

BlackRock

Pricing and Liquidity of Fixed Income ETFs in the Covid-19 Crisis of 2020

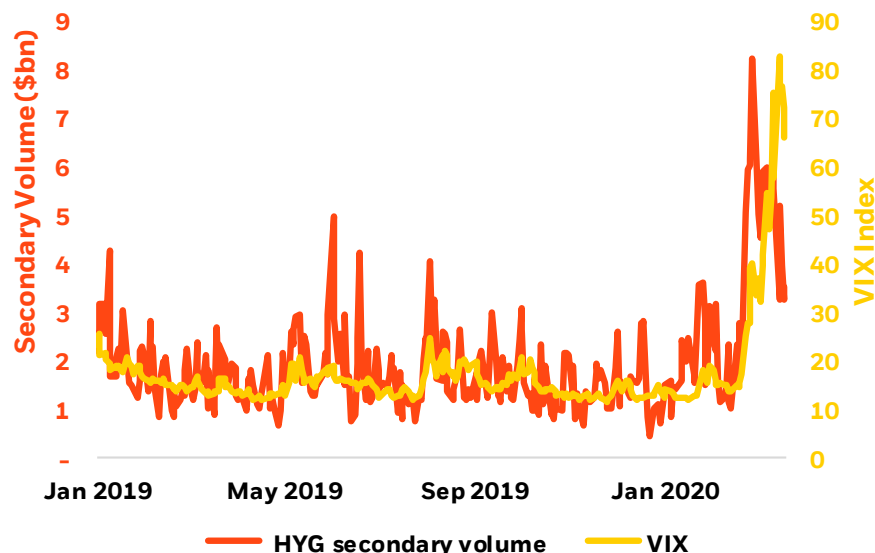
How Did Fixed Income ETFs Behave During the Covid-19 Crisis?

- **Fixed income ETFs generally performed as expected and provided an alternate source of liquidity for challenged bond markets.**
- **Market participants turned to fixed income ETFs for price discovery.**

We demonstrate this by **evaluating the following dynamics:**

- 1 Pricing** – Fixed income ETFs reflected real-time value
- 2 Liquidity** – Fixed income ETFs were efficient to trade
- 3 The Arbitrage Mechanism** – performed as expected.

iShares iBoxx \$ High Yield Corporate Bond ETF (HYG) secondary volume vs. Cboe Volatility Index



Source: BlackRock, Bloomberg (data as of March 24, 2020)

Price Discovery:

During the height of the volatility in March 2020, **bond ETFs posted large price discounts from Net Asset Value (NAV).**

Are Large Premiums and Discounts to NAV Problematic?

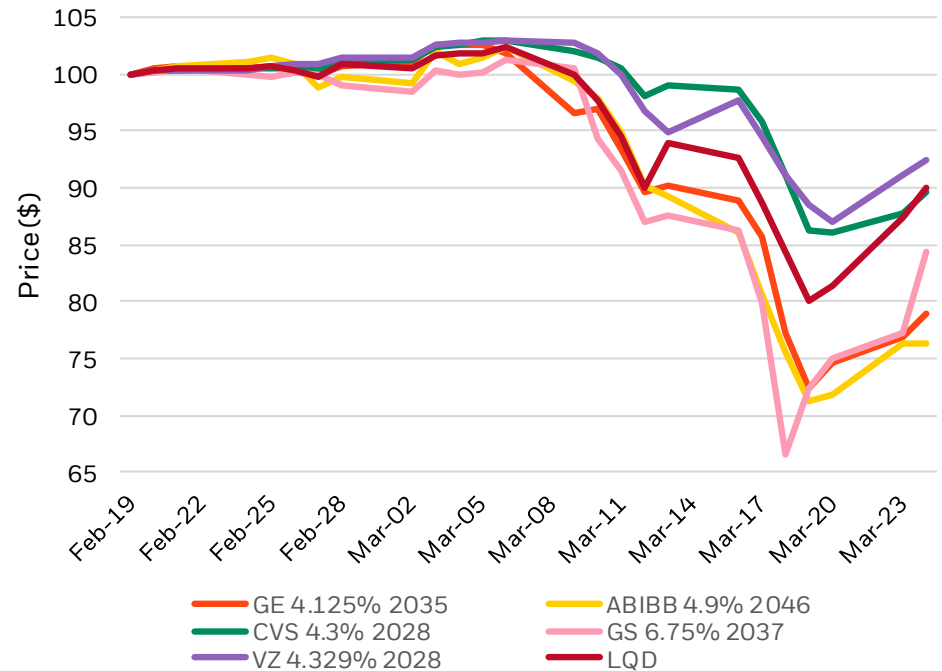
NO.
There is information value.

