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> THE HEARTBEAT OF ETF
TAX EFFICIENCY

By Elisabeth Kashner

› ETFS ARE HIGHLY TAX EFFICIENT, UNLIKE MUTUAL FUNDS.

At year-end, many mutual fund investors receive unwelcome news of a taxable capital gains distribution, even if they sold no shares during the year. ETFs rarely make such distributions, thus endearing themselves to cost-conscious investors.

Many ETF investors appreciate the tax break, but few understand the technology of in-kind share creation and redemption that makes ETF tax efficiency possible. In-kind creation/redemption is powerful, as it allows ETF portfolio managers (PMs) to handle client redemptions without incurring any tax liability. In recent years, PMs have cooperated with broker/dealers to leverage the creation/redemption process for portfolio rebalances, thus eliminating a major source of pass-through capital gains charges.

While the cooperation occurs behind the scenes, it leaves traces not just in obvious places such as daily portfolio files, but throughout ETF time series data, with a signature “heartbeat” pattern in the fund flows prior to and on index rebalance dates and, less visibly, in incrementally depressed index and NAV returns. The heartbeat trade allows ETF market-making broker/dealers to front-run rebalance trades. While the benefits of the tax savings are enormous, they may come at the cost of eroding a high-turnover strategy’s edge, or alpha.

Here we will trace the process of a “heartbeat” rebalance, illustrating the bespoke use of the creation/redemption process and analyzing its impact on investor costs and returns. A description of creation/redemption comes first, followed by a walk-through of the evidence for “heartbeat” trades, an overview of the key players, a step-by-step analysis of a single rebalance trade, and finally a recounting of the costs and benefits of heartbeat portfolio rebalances.

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CREATION/REDEMPTION

Behind ETF tax efficiency is a financial technology that allows ETF portfolio managers to add or remove shareholder assets without ever handling cash or trading on the exchange floor. The ETF creation/redemption process allows specialized broker/dealers called Associated Persons (APs) to deliver a basket of securities to the ETF portfolio manager and to receive shares of the ETF in exchange. This is called an in-kind exchange, as the AP delivers securities that are equivalent in value to ETF shares. This process works in reverse, too. APs can deliver ETF shares to the ETF asset manager and receive a basket of securities. In-kind redemptions are not taxable events, as the portfolio manager never sells any portfolio securities.

In-kind creation/redemption is designed to support investor transactions—that is, the purchase or redemption of shares by the investing public. The process is considered tax fair because it isolates the trading activity around a purchase or sale to the parties involved and does not socialize the tax cost of such transactions amongst the shareholder base. As a bonus, in-kind creation/redemption provides an arbitrage mechanism that incentivizes APs to keep ETF trading prices close to portfolio values throughout the trading day.

In recent years, creation/redemption has been put to work to support a different kind of transaction: the portfolio rebalance. A rebalance takes place when there is a change to the composition of an ETF's underlying index. Complex indexes such as those underlying most "smart beta" funds require periodic rebalances to keep the strategy on target. The practice of replacing winners with fresh prospects is key to these strategic indexes' value proposition.

To keep the portfolio matching the index constituents, an ETF portfolio manager would normally sell and buy stocks or bonds for cash in an exchange or OTC transaction. Any position sold at a gain incurs a capital gains tax liability. Thus, rebalances can have tax consequences, even as they maintain overall portfolio strategy.

In-kind redemptions can remove the tax liability. The higher an ETF portfolio's turnover, the greater the benefit of (and the need for) in-kind redemptions. Yet the redemption process normally depends on customer order flow. Day-to-day trading activities sometimes don't create enough opportunity to wash out gains, especially when volumes are thin or markets are balanced between natural buyers and sellers. In fact, if a portfolio manager must rebalance on a specific date, he or she runs the risk that no AP will choose to redeem shares that day.

Yet few high-turnover ETFs distribute capital gains. Portfolio managers seem to be getting the redemptions they need on the exact right day. Fund flow charts show a pattern: huge inflows in the days prior to an index rebalance, followed by equally large outflows on rebalance day.

This practice is common in the ETF industry. Evidence of large inflows that reverse on rebalance day can be found in ETFs from almost all large asset managers and in many of the funds from smaller issuers, as well. Once you know what to look for, it's easy to see these extraordinary flows. They look like an EKG tape.

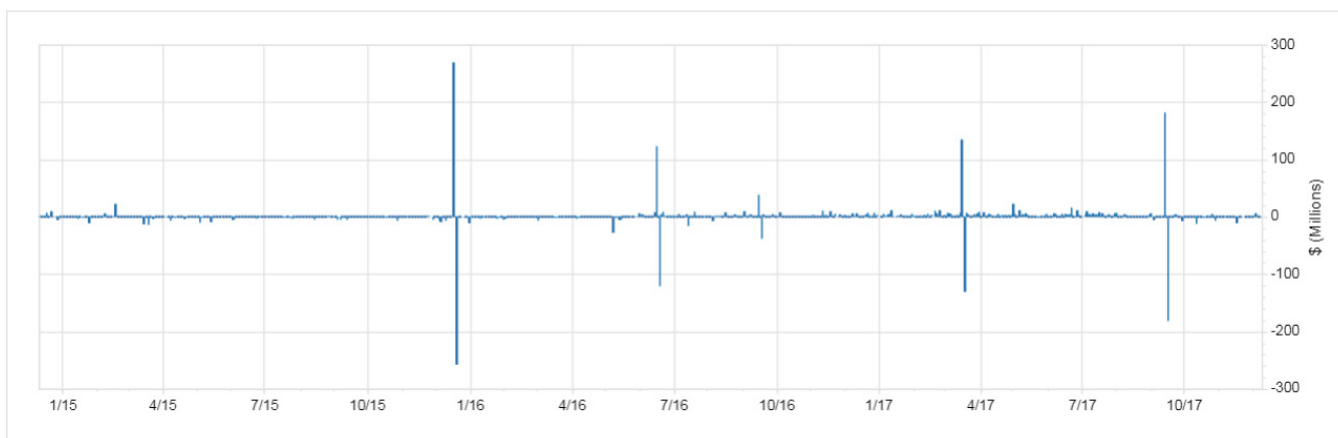
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HEARTBEAT FLOWS

