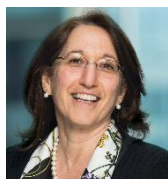


February 2018 Case Study: ETF Trading in a High-Velocity Market



Barbara Novick
Vice Chairman



Samara Cohen
Head of iShares
Global Markets



Stephen Laipply,
Head of US
iShares Fixed
Income Strategy



Ananth Madhavan,
PhD, Global Head
of Research, ETF
and Index Investing



Brendan McCarthy
iShares Americas



Alexis Rosenblum
Global Public
Policy Group

The sharp equity market sell-off and volatility spike during the week ended February 9, 2018 served as a market-wide stress test, especially for exchange-traded products (ETPs). During this week, exchange traded funds (ETFs) experienced more than \$1 trillion in US-listed exchange trading volume, roughly double normal trading volumes (Source: Bloomberg). While much of the media attention focused on losses in certain complex exchange-traded products (that are not ETFs), this episode underscored stability and liquidity of ETF trading amidst historic trading volumes. In fact, BlackRock observed some of the highest on-exchange volumes ever in its US-listed ETFs during this period.

We view this case study as a powerful counterpoint to questions that have been raised about the resilience of the ETF product structure and ecosystem in stressed markets. Not only was ETF trading orderly, an upswing in trading volume showed that investors again turned to ETFs in times of turbulence. Importantly, even with heavy trading of ETF shares on exchange, the funds experienced minimal outflows. In other words, buys and sells on exchange largely cancelled each other out, with the outflows representing minimal demand imbalance. In effect, ETFs acted as “shock-absorbers” in choppy markets.

Key Observations

- Global markets experienced a market-wide stress test the week of February 5-9, 2018 with a spike in volatility and historic trading volumes.
- Even with heavy trading of ETF shares on exchange, we observed minimal outflows from the ETFs themselves (\$30 billion in net ETF outflows compared to \$1 trillion in ETF exchange trading over the week) (Source: Bloomberg).
- Using a calculation of the impact of ETF flows on trading in individual stocks, ETF flows comprised just 3.86% of overall US equity trading volume during this period, down from an average of 4.32% in the 12 months prior (Source: BlackRock calculations).
- Despite severe market volatility and heightened trading volumes, ETFs traded with generally tight bid-ask spreads, heavy volumes and high liquidity.
- Recent volatility was very different from the “Flash Event” on August 24, 2015. Even so, many safeguards and protocols implemented after this event functioned as expected.
- However, the rapid price collapse of certain leveraged and inverse volatility-related exchange traded products emphasized a need for a clear classification framework to help investors better distinguish more complex ETPs from traditional ETFs and risks across product types.

All \$ figures provided in this piece are in USD.

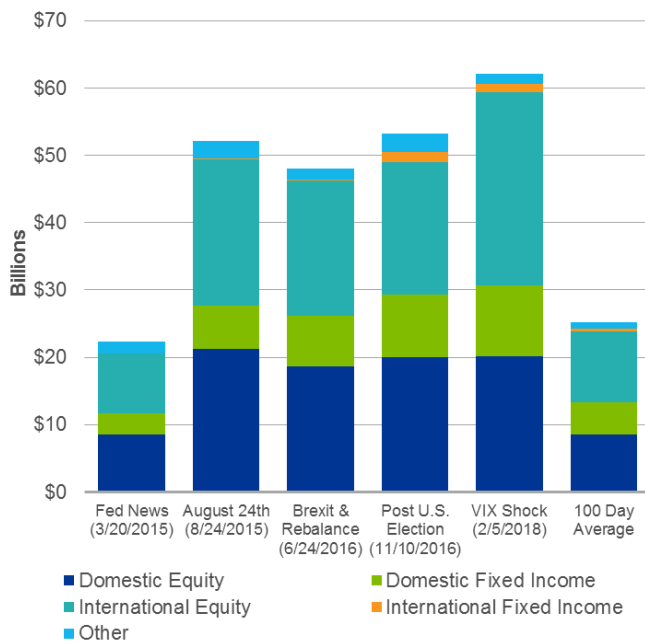
Any statements where a source is not explicitly provided are sourced from BlackRock.

The opinions expressed are as of March 2018 and may change as subsequent conditions vary.