Average Absolute Stated Premium / Discount to NAV

	January-February	March-April
TLT	0.13%	0.86%
LQD	0.13%	1.39%
HYG	0.21%	1.06%

Source: BlackRock, based on data from Bloomberg as of 4/30/2020.

A Window Into Real Time Pricing Prices of LQD vs. Top Holdings

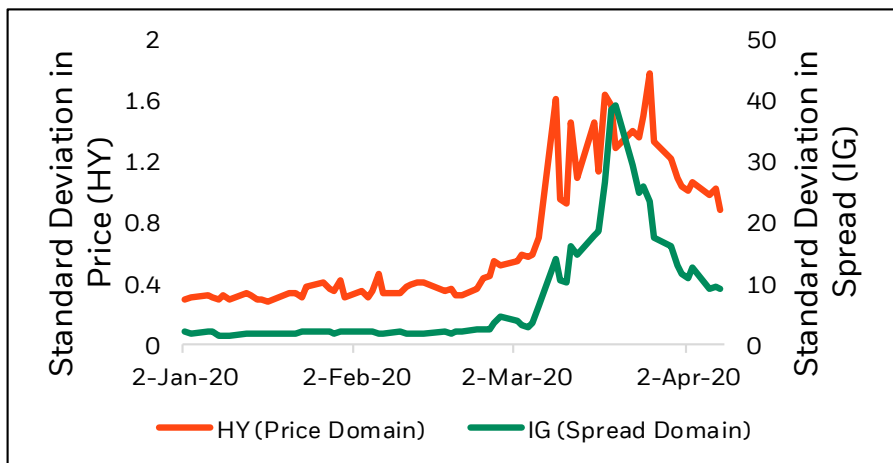


Source: FINRA TRACE, Bloomberg. As of 3/23/2020.

Holdings are subject to change. Holdings shown should not be deemed as a recommendation to buy or sell securities. For complete holdings, see www.ishares.com

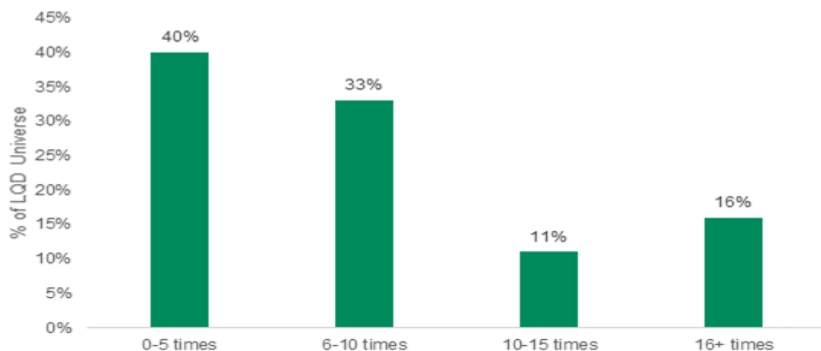
Price Discovery: Market Price vs. NAV?

Deviation of Dealer Quotes to Actual Trade Price



Source: FINRA TRACE, Dealer quotations.

Trading activity in LQD universe, March 2020

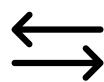


Source: FINRA TRACE, BlackRock from 3/2/2020 – 3/20/2020. Includes only end investor buys and sells – not dealer-to-dealer trades.

What Causes Discounts on Bond ETFs vs. NAV?