Behind the scenes, someone provides short-term capital to fund share creations in ETFs slated to rebalance their portfolios. This short-term access to capital allows ETF portfolio managers to essentially manufacture redemptions that wash out capital gains that would otherwise be realized in a rebalance. The capital is required for less than a week, often for just one to three business days, as it will be returned as soon as those shares are redeemed. Put another way, something like a short-term loan—sometimes over \$1 billion in market value—is behind ETF tax efficiency.

VanEck Vectors Morningstar Wide Moat ETF's (MOAT-US) three-year flow chart shows a healthy-looking pattern of huge inflows and matching outflows two business days later.

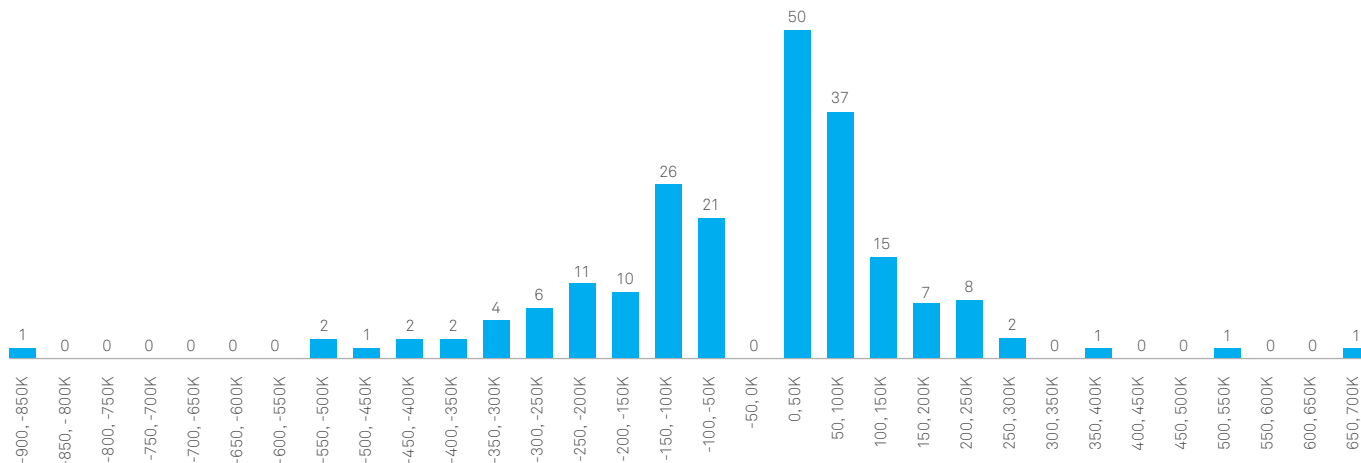
FIGURE 1: MOAT FUND FLOWS 12/2014–12/2017



Source: FactSet

MOAT's "heartbeat" flows are revealing. They skew the scale of the chart, rendering normal flows almost invisible. Since January 1, 2015, MOAT has had flows—in or out—207 times, excluding rebalance days. The most common was a single creation unit, or 50,000 shares. Outflows were rarely bigger than 200,000 shares.

FIGURE 2: MOAT FLOWS 2015–17 EXCLUDING REBALANCE DATES



Source: FactSet

By contrast, Figure 3 shows flows from rebalance weeks in 2015–17. Shares created and redeemed range from 1 million to 9 million, dwarfing the day-to-day flows.

The pattern is clear: inflows a few trading days ahead of time, outflows on rebalance Monday. The benefit is enormous: MOAT turned over 25% of its portfolio in the September 2017 rebalance. The realized gains could be significant, especially in a hot equity market. That could make for a hefty tax bill come year-end, an unhappy holiday gift.

ENTER THE HAPPY TRADE

Someone created 4.5 million shares on September 14, 2017, a 14% increase in shares outstanding. While we cannot know the exact source of the creation, the pattern of outsized creations and redemptions shown above suggests that MOAT’s portfolio manager could count on a 4.5 million-share redemption on rebalance day. That’s a huge opportunity to in-kind away low-basis stock at no cost to the fund holders.

