Exchange Traded Funds Thematic Note - Findings and Observations during COVID-19 induced market stresses

Public Report



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The unprecedented nature of the COVID-19 pandemic brought severe shock to the financial markets. At the height of the market turmoil in March and April 2020, exchange traded funds (ETFs) in various markets went through a stress period. This note reviews the operation and activities of the primary market and secondary market of ETFs during such a period. In particular, it explores the impact of the stress on the ETF structure and functioning, including the causes of the substantial pricing differences between some fixed income ETFs' secondary market prices and their Net Asset Values (NAVs). It also outlines some challenging circumstances concerning some derivatives-based ETFs. The information sources drawn on by this note include, among others:

- Data analysis compiled by a core research group (CRG) from IOSCO's Committee 5 on Investment Management (C5);
- Responses to a survey from 24 C5 members; and
- Responses to an industry survey from 49 industry participants.

By examining the aforementioned, this note seeks to review the resilience of the ETF structure during the COVID-19 volatility. Overall, available evidence, including data analytics and feedback from C5 members and industry participants, has not indicated any major risks or fragilities in the ETF structure although a subset of ETFs temporarily experienced unusual trading behaviors. The COVID-19 volatility has shed light on the resilience of most ETFs across various market segments during stressed markets. There is an emerging consensus that fixed income ETFs could provide useful pricing information to the wider market. However, a fixed income ETF's value as a price discovery tool for the individual bonds in the underlying portfolio remains subject to debate and ongoing research. In addition, the stress episode helped alleviate concerns about possible financial stability risks relating to the ETF structure. Nevertheless, this note could also prove instructive in the consideration of future enhancements in ETF regulation and guidance.

The first section of the note provides the background of the COVID-19 volatility. The second section provides a description of how various ETF markets generally fared during the period, based on data analytics. The third section summarizes the initial findings and observations, supplemented by survey responses.

1. Background – COVID-19 volatility

The outbreak of COVID-19 and the public health measures put in place across the world to contain the spread of the pandemic led to a sudden decline in global business activity. While first and foremost a health crisis, the global pandemic also led to high volatility and significant stresses in financial markets in March and April 2020. Market prices of equity and debt securities fell rapidly, yields increased across the yield curve, uncertainty in the economy and asset-price volatility spiked, and bid-ask spreads widened significantly even for high-quality and liquid government debt securities, such as US Treasury securities. Investors rapidly and generally shifted their risk preferences toward cash and other highly liquid instruments.

In response to the shock to the financial market, authorities around the world implemented a variety of support measures which (including the effect of their announcements) had a major impact in restoring confidence in the functioning of financial markets around the world.[1]

The COVID-19 pandemic, therefore, presented a real-world test for the ETF structure in response to significant market stress. Concerns about potential financial stability risks, linked primarily to perceived risks around the impact of primary market selling pressures onto the underlying asset markets such as corporate bonds, had also not been examined empirically under such conditions.

2. General observations from data analytics

The CRG for the IOSCO C5 ETF work[2] conducted data analytics work on the operations of ETFs during the COVID-19 stress. The timeframe of the analysis on ETFs was from Q4 2019 to Q2 2020, covering the height of market volatility experienced in March and April 2020 before markets gradually returned to more normal levels from May 2020 onwards. In addition, the analysis grouped ETFs based on their underlying asset classes (i.e., equities, government bonds, investment-grade (IG) bonds and high-yield (HY) bonds)[3] and geographical regions / listing venues (i.e., US, Europe and Asia Pacific) to provide a more granular view of how each category of ETFs fared in different regions during the period.

1 These measures included (1) fiscal support measures, including tax measures, grants and subsidies, expansion of unemployment benefits, cash to household schemes, and loan programs; (2) monetary support measures, including expanded quantitative easing programs, reduction in key rates, and central bank liquidity facilities; (3) financial support measures, including easing of regulatory requirements and payment holidays (e.g., on consumer credit products and mortgages); and (4) in some instances, measures to directly support the functioning of debt security markets.

2 The core research group comprises Autoriteit Financiële Markten (AFM, Netherlands), Autorité des Marchés Financiers (AMF, France), Central Bank of Ireland (CBI, Ireland), European Securities and Markets Authority (ESMA), Financial Conduct Authority (FCA, UK), Securities and Futures Commission (SFC, Hong Kong) and Securities and Exchange Commission (SEC, US).

3 Depending on the data sources, fund categories may not be mutually exclusive. For example, for US ETFs, IG or HY bond ETF categories may include government or municipal bond ETFs.

(i) Temporary spikes in premia/discounts to day-end NAV

Day-end premium or discount to NAV is a common metric used for assessing the difference between an ETF's secondary market price and its NAV. Depending on market conditions, a minimal or small premium or discount to NAV at close of trading day is generally expected and indicative of an effective arbitrage mechanism while a larger difference may imply that other market factors may have had some impact on the arbitrage mechanism.

- US-registered ETFs (US ETFs)[4] experienced above-average levels of premia and discounts in March 2020.[5] Discounts were most pronounced in fixed income ETFs, where the median ETF traded at increased discounts for several consecutive days during March 2020. At one point, certain IG bond and HY bond ETFs in extreme cases and for a short time traded at discount levels ranging from 6% to 10%. Markets began stabilizing in Q2 2020, and premia and discounts reverted closer to their pre-March levels.

- Similar trends were observed in Europe and Asia Pacific where premia and discounts widened in March 2020.[6] The discount of the more impacted fixed income ETFs also increased to as much as 10% at one point (e.g., IG bond ETFs in Europe). The spike in price difference was, however, short-lived and normalized shortly thereafter.

- Among fixed income ETFs across regions, the largest discounts were generally observed in HY bond ETFs at the height of the market volatility, followed by IG bond ETFs and government bond ETFs.

Widened premia or discounts were generally observed across both equity and fixed income ETFs in March 2020. For instance, in some jurisdictions in Europe and Asia in particular, it is noted that premia or discounts for equity ETFs could be largely attributable to trading hour differences and hence valuation differences between the ETFs and their underlying assets. For example, in the case of an ETF listed in Asia that tracks a US equity index, its secondary market closing price and NAV (calculated by using US market closing prices) are valued at different time points that may be more than ten hours apart. Therefore, the two valuations could potentially diverge because they may reflect different market information, especially during increased market volatility such as in March and April 2020. For fixed income ETFs, there were potentially additional factors in play (see discussion in **section 3(i)**).

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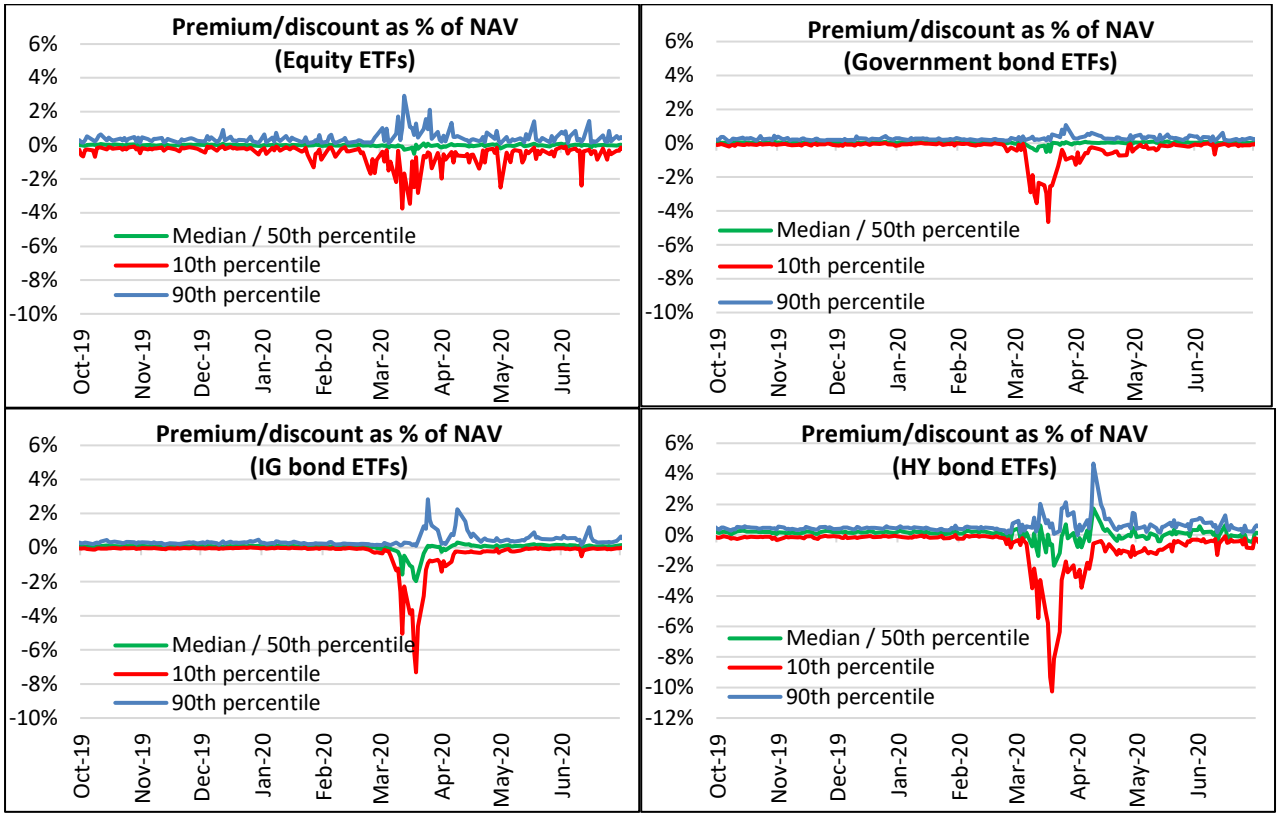
4 US ETFs in this note are registered with the U.S. SEC under the Investment Company Act of 1940.

5 In March 2020, for US ETFs, the largest median discounts observed among equity ETFs, government bond ETFs, IG bond ETFs and HY bond ETFs were -0.5%, -0.5%, -2.0% and -2.0% respectively.

6 In March 2020, for European ETFs, the largest median discounts observed among equity ETFs, government bond ETFs, IG bond ETFs and HY bond ETFs were -0.2%, -0.5%, -5.4% and -3.4% respectively. For Asia Pacific ETFs, the largest median discounts observed among equity ETFs, government bond ETFs, IG bond ETFs and HY bond ETFs were -0.1%, -0.2%, -2.5% and -2.6% respectively.

