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Short selling and exchange-traded funds returns: evidence from the London Stock Exchange

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Abstract

An Exchange Traded Fund (ETF) is a security that tracks a basket of stocks. An ETF investor gains immediate exposure to the basket, by taking either a long or short position on this instrument. Both hedgers and speculators can short ETFs, making the informational content of increases in ETF short interest difficult to interpret. Using high frequency (daily) short interest data for ETFs traded on the London Stock Exchange between June 2006 and April 2010, we examine the price impact on ETFs of increases in short interest. Contrary to the received wisdom for individual stocks, we report evidence that large increases in ETF short interest are associated with subsequent over-performance relative to a benchmark index.

1. Introduction

An interesting yet unexplored empirical question for short sellers, academics, and regulators is whether short selling in Exchange Traded Funds (ETFs) leads to predictable changes in ETF prices. An ETF is a security that tracks a basket of stocks, an index, or a fund. Traditionally, an increase in the short interest in a stock is viewed as a signal that the stock price is likely to fall, if market participants believe short sellers possess private information. In general, a short sale is costlier to execute than a long sale, owing to the need to cover the borrowing costs. Diamond and Verrecchia (1987) suggest only those investors with strong expectations of a significant price decline will choose to short. Accordingly, significant increases in short interest should be followed by negative abnormal returns.

On the contrary, Gastineau (2004) argues that short selling of ETFs may be tax-related, and therefore lacking in informational content. Gastineau (2008) develops the argument that a large increase in short interest does not necessarily indicate that short sellers expect an ETF portfolio to under-perform other ETFs in the same sector. To our knowledge this intuition has not previously been subject to empirical scrutiny, perhaps due to the lack of suitable ETF short interest data as well as the opaqueness of ETF data in general. This study is the first to investigate empirically the association between an increase in ETF short interest and the subsequent performance of ETFs. Using high-frequency (daily) ETF short interest data, we sort increases in ETF short interest based on shares on loan and the short interest ratio into deciles. For both measures, the most (least) heavily shorted deciles yield the highest (lowest) Jensen's alpha .[1]

Our results offer insights into ETF shorting, which differ from the received wisdom concerning individual stock shorting. For individual stocks, the literature suggests the higher the level of short interest, the larger is the negative abnormal return (Figlewski, 1981; Senchack and Starks, 1993; Choie and Hwang, 1994; Asquith and Meulbroek, 1995; Desai, Ramesh, Thiagarajan, and Balachandran, 2002; Asquith, Pathak, and Ritter, 2005). For ETF, our results suggest that the larger the increase in short interest, the larger is Jensen's alpha. We interpret this as evidence that hedgers, rather than

[1] The ETF short interest ratio is the percentage of available lendable ETFs sold short.

speculators, dominate the market for the short selling of ETFs in the UK. Hedgers take short positions because they are bullish and want to protect their portfolios, while speculators do so because they are bearish and want to profit from their expectations. This interpretation points to an executable trading opportunity, involving taking a long position in ETFs in response to signals of large increases in short interest.

The remainder of this paper is organized as follows. The next section provides a brief description of the characteristics of ETFs listed on the London Stock Exchange, and lending fees. Section 3 reviews the literature on the informational content of short interest. Section 4 describes our data and research methodology. Section 5 reports our main results and a robustness check. Finally Section 6 offers some concluding remarks.

2. Exchange Traded Funds and Lending Fees

Exchange Traded Funds are a variant of open-ended funds, listed and traded on exchanges in the same way as ordinary shares. Most ETFs track a basket of stocks or an index. Unlike normal open-ended funds, ETFs are traded continuously on an exchange, meaning they can be purchased, sold, and even shorted at any time during market trading hours. The distinctive advantage of ETFs is that they allow investors to gain exposure to a diverse range of assets, offering simple and efficient access to broad and sector indices. By going long or short on ETFs, investors can effectively gain access to a basket of stocks or an entire index, without engaging in the cumbersome process of investing in each of the constituent stocks. This feature makes ETFs a highly efficient investment tool. Hedgers may wish to short ETFs for portfolio insurance purposes, obtaining protection against market risk. Speculators may wish to short ETFs, if they hold a bearish view of ETF prices.

The first ETF was listed on the London Stock Exchange Main Market in April 2000. This was followed by a steady growth in the number of funds listed. In January 2002, the value of ETFs traded during the month was only £6 million. By January 2003 this value had risen to £172 million, and in January 2006 the value of ETFs traded was £799 million (Chelley-Steeley and Park, 2011). In February 2007, stamp duty for foreign domiciled ETFs was abolished. As a consequence the number of ETFs listed on the

London Stock Exchange increased by 146 percent on the 2006 figure; the monthly value traded increased by 103 percent; and the number of trades increased by 88 percent.[2]

In the UK, all ETF contracts are cleared through a central counterparty, Euroclear UK and Ireland. As the UK's central securities depository, Euroclear provides custodian services and operates the securities settlement system for almost all UK securities and at least 83 percent[3] of UK unit trust funds, including ETFs. Euroclear has published monthly and daily stock lending data since September 2003. In order to short an ETF, the seller must locate and borrow the ETF. Stock lending data on ETFs can be interpreted as a good proxy for the outstanding level of short interest in ETFs. The annual loan premium can range from nearly 10bp (basis points) in a very low interest rate environment, to a maximum of around 30bp if management recapture is built into the loan premium. If the loan premium rises above 30bp, ETF short sellers are likely to switch into futures contracts, and some ETF investors may create ETF shares to lend (Gastineau, 2004).

3. Related Literature

The extant literature provides three different perspectives on the expected relationship between short interest and stock returns. First, Diamond and Verrecchia (1987) develop a model based on a rational expectations framework, and derive a negative association between short interest and subsequent stock returns. When short selling is restricted, either directly or through the imposition of additional costs, uninformed traders tend to be driven out of the pool of shorts, and informational efficiency may be improved. Only well-informed traders with strong expectations of a price decline will choose to bear the cost of shorting stocks. Unexpected or unusually large increases in short interest tend to signal poor subsequent stock returns.

