

Discussion: A Dynamic Equilibrium Model of ETFs

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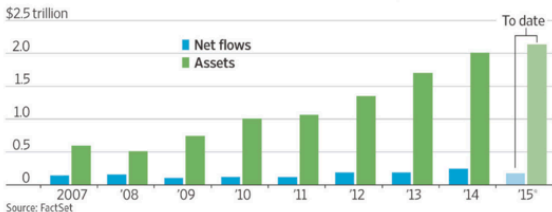
Worries

- **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

Money Flowing In

Net investor flows into ETFs, and the resulting assets under management



TOTAL NUMBER OF ETFS
1,623
TOTAL ASSETS (U.S.)
\$2.13 trillion (Compared with \$12.61 trillion in long-term mutual funds)
PERCENT OF MARKET
25% ETFs' share of the stock market's daily value of trading

LARGEST ETFs (in billions)	
SPDR S&P 500 ETF (SPY)	\$182
iShares Core S&P 500 ETF (IVV)	\$71
iShares MSCI EAFE ETF (EFA)	\$59
Vanguard Total Stock Market ETF (VTI)	\$58
PowerShares QQQ ETF (QQQ)	\$43

Note: Numbers for total products and assets excludes exchange-traded notes.
Sources: Morningstar; XTF Inc.; Investment Company Institute; FactSet

THE WALL STREET JOURNAL.

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

More on ETF's

- 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 them 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.

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

$$d_t \sim N[\bar{d}, \Sigma_d] \quad (1)$$

- vector of basic security prices

$$p_t = (p_{t,1}, \dots, p_{t,N})^T \quad (2)$$

- L ETF's, ETF m pays following dividend defined by vector of weights $f_m = (f_{m,1}, \dots, f_{m,N})^T$

$$f_m^T d_t = (f_{m,1}, \dots, f_{m,N}) d_t \quad (3)$$

- Matrix of weights for all L ETF's defined by

$$\mathbf{F} = [f_{mi}]_{m \in \{1, \dots, L\}, i \in \{1, \dots, N\}} \quad (4)$$

Model II

- vector of ETF prices

$$P_t = (P_{t,1}, \dots, P_{t,m})^\top \quad (5)$$

- Pricing gap

$$P_t - \underbrace{Fp_t}_{=NAV_t} \quad (6)$$

- basic dealers

$$E \left[\sum_{t=0}^{\infty} -e^{-\beta t - \alpha_D c_t} \right] \quad (7)$$

$$M_{t+1}^D = (M_t^D - c_t - ((x_t^D)^\top p_t) e^r + (x_t^D)^\top (p_{t+1} + d_{t+1}) + \underbrace{\epsilon_t^\top d_{t+1}}_{\text{exog. income shocks}} \quad (8)$$

Model III

- AP's

$$E \left[\sum_{t=0}^{\infty} -e^{-\beta t - \alpha c_t} \right] \quad (9)$$

$$M_{t+1}^A = (M_t^A - c_t - (x_t^A)^\top p_t - (y_t^A)^\top P_t - 0.5(Z_{I,t+}^\top \Lambda_I Z_{I,t+}) - 0.5(Z_{C,t+}^\top \Lambda_C Z_{C,t+}))e^r \quad (10)$$

$$+ (x_t^A)^\top (p_{t+1} + d_{t+1}) + (y_t^A)^\top P_{t+1} + \mathbf{F}^\top (y_t^A)^\top d_{t+1} \quad (11)$$

$$+ \mathbf{F}^\top (Z_{C,t+})^\top d_{t+1} + (Z_{I,t+} + Z_{C,t+})^\top (P_{t+1} - \mathbf{F}p_{t+1}) \quad (12)$$

- x_t^A holdings of basic securities
- y_t^A holdings of ETF's
- $Z_{I,t+}$ in-kind creation/redemption – associated quadratic cost
- $Z_{C,t+}$ cash creation/redemption – associated quadratic cost – exposure to dividend risk

Model IV

- ETF clients – can only trade ETF's

$$E \left[\sum_{t=0}^{\infty} -e^{-\beta t - \alpha_E c_t} \right] \quad (13)$$

$$M_{t+1}^E = (M_t^E - c_t - (y_t^E)^\top P_t) e^r + (y_t^E)^\top (P_{t+1} + \mathbf{F} d_{t+1}) + \underbrace{\xi_t^\top d_{t+1}}_{\text{exog. income shocks}} \quad (14)$$

- 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

Comments I

- 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?

Comments II

- 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