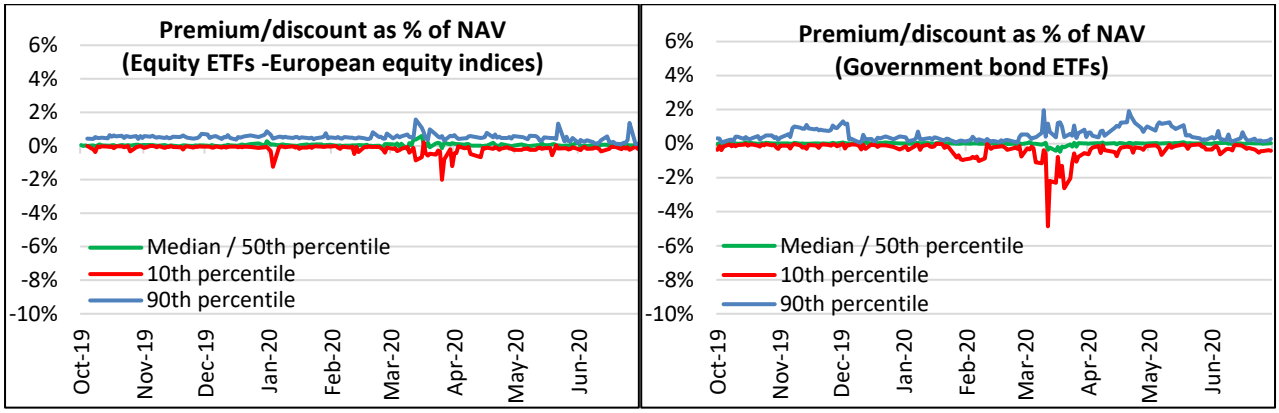
Exhibit 1 – Premium or discount to day-end NAV

US ETFs

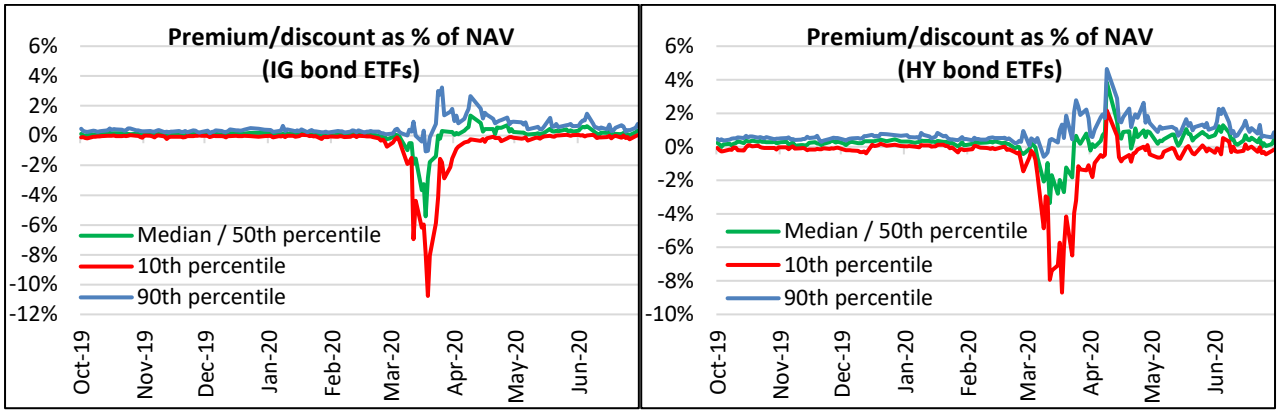


Source: SEC staff calculations based on data provided by Bloomberg.

European ETFs[7]

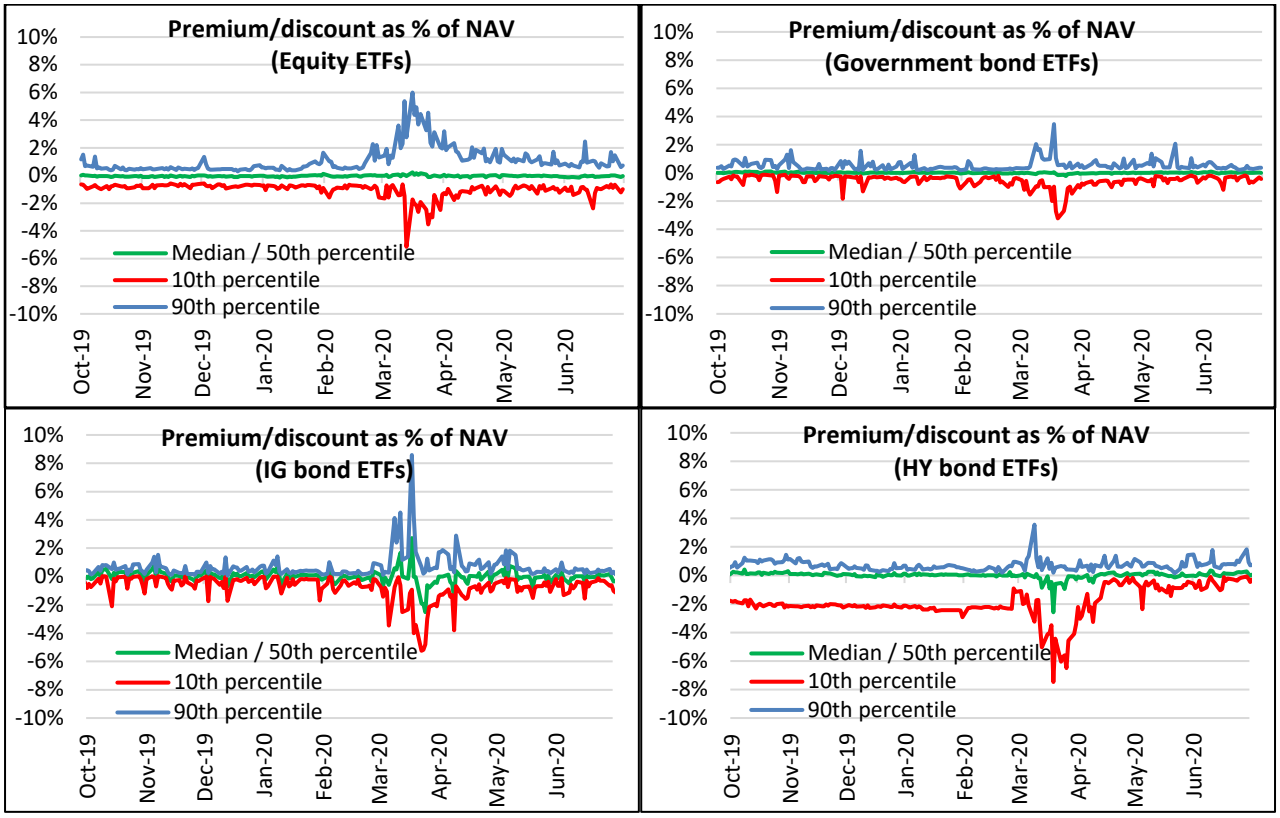


7 Unless otherwise specified, the data shown for European ETFs in this note focus on a representative sample group, consisting of the top 30 ETFs within each category (i.e., equity ETFs and government bond ETFs, etc.) based on end-2019 NAV to simplify the data collection exercise in respect of the more fragmented European ETF markets. Accordingly, for the premium / discount to NAV of European equity ETFs, the sample group excluded ETFs tracking non-European equity indices to avoid including a significant portion of data impacted by valuation timing differences between the ETFs (secondary market prices) and their underlying assets.



Source: IOSCO calculations based on data provided by Morningstar.

Asia Pacific ETFs[8]



Source: IOSCO calculations based on data provided by Bloomberg.

[8] Asia Pacific ETFs in this note include all ETFs listed in exchanges in Australia, Mainland China, Hong Kong, India, Indonesia, Japan, South Korea, Malaysia, New Zealand, Philippines, Singapore, Thailand, Taiwan and Vietnam.

(ii) Widened bid-ask spreads

Bid-ask spread is an indicator of the prevailing liquidity conditions for exchange-traded securities. It tends to widen to compensate buyers for accepting additional risk when selling pressure is intensified, and/or when there is a supply-demand imbalance / uncertainty in hedging increases. For ETFs, the frictions in the arbitrage mechanism may also affect their bid-ask spread (to be discussed in details in **section 3(i)**).

- Globally, bid-ask spreads for ETFs generally widened in March 2020 due to COVID-19-related market events.[9] Across different underlying assets and listed venues, the median bid-ask spreads reached around 1% to 2.5% at the height of the volatility.[10] The widened spreads normalized across most ETF categories in the second quarter of 2020.

- The widening of bid-ask spreads was notably larger among certain types of fixed income ETFs than equity ETFs. For example, in extreme cases, spreads at one point briefly increased to around 5% in US HY bond ETFs, and 10% in Asia Pacific HY bond ETFs.[11]

- Among fixed income ETFs across regions, the bid-ask spreads for HY bond ETFs were generally the widest during the height of the volatility period, followed by IG bond ETFs and then government bond ETFs.

The more challenging liquidity environment in March 2020 was, however, experienced market-wide and was not specific to ETFs. Some industry participants pointed out that the widened bid-ask spreads for fixed income ETFs still remained narrower than the average spread of the underlying bonds in which the ETFs invest (notably US treasuries and HY bonds),[12] which suggested that it was relatively cheaper to trade such ETFs than directly in their underlying portfolio assets during the COVID-19 market volatility.

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9 It should be noted that widened bid-ask spread is not entirely unusual as bid-ask spread for some ETFs could widen from time to time for idiosyncratic or localized events/stresses.

10 In March 2020, for US ETFs, the largest median average rolling 5-day bid-ask spreads observed among equity ETFs, government bond ETFs, IG bond ETFs and HY bond ETFs were 0.8%, 0.5%, 0.5% and 1.1% respectively. For European ETFs, the largest median average rolling 5-day bid-ask spreads observed among equity ETFs, government bond ETFs, IG bond ETFs and HY bond ETFs were 0.5%, 0.8%, 2.0% and 2.5% respectively. For Asia Pacific ETFs, the largest median average rolling 5-day bid-ask spreads observed among equity ETFs, government bond ETFs, IG bond ETFs and HY bond ETFs were 0.8%, 0.6%, 2.2% and 1.7% respectively.

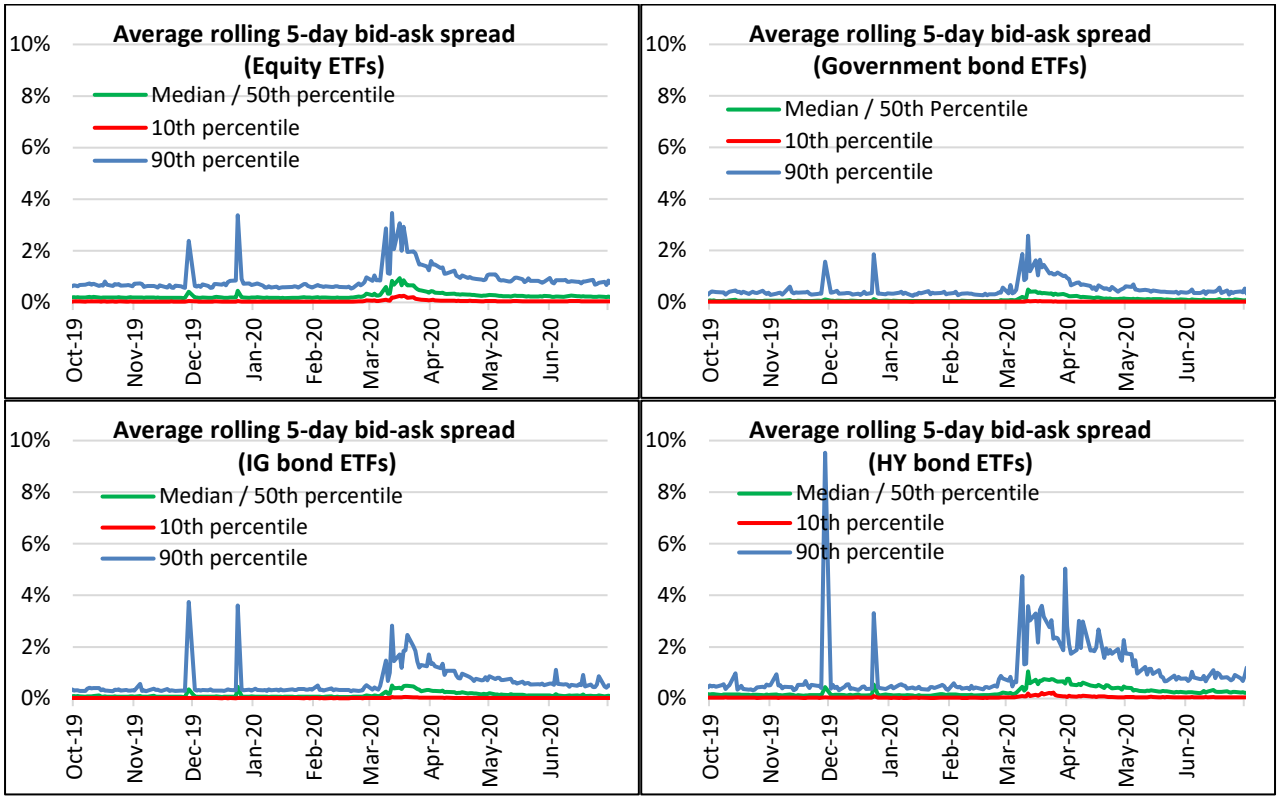
11 Based on the 90th percentile of the respective ETF universe.

