to the fund and oversee the fund’s activities. In particular, the board of directors hires a management firm to manage the fund’s assets. This firm provides management services to the fund and is obligated to act as a fiduciary in the fund’s best interest. The fund’s assets are held by a custodian (typically a U.S. bank) and are segregated from both the asset manager and the bank’s assets. If the management firm or bank were to go bankrupt, ETF and mutual fund investors have a legal right to the fund’s assets.

The 1940 Act also governs a fund’s activities. For instance, it requires funds to hold at least 85% of their net assets in liquid assets and to value portfolio holdings on a daily basis. In addition, funds are limited to a simple capital structure that constrains the use of leverage, either explicitly through borrowing money, or implicitly through activities such as short sales, securities lending, and derivative transactions that could create leverage. For example, funds are generally limited to borrowing only from a bank and must maintain a 300% asset-coverage ratio for all such borrowings.

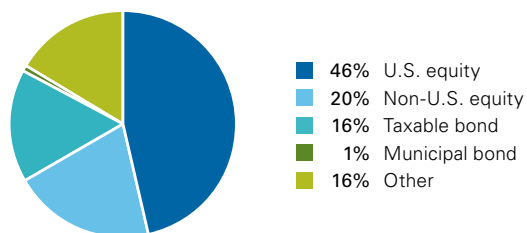
All 1940 Act ETFs and mutual funds must comply with the disclosure-based provisions of the 1940 Act, the Securities Act of 1933 (1933 Act), and associated SEC rules.³ These provisions require ETFs and mutual funds to disclose material information via fund prospectuses and annual reports to help investors make informed investment decisions.

All 1940 Act funds also are subject to regulation under the U.S. Internal Revenue Code. From a shareholder’s perspective, taxation of 1940 Act ETFs and mutual funds is the same. For example, capital gains or losses on the sale of ETF and mutual fund shares by investors are subject to the same capital gains taxation rules. Equivalent taxation also applies to buying and selling of securities by the portfolio manager of an ETF or a mutual fund: When an ETF or mutual fund distributes gains generated on the sale of portfolio securities to its shareholders, short-term capital gains are taxed to shareholders at ordinary income tax rates, and long-term capital gains are taxed to shareholders at the lower long-term capital gains rates. In addition, any net investment income (for example, interest or dividends received by a fund on its portfolio securities) paid out by both ETFs and mutual funds are treated as current income and generally taxed to shareholders at ordinary income tax rates. For ETFs or mutual funds that invest in dividend-paying stocks, however, some or all of these distributions may be taxable to shareholders at the currently lower qualified dividend rates.

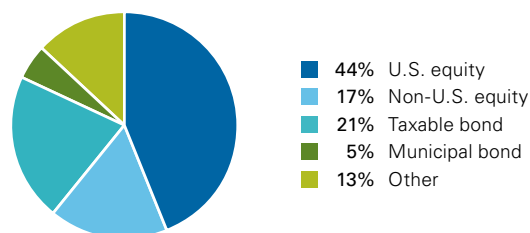
³ The SEC is the primary regulator of U.S. mutual funds and ETFs subject to the 1940 Act. Among other oversight functions, the SEC conducts both periodic and special examinations of funds’ compliance controls, operations, and compliance with regulatory requirements.

Figure 1. ETF and mutual fund investors allocate assets similarly

a. Allocation of ETF assets



b. Allocation of mutual fund assets



Notes: Data are as of June 30, 2018. The "Other" category represents sector-equity, commodities, alternative, and allocation funds as defined by Morningstar, Inc. Percentages may not add up to 100% due to rounding.

Sources: Vanguard calculations, based on data from Morningstar, Inc.

Using ETFs to implement investment strategy

The fundamental purpose of a fund, whether an ETF or a conventional mutual fund, is to facilitate diversified access to a particular investment strategy. Both structures conveniently enable investors to construct their portfolios in accordance with their asset allocation. **Figure 1** shows how similar investor allocations using ETFs are to those using mutual funds.

