ETF Arbitrage under Liquidity Mismatch

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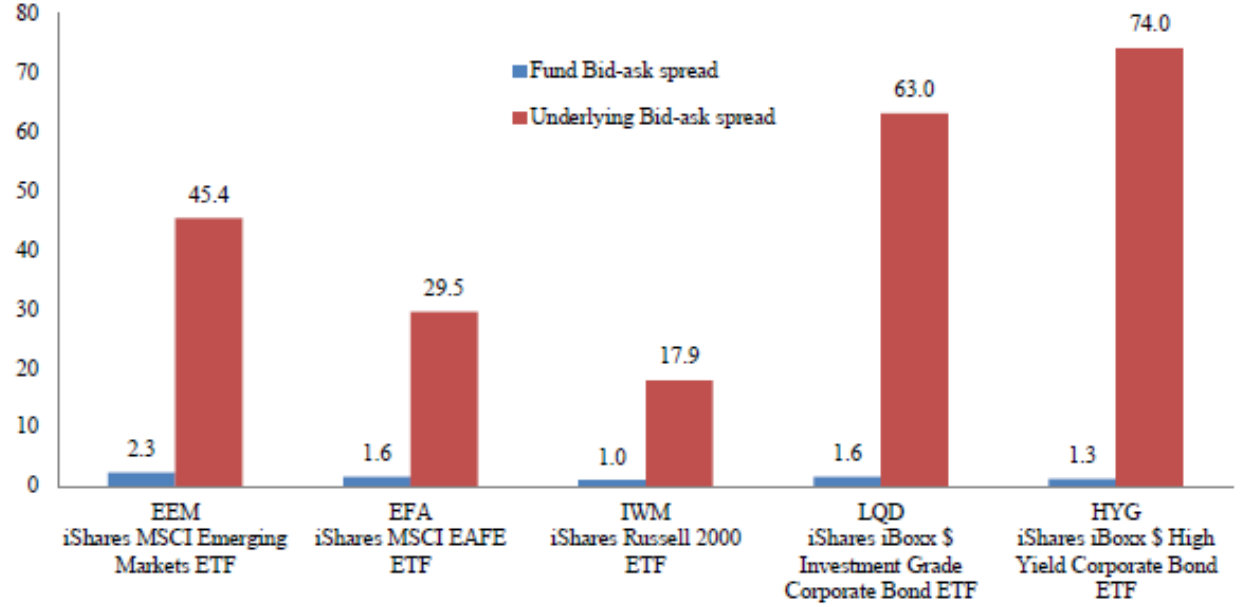
Outline

1. The Motivation
2. Discussion about the 3 Main Conjectures of the Paper
3. Comments about the Model
4. Comments about the Empirical Analysis

The Motivation: Liquidity Mismatch

- Bond ETFs, a fast growing market: $480 billion in US, $150 billion in Europe
- Bond ETFs are significantly more liquid than the bonds in their portfolios

Exhibit 7
Bid-Ask Spreads of Select ETFs and Underlying Baskets, in Basis Points



Source: Bloomberg and TRACE data from the month of June 2013.

Source: Madhavan and Sobczyk (2014)

Where does the 'new' Liquidity come from?

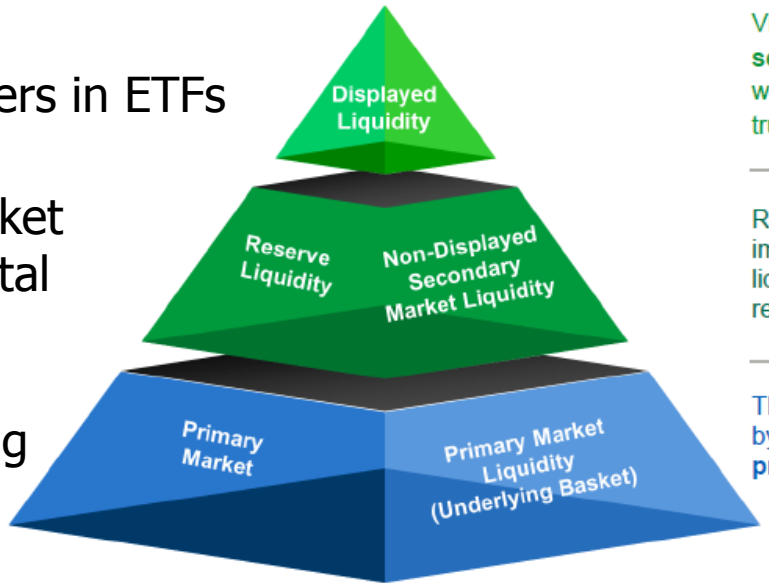
- From illiquid securities, a liquid security is created
  - ➢ Reminiscent of securitization…from Junk to AAA

- Here's how BlackRock reassures investors about the resilience of bond ETF liquidity:

Liquidity Traders in ETFs

Commitment of Market Makers' (MMs) capital

Primary Market Hedging



Visible "on screen" depth is one element of **secondary** market liquidity. Market makers will publicly display only a fraction of their true willingness to provide liquidity.