12 Investment Company Institute, Report of the COVID-19 Market Impact Working Group - Experiences of US Exchange-Traded Funds During the COVID-19 Crisis (October 2020), page 7, *available at* https://www.ici.org/pdf/20_rpt_covid2.pdf

See also, BlackRock, Lessons from COVID-19: ETFs as a Source of Stability (July 2020), page 3 - 5, *available at* https://www.blackrock.com/corporate/literature/whitepaper/viewpoint-lessons-from-covid-19-etfs-as-a-source-of-stability-july-2020.pdf

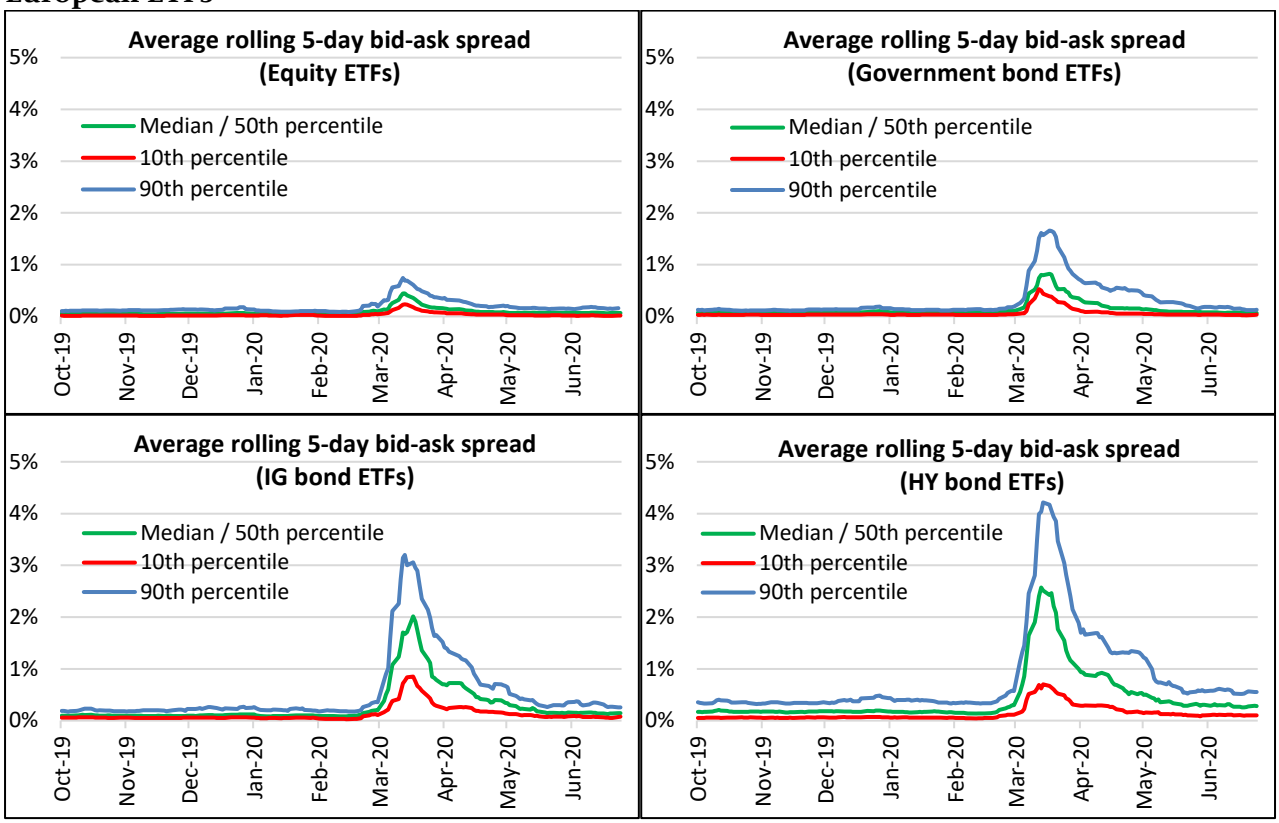
Exhibit 2 – Average rolling 5-day bid-ask spread

US ETFs



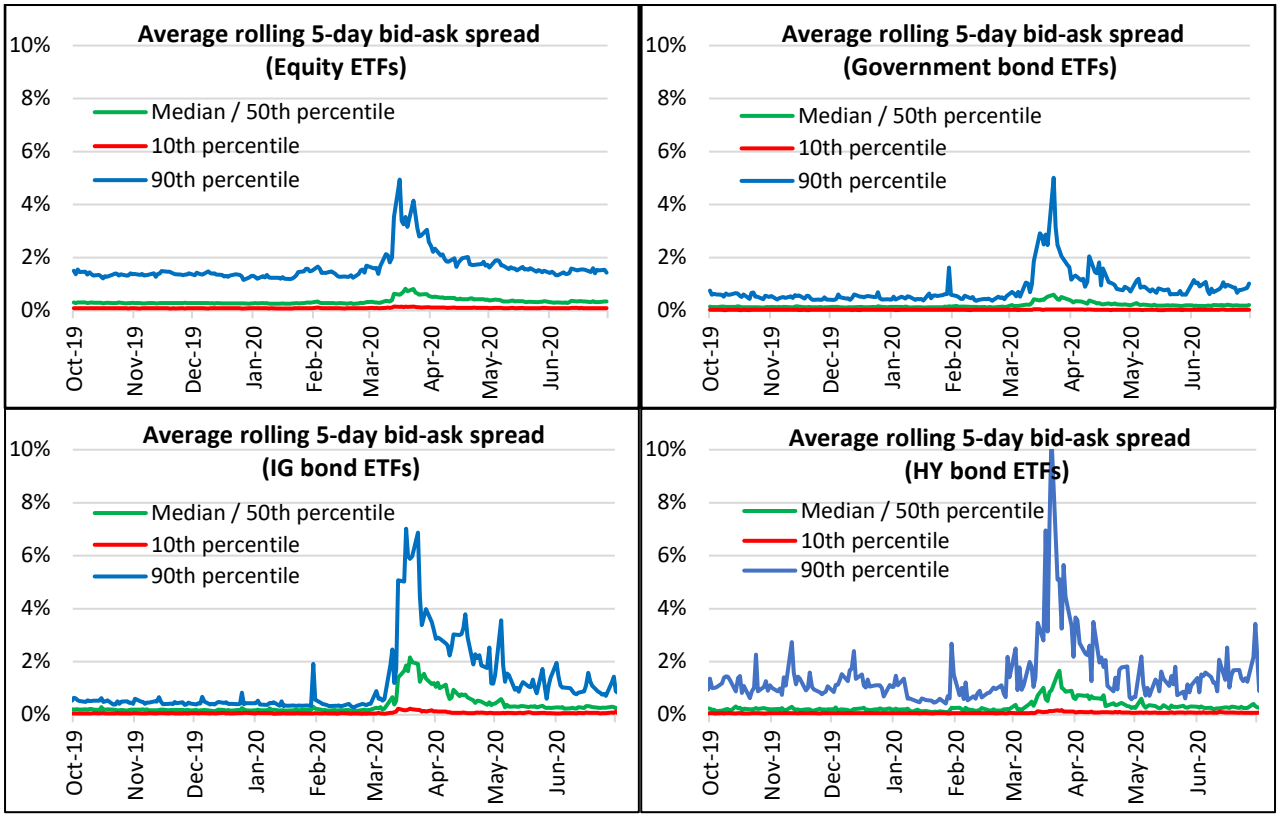
Source: SEC staff calculations based on data provided by Bloomberg.

European ETFs



Source: IOSCO calculations based on data provided by Morningstar.

Asia Pacific ETFs



Source: IOSCO calculations based on data provided by Bloomberg.

(iii) Substantial increase in secondary market turnover

Historically, secondary market turnover of exchanged-traded securities has tended to increase significantly during volatile times. That held true for ETFs in March 2020.

- Daily turnover of ETFs listed on US exchanges increased approximately 100% in March 2020 when compared to February 2020 levels, with increases across equity, fixed income, and other categories of ETFs. Trading activity peaked in the week ending March 13 and receded during the remainder of the month.

- Daily turnover of ETFs listed on European and Asia Pacific exchanges also experienced similar degrees of increase across asset classes in March 2020.[13]

In particular, in the US, the ETF share of US stock market trading reached about 40% in early March 2020, up from 20% - 30% in normal times.[14] Such increase in trading may lend some support to the view that ETFs are convenient and preferred tools for market participants to adjust their exposures in a stressed market.

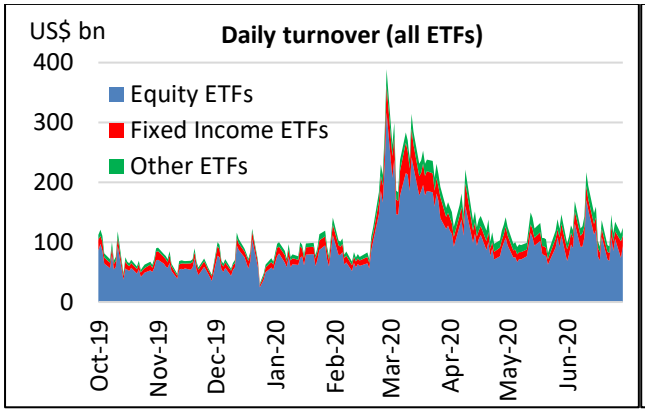
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[13] The average daily turnover of European ETFs and Asia Pacific ETFs increased 162% and 67% respectively in March 2020, compared to that in February 2020.