Fund NAV is **calculated once per day** using actual trades, dealer “runs”, and estimation methods.



Majority of bonds do not trade on a given day – NAV largely based on estimation.



These dynamics are **exacerbated during periods of volatility**.



The ETF price reflects an actionable trade on exchange.

Price Discovery: Intraday Intrinsic Value?

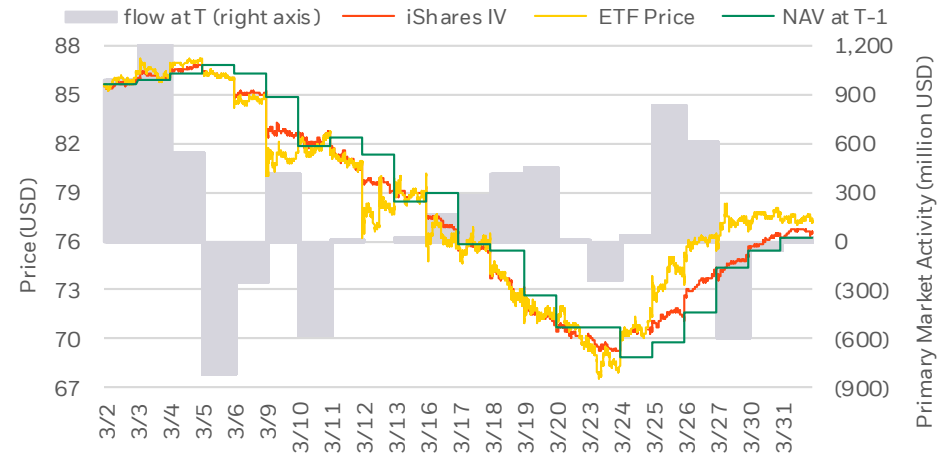
What Is Intraday Intrinsic Value?

- Bottoms-up, bond-by-bond valuation, calculated throughout the day.
- 12-factor intraday bond valuation model developed by BlackRock in 2015.

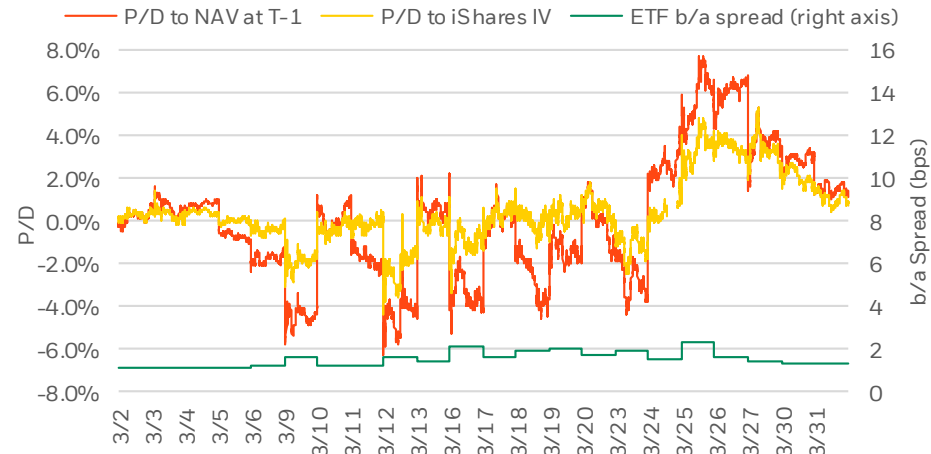
Intrinsic Value Offers an Intraday Estimate of ETF Premium / Discount

- On March 24th: HYG traded at 2.4% closing premium to NAV, but only a 0.4% average intraday premium to Intrinsic Value.