A Severe Bout of Volatility

The steep drop in equity benchmarks on February 5, 2018 coincided with a 115% jump in the CBOE Volatility Index (Source: Bloomberg). This was the largest one-day percentage increase ever recorded in the VIX level, according to Bloomberg, and was associated with extremely large trading volumes. The volume chart shown in Exhibit 1, which depicts aggregate trading volumes experienced by BlackRock's US-listed ETFs on several large trading days, illustrates that the volatility event was a major market-wide stress event, comparable to other recent events, such as Brexit. Relative to 100-day average daily volume, the volume experienced on February 5, 2018 was dramatically higher (Source: Bloomberg).

Exhibit 1: BlackRock's US-Listed ETFs Historic Daily Volume Comparison



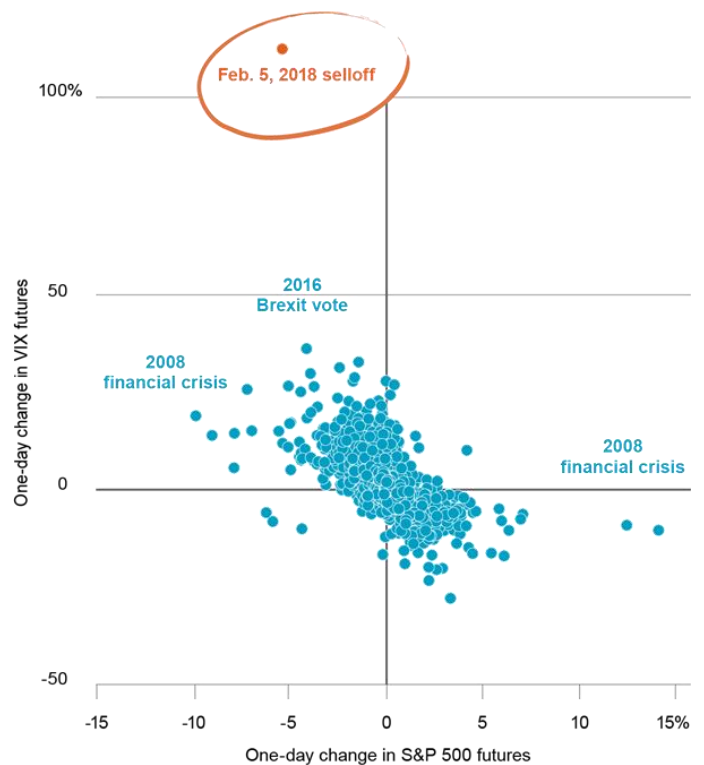
Source: BlackRock. As of February 26, 2018.

Exhibit 2 shows a plot of daily S&P 500 returns and changes in VIX futures from 2007 onward. The chart illustrates how outsized the VIX surge of February 5, 2018 (circled) was relative to the move in the S&P 500. The disconnect between the two was more dramatic than anything seen during the depths of the financial crisis or in the aftermath of the Brexit referendum (Source: BlackRock, Thomson Reuters).

Performance of Inverse Volatility ETPs

After the closing bell on February 5, 2018, a subset of ETPs that provide a return that is opposite (or inverse) VIX levels by shorting VIX futures suffered declines in excess of 90% (Source: Bloomberg). These price declines reflected the embedded economics of these inverse ETPs, as a fall in the

Exhibit 2: Daily Moves in S&P 500 versus VIX Futures, 2007-2018



Source: BlackRock Investment Institute, with data from Thomson Reuters, February 2018.

Notes: The chart compares daily moves in the spot VIX and S&P 500 e-mini futures since 2007.

VIX increases the value of the inverse ETP while a rise in the VIX decreases the value of the ETP. While these products performed as designed, the dramatic jump in VIX prompted the closure of an inverse VIX exchange traded note (ETN) by its sponsor under the terms detailed in the ETN's prospectus (a so-called "event acceleration") (Source: Credit Suisse).¹

That said, the loss of about \$3 billion in value to the holders of these VIX related ETPs garnered considerable press attention and led to questions regarding the suitability of these products for retail investors, regardless of whether they performed in line with their prospectus disclosures (Source: Bloomberg).²

The Need for Clear Classifications of Exchange Traded Products

In our view, this episode highlights the need for clearer labeling of ETPs in order to make sure investors understand that certain ETPs come with greater embedded risks and more complexity than others.

In our 2017 *ViewPoint*, A Primer on ETP Primary Trading and the Role of Authorized Participants (and in several prior papers), BlackRock has called upon the industry and regulators to clearly differentiate plain vanilla ETFs from other

types of ETPs, such as those that seek to provide a multiple of a day's index returns. In the absence of classification standards, complex and risky ETPs are lumped together under the common ETF descriptor, even though ETFs share

little in common with these products.³ These classifications are not used consistently in the industry or in regulation today, however, we hope to see the marketplace coalesce around these terms in a standardized way over time.