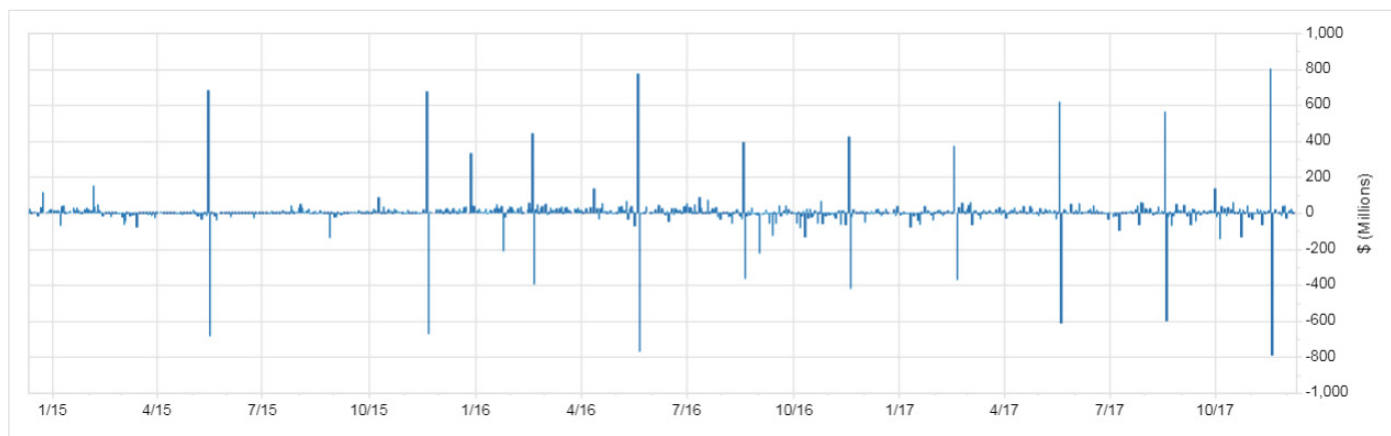
MOAT is hardly the only fund to display the “heartbeat” flow pattern. Other prominent funds with a similar pattern include PowerShares S&P 500 Low Volatility Portfolio (SPLV-US), First Trust Morningstar Dividend Leaders Index Fund (FDL-US), and Vanguard Russell 1000 Value ETF (VONV-US). These charts show three years of flows for SPLV and VONV.

FIGURE 3: MOAT FLOWS 2015–17 DURING REBALANCE WEEKS

DATE	CHANGE IN SHARES OUTSTANDING
09/18/2017	-4,550,000
09/14/2017	4,500,000
03/20/2017	-3,500,000
03/16/2017	3,500,000
09/19/2016	-1,150,000
09/15/2016	1,150,000
06/20/2016	-3,750,000
06/16/2016	3,750,000
12/21/2015	-9,000,000
12/17/2015	9,000,000

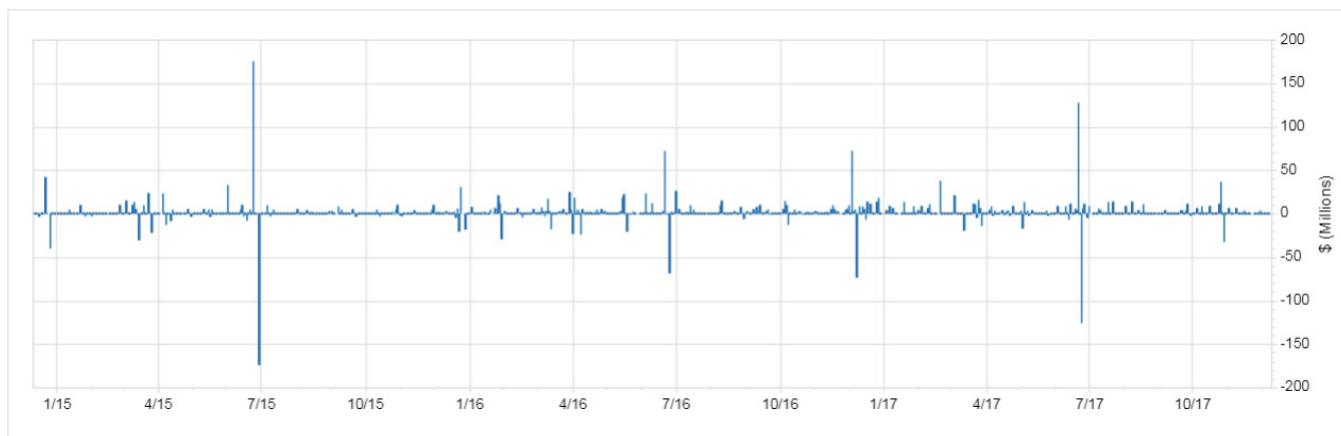
Source: FactSet

FIGURE 4: SPLV FUND FLOWS 12/2014–12/2017



Source: FactSet

FIGURE 5: VONV FUND FLOWS 12/2014–12/2017



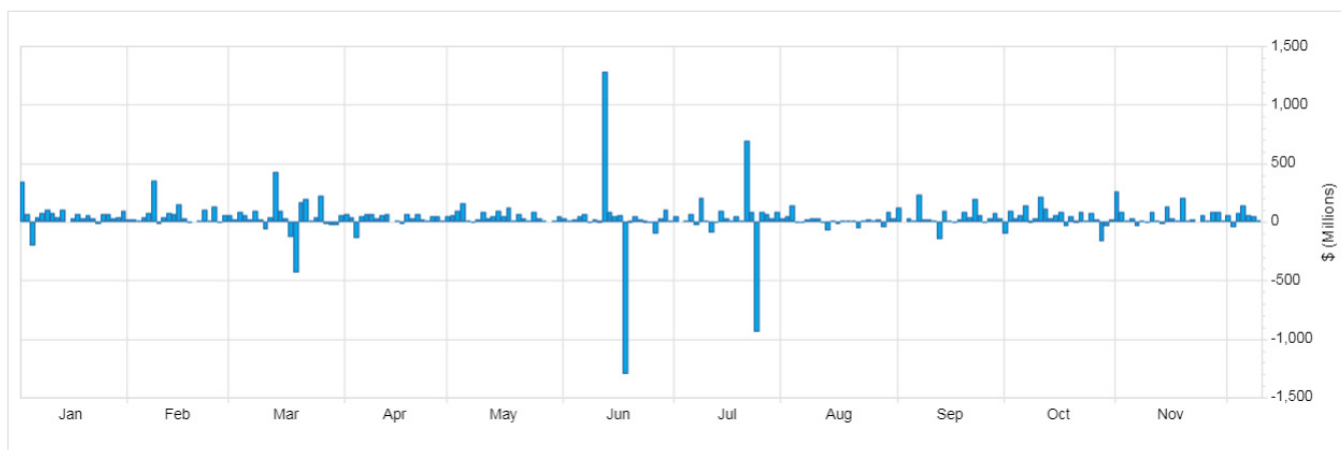
Source: FactSet

VanEck is but one of many issuers whose rebalance date fund flows look like an EKG. ETFs from nearly every large ETF issuer, and many smaller ones, show the heartbeat flow pattern, sometimes for nearly every fund and sometimes used quite selectively. Most commonly these were high-turnover portfolios, mostly in smart beta products, but there were also those with equal-weighting and active management; even vanilla funds benefit sometimes.