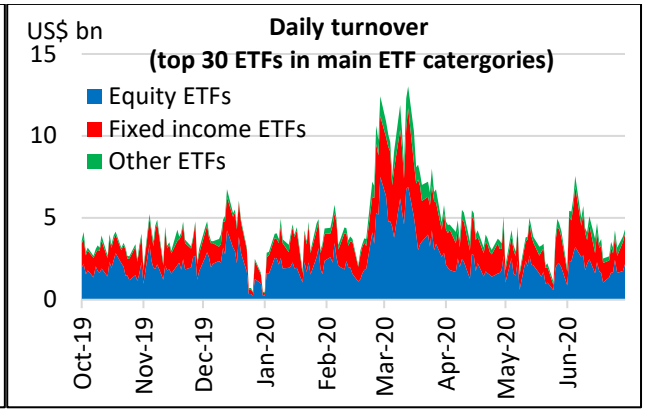
[14] Investment Company Institute, Report of the COVID-19 Market Impact Working Group - Experiences of US Exchange-Traded Funds During the COVID-19 Crisis (October 2020), *available at* https://www.ici.org/pdf/20_rpt_covid2.pdf

Exhibit 3 – Secondary market turnover

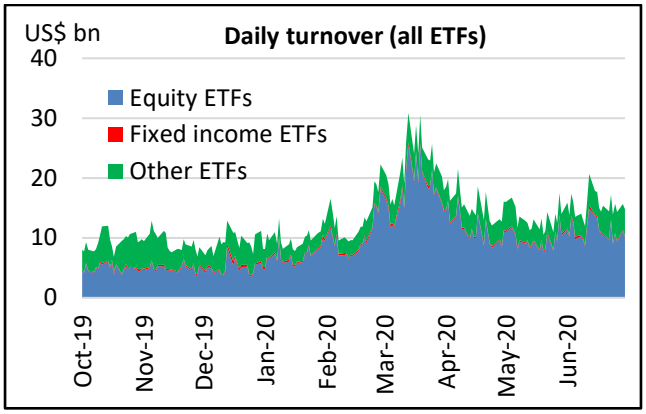
US ETFs



European ETFs



Asia Pacific ETFs



Source: SEC staff calculations based on data provided by Bloomberg.(US ETF data), IOSCO calculations based on data provided by Bloomberg (European and Asia Pacific ETF data).

(iv) Fund flows[15]

Similar to secondary market turnover, primary market activities of ETFs (in terms of net fund flows[16]) also tend to increase during volatile times, but typically to a lesser extent (in terms of notional amount).

- During the height of the COVID-19 volatility, weekly fund flows (as a % of NAV) of equity ETFs across regions remained stable or briefly increased. However, fixed income ETFs across regions generally experienced larger outflows.[17]

- Equity ETF fund flows reverted to relatively normal levels from late-March to the second quarter of 2020. Meanwhile, after market stress, particularly in fixed income markets, receded following

15 All fund flows as mentioned in this note are on net basis.

16 The metric net fund flows is generally used for gauging the fund flow trend of the overall market as creations and redemptions for different ETFs are netted off.

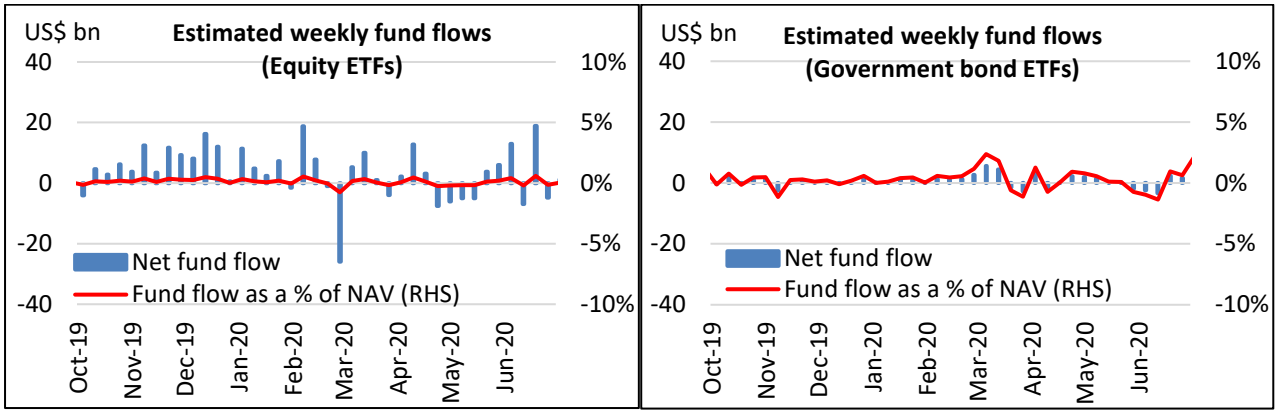
17 In March 2020, the largest weekly outflows (as a % of NAV) across the US, Europe and Asia Pacific were around 0.8% for equity ETFs, ranged from 1.1% to 5.2% for government bond ETFs, ranged from 2.4% to 4.4% for IG bond ETFs and ranged from 8.6% to 10.5% for HY bond ETFs (excluding Asia Pacific HY bond ETFs to avoid skewed statistics due to small sample size).

major central banks' action,[18] both IG bond and HY bond ETFs in the US and Europe[19] experienced fairly consistent inflows for much of the second quarter of 2020. Mixed flows were observed in the Asia Pacific region during the same period.

The fund flow data showed that primary market activities of ETFs generally increased with weekly outflows of fixed income ETFs around or less than 10% of NAV at their peak. That said, the amount of such primary market activities during the height of the COVID-19 volatility was far less than the secondary market turnover of ETFs (e.g., the net outflow of US fixed income ETFs was around US$ 20 billion in March 2020 while the secondary market turnover was around US$ 720 billion in total during the same period, see **section 2(iii)** above). It appears that during the stress period in March and April 2020, investors still traded these ETFs mostly through the secondary market, without necessarily engaging in significant additional primary market activities. Hence, the additional layer of liquidity in the secondary market may have helped mitigate the liquidity risk and/or shock propagation to the underlying asset markets from the selling pressure during the period.

Exhibit 4 – Fund flows

US ETFs



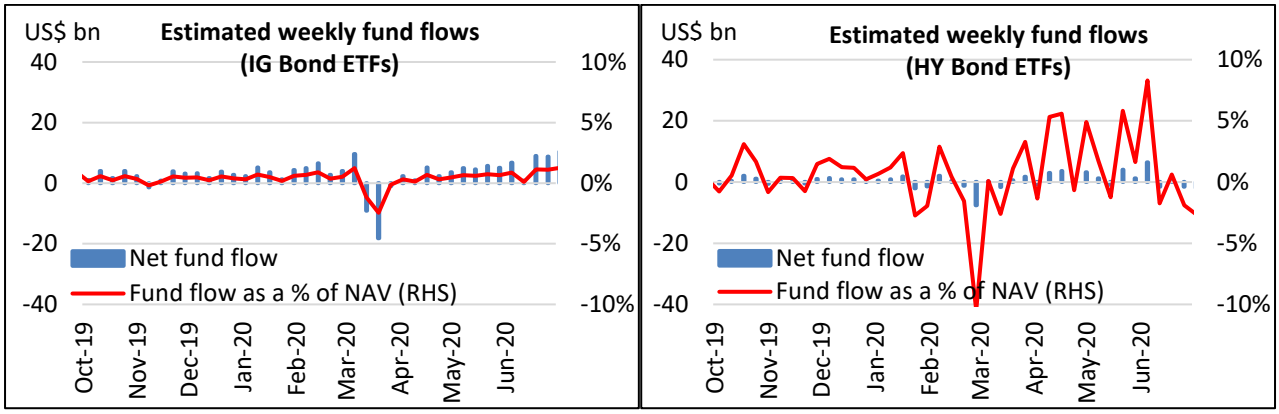
[18] For example, the Federal Reserve established the Secondary Market Corporate Credit Facility to support market liquidity by purchasing in the secondary market corporate bonds issued by investment grade US companies or certain US companies that were investment grade as of March 22, 2020, as well as US-listed ETFs whose investment objective is to provide broad exposure to the market for US corporate bonds. Similar asset purchase programmes were launched by European Central Bank and Bank of England.

See, Federal Reserve, "Secondary Market Corporate Credit Facility" (March 2021), *available at* https://www.federalreserve.gov/monetarypolicy/smccf.htm

See also, European Central Bank's Pandemic emergency purchase programme (PEPP), *available at* https://www.ecb.europa.eu/mopo/implement/pepp/html/index.en.html

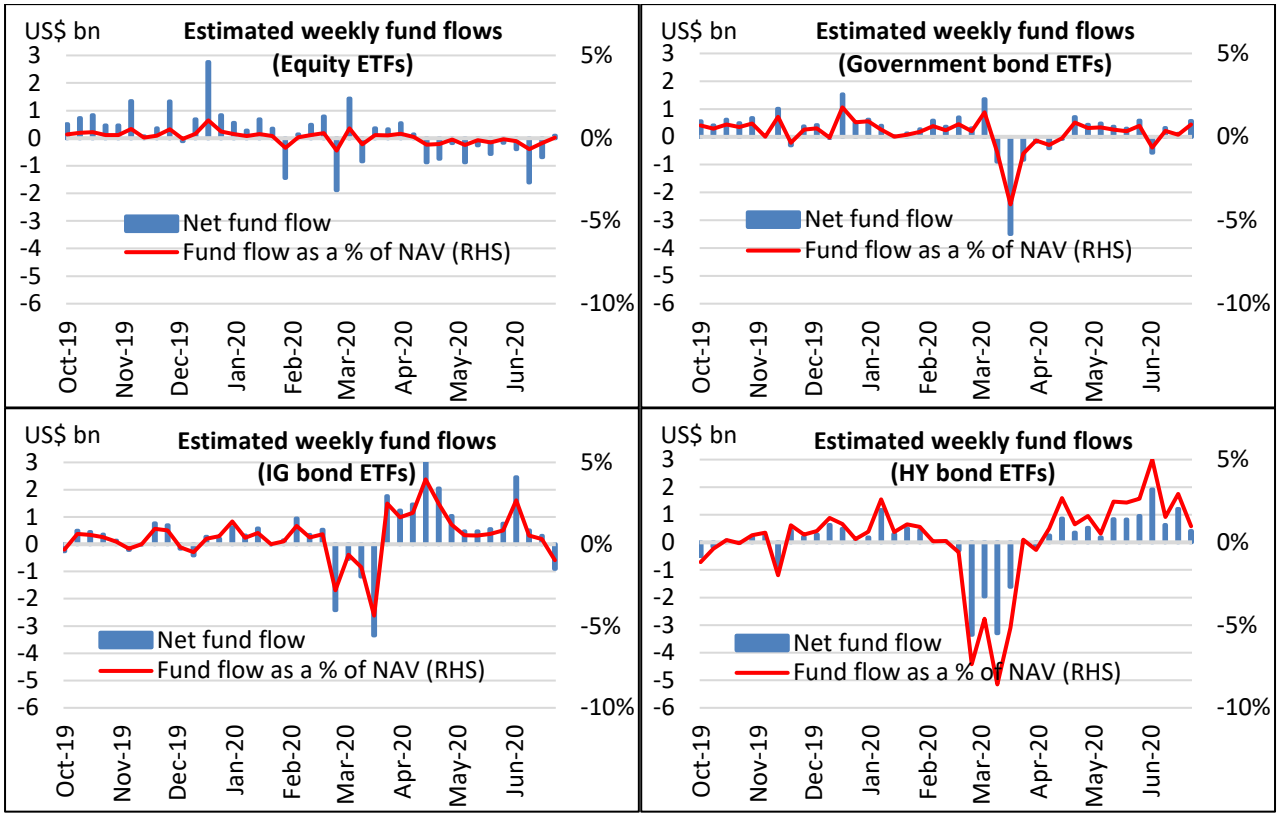
See also, Bank of England's Covid Corporate Financing Facility (CCFF), *available at* https://www.bankofengland.co.uk/markets/covid-corporate-financing-facility

[19] Some market participants have also attributed inflows in Europe fixed income ETFs arising from the Federal Reserve action to a "spill-over" effect arising from the similarity between index constituents for US and European fixed income ETFs.