iShares HYG ETF



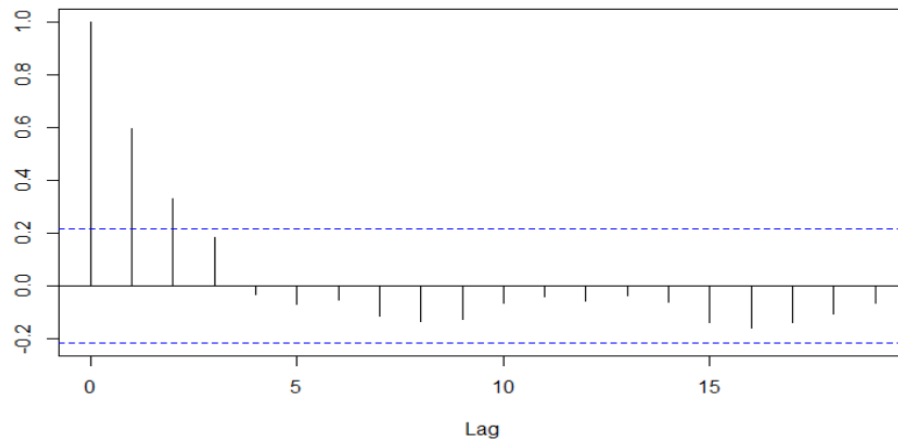
iShares HYG ETF



As of 6/26/2020. Source: BlackRock, Bloomberg and Refinitiv.

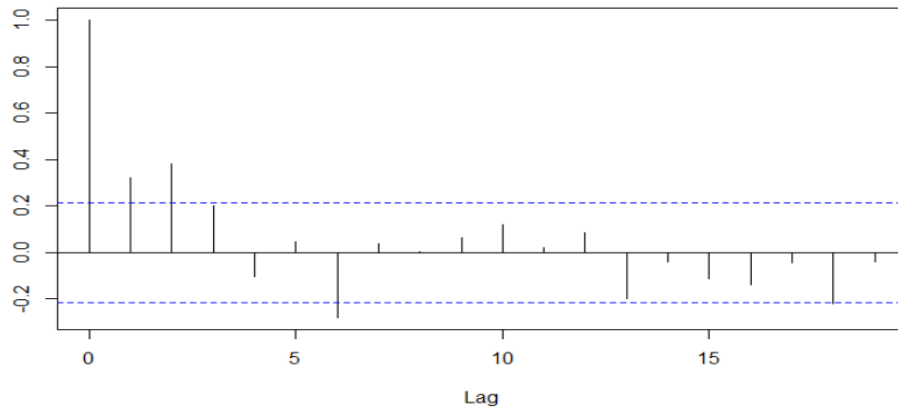
Price Discovery: The presence of lag effects in Net Asset Values

Autocorrelation Function for LQD 1/2/20-4/30/20



Daily NAV-Based Returns Exhibit Positive Correlation to the Previous Day's NAV Return.

Autocorrelation Function for HYG 1/2/20-4/30/20



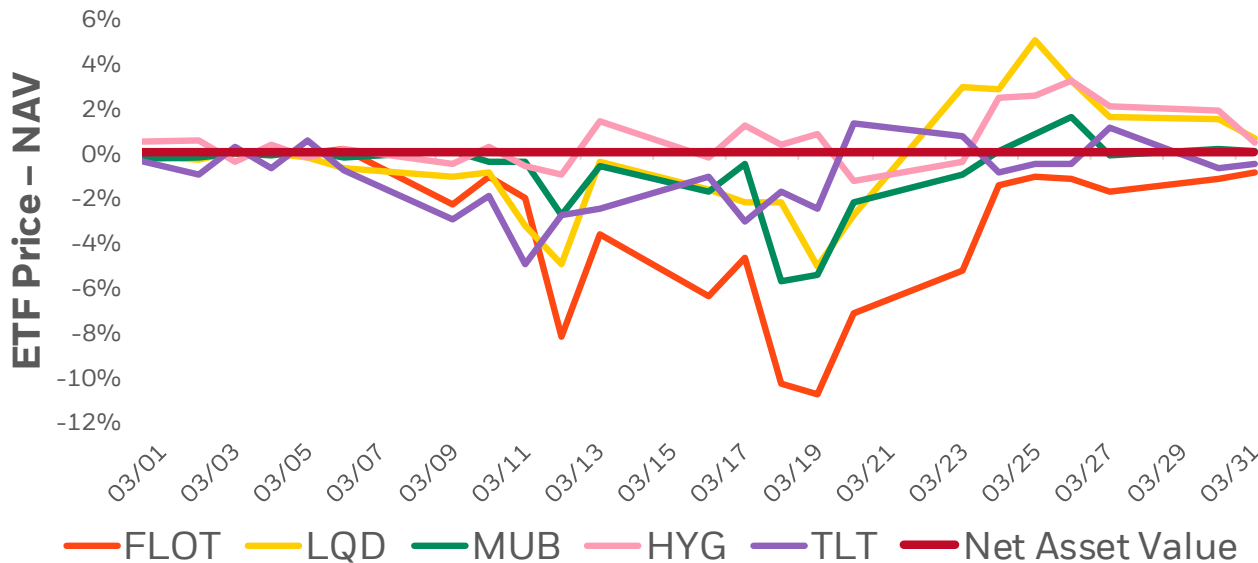
Daily ETF Total Returns Have Tended To Be Uncorrelated To Past Returns.