This perspective is supported by several empirical studies. Aitken, Frino, McCorry, and Swan (1998) find short sellers tend to use market orders to execute selling orders; this suggests they are informed traders. Asquith and Meulbroek (1995), Desai et al. (2002), and Asquith et al. (2005) find high levels of short interest in stocks are bearish signals

[2] See http://www.londonstockexchange.com/specialist-issuers/etfs/etfs.htm
[3] See Euroclear UK and Ireland Market Performance Statistics for October 2011.

of a negative relationship between the level of short interest and stock returns. Senchack and Starks (1993) and Choie and Hwang (1994) identify a negative association between changes in short interest and stock returns, in accordance with Diamond and Verrecchia's hypothesis. Choie and Hwang's (1994) find large increases in short interest provide a more informative signal than the level of short interest about short selling returns. Boehmer, Jones, and Zhang (2008) find heavily shorted stocks on the New York Stock Exchange (NYSE) significantly under-perform lightly shorted stocks over 20 trading days. Institutional non-program shorts are the most informative. Diether, Lee, and Werner (2009) find that portfolios of long, lightly shorted stocks and short, heavily shorted stocks yield positive abnormal returns over five trading days.

The second perspective, widely shared by technical traders and analysts and sometimes known as the 'Wall Street view', suggests a positive relationship between a high level of short interest and stock returns. A high level of short interest reflects a latent demand for shorted stocks. Short positions need to be covered eventually, resulting in future purchases that will place upward pressure on prices. A high level of short interest is a bullish signal (Epstein, 1995). Proponents suggest, from a contrarian viewpoint, that institutional investors do not sell short, so a high level of short interest reflects misguided pessimism on the part of the public and traders.[4] If the investing public and traders are wrong more often than they are right, a high level of short interest is a bullish (buying) signal (Biggs, 1966; Fosback, 1995). Despite its popularity among practitioners, the Wall Street view is not supported by most of the previous empirical evidence. The only study which supports this conjecture is documented by Au, Doukas and Onayev (2009). Using UK dataset, they show highly shorted stocks exhibit positive albeit statistically insignificant abnormal returns.

A third and final perspective suggests no association between a high level of short interest and stock returns. According to Brent, Morse, and Stice (1990), the increasing trend in short interest in the US from 1974 to 1985 relates mostly to hedging and arbitrage. Short interest is uninformative if it is driven by arbitrage. Using monthly

[4] Biggs (1966) quotes Joseph Granville's trading rule "*If the short interest is rising it means people are growing bearish on the issue. The further short interest rises, the more bearish is the public opinion on the stock. The market cannot accommodate that many people as being right and thus the stock is destined to advance. A rising short interest is bullish, the longer it rises, the more bullish it is."*

short interest data for stocks listed on the NYSE and NASDAQ for the period 1986-91, Woolridge and Dickinson (1994) conclude that short sellers do not possess superior timing skills on average, and do not generate unfair profits by driving prices down. They provide liquidity, however, by shorting into up markets and reducing short positions in down markets. Using a long-horizon weekly UK dataset for 2003-06, Au, Doukas, and Onayev (2009) find no significant relationship between a high level of short interest (proxied by stock lending) and stock returns. Using short interest as a selling signal may not be optimal. Short selling is dominated by arbitrage, and lacks informational content.

As noted above, we are unaware of any previous empirical evidence on the price impact of ETF short selling. Given that the first perspective is dominant both analytically and empirically, our prior hypothesis is that large increases in short interest in ETFs are associated with subsequent negative ETF returns.

4. Research Methodology

Daily data for shares on loan, the short interest measure used in this study, are obtained from Euroclear UK and Ireland for all 86 ETFs traded on the London Stock Exchange during the period June 2006 - April 2010. These ETFs are listed and described briefly in Table 1. Most ETFs traded on the London Stock Exchange during the period were equity funds, but there were some debt, real estate, and commodity funds. The ETF descriptions and daily closing prices are compiled from Bloomberg and Datastream. The data set contains 20,912 daily observations of changes in ETF shares on loan.

< Insert Table 1 here>

Figure 1 illustrates the growing importance of ETF shorting. Three alternative measures, the aggregate quantity of shorted ETFs, the aggregate supply of ETFs in Euroclear, and the median of the short interest ratio (short interest as a percentage of the available supply of ETFs) reflect an upward trend in the aggregate supply of ETFs over the observation period. Shorting, however, appears to become less prevalent, both in terms of aggregate volume and as a percentage of the available supply, towards the end of this period.

<Insert Figure 1 here>

Figure 2 illustrates the distribution of the sample by ETF type and year of inception. In Panel A, the majority of ETF shorts are for equity ETFs (N = 2666), followed by debt (298), real estate (72) and commodity (4). In Panel B, the most frequent year of inception is 2005 (903), followed by 2004 (687) and 2000 (409). The number of ETFs has declined sharply since 2008, plausibly as a consequence of the financial crisis.

<Insert Figure 2 here>

In the US, ETF short interest data are not publicly available. However, a weekly summary can be requested from the American Stock Exchange, and institutional ownership as a proxy for supply of shortable ETF shares can be retrieved via 13-F filings and similar quarterly filings with the US Securities and Exchange Commission (Gastineau, 2004). This institutional constraint precludes study of the informational content of ETF short interest in the US. In the UK, by contrast, Euroclear publishes daily ETF share lending positions after a delay of three trading days. Data relating to lending positions on Monday, for example, are available on Thursday. Accordingly, it is feasible to investigate the impact on prices of changes in ETF short interest. We test whether a trading strategy of shorting ETFs following an increase in short interest can yield abnormal profits.

In the UK, the most common motive for borrowing securities is to cover a short sale, with the short seller borrowing the securities to be delivered to the buyer on settlement. With reference to covered short sales, an ETF is deemed to have been shorted if and only if there is an increase in shares on loan. Two alternative measures of ETF short interest are employed: (i) increase in the natural logarithm of ETF shares on loan; and (ii) increase in the ETF short interest ratio, where the short interest ratio is the number of ETF shares on loan divided by the number of ETFs shares to be loaned through Euroclear. The latter measure is subject to the difficulty that an increase in the short interest ratio might be driven by a decrease in the denominator (shares available for loan). Accordingly, for an ETF to be deemed to have experienced an increase in short interest, it must experience an increase in shares on loan. We exclude daily observations

for which the increase in short interest is zero or negative, yielding a sample of positive increases in short interest in ETFs of 3,040 daily observations.