Classifying Exchange-Traded Products

What are ETPs?

The term “exchange-traded product” is the broadest possible catch-all for the more than 2,100 US-listed portfolio products of all types (Source: Bloomberg). BlackRock outlines four structures that fall under the ETP umbrella.

What are ETFs?

The ETF label should be reserved for non-complex funds that are registered investment companies under the Investment Company Act of 1940 (1940 Act) or other commensurate regulatory regimes, such as UCITS. ETFs invest in corporate securities such as stocks and bonds as well as bonds and other obligations of US and foreign governments. They may use derivatives to equitize cash, gain exposure to sectors that are more efficiently accessed with synthetics, or hedge rates or currencies. Funds that invest in complex and esoteric instruments such as CDOs, CLOs, Bitcoin and other cryptocurrencies should not use the ETF label. In addition, the ETF label should not be available to funds that incorporate more risky structural features or trading objectives such as those designed to amplify the return of an index by employing leverage or providing an inverse return. Today, many of these complex and risky ETPs are referred to as ETFs. We believe this situation can create confusion, particularly for retail investors who have come to utilize ETFs as core positions in their portfolios.

What are ETNs?

ETNs, such as the inverse-volatility ETNs that experienced losses during the week of February 5-9, 2018, are unsecured debt instruments issued by banks or bank-sponsored entities. The performance of an ETN is linked to one or more financial assets, index or commodity. Some ETNs offer plain vanilla exposure, but many ETNs employ some sort of financial engineering, like leverage. Beyond the risks associated with a given asset, investors also contend with unsecured credit risk of the issuer. Additionally, as debt instruments (i.e., bonds), the issuers are generally not registered under the 1940 Act, and these products are not ETFs.

What are ETIs?

Exchange listed inverse and leveraged ETPs may be structured as notes (debt instruments issued by an obligor) or as funds (equity interests in a company or trust that may or may not be 1940 Act registered) and come

with different risks. Both product types, which BlackRock believes should be referred to as exchange traded instruments (ETIs), seek to provide a multiple of a day's index returns. These instruments are not ETFs. ETIs are a small subset of the ETP universe. We estimate ETIs represent only 1.4% of US-domiciled ETPs as of March 1, 2018 (Source: BlackRock, FactSet).⁴

Leveraged and inverse ETIs rebalance in the same direction as the market to maintain their leverage (Source: Cheng, Madhavan 2009).⁵ Intuitively, a jump in VIX will increase the net asset value of a leveraged long fund, meaning that to maintain its exposure, it must increase its purchase of VIX futures. Similarly, an inverse VIX fund will have a lower net asset value on a day when VIX is up. As a consequence, the fund must shed exposure to maintain its -1x daily return profile, meaning it will have to decrease its current negative VIX exposure, effectively leading to purchases of VIX futures. This same direction rebalancing – like portfolio insurance – can cause these products to amplify sharp price movements in the market (Source: Cheng, Madhavan 2009).⁶ Inverse VIX products, for example, executed their investment objective to purchase VIX futures to maintain their leverage after the sudden spike in VIX (Source: Financial Times).⁷

The value of both inverse and leveraged ETIs that seek to provide a multiple (or the inverse) of the day's return erodes over longer horizons, especially when the underlying index is volatile. Inverse volatility funds also have the potential for sharp losses in short windows if volatility were to spike, possibly triggering redemption clauses. Indeed, the prospectus of the inverse-volatility ETN that closed after the week of February 5-9, 2018 explicitly states that the long-term expected value of the fund is zero (Source: Credit Suisse).⁸ Clearly this was a product that is designed for use as an intraday hedging tool, rather than a long-term investment allocation.

What are ETCs?

