Tortoise℠

Understanding ETF Liquidity

Understanding the exchange-traded fund (ETF) life cycle

Despite the tremendous growth of the ETF market over the last decade, many investors struggle to understand the mechanics behind ETF trading and liquidity. The potential efficiencies, tax benefits, targeted exposure and typically lower fees that ETFs offer make them an opportunistic tool for many investors. To fully capitalize on ETFs, however, investors must understand the vehicle and its "true" liquidity. To facilitate this understanding, here is a discussion about the ETF structure, its trading mechanics and liquidity, and an example showing how ETFs work.

What is an ETF?

An ETF, aptly named, is a fund or a pool of assets that trades as one security on an exchange. The assets of the ETF, are the combined value of all fund holdings, and the NAV of the ETF is determined by dividing the combined valued of those assets by the number of ETF shares, resulting in the NAV per share. ETFs generally have a specific mandate regarding the securities in which they invest, such as security type (equities, fixed income), sector (energy, consumer staples), geography (domestic, international) or some other distinction. Often, ETFs invest in the same securities that comprise an index, following the index methodology in an attempt to replicate, or "track," the returns of that index.

Not a stock, not a mutual fund: a combination of attributes

An ETF combines the diversification, transparency and open architecture (ability of investor demand/supply to change the number of shares outstanding) of a mutual fund with the intraday liquidity and price discovery of a stock. The table below highlights the characteristics that stocks and mutual funds have in common with ETFs.

	Stock	ETF	Mutual Fund
Shares outstanding	Generally fixed	Flexible	Flexible
Holdings transparency	Quarterly	Daily	Quarterly
Intraday liquidity	Yes	Yes	No
Expected trading counterparty	Market participants	Issuer and Market Participants	Issuer
Diversification	No	Yes	Yes
Valuation	Varies/Subjective	Intraday & end of day	End of day
Tax efficiency	N/A	In-kind transactions allow PM to manage taxable gains	Normal
Typical source of liquidity	Secondary market only	Both secondary and primary markets	Primary market only
Ownership percentage	Important, regulatory reporting required	Not applicable, will fluctuate with shares outstanding	Not applicable, will fluctuate with shares outstanding

Shading represents ETF characteristics

An ETF is NOT a stock, but it sure can look like one

ETFs are listed and can be bought and sold on regulated exchanges, just like stocks. In fact, in many ways ETFs resemble stocks, particularly when trading volume is extremely high. Here are the most significant distinctions that differentiate ETFs from stocks:

- **Flexible shares outstanding:** The supply of ETF shares is flexible, and varies like that of a mutual fund. ETFs can constantly change the supply of available ETF shares to match demand; as a result, the price movements of the ETF are largely driven by the performance of its holdings (NAV performance), rather than by supply/demand of the ETF itself. Conversely, common stocks generally have a fixed amount of shares outstanding, so supply and demand for those shares will drive their value.

- **Investors drive share changes:** Changes in ETF shares outstanding are driven by investors, while changes in shares outstanding of a stock are dictated by the issuing company's financing decisions.
- **Value transparency:** ETFs legally are required to report a transparent and defined net asset value (NAV) at a given point in time. ETFs have intraday NAVs (calculated and published publicly every 15 seconds), and at the end of the trading day ETFs post their exact NAV. Stocks tend to have a range of valuation metrics, and few investors agree on exact stock valuations.

An ETF closely resembles a mutual fund, but it's still an ETF

While an ETF's intra-day tradability compels investors to compare an ETF to a stock, we believe ETFs are much more comparable to mutual funds. In fact, from an investor's perspective, an ETF might seem like a particularly transparent mutual fund. ETFs offer enhancements over mutual funds by providing:

- **Intra-day tradability:** ETFs are tradable when the exchange they are listed on is open. Mutual funds are only tradable at the closing NAV each day.
- **Enhanced price discovery:** ETFs are required to report intra-day NAV every 15 seconds, whereas mutual funds price only at the end of each day.
- **Frequent transparency:** ETFs must disclose their holdings each day, while mutual funds generally report their holdings only quarterly (with a lag).
- **Tax efficiency:** ETFs are structured in a way to minimize taxes. From a tax perspective, the overall amount paid will almost always be less than what an investor would pay for the exact same exposure in a mutual fund.
    - In a mutual fund, managers must constantly rebalance the fund by selling securities to accommodate redemptions in cash or implement investment decisions. The actual sale of securities within the fund can generate taxable gains for the shareholders, even ones that have an overall unrealized loss.
    - ETF creations/redemptions are generally done in-kind (delivery of securities instead of cash, described more in depth on the next page). This unique feature of ETFs provides ETF investors significant potential shelter from exposure to capital gains on an individual security in the structure. Additionally, ETFs generally track passive indices, which typically have lower turnover than actively managed products.

