



SHARKS, HIGH FREQUENCY, AND ETFs

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"You know, I have one simple request. And that is to have sharks with frickin' laser beams attached to their heads!"

~ Dr. Evil from Austin Powers

Published: October 2016
(Revised February 2017)

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Sharks, while being some amazing animals, have gotten a pretty bad reputation. The media, including the big screen, has painted the picture that these sea creatures are the ultimate killing machines and that we should beware of them at all costs! It is interesting, however, to ponder the fact that the chances of being killed by a shark attack are slim at best. You have a better chance of being killed by hornets, wasps, bees, or even dogs. In fact, more people are killed every year in Asia by falling coconuts than are killed by shark attacks the world over!

These super-predators have been traced back to over 400 million years ago. The one fact I want you to take away is that most sharks will drown if they stop moving. They lack the muscles necessary to move oxygenated water over their gills, so stasis means no breath. The truth is sharks aren't all that bad and likely won't bother you if you don't bother them; or more accurately - if you know how to properly avoid their bite.

The same principle is true for avoiding the treachery of sharks in the stock market. There are so many players now – specialists, market-makers, market-takers, professional traders, institutional investors, arbitrageurs, hedgers, speculators, and the retail investor. There has also been a lot of talk for years now about “algo-traders,” which are more officially known as High Frequency Trading (HFT) firms. They have been likened to sharks in the stock market and have been both deified and vilified. One thing is for sure, HFT firms are here to stay and their impact on the markets is permanent. They can be feared to the point that people proverbially do not want to leave the safety of the beach to get into the water, or you can go into the water after learning how to properly avoid getting chewed up by them. High Frequency Traders, as the name implies, are like sharks in that if they don't move frequently, they will wither and die.

In this paper, we seek to understand HFT; but more specifically, to address how to avoid being taken advantage of by sharks in financial markets. We will specifically talk about how Exchange Traded Funds (ETFs) work, their inefficiencies, and their idiosyncrasies. We will pose and address the following questions:

- **Did you know that ETFs can be more expensive to trade than stocks and don't always trade near their Net Asset Value (NAV)?**
- **How do ETF managers consistently have issues executing trades without significant impact?**
- **Why did many popular ETFs, known for their low volatility, trade at up to a 35% intraday discount during market extremes?**

- **Why did robo-advisors halt trading after Brexit?**
- **Are the algorithmic traders and HFT firms now preying on big-sector ETFs?**

Before we get to those questions, it would be beneficial to go over some background about ETFs, their construction, the hidden costs associated with trading them, and of course some context on how HFT firms do what they do.

HOW ETFS WORK: A QUICK PRIMER

This will by no means be exhaustive, but let's begin at well... the beginning. As you all know, an ETF is a security that tracks a basket of underlying assets functioning much like an index. The basket can be composed of stocks, commodities, or bonds, or it can track an index such as the S&P 500. ETFs trade like common stock on an exchange and have daily price fluctuations. ETFs are known to typically have higher daily liquidity and lower fees than mutual fund shares, making them an attractive alternative for individual investors. This description makes ETFs sound pretty great, but what's the downside?

Like anything, there are flaws with ETFs. The truth is that ETFs manage to wear a lot of makeup to keep these flaws well hidden, but that doesn't mean they aren't there! Let's go over a few of those flaws...

Question #1: Did you know that ETFs can be more expensive to trade than stocks and don't always trade near their Net Asset Value (NAV)?

ETFs don't have a daily calculated NAV like a mutual fund as they trade freely all day. But at any given moment, the basket of assets has a net asset value, and ETFs typically trade at either a premium or a discount to that NAV. This comes from the difference between an index value and the value of its constituent stocks in the aggregate, or a physical commodity and its associated futures contract.



