Fixed Income ETF Relative Value Trading During COVID-19

Introduction

In March 2020, the COVID-19 shock triggered one of the fastest liquidity crises in modern financial history. Credit markets seized, dealers reduced risk, and price discovery deteriorated across large segments of the fixed income universe.

The dysfunction was particularly evident in fixed income exchange-traded funds (ETFs). Products designed to track diversified bond portfolios began trading at persistent and unusually large discounts to net asset value (NAV), in some cases exceeding 3%.

While the most extreme dislocations lasted only days, elevated dispersion and impaired arbitrage conditions persisted for several months. During this period, I deployed personal capital into a systematic long/short relative-value strategy using fixed income ETFs. The strategy generated a **return of more than 20%** over approximately **six months** with minimal market beta.

Key performance metrics for the period:

- Sharpe Ratio: 3.4
- Max Drawdown: –1.8%
- t-stat: 2.3

This paper summarizes:

- Structural characteristics of fixed income ETFs
- Market conditions during the COVID liquidity shock
- The trading framework and implementation
- Realized performance
- Lessons learned and future opportunities

The Appendix contains additional background on fixed income markets and ETF structure.

A separate spreadsheet shows examples of real trades that were executed and the resulting profitability.

Structural Characteristics of Fixed Income ETFs

Fixed income ETFs exhibit extremely high cross-sectional correlation, often exceeding 90–95%. The industry also contains a large number of products with overlapping exposures, many of which track identical or closely related benchmark indices.

Several structural features contribute to this environment:

- Most products provide passive beta exposure rather than active management
- A limited number of index providers dominate the market
- Issuers maintain broad product shelves, resulting in substantial overlap across funds
- Many ETFs track identical or nearly identical portfolios

As a result, economically substitutable instruments exist across issuers and structures. ETFs tracking the same index often exhibit near-perfect correlation, while funds with similar exposures frequently maintain correlations above 95%.

This redundancy creates a large universe of highly correlated securities with historically stable spread relationships — an ideal setting for relative-value analysis.

Market Dislocation in March 2020

Several factors combined to disrupt normal ETF arbitrage relationships:

- Regulatory changes had already increased pressure on dealer balance sheets (e.g., Supplemental Leverage Ratio constraints)
- The pandemic shock accelerated broad risk reduction across the financial system
- Leverage within credit markets amplified forced selling
- Underlying bond markets became illiquid and difficult to price

Despite these stresses, ETF shares continued to trade continuously on equity exchanges.

The consequences were significant:

- Discounts and premiums widened dramatically
- Deviations from NAV were measured in percentage points rather than basis points
- ETFs with nearly identical exposures diverged sharply
- Dislocations persisted for days or weeks rather than minutes

Spread relationships repeatedly widened and subsequently reverted, creating unusually favorable conditions for statistical arbitrage.

Institutional Arbitrage Framework (Baseline)

Traditional ETF arbitrage is conducted by dealers and authorized participants:

- Buy ETF at a discount
- Hedge or short the underlying bond basket
- Create or redeem ETF shares
- Capture convergence between price and NAV

This approach requires:

- Access to bond trading and inventory
- Significant balance sheet capacity
- Repo and financing infrastructure

These requirements make the traditional arbitrage mechanism inaccessible to smaller market participants.

Relative-Value ETF Pair Strategy (my strategy)

Rather than arbitraging ETFs against their underlying bonds, the strategy exploited temporary mispricings between economically similar ETFs.

Core Trade

1. Identify ETF pairs with historically high correlation
2. Determine hedge ratios to minimize duration and credit exposure
3. Buy the ETF trading at the larger discount
4. Short the relatively richer ETF
5. Capture profits as the spread normalized

Positions were directionally neutral, with market beta minimized. Performance depended primarily on spread convergence rather than market direction.

The strategy emphasized:

- Many small, independent positions
- Limited exposure per spread
- Active management of an inventory of relative-value opportunities

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Pair Selection

Pairs were selected based on:

- Same asset class and credit segment
- Similar duration profile
- Similar or identical benchmark index
- High overlap in underlying holdings
- Historical correlation above 0.95
- Stable pre-crisis spread behavior
- Adequate liquidity and short availability

Hedge Ratio Estimation

An initial approach estimated hedge ratios using ordinary least squares (OLS) on daily price changes between ETF pairs.