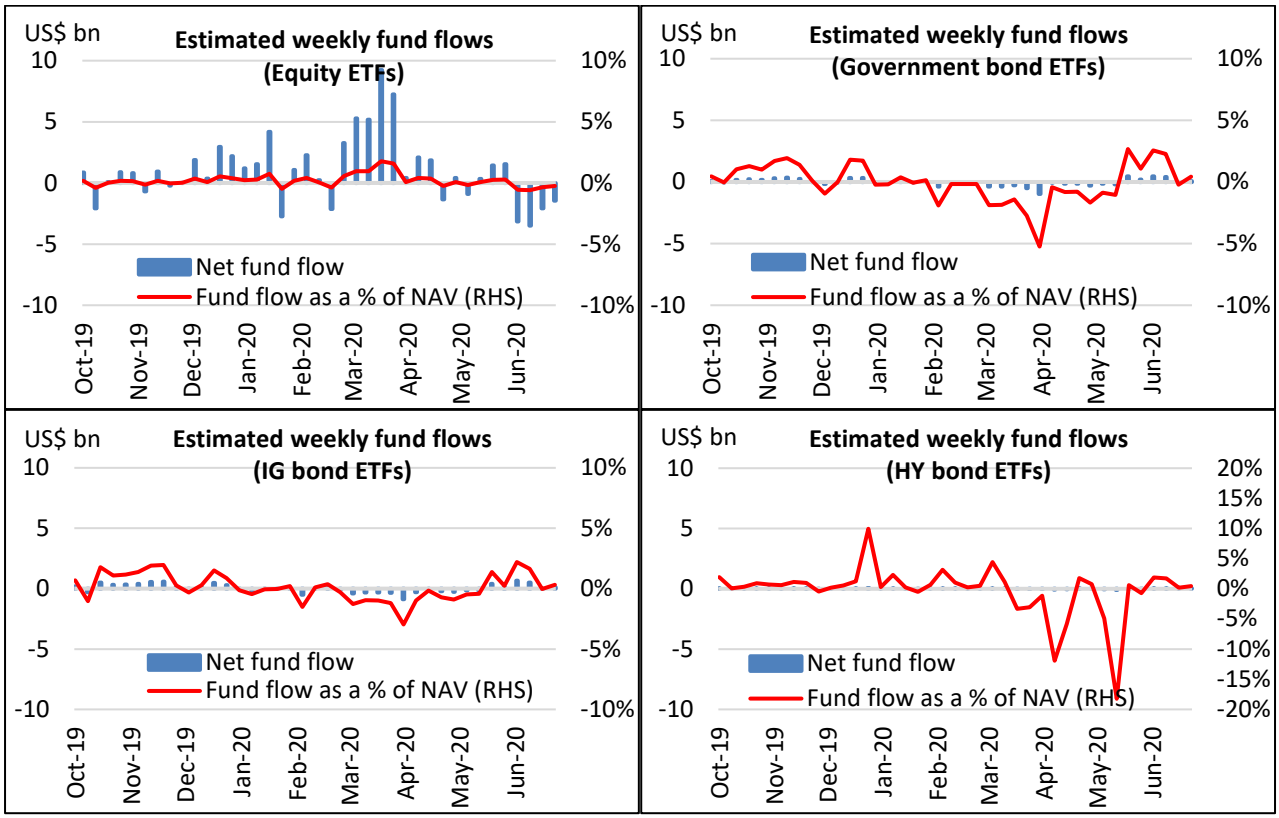
Source: SEC staff calculations based on data provided by Bloomberg.

European ETFs



Source: IOSCO calculations based on data provided by Bloomberg.

Asia Pacific ETFs



Source: IOSCO calculations based on data provided by EPFR.

(v) Fund flows of ETFs compared to unlisted open-end mutual funds

An analysis has also been conducted to compare the monthly fund flows of ETFs and unlisted open-end mutual funds[20] that were invested in similar underlying assets from 2019 to 2020.

- In the US, while equity ETFs experienced inflows for much of 2019 and 2020, equity mutual funds saw outflows for much of this period. For the month of March 2020, the height of COVID-19-related market turmoil, equity ETFs saw inflows of approximately 0.4% of assets, while equity mutual funds saw outflows of 0.3% of assets.

  In comparison to equity funds, both fixed income ETFs and mutual funds in the US saw steady inflows during 2019 and 2020, apart from March 2020. During March, fixed income ETFs lost over 2% of assets to outflows, while fixed income mutual funds lost nearly 6% to outflows, or close to US$ 250 billion. After the large outflows in March, both fixed income ETFs and mutual funds had positive net inflows for the remainder of 2020.

- In Europe, equity and fixed income ETFs[21] and mutual funds with similar underlying asset classes generally experienced similar fund flow trends in 2019 and 2020. During the observation period, equity ETFs and mutual funds had mixed flows while fixed income ETFs and mutual

[20] Unlisted open-end mutual funds are generally described as mutual funds in the following paragraphs in this section.

[21] For section 2(v), the full universe of ETFs domiciled in Europe was included in the analysis.

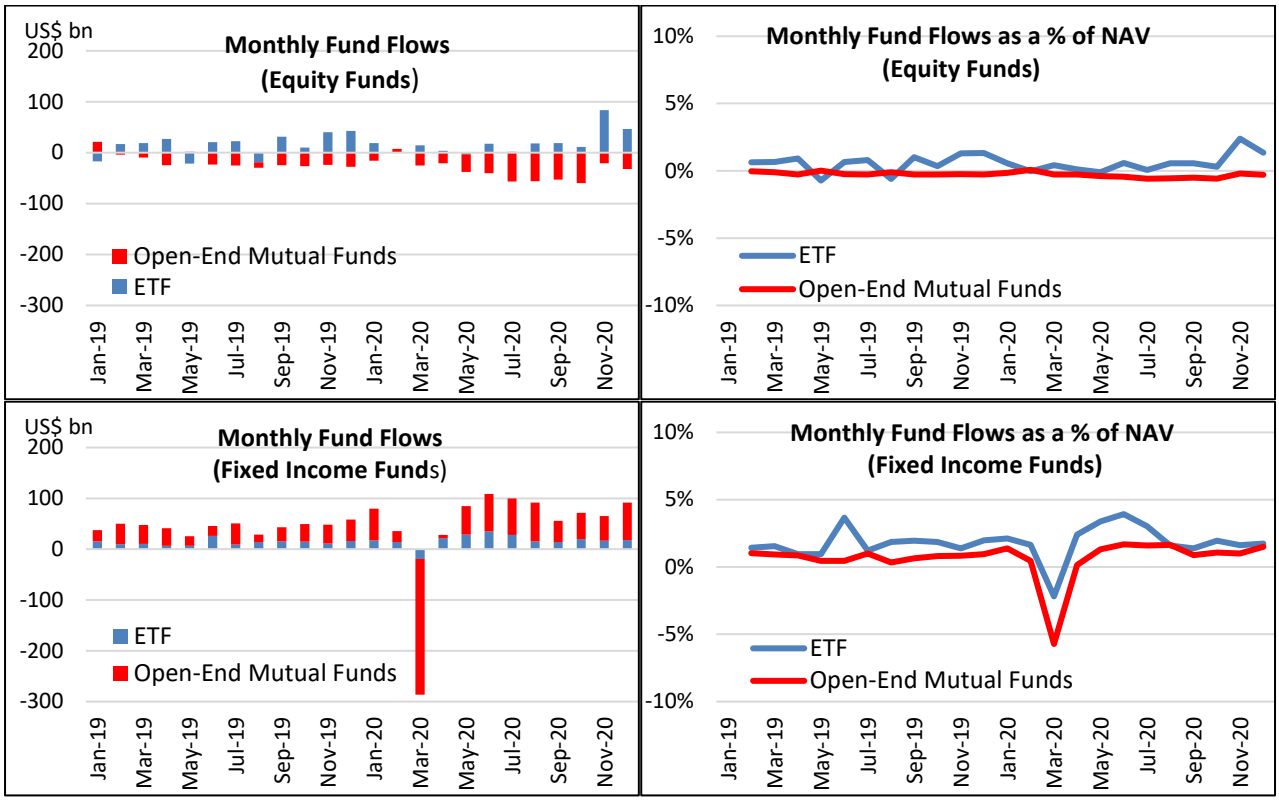
funds recorded inflows in much of the period. Both types of funds saw sharp outflows in March 2020 before recovering with steady inflows thereafter.

- In Asia Pacific, equity ETFs experienced inflows for much of 2019 and 2020 (including March / April 2020) while the flows of equity mutual funds were mixed. Fixed income ETFs and mutual funds experienced inflows for much of 2019 and 2020 but had sharp outflows in March 2020.

Overall, at the height of the COVID-19 volatility, the outflows (as a % of NAV) of both ETFs and mutual funds with similar underlying asset classes were generally comparable.[22] Generally, there was also no significant difference between their fund flow trends in the whole of 2019 and 2020 although the nominal fund flow figures for ETFs across regions were generally much smaller than that for mutual funds due to their size difference in terms of AUM.[23]

Exhibit 5 – Comparison of fund flows of ETFs and mutual funds

US

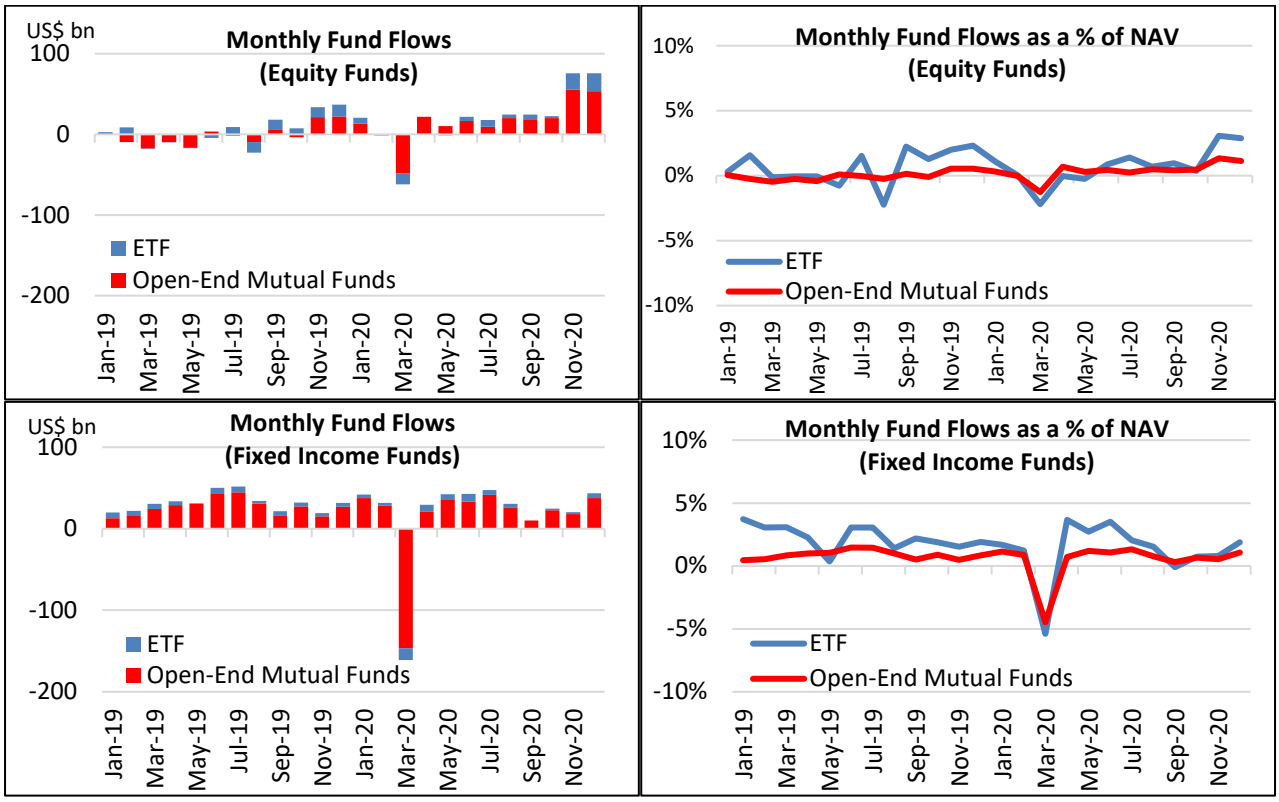


Source: SEC staff calculations based on data provided by Bloomberg and Morningstar.