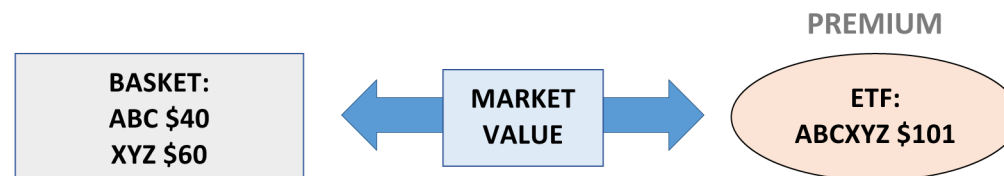
Source: direxion

Let's take a quick look at an example:

Let's imagine a hypothetical ETF: "ABCXYZ" tracks only two stocks, "ABC" and "XYZ". "ABC" is trading at \$40 and "XYZ" is trading at \$60. The value of this ETF should be \$100 in a perfect world (excluding fees, such as management fees of course!):

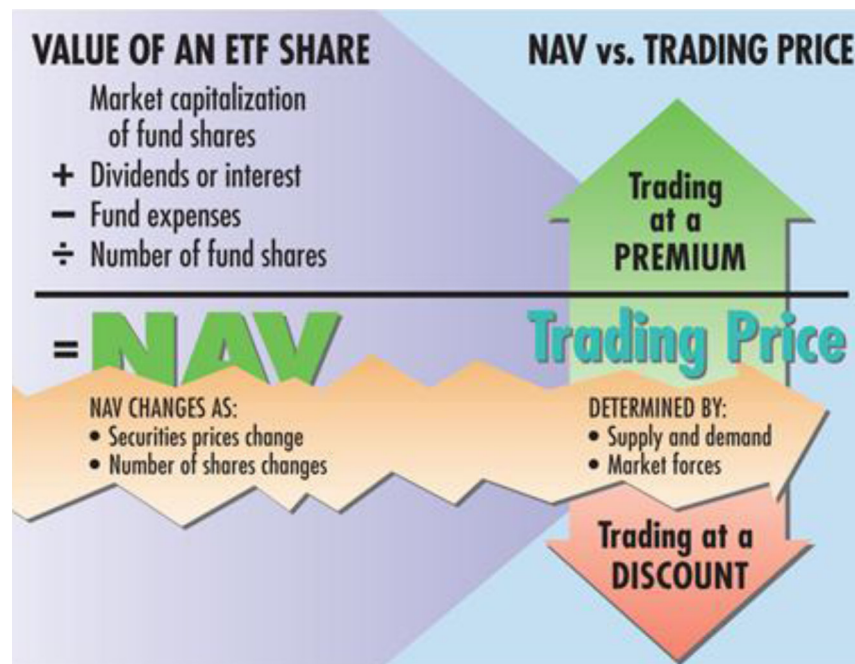


Since it trades freely on an exchange, the ETF may trade at a 1% premium (\$101) due to high demand:



The premium or discount of an ETF is determined by supply and demand and market forces. The NAV, on the other hand, is slightly more involved. It is determined by:

$$\text{NAV} = \frac{\text{Market Capitalization of Fund Shares} + \text{Dividends and Interest} - \text{Fund Expenses}}{\text{\# of Fund Shares}}$$



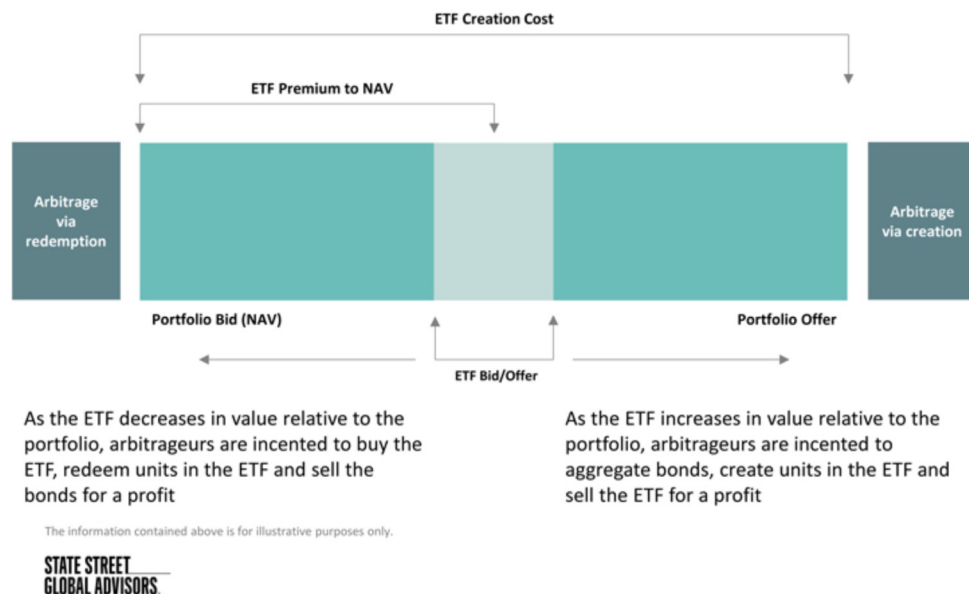
Source: lightbulbfinancial

One of the reasons why the concept of premium/discount is so important is that it drives a lot of the liquidity behind ETFs. It also drives the process of creating and redeeming ETFs.