Reserve or contingent liquidity is an important element of **secondary** market liquidity and may be sourced through relationships with market makers.

The "true" liquidity of an ETF is limited only by the underlying basket liquidity in the **primary** market.

Assessment of the Liquidity Sources

1. Liquidity Trading in the ETF
   - A new layer of investors are attracted to ETFs due to their higher liquidity (mutual funds, hedge funds, retail, etc.)
   - High liquidity of ETF is equilibrium outcome founded on belief that the ETF is more liquid
   - It works well, as long as liquidity trading is non-directional

2. Commitment of MMs' capital
   - Not consistent with business model of HFTs
   - New regulations and capital requirements reduce willingness to commit capital

3. Primary Market Hedging
   - MMs can reduce their exposure dumping ETF shares on ETF sponsor
   - But they also need to sell bonds in illiquid market
   - Hence, in extreme situations (e.g. reversal of monetary policy), ETF liquidity can evaporate
   - Also, MMs liquidity demand can exacerbate bond market illiquidity

This is a ‘hot’ issue

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Explosive growth of bond ETFs stirs fears of impending crisis

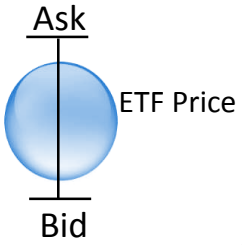
High-profile investors say a sudden fall in debt prices could trigger a vicious cycle

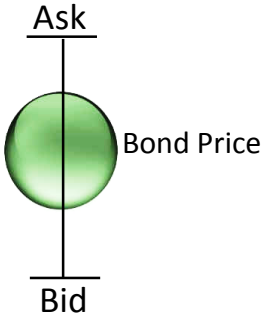
- The paper studies the determinants of bond ETFs’ liquidity and the impact on the bond market

- Relevant and topical question

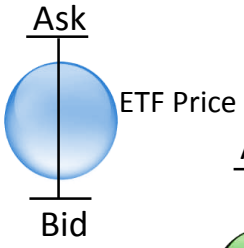
1st Conjecture: Limits of Arbitrage

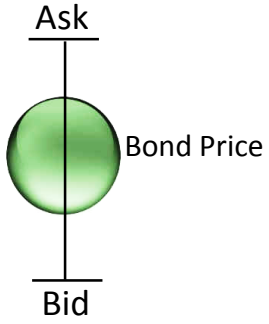
- The illiquidity of the bond market is a limit to arbitrage
- Hence, it can constrain MMs' liquidity provision
- Quite intuitive
  - Arbitrageurs respond to signal: **Price ETF – Price Bond**
  - But transaction costs can prevent arbitrage





Arbitrage occurs (creation of ETF shares)





Arbitrage does not occur

2nd Conjecture: Inventory Management by MMs

- MMs operate in both the ETF and Bond market
- MMs' bond inventory may distort their incentive to provide liquidity
- Example:
  - A MM starts the day with positive bond inventory
  - If the signal is negative (Price ETF < Price Bond), MM **should redeem ETF shares** and absorb more bonds
  - However, the MM **may prefer to create ETF shares** to unload his bond inventory to ETF sponsor, avoiding paying the high transaction costs in bond market
  - This transaction may exacerbate ETF mispricing

- Is it relevant in practice?

Inventory Management: Is it relevant?

- Each Bond ETF has on average 30 Authorized Participants (APs, i.e. MMs in primary market)
- Of these, on average 4 are active
- Non-registered liquidity providers are, however, around 17 per ETF
- MMs' idiosyncratic inventory shocks are likely to be diversified away

Example:

Knight Trading Group, in August 2012, suffered from trading-related losses and stopped making the market for about 200 ETFs.