For each measure we sort the sample into portfolios based on increase-in-short-interest deciles: the portfolio for increase-in-short-interest decile 1 contains the daily observations on an ETF for 30 days after an increase in short interest assigned to the smallest decile; and the portfolio for increase-in-short-interest decile 10 contains the daily observations on an ETF for 30 days after an increase in short interest assigned to the largest decile. Let $\Delta s_{i,t}$ denote the increase in short interest for ETF i between day t–1 and day t. As noted above, daily changes in the short-interest ratio are observed for 86 ETFs over 30 trading days between June 2006 and April 2010. We observe $\Delta s_{i,t} > 0$ for 3,040 out of 20,912 daily observations. The 3,040 positive values of $\Delta s_{i,t}$ are sorted into 10 increase-in-short-interest deciles. We write $\{i, t\} \in j$ to denote ETF-trading day observations for which the positive observed value of $\Delta s_{i,t}$ belongs to decile j, for j=1,...,10. Descriptive statistics for each short interest measure and each increase-in-short-interest decile are reported in Table 2.

< Insert Table 2 here>

In order to compare the performance of portfolios defined with reference to the ETF increase-in-short-interest deciles, we adopt the Jensen (1968) alpha approach. In the market model, a positive alpha (intercept coefficient) indicates over-performance, and negative alpha indicates under-performance, relative to a benchmark index. The market model specification is as follows:

$$r_{i,t+\tau} - r_{f,t+\tau} = \hat{\alpha}_j + \hat{\beta}_j (r_{m,t+\tau} - r_{f,t+\tau}) + \varepsilon_{i,t+\tau}$$

where $r_{i,t+\tau}$ is the daily (calendar time) logarithmic return for ETF i on day $t+\tau$ for τ=1,…,30 following an observed increase in short interest observed for ETF i on day t; $r_{m,t+\tau}$ is the daily logarithmic return on an appropriate benchmark index on day $t+\tau$; and

$r_{f,t+\tau}$ is the risk-free rate proxied by the UK Treasury Bill rate on day $t+\tau$.[5] The intercept, $\hat{\alpha}_j$ (Jensen's alpha) measures the average abnormal daily return with respect to the benchmark. $\hat{\alpha}_j$ is estimated using the data from day t+1 to day t+30 following an increase in shares on loan or short interest ratio for ETF i on day t, over all $\{i, t\} \in j$.

We use the following benchmark indices: MSCI ACWI (All Countries Weighted Index) IMI (Investable Market Indices) Value Weighted Price Index for equity ETF; iBoxx Euro Corporates Overall Price Index for debt ETF; MSCI ACWI (All Countries Weighted Index) Real Estate Price Index for real estate ETF; and MSCI Commodity Producers Sector Capped Price for commodity ETF.

5. Empirical Results

To investigate the price impact on ETFs following an increase in short interest, Table 3 reports the estimated values of Jensen's alpha, the risk-adjusted performance measure, for each of the two sets of portfolios comprising ETFs sorted into increase-in-short-interest deciles. For both measures, we find no evidence of under-performance for heavily shorted ETFs in decile 10, and no evidence of over-performance for lightly shorted ETFs in decile 1. Indeed, the results suggest the opposite: heavily (lightly) shorted ETFs yield the highest (lowest) abnormal returns. For example, Jensen's alpha for decile 10 is 0.038% (increase in shares on loan measure) or 0.035% (increase in short interest ratio measure), and statistically significant in both cases. Assuming there are 240 trading days per year, this strategy translates into annualised risk-adjusted profits of 9.12% or 8.40%, respectively. For decile 1 the corresponding figures are 0.012% and 0.002%, respectively, and neither of these is significant. Although the relationship is not monotonic, there is a clear tendency for the estimated alpha to increase with both short interest measures.

<Insert Table 3 here>

The observation period for the results reported in Table 3 coincides with the financial crisis of the late-2000s, as well as a UK ban on short selling, effective during the period

[5] For example, on 3rd January 2007, where the annualized rate for the three-month UK Treasury-Bill was 5.0625%, the average daily return was 5.0625/365 = 0.0139%.

19th September 2008 to 16th January 2009. In order to investigate whether the relationship between short interest and performance might vary according to market trading conditions, Table 4 reports compares Jensen alphas for all deciles between pre and post (during?) financial crisis period. The cut-off date in partitioning our sample is 19th September 2008 which coincides with the start of the short selling ban. Our results show during the period prior to financial crisis, heavily shorted ETFs yield the highest abnormal returns using the first measure (increase in shares on loan), but no clear pattern using the second measure (increase in short interest ratio). Both measures show abnormal returns are the highest and statistically significant in heavily shorted deciles during and after the short selling ban period.

<Insert Table 4 here>

In Table 5 below, we compare the abnormal returns for all deciles according to the ages of ETFs. In so doing, we partition our sample based on the median of ETF years (5 years), and classify the age of ETFs between 0 and 5 years as 'young' and more than 5 years as 'old'. In the case of 'young' ETFs, the result is broadly consistent with that of the full sample. That is, for both measures, heavily shorted ETFs earn the highest abnormal performance and *vice-versa* for lightly shorted ETFs. For instance, the highest Jensen alpha using the first measure (increase in shares on loan) is in decile 10 (0.043%), and using the second measure (increase in short interest ratio) is in decile 9 (0.044%) followed by decile 10 (0.041%), and statistically significant in all cases. However, the abnormal returns are not statistically significant with to 'old' ETFs and there is no clear trend across different deciles. Our results appear to suggest that abnormal returns mainly stem from ETFs which are relatively new in the market.