Enhanced tax management is a characteristic driven by ETF primary market trading, which brings us to our next point. ETFs are truly unique, because they have both *active* primary and secondary markets.

Secondary market trading

The secondary market is where an ETF behaves most like a common stock. ETF trading in the secondary market requires both a buyer and a seller to transact in ETF shares that already exist, just like with any other stock. Market makers maintain a two-sided market with a bid and ask; there is a last price, trading volume and other quantifiable characteristics pertaining to risk/return just as with common stocks.

The ETF's trading volume in the secondary market is referred to as "on-screen" liquidity. When investors review an ETF's liquidity, this "on-screen" liquidity frequently is the only input assessed, as it is easily obtainable information. For a common stock, this assumption generally is correct. For ETFs, however, assuming that this on-screen trading volume is the only accessible liquidity, or that it's representative of the ETF's "real" liquidity, is incorrect. This misperception could dissuade some investors from accessing what might be the most efficient investment vehicle available to them. To discover an ETF's real liquidity, it is important to look at the primary market as well.

Primary market trading

While certain nuances of the process differ, an ETF's primary market trading is similar to that of a mutual fund. Through an intermediary, an investor requests to buy or redeem shares of an ETF from the issuer, increasing or reducing the shares outstanding and assets accordingly. Even more so than a mutual fund, ETF primary market trading takes place behind the scenes and investors likely will not see it from their perspective. However, it is important for investors to understand the mechanics behind it.

A few important points:

- The counterparty for a primary market trade is always the issuer, so investors likely need not worry about significantly affecting the ETF price due to size.

- Issuers typically require a minimum size block of ETF shares to transact, typically 25,000 or 50,000 units. This is called a creation unit, and differs from mutual funds that allow exact dollar amount purchases with much smaller size requirements. While aggregating shares into creation units sounds confusing, it's merely a minimum size required to avoid excessive operational processes and make the product more cost efficient. Trades less than the size of one creation unit, will have to access secondary market liquidity.
- Like mutual fund investors, ETF investors accessing the primary market will see one trade when they buy and one trade when they sell.

Creation/redemption basket and in-kind transactions

Each day, ETF issuers generate a daily basket of securities that is a representation of the fund holdings, which they send to the fund custodian, who then publicly publishes the basket holdings to various market participants. Since the posted basket is representative (similar weights) of the holdings of the ETF, it also reflects what the ETF wants to own. The basket of securities the issuer posts to the market daily has three purposes:

- **In-kind transactions:** The majority of creations/redemptions are required to take place in-kind, meaning that ETF units are created or redeemed for a representative sample of the current holdings of the ETF. In-kind transactions help ETF issuers manage taxes. They also increase efficiency and reduce certain exposures to tracking error and fund level transaction costs relative to their mutual fund counterparts. More importantly, they lead to increased transparency and the need for the "creation/redemption basket".
- **Creation/redemption process:** This basket is also what the ETF issuer will accept in exchange for issuing new ETF units and is what the ETF issuer will give out when shares are redeemed. Not coincidently, the size of the basket the issuer publishes is equivalent to 1 creation (or redemption) unit. Authorized participants (explained in the next section) know that the basket represents the fund holdings. They trade the basket to perform creations/redemptions and use the basket securities as a hedging tool when facilitating investor-driven trades.
- **Intraday valuation transparency:** The NAV of this basket is calculated and posted to the market every 15 seconds by the primary listed exchange and helps investors with intraday price (value) transparency.