Vanguard Total Stock Market (VTI-US) experienced a large, quick inflow and outflow in the third week of March and June 2017,

on dates that match its underlying index's rebalancing window. VTI rebalanced approximately 1.2% of its portfolio in June 2017 (weight based on a comparison of FactSet's daily ETF holdings data for May 31 and June 30, 2017). VTI had an abnormally large inflow of 10.2 million shares on June 13, coupled with an outflow of 10.4 million shares on June 19. Those 10.2 million shares are about 1.6% of VTI's ETF shares outstanding, though VTI's portfolio is mostly held in mutual fund format (about 7/8 of VTI's portfolio by dollar value was held via mutual fund share classes as of October 31). Figure 6 shows VTI's flows in 2017.

FIGURE 6: VTI FUND FLOWS 2017



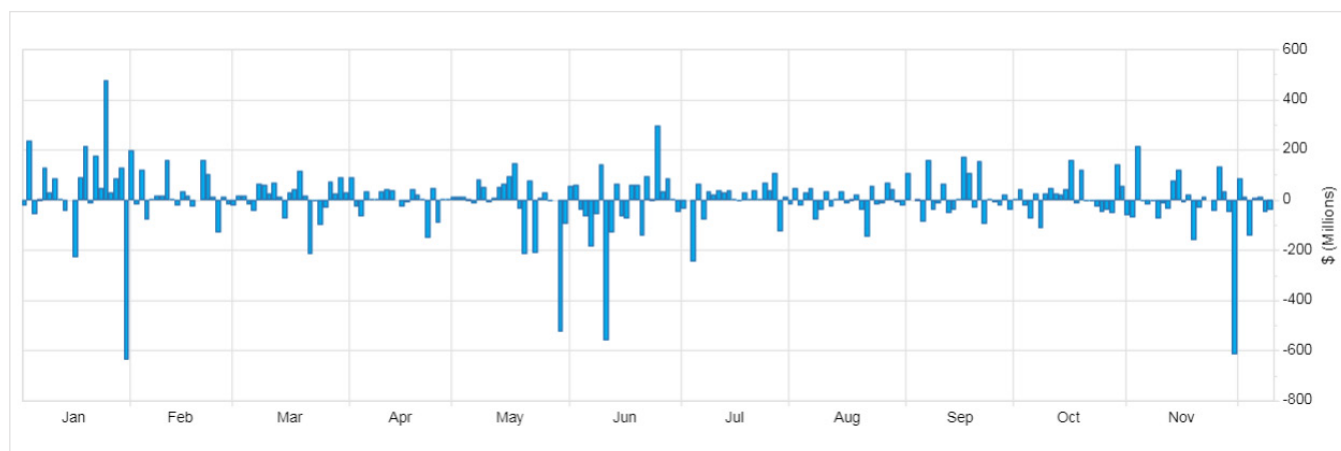
Source: FactSet

If VTI, one of the lowest-turnover ETFs in the entire U.S. ETF landscape, takes advantage of well-timed inflows and outflows, it's a clear sign that virtually any ETF would benefit from this practice.

Of course, some funds have tremendous turnover in shares outstanding because of active trading that leads to daily creations

and redemptions. The Technology Select Sector SPDR Fund (XLK-US) is a great example, with 100 days of net redemptions year-to-date through December 6. Low portfolio turnover coupled with consistent redemption activity allows many opportunities for washing out low-basis positions. We can see this in Figure 7.

FIGURE 7: XLK FUND FLOWS 2017



Source: FactSet

TRACING THE MONEY FLOWS: KNOW THE PLAYERS

The trading activities around ETF portfolio rebalances are not free. In fact, this is one area where ETF transparency can bring additional costs. Following the portfolio rebalance money—the inflows, outflows, and trading activity in the underlying securities—makes these costs knowable. The money trail is complex but traceable. The first step is to understand the players and what role each plays.

The most plausible sources of the heartbeat cash are asset management firms and trading firms. Other types of lenders would likely shy away from the overnight exposure to changes in asset prices, as one day's adverse movements in the stock market could easily wipe away any interest charges. Put another way, the basis risk is too high to make this loan profitable for anyone who cannot hedge it or otherwise offset the risk.

Asset managers benefit from eliminating capital gains exposure while trading firms benefit from executing trades in the securities markets. Although asset managers have plenty of reason to lend capital to their portfolio managers in order to set up an outflow, they are legally prohibited from doing so, as this would constitute self-dealing.

That leaves the market makers. These broker/dealer firms have access to capital, holdings, and rebalance information, as well as the technical expertise to anticipate portfolio managers' needs. Rebalance trades provide an excellent opportunity for trading firms to deploy capital, with the expectation of profiting from the associated trading opportunities. Because most ETF issuers have a capital markets desk that works with market makers on keeping the ETF shares trading close to net asset value, they have plenty of experience communicating about and coordinating creations and redemptions.

Off-the-record conversations with ETF market makers and asset managers have confirmed this assessment. The trades in the ETF itself, meaning the massive heartbeat inflows and outflows, come from ETF trading desks at capital markets firms. These firms partner, officially or informally, with ETF portfolio managers to facilitate smooth, tax-efficient portfolio rebalances.