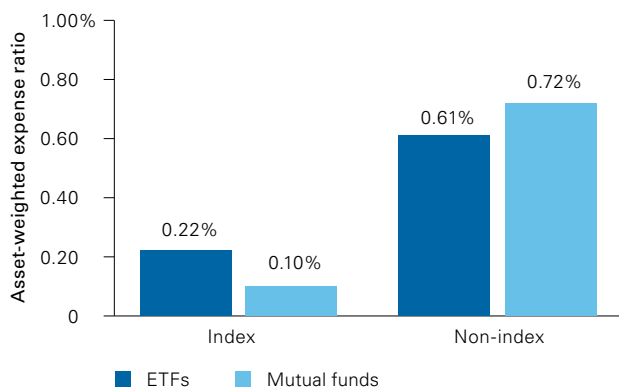
As part of the portfolio-construction process, investors can choose to implement their allocations using an index-based or an actively managed strategy.⁴ Hallmarks of indexing include broad diversification and low costs.

ETFs have often been touted as having low costs. Although it is true that their expense ratios tend to be lower than those of mutual funds, the lower cost mostly reflects the difference between indexing and active management. This is because 98% of ETF assets follow index-based strategies, whereas just 23% of mutual fund assets follow index strategies, as of June 30, 2018 (according to Morningstar, Inc.). Because most index funds cost less than actively managed funds, most index ETFs and index mutual funds have expense ratios that are lower than those of active ETFs and active mutual funds. **Figure 2** illustrates that the expense-ratio advantage has more to do with indexing than with whether the vehicle is an ETF.

ETFs provide additional benefits to market participants

ETFs differ from mutual funds largely in the way investors transact in fund shares, and as a result provide the additional benefits of on-exchange liquidity and market-based prices. Secondary-market transactions represent an additional source of liquidity for investors, while market-based prices reveal valuable information about market conditions.

Figure 2. Cost differences are due more to investment strategy than product structure



Notes: Data are as of June 30, 2018. Morningstar defines index mutual funds and index ETFs as vehicles that track a particular index and attempt to match the returns of that index. Non-index vehicles include actively managed vehicles.

Sources: Vanguard calculations, based on data from Morningstar, Inc.

Secondary markets provide additional source of intraday liquidity

ETFs provide investors the flexibility to trade shares intraday, and the intraday trading is recorded as trading volume on U.S. stock exchanges.⁵ However, the overwhelming majority of this trading reflects secondary-market transactions (i.e., trading of ETF shares between two market participants). Only a limited amount of this trading volume by market participants results in primary-market trading (i.e., trading in the underlying securities market). The secondary market provides investors with an additional source of liquidity, meaning they can trade a broad portfolio of securities without trading in the underlying market.

During the course of the trading day, investor orders to buy and sell ETF shares are matched on an exchange with the help of market makers. At the end of the trading day, if market makers have a net short position in shares of an ETF (i.e., they sold more than they bought) or a net long position (i.e., they bought more than they sold), they might decide to offset those positions by seeking to create new shares or redeem the existing shares. ETF creations and redemptions are usually executed once per day at their net asset value at 4 p.m., Eastern time.⁶

Figure 3a shows the percentage of daily equity ETF trading volume conducted solely on the secondary market. The median ratio was 92%, suggesting that for every \$1 in trading volume, only 8 cents resulted in primary market trading. Put another way, 92% of the trading volume resulted in no portfolio management impact and no trading in underlying securities. (**Figure 3b** shows the same analysis for bond ETFs—the median ratio was 83%.) The Investment Company Institute (2018) found similar results for equity ETFs (89%) and bond ETFs (79%).

Market prices reveal valuable information about market conditions

An ETF's market price can deviate from the value of its underlying securities, revealing important information about market conditions. The creation and redemption mechanisms of ETFs generally keep the market price close to the currently observed or implied value of an ETF's underlying securities (see "Creation and Redemption of ETF Shares," on page 8). Any small differences between the two—known as "premiums" (when the market price is greater than the value of the underlying securities) and "discounts" (when the market price is lower than the value of the underlying securities)—are largely influenced by transaction costs in the underlying securities' markets, time-zone differences across global markets, and intraday investor supply and demand for the ETF shares.