<Insert Table 5 here>

Our prior hypothesis, that large increases in ETF short interest are associated with negative abnormal returns, is not supported by the data. Instead the results suggest that heavily shorted ETFs are likely to over-perform. This is generally consistent with empirical findings of Au et al., (2009), and the Wall Street view. It is plausible that a high degree of short interest is a sign of a latent demand for shorted ETFs. Short

positions need to be covered ultimately, resulting in future purchases that will place increasing pressure on prices. This could also reflect the fact that the market is dominated by hedgers. Hedgers who expect an increase in the value of the stock market index, or of a particular ETF, may short ETFs heavily so as to attain their desired hedge ratio and protect their portfolios against market risk. The goal of hedgers is not to speculate, but rather to create a balanced portfolio of long and short positions that offers a relatively low variance. Light shortings of ETFs, indicated by small increases in short interest, are likely to be undertaken by other traders, for reasons other than hedging. High increases in ETF short interest decile portfolios significantly overperform the market as compared to low increases decile portfolios.

As a robustness check, we apply the methodology used by Harper, Madura, and Schnusenberg (2006), as an alternative method for assessing the association between an increase in ETF short interest and subsequent ETF performance. We calculate cumulative average returns over a 35-day window before and after an increase in short interest (measured by the short interest ratio), for portfolios based on increase-in-short-interest deciles, constructed in the same way as before. In applying this methodology, we assume there is no tracking error between the ETFs and the underlying index.

Using the same notation as before, we let $CAR_{j,s} = (1/n_j)\sum\sum_{\{i,t\}\in j}\left(\sum_{\tau=-5}^{s} r_{i,t+\tau}\right)$ denote the cumulative average return from trading day t–5 to trading day t+s (for s=–5,...,30) before or after day t when a positive value of $\Delta s_{i,t}$ is observed for ETF i, calculated over the n_j ETF-trading day observations for which $\{i, t\} \in j$. Figure 3 plots $CAR_{j,s}$ for the increase-in-short-interest deciles j=1,…,10 over the event window (s = t–5, …, t+30). The results show that heavily shorted ETFs yield positive cumulative average returns, whereas lightly shorted ETFs yield negative cumulative average returns. The results of this exercise are consistent with the main results reported in section 5. The larger (smaller) the increase in ETF short interest, the larger (smaller) is the subsequent average return.

6. Conclusion

In this paper, we examine the association between increases in short interest and the subsequent performance of ETFs listed on the London Stock Exchange. As far as we are aware, this paper is the first to study the price effects of increases in short interest in ETFs. Tracking errors aside, shorting an ETF is similar to shorting an index. From both the practitioner and academic perspectives, the price impact is interesting to study, because more than one type of investor may be involved in the short selling of ETFs. Since different types of trader may have different motives for short selling, the signals are not easy to interpret. Accordingly, short selling of ETFs may be viewed as a high-risk financial activity.

Using two measures of ETF short interest, we create ten ETF portfolios defined on the basis of the magnitude of the increase in short interest. We estimate Jensen's alpha for each portfolio over a 30-day window following any observed increase in short interest. The pattern is the reverse of that reported in most previous studies of the association between increases in short interest in individual stocks and their subsequent performance, which indicate under-performance following large increases in short interest (Senchack and Starks, 1993; Choie and Hwang, 1994). We report evidence that ETFs tend to over-perform following large increases in short interest.

We interpret our findings as indicative that the short selling of ETFs is dominated by traders implementing hedging strategies. Hedgers take short positions because they are bullish, while speculators do so because they are bearish. Interestingly, this interpretation of the results points to an executable contrarian trading opportunity. It appears that when ETFs are being heavily shorted, indicated by large increases in ETF short interest, investors can trade profitably by taking a long position in ETFs. Our evidence provides new insights on how to interpret large increases in short interest.