Having nothing to do with spirituality, “creation” and “redemption” are processes related to the creation and sale of ETFs. Authorized Participants (APs) are large financial institutions which are specially authorized to create shares of ETFs. In our hypothetical case of “ABCXYZ” ETF, the AP would assemble the basket of shares of “ABC” and “XYZ” and deliver it to the fund in exchange for shares of the newly created “ABCXYZ” ETF. The redemption process is the opposite – delivering shares of ETFs in exchange for the basket of constituents. This opens the door to possible arbitrage opportunities, which we will discuss later.

Premium/Discount Mechanics

The premium or discount of the ETF market price to the Net Asset Value (NAV) of the underlying basket will help drive the create/redeem process



Source: State Street

You may be thinking, “These premium discounts are relatively small and don’t really impact me.” The reality is that there are thousands of ETFs and many trade at a significant premium or discount. Extreme market fluctuations further amplify these premiums and discounts, paving the way for more arbitrage until the cycle eventually comes back in line.

The two exhibits below came from a search of ETFchannel.com on September 12, 2016 in which I ran a search for ETFs trading at premiums or discounts. As you can see, in some cases these are huge numbers. Some

of the tickers are relatively common like GDXJ – the Market Vectors Junior Gold Miners ETF, for instance. As you can see on this particular day, that ETF traded at more than a 7% discount! You can also find ETFs trading at much bigger premiums. This occurs daily. (Please note: Navellier & Associates, Inc. does not own GDXJ for any client portfolios. Please see additional important disclosures at the end of this paper.)

RECENT DISCOUNT TO NAV – PAGE 1 OF 53

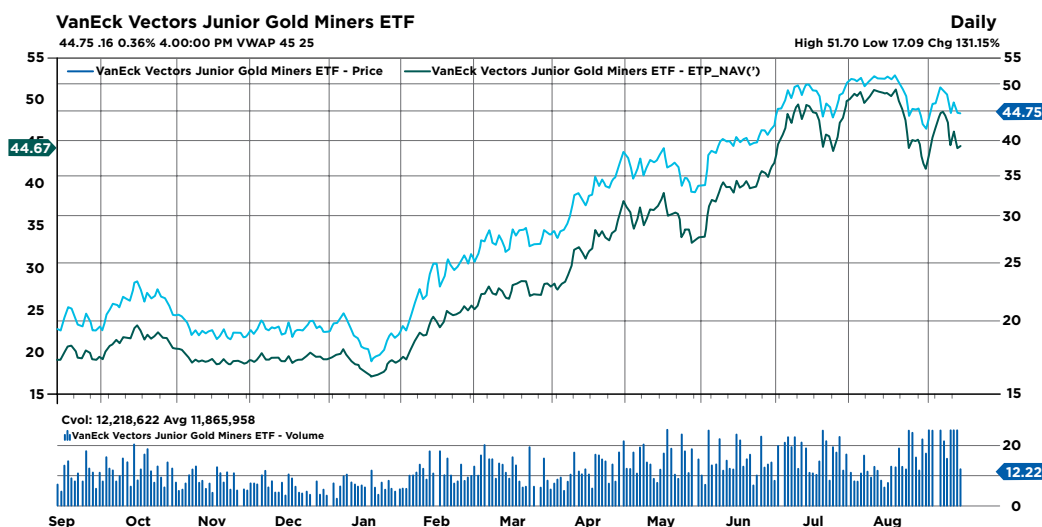
(updated 2 hours, 3 minutes ago)					
Rank	ETF	Recent Price	NAV Symbol	Recent NAV	Discount
#1		23.6300		29.1193	-18.85%
#2		66.1700		78.3601	-15.56%
#3	<u>GDXJ</u>	44.4400	<u>GDXJ.NV</u>	47.8306	-7.09%
#4		45.2400		48.6500	-7.01%
#5		14.4400		15.4997	-6.84%
#6		33.0800		35.4271	-6.63%
#7		25.2199		26.8115	-5.94%
#8		17.6400		18.7500	-5.92%
#9		25.1425		26.6896	-5.80%
#10		9.0511		9.6000	-5.72%