Underlying market transaction costs substantially influence the existence of premiums and discounts. What investors infer from the existence of premiums and discounts can be somewhat misleading because transaction costs are more transparent with ETFs than with traditional mutual funds. In fact, not only are such costs more transparent, but they also are externalized, meaning the costs associated with trading ETFs in the market are passed along to the investor. When trading ETFs, the investor bears the cost of his or her own transaction.

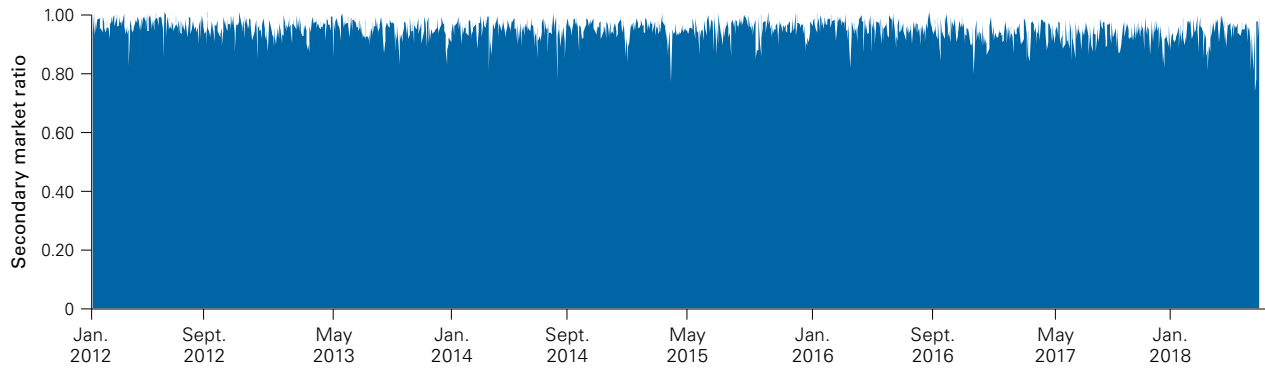
During times of equilibrium, markets essentially have balanced supply and demand. In such an environment, an ETF's market price would likely be at a small premium. The premium would reflect various costs faced by the market maker, including those to transact in the underlying market as well as fees related to the creation or redemption of ETF shares.

⁵ From July 1, 2017, to June 30, 2018, the average daily trading volume of all ETFs in the United States was \$76.7 billion (Vanguard calculations, based on ArcaVision data).

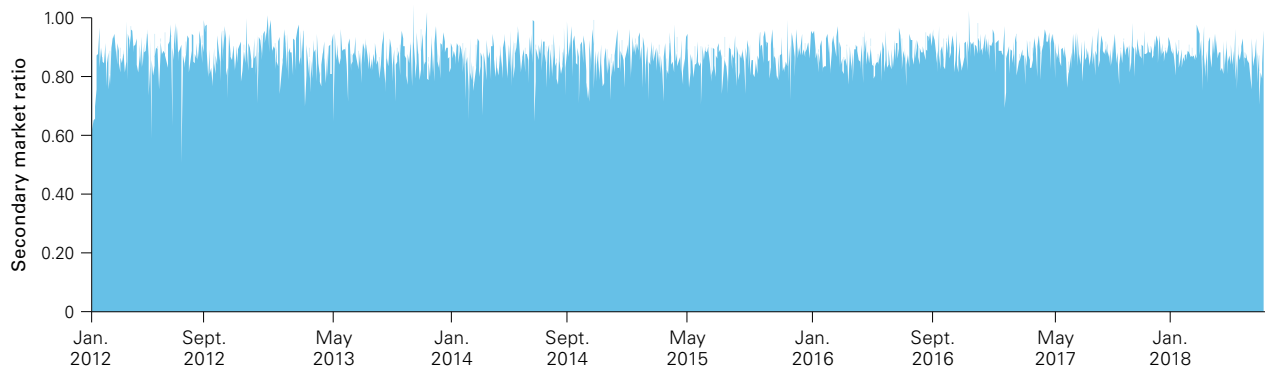
⁶ The process by which ETFs issue and redeem new shares is actually quite similar to that of mutual funds. Mutual funds accept buy and sell orders throughout the day. At the end of the day, only the difference between the buy orders and sell orders results in net share issuance or redemption. Shares are issued or redeemed once per day at their net asset value, at 4 p.m.