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Table 1. ETF Data Samples

Ticker	ETF Name	Type	Inception
SGLD	Source Physical Mkt Plc Ltd Co	Commodity	30/06/2009
WOOD	Ishares S&P Timber	Commodity	12/10/2007
EEX5	Ishares Barclays Euro Corp Bond	Debt	25/09/2009
EEXF	Ishares Barclays Euro Corp Bond	Debt	25/09/2009
IBCI	Ishares Euro Inflation	Debt	19/12/2005
IBCX	Ishares Euro Corp	Debt	07/05/2003
IBGE	Ishares Barclays Euro T- Bond	Debt	06/03/2009
IBGL	Ishares Euro Govt Bond 15-30	Debt	08/12/2006
IBGM	Ishares Euro Govt Bond 7-10	Debt	11/12/2006
IBGS	Ishares Eur Govt	Debt	02/06/2006
IBGX	Ishares Euro Govt Bond 3-5	Debt	08/12/2006
IBTM	Ishares $ T- Bond 7-10	Debt	08/12/2006
IBTS	Ishares $ T- Bond	Debt	02/06/2006
IEBC	Ishares Barclays Euro Corp Bond £	Debt	06/03/2009
IEGA	Ishares Barclays Euro T- Bond £	Debt	20/04/2009
IEGY	Ishares Barclays Euro Govt Bond	Debt	16/04/2009
IEMB	Ishares Jpmorgan Usd	Debt	15/02/2008
IGLS	Ishares Ftse Uk Gilts	Debt	17/04/2009
IGLT	Ishares Ftse Uk All	Debt	01/12/2006
INXG	Etf Ishares £ Idx Lkd	Debt	01/12/2006
ITPS	Ishares $ Tips	Debt	08/12/2006
LQDE	Ishares Usd Coporate Bond	Debt	20/05/2003
SCOV	Ishares Iii Plc Ltd Co	Debt	01/08/2008
SE15	Ishares Barclays Euro Corp	Debt	25/09/2009
SGIL	Ishares Iii Plc Ltd Co	Debt	01/08/2008
SGLO	Ishares Citigroup Global Govt	Debt	06/03/2009
SLXX	Ishares Plc Ltd Co	Debt	01/09/2004
ALTE	Etfx Daxglobal Alternative Energy	Equity	07/10/2008
BRIC	European Etf Ishares	Equity	20/04/2007
DJMC	Ishares Dj Euro Stoxx	Equity	19/12/2005
DJSC	Ishares Dj Euro Stoxx	Equity	19/12/2005
EQQQ	Nasdaq 100 European	Equity	13/12/2004
EUE	Ishares Dj Eurostoxx 50	Equity	11/10/2001
EUN	Ishares Dj Stoxx 50	Equity	11/10/2001
IAEX	Ishares Aex	Equity	16/12/2005
IAPD	Ishares Dj Asia/Pacific	Equity	02/06/2006
IBZL	Ishares Msci Brazil	Equity	19/12/2005
IDFX	Ishares Plc Ltd Co	Equity	26/10/2004
IDJG	Ishares Dj Euro Stoxx	Equity	16/12/2005
IDJV	Ishares Dj Eurostoxx	Equity	20/12/2005
IDNA	Ishares Msci North America	Equity	02/06/2006
IDVY	Ishares Dj Eurostoxx	Equity	16/12/2005
IEEM	Ishares Msci Emerging Mkt	Equity	16/12/2005
IEER	Ishares Msci Eastern Europe	Equity	16/12/2005
IEMI	Ishares S&P Emerging	Equity	15/02/2008
IEUR	Ishares Ftseurofirst 80	Equity	20/12/2000
IEUT	Ishares Ftse Eurofirst	Equity	23/10/2001
IEUX	Ishares Msci Europe	Equity	05/06/2006
IFFF	Ishares Msci Ac Far East	Equity	07/12/2005
IH2O	Ishares S&P Global Water	Equity	19/03/2007
IJPN	Ishares Msci Japan Shares	Equity	04/10/2004
IKOR	Ishares Msci Korea	Equity	19/12/2005
IMEU	Ishares Msci Europe	Equity	06/07/2007
IMIB	Ishares Ftse Mib	Equity	06/07/2007
INFR	Ishares Ftse/Macquarie	Equity	20/10/2006
INRG	Ishares Global Clean Energy	Equity	06/07/2007
IPRP	Ishares Ftse/Epra Euro	Equity	19/12/2005
IPRV	Ishares S&P Listed Private	Equity	19/03/2007
IPXJ	Ishares Msci Pacific	Equity	17/04/2009
ISEM	Ishares Msci Emerging Mkt	Equity	07/12/2007
ISF	Ishares Ftse 100	Equity	19/05/2000
ISFE	Ishares Ii Plc Ltd Co	Equity	12/05/2008
ISJP	Ishares Iii Plc Ltd Co	Equity	12/05/2008
ISP6	Ishares Iii Plc Ltd Co	Equity	12/05/2008
ISUS	Ishares Msci Usa Islamic	Equity	07/12/2007
ISWD	Ishares Msci World Islamic	Equity	07/12/2007
ITKY	Ishares Msci Turkey	Equity	03/11/2006
ITWN	Ishares Msci Taiwan Index	Equity	19/12/2005
IUKD	Ishares Ftse Uk Dividend Plus	Equity	16/12/2005
IUSA	Ishares S&P 500	Equity	19/03/2002
IWDP	Ishares Ftse Epra/Nareit	Equity	20/10/2006
IWRD	Ishares Msci World	Equity	19/12/2005
IWXU	Ishares Ftse Developed	Equity	17/04/2009
IXMU	Ishares Msci Europe Ex-Emu £	Equity	17/04/2009
LTAM	Ishares Msci Latin America	Equity	12/10/2007
MIDD	Ishares Ftse 250	Equity	19/05/2004
S250	Source Mkt Ftse 250 Source	Equity	20/04/2009
SACC	Ishares S&P 500 (Acc)	Equity	25/09/2009
SCAN	Ishares Msci Canada	Equity	22/01/2010
SEMA	Ishares Msci Emerging Mkt (Acc)	Equity	25/09/2009
SEMS	Ishares Msci Emerging Mkt	Equity	06/03/2009
SMEA	Ishares Msci Europe (Acc)Plc	Equity	25/09/2009
XLKS	Technology S&P Us Sel	Equity	04/01/2010
IASP	Ishares Ftse Epra/Nareit	Real Estate	20/10/2006
IUKP	Ishares Ftse Epra/Nareit	Real Estate	19/03/2007
IUSP	Ishares Ftse Epra/Nareit	Real Estate	03/11/2006

Note: This table contains the tickers, names, types and date of inception of funds of all Exchange Traded Funds samples traded on the London Stock Exchange during the study period June 2006 through April 2010.

Table 2. Descriptive Statistics

Panel A: Increase in ETF Shares on Loan Deciles (in %)

Decile	N	Mean	Std Dev	Min	0.25	Median	0.75	Max
1	304	0.210	0.133	0.004	0.089	0.205	0.324	0.460
2	304	0.782	0.186	0.460	0.625	0.782	0.939	1.114
3	304	1.609	0.297	1.116	1.351	1.617	1.870	2.126
4	304	3.005	0.576	2.126	2.510	2.956	3.479	4.056
5	304	5.415	0.828	4.058	4.727	5.382	6.104	6.943
6	304	8.987	1.298	6.958	7.836	8.924	10.016	11.388
7	304	14.414	2.115	11.393	12.516	14.054	15.948	18.734
8	304	25.142	4.296	18.734	21.309	24.521	28.936	33.492
9	304	47.036	8.646	33.566	39.148	47.014	53.650	64.602
10	304	139.972	91.840	64.756	81.798	109.308	162.521	863.070

Panel B: Increase in ETF Short Interest Ratio Deciles (in %)

Decile	N	Mean	Std Dev	Min	0.25	Median	0.75	Max
1	304	0.002	0.002	0.000004	0.001	0.002	0.003	0.005
2	304	0.010	0.010	0.005	0.007	0.010	0.012	0.015
3	304	0.022	0.022	0.015	0.018	0.022	0.025	0.030
4	304	0.041	0.042	0.030	0.035	0.042	0.047	0.053
5	304	0.070	0.069	0.053	0.060	0.069	0.079	0.090
6	304	0.114	0.114	0.090	0.100	0.114	0.128	0.144
7	304	0.184	0.182	0.144	0.161	0.182	0.204	0.232
8	304	0.316	0.310	0.232	0.271	0.310	0.365	0.415
9	304	0.593	0.578	0.415	0.482	0.578	0.702	0.833
10	304	2.632	1.337	0.834	1.009	1.337	2.125	71.375

Notes: An ETF is deemed to have been shorted if and only if there is an increase in shares on loan. The degree of ETF shorting is measured in two ways: a) increase in ETF shares on loan; b) increase in ETF short interest ratio. Panel A presents the summary statistics of increases in ETF shares on loan while Panel B shows the summary statistics of increases in ETF short interest ratio for each decile during the sample period June 2006 through April 2010. Decile 1 contains the lowest increases whereas Decile 10 contains the highest increases in ETF shares on loan or short interest ratio. An increase in ETF shares on loan is natural log increase in shares on loan while an increase in short interest ratio is a simple arithmetic increase in the ETF short interest ratio from one day to the next. The short interest ratio is the percentage of available (lendable) supply of ETF shares being lent out.