[22] In particular, in March 2020, the outflows (as a % of NAV) of fixed income ETFs in the US and Asia Pacific were smaller than that of the fixed income mutual funds domiciled in the respective regions (i.e., US fixed income ETFs vs mutual funds: 2.2% vs 5.7%; Asia Pacific fixed income ETFs vs mutual funds: 6.2% vs 8.8%), whereas the outflows in Europe were comparable (i.e., European fixed income ETFs vs mutual funds: 5.4% vs 4.5%).

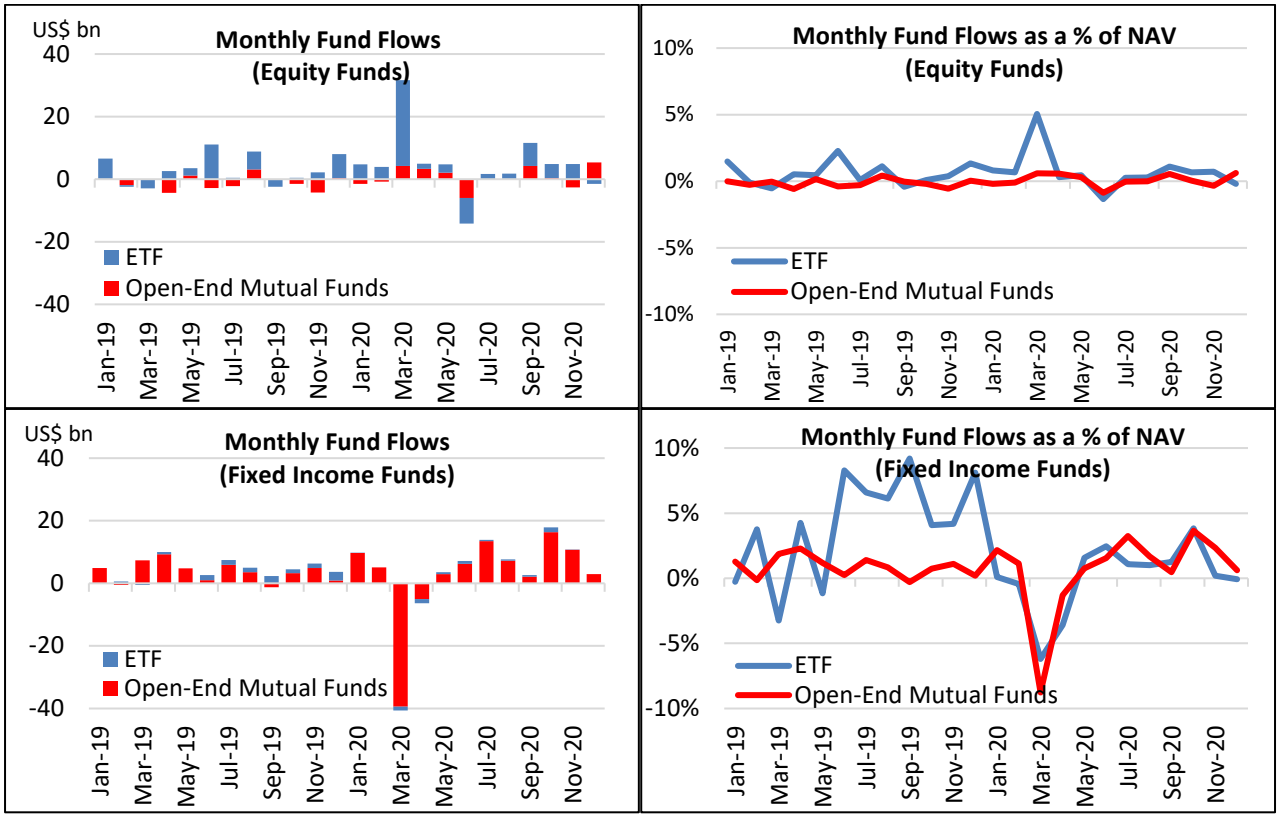
[23] Based on data from ETFGI and The International Investment Funds Association, global ETF AUM was USD 7.9 trillion at the end of 2020, compared to global AUM for all regulated open-end funds of USD 63.1 trillion. Regulated open-end funds include mutual funds, ETFs and institutional funds.

Europe



Source: IOSCO calculations based on data provided by EPFR and Morningstar.

Asia Pacific



Source: IOSCO calculations based on data provided by EPFR and Morningstar.

3. Initial observations

Two surveys were conducted by IOSCO C5 on how ETFs fared during the COVID-19 volatility respectively solicited views and feedback from C5 members as well as industry participants (i.e., ETF managers, authorized participants (APs), market makers (MMs) and liquidity providers (LPs)). They provided useful market insights to supplement the analytics work as set out in **section 2**. Some initial observations are set out below.

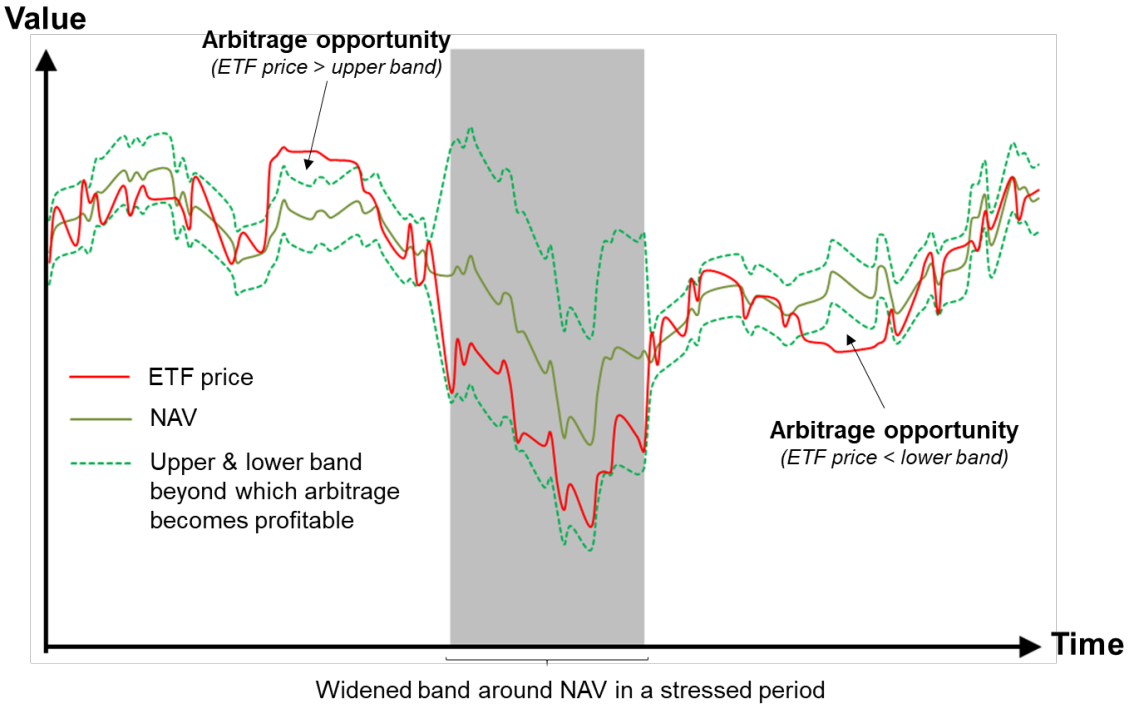
(i) Fixed income ETFs' role in providing additional pricing information in underlying bonds

As shown in **section 2(i)**, increased levels of premia or discounts to day-end NAV (or so-called price dislocations in certain instances) were observed in March 2020. Yet, increased premia or discounts were generally short-lived in most markets and typically lasted for only up to two weeks. By April 2020, these pricing differences were largely eliminated, following the actions taken by various central banks to help restore liquidity (and hence greater pricing transparency) and market confidence to underlying bond markets. In most industry respondents' views, this demonstrated the resilience of the ETF structure as the arbitrage mechanism quickly resumed to normal following the initial period of volatility.

Regarding the possible causes of pricing differences in fixed income ETFs, respondents suggested several possible factors:

- Frictions in the arbitrage mechanism: In general, the secondary market price of an ETF's shares should be at or close to its NAV as a result of an effective arbitrage mechanism. That said, the arbitrage mechanism may also reflect other inputs, such as increased transaction costs (e.g., bid-ask spread, commissions, taxes, fees charged in the creation or redemption process), increased uncertainty related to valuation of underlying assets (to be discussed below) and higher hedging costs due to heightened uncertainty during periods of market stress.[24] These frictions in the arbitrage process in turn may translate into wider bid-ask spreads for an ETF's secondary market price and greater divergence from an ETF's NAV, as it may then take larger pricing differences for an arbitrage trade to be profitable (*see illustration below*). These factors may partly explain why certain fixed income ETFs exhibited significantly wider spreads and discounts during the COVID-19 volatility.

[24] DWS, ETF Trading in Volatile Times (April 2020), *available at* https://www.dws.com/en-gb/insights/investment-insights/etf-trading-in-volatile-times/



Source: IOSCO. For illustration purpose only.

- Uncertainty related to valuation of underlying assets: For NAV calculation of fixed income ETFs, inputs used to value underlying bonds may include bid prices that become stale[25] or modeled pricing estimates that are non-actionable, especially in fixed income markets with lower transparency or liquidity.[26] These features tend to compound under stress. In other words, when the underlying bond markets are under stress as they were during the COVID-19 volatility, the NAV of a fixed income ETF may be based on pricing inputs that may no longer accurately reflect underlying market conditions.[27] Therefore, many industry respondents commented that the discounts in fixed income ETFs observed in March 2020 reflected known valuation and liquidity issues related to underlying bond markets, especially given the exceptional market conditions at that time.[28]

- Actionable ETF secondary market price: Most industry respondents expressed the view that the secondary market price of fixed income ETFs provided an indication of the aggregate value of

25 These include published bid prices and/or indicative broker quotes for individual bonds typically traded in dealer intermediated OTC markets.