RECENT DISCOUNT TO NAV – PAGE 53 OF 53

(updated 2 hours, 28 minutes ago)					
Rank	ETF	Recent Price	NAV Symbol	Recent NAV	Discount
#1041		19.5500		17.7200	10.33%
#1042		22.7600		20.5400	10.81%
#1043		30.0400		26.9800	11.34%
#1044		48.0300		42.9300	11.88%
#1045		33.1203		29.5900	11.93%
#1046		49.1000		43.8600	11.95%
#1047		19.0115		16.8900	12.56%
#1048		19.1600		16.9026	13.36%
#1049		47.6400		41.4100	15.04%
#1050		48.4200		42.0500	15.15%
#1051		22.5000		19.4800	15.50%
#1052		32.3600		28.0148	15.51%
#1053		11.4301		6.3312	80.54%
#1054		22.2400		4.3100	416.01%

Source: ETF Channel 9/12/2016

Look at the FactSet chart (below) of GDXJ, The VanEck Market Vectors Junior Gold Miners ETF. The blue line plots the price of the ETF while the green line plots the NAV. Note how even though there is a consistent spread between NAV and price (premium), there are periods in which the spread widens and contracts.



The academic community has already documented that ETFs are more expensive to trade than stocks, as the following sources show:

- “Is There a Dark Side to Exchange Traded Funds (ETFs)? An Information Perspective.” Stanford Graduate School of Business. Doron Israeli, Charles M.C. Lee, and Suhas A. Sridharan. 26 July 2015.
- “Are Exchange Traded Funds Dumbing Down the Markets?” Stanford Graduate School of Business. Edmund L. Andrews. 24 August 2015.
- “The Downside of ETFs.” *Wall Street Journal*. Wsj.com. Simon Constable. 09 August 2015.

ETF execution is increasingly flawed due to wider premiums/discounts. This means that ETFs can indeed be more expensive to trade than stocks, with fees and slippage imbedded in the bid/offer spreads and the premium/discount to NAV. These phenomena are at the heart of why trading ETFs can be more complicated than the simple broad-exposure instruments they are made out to be. This brings us to the next question...

Question #2: How did one of the largest ETF managers consistently have issues executing trades without significant impact?

There are many market participants involved in trying to grab their piece of the pie that exists within the ETF bid/offer spread and the premium or discount. “Market Makers” stand to gain significantly if they can anticipate the direction of potential large order flows.

There was a prominent, large (and growing) ETF model manager that would execute trades on a predictable basis. This was not an issue when they were relatively unknown with a few hundred million dollars under management. But when their assets swelled to well over \$10 billion, their movements became so well-known across Wall Street that size worked against them. Large asset managers who need liquidity in ETFs cannot simply place a trade on an electronic platform.

Enter the Market Maker...