Table 3 Comparison of Jensen Alphas between Deciles

Panel A: Increase in Shares on Loan Deciles

Decile	*N*	Alpha (%)	Std Error (%)	t-stat	P-value	Beta	Std Error	t-stat	P-value
1	304	0.012	0.012	1.00	0.32	0.833	0.010	85.22	0.00
2	304	0.023	0.011	2.04	0.04	0.879	0.009	94.78	0.00
3	304	0.009	0.012	0.72	0.47	0.904	0.009	95.44	0.00
4	304	0.016	0.012	1.34	0.18	0.875	0.009	94.49	0.00
5	304	0.022	0.011	2.02	0.04	0.891	0.009	95.74	0.00
6	304	0.020	0.013	1.53	0.13	0.959	0.010	92.56	0.00
7	304	0.029	0.013	2.24	0.03	0.911	0.011	84.05	0.00
8	304	0.019	0.012	1.64	0.10	0.830	0.011	77.13	0.00
9	304	0.032	0.013	2.42	0.02	0.845	0.011	76.56	0.00
10	304	0.038	0.013	3.03	0.00	0.805	0.010	77.48	0.00

Panel B: Increase in Short Interest Ratio Deciles

Decile	*N*	Alpha (%)	Std Error (%)	t-stat	P-value	Beta	Std Error	t-stat	P-value
1	304	0.002	0.013	0.18	0.86	0.800	0.010	82.36	0.00
2	304	0.019	0.013	1.45	0.15	0.853	0.010	81.41	0.00
3	304	0.006	0.013	0.45	0.66	0.879	0.010	84.21	0.00
4	304	0.018	0.012	1.49	0.14	0.858	0.010	88.46	0.00
5	304	0.024	0.012	1.94	0.05	0.899	0.010	90.57	0.00
6	304	0.025	0.013	2.03	0.04	0.922	0.011	83.85	0.00
7	304	0.032	0.012	2.65	0.01	0.898	0.010	93.74	0.00
8	304	0.026	0.012	2.19	0.03	0.929	0.009	100.45	0.00
9	304	0.034	0.012	2.89	0.00	0.828	0.010	85.56	0.00
10	304	0.035	0.012	2.98	0.00	0.903	0.011	82.33	0.00

Notes: This table reports the alphas for all deciles; Panel A shows alphas for increases in shares on loan deciles while Panel B shows alphas for increases in short interest ratio deciles. Decile 1 contains the lowest increases whereas Decile 10 contains the highest increases in ETF shares on loan or short interest ratio. Alphas (0, +30) are measured using the Jensen alpha method:

$$r_{i,t+\tau} - r_{f,t+\tau} = \hat{\alpha}_j + \hat{\beta}_j (r_{m,t+\tau} - r_{f,t+\tau}) + \varepsilon_{i,t+\tau}$$

Table 4 Comparison of Jensen Alphas between Pre and Post Financial Crisis

Panel A: Increase in Shares on Loan Deciles

Pre Financial Crisis				Post Financial Crisis			
Decile	*N*	Alpha (%)	t-stat	Decile	*N*	Alpha (%)	t-stat
1	119	0.018	0.84	1	185	0.039	2.79
2	124	0.034	1.67	2	180	0.033	2.45
3	116	-0.016	-0.86	3	183	0.034	2.02
4	121	0.015	0.81	4	183	0.033	2.39
5	121	0.002	0.10	5	184	0.017	1.11
6	120	0.034	1.86	6	182	0.039	2.26
7	121	0.055	2.42	7	187	0.032	2.18
8	119	0.001	0.05	8	186	0.026	1.79
9	119	0.023	1.18	9	187	0.045	2.91
10	120	0.064	2.61	10	183	0.030	1.97

Panel B: Increase in Short Interest Ratio Deciles

Pre Financial Crisis				Post Financial Crisis			
Decile	*N*	Alpha (%)	t-stat	Decile	*N*	Alpha (%)	t-stat
1	121	0.019	0.82	1	184	0.014	0.94
2	121	0.015	0.66	2	185	0.032	2.02
3	119	-0.004	-0.22	3	184	0.016	1.00
4	119	0.042	2.20	4	185	0.013	0.88
5	119	0.017	0.83	5	183	0.031	2.02
6	121	0.026	1.36	6	184	0.047	3.06
7	121	0.039	2.10	7	184	0.036	2.36
8	121	0.032	1.62	8	185	0.038	2.51
9	121	0.021	1.05	9	182	0.047	3.14
10	117	0.018	0.94	10	184	0.051	3.78

Notes: This table reports the alphas for all deciles and compares between pre and post financial crisis period. The cut-off date for financial crisis is 19th September 2008 which coincides with the start of short selling ban. Panel A shows alphas for increases in shares on loan deciles while Panel B shows alphas for increases in short interest ratio deciles. Decile 1 contains the lowest increases whereas Decile 10 contains the highest increases in ETF shares on loan or short interest ratio. Alphas (0, +30) are measured using the Jensen alpha method:

$$r_{i,t+\tau} - r_{f,t+\tau} = \hat{\alpha}_j + \hat{\beta}_j (r_{m,t+\tau} - r_{f,t+\tau}) + \varepsilon_{i,t+\tau}$$

Table 5 Comparison of Jensen Alphas between Young and Old ETFs

Panel A: Increase in Shares on Loan Deciles

Young ETFs				Old ETFs			
Decile	*N*	Alpha (%)	t-stat	Decile	*N*	Alpha (%)	t-stat
1	222	0.017	1.11	1	83	0.006	0.34
2	222	0.024	1.68	2	81	0.016	0.94
3	220	0.008	0.52	3	81	0.010	0.60
4	223	0.012	0.85	4	81	0.011	0.61
5	223	0.022	1.51	5	82	0.030	1.52
6	221	0.030	1.86	6	82	-0.006	-0.30
7	222	0.020	1.23	7	81	0.034	1.63
8	224	0.022	1.66	8	83	0.035	1.64
9	224	0.042	2.56	9	81	0.022	1.22
10	223	0.043	2.77	10	81	0.006	0.29