PORTFOLIO SECURITIES TRADES

ETF portfolio managers must plan their rebalance trades carefully because of their strict index-tracking mandate. They need to know precisely which shares to buy and sell, so that they can keep the portfolio aligned with the index. Indexes can rebalance overnight by simply swapping out one position for another. Portfolio managers, on the other hand, must trade securities, executing real purchases and sales on the trading floor.

If portfolio managers can expect outflows on rebalance day, they have the option of exchanging securities for ETF shares in kind. Redemptions on rebalance day mean that the PM has two ways

to trim positions: outright sale or in-kind redemption. The first is best for harvesting capital losses, the second for washing away capital gains. Careful planning is needed regardless.

The massive heartbeat flows allow ETF portfolio managers to plan their redemptions with confidence. The inflows strongly suggest matching outflows on rebalance day, making the redemptions predictable. The size of the redemption basket is also known, as the PM can assume that the outflow share count will match the inflows.

PLANNING AND COORDINATION

Clearly, this process works best if the two parties can coordinate, which can be done without outright collusion. Indeed, much of the information needed for planning is public, since the PM is legally required to publish the exact redemption list prior to the market opening, specifying both the securities and their quantities made public via the NSCC. Moreover, daily fund flow data allows for tracking of the transaction price of each portfolio constituent. Careful accounting makes it possible for the broker/dealer to forecast the dollar value of embedded capital gains.

If the market makers know the dollar value of the capital gains exposure, they know how much capital to inject in order to optimize the redemption basket dollar value. The PM can use the basket size to plan for allocating position reductions between outright sales and in-kind redemptions.

ETF trading desks at capital markets firms partner, officially or informally, with ETF portfolio managers to facilitate smooth, tax-efficient portfolio rebalances.

HOW TO PUT ON A REBALANCE TRADE

Here is how each side likely plans its part of the rebalance trade.

The Market Makers:

1. Total up the accrued capital gains in positions that will need to be trimmed.
2. Create that value in ETF shares, a day or two prior to the rebalance.
3. During the course of the rebalance day, establish a short position in the securities that will be removed from the portfolio via the redemption basket.
4. At the end of the day, tender the ETF shares for redemption.

At the end of the rebalance day, the market maker should have no position in the ETF or its underlying securities. The ETF shares created in Step 2 are redeemed in Step 4, while the short positions from Step 3 are neutralized by the long positions received in the redemption basket. If this is done correctly, market makers pocket the difference between the sale price and the day's closing price.

The Portfolio Managers:

1. Note the inflows from the creations ahead of the rebalance.
2. Identify the lowest-basis securities and mark them for the rebalance day redemption basket.
3. Build three lists: buys, sales, and redemption basket.
4. In cases where a single name might go in both the sales and redemption baskets, split them proportionally, based on available space in the basket (known from Step 1) and capital gains exposure (from Step 2) on a single-lot basis.
5. On rebalance day, publish the rebalance-specific creation and redemption baskets with the NSCC.
6. Execute the buys and sales, possibly working with a broker/dealer.
7. At the end of the trading day, accept shares of the ETF from the market maker in exchange for the redemption basket.

If portfolio managers and their partners have done this well, at the end of the day the PM will have a portfolio that matches the reconstituted index and no capital gains exposure. They might have accrued a tax credit if the sales generated capital losses. Additionally, if buys and sales are executed at the market closing price, this exercise will have perfect index tracking, as index reconstitutions and rebalances are accounted for based on the closing price. The round-trip heartbeat trade marries the interest of APs and PMs; APs have the opportunity to front-run the rebalance while PMs can rebalance their portfolios without incurring capital gains.

HEARTBEAT TRADE FORENSICS

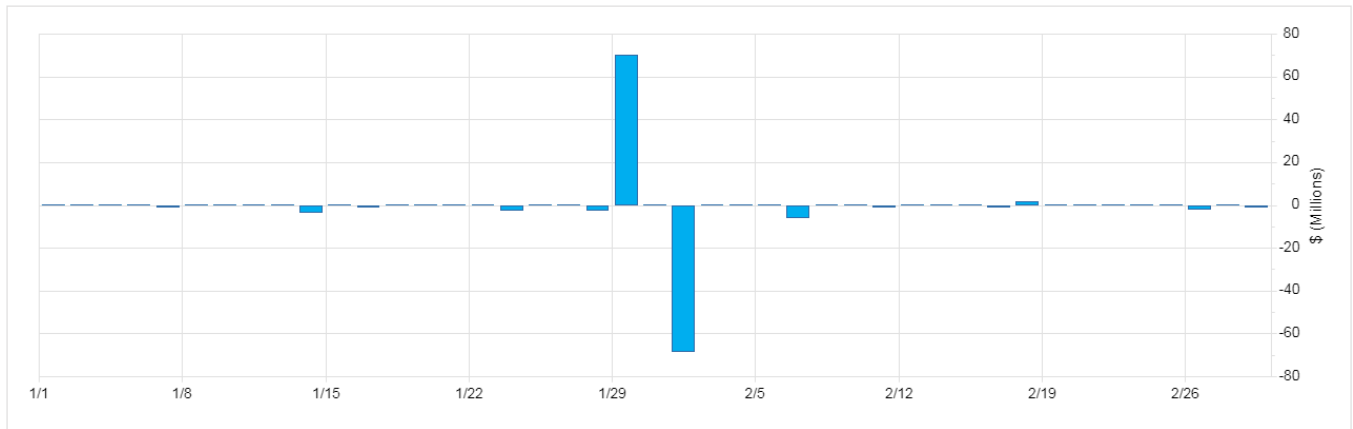
Heartbeat trades leave a data trail, observable in fund flows but also in ETF portfolios and on the trading history of each stock involved. Together, these datasets offer a toolkit for assessing these hidden costs forensically. One trade in a specific fund illustrates the process.