- Produced betas that were systematically too low because of microstructure noise
- Small, idiosyncratic daily moves (e.g., one ETF up one cent while the other was down one cent) frequently created the appearance of short-term negative co-movement

Instead, the hedge ratio was estimated using the average price ratio between the ETFs.

- Daily price ratio was calculated over the observation window
- Hedge ratio was defined as the average of these ratios
- Reduces the impact of day-to-day noise and provides a more stable estimate of the relative exposure required to maintain market neutrality

The choice of observation window is therefore critical.

- Window must be long enough to provide statistical stability but short enough to reflect the conditions expected during the holding period
- In ETF pairs, this tradeoff is influenced by differences in expense ratios
- Management fees create a gradual performance drag that reduces net asset value relative to the underlying exposure
- When expense ratios differ between paired ETFs, longer estimation windows incorporate the cumulative fee differential into the price relationship and bias the hedge ratio

To mitigate this effect, the length of the observation window for ETF paris with large fee differentials needs to balance stability against the risk of fee-induced drift.

- Shorter, regime-relevant windows are preferred when expense differentials are meaningful
- Sensitivity to window length is monitored as a source of model risk given its direct impact on portfolio neutrality.

Entry / Exit Decisions

During “normal” times, statistical tools used would include:

- Spread Z-scores
- Rolling mean and volatility bands
- Mean-reversion half-life estimates
- Liquidity filters

Entry would typically occur at 2–3 standard deviation extremes, with position sizes increasing as spreads widened.

Exit criteria should include:

- Mean reversion or partial normalization
- Time-based exits
- Risk limits
- Reallocation based on relative opportunity across spreads

The reality of my trading during the crisis was different:

- Entry levels frequently exceeded 10 standard deviations
- Exit levels were driven by opportunity costs of other out-of-line pairs
- Focused on pairs that exhibited frequent cycles
- Shares available to borrow

The suddenness of the opportunity and the limited window of time to capture profits resulted in a somewhat helter-skelter approach to transaction decisions. Optimization tools and previous experience with the strategy would have been very helpful.

Execution

Fixed income ETFs offered several operational advantages relative to bonds:

- Continuous exchange liquidity
- Transparent pricing
- Tight bid-ask spreads, even during stress
- Availability in retail amounts
- Reliable short availability for liquid tickers

The implementation stack included:

- Python and pandas for screening and signal generation
- Real-time market data ingestion
- Automated spread monitoring
- Scripted trade execution

Statistical Summary

- Capital deployed: ~ $100,000
- Dollar turnover: ~ $30 million
- Period: ~ 6 months

- Number of trades: ~ 1,800

Performance:

- Gross return: 21%
- CAGR: 55%
- Max Drawdown: –1.8%
- Estimated Sharpe Ratio: 3.4
- t-stat: 2.3

Holding period distribution:

- 65–70% intraday (minutes to ~4 hours)
- 20–25% held 1–3 days
- 5–10% held 4–7 days

Daily outcomes:

- Positive days: 58%
- Negative days: 39%
- Flat days: 3%

Observations

- The majority of P&L came from frequent small convergences
- Occasional extreme dislocations generated outsized gains
- Strategy returns exhibited low correlation to equity or credit beta
- Market liquidity was sufficient to support materially larger position sizes

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Why the Opportunity Existed

During the crisis, traditional arbitrage capital was temporarily impaired. Dealers and hedge funds reduced balance sheet usage, while funding constraints limited the ability to warehouse risk.

Under normal conditions, ETF arbitrage compresses pricing discrepancies within minutes. During March–April 2020, convergence horizons extended to days as market participants prioritized liquidity and risk reduction.

At the same time, the large number of economically redundant products created natural substitutes. Forced flows and constrained balance sheets allowed statistically predictable relationships to diverge significantly.

In combination, impaired arbitrage capacity, product redundancy, and forced positioning created persistent relative-value dislocations.