Source: BlackRock, based on daily NAV returns from Bloomberg

Price Discovery: Large Premiums/Discounts Do Not Persist



Bond ETF Prices and NAV Converge As Markets Normalize, March 2020



Source: BlackRock, Bloomberg. 3/31/20

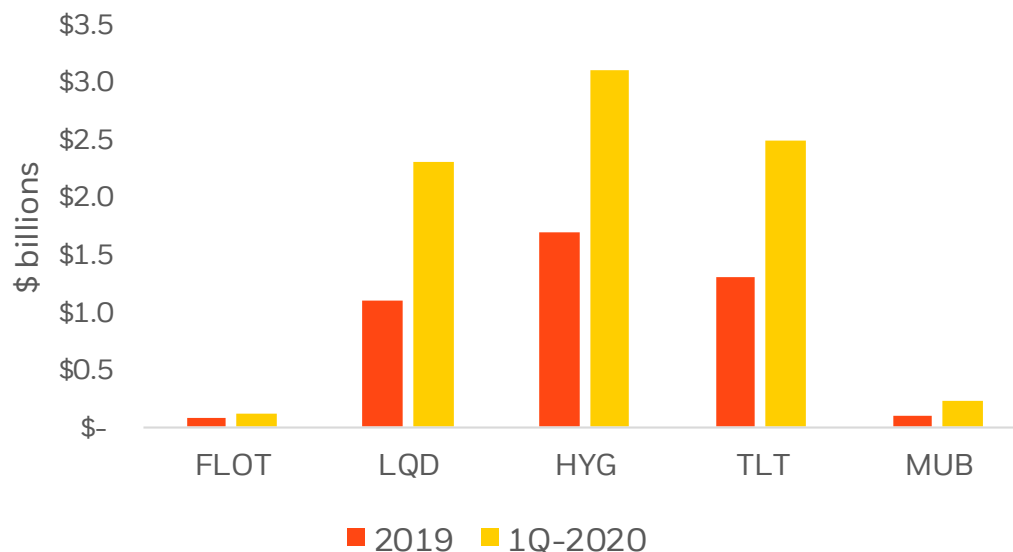
Liquidity: Bond ETF volumes tend to accelerate during Volatility

While liquidity became challenged in the underlying bond markets, bond ETFs traded at record volumes on exchange.

Average daily volume during Q1 2020 was more than 2x that of 2019.

Primary to secondary ratio rose modestly in stress period

Average Daily Exchange Volumes (\$bn)