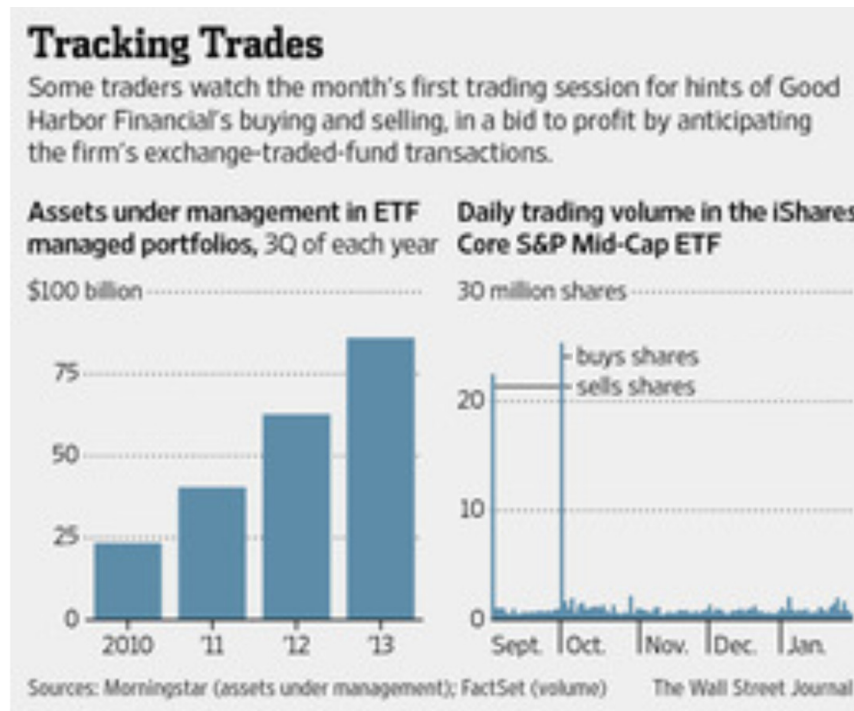
Let's assume I am an ETF manager with \$10 billion under management and I need to buy \$1 billion worth of mid-cap equity exposure. I may be used to trafficking in a specific ETF with limited liquidity. If the hypothetical "DEF" Midcap ETF has an NAV of \$100, then as the ETF manager I need to buy 10 million shares of it. If it only trades an average of one million shares a day, I need to call a market maker, which is typically a large bank that can make prices out of inventory on its balance sheet to offer liquidity. Market makers earn their keep by retaining captured spread, or the premium discount we discussed earlier. This market maker may look on the screen to see the ETF is trading at \$100. Let's assume there is no premium or discount. The market maker would have to sell 10 million ETF shares out of thin air to me – the manager – and quickly buy \$1 billion dollars' worth of the stocks that make up the constituents.

It's a risky business indeed, and if that market maker offers the shares and misses the hedge, they could stand to lose a lot of money. But if the market maker offers these ETF shares at a slight premium and hedges by purchasing the stocks that make the basket and manages to capture a spread, he or she will be happy to do that all day long. Earning the spread is the market maker's reward for taking the risk to provide liquidity.

Let's say the market maker offers me 10 million shares of "DEF" at \$100.10. The 10 cents represent 10 basis points of the ETF price - or 0.1%. I, the manager, feel that's a fair price to pay for the liquidity. I buy the ETF at \$100.10. I book my trade and am done. The market maker is now short \$1 billion of mid-cap exposure and needs to buy the stocks to hedge. If he or she does this well and retains the spread, they are happy. Let's say they retain 4 cents of the 10-cent premium. The reward for that risk would be \$400,000! While that sounds great, let's not forget that it can and does go the other way as well.

This example is fine when a market maker doesn't know what to expect. But what happens when an ETF manager's movements are literally broadcasted in the Wall Street Journal? Like in this article: "Traders Keep an Eye Out for Good Harbor." *Wall Street Journal*. Wsj.com. Chris Dieterich. 02 February 2014.

Well, “ouch” happens for the ETF manager. It’s far too tempting to Wall Street not to take advantage when the offer of free money is lying around. This is because market makers can try to anticipate the pending order flow to drive that premium discount spread even wider, thus increasing his or her chance to make larger profits. When everyone knows when and what you are going to do as a big investment manager, it makes it hard not to be vulnerable to being taken advantage of. The result was poor performance and an ultimate loss of more than 80% of assets under management in one year.