Authorized participants

Authorized participants (APs) are the "gatekeepers" of ETFs in the primary market, acting as an intermediary between investors and issuers to facilitate transactions. Their existence is critical to the functioning of ETFs, because *only* APs are allowed to transact directly with the issuers. In fact, they must have a legal contract with the issuer to do so. Anyone who wants to buy or sell in the primary market must transact through an AP.

An AP's primary role is this: They act as a bridge to allow investors to access the primary market intraday. While ETFs trade on the secondary market, often times secondary liquidity isn't enough and investors require access to the primary market. The AP will short ETF shares, and go long the basket securities (hedge), knowing they can exchange those securities with the issuer for new ETF shares at the end of the day.

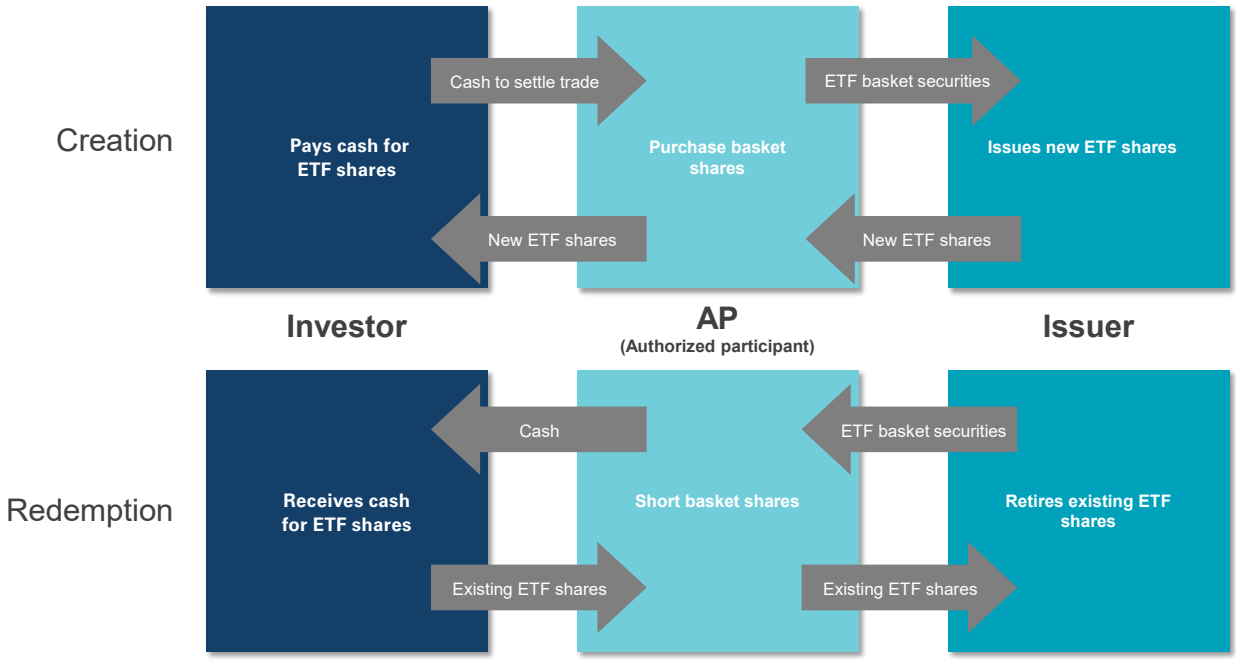
The fact that these new ETF units aren't truly issued until the end of the day doesn't affect the investor at all. In fact they won't even notice, only the AP and issuer are involved. Both the AP and the issuer prefer to wait until they can get a static NAV at closing prices to ensure the value is fairly exchanged. Generally there are too many holdings in an ETF to get a 100% accurate intra-day valuation of the ETF. APs perform the vital function of bridging the time gap, and they are willing to do so because they know that **the issuer will always be there to be the counterparty to issue new shares.**

Trading ETFs: The creation/redemption basket process

The terminology of the ETF creation/redemption process may make it sound complicated, but it is actually very basic. An investor who wants to buy shares of an ETF, contacts an AP and requests to buy some shares. The AP thinks the trade is too large given "on-screen" volume of the ETF and decides to utilize the primary market. To buy ETF shares directly from the issuer, the AP typically delivers exact quantities of each security in the published basket in-kind. The AP reviews the basket and its liquidity relative to the size needed to purchase. The AP will need to buy the basket once for each creation unit, so for an order of 8 creation units, the AP must buy the basket 8 times. The AP will then buy the basket and give the investor an aggregate price for ETF shares.

