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"Big Data and High-Performance Computing for Financial Economics"

What Are the Risks to ETF Authorized Participants?

Financial markets in the US and around the world have been revolutionized by the growth of exchange-traded funds (ETFs). One of the defining features of ETFs is the creation/redemption mechanism that allows traders to arbitrage away mis-pricings between the ETF itself and its underlying holdings. Arbitrage keeps the premiums (or discounts) relative to net asset value (NAV) in check, and algorithmic traders are constantly hunting for arbitrage opportunities, especially in the most liquid ETFs (Abner (2016)). Creation/redemption (C/R) activity has been shown to predict future returns in both the ETF (Brown, Davies, and Ringgenberg (2018)) and in the underlying securities (Staer (2017)).

An important fact about the creation/redemption process is that it is entirely intermediated by "authorized participants" (APs): large financial institutions given the right to access a two-way exchange window with the ETF sponsor, where the AP can either hand in a bundle of ETF shares (called a creation unit) and receive the equivalent portfolio of underlying securities or vice versa. As Madhavan (2016) notes, the ETF sponsor "designates the APs before the fund is launched; they are given exclusive rights to alter the ETF's outstanding shares through creation or redemption. APs thus play a critical role in liquidity provision, linking the primary markets, where the fund's primary markets are traded, with the secondary exchange-traded market for the ETF's shares."

Though APs clearly serve in a vital capacity for mediating the size and liquidity of ETFs, the existing literature is scarce on the risks facing APs. Using confidential audit trail data from FINRA with each AP identified in both their secondary-market trades and their primary-market creation/redemption activity, I seek to investigate the myriad risks incurred by APs, including inventory risk, information risk, and liquidity risk. Audit trail data is extremely granular, showing the complete history of each order once it is submitted to a market.[2] In theory, with FINRA's audit trail data and sufficient computing power, one could see (for each ticker) the entire order book change in continuous time at every lit exchange and also see the inventory of each market participant (at the MPID level) in continuous time. Reaping the full benefits of this granularity requires an enormous amount of computing power and skill, and it is on this basis I submit this proposal to the NBER Big Data Workshop.[3] The remainder of this proposal addresses research questions and strategies for inventory risk, information risk, and liquidity risk.

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[2] The audit trail data do not give 100% visibility into order submission strategies, as they cannot see if firms are using order-splitting algorithms internally before sending them out to the market. But, once an order is submitted to an exchange or trade reporting facility, FINRA's audit trail data can see how each order gets routed and executed or canceled, with MPID identifiers for the vast majority (~90%) of orders. This makes it far more granular than traditional trade and quote data.

[3] In preliminary work on this topic, I have limited the scale of my data and my analysis to small samples of data just to keep it manageable, but it would be greatly beneficial to be able to 'dream big' and test the research questions that are of highest interest without concern for data feasibility. I have primarily been using R in preliminary work.

Inventory Risk

Little is known about the inventory risks facing ETF authorized participants (partially due to difficulties obtaining detailed data). APs must carry some amount of inventory to participate in the creation/redemption window, as most ETFs have creation units of 25,000-50,000 shares (approximate dollar value of $5-10 million), and ETFs require APs to transact integer multiples of a creation unit. ETF portfolios are published each day (via the DTCC), with portfolio composition file (PCF) data showing the exact quantities of each component in each ETF for each day.[4] These data provide an opportunity to answer important questions that have not been previously answered: How do APs manage their ETF inventory throughout the trading day? How does their inventory of ETF shares compare to their inventories of underlying shares? Is an AP's creation/redemption activity predictable based on their intraday inventories? A basic strategy here is to track inventories throughout the day and use a simple OLS approach to see if an AP's net inventory levels (in the ETF and/or its underlying components) at 4pm are significantly associated with their creation/redemption activity in the same ETF that day.[5]

Information Risk

Some APs (but not all) also function as market makers, both for ETFs and their underlying stocks. Audit trail data provide a rich basis to measure information on both a pre-trade basis (such as VPIN from Easley et al. (2012)) and post-trade basis (such as price impact). One useful question, for example, is to see if the ETF trades of APs have a higher price impact than trades that do not include an AP. The research strategy of Hasbrouck & Sofianos (1993) provides an exemplary model for this question, using a VAR approach to measure the price impact of NYSE specialist trades. It is not clear, ex ante, what to expect about the price impact of AP trades: it could be larger if APs are more informed and other market participants can discern AP trades from non-AP trades.[6] Alternatively, if APs are strategic about when to place orders, they may selectively trade when they believe their price impact will be minimal. A measure of pre-trade information, such as VPIN, is necessary for analyzing if/how APs trade strategically with respect to information in the ETF market.

Liquidity Risk

As noted earlier, APs are critical for maintaining liquidity in an ETF, because they provide the conduit to the creation/redemption window, which provides a 'release valve' for arbitrage trading that keeps the ETF price closely in line with the underlying NAV.[7] But do APs bear some sort of liquidity risk? (Or earn an illiquidity premium?) Given their access to the creation/redemption window, it seems theoretically possible that APs could choose to hold any overnight inventory in the more liquid asset (between the ETF and its underlying holdings), maximizing their overnight liquidity. This raises two more questions: One, how persistent is liquidity in an ETF from day to day? And two, to what extent do APs serve a liquidity provision role for ETFs? Is it possible, for example, that they "provide liquidity" in a broad sense (their existence makes ETFs possible) but still step away from trading in illiquid times?

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[4] PCF data is only available for US equity ETFs.

[5] Other, more complex approaches may be useful here. For example, one could use a censored regression model to study creation/redemption, since there is a minimum quantity threshold (the creation unit) to transact, and it would be insightful to see how APs choose to trade towards the end of the day if they are close to a creation unit threshold.

[6] Hasbrouck & Sofianos (1993) find that NYSE specialist trades have larger price impact. However, it is not obvious that this result, derived from a single-specialist, non-HFT setting, should hold in a modern, fragmented, HFT setting.

[7] Without the creation/redemption window, an ETF essentially becomes a closed-end fund.

References

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