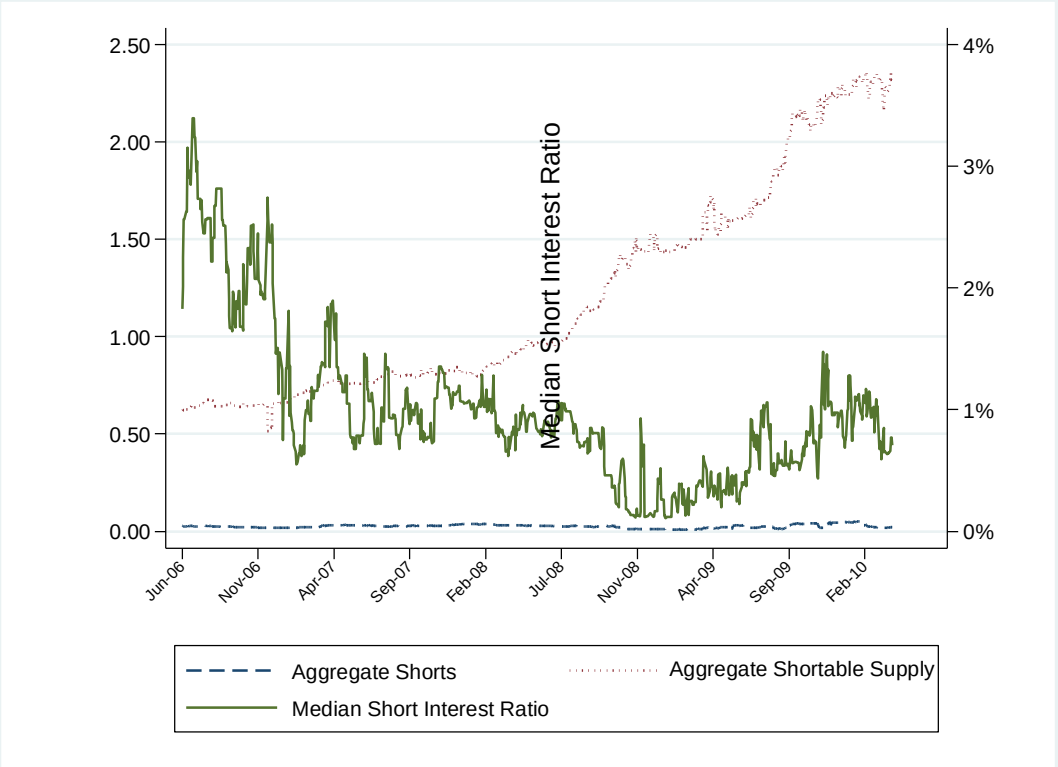
Panel B: Increase in Short Interest Ratio Deciles

Young ETFs				Old ETFs			
Decile	*N*	Alpha (%)	t-stat	Decile	*N*	Alpha (%)	t-stat
1	222	0.017	1.03	1	83	-0.001	-0.06
2	223	0.002	0.09	2	81	0.004	0.20
3	222	0.013	0.84	3	82	0.010	0.51
4	223	0.012	0.83	4	82	0.019	1.00
5	222	0.039	2.53	5	81	0.020	1.01
6	221	0.019	1.23	6	81	0.007	0.37
7	222	0.028	1.89	7	82	0.026	1.38
8	223	0.027	1.88	8	81	0.035	1.84
9	223	0.044	3.17	9	83	0.012	0.60
10	223	0.041	2.79	10	80	0.021	1.30

Notes: Notes: This table reports the alphas for all deciles and compares between young and old ETFs. The partition is based on the median of ETFs, i.e., 5 years. Panel A shows alphas for increases in shares on loan deciles while Panel B shows alphas for increases in short interest ratio deciles. Decile 1 contains the lowest increases whereas Decile 10 contains the highest increases in ETF shares on loan or short interest ratio. Alphas (0, +30) are measured using the Jensen alpha method:

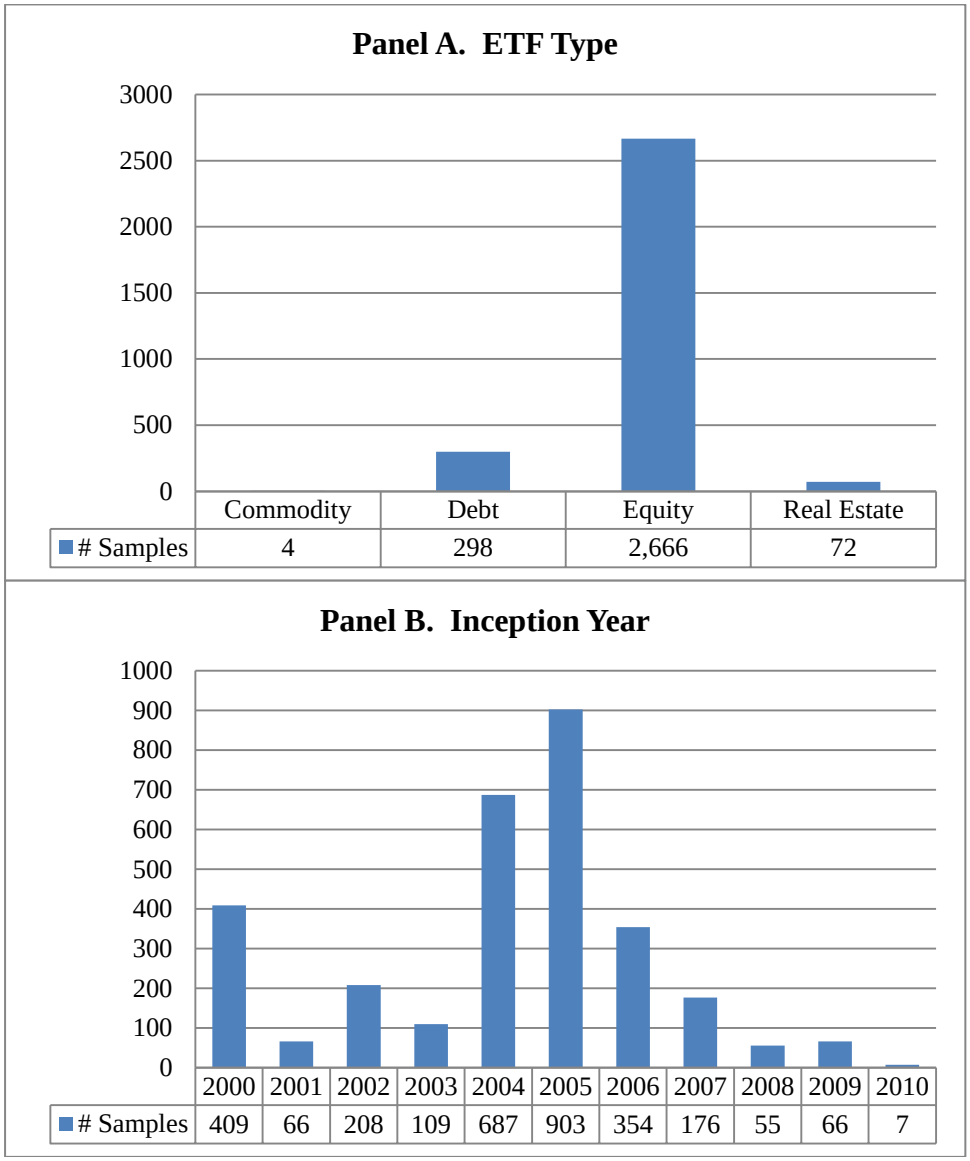
$$r_{i,t+\tau} - r_{f,t+\tau} = \hat{\alpha}_j + \hat{\beta}_j (r_{m,t+\tau} - r_{f,t+\tau}) + \varepsilon_{i,t+\tau}$$