Figure 3. ETF transactions are concentrated in the secondary market

a. The majority of equity ETF trading volume is conducted on the secondary market



b. The majority of bond ETF trading volume is conducted on the secondary market



Notes: Data cover the period from January 1, 2012, through June 30, 2018. ETFs covering approximately 75% of total fund assets were used here as proxies (75 funds for equity and 50 funds for fixed income). Secondary market ratio is measured as secondary activity divided by the sum of primary-market and secondary-market activity. Primary-market activity is computed as daily creations or redemptions for each ETF, estimated by daily change in shares outstanding times net asset value.

Sources: Vanguard calculations, based on daily data from Bloomberg Inc.

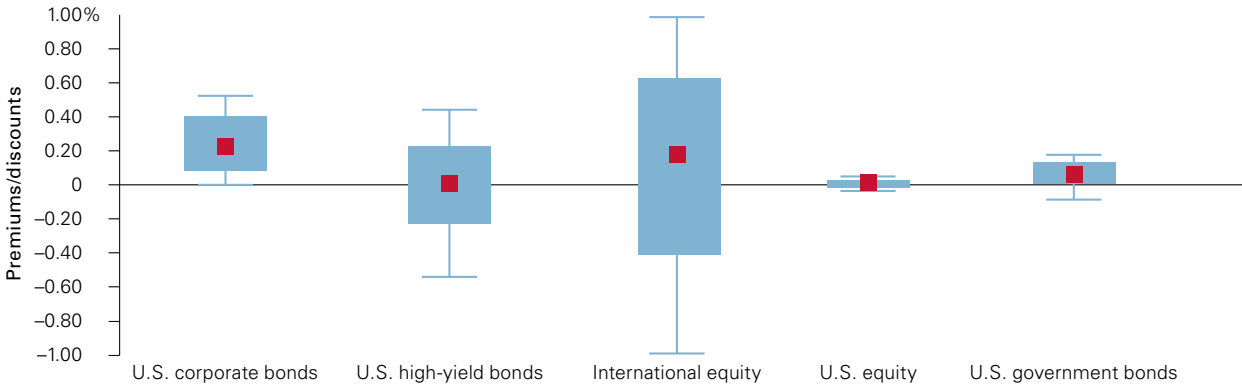
Figure 4 provides insight into how the average premiums/discounts in ETFs tend to be a function of underlying market transaction costs. In the five categories shown, the median premium/discount, indicated in the figure by the red square, rises with the transaction costs in the underlying markets. U.S. equities are extremely liquid and have minimal transaction costs, as do U.S. government bonds. International equities have slightly higher transaction costs than either U.S. stocks or U.S. government bonds.

Figure 4 also illustrates how the variability of the premium/discount largely reflects time-zone differences between an ETF’s trading hours and the trading hours of the underlying securities, as well as the propensity of the underlying market’s transaction costs to fluctuate. In the case of time-zone differences, the effects can be seen notably with international stock ETFs. With fluctuating transaction costs, the effects can be seen notably with U.S. corporate bond ETFs and U.S. high-yield bond ETFs.

Effect of time-zone differences. Most ETF NAVs—and stock-index values—are calculated using the closing prices of the underlying securities in their local markets. However, many local markets close before the U.S. markets, meaning the local prices of international stocks are stale as trading continues in U.S. stock markets. Price-affecting information continues to enter the global marketplace, but does not affect the underlying stocks in an international stock ETF’s portfolio, because the markets in which they trade are closed. In the meantime, international stock ETFs continue to trade in the United States, and market participants engage in what is known as “fair-value pricing,” meaning that participants set prices on these ETFs based on what the underlying international stocks would likely be worth if their local markets were still open for trading. Thus, the ETF’s market price more accurately represents the value of the underlying stocks in the portfolio.