The impact on ETF liquidity was minor because other liquidity providers stepped in

Relevant only in case of Aggregate Shocks

- For example, when there is a widespread bond selloff
- MMs may want to use the bond inventory to create ETF shares and sell them in the secondary market

- However, this turns out to be the right thing to do for MMs
- Selling pressure on bonds implies:

  $$\text{Price Bond} < \text{Price ETF}$$

  which is a signal for the creation of ETF shares

- In this case, inventory management is not distortionary

3nd Conjecture: ETF Arbitrage benefits Bond Liquidity

- This claim is not obtained in their model. It is just tested

- One could tell a story where arbitrageurs transfer liquidity shocks from ETF to Bond market
  - Ben-David, Franzoni, Moussawi (2017)
- Liquidity trading in the bond market increases...and bond liquidity is improved
  - Bond Yields decrease due to a lower liquidity premium

- But the effect could go the other way:
  - More liquidity shocks in bond market → Higher bond price volatility → Lower Liquidity due to inventory risk

- Ultimately, it is an empirical question

Comments about the Model: General

- Do you need a model?
  - Claim about liquidity provision and limits of arbitrage is uncontroversial
  - To talk about endogenous liquidity, you need a model with price formation, which you do not have
    - You can use Malamud (2015)
- A model may be useful to show the inventory management motive
  - But, then, you need to give MMs a reason to hold inventory
  - In your model, inventory holdings are exogenous
  - In fact, MMs may optimally determine inventory level anticipating future demand

Comments about the Model: Details

- You assume proportional transaction costs for bond trading
  - As a result, arbitrage always takes place
  - In practice, arbitrage often does not occur (inaction area)
  - For that, you need fixed transaction costs (bid-ask spread)
- You assume MMs to bear the transaction costs in bond market, as liquidity demanders
  - In fact, most of the time MMs earn the transaction costs (they are liquidity providers)
  - Results on inventory motive would change drastically

Comments about the Model: Smaller issues

- Corollary 1, part (iii), and Corollary 2, part (vii), are in contradiction when they both refer to the level of z^*

- Corollary 1, part (iii), when referring to the derivative of z^*, does not always hold , but only for values of $\rho << 1$
  - Intuition: when the bond and ETF prices are highly correlated ($\rho \approx 1$), carrying inventory to the last period is less risky. Hence, arbitrageurs act more aggressively on a given signal

Comments about the Empirics: Tables II - IV

- The tests on the impact of bond illiquidity and volatility on ETF arbitrage are the most convincing

- Do you have time FE in these tests?
  - Necessary to do cross-sectional comparison of impact of ETF premium on arbitrage activity to avoid capturing trends

- Measurement error in ETF premium is a concern
  - Higher volatility/illiquidity → less reliable pricing of bonds → more measurement error → weaker relation of arbitrage to signal

- Possible violation of exclusion restriction for instrument
  - Potential correlation in order flow in secondary and primary markets if APs act as agents for institutional investors

- To instrument VIX × ETF Premium, use VIX × Instrument, not VIX × Fitted ETF Premium

Comments about the Empirics: Tables V - VIII

- Test of a cross-partial derivative
  - Effect of MM's bond inventory on the sensitivity of arbitrage to the ETF premium

- Focus on the sign of interaction:
  ETF Premium × MM's inventory
  - You can break premium into +/-
  - You can break MM's inventory into +/-

- No need to break inventory into small/large
  - Hard to interpret and you lose power in the tails

- Use dummy variables
  - Easier to interpret the direction of the effect

- My interpretation of these results differs:
  - Convex effect of inventory on arbitrage sensitivity to signal
  - Periods/Bonds with large inventory are the most liquid ones
  - In those situations, arbitrageurs are more aggressive
  - Symmetric and opposite to the effect of limits of arbitrage

Comments about the Empirics: Tables X - XI

- Support for prediction that arbitrage activity reduces bond yields and improves bond liquidity (3rd Conjecture)

- You want to be careful about 2 dimensions of potential endogeneity
  - ETFs with more arbitrage activity tend to hold or trade in more liquid bonds to begin with
  - Arbitrageurs become more active when they expect an improvement in liquidity

Final Comments

- Paper can be streamlined in length and structure of empirical tests

- Provide more institutional details
  - Who are the MMs?
  - Describe episodes of stress in bond ETFs (e.g. taper tantrum, inflation fears in 11/2016)

- Most robust parts, which tie in nicely with motivation:
  - Effects of Limits of Arbitrage on liquidity provision
  - Effects of ETF arbitrage on bond market liquidity
- Inventory management effect
  - Potentially most interesting part
  - But need to do more to be convincing