At this point, the AP is long the shares they need to exchange for units of the ETF, and short the ETF to the investor ("perfectly" hedged). Now, the AP will ask that the ETF issuer create new shares. The ETF issuer will give new shares of the ETF to the AP, and the AP will give them the basket shares they bought during the day. The AP will then pass the ETF shares on to the end investor in exchange for cash to settle the trade (this is all the investor sees).

The opposite happens upon redemption. The investor wants to sell and asks the AP to redeem the investor's shares back to the ETF issuer. The AP will sell shares of the basket (hedging and facilitating the redemption) in an amount that matches their investor demand, and tells the issuer they will redeem ETF shares. At the end of the trading day, the ETF issuer will take back the ETF shares and give the AP a representative amount of the basket shares. The AP already has sold short basket shares, so they use the shares from the issuer to offset their short positions, passing the sale proceeds onto the investor. Below is an illustration of each process.



Primary market trading example

Step 1: An investor wants to buy an ETF with the ticker XYZ. XYZ is trading at $25 with 50,000 shares outstanding. It tracks an index comprised of four securities, A, B, C and D, equally weighted at 25% each. Creation unit size is 50,000, so there is only one creation unit outstanding (50,000 existing shares/50,000 shares per creation unit). Table 1 below is a summary of the current ETF holdings. You can see that each of the securities has the same market value. Dividing the AUM by the ETF shares outstanding, you get the NAV price per ETF share. (Don't get too bogged down in the creation units vs. shares, creation units is just an additional size metric).

Table 1

Underlying holding	Price	Shares owned	Market value
A	100	3,125	$312,500
B	50	6,250	$312,500
C	125	2,500	$312,500
D	25	12,000	$312,500
			$1,250,000 (AUM)
Creation units outstanding			**1**
ETF shares outstanding			**50,000**
NAV (Total Net Asset Value/shares outstanding)			**$25**
Market price/share			**$25**

Step 2: XYZ trades 2,000 shares/day ($50,000 value) in the secondary market. Per the previous example, the total AUM of the fund is $1.25 million (AUM is similar to market cap for a traditional equity). For this example, an investor decides they want to buy $10 million of XYZ. Only factoring the existing ETF shares outstanding and the current liquidity of the ETF in the secondary market, investing $10 million would be literally impossible. There are not enough shares outstanding to meet this investor demand in the secondary market, even if the stock had sufficient trading liquidity. This investor must look to the primary market to invest.

Step 3: The investor begins by talking to their broker, who may or may not be an AP. If the broker is not an AP, the broker will contact an AP and the process will be the same. The broker will tell the AP that they want to buy $10 million of XYZ. Now you start to see what role the AP plays in this process. Knowing the creation basket size, simple multiplication will determine how many shares of each underlying security the AP needs to purchase to own $10 million of holdings that match the ETF holdings. Per table 1 above, each creation unit is worth $1.25 million. Dividing $10 million by $1.25 million determines the purchase amount of 8 creation units. To know how many shares of each holding the AP needs to purchase multiply the shares needed for one creation unit by 8 (creation unit size times 8 equals the number of desired shares). Below are the calculations along with the daily liquidity of each security relative to the size targeted for investment.

Table 2

Underlying holding	Price	Holding shares per creation unit	Holding value per creation unit	Desired shares[1]	Average daily volume (ADV) (shares)	Percent of ADV[2]
A	$100	3,125	$312,500	25,000	2,305,911	1.08
B	$50	6,250	$312,500	50,000	3,815,225	1.31
C	$125	2,500	$312,500	20,000	1,275,888	1.57
D	$25	12,500	$312,500	100,000	13,407,891	0.75
			1,250,000			

[1] Creation unit size times 8
[2] Desired shares divided by the underlying holdings ADV

Step 4: Knowing the trade is not feasible in the secondary market, the broker will look at the liquidity of the basket (Table 2). Over the course of any given day, the AP would be able to purchase the full basket in the desired shares (in table 2) without a substantial effect on the underlying holding as a percent of average daily trading volume, or ADV (max volume required is 1.57%, per the percent of ADV column in table 2 above). This is representative of the true liquidity of the ETF and why the "on-screen" secondary market volume alone is not a good barometer of actual investability.