Risks and Limitations

Key risks included:

- Spreads widening further before converging (margin risk)
- Liquidity gaps during periods of extreme stress
- Borrow cost increases or short availability constraints
- Episodic opportunity set rather than a permanent strategy environment
- Hedge ratio miscalculation

Lessons Learned

- ETF prices can decouple significantly from fundamentals during liquidity shocks
- Microstructure noise can have meaningful negative impacts on ordinary lease squares calculations
- Relative-value positioning offers a more controlled risk profile than directional exposure
- Crisis environments often provide the clearest statistical opportunities
- Preparation and operational readiness are more important than predictive models
- Execution speed and discipline are critical to capturing short-lived dislocations

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Future Areas for Investigation

- Relative value across options on similar fixed income ETFs
- Dividend and coupon carry differentials across substitute ETFs
- Cross-asset relative value between bond ETFs and futures

Appendix – Fixed Income Market and ETF Background

Structural Evidence of Fixed Income ETF Dislocations

This exhibit provides empirical evidence that the relative-value opportunity observed during March–June 2020 reflected a temporary breakdown in normally stable relationships among economically similar fixed income ETFs.

The analysis focuses on representative ETF pairs with highly overlapping exposures and historically stable spread behavior.

A. Pre-Crisis Correlation Structure

Fixed income ETFs tracking similar benchmarks typically exhibit extremely high correlations due to shared exposure to duration and credit risk.

Representative correlations (January 2019 – December 2019):

ETF Pair	Asset Class	Correlation
TLT – VGLT	Long-Term Treasuries	99.997%
SPLB - VCLT	Long-Term Corporates	99.974%
MBB – SPMB	Mortgages	99.435%
MUB – VTEB	Municipal Bonds	99.908%

Observation
Cross-sectional correlations in fixed income ETFs were typically in the 0.95–0.99 range prior to the COVID shock, indicating highly stable relative pricing relationships.

B. Spread Stability and Breakdown

For each pair, spreads were defined using price ratios or hedge-adjusted differences.

Pre-COVID behavior

- Tight, mean-reverting distributions
- Deviations rarely exceeded ±2 standard deviations
- Intraday convergence was typical

March–April 2020 behavior

- Rapid widening of spreads

- Frequent deviations exceeding 5–10 standard deviations
- Convergence horizons extended from minutes to multiple days

These dynamics created an environment in which relative mispricings persisted long enough to be systematically monetized.

C. Distribution of Spread Extremes

The frequency of extreme deviations increased materially during the liquidity crisis.

Period	% of observations beyond ±3σ
2019 (normal conditions)	< 1%
Mar–May 2020	8–15%

Interpretation
Spread behavior shifted from a normal distribution with tight tails to a regime characterized by frequent and persistent outliers.

D. ETF Premium/Discount Behavior

Bond ETF discounts to NAV widened dramatically during the crisis.

Representative observations:

- Investment grade and high yield ETFs traded at discounts of 2–4%
- Muni bond ETFs traded at even bigger discounts due to dealer desks using them as hedge instruments (it is hard to short Muni bonds directly because of their small issuance sizes)
- Deviations persisted for multiple trading sessions
- Premium/discount volatility increased by several multiples relative to historical norms

Implication
The traditional creation/redemption arbitrage mechanism was temporarily impaired, allowing price relationships between substitute ETFs to diverge materially.

E. Convergence Speed

Estimated convergence characteristics:

Period	Typical Mean Reversion Horizon
2019	Intraday (minutes to hours)
Mar–Apr 2020	1–3 trading days

Interpretation
Extended convergence horizons allowed smaller capital bases to participate in relative-value opportunities that are normally arbitraged rapidly by dealers and large hedge funds.

F. Liquidity and Capacity

The ETFs traded during the strategy period were among the most liquid fixed income instruments available.

Typical characteristics:

- Daily trading volume: $100MM–$1B+ per ETF
- Average trade size: small fraction of daily volume
- Estimated participation: generally < 1% of average daily volume

Implication
Market liquidity was sufficient to support materially larger capital deployment without significant market impact.

Summary

Prior to the COVID shock, fixed income ETFs exhibited extremely stable relative pricing relationships. During March–May 2020, the combination of impaired arbitrage capacity, forced flows, and underlying bond market illiquidity produced:

- Large and frequent spread deviations
- Extended convergence horizons
- Persistent discounts and premiums
- Continued high liquidity in ETF trading

These conditions created a temporary but unusually favorable environment for systematic relative-value trading.