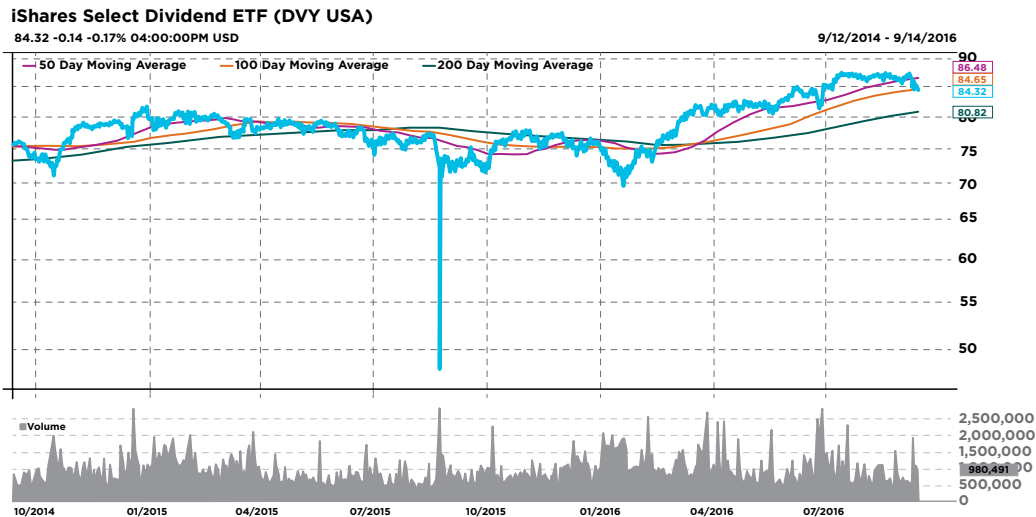
Source: Wall Street Journal

Question #3: Why did many popular ETFs, known for low volatility, trade at up to a 35% intraday discount during market extremes?

How else can this premium/discount phenomenon potentially mar an otherwise well-intended product like an ETF? Well, we can look at certain instances in which ETFs traded at such extreme levels of volatility that it totally didn't match the investment objective of the ETF itself!

If we look back at August 24, 2015, we find a day of extreme market volatility. In what is now widely attributed to a “flash crash,” stocks began the day down sharply and many triggered circuit breakers. At one point, well over 1000 stocks were halted from trading, yet many ETFs with those same stocks as underlying constituents kept right on trading. Specialists stood to make a lot of money. Some ETFs traded straight down at a deep discount to the last posted prices of their constituents. Logically this makes sense given

the environment of the day. However, ETFs that normally exhibit very low volatility had immense intraday swings. Look at the case of the normally-smooth DVY iShares Select Dividend ETF: It had a 35% intraday range. (Please note: Navellier & Associates, Inc. does not own DVY for any client portfolios. Please see additional important disclosures at the end of this paper.)



Source: FactSet

One main objective for investors in this ETF is to gain exposure to a portfolio of dividend stocks with usually-low volatility. Obviously that wasn't the case on August 24th, 2015. Again, the exploitation of discount/premiums on ETFs was largely to blame here as market makers, specialists, and professional traders sought to grab what became a huge spread.

This event also brings the question forward, "What kinds of traders can act this fast anyway?"

More on that in a moment...

There is certainly no shortage of articles highlighting the issues of August 24th, 2015:

- "The Great ETF Debacle Explained." Barrons.com. Chris Dieterich. 05 September 2015.
- "ETFs' Rapid Growth Sparks Concern at SEC." *Wall Street Journal*. Wsj.com. Leslie Josephs. 16 October 2015.
- "SEC Report Sheds Light on the August Flash Crash." The Washington Post. washingtonpost.com. Jonnelle Marte. 30 December 2015.

- “US Equity Market Structure: Lessons From August 24.” Securities and Exchange Commission (SEC). <https://www.sec.gov/comments/265-29/26529-52.pdf>. October 2015.
- “SEC, industry to dig into Aug. 24 volatility that hit ETFs, big-cap stocks.” MarketWatch.com. Francine McKenna. 01 February 2016.
- “ETF providers scramble to put Aug. 24 ‘flash crash’ in rearview mirror.” InvestmentNews.com. Jeff Benjamin. 23 August 2016.
- “One Year Later: Have Lessons From Aug. 24 Stock Market Flash Crash Been Learned?” Investor’s Business Daily: investors.com. Aparna Narayanan. 22 August 2016.
- “Trading was halted 1,200 times Monday.” Cnn.com. Matt Egan. 24 August 2015.

Question #4: Why did the largest robo-advisor halt trading after Brexit?

A **robo-advisor** is an online wealth management service that provides automated, algorithm-based portfolio management advice without the use of human financial planners. We are living in a modern world with modern problems. Sadly, humans are being replaced all over the place. The very notion of giving a robot your hard-earned money seems absurd to some. But clearly, there is a growing contingent that thinks this is a good idea. A very prominent robo-advisor, which at the time managed \$4.8 billion, halted all trading from 9:30 – noon on the day after the Brexit referendum passed. This firm typically avoids early and late day trading to sidestep volatility. So it does not seem uncharacteristic of them to halt trading on this extremely volatile day. They just didn’t notify their retail clients, as can be seen in the articles below.