Traders will use this and other information, such as bid/ask spreads of the underlying holdings, to quote a price at which they will execute their demand for the ETF. Investors can then determine if that price seems fair, or negotiate and execute accordingly.

Keep in mind, an investor just bought 400,000 shares of XYZ, which previously had only 50,000 shares outstanding and traded 2,000 shares a day! This highlights that the true liquidity of an ETF lies with the underlying holdings and the secondary market trading. The liquidity of the underlying holdings may be substantially greater than the trading of ETF shares on the secondary market as in this case.

Step 5: The broker gave the investor an offer price for their demand of 400,000 ETF shares (8 creation units with each creation unit being 50,000 ETF shares) at $25. Upon execution, the investor is long those shares, but the AP is now short 400,000 shares. This is where the importance of the AP and the functionality of the basket are displayed. APs are able to neutralize the trade, or hedge themselves by buying up the basket of securities in the quantities needed to create the shares the investor just bought.

There has been no direct interaction with the issuer up to this point. Now, the AP will transact with the issuer using the creation/redemption process to create more units with XYZ issuer. The AP will notify XYZ issuer that they would like to create 8 new creation units (400,000 ETF shares). At the close of business, the AP will give XYZ issuer all the shares of underlying holding A, B, C and D they bought in exchange for 400,000 new ETF shares at the determined NAV.

Then the AP will give the new shares to the investor, so the investor now is long the desired position. The AP is no longer short the shares and has delivered the shares of the underlying holdings they bought to XYZ issuer and no longer holds a position. XYZ issuer now manages another $10 million and has an additional 400,000 units outstanding. Table 3 below is how the ETF looks now.

Table 3

Underlying holding	Price	Shares owned	Market value
A	$100	28,125	$2,812,500
B	$50	56,250	$2,812,500
C	$125	22,500	$2,812,500
D	$25	112,500	$2,812,500
			$11,250,000 (AUM)
Creation units outstanding			**9**
ETF shares outstanding			**450,000**
NAV (Total Net Asset Value/shares outstanding)			**$25**
Market price/share			**$25**

Redemption process:
XYZ has remained at $25 and the investor wants to exit their entire position. They still own 400,000 of the 450,000 ETF shares outstanding, which would be problematic if this were a common stock, as finding a buyer of almost 90% of outstanding shares of a common stock would be extremely difficult, for many reasons. However, to sell this position in XYZ, investors go back to their trader and request to sell. The AP will buy the ETF shares from the investor while simultaneously hedging by selling an equivalent dollar amount of basket shares.

At the end of the trading day, at NAV, the AP will give shares of the ETF back to XYZ issuer, and XYZ issuer will give the AP an equivalent value of basket holdings (in-kind goes both ways). Because the AP already is short these same holdings, those positions offset. The AP is left with the cash from its short sales, which it passes on to the investor after a very small fee, and the AP is left neutral. The shares outstanding for the ETF are reduced to 50,000 and the transaction is complete.

Percentage ownership and volume summary
This transaction highlights that neither the percentage of ownership nor on-screen liquidity (while important to stocks) are effective metrics for evaluating an ETF. Assuming one orignial investor owned all 50,000 shares of XYZ, their ownership went from 100% to approximately 11% for six months, then back to 100%.

Because the number of ETF shares is changing constantly, percentage of ownership and volume metrics should be applied only to the underlying holdings, not the percentage of shares outstanding of the ETF. In this case, the investor's $10 million investment required they own only approximately 1% (per table 2) of a normal day's trading volume in underlying holdings, which is generally viewed as a very liquid investment. Thus the investor was able to invest in a perceived illiquid ETF with relative ease given the underlying holding's liquidity.

Conclusion
Given the many advantages offered by ETFs, their rapid rise in popularity is not surprising. In addition to their potential tax benefits, transparency and typically lower fees, they serve as an innovative investment solution by which even the most novice investors can gain exposure to different styles, sectors, industries and market segments, adding a measure of diversity to a larger portfolio at a reasonable cost.

Disclaimer

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