Discussion: A Dynamic Equilibrium Model of ETFs

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Motivation

Model

Main Results

Comments
Worries

- **Kara Stein**, SEC Commissioner, Nov 9th 2015, Harvard Law School
  
  ‘However, it is increasingly apparent that ETFs behave very differently than mutual funds in our capital markets. The events of August 24 demonstrate that ETFs may act quite unusually in stressed market conditions and, frankly, break down in ways that we do not completely understand.’

- August 24th 2015 – ‘Many stocks opened extremely and unexpectedly low. Certain stocks dropped almost 50% and then quickly recovered, for no apparent reason. As a result of circuit breakers being tripped, there were over 1,200 trading halts that day. This means that trading in securities was suspended over 1,200 times temporarily, and over 75% of these halts were ETFs.[15] This is a stunning number of circuit breakers tripped in one day, and it is an especially stunning number of ETFs.’
About ETF’s

Figure: ETF’s are cousins of mutual funds, with some important differences – the main one being that ETF’s can be bought and sold all day like stocks on an exchange.
ETF manager, called a **sponsor** (e.g. BlackRock iShares) files a plan with SEC to create ETF.

Sponsor forms agreement with **authorized participant**, usually a market maker, specialist or large institutional investor, who can create/redeem ETF shares.

Authorized participant gets the underlying assets, perhaps by borrowing stock shares from a pension fund. Assets are placed in a trust and used to form ETF creation units – bundles of stock, usually 50,000 shares per unit. Trust provides shares of the ETF – slivers of the creation units – to the authorized participant.

At end of a trading day, authorized participants can create/redeem ETF shares via two ways:

- **In-kind transaction** – ETF shares created via AP delivering underlying assets and receiving corresponding number of ETF units
- **Cash transaction** – settled at end-of-day price of ETF

Authorized participant sells ETF shares on open market.

Investor can sell an ETF in the open market. Large investors can buy the original creation units and exchange them for the underlying assets. The creation unit is destroyed and the underlying assets can be sold.
Motivation

Questions

- Do ETF’s increase welfare in a world where we already have mutual funds?
- Does the creation/redemption mechanism lead to unusual asset return dynamics?
Model I

- \( t \in \mathbb{N}_0 \)
- bond: risk-free rate \( r \)
- \( N \) risky dividends, \( d_t \) is an \( N \)-dimensional vector, where
  \[
  d_t \sim \mathcal{N}[\bar{d}, \Sigma_d]
  \]

- vector of basic security prices
  \[
  p_t = (p_{t,1}, \ldots, p_{t,N})^T
  \]

- \( L \) ETF’s, ETF \( m \) pays following dividend defined by vector of weights
  \[
  f_m = (f_{m,1}, \ldots, f_{m,N})^T
  \]
  \[
  f_m^T d_t = (f_{m,1}, \ldots, f_{m,N})d_t
  \]

- Matrix of weights for all \( L \) ETF’s defined by
  \[
  F = [f_{mi}]_{m\in\{1,\ldots,L\},i\in\{1,\ldots,N\}}
  \]
Model II

- vector of ETF prices

\[ P_t = (P_{t,1}, \ldots, P_{t,m})^\top \]  

(5)

- Pricing gap

\[ P_t - Fp_t = NAV_t \]

(6)

- basic dealers

\[ E \left[ \sum_{t=0}^{\infty} -e^{-\beta t - \alpha D c_t} \right] \]

(7)

\[ M_{t+1}^D = (M_t^D - c_t - ((x_t^D)^\top p_t)e^r + (x_t^D)^\top (p_{t+1} + d_{t+1}) + \epsilon_t^\top d_{t+1} \]

exog. income shocks

(8)
Model III

- AP’s

\[
E \left[ \sum_{t=0}^{\infty} -e^{-\beta t - \alpha c_t} \right]
\]

(9)

\[
M_{t+1}^A = (M_t^A - c_t - (x_t^A)^T p_t - (y_t^A)^T P_t - 0.5(Z_{I,t+1}^T I Z_{I,t+1}) - 0.5(Z_{C,t+1}^T C Z_{C,t+1})) e^r
\]

(10)

\[
+ (x_t^A)^T (p_{t+1} + d_{t+1}) + (y_t^A)^T P_{t+1} + F^T (y_t^A)^T d_{t+1}
\]

(11)

\[
+ F^T (Z_{C,t+1}^T d_{t+1} + (Z_{I,t+1} + Z_{C,t+1})^T (P_{t+1} - F p_{t+1})
\]

(12)

- \(x_t^A\) holdings of basic securities
- \(y_t^A\) holdings of ETF’s
- \(Z_{I,t+1}\) in-kind creation/redemption – associated quadratic cost
- \(Z_{C,t+1}\) cash creation/redemption – associated quadratic cost – exposure to dividend risk
ETF clients – can only trade ETF’s

\[
E \left[ \sum_{t=0}^{\infty} -e^{-\beta t - \alpha E c_t} \right]
\]

(13)

\[
M_{t+1}^E = (M_t^E - c_t - (y_t^E)^\top P_t)e^r + (y_t^E)^\top (P_{t+1} + F d_{t+1}) + \xi_t^\top d_{t+1}
\]

(14)

exog. income shocks

From AP’s stochastic optimal control problem can see that an ETF and its basket are exposed to different demand shocks, so NAV and price not necessarily the same.
Results

- Creation/redemption mechanism can lead to a momentum in asset returns and a persistent ETF pricing gap.
- Introducing new ETF’s can reduce volatility and comovement in returns (when risk aversion is low) and increase liquidity.
- ETF trading costs lower than those of underlying assets.
- Proposition 7.1 – extends CAPM.
  - ETF trading introduces an additional risk factor into equilibrium dynamics – the ETF dividend, because of hedging demand.
- Too many ETF’s can reduce welfare – benefits outweighed by cost of extra risk factor.
Not many theoretical papers studying the impact of ETF’s – Bhattacharya & O’Hara study impact of introducing ETF’s on hard-to-trade assets

Not at an easy model to set up and solve

Do we really care that much about changes in asset return dynamics caused by ETF’s

Why not focus more on welfare effects?
  - What would the correct benchmark economy be?
  - Study welfare impact of introducing ETF’s in a world where there are mutual funds?
ETF’s are only non-redundant because of financial frictions (market incompleteness). How realistic are the frictions in the model?

I can trade individual shares and ETF’s. Why can’t everyone in the model?

Risk-free rate is exogenous – Loewenstein & Willard (2006) point out that endogenizing the risk-free rate can change results significantly.

Do dealers really face exogenous income shocks?

How small does volatility have to be for mathematical results to hold? Why not solve numerically?
The End