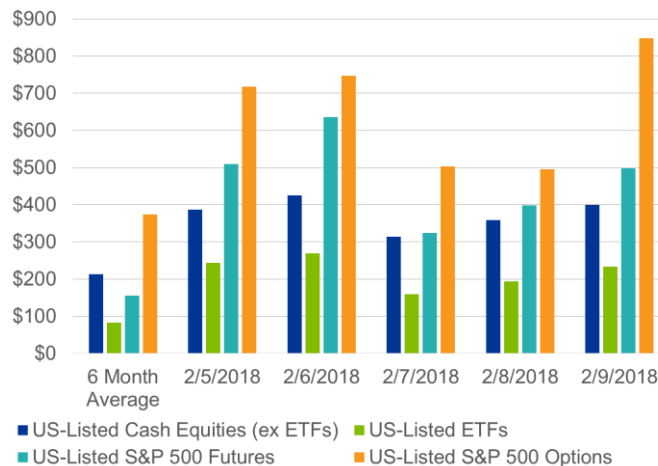
BlackRock also believes that there should be greater differentiation for commodity-linked ETPs from an ETP classification perspective. Some exchange traded commodities, or ETCs, seek to deliver the performance of a commodity by holding physical commodities. Others will invest in commodity futures and are registered with the CFTC as commodity pools.⁹

ETFs Provide Price Discovery and a Means for Risk Transfer in High-Velocity Markets

The trading dynamics in the volatile week ended February 9, 2018 highlighted how ETFs are used as tools for risk transfer, especially in a high-velocity market. Increasingly, investors are using ETFs in much the same way they use futures. For instance, US-listed S&P 500 futures, and the two largest US-listed S&P 500 ETFs combined for more than \$2.9 trillion of turnover on exchange for the week ending February 9, 2018 – more than all single stocks combined (Source: Bloomberg, BlackRock). Trading volumes in these instruments are shown in Exhibit 3. In times of sharp sentiment reversal, investors favor broad-market, or “beta,” exposures of all types, including index futures, index options and, increasingly, ETFs.

Exhibit 3: Volume Traded

\$ billions



Source: Bloomberg and BlackRock, showing US-listed equities, ETFs, and front month US-listed S&P 500 futures volumes from February 5-9, 2018 as compared to the prior 6 month average. Data accessed on March 2, 2018.

Over these volatile sessions, ETFs acted as “shock-absorbers,” allowing buyers and sellers to interact in the secondary market at market determined prices. Liquidity was generally evident by relatively tight tracking and bid-ask spreads. Over one of the most volatile periods in recent history, BlackRock’s US-listed S&P 500 ETF on average traded within 2.5 cents of its net asset value (NAV), or within 0.01 percentage point (one basis point). The ETF’s bid-ask spread as a percentage of price moved in lockstep with US-listed S&P 500 futures; at times, BlackRock’s US-listed S&P 500 ETF maintained a tighter spread than the comparable futures contract (Source: Bloomberg).

Impact of Primary ETF Flows on Underlying Stocks

While on-exchange volumes were heavy, empirical evidence shows minimal impact of ETF flows on US stocks during the week ended February 9, 2018 (Source: Bloomberg). That is consistent with the fast-growing but still-small market share of ETFs. One recent tally found that ETFs represent roughly 4% of the global equity market by market value (Source: BlackRock).¹⁰ But while the share of index products, including ETFs, in world equity market capitalization remains small, some commentators continue to voice concerns about flows into these products, particularly in times of stress.

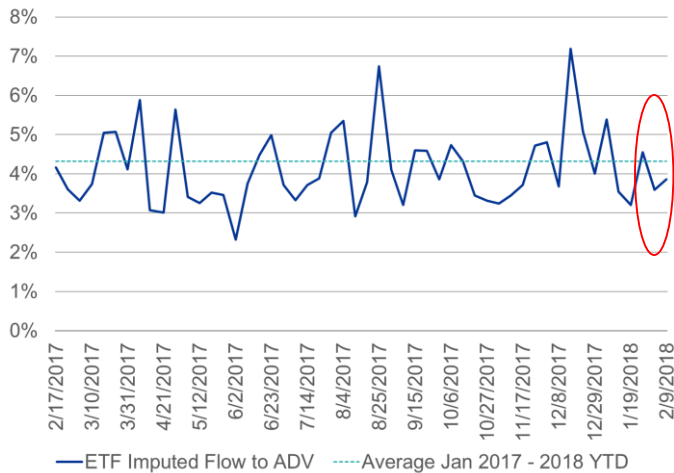
A standard metric used to interpret ETF trading is the ratio of secondary to primary market volumes. Secondary market ETF trading reflects an exchange of ownership, not actual trading activity by the fund in its underlying portfolio. In times of market stress, it is typical to witness elevated secondary market ETF trading as well as greater volumes in individual stocks. This was true the week ended February 9, 2018 when secondary trading volumes eclipsed \$1 trillion, though net redemptions from all US-listed ETFs were just \$29.9 billion (Source: Markit, BlackRock).¹¹ Equity ETFs saw outflows of \$28.1 billion; fixed-income ETFs saw outflows of \$468 million (Source: Bloomberg).