Figure 4. ETF premiums/discounts are a function of transaction costs and time-zone differences

Historical premium/discount distribution



Notes: Data set includes all available ETFs from July 1, 2015, through June 30, 2018, in each category as defined by Morningstar. “U.S. equity” represents Large, Mid, and Small, as well as Growth, Value, and Blend, Morningstar categories; “U.S. government bonds” represents Short, Intermediate, and Long U.S. government bond Morningstar categories; “International equity” represents Foreign Large, Mid, and Small, as well as Growth, Value, and Blend, Morningstar categories; “U.S. corporate bonds” and “U.S. high-yield bonds” represent their Morningstar categories. Each blue box represents 5th–95th percentiles; whiskers represent 0.5%–99.5% of observations; and red squares represent median value for each category, using daily data from Bloomberg. For an evaluation of premiums/discounts and trading volume during the 2007–2009 financial crisis, see Figures A-1 and A-2, respectively, on page 10 in the Appendix. For an evaluation of premiums/discounts and trading volume during the 2013 “taper tantrum,” see Figures A-3 and A-4, respectively, on page 11 in the Appendix.

Sources: Vanguard, based on data from Morningstar, Inc., and Bloomberg Inc.

Effect of transaction costs. Bond ETFs are more subject to changing transaction costs and investor demand than the other listed ETF categories. This can largely be explained by the over-the-counter nature of trading in these bonds, an effect that is especially pronounced for corporate and high-yield bond ETFs. If there is greater relative demand to buy an ETF, the ETF's market price could rise, causing premiums to grow. The opposite is true if there is increased demand to sell an ETF. Given greater relative pressure to sell an ETF, the ETF's market price could drop, causing premiums to fall or possibly leading to the emergence of a discount.

During times of lower liquidity in the underlying markets, these premiums or discounts could expand. However, if the size of the premium or discount were to exceed the heightened transaction costs of the underlying market, market makers and authorized participants would have an incentive to engage in the creation or redemption of new shares. It's important to be aware that even though the level of the premium or discount can vary, the ETF's bid-ask spread itself can still remain tight. In fact, the bond ETF bid-ask spread is often tighter than the spread on the underlying bonds because the ETF consolidates the many different bonds in the underlying strategy into a standardized, tradable unit, concentrating liquidity. As previously mentioned, this liquidity in the shares of the bond ETF adds to the liquidity of the underlying bond market, since market participants can buy and sell bond market exposure by trading solely in the shares of the ETF.

When analyzing premiums and discounts, it's critical to note that a mutual fund portfolio manager trying to buy or sell the same basket of securities as those in an ETF may face the same transaction costs. However, mutual fund investors do not see those costs in real time; rather, the costs are captured as part of the fund's NAV. Investors trying to trade individual bonds in smaller quantities would likely face even higher transaction costs—especially in the non-U.S. Treasury sectors of the bond market (see Bennyhoff et al., 2017). That is why premiums and discounts in ETFs—especially bond ETFs—largely reflect the externalization of transaction costs.

Creation and redemption of ETF shares

ETF shares are created and redeemed by an entity known as an authorized participant, or AP, typically a large broker-dealer. Each business day, the ETF publishes a "creation basket"—a list of names and quantities of securities or other assets. To create ETF shares, an AP delivers the creation basket to the ETF and receives in return a "creation unit," a large block of ETF shares (typically 50,000). Under certain circumstances, the AP may provide cash in lieu of some or all of the securities, along with a transaction fee to offset the cost to the ETF of acquiring them. Upon receiving the ETF shares, the AP may sell some or all of them in the secondary market.

A creation unit is liquidated when an AP returns the specified number of shares to the ETF in exchange for the "redemption basket" (generally comprising the same list of securities as that in the creation basket). If the AP receives cash in lieu of securities, the AP typically pays a transaction fee to offset the cost to the ETF of liquidating the securities.

The creation and redemption mechanisms help ETF shares trade at a price close to the market value of their underlying assets. When rising demand for the shares causes them to trade at a higher price (i.e., at a premium), the AP may find it profitable to create shares by buying the underlying securities, exchanging them for ETF shares, and then selling those shares into the market. Similarly, when falling demand for the ETF shares causes them to trade at a lower price (i.e., at a discount), an AP may buy shares in the secondary market and redeem them to the ETF in exchange for the underlying securities. These actions by APs, commonly described as "arbitrage activities," help keep the market-determined price of an ETF's shares close to the market value of the underlying assets.