26 Some underlying bonds of fixed income ETFs, especially corporate bonds, could be thinly traded and are mostly traded over the counter without an official closing price like equities. The availability of non-stale prices for bonds depends on the frequency with which they are traded in addition to the availability of actionable pricing from bond traders and other sources. For example, fewer than a quarter of the bonds in the Bloomberg Barclays U.S. Aggregate Bond Index (a widely referenced bond index) are traded on a typical day and many may not be traded for weeks.

27 For example, fixed income ETFs are traded on the secondary market in the US until 4pm (ET). Yet, individual bond prices, which are used to calculate the NAV of such ETFs, could be determined at 3pm (ET) instead.

28 Some market participants remarketed that the pricing difference between fixed income ETFs' NAVs and secondary market prices was a foreseeable feature of the ETF structure.

the underlying bonds actively traded as a basket on the secondary market. This is because ETF shares generally continued to trade at higher volumes and frequencies than their less liquid underlying bond holdings.[29] As a result, secondary market prices of fixed income ETFs incorporated more timely information about the value of underlying bonds held by such ETFs, including the cost to trade the underlying bonds under prevailing market conditions.[30] Many C5 member respondents also concurred with this view.[31]

- Increased liquidity cost: Many industry participants were also of the view that secondary market prices for fixed income ETFs may have traded at a cost reflecting the relative liquidity provided by ETFs in the secondary market as liquidity deteriorated in the underlying bond markets (i.e., investors would need to pay an additional cost for the immediate liquidity offered by fixed income ETFs). Fixed income ETFs remained tradable as underlying bonds became increasingly illiquid. Despite the increased liquidity cost, as mentioned in **section 2(ii)**, the bid-ask spread of fixed income ETFs generally remained narrower than those of the underlying bonds which implied that fixed income ETFs were a more cost-efficient trading tool at that time.

Based on the above, most industry respondents came to a view that fixed income ETFs in particular provided additional pricing information for underlying bonds that were not as actively traded during the COVID-19 volatility. They opined that the discounts observed were neither an issue in themselves nor a risk that needed to be mitigated as they could be attributable to the possible factors as set out above.[32] Moreover, empirical evidence showed that ETF share prices in the secondary market were leading NAVs and thus incorporated new information in a timelier manner than that of the underlying assets, especially during times of market stress.[33] Industry respondents generally regarded such

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[29] Some industry respondents were of the view that the absence of a commensurate increase in fixed income ETFs' primary market transactions against the substantial increase in their secondary market trading volume indicated a market where NAVs were not reflective of actionable prices.

See also, Bank of England, Financial Stability Report (August 2020), *available at*

[30] In light of the uncertainty in the valuation of underlying bonds during the stress period, APs and MMs tended to independently evaluate the actionable prices for underlying bonds, which would be translated into a price that may be different from the fixed income ETF's NAV, but at which the AP/MM was willing to trade it in the secondary market.

[31] For example, *see*, SEC, U.S. Credit Markets Interconnectedness and the Effects of the COVID-19 Economic Shock (October 2020), page 37 – 39, *available at* https://www.sec.gov/files/US-Credit-Markets_COVID-19_Report.pdf

"Thus, ETF market prices can rapidly incorporate new information as it becomes available. In contrast, most bonds trade only infrequently, and as a result, bond prices may be relatively insensitive to the arrival of new information. Bond funds, including bond ETFs, generally calculate their NAV in reliance on evaluated prices, matrix prices, price opinions, or similar pricing estimates. During periods of market volatility when the information environment is changing rapidly—as was the case during in March 2020—ETF market prices are viewed by some market participants as a more reliable indicator of actionable value than the ETF's NAV."

[32] Some view premium / discount to NAV of an ETF as "implicit" trading costs which are borne by the willing investors conducting the trading, as opposed to being borne by the ETF or remaining investors. In addition, some may view premium / discount to NAV as an inherent feature of an ETF as it is traded like a stock at a secondary market price but with known intrinsic value.

[33] BIS Bulletin No.6, The recent distress in corporate bond markets: cues from ETFs (April 2020), *available at* https://www.bis.org/publ/bisbull06.pdf

additional pricing information or function provided by fixed income ETFs as an important and valuable tool for understanding price trends in underlying bond markets. A number of C5 members also expressed similar views.[34] However, a fixed income ETF's value as a price discovery tool for the individual bonds in the underlying portfolio remains subject to debate and ongoing research.[35]

Box 1: Example of ETF secondary market price leading NAV (based on the respective 15 largest IG bond and HY bond European ETFs)

The graph below, which compares the average of the secondary market closing price and the NAV of the 15 largest IG bond and HY bond European ETFs, illustrates the delay that ETF's NAV experienced to incorporate new information under the stressed market conditions. For example, the secondary market prices of IG bond ETFs dropped to 92 two days before the NAV did, which was consistent with industry respondents' common view that the secondary market prices of fixed income ETFs were more actionable and were leading the ETFs' NAVs.

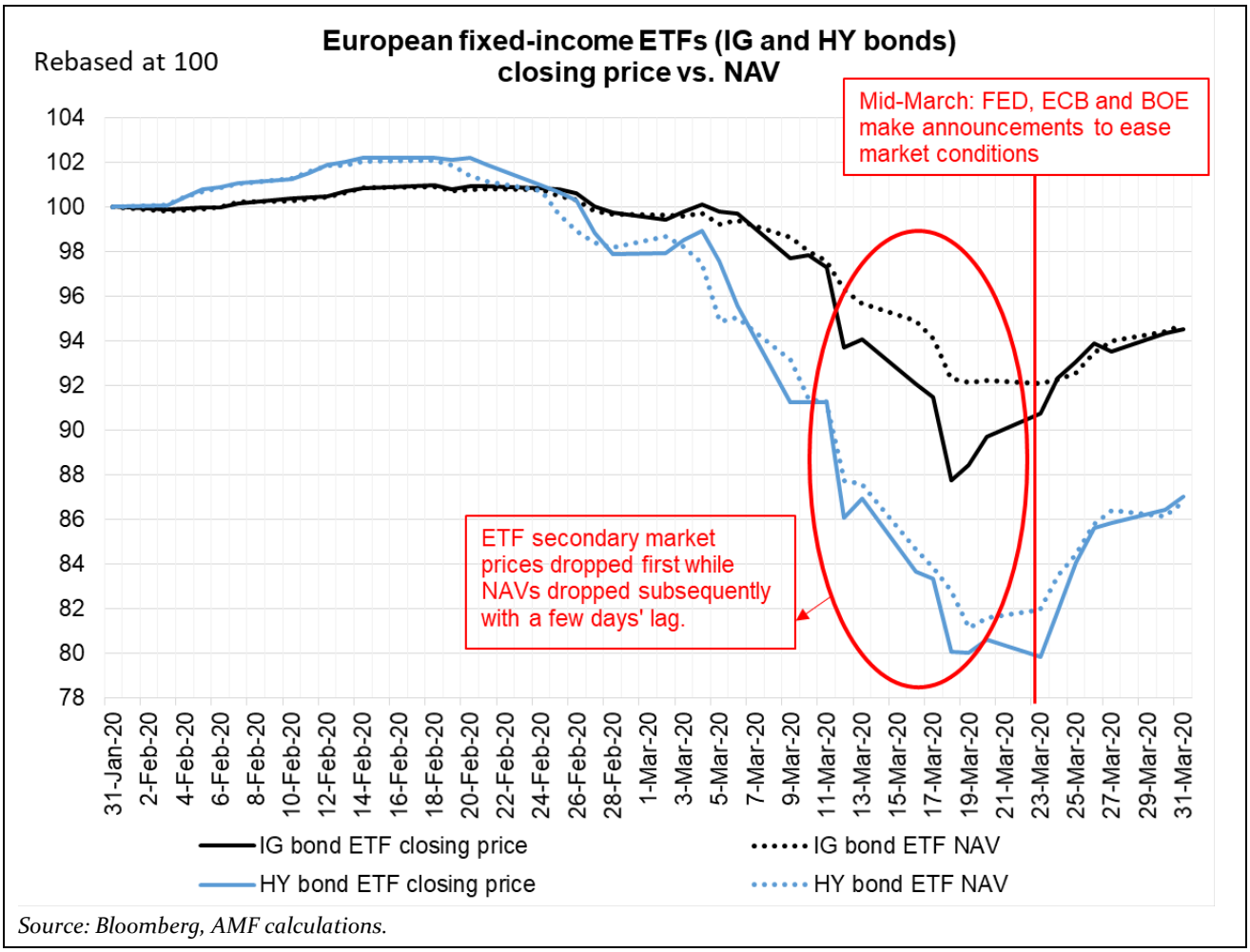
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34 For example, one SEC staff report highlighted that potential price discovery characteristics of bond ETFs were evident in March 2020 when the information environment was changing rapidly and volatility and stress more generally were high. *See*, SEC Staff, U.S. Credit Markets Interconnectedness and the Effects of the COVID-19 Economic Shock (October 2020), available at https://www.sec.gov/files/US-Credit-Markets_COVID-19_Report.pdf

"In addition, because bond ETFs trade on exchanges and are generally more liquid than the cash bond market, bond ETFs are viewed by a number of market participants as playing an increasingly important role in price discovery. These liquidity and potential price discovery characteristics were evident in March 2020 when the information environment was changing rapidly and volatility and stress more generally were high. During that period, ETFs generally functioned as expected, allowing investors to transfer diversified bond risk on the secondary market without transacting directly in the underlying bonds."

35 As the ETF secondary market price is based on a basket of bonds and is not specific to individual bonds, it may not be straightforward to directly apply the ETF secondary market prices in valuing the relevant individual bonds, for example, held in other fixed income portfolios.

36 For example, *see*, BlackRock, Lessons from COVID-19: ETFs as a Source of Stability (July 2020), *available at* https://www.blackrock.com/corporate/literature/whitepaper/viewpoint-lessons-from-covid-19-etfs-as-a-source-of-stability-july-2020.pdf



Source: Bloomberg, AMF calculations.

(ii) Primary market activity

Industry survey respondents generally reported that the number and composition of AP participation in the primary market activities of ETFs remained robust and did not change significantly during the height of the COVID-19 volatility. Indeed, many industry respondents observed that, overall, primary markets were more active than during normal times and were conducted by a broad number of APs[36] (see also **section 2(iv)**). Responses by APs (and MMs) also indicated an eagerness to actively participate in the market during times of volatility as there may be additional arbitrage opportunities as a result of such volatility. Moreover, even if a particular AP (or MM) were to cease activities, even temporarily, respondents generally expected other market participants would step in accordingly.

Suspension and disruption in the ETF primary markets were also not common in general, except for certain types of commodity ETFs that experienced extreme price volatility (discussed in **section 3(v)**

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[36] For example, *see*, BlackRock, Lessons from COVID-19: ETFs as a Source of Stability (July 2020), *available at* https://www.blackrock.com/corporate/literature/whitepaper/viewpoint-lessons-from-covid-19-etfs-as-a-source-of-stability-july-2020.pdf

"Participation from authorized participants (APs) was broad, with 22 different APs creating and redeeming shares of iShares ETFs in Europe and 24 in the US during March 2020. For comparison, 24 and 28 APs were active in iShares ETFs in Europe and the US, respectively, in 2019."

See also, Vanguard, ETFs prove resilient during COVID-19 volatility (December 2020)

below). ETF providers also indicated they had controls and processes in place to manage relationships and to monitor activities of APs. These observations and responses seem to alleviate earlier concerns that APs might step away during volatile times and that primary market activities might become overly concentrated in a limited number of APs.