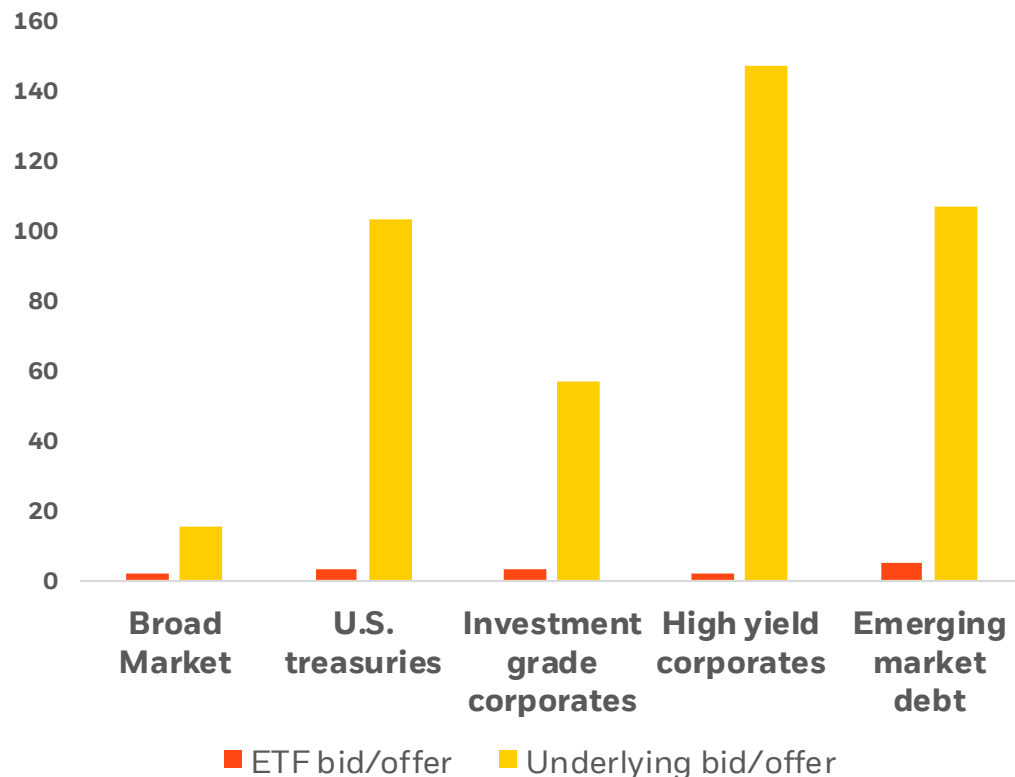
Average Primary to Secondary Volume %

	January-February	March-April
TLT	9.83%	10.28%
LQD	12.99%	14.66%
HYG	7.99%	9.58%

Source: BlackRock, based on data from Bloomberg as of 4/30/2020.

Liquidity: Bid-ask spreads – “liquidity mismatch”?

Average bid/ask spread (price bps), March 2020



Source: BlackRock, Bloomberg. 3/31/20

Bid/ask spreads for fixed income ETFs are much lower than that of individual bonds.



Is this a concern – “Liquidity mismatch”?



No. Bond ETFs *should* trade at tighter spreads (portfolio effects, transparency/efficiency of exchange).