Only a fraction of secondary volume trickles down to result in primary market activity, where ETF shares are created and redeemed based on supply and demand. When there is an imbalance between supply and demand of shares in the secondary market, primary trades (inflows and outflows to the ETF) will take place and this results in transactions in underlying stocks and bonds. Is it possible that ETF flows might move constituent stocks, as some have suggested?

To answer this question, we calculated a metric called, stock-level imputed flow, as a means of assessing the impact ETF flows have on trading in individual stocks. More specifically, this analysis entails the following steps to derive stock-level imputed flow:

- First, we obtain all the holdings (constituents and weight) of every US-listed equity ETF.¹²
- Second, we obtain the daily primary market inflows and outflows to each US-listed ETF.
- Third, the imputed flow in an individual stock is computed as the sum over all ETFs of the product of an ETF’s flows and its weight on that stock.
- Finally, we compared absolute ETF imputed flows across all stocks and compared this to US stock volumes in week of February 5, 2018 as shown on the following page.

Exhibit 4: Stock-Level Imputed Flow



Source: BlackRock based on data from February 17, 2017 to February 9, 2018.

The output of our stock-level imputed flow calculations are shown in Exhibit 4. Based on the analysis shown in Exhibit 4, we can see that heavy secondary market trading was even more efficient than usual.¹³ Creations and redemptions resulted in just 3.86% of US equity market trading over the week of February 5-9, 2018, down from an average of 4.32% in the 12 months ended in January. In other words, more than 96% of the volume in individual stocks was not ETF related. This finding shows that claims that ETF flows distort pricing in individual stocks is without empirical foundation.

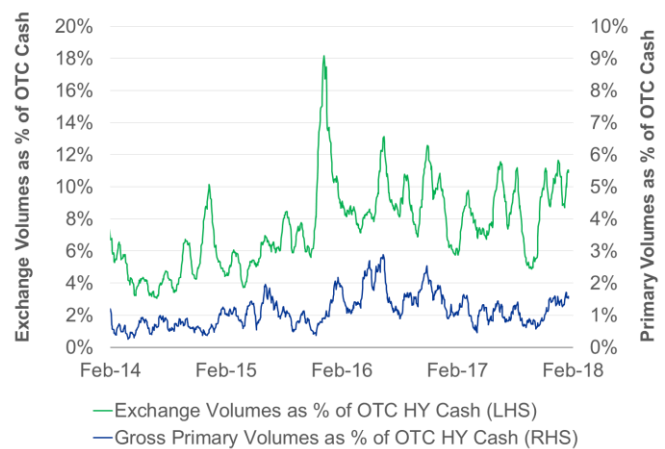
Behavior of Bond ETFs

It is worth noting that bond ETFs also traded in an orderly manner during this period, as they have in past times of stress. Recent trading in the largest ETFs tied to high yield and investment grade bonds serve as a case study.

Secondary trading volume in a representative large high yield ETF was elevated in early 2018 through February 14, averaging \$1.5 billion per day and reaching as high as \$4 billion. Yet total gross creation and redemption activity over this period was \$6.7 billion, compared to \$49 billion on the secondary market, a ratio of 7:1. For further context, this representative ETF's "primary" market activity accounted for just 1.45% of total over-the-counter (OTC) high-yield cash bond volume, which was roughly \$463 billion. This dynamic is shown in Exhibit 5. Premium / discounts remained stable and this fund's performance tracked within 5 basis points of its benchmark performance (which was within fund expenses) (Source: BlackRock, Bloomberg).¹⁴

In another example, a representative large investment grade corporate bond ETF experienced the largest redemption in the fund's 16-year history on February 14, 2018, with an outflow of \$921 million (Source: BlackRock, Bloomberg).¹⁵ This ETF traded \$1.3 billion in secondary volume that day. In

Exhibit 5: Representative High Yield ETF– 20 Day Rolling Volumes as % of OTC High Yield Cash Activity



Source: Bloomberg, BlackRock, SIFMA as of 2/14/2018. 144a HY OTC volumes included.

contrast to concerns about liquidity, trading was orderly and the investment-grade corporate spreads finished nearly unchanged.¹⁶

In light of concerns by some market participants that the growth of credit ETFs could become a market issue if there were large redemptions over a short period of time, it is notable that bond ETFs hold just 2.9% of high-grade corporate bonds outstanding, meaning they are a small subset of the market relative to other market participants.¹⁷

Taken together, heavy trading in credit ETFs again illustrates how fixed-income ETFs helped to provide for stability by providing additional liquidity and pricing transparency for the OTC bond markets.