Generally, the ETF primary market is flexible in allowing APs to manage risk via cash or in-kind creation/redemption, of which custom basket is a form of in-kind transfer.[37] Many industry respondents commented that the custom basket approach, a common market practice of transacting creations and redemptions in fixed income ETFs, provides flexibility to both ETF managers and APs/LPs so that they do not need to transact all underlying bonds which may otherwise have to be sold at discounted prices for liquidity. The custom basket approach is hence valuable in a stressed market, including during the COVID-19 volatility. While some empirical evidence showed that the custom basket of fixed income ETFs could differ considerably from the actual ETF holdings (e.g., only 3% of the bond holdings are in the basket), potentially with lower liquidity or quality,[38] some market observers also note that the characteristics of custom baskets are typically similar to the ETF portfolio in terms of duration, credit and liquidity.[39]

(iii) Increased secondary market turnover with potential shock-absorbing function

Turnover in the secondary market for ETF shares increased significantly during the period (including fixed income ETFs) in the US, Europe and Asia Pacific (see **section 2(iii)**). Regulators from major ETF jurisdictions generally did not observe MMs/LPs stepping away at the height of the COVID-19 volatility.[40] Industry respondents similarly noted that MMs/LPs generally remained active in the ETF space, and in some instances, even increased their participation.

Bid-ask spreads generally widened for ETFs during March 2020 (see **section 2(ii)**) as MMs/LPs priced in market uncertainty and higher liquidity costs. Nevertheless, as liquidity deteriorated and transaction costs increased in underlying fixed income markets (especially corporate bonds), [41] investors increasingly relied on ETFs to adjust their exposure to underlying fixed income markets, as evidenced

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37 A custom basket typically differs from the standard creation or redemption basket issued by the ETF manager because it is negotiated between the ETF manager and an AP. The prevalence of cash, in-kind and custom basket creation/redemption may vary across different ETF markets. For example, the in-kind and custom basket approach may be more common in the US market than in Europe or Asia Pacific.

Separately, the in-kind and custom basket approach may be more common in the ETF market than in the unlisted open-end mutual fund market.

38 BIS Quarterly Review March 2021, The anatomy of bond ETF arbitrage (March 2021), *available at* https://www.bis.org/publ/qtrpdf/r_qt2103d.pdf

39 BlackRock, "By the Numbers: New Data Behind the Bond ETF Primary Process" (May 2021), *available at* https://www.blackrock.com/corporate/literature/whitepaper/ishares-by-the-numbers-new-data-behind-the-bond-etf-primary-process.pdf

40 However, there were APs/MMs who had issues/disruption in the provision of their services during a limited time period due to work-from-home or quarantine arrangement.

41 MSCI, Bond Liquidity: How Bad Was COVID? (September 2020), *available at* https://www.msci.com/www/blog-posts/bond-liquidity-how-bad-was/02090095898

by higher trading volumes in ETF shares relative to underlying bonds.[42] As such, many industry respondents commented that the additional layer of liquidity offered by fixed income ETFs can generally help absorb shocks during stressed market conditions.[43] Some market observers from IOSCO's engagement with the industry also indicated that ETFs were used effectively as hedging tools during the COVID-19 volatility.

(iv) Little evidence of spillover between ETFs and underlying bond markets

Regulators from major ETF jurisdictions are not aware of any material impact from the pricing differences of fixed income ETFs on underlying bond markets during the COVID-19 volatility. As mentioned in **section 3(i)** above, some regulators believe that share prices of fixed income ETFs may serve as an additional source of pricing information for the underlying bond markets.

Some ETF managers also reported that discounts in fixed income ETFs did not affect other unlisted fixed income funds. Some of them emphasized that trading conditions of underlying bonds were identical regardless of the particular fund structure (ETF or unlisted fund).

On a related note, some have suggested that the discounted prices of fixed income ETFs may signal to investors in comparable mutual funds to redeem ahead of others because of potentially stale valuations of underlying portfolio holdings.[44] It should however be noted that such signalling effect largely reflects the efficiency and interconnectedness of the financial markets. The phenomenon is not novel as it exists among many common types of instruments, such as equity futures and the underlying stocks. Moreover, open-end mutual funds may effectively manage their liquidity and if needed (depending on the jurisdiction) employ various liquidity management tools, including swing pricing, redemption gates and anti-dilution levies to mitigate liquidity run risk.

(v) Stresses around derivatives-based ETFs

Apart from anomalies concerning the pricing and arbitrage mechanism of fixed income ETFs, certain futures-based oil ETPs/ETFs[45] and leveraged/inverse ETFs (L&I ETFs) experienced difficulties during COVID-19 volatility.

- Futures-based oil ETPs/ETFs: In April 2020, prices of oil futures were subject to high volatility (including falling to negative prices), which triggered concerns that the continued holding of

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42 For example, an industry respondent reported that the ratio of trading volume in corporate bond ETFs to trading volume in the underlying corporate bonds almost doubled during the stress period.

43 Vanguard, ETFs prove resilient during COVID-19 volatility (December 2020)

See also, BlackRock, Lessons from COVID-19: ETFs as a Source of Stability (July 2020), *available at* https://www.blackrock.com/corporate/literature/whitepaper/viewpoint-lessons-from-covid-19-etfs-as-a-source-of-stability-july-2020.pdf

44 FSB, Holistic Review of the March Market Turmoil (November 2020), *available at* https://www.fsb.org/wp-content/uploads/P171120-2.pdf

45 In the US, some commodities-based vehicles, such as USO, are exchange-traded products (ETPs). These ETPs register their securities under the Securities Act of 1933, but are not "ETFs" registered under the Investment Company Act of 1940. Save for the US, the other futures-based oil ETFs (domiciled in other jurisdictions) as mentioned in this note are structured as ETFs.

oil futures for certain futures-based oil ETPs/ETFs might lead to a substantial or total loss to investors. In view of this, the managers of many of these ETPs/ETFs decided to implement a temporary change of investment strategy, such as an accelerated rollover to replace the oil futures contracts with longer term contracts, with short notice to investors.

Moreover, service providers to ETPs/ETFs may generally restrict the size or exposure of the funds due to additional risk controls under stressed market conditions. For example, the clearing broker of a futures-based oil ETP/ETF may demand that the ETP/ETF take additional risk management measures to address the risk of negative prices of oil futures contracts, such as purchase of put options on oil futures contracts; suspension of creation application; and roll-over to diversify the oil futures holdings to longer term contracts.

- L&I ETFs: Certain L&I ETFs (e.g., with oil futures as underlying) experienced significant price and bid-ask spreads fluctuations due to extreme volatility and prohibitive trading costs in the underlying derivatives markets. As a result, some of them experienced multiple intraday restrike events.[46] Some instituted a series of temporary measures, including halting creation, periodic halting of trading, temporary reduction in leverage (e.g., from 2X to 1X), temporary name changes to reflect the reduction in leverage and amended rolling methodology. Some of them changed their investment strategy from a completely futures-based approach to include swaps to mitigate the risk of exceeding the futures position limit and any resulting difficulties in rebalancing activities. In more extreme cases, some L&I ETFs were liquidated.

The above observations highlight risks [47] specifically relating to product structuring of certain derivative-based ETFs with more distinct features (e.g., investing in less diversified assets, such as commodity futures / VIX, or adopting a leveraged strategy). While these ETPs/ETFs collectively amount to only a small portion of the ETF space (around 2% of AUM),[48] these potential risks, if not properly mitigated, could potentially impair the product viability of such ETPs/ETFs. Furthermore, many investor comments received by C5 member respondents in relation to the COVID-19 volatility were about futures-based oil ETPs/ETFs and L&I ETFs.[49] This raises questions around whether investors were able to fully appreciate the distinctive features and risk profiles of such ETPs/ETFs.

(vi) Functional volatility control mechanism (VCM)

Many jurisdictions and trading venues have implemented VCMs to address disorderly trading during extreme volatility events. They may include, for example, price banding (e.g., where executions or order entries may only be made within prescribed price bands) and trading halts (e.g., single stock or market-

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46 A restrike event for L&I ETFs typically refers to an intraday rebalancing of the ETF, which is triggered by the price movement of the underlying asset moving beyond a pre-defined threshold.

47 For example, tail risk from extreme price volatility, impact of rollover of futures contracts, concentration risk in underlying asset and instrument, and operational risk of relying on single service provider / counterparty for key services such as clearing brokerage or swaps.

48 IOSCO calculation based on data provided by Bloomberg.

49 These comments about futures-based oil ETPs/ETFs, or leveraged oil ETFs were generally related to disclosure and manager conduct issues, accuracy of indicative NAV, return differences between the ETF price and the price of their underlying futures and suspension of creations.

wide circuit breakers). In some jurisdictions, trading halts are generally applied to ETF shares in the same manner as to other listed securities. Other jurisdictions may impose trading halts that apply specifically to ETFs (i.e., monitored as investment funds rather than listed securities) when the pricing difference between the indicative NAV and the transaction price exceeds a threshold level.

During the COVID-19 volatility, VCMs were triggered in most of the major ETF markets. ETFs affected by VCMs during such period include equities, fixed income, commodity ETFs as well as L&I ETFs. Most jurisdictions also had VCMs triggered for underlying assets in the ETF portfolios during the same period.[50]

Overall, most C5 member respondents reported that VCMs were effective in addressing potential disorderly trading in ETFs and underlying markets during the COVID-19 volatility. In addition, certain jurisdictions demonstrated flexibility in recalibrating the VCMs against the prevailing market volatility. For example, in France, the triggering thresholds of VCM for ETFs (in the form of pre-defined corridor around the indicative NAV of ETFs) were doubled temporarily to accommodate the extreme volatility in March and April 2020.

While most C5 member respondents reported that they are not considering any enhancement or adjustment to VCMs for ETFs, there are individual concerns over the effectiveness of VCMs for ETFs listed in Europe due to the fragmental trading environment where each exchange may have a different trading halt threshold for cross-listed ETFs. In the US, regulatory bodies are preparing a study on the design and operation of the current VCMs in volatility situations and will inform regarding any recommended changes to the VCMs.

Closing

The COVID-19 volatility was a significant stress test to the ETF structure and operation. Based on the analysis and findings as outlined in this note, no imminent risks associated with these observations have been identified from a regulatory or financial stability perspective. In fact, empirical evidence and stakeholder feedback tend to suggest that the ETF structure was indeed relatively resilient throughout such a period. In particular, it highlighted that the pricing of ETFs could be different when the liquidity of their underlying assets deteriorated significantly and deepened the industry's understanding of fixed income ETFs' potential role in providing additional pricing information for the underlying bond markets. Moreover, it demonstrated the utility of the additional layer of liquidity provided by ETF secondary markets. It also raised the question of whether certain derivatives-based ETPs/ETFs that were impacted by extreme market circumstances may warrant further consideration related to product structuring and contingency planning.

The initial findings regarding ETFs during the COVID-19 volatility can serve as an important basis for IOSCO's consideration of potential next steps, including providing additional guidance to authorities and responsible entities of ETFs. As mentioned in IOSCO Board Priorities - Work Program 2021-2022, IOSCO will consult on possible policy proposals in late-2021 / H1 2022.

[50] For example, in the US, the market wide circuit breakers were triggered four times on March 9, 12, 16, and 18, 2020 respectively.