ProShares S&P MidCap 400 Dividend Aristocrats ETF's (REGL-US) small portfolio size of only 52 stocks, proportionally large "heartbeat flows," overall low level of creation/redemption activity, and low average portfolio security volume make it a good candidate for forensic identification of traces of a

heartbeat trade. Of course, REGL is but one of many ETFs that benefit from these heartbeat flows.

REGL's underlying index, the S&P MidCap 400 Dividend Aristocrats, reconstitutes annually after the close of the last business day of January. REGL's portfolio must follow suit. The process begins a few days ahead of time, on January 29, with a massive inflow, which sets up an equally large outflow on January 31. Figure 8 shows a close-up of January and February flow activity.

FIGURE 8: REGL FUND FLOWS JANUARY 18 TO MARCH 18



Source: FactSet

REGL gained and lost 1,250,000 shares during the final three days of January. That's about 15.9% of starting AUM. In dollar terms, that's \$69.45 million in and \$68.44 million out. Portfolio data shows the inflows clearly. Every one of REGL's 44 securities increased in share count by 15.91% between Friday, January 26 and Monday, January 29 in each of REGL's 44 equity positions.

The January 29 portfolio changes and flows match in dollars, as well as percent. These portfolio share count increases were worth \$69.47 million at the day’s closing price, matching the \$69.45 million net inflows number almost exactly.

January 31 turned out to be a big turnover day for REGL. Comparing holdings between January 30 and 31, we find that REGL added eight new positions, increased the size of one existing position, and trimmed 43 positions. These trades netted out as a \$68.44 million sale, including some balancing cash.

Two examples—one buy in Flowers Foods (FLO-US) and one sell of Nordson Corporation (NDSN-US)—offer a window into the mechanics and profitability of these trades.

FIGURE 9: SHARE COUNT CHANGES ON THE HEARTBEAT INFLOW DAY

TICKER	SHARE COUNT		PERCENT CHANGE
	01/26/2018	01/29/2018	
ATO	110,968	128,624	15.91%
BRO	193,684	224,500	15.91%
CDK	142,969	165,719	15.91%

Source: FactSet

BUYING THE NEW POSITIONS

REGL initiated a position of 431,423 shares in Flowers Foods on January 31. FLO’s composite tape shows a trade of 431,423 FLO shares reported at 4:19:22 p.m., using Form T, which indicates a late report. It appears as a block trade (BK), reported via the FINRA alternative display facility. FINRA’s ADF is used for reporting transactions from dark pools.

The price was equal to the day’s closing price of \$19.610, as you can see by looking at the 535,232 share print from the NYSE, marked “CLS” in the right-hand column.

FIGURE 10: FLOWERS FOODS (FLO) COMPOSITE TAPE

Flowers Foods, Inc.											USD
Last	Chg	%Chg	Bid	Ask	Vol	CVol					Turnover
21.28	D -0.09	-0.42%	17.01	25.65	148006	791,904					20008.32
Date/Time Range	Time	Price	Vol	Exch	Bid	BSize	ASize	Ask	CVol	VWAP	
	16:31:17	19.610	106	FINRA ADF	18.590	6	3	20.000	2,062,153		.T, AVP
	16:31:14	19.610	2,151	FINRA ADF	18.590	6	3	20.000	2,062,047	19.5782	.T
01/31/2018	16:19:22	19.610	431,423	FINRA ADF	18.590	6	3	20.000	2,059,896		.T, AVP, BK, XLT
	16:06:31	19.610	200	FINRA ADF	18.590	6	3	20.000	1,628,473	19.5782	.T
1 Day Ago	16:06:30	19.610	1,314	FINRA ADF	18.590	6	3	20.000	1,628,273		NXT, .T, x
	16:06:30	19.610	22,945	FINRA ADF	18.590	6	3	20.000	1,626,959	19.5782	.T, BK, XLT
04:00:00	16:06:28	19.610	6,570	FINRA ADF	18.590	6	3	20.000	1,604,014	19.5777	.T
	16:06:04	19.610	662	FINRA ADF	18.590	6	3	20.000	1,597,404	19.5776	.T
	16:06:04	19.610	3,133	FINRA ADF	18.590	6	3	20.000	1,596,742	19.5775	.T
	16:06:03	19.610	400	FINRA ADF	18.590	6	3	20.000	1,593,609	19.5775	.T, PRF
01/31/2018	16:06:02	19.610	535,232	NYSE	18.590	6	3	20.000			CLS
	16:06:02	19.610	535,232	NYSE	18.590	6	3	20.000	1,593,209	19.5775	CLT, BK, XLT

Source: FactSet

There is additional information about this trade in the far right-hand column. The code “AVP” tells us that this was reported as an average price trade. According to FINRA’s Trade Reporting FAQ (A404.1), AVP flags the customer leg of an order that a dealer worked during the trading day. The broker/dealer selling to the REGL PM likely bought shares throughout the trading day and then sold them at the close at a mark-up.

All eight new additions and the one position increase in REGL’s portfolio for January 31 are reflected on the tape the same way. All have time stamps of 4:19:22 p.m., with block trade and AVP flags and with prices that match the day’s official closing price.

These customer trade flags strongly suggest that REGL’s portfolio managers worked with a broker/dealer to execute the buy list. The fact that the trades were priced at the day’s closing price supports this assertion, as we know the portfolio managers want to minimize tracking error.

THE SELL SIDE

Now, to confirm sales and redemptions.