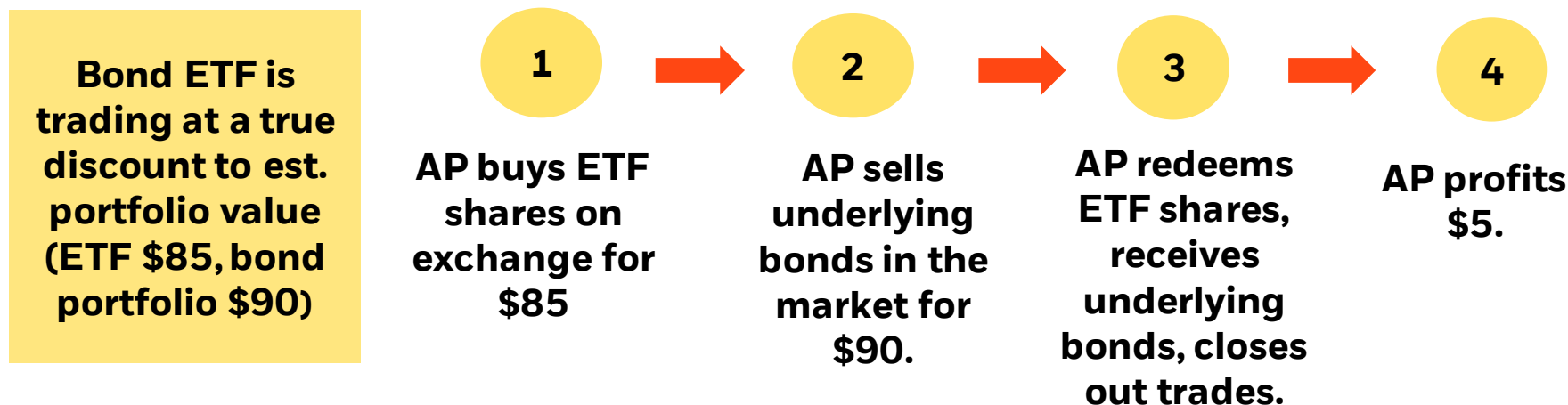


Bond ETFs represent a diversified portfolio of bonds: less idiosyncratic risk than individual bonds.

Is the Bond ETF Arbitrage Mechanism Efficient?

When the ETF share price trades at a true (actionable) premium or discount to the value of the securities held by the ETF, there is an **ECONOMIC INCENTIVE** for Authorized Participants (APs) to create or redeem shares to capture value (and thereby close the differential).

Simple Example of bond ETF arbitrage:



APs are generally not incentivized to engage in creation/redemption unless the arbitrage is (i) actionable and (ii) profitable (or at least neutral)

For illustrative purposes only. Although market makers will generally take advantage of differences between the NAV and the trading price of iShares ETF shares through arbitrage opportunities, there is no guarantee that they will do so.

Can there be “Wrong Way” Arbitrage?

Recent academic research purports the existence of “wrong way” arbitrage in bond ETFs driven by dealer balance sheet dynamics:

- *Motivation to manage bond inventory and balance sheet costs outweighs the loss on the “wrong way” arbitrage.*
- *Two primary issues with the theory:*
 - *Conflation of broker-dealer / AP and market-maker roles*
 - *Use of closing premiums/discounts to NAV which are end of day valuations subject to lag effects*

Regression Estimates of Daily Primary Flows Scaled by AUM

	TLT		LQD		HYG	
	Estimate	p-Value	Estimate	p-Value	Estimate	p-Value
<i>Intercept</i>	-0.02	0.03	0.00	0.06	-0.01	0.06
<i>Premium.IV</i>	46.08	0.01	1.76	0.04	0.84	0.56
<i>Crisis</i>	0.03	0.01	0.01	0.00	0.02	0.01
<i>Premium.IV*Crisis</i>	-43.69	0.02	-1.39	0.10	-0.33	0.82
Adj. R-Squared	0.455		0.336		0.158	

Source: BlackRock, based on data from Bloomberg as of 4/30/2020. Estimates that are significant at the 5% confidence level are in bold.

We regress bond ETF creation/redemption flows on the average intraday premium/discount to intrinsic value and add an interaction term for the crisis period. In no case are the coefficients negative. **Accordingly, we find no evidence of wrong way arbitrage even in times of market stress.**

Conclusions

1 Bond ETFs serve as vehicles for efficient price discovery

- Amid increased trading during the Covid-19 crisis, fixed income ETFs were indicators of real-time, actionable prices.
- Bond ETF prices showed large deviations from NAV. However, we believe these deviations were a function of price discovery coupled with NAV latency effects in a challenged liquidity environment.
- Bond ETF prices represented actionable values on exchange based on elevated volumes.
- We find that Intraday Intrinsic Value provides real-time information value relative to end-of-day estimates.

Bond ETFs were more efficient to trade than the underlying bonds.

2

- While fixed income ETF trading costs are generally cheaper than those of underlying bonds, this difference was magnified during the Covid-19 crisis.
- Bond ETFs traded in record volume while the underlying market experienced liquidity challenges.

We find no evidence supporting claims of “wrong way” arbitrage.

3

- We find no empirical evidence for the claim that Authorized Participants are motivated to engage in money losing bond ETF primary transactions due to balance sheet dynamics.

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