

## Summary of the Research Project Proposal:

# Inefficiencies in the pricing of exchange-traded funds

**Antti Petajisto**

Exchange-traded funds (ETFs) have recently become an extremely popular way for investors to adjust their exposure to broad asset classes such as US equities or even narrow market segments such as biotech stocks. The number of ETFs has surged in only a few years to over 800 funds with about \$800bn in assets at the end of 2009. Similarly to closed-end funds, ETFs are continuously traded on the stock exchange, but there is a key difference: investors can create or redeem ETF shares through the ETF sponsor. If the ETF price ever deviates from the net asset value (NAV) of its underlying portfolio, creating or redeeming ETF shares represents a pure arbitrage opportunity. As a result, investors generally assume that ETF prices are so close to their NAVs that any temporary premiums or discounts can be ignored.

However, empirical evidence indicates that many ETFs often trade at prices significantly above or below their NAVs. Not only does this suggest that arbitrage opportunities exist in this market, but it also presents ETF investors with an unexpected cost that they will sometimes bear. The average premium is about 9 basis points (bp), which is close to zero, indicating that there is no persistent discount or premium like in closed-end funds. But the volatility of the premium is still significant: it is 89 bp across all funds, and as high as almost 300 bp for emerging market bonds. This implies that the with a probability of 95%, the average ETF is trading within a range from -175 to +175 bp of its NAV, or an interval of 350 bp, which is economically very significant.

Stale pricing in the determination of the NAV is certainly one explanation for some of the nonzero premiums, particularly when the underlying assets are traded in a different time zone or when the underlying assets are illiquid. However, this does not explain the significant contemporaneous cross-sectional variation in premiums among similar ETFs: for example, a large municipal bond ETF can trade at a 3% discount while a very similar ETF trades simultaneously at a 2% premium. Neither does it explain the occasional premiums that exist even for liquid U.S.-traded underlying assets.

In this project, we want to systematically document the distribution of ETF premiums. We start by showing how large the premiums (and discounts) are in the cross-section and over time. We investigate their time-series properties to see how quickly the premiums revert. When premiums are measured relative to the published NAVs, we quantify the role of stale pricing in the underlying portfolio. Since the results of the analysis depend on the type of underlying asset, we conduct it separately for different types of ETFs, such as equities, bonds, commodities, and U.S. versus international markets.

Furthermore, we investigate how much of the variation in premiums is driven by systematic factors and therefore common across multiple ETFs. We relate it to measures of arbitrage capital and the limits to arbitrage faced by institutional investors who could otherwise make the market more efficient. Finally, we want to find out how a less sophisticated individual investor could use this information when occasionally trading in and out of ETFs. This is potentially relevant for millions of small retail investors who might otherwise be trading at disadvantageous prices.