On January 31, REGL trimmed its position in Nordson by 31,644 shares. According to REGL’s daily holdings, the ETF held 88,353 shares of NDSN on January 30, but only 56,709 shares on January 31. We are looking for a trade of 31,644 shares.

But no 31,644 block of NDSN traded on January 31.

At 4:19:22 p.m., there was a FINRA ADF trade for 10,394 shares of NDSN, reported with codes T and AVP, same as we saw with FLO. This was a late, average price trade, just like FINRA specifies for customer legs of a dealer’s worked order. The price was equal to the day’s official closing price, like the buys we just saw.

FIGURE 11: NORDSON CORPORATION (NDSN) COMPOSITE TAPE

Nordson Corporation											USD
Last	Chg	%Chg	Bid	Ask	Vol	CVol	Turnover				
137.17	D	-0.49	-0.36%	137.02	137.20	100	65,201				8956.01
Date/Time Range	Time	Price	Vol	Exch	Bid	BSize	ASize	Ask	CVol	VWAP	
	17:56:34	143.720	3,430	FINRA ADF			1	154.010	488,946		NXT, .T, x
	16:19:22	143.720	10,394	FINRA ADF	135.680	1	1	151.600	485,487		T, AVP, BK, XLT
	16:00:14	143.720	3,007	FINRA ADF	143.220	1	1	143.840	475,093	143.8603	.T
	16:00:14	143.720	187	FINRA ADF	143.220	1	1	143.840	472,086		NXT, .T, x
	16:00:13	143.720	46,100	FINRA ADF	143.220	1	1	143.840	471,899	143.8613	.T, BK, XLT
	16:00:13	143.720	15,400	FINRA ADF	143.220	1	1	143.840	425,799	143.8798	.T, BK, XLT
	16:00:12	143.720	937	FINRA ADF	143.220	1	1	143.840	410,399	143.887	.T
	16:00:07	143.720	1,850	FINRA ADF	143.220	1	1	143.840	409,462	143.8875	.T
	16:00:03	143.720	500	FINRA ADF	143.610	2	2	143.680	407,583	143.8884	.T
	16:00:00	143.720	177	FINRA ADF	143.650	11	268	143.680	407,083	143.8887	
	16:00:00	143.720	184,148	NASDAQ	143.650	11	268	143.680			CLS
	16:00:00	143.720	184,148	NASDAQ	143.650	11	268	143.680	406,866	143.8888	CLT, CRX, x, BK, XLT

Source: FactSet

The 10,394 trade was almost certainly executed by broker/dealers, as one of the trades on the PM’s sale list. Yet this trade accounted for only about one-third of the position change. We must still account for the other 21,250 shares.

But again, there was no print of 21,250 shares, so we must look harder.

REVERSE ENGINEERING THE REDEMPTION BASKET

REGL's portfolio managers likely split the position reductions between the sale list and the redemption basket, placing the lowest-basis stocks in the redemption basket and perhaps realizing capital losses by selling high-basis stocks outright. The 21,250 shares could easily have gone in the redemption basket.

While we cannot find the 21,250-share trade on the tape, we can account for it nonetheless.

The total value of all position reductions should equal the broker/dealer net sales plus total outflows. If so, then the shares not traded in dark pools at 4:19:22 p.m. constitute the redemption basket.

We can see trades in all 43 REGL stocks with January 31 share reductions with timestamps at 4:19:22 p.m. on January 31. All had FINRA ADF trades with the Form T and AVP flags, same as the buys. The total dollar volume traded was \$67.23 million.

The total value of positions trimmed in REGL on January 31 was \$135.18 million: \$135.42 million - \$67.23 million = \$68.19 million. Add back the cash and that number becomes \$68.44 million, the value of REGL's outflows on January 31.

Therefore, the balance of position reductions not sold via broker/dealers went in the redemption basket. We can determine each position's split between broker/dealer and basket trades by subtracting the size of the FINRA ADF trade from the overall position reduction.

MARKET MAKER ACTIVITY

During regular trading hours (excluding the opening and closing auctions), the median NDSN trade was a mere 50 shares. The largest non-customer trade was only 2,567 shares. The 21,250 must be scattered among the tiny trades that comprise the bulk of NDSN's activity. We will not be able to discern which of the tiny trades to attribute to the market maker. The best we can do is to assume that the market maker traded at approximately the day's volume-weighted average price, also known as the VWAP.

The REGL-US example shows that it is entirely possible for an ETF to have low all-in costs, including trading costs, expenses, tracking difference, and tax liabilities, but still leak cash.

ADDING IT ALL UP

Now that we have the prices and quantities for all the rebalance trades, we can figure out how each of the players—the PM, the broker/dealer, and the market maker—benefits. Our example positions, FLO and NDSN, help illustrate the situation.

The portfolio managers bought FLO from the broker/dealer, paying the closing price of \$19.61. VWAP—our assumed B/D execution price—in FLO was \$19.57823. Profit equals \$0.031766 per share, or \$13,704.58 for the trade.

The PMs sold NDSN to the market maker at \$143.72. NDSN's VWAP was \$143.8603. That's a \$0.14029 per share profit, totaling \$4,439.37.

The buy and sell list trades were profitable. The difference between selling at VWAP and buying the shares back at the closing price, multiplied by the number of shares traded, summed up over each position, comes to \$96,700.21 for the sell list and \$44,866.01 on the purchases, based on buying at VWAP and selling at the closing price.

The market maker did well, too. The difference between selling short at VWAP and buying back shares on the close, for the 41 positions in the redemption process, was \$121,553.04. All told, the broker/dealer and the market maker's net profit came to \$263,119.26, or 0.06% of the AUM on January 31.