Figure 1. Time Series of Three Short Selling Measures for ETF Shares



Notes: This figure shows market aggregate shorts, shortable supply, and median short interest ratio for ETF shares traded on the London Stock Exchange from June 2006 through April 2010. The short interest ratio is the percentage of available (lendable) supply of ETF shares sold short. The aggregate shortable (lendable) supply is the total number of ETF shares that can be borrowed and shorted. The aggregate shorts is the total number of ETF shares that has been borrowed and shorted by investors.

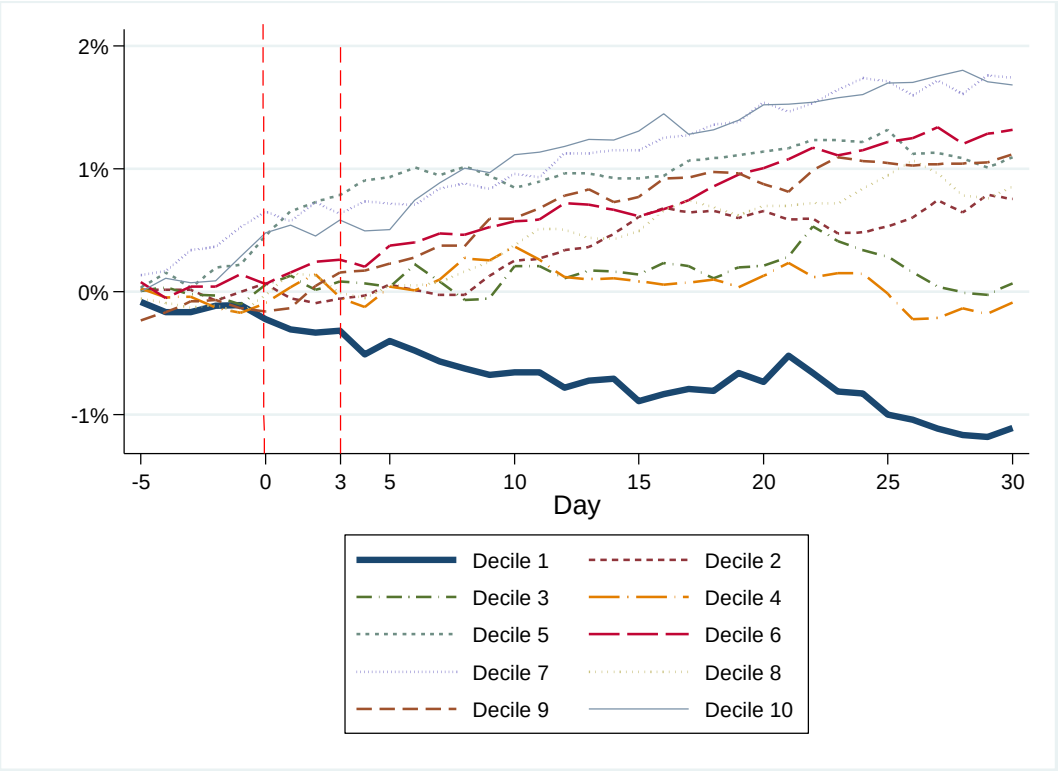
Figure 2. ETF Shorts Samples by Type and Inception Year



Notes: These figures report the distribution of the ETF shorts samples from June 2006 through April 2010. The total number of samples is 3040. These samples are distributed by type and year of inception. The benchmarks used are as follows:

a) Equity ETF; MSCI ACWI (All Countries Weighted Index) IMI (Investable Market Indices) Value Weighted Price Index
b) Debt ETF; iBoxx Euro Corporates Overall Price Index
c) Real Estate ETF; MSCI ACWI (All Countries Weighted Index) Real Estate Price Index
d) Commodity ETF; MSCI Commodity Producers Sector Capped Price

Figure 3. Cumulative Average Returns for all ETF Deciles



Notes: This figure presents the comparison of cumulative average returns from five trading days before through 30 trading days after between the ten deciles. Day0 is the day of occurrence of increases in ETF short interest. Day3 is the day when the short interest information on ETFs is released to the public. Increases in ETF short interest are sorted in deciles. Decile 1 contains the lowest increases, while decile 10 contains the highest increases in ETF short interest. Cumulative average returns are cumulative values of daily logarithmic returns of ETFs for each decile.