- “Robo Adviser Betterment Suspended Trading During ‘Brexit’ Market Turmoil.” *Wall Street Journal*. [Wsj.com](http://wsj.com). Michael Wursthorn and Anne Tergesen. 24 June 2016.
- “Robo Advisor Halted Trade During Brexit Storm.” Barrons.com. Teresa Rivas. 27 June 2016.
- “Robo-advisor CEO: Here’s why I told clients they couldn’t trade in sell-off.” Cnbc.com. Alex Rosenberg. 29 June 2016.
- “Betterment halted trade amid Brexit panic—here’s why.” MarketWatch.com. Anora Mahmudova. 01 July 2016.
- “Betterment explains why its Brexit-sparked trading halt on Friday wasn’t ‘suspended’ trading.” RIAbiz.com. Lisa Shidler. 28 June 2016.

- “When the Market Panics, Even Robo-Advisors Get Caught in the Crosshairs.” WealthyRetirement.com. Kristin Haugk of The Oxford Club. 11 July 2016.
- “Investors Can Do Better Than Betterment.” WallStreetDaily.com. Tim Maverick. 06 July 2016.
- “After trading halt, Betterment suffers its own Brexit shock.” FinancialPlanning: financial-planning.com. Suleman Din. 29 June 2016.

The issue here is that it was not the technology that halted trading, it was the management team. So, even when you elect to allow a robot to manage your money, the robot apparently has a boss, too.

Question #5: Are the algorithmic traders/HFT firms now preying on big-sector ETFs?

This is the biggest question on many people’s minds today, and my answer is undoubtedly **yes**. The answer to many of these questions surrounding volatility, amplified moves, liquidity concerns, and other general ETF and stock market anomalies can be found in the High Frequency Trader.

A High Frequency Trader is actually a computer. More accurately it is a computer program uploaded to a trading platform API (Application Programmers Interface). If you are savvy enough, you can script (*a fancy way of saying write*) your own algorithm (*a fancy way of saying a set of instructions*) and upload it to your own brokerage account. Several online brokers offer this functionality.

The High Frequency Trader that the media loves to talk about typically looks like this: It is a large investment firm, typically in a hedge fund structure, that invests based on technology acting on algorithms. They spend an immense amount of money on technological architecture, infrastructure, data warehousing, and server locations. Many HFT firms will pay a giant premium to co-locate their servers near or even at the site of an exchange so that the latency (*delay from the time the trade instructions are sent until they are acted upon*) is at a bare minimum.

HFT firms deal in units of time at the level of nanoseconds. Maybe you’ve heard of a nanosecond, but to put it in perspective, it’s one billionth of one second. Yes, HFT firms will seek to improve the speed of their trading by taking one second sliced into a billion units, and grabbing just a few of those.

This begs the question of “How can anyone compete with that?” It’s a great question but perhaps you should know more about how an actual “High Frequency Trade” works. HFT firms pay a lot for data. Data is the lifeblood of the HF Trader. Exchanges sell their data to willing buyers and some of

this data is order flow data. Believe it or not, HFT firms can buy the data associated with your order to buy 100 shares of an ETF in your brokerage account. The HFT firm can see your order come in, buy the shares ahead of you, and turn around and sell them to you for even a fraction of a penny higher, and do it all literally faster than you can blink your eye. Some firms do this many thousands of times a day across many thousands of stocks, futures, and of course ETFs.

The ETF High Frequency Trader is where things get even more complicated and more interesting. The arbitrage of buying an ETF and selling its constituent stocks is a complicated one. Machines acting out on algorithms seek to make the process less complicated and certainly unemotional. So the HF Trader will buy the ETF and sell the stocks as close to instantaneously as possible. Now, in an ever conscientious effort to save fees and reduce trading costs, HFT firms can employ other algorithms in conjunction with the ETF arbitrage algorithm.