For most fund holders in taxable accounts, the capital gains avoidance is almost certainly worth more than the slippage from adding market makers and broker/dealers to the mix. The capital gains could have run in the hundreds of basis points, while the capital markets slippage from the redemption trade amounted to only 0.03% of the January 26 AUM.

The broker/dealer gains cost another 0.03% of AUM. It's entirely possible that this is a reasonable price to pay for removing execution risk and for keeping tracking tight.

Perhaps the biggest take-away from this exploration is that rebalances are not free. ETF strategies that require frequent or significant rebalancing or reconstituting bring with them the risk that the potential outperformance of the strategies gets eaten up by front-running on the trading floor. If the 0.06% slippage from REGL's January reconstitution recurs in the quarterly rebalances, REGL would earn approximately 0.24% less than it would if index tracking and tax avoidance were not at issue. That's a real consideration in a world where even 0.10% of alpha is increasingly hard to come by.

LEAVING CASH ON THE TRADING FLOOR

The REGL-US example shows that it is entirely possible for an ETF to have low all-in costs, including trading costs, expenses, tracking difference, and tax liabilities, but still leak cash. It happens when a portfolio manager with a complex mandate adopts a low-tracking-difference-oriented, tax-managed trading strategy.

This explains how a "smart" strategy may well lose its edge when it hits the real world.

Most of the leakage takes place on the trading floor, beyond observation to all but the most dedicated and highly equipped. The edge hasn't been lost as much as transferred to traders.

FOLLOW THE LEADER

Index tracking requires mimicking index behavior. Basic index rules require pricing at the day’s closing value. This means that index additions and deletions also happen at the closing price. ETF portfolio managers with a zero-tracking-error mandate are pretty much forced to execute trades at the closing auction. They can’t trade ahead for fear of diverging from the index value. During a rebalance, they can’t not trade or they’ll start the next day with the wrong portfolio. That’s a vulnerable position in the capital markets. Market-on-close execution invites front-running.

THE COST OF COMPLEXITY

The hidden cost of rebalancing is borne unequally across the ETF landscape because some funds rebalance frequently, while others need almost no tweaks. The broadest, cap-weighted funds can chug along for years with the same constituents, with occasional adjustments for IPOs, spinoffs, and the like.

Turnover in equity funds is primarily driven by the need to maintain the desired active risk against the broad market. The biggest turnover funds are the “anything but market cap” crowd. The chart below shows annual turnover through May 2018 by ETF strategy for all U.S.-domiciled ETFs that draw from the total U.S. equity market. Turnover is calculated monthly and totaled, then averaged across the strategy.

The difference is stark. Vanilla funds that include virtually every U.S.-listed stock, cap-weighted, barely touch the capital markets. iShares Dow Jones U.S. ETF’s (IYY-US) portfolio managers are the champions of sitting on their hands, with annualized turnover of a mere 3.83% of the portfolio.

Contrast that with turnover king Direxion All Cap Insider Sentiment Shares (KNOW-US), which, by FactSet ETF Analytics’ calculations, saw 912% portfolio turnover in the 12 months through May 2018. That’s quite a bit of exposure to slippage in the capital markets.

Slippage could well be the reason that “smart beta” ETFs have consistently failed to produce risk-adjusted outperformance vs. broad, cap-weighted benchmarks or ETFs that track them. After all, if the foundations of the strategy remain sound, alpha should persist when packaged into indexes and ETFs. Yet we have seen that, most often, it does not.

The front-running that comes along with portfolio rebalances alters the index performance because it increases the price of additions and decreases the price of deletions. The larger the AUM tracking an index, the higher the risk of underperformance; that is, underperformance vs. the backtest.

Put another way, had REGL’s portfolio managers worked the rebalance trades themselves, they could have been on track to outperform their underlying index, as their sells throughout the day depress closing prices and their buys inflate them.

FIGURE 12: SHARE COUNT CHANGES ON REBALANCE DATE

STRATEGY	AVERAGE TURNOVER
Copycat	339%
Time Since Launch	122%
Momentum	115%
Multi-factor	106%
Active	103%
Growth	69%
Value	60%
Fundamental	56%
ESG	32%
Equal	27%
Dividends	26%
Low Volatility	19%
Vanilla	8%

Source: FactSet

NARROWNESS HAS ITS PRICE TOO

Rebalancing slippage can also weigh down returns of slice-and-dice funds that target portions of the market. The style box has a surprising amount of movement, as companies grow from small- to mid- to large-caps, or shrink, or bounce between categories. A nine-fund suite covering the full style box sees much more capital markets activity than a single total market fund like iShares Core S&P Total U.S. Stock Market ETF (ITOT-US).

A quick look down the market cap spectrum bears this out. Among even the simplest style box funds, vanilla ETFs that cover the U.S. equity market, turnover rises as capitalization size shrinks.

Perhaps rebalance slippage explains why cost-obsessed Vanguard uses the broadest possible funds in its target date and personal advisory services products. While heartbeat flows can wash out capital gains, they can't erase the impact of information leakage.

CONCLUSION

Bottom line, if you are looking for effective tax management in an ETF, look at the turnover rate. Low-turnover funds offer tax efficiency by virtue of their consistency. For high-turnover funds, look at the flow chart. If you see oscillations that look like an EKG, your funds are likely in good shape, thanks to the behind-the-scenes heartbeat of well-timed creations and redemptions. But keep this in mind: heartbeat flows aren't free. Their costs can be seen in depressed performance.

FIGURE 13: AVERAGE TURNOVER ACROSS MARKET CAPS

FOCUS	AVERAGE TURNOVER
Total Market	8%
Large Cap	5%
Mid Cap	16%
Extended Market	37%
Small CAP	23%
Micro Cap	15%

Source: FactSet



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