Revisiting August 24

The resiliency of the ETF market in times of stress is reassuring, but our work is far from over. Extraordinary market events provide us with opportunities to reassess market resiliency and reinforce safeguards.

In the past, we have called for market structure changes to strengthen the ecosystem. The Flash Event of August 24, 2015 – when the prices of many equities and ETFs fell sharply only to recover in a short period – was one such test for the equity market and it revealed several opportunities for improvement.¹⁸

Over the past two years, market participants have worked to progress reforms intended to reduce the risk of a similar re-occurrence. While there is more to be done, it is important to reflect on what has been accomplished. Market structure changes since August 2015 are summarized in the box on the following page, all of which contribute to safer and more stable markets.

Major market reforms post-August 2015

- New harmonized re-opening procedures which seek to relieve market order imbalances prior to resumption of trading following a halt;
- Industry has broadly increased education efforts around trading best practices. Exchanges are no longer accepting market stop orders and FINRA has issued guidance encouraging appropriate systemic safeguards and investor disclosure regarding market stop orders, which may have contributed to the sharp price declines and;
- Industry participants are still exploring further modifications to the mechanics of halts, including refining price bands in response to market-wide volatility, and harmonizing limit state behavior with futures markets.

Conclusion

The ETF ecosystem functioned smoothly during February's volatility surge, a demonstration of stability as assets invested in ETFs continue to grow. Elevated trading volumes show that investors used ETFs to adjust positions in a fast-changing market. Widely owned ETFs maintained tight bid-ask spreads throughout the turmoil. Meanwhile, evidence shows that heavy trading volumes in both stock and bond ETFs took place efficiently. The trading disruptions experienced by certain exchange traded products that week did not occur with ETFs. This underscores the importance of improved classification standards for these products. Overall, ETF outflows were muted relative to on-exchange trading, an example of how ETFs act as "shock-absorbers" when market sentiment reverses. Our analysis shows that, rather than accelerate stock price moves, heavy ETF trading exerted less influence than average on the US equity market.

Endnotes

1. Press Release, Credit Suisse AG Announces Event Acceleration of its XIV ETNs (Feb. 6, 2018).
2. See e.g., Speech by SEC Commissioner Kara Stein, Remarks at SEC Speaks: Increasing Product Complexity: What's at Stake? (Feb. 23, 2018).
3. iShares does not offer inverse or leveraged ETPs because of the concerns noted regarding the erosion of value over long horizons.
4. Source: BlackRock, FactSet. As of March 1, 2018.
5. See Cheng, Minder and Ananth Madhavan, "The Dynamics of leveraged and inverse exchange-traded funds." *Journal of Investment Management*, Vol. 7, No. 4. (2009), pages 43-62.
6. See footnote 5.
7. Inverse Vix Funds: Shark Chum, *Financial Times* (Feb. 20, 2018).
8. See XIV prospectus supplement at pages 28-29.
9. Other retail considerations may include alternative tax treatment (e.g., issuing K-1s), exotic/illiquid holdings, structure, and liquidity. In contrast to the volatility products discussed above, traditional ETFs, which seek to provide a one-to-one correspondence to index returns performed fine despite the choppiness in the markets, as they have in similar episodes in the past.
10. BlackRock *ViewPoint*, "Index Investing Supports Vibrant Capital Markets," October 2017.
11. Markit, BlackRock.
12. The sample comprises all U.S.-listed equity ETFs; we focus only on physically backed ETFs (i.e., we exclude inverse and levered products) with exposure to U.S. stocks.
13. This statistic is likely an upper bound as some primary market flows might be netted out over longer horizons.
14. BlackRock, Bloomberg, as of 2/14/2018. From 12/29/2017 to 2/14/2018, HYG's NAV returned -1.58% vs -1.53% for its benchmark, for a tracking difference of -0.05%.
15. Bloomberg, BlackRock as of 2/14/2018.
16. Bloomberg, BlackRock as of 2/14/2018. From 2/13/18 – 2/14/18, the Bloomberg Barclays US Corporate Index OAS went from 95bp to 94bp, for a -1bp change day over day.
17. Bloomberg, Never Fear the ETF Taper. Credit Funds Have Bigger Ballast, By Sid Verma (February 19, 2018).
18. BlackRock *ViewPoint*, "US Equity Market Structure: Lessons from August 24", (October 2015).

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