Stock exchanges compete with each other, just like any other business. Some exchanges offer rebates to post liquidity and charge fees to take liquidity. Other exchanges offer rebates to take liquidity and charge fees to post liquidity. Imagine if we could write a program to optimize trading to take advantage of these fee inefficiencies and even get **paid** to trade! Well of course that already occurs, and is prevalent today. Couple this with the original ETF order seeking algo, which sniffs out your buy order and jumps in front of it, and you have some powerful trading. Algos exist to arbitrage one ETF against a like ETF as well. There are several S&P 500 tracking ETFs and if there are market inefficiencies between two or more of them, algos seek them out and exploit them. All this occurs until the ETFs and/or baskets come back in line and the arbitrage opportunity ceases to exist.

This is all done in microseconds all day long. This whole process can create a lot of trading volumes and potentially a lot of volatility along with it. Remember, when spreads widen, these HFT firms and arbitrageurs make more money. So it is not a wild leap to think that there are algorithms written to attempt to widen spreads as they naturally become wider on volatile days, and try to exploit that.

It has been discussed academically that HF Trading adds liquidity when it is not needed, and removes liquidity when it is most needed. High Frequency Traders are not necessarily specialists or market makers who are required to post liquidity, therefore they can stop playing whenever they want to. (Source: "Swedroe: High Frequency Trading's Impact." *ETF.com*. Larry Swedroe. 24 February 2016.)

If an extreme market move occurs and a tipping point is reached, excessive volatility rears its ugly head, and flash crashes can occur for precisely this reason. So beware these shark-infested waters by making most of your investments in times of relative market calm so that your buy-sell spread is minimized.

Now What?

So what is one to do with all this? It's enough to make you put up your hands and say, "There's nothing I can do, I just have to live with it." Well, this is not true and it's also where the sharks come back in.

Sharks are in the ocean; that is an undeniable fact. But it doesn't necessarily mean they are an imminent threat. If you arrive at the beach, look to the sea, and happen to see a bloody pool with 30 frenzied sharks, odds are you're not going to want to go for a swim. But how many times have you arrived at the beach and seen that? The key is recognizing the environment and being prepared to deal with it. Odds are that most advisors or individual investors will desire the benefits offered by ETFs at some point in the future. So with the various pitfalls we have outlined above, how does one navigate the choppy waters?

We have widely discussed that much of the financial and energy rally this year in the equity market was attributable to algorithmic traders. These same High Frequency Traders are increasingly swimming in the financial & energy ETFs looking to exploit arbitrage opportunities. This added activity exacerbated volatility and amplified market moves. At Navellier & Associates, we use our quantitative investment philosophy and steer clear of these sector rallies rife with volatility and built on fundamentally weak ETF sectors!

Certainly, choosing an experienced and knowledgeable ETF manager is essential in mitigating risk. Navellier & Associates is obsessed with risk management. We apply our quantitative investment methods across all asset classes and have done so for decades. Not only are we an ETF manager, but Morningstar has given two of our current ETF strategies 5-Star Overall Morningstar Ratings™. Our ratings are due in no small part to our performance. Our top ratings are also due in no small part to our trading desk that knows all of the pitfalls detailed above! The traders make sure to affect every trade with the aim of not buying ETFs at premiums or selling ETFs at discounts; if the premium or discount is too great, we do not trade which translates directly to the investor. In being obsessed with risk, we are also extremely mindful of excessive volatility. When we detect it, we steer clear of it.

As evidenced in this paper, trading ETFs alone can invite the many sharks who smell blood in the water when the solitary trader ventures into the deep. Using an ETF manager that not only offers a couple of 5-Star Overall Morningstar Rated™ ETF strategies, but also knows how to navigate the ETF market is a great way for investors to protect their accounts, and for advisors to protect their investors. Being informed can mean the difference between wading fearfully in the ocean or confidently swimming with sharks.

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- ETF shares may trade above or below their net asset value;
- An active trading market for an ETF's shares may not develop or be maintained;
- The value of an ETF may be more volatile than the underlying portfolio of securities the ETF is designed to track;
- The cost of owning shares of the ETF may exceed those a client would incur by directly investing in the underlying securities; and

- Trading of an ETF's shares may be halted if the listing exchange's officials deem it appropriate, the shares are delisted from the exchange, or the activation of market-wide "circuit breakers" (which are tied to large decreases in stock prices) halts stock trading generally.

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