In summary, the divergence of market price from net asset value among international stock ETFs and bond ETFs is a natural outcome of the relationship between an ETF and its underlying securities. This reveals valuable information about market conditions (as investors trade at mutually agreed-upon prices). There are times when market conditions lead to larger deviations between current and stale security pricing or in higher transaction costs.

Conclusion

ETFs offer an attractive, efficient way for investors to implement an investment strategy. ETFs' broad acceptance in the market can be tied to their fundamental similarities with mutual funds, including their organizational structure, their strict regulatory framework, and, for many ETFs, their index-based nature. As a result, investors have used ETFs and mutual funds for similar purposes.

ETFs also possess important features stemming from the method by which investors transact in fund shares. Notably, secondary markets serve as an additional source of intraday liquidity for investors. Moreover, ETF market prices reveal valuable information about market conditions, including the level of transaction costs in the underlying markets and, with respect to international stock ETFs, a more current value of that ETF's underlying securities. This means that the trading of ETFs represents an on-exchange source of liquidity at a mutually agreed-upon price between market participants.

References

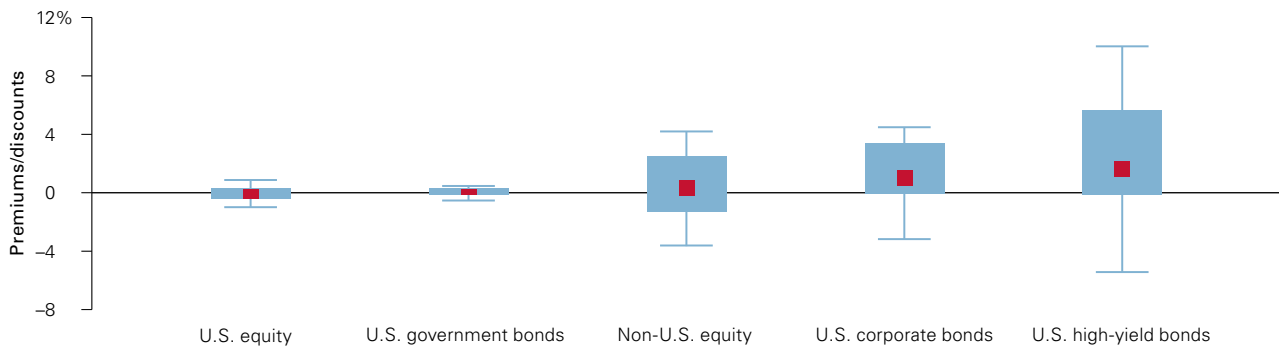
- Bennyhoff, Donald G., and David J. Walker, 2016. *Investors Are "Voting With Their Feet" on Costs*. Valley Forge, Pa.: The Vanguard Group.
- Bennyhoff, Donald G., Scott J. Donaldson, James Dunlap, and Daren R. Roberts, 2017. *A Topic of Current Interest: Bonds or Bond Funds?* Valley Forge, Pa.: The Vanguard Group.
- Cogent Wealth Reports, 2014. *Advisor Brandscape: Measuring the Impact of Brand and Loyalty on Revenue in the Advisor Workplace*. Livonia, Mich.: Market Strategies International, July.
- Cogent Wealth Reports, 2018. *Advisor Brandscape: Measuring the Impact of Brand and Loyalty on Revenue in the Advisor Workplace*. Livonia, Mich.: Market Strategies International, June.
- Investment Company Institute, 2018. *2018 Investment Company Fact Book: A Review of Trends and Activities in the U.S. Investment Company Industry*, 58th ed. Washington, D.C.: Investment Company Institute; available at https://www.ici.org/pdf/2018_factbook.pdf.
- Rowley, James J., Jr., David J. Walker, and Sarinie Yating Ning, 2018. *The Case for Low-Cost Index-Fund Investing*. Valley Forge, Pa.: The Vanguard Group.
- Spectrem Group, 2017. *The Mass Affluent Investor: Advisor Relationships and Changing Advice Requirements*. Chicago: Spectrem Group, 26.
- U.S. Internal Revenue Code of 1986. U.S. Public Law 99-514, 99th Cong., §2, October 22, 1986, 100 Stat. 2095; available at <http://uscode.house.gov/statviewer.htm?volume=100&page=2095#>.
- U.S. Investment Company Act of 1940. U.S. Public Law 76-768, 76th Cong., August 22, 1940, 15 U.S.C. §§ 80a-1–80a-64; available at www.law.cornell.edu/uscode/text/15/chapter-2D.
- U.S. Securities Act of 1933, as amended through U.S. Public Law 112-106, 112th Cong., April 5, 2012; available at www.sec.gov/about/laws/sa33.pdf.

Appendix. Premiums/discounts and trading volume of ETFs during 2007–2009 global financial crisis and ‘taper tantrum’ of May–June 2013

Figure A-1 measures premiums/discounts across five ETF categories during the global financial crisis of 2007–2009. The relationships between the average and variability of premiums/discounts and the fund category are shown to be similar to findings displayed earlier in Figure 4 on page 7: The median premium/discount rises in accordance with the liquidity characteristics of the underlying markets. Also, the relative variability of premiums/discounts across the five categories is similar

to that in Figure 4 (though each category exhibits greater variability when compared to itself). There are more extreme levels of discount observations in Figure A-1’s earlier time period, highlighting the difficult conditions in the bond market. However, even during this period of increased transaction costs, U.S. corporate bond ETFs and U.S. high-yield bond ETFs posted discounts on only 6% and 5% of the 392 days, respectively.

Figure A-1. ETF premium/discount relationships during 2007–2009 financial crisis were similar to those in Figure 4



Notes: Data set includes all available ETFs in each category as defined by Morningstar (see notes to Figure 4 for fund representation by category) during the global financial crisis, defined here as the period from October 1, 2007, through March 31, 2009. Each blue box represents 5th–95th percentiles; whiskers represent 0.5%–99.5% of observations; and red squares represent median value for each category.

Sources: Vanguard calculations, based on data from Morningstar, Inc., and Bloomberg Inc.

Figure A-2. Bond ETF trading volume remained robust on ‘discount days’ during 2007–2009 financial crisis

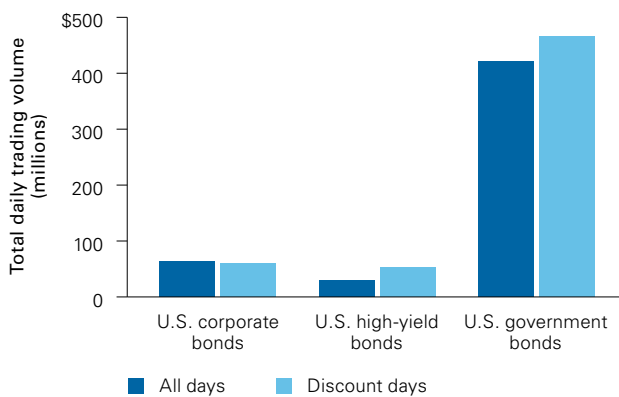


Figure A-2 compares total daily trading volume of bond ETFs on all days during the 2007–2009 global financial crisis with those days during the defined period on which they traded at a discount. Despite the challenging bond market conditions, market participants were able to use ETFs to transact in these asset classes at a mutually agreed-upon price.

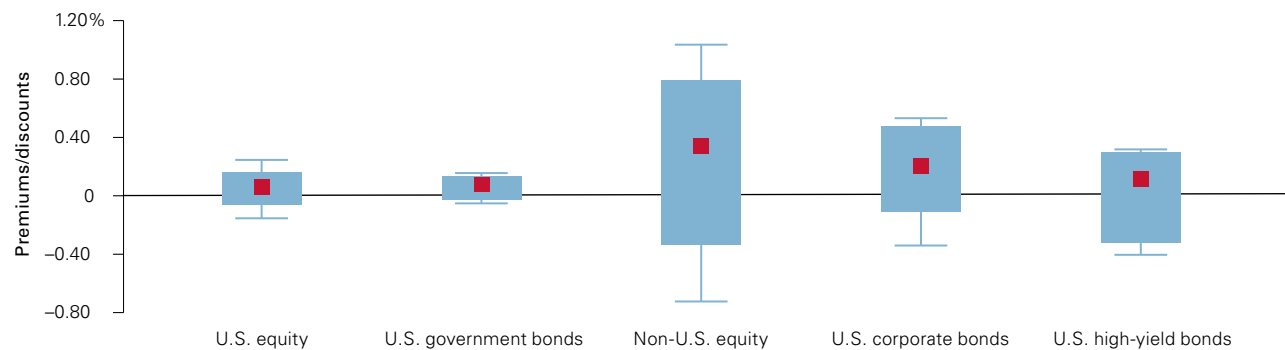
Notes: Data set includes all available ETFs in each category as defined by Morningstar (see Notes to Figure 4 for fund representation by category) during the global financial crisis, defined here as the period from October 1, 2007, through March 31, 2009.

Sources: Vanguard calculations, based on data from Morningstar, Inc., and Bloomberg Inc.

Figures A-3 and A-4 mirror the analysis performed in Figures A-1 and A-2, but instead using the period of May through June 2013, known as the “taper tantrum,” when government bond yields soared globally after the U.S. Federal Reserve suggested it might start slowing its bond purchases later that year. In Figure A-3, the relationships between the median and variability of premiums/discounts and the fund category are again similar to our earlier findings in Figure 4. In particular, as this period

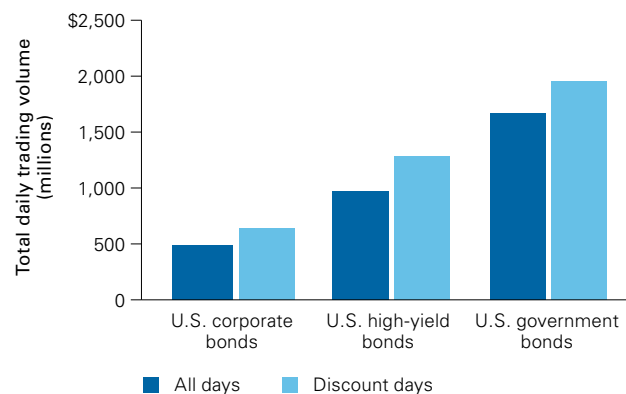
most directly affected fixed income markets, the figure shows that the most extreme premium/discount observations remained similar to those seen in Figure 4. During this period, corporate bond ETFs and high-yield bond ETFs posted discounts on 19% and 37% of the 43 days, respectively, though at levels of minimal magnitude. Figure A-4 shows that, notwithstanding the challenging market environment, participants transacted in greater amounts on “discount days.”

Figure A-3. ETF premium/discount relationships during ‘taper tantrum’: May–June 2013



Notes: Data set includes all available ETFs from May 1, 2013, through June 30, 2013, in each category as defined by Morningstar (see Notes to Figure 4 for fund representation by category). Each blue box represents 5th–95th percentiles; whiskers represent 0.5%–99.5% of observations; and red squares represent median value for each category. Sources: Vanguard calculations, based on data from Morningstar, Inc., and Bloomberg Inc.

Figure A-4. Bond ETF trading volume remained robust on ‘discount days’ during ‘taper tantrum’: May–June 2013



Notes: Data set includes all available ETFs from May 1, 2013, through June 30, 2013, in each category as defined by Morningstar (see Notes to Figure 4 for specific fund representation by category). Sources: Vanguard calculations, based on data from Morningstar, Inc., and Bloomberg Inc.

Connect with Vanguard® > vanguard.com

The information presented in this paper is intended for educational purposes only and does not take into consideration your specific circumstances or other factors that may be important in making investment decisions. We recommend that you consult a financial or tax advisor about your individual situation before investing.



Vanguard Research

P.O. Box 2600
Valley Forge, PA 19482-2600

© 2019 The Vanguard Group, Inc.
All rights reserved.
Vanguard Marketing Corporation, Distributor